Medico-Legal Update

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INTRODUCTION

Death note or Suicide note is actually a message left behind by a person who committed suicide; it is important piece of evidence to find out the intention of the deceased, especially when it contains the reason behind his death. In this situation, it helps medico legally to confirm the actual manner of death. Occasionally, it is faked to start a new life or avoid prison, or for other reasons.1 Studying of the content of the suicide note not only helps medico legally, but also to understand and search for the preventive measures to reduce the incidences of suicide. The present article focuses on both aspects of the importance of suicide note.

Reasons for committing Suicide

Intentional killing of oneself i.e. suicide is considered as a crime in various areas of the globe. It is almost always associated with some reason. Badrinarayana (1977) revealed that younger people (10 to 30 years) were more likely to attempt suicide and in majority of cases attempts were due to mental illness and disturbed interpersonal relationships.2 Srivatsava et al. (2004) identified unemployment, presence of a stressful life event in the last six months, suffering from physical disorders and having idiopathic pain as definite risk factors for attempting suicide.3

Bagadia et al conducted a study on 521 patients admitted for suicidal behavior and observed that previous attempts were reported in 7% with 2.4% having more than one previous attempt. Depression (39.73%), schizophrenia (24.4%) and hysteria (14%) were the most common psychiatric diagnosis made.4

The common reasons in suicide are Unbearable Psychological Pain, Cognitive Constriction or Tunnel vision, Indirect Expressions, Inability to Adjust, Ego, Interpersonal Relations, Rejection-Aggression (Loss is often an unbearable narcissistic injury) and Identification-Egression (Failure to meet emotional needs from emotionally tied person).5 So, Suicide is mainly due to psychological and emotional distress which occurs when people perceive the world as threatening.6

Prevention of Suicide and Role of Suicide Note:

Vijayakumar expresses the urgent need for suicide prevention in India and stresses that suicide is a multifaceted problem and hence the prevention programs should also be multidimensional. Collaboration, coordination, cooperation and commitment are needed to develop and implement a
national plan, which is cost-effective, appropriate and relevant to the needs of the community. In India, suicide prevention is more of a social and public health objective than a traditional exercise in the mental health sector.7

An assailant, while committing a murder, leaves a number of evidences. Similarly, a person contemplating suicide also leaves some important evidence which helps an investigator to find out the manner of death. Suicide Note is one such evidence. It can be a written note, an audio message or a video. The common reasons why people, committing suicide, choose to write a suicide note include:

• To ease the pain of those known to the victim by attempting to dissipate guilt.
• To increase the pain of survivors by attempting to create guilt.
• To set out the reason(s) behind suicide.
• To express thoughts and feelings that the person felt unable to express in life.
• To give instructions for disposal of the remains.
• Occasionally, to confess about some offence.

Case 1: A school girl committed suicide as she was unsatisfied with her academic performance. She specifically mentioned about this in her suicide note and also expressed that her parents are not at all related to her death. [Photo 1]

Case 2: A police person committed suicide as he was suffering from incurable disease. He mentioned in his suicide note that his family members are responsible for the disease. [Photo 2]

Girdhar et al studied 320 suicides in the New Delhi area, India and found that the note writers do not differ greatly from other suicides. Males wrote more notes and suicide in India is associated with psychiatric/psychological and social factors.8

Haines et al (2011) studied 1051 suicides cases and found that note writers are more often in the midst of interpersonal conflicts and, therefore, have more need to communicate to others. However, those who do not leave a suicide note were medically ill and under psychiatric care and they assume that the reasons for their decision would be obvious.5

The content of a suicide note may be distressing to family and friends, when it express anger and blame toward them. However, many suicide notes do express love for their family and friends and explain in a reasonable manner as to why they are making the decision. Suicide note also has a multiple meaning if it is examined within the context of the person’s life.5 Thus, a suicide note can be an important piece of information in assessing mental status of the patient in psychological autopsies of completed suicide cases as well as in those who survived the attempt and can be used to find the solutions or treat any evident psychopathology in the survivors.

Foster (2003) studied the role of suicide notes themes in framing suicide prevention strategies and concluded that cognitive therapy techniques may have an important role to play in suicide prevention and ideally all health professionals working with suicidal people should be familiar with basic cognitive therapy techniques, especially problem solving skills training.9 Cognitive Therapy is most widely researched psychotherapy and found to be very useful in the treatment of emotional problems by changing or
restructuring maladaptive patterns of thought. Patients are taught how to uncover and re-examine their negative beliefs, and replace them with more adaptive ways of viewing life events. So, this technique helps patients to learn self-help that can produce rapid symptom relieve, solve current life problems, and improve self-esteem. The treatment includes a 12-week acute phase and a continuation phase, over 6 months of contact. It is primarily an individual therapy but also includes family interventions as needed to reduce the adolescent’s suicide risk.\(^\text{10}\)

Cognitive Behavior Therapy for Suicide Prevention (CBT-SP) is based on a Stress-Diathesis Model of suicidal behavior. The diathesis for suicidal behavior includes multiple factors, such as sex, religion, familial and genetic components, childhood experiences and psychosocial support system. The stressors trigger suicidal behavior in the context of an individual who possesses the diathesis. Stressors include a variety of psychosocial events, such as interpersonal conflict and work or school-related difficulties. CBT-SP acts to modify reactions to stressors both acutely and chronically in the context of vulnerability (i.e. positive diathesis). A central focus of CBT-SP is the identification of proximal risk factors and stressors. These risk factors are identified by conducting a detailed chain analysis of the sequence of events, and their reactions to these events, that led to the suicidal crisis.\(^\text{10}\)

Brown et al conducted a research on suicide attempters and concluded that cognitive therapy proved better for treating depression and feelings of hopelessness than the methods available. They observed that the Cognitive therapy sessions helped patients to learn new ways to handle negative thoughts and feelings of hopelessness. In a relapse-prevention task, the participants were asked to focus directly on the factors that led to their previous suicide attempts and explain them the methods to respond to these situations in a more adaptive way. If they handle these situations successfully, their cognitive therapy ended; if they were unsuccessful, additional sessions were provided.\(^\text{11}\)

**Medico-legal and Legal Importance of Suicide Note**

**Direct evidence vs. Suicide note**

In Sarbans Singh and Ors. Vs. State of NCT of Delhi, the deceased has expressed her regrets in the suicide note, for not possessing the good virtues of a woman and that she was unable to look after either her husband or her in-laws. She specifically mentioned that her in-laws have not caused her any harassment on any count and that her death be treated as merely a suicide. The question that arises in this case is whether in view of the statements of the parents of the deceased alone charge can be framed against the accused husband and his relatives, by overlooking the other evidence including the suicide note which also is a part of material placed on the record by the prosecution itself. The High Court observed that there is no doubt that suicide note is genuine and discharge the petitioner on the basis of guidelines set by Supreme Court in Union of India vs. Prafulla Kumar Samal Anr. In this Leading case Supreme Court declared that the court has the power to find out whether a prima facie case against the accused has been made out. However, the test to determine a prima facie case would naturally depend upon the facts of each case and it is difficult to lay down a rule of universal application. By and large however if two views are equally possible and the judge is satisfied that the evidence produced before him give rise to some suspicion but not grave suspicion against the accused, he will be fully within his right to discharge the accused.

**Suicide note and Section 306 IPC**

In Bindu Patel vs. State of Madhya Pradesh, the High Court observed that the husband committed suicide by consuming some poisonous substance, while getting disturbed by his wife’s taunts and immoral activities. From the suicidal note it was revealed that wife (petitioner/applicant) was having illicit relations with more than one person and even after repeated warning and advice, she continued with these activities. It is also mentioned in the suicide note that she aborted her pregnancy without consent of her husband. The High Court upheld the judgement of Trial Court and mentioned that trial Court has not committed any illegality or perversity or not committed any error in framing the charge u/s 306 IPC against the wife as there is prima facie case against her.

In Deepak Prabhakarrao Chondekar vs. State of Maharashtra, the High Court observed that under section 306 IPC there has to be a clear mens rea to commit the offence. It also requires an active act or direct act which led the deceased to commit suicide seeing no other option and this act or illegal omission must have been intended to push the deceased into such an ultimate position that he commits suicide.

In Madan Mohan Singh vs State of Gujrat, the Supreme Court observed that in the so-called suicide
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note, it cannot be said that the accused ever intended that the driver under him should commit suicide or should end his life and did anything in that behalf. In order to bring out an offence under Section 306 IPC specific abetment as contemplated by Section 107 IPC on the part of the accused with an intention to bring out the suicide of the concerned person as a result of that abetment is required. Court also observed that there is no nexus between the so called suicide and any of the alleged acts on the part of the appellant. The person like the appellant in present case who is serving in a responsible post would certainly suffer great prejudice, were he has to face prosecution on absurd allegations of irrelevant nature. For all these reasons Supreme Court quashed the proceedings initiated against the accused.

In Dr. B.P. Singh Anr V State & Ors, the Delhi High Court observed that most cases have arisen out of matrimonial disputes, in which one of the spouses asks the other to “go and die” immediately following a quarrel. In these cases it has been held by the Supreme Court that such oral statement by itself will not amount to abetment to commit suicide in terms of Section 306 IPC read with 107 IPC thereof. There has to be some overt act which really drives the deceased to commit suicide.

Suicide Note as a valid will

Suicide note may be considered as a valid will if it meets the requirements for the appropriate jurisdiction. In India, The will can be made at any age after 21 years and procedure of making legally valid will is very simple as compared with many other countries. A will can be made on plain paper and not necessarily on judicial or non judicial stamp paper. It may be typed or handwritten (Holographic will). However, it is advisable to write will in his/her own hand writing so that the same can be verified later in case of any doubts raised by the relatives. Section 63(c) of the Indian Succession Act prescribes that a will should be witnessed by two witnesses. It is better to select the witnesses who are not related to the party (Independent witnesses). These witnesses only certify that the testator has signed the will in their presence. Similarly, revocation of will can also be made in writing through declaring an intention to revoke and the writing must be signed by the testator and attested by two witnesses.

However, it is not seen that a person committing suicide certifies his suicide note-cum-will or suicide note -cum revocation of will by independent witnesses. So, the question arises whether such note can act as a will in the absence of signatures of independent witnesses?

This question is a complex one. South Africa Court first time held that if a court is satisfied that a document or the amendment of a document drafted or executed by a person who has died since the drafting or execution thereof, was intended to be his will or an amendment of his will, the court shall order the Master to accept that document as a will, although it does not comply with all the formalities for the execution or amendment of wills.10

However, Indian Courts have not admitted such suicide notes as valid wills due to absence of signature of two independent witnesses, who have seen the testator sign or affix his mark to the will. There is one more question related to the validity of such will and this is about the soundness of mind of the testator at the time of making suicide note cum will. However, a person who writes a will is presumed to be of sound mind under Indian law. The burden of proof is on the person who believes that the testator was of unsound mind, which is very difficult to prove.

A valid holographic will is one that is written entirely in decedents own handwriting, and signed, and indicates testamentary intent. When a suicide note fulfills all these requirements, the note could certainly be legally recognized as a valid will. However, such holographic will, without the certification of independent witnesses, are not legally valid under Indian Law.

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Conflict of Interest Statement

This is to certify that the research article entitled “Importance of Suicide Note: In Indian Context” submitted by us has not been submitted to any other journal for publication. Measures have been taken not
to reveal identity of the victim. All of us have same conclusion.

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REFERENCES

5. http://www.suicidefindinghope.com/content/suicide_notes
12. Sarbans Singh and Ors. Vs State of NCT of Delhi, 2005 Cri.LJ 2625
13. Bindu Patel vs State of Madhya Pradesh, Criminal Rev No.604/2012 in the High Court of Madhya Pradesh: Jabalpur
16. Dr. B.P. Singh Anr V State & Ors. In the High Court of Delhi WP (CRL) 2152-53 of 2005 & Crl M A 12445/05, 13016/07, 3710/08, 8133/08
Estimation of Stature from Dimensions of Foot

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ABSTRACT

Background: Establishing personal identity is one of the main concerns in forensic investigations. Estimation of stature forms a basic domain of the investigation process in unknown and co-mingled human remains in forensic anthropology. The objective of the present study was to set up standards for estimation of stature from the foot length and breadth.

Method: The sample for the study constituted 120 medical students (60 males and 60 females) of Sri Devaraj Urs Medical College, Kolar. The participants were aged between 18 and 21 years. Two anthropometric measurements viz. foot length and foot breadth will be taken independently on the left foot of each individual. The results were tabulated and then regression equation was derived.

Results: The correlation between stature and all the foot measurements was found to be positive and statistically significant (p-value < 0.001). Regression equations were derived for estimation of stature from the measurements of the foot. The present study indicates that anthropometric measurements of foot length and breadth are valuable in the estimation of stature. Foot length measurements estimate stature with greater accuracy when compared to foot breadth measurements.

Keywords: Foot Length, Foot Breadth And Stature

INTRODUCTION

Anthropometry is a series of systemized measuring techniques that express quantitatively the dimensions of the human body and skeleton. It is often viewed as a tradition and perhaps the basic tool of biological anthropology. It is finding increased use in medical sciences especially in the field of Forensic Medicine. Relationship that exists between different parts of the body and height has been of great interest to anthropologists, for many years. “Stature” is one of the most important elements in the identification of an individual.

There is an established relationship between stature and various body parts like head, trunk, upper and lower extremities. This allows a forensic scientist to estimate stature from different parts of the body. With the increasing frequency of mass disasters, homicides, air plane crashes, blasts train and road accidents etc., there is always need for such studies which help in identifying the deceased from fragmentary and dismembered human remains. In such a situation, measurements of hands and feet provide good approximation about the height of a person.

Some of the authors have successfully tried to estimate stature from percutaneous body measurements 1-5, some from the isolated long bones6-8 and some focused their attention on the estimation of stature using radiographic material.

The purpose of the present study is to analyze the anthropometric relationship between dimensions of feet and stature and to devise regression formulæ to estimate stature from these dimensions.

MATERIALS AND METHOD

The present study consists of a cross-sectional sample of 120 subjects (60 males and 60 females), ranging in age from 18 to 22 years. The procedure, aims & objectives of the study was informed & explained in a group for participants. A written valid informed consent form shall be signed by each participant. The data collected will only be used for the above mentioned research purpose.

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consent is taken from each of the participant. A small group of ten students are taken for measurements each day at a fixed time to avoid diurnal variations.

Two anthropometric measurements viz. maximum foot length and maximum foot breadth will be taken independently on the left foot of each individual. The left foot was selected for measurement as per recommendation of the international agreement for paired measurements at Geneva (1912). Besides these, stature of each subject will also be recorded. All the measurements will be taken in a well-lighted room. Before taking the measurements, each subject would be asked to remove the shoes. The measurements are taken by one observer in order to avoid inter-observer error. The measurements will be taken using standard anthropometric instruments in centimeters to the nearest millimeter according to the techniques described by Vallois.9

### Foot length

It is the distance from the most prominent part of the heel backward to the most distal part of the longest toe (2nd or 1st).

**Acropodian:** It is the most forwardly projecting point on the head of the 1st or 2nd toe which ever is larger when the subject stands erect.

**Pternion:** It is the most backwardly projecting point on the heel when the subject is standing upright with equal pressure on both the feet.

**Instrument: Sliding caliper.**

**Technique:** The measurement is made on the standing subject, his right leg being slightly bent and drawn backward so that the body rests mainly on the left foot, which one is to be measured. The caliper is horizontally placed along the inner border of the foot.

### Foot breadth

It is the distance between the points of the anterior epiphyses (distal) of the 1st metatarsal, the most prominent of the inner side of the foot (metatarsal-tibiale), and the joint of the anterior epiphyses of the 5th metatarsal, the most prominent of the outer side (metatarsal-fibulare).

**Metatarsal-tibiale:** It is the most medially projecting point on the head of the 1st metatarsal bone when the subject stands erect.

**Metatarsal-fibulare:** It is the point most laterally projecting on the head of the 5th metatarsal bone, when the subject stands erect.

**Instrument: Sliding caliper.**

**Technique:** The measurement which is taken in the dorsal region of the foot ‘loaded’ as in the preceding measurement is oblique with regard to length.

### Statistical analysis

The primary outcome is to derive a regression equation for each parameter. Correlation coefficient will be calculated for each parameter. We will analyse our data using SPSS (version 16.0.2).

### RESULTS

Descriptive statistics of foot dimensions (cm) are shown in the Table 1.

Table 2 depicts the Correlation coefficient and regression equation for the foot length and foot breadth. These regression formulae may be applied in stature estimation from the foot and its various segments independently. It is observed that stature can be estimated more accurately from foot length measurements than foot breadth measurements.

### Table 1. Descriptive statistics of foot dimensions.

<table>
<thead>
<tr>
<th></th>
<th>Foot length (left)</th>
<th>Foot Breadth (left)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>Males 19.2</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td>Females 17.7</td>
<td>6.1</td>
</tr>
<tr>
<td>Maximum</td>
<td>Males 27.1</td>
<td>10.3</td>
</tr>
<tr>
<td></td>
<td>Females 24.6</td>
<td>9.6</td>
</tr>
<tr>
<td>Mean</td>
<td>Males 23.2</td>
<td>9.1</td>
</tr>
<tr>
<td></td>
<td>Females 22.2</td>
<td>8.7</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>Males 1</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Females 1</td>
<td>0.48</td>
</tr>
</tbody>
</table>

### Table 2. Linear regression models for reconstruction of stature from foot dimensions.

<table>
<thead>
<tr>
<th>Regression model</th>
<th>S.E.E</th>
<th>Correlation co-efficient (r)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foot length 69.346 + 3.663 x (foot length)</td>
<td>4.568</td>
<td>0.636</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Foot breadth 112.483+4.619 x foot breadth</td>
<td>5.488</td>
<td>0.375</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
DISCUSSION

Pearson was the first person to estimate the stature from limb bones, many studies have followed and lot of regression equations have been developed. However the measuring bone or part of the body and the method employed were different. The adult stature is attained by the age of 18 years. Hence in the present study all the subjects selected were above 18 years.

These regression models may be applied in stature estimation from the foot and its various segments independently. It is observed that stature can be estimated more accurately from foot length measurements than foot breadth measurements. These regression models may be applied in stature estimation from the foot and its various segments independently. It is observed that stature can be estimated more accurately from foot length measurements than foot breadth measurements.

In our study it was observed that the foot length and foot breadth was more for males as compared to females. The regression formula for foot length and foot breadth calculated for males and females is depicted in Table 2.

Macdonnel10 conducted study on 3000 people and his regression formulate for stature based on foot length was 166.457+4.031 (foot-25.688)+/-2.9.

Patel held a study in Gujarat to derive a regression equation and the formula is 75.45+3.64 X foot length. A study conducted by Qamra11, Singh and Phookan showed that foot length was more accurate than the foot breadth. Which is in agreement with our study

Gordon after conducting a study on foot length and foot breadth for estimation of stature concluded that regression equations containing both foot length and foot breadth were better than individual parameters.

Agnihotri et al, developed a relationship between foot length and stature using linear and curvilinear regression analyses on 250 medical students and concluded that general multiple linear regression model was highly significant.12

CONCLUSION

In the present study the foot length and foot breadth were included in the investigation. Linear regression equations are derived which can be of immense help to the police in solving crimes. Stature, foot length and foot breadth are positively and significantly correlated with each other.

While calculating the regression equation it is noted that there is a linear relationship between the 3 parameters and which is corroborating with the previous studies. However there is variation in the slope and intercept of the equation which may be due to racial differences.

It was observed that the regression models derived from foot length measurements were more reliable than those from foot breadth measurements in the prediction of stature in forensic examinations.

This study was conducted on a diverse population as is the population of our country. Hence it is possible to determine the height of a person by using this formulae with a fair accuracy in our place.

ACKNOWLEDGEMENT

We are grateful to our Principal Dr. M. B. Sanikop without whose constant support this work would not be possible.

Ethical Clearance has been obtained from our institute.

Self Funded

Conflict of Interest: None.

REFERENCES

11. Qamra SR, Jit I, Deodhar SD, A model for reconstruction of height from foot measurements in an adult population of North west India.
Oral Mucosal Biopsy: Comparison of Surgical Artifacts in Incisional and Punch Oral Mucosal Biopsy

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ABSTRACT

Background: Artifact is an artificial structure or tissue alteration on a prepared microscopic slide, as a result of an extraneous factor. It makes diagnosis difficult. Punch & Incisional biopsy commonly used for diagnosis of oral lesions often present with artifacts.

Aims & Objective: To study the artefacts arising in specimens during incisional & punch biopsy and to compare their occurrence in punch & incisional biopsy cases.

Methodology: The study was carried out at Department of Oral Pathology and Microbiology between March 2007 to May 2008. Study design was cross sectional & study unit comprised of subjects with oral lesions, having indications for incisional & punch biopsy. Incisional biopsy and punch biopsy specimens were taken from 25 cases each having oral lesions needing biopsy for diagnosis after informed consent. Specimens were compared for artefacts like curling, crush, haemorrhage, splits & fragmentation, stretch, pseudo cyst etc. Chi-square test was used to determine any significant difference between the two biopsy techniques.

Results: Artefacts were more frequent in Incisional biopsy group compared to punch biopsy group except for stretch artefact which was significantly higher in punch biopsy group. No statistically significant difference in proportion of artefacts was observed for artifact induced by improper surgical removal, by surgical suction instruments, curling, crush and injection artifacts. A statistically significant difference was found between Incisional & punch biopsy cases for haemorrhage and split & fragmentation artifact, both of which were lesser in punch biopsy group.

Conclusions: Punch biopsy technique produces much less artefacts in biopsy specimens compared to Incisional biopsy. It is rapid, safe and can reduce potential diagnostic problems and misdiagnosis

Keywords: Artefacts; Biopsy

INTRODUCTION

Biopsy [bios meaning (life) and opsis meaning (vision) i.e. vision of life] is a technique of obtaining tissue from living organism with a purpose of examining it under the microscope in order to establish a diagnosis based on the sample. The technique allows us to establish the histological characteristics of the suspect lesions, their differentiation, extent or spread, and to adopt an adequate treatment strategy. However, errors may occur during taking of a biopsy specimens or immediately thereafter, before receipt of the specimen by the pathologists, resulting in tissue artifacts in the specimen. It is important to know and understand about artifacts as by learning to recognize them, we can avoid misdiagnosis. Artifact refers to an artificial structure or tissue alteration on a prepared microscopic slide – the result of an extraneous factor. In some cases, degree of artifactual damage is excessive or may involve the entire specimen, rendering it suboptimal or useless for diagnostic purposes. Biopsy is an important step in diagnosis and management. Up till now, many practitioners have used the traditional scalpel 15 and, recently, the scalpel punch, an easy and quick device has been introduced.

Punch biopsy is a safe and rapid method of performing a biopsy in oral cavity. As per some authors
punch biopsy tissue sample shows less of surgical artifacts compared to incisional biopsy. It is primarily designed to biopsy epithelial lesions and is unsuitable for lesions arising in deeper tissues. Certain anatomical structures are difficult to biopsy particularly the maxillary buccal alveolar ridge and the anterior lingual aspect of the mandible.6

The present study was done to know the various artifacts arising in specimens during. Incisional and punch biopsy & to compare their occurrence in punch & incisional biopsy cases.

**METHODOLOGY**

The present study was carried out at Department of Oral Pathology and Microbiology, between March 2007 to May 2008. The study design was cross sectional & study unit comprised of patients with oral lesions, having indications for biopsy (Lichen planus, leukoplakia, squamous cell carcinoma, candidiasis, oral submucous fibrosis etc.) attending OPD of Department of Oral Medicine and Radiology and Department of Oral and Maxillofacial Surgery. Subjects were enrolled for the study after informed consent. An initial screening test for blood sugar, bleeding time, clotting time and haemoglobin was done & subjects found to have results within normal range were randomly assigned into two groups, Group I (punch biopsy) and Group II (Incisional biopsy) using lottery method. Each group comprised of 25 patients each. Medically compromised patients, Geriatric age group patients, Patients with any systemic disease & Non cooperative patients were excluded from the study. Subjects in both punch biopsy and incisional biopsy group were interviewed for relevant history of lesion on a predesigned proforma. Biopsy was done following universal precautions & biopsy specimen were processed & subsequently stained with Haematoxylin and Eosin.

For Group I cases a non disposable punch of 5 mm diameter was used, wheras among Group II cases incisional scalpel biopsy was done. Both groups were compared for occurrence of certain select artifacts (Artifacts induced by improper surgical removal, Curling, Crush, Haemorrhage, Splits and fragmentation, Stretch, Pseudocyst & Artifacts induced by surgical suction instruments) following microscopic examination of the prepared slide. Artifacts which arose from processing, embedding and staining errors were excluded from the study. Results were tabulated and presented as numbers and percentages. Chi-square test was used to determine any significant difference between the two biopsy techniques. A ‘p’ value of 0.05 or less was considered significant for statistical analysis. RESULTS

A total of 25 cases each were assigned to both group I & group II. Among group I cases 20 were males and 5 cases were females, whereas in Group II, 13 cases were males and 12 cases were females. Group I and Group II cases were compared for nine different artifacts. Artifacts induced by improper surgical removal, curling, stretch, injection and artifacts induced by surgical suction instruments only presence of the artifact was considered, whereas for crush, haemorrhage, split and fragmentation and pseudocyst both presence and location of the artifact was taken into consideration.

Table 1 shows the comparison of occurrence of artifacts between Punch & Incisional biopsy groups. Higher percentage of Curling artefact, Artifacts induced by surgical suction instruments & Injection artifacts were observed in punch biopsy group (i.e. 64%, 96% & 52% respectively) compared to Incisional biopsy group. Whereas higher percentage of cases in Incisional biopsy group had Artifacts induced by improper surgical removal (92%) & Stretch artifacts (88%). A statistically significant difference was seen between the two groups with respect to occurrence & position of haemorrhage artifacts (p=0.028) & split and fragmentation artifacts (p=0.036).
Table 1: Comparison of occurrence of artifacts between Punch & Incisional biopsy groups

<table>
<thead>
<tr>
<th>Type of artifact</th>
<th>Occurrence</th>
<th>Group I (n=25)</th>
<th>Group II (n=25)</th>
<th>$\chi^2$</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artifacts induced by improper surgical removal</td>
<td>Present</td>
<td>21 (84%)</td>
<td>23 (92%)</td>
<td>0.189</td>
<td>0.66</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>4 (16%)</td>
<td>2 (8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curling artifact</td>
<td>Present</td>
<td>16 (64%)</td>
<td>15 (60%)</td>
<td>0.085</td>
<td>0.77</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>9 (36%)</td>
<td>10 (40%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Artifacts induced by surgical suction instruments</td>
<td>Present</td>
<td>24 (96%)</td>
<td>22 (88%)</td>
<td>0.272</td>
<td>0.60</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>1 (4%)</td>
<td>3 (12%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injection artifacts</td>
<td>Present</td>
<td>13 (52%)</td>
<td>11 (44%)</td>
<td>0.32</td>
<td>0.57</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>12 (48%)</td>
<td>14 (56%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stretch artifacts</td>
<td>Present</td>
<td>12 (48%)</td>
<td>22 (88%)</td>
<td>7.45</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>13 (52%)</td>
<td>3 (12%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Degree of freedom =1

Table 2: Comparison of occurrence of artifacts between Punch & Incisional biopsy groups in relation to location.

<table>
<thead>
<tr>
<th>Type of artifact</th>
<th>Occurrence</th>
<th>Group I (n=25)</th>
<th>Group II (n=25)</th>
<th>$\chi^2$</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crush</td>
<td>Absent</td>
<td>17 (68%)</td>
<td>12 (48%)</td>
<td>2.095</td>
<td>0.55</td>
</tr>
<tr>
<td></td>
<td>Base</td>
<td>4 (16%)</td>
<td>6 (24%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Superficial</td>
<td>3 (12%)</td>
<td>5 (20%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Combined</td>
<td>1 (4%)</td>
<td>2 (8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemorrhage</td>
<td>Absent</td>
<td>16 (64%)</td>
<td>7 (28%)</td>
<td>9.088</td>
<td>0.028</td>
</tr>
<tr>
<td></td>
<td>Base</td>
<td>7 (28%)</td>
<td>8 (32%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Superficial</td>
<td>1 (4%)</td>
<td>7 (28%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Combined</td>
<td>1 (4%)</td>
<td>3 (12%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Split and fragmentation</td>
<td>Absent</td>
<td>16 (64%)</td>
<td>6 (24%)</td>
<td>8.523</td>
<td>0.036</td>
</tr>
<tr>
<td></td>
<td>Base</td>
<td>2 (8%)</td>
<td>5 (20%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Superficial</td>
<td>2 (8%)</td>
<td>6 (24%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Combined</td>
<td>5 (20%)</td>
<td>8 (32%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pseudocyst</td>
<td>Absent</td>
<td>17 (68%)</td>
<td>12 (48%)</td>
<td>2.095</td>
<td>0.55</td>
</tr>
<tr>
<td></td>
<td>Base</td>
<td>4 (16%)</td>
<td>6 (24%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Superficial</td>
<td>3 (12%)</td>
<td>5 (20%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Combined</td>
<td>1 (4%)</td>
<td>2 (8%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 1. Artifacts induced by improper surgical removal

Fig. 2. Curling Artifact
DISCUSSION

Both incision and punch biopsy techniques have relatively high accuracy and there is a high concordance between tissue diagnosis made by each of these techniques. Incisional techniques should preferably be performed on any atypical lesion. Previous studies have indicated that oral mucosal punch biopsy is a safe and rapid method of obtaining tissue from the mouth but have not indicated the incidence of artifacts.7,8

Artifact induced by improper surgical removal, curling and injection do not directly depend on the type of biopsy technique used, they occur irrespective of the use of punch or scalpel. These parameters were assessed as a part of our study because they occur immediately after the biopsy procedure and can be considered as surgical/handling artifact. This is in accordance with previous studies.8 In our study too, we found that surgical skill, handling of the specimen, laboratory conditions and the time period between transfer from chairside to laboratory play an important role in causing artifacts induced by improper surgical removal and curling. Improper surgical removal and curling artefacts were reported with both techniques. One of the reasons that could be attributed to slightly higher number of cases showing curling artifact in the present study may be environmental condition. The environmental conditions in tropical countries like ours are conducive to cause dehydration which ultimately results in curling of the tissue specimen. This environmental effect seems to be so dominating on both the groups that it is difficult to distinguish between the two groups on this issue alone. Owing to presence of curling artifacts, the evaluation of epithelium was found to be difficult, this finding endorses that of a previous study which also stated that owing to curling the evaluation of the epithelium is impossible.8 Higher occurrence of artefact due to improper surgical removal & curling can be attributed to the fact that punch biopsies were not routinely used in a clinical set up by oral surgeons and lack of experience in obtaining the biopsy is probably the reason for inadequate depth of the biopsy. In our study we observed that both the groups were showing injection artifacts in many specimens. According to a previous study, if infiltration techniques are used, the solution should not be deposited within 1cm of the lesion to avoid injection artefact.9

In our study very few cases were found to have artifacts caused due to improper use of surgical suction
apparatus. This is in accordance with a previous study.10 The artifact occurs when vacuum draws air into connective tissue and mobilizes connective tissue mucins. The suctioning effect also induces extravasation of blood and focal accumulation of erythrocytes within the connective tissue vacuole.10 Suction devices should be used with caution or completely avoided to prevent inadvertent loss of the specimen.10

In the present study, the crush artifact was found to be insignificant, however it was found less in Group I than in Group II, both at base & superficially. Previous studies have shown that punch biopsy have less number of crush artifacts as compared to scalpel biopsy/wedge biopsy which is in accordance with our study.8 The punch biopsy yields a cylindrical core of tissue that must be gently handled (usually with a needle) to prevent crush artifact.3,11

Our study showed a significant difference between Group I and Group II in terms of haemorrhagic artifact ($\chi^2$; p=0.0028), with higher number of artefacts in group II. This is in accordance with a previous study.8 A previous study also reported that, use of B forceps with punch caused less haemorrhagic artifacts, while they were significantly higher when performed with scalpel without B forceps.12

In our study, split and fragmentation artifact was significantly less in punch biopsy than in scalpel biopsy ($\chi^2$; p=0.0038). This artifact occurs more in Group II because the use of scalpel in incisional biopsy leads to multiple cuts, which leads to splits in the specimen. Punch biopsy is a single shot procedure and does not incorporate multiple cuts, thus there are fewer chances of split and fragmentation artefact. According to a previous study also, splits and other handling artifacts were significantly less in the group that combined punch and suture traction. The scalpel and suture traction group showed significantly more artifacts than the group without suture.13

In this study, there was no significant difference in pseudocyst artifacts found between the specimens of Group I and Group II. The pseudocysts were present both superficially and in depth of the specimen. The forceps used to grasp the specimen perforate and create compression zones, as stated in review papers.14,15

In our study, a significant difference for stretch artefact was observed between Group I and Group II, with more number occurring in group I. For punch biopsies, stretching the skin perpendicular to the Langer lines creates an ellipse oriented in this optimal direction and facilitates closure. Use of a sharp instrument (cut rather than tear the specimen) prevents stretch artifact in the histologic specimen. So, we see that the punch biopsy causes a lot of stretching of the specimen, which induces stretch artifact. Punch should be carefully removed perpendicular to the skin so as not to tear off the biopsy specimen.16

CONCLUSION

Our study confirms with findings of previous studies that described punch biopsy as a quick and simple procedure. It is easy to perform in an outpatient environment and requires minimum surgical equipment and specific surgical skills. If the site of biopsy is carefully chosen, punch biopsy provides tissue specimens of adequate size and quality for accurate histological diagnosis. Punch biopsy produces a more accurate assessment of the superficial mucosal lesions than incisional biopsy, with fewer artifacts.

Source of Funding: It is a self funded study

Conflict of Interest: Is nill

Ethical Clearance: My college authority had given me ethical clearance on this study.

ACKNOWLEDGEMENT

I acknowledge my principle, my departmental staff, my colleagues and last but not the least my husband for letting me carry this study and give it a final shape

REFERENCES

Pattern of Skeletal Injuries in Victims of Fatal Road Traffic Accident

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ABSTRACT

Deaths due to Road Traffic Accidents (RTA) are increasing at a shocking rate throughout the world. Victims in RTA sustain large varieties of injuries and occurrence of skeletal injuries is extremely high in RTA. Present cross-sectional study was carried out to know the pattern of skeletal injuries in victims of fatal RTA. In this study, out of 176 medico legal autopsies conducted, 57% were RTA related deaths. Skull fracture was present in maximum number of victims and was predominant in all categories of road user except drivers of motor vehicle. Commonest type of fracture present in vault and base of the skull was fissured fracture. Commonest fossa involved was the middle cranial fossa (49%).

Keywords: Road Traffic Accident, Skeletal Injury, Victim, Offending Vehicle, Skull Fracture, Fissured Fracture

INTRODUCTION

Victims of Road traffic accident (RTA) sustain varieties of injuries and incidence of skeletal injury comparatively more than other injuries. Pattern of skeletal injuries or fractures mainly depends upon the type of road user and the offending vehicle. Vital organs of the body may be injured in RTAs with or without fracture of the adjacent bones. Visceral injuries associated with fracture of the adjacent bone will be more fatal. Furthermore, pattern of injuries sustained by the victim including skeletal injuries is one of the important contributors in the reconstruction of RTA. This will be an additional aid to the police in identification of those responsible for the accident.

METHODOLOGY

Present cross-sectional study was carried out from 15-03-2004 to 14-09-2005, to know the pattern of skeletal injuries in victims of RTA who died while undergoing treatment at KLE’s Dr. Prabhakar Kore Hospital & MRC, Belgaum, Karnataka, India and subsequently autopsied. Information regarding the type of victim/ road user and the type of offending vehicle were gathered from all possible sources. X-ray / scan reports of each case were reviewed before the autopsy. Victims with fracture were included in the study; however, those with Burr hole, craniotomy, subluxation/ dislocation of joint were excluded. Consent for collection of data was obtained from the legally authorized person. In each case, a thorough external and internal examination was done to locate the fractures. Data obtained was recorded in the predesigned and pretested proforma, and analyzed. Victims were categorized into pedestrian, pedal cyclist, motorcyclist, occupant of motor vehicle (driver, front and rear seat passenger) and occupant of animal driven vehicle. Offending vehicles were divided into pedalcycle, motorcycle, motor vehicle, animal driven vehicle, unknown (vehicles that could not be traced) and others (stationary objects like wall, tree etc). Motor vehicles were classified according to Motor Vehicle Act of 1985 of India into, Light Motor Vehicle e.g. auto rickshaw, car, zeep, taxi etc., Medium Motor vehicle e.g. tempo, van, tractor etc. and Heavy Motor Vehicle e.g. bus, truck etc. Fracture of different bones were categorized according to Chapter XIX of the International Statistical Classification of Diseases and Related Health Problems -10² (S02 to S92).

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DOI Number: 10.5958/j.0974-1283.14.1.004
RESULTS

During the study period, out of 176 medico-legal autopsies conducted, 100 cases were of RTA. Skull fracture was present in maximum number of victims (85%). Hyoid bone fracture was not present in any case [Table 1]. Skull was the most commonly fractured bone among pedestrians (90%) [Table 2], motor cyclists (91%) [Table 3] and front seat passenger of motor vehicle (71%) [Table 4]. Whereas, fracture of ribs was most common in drivers of motor vehicle (85%) [Table 4]; fracture of skull and leg bones in pedal cyclists (80%) [Table 3]. Fracture of multiple bones was present in majority of victims (72%).

Fracture of vault of skull alone was seen in 37% of cases [Table 5]. This is more than fracture of base of skull alone (12%). Combination of fracture of vault and base (48%) was more than fracture of vault alone. Seventy two cases having 124 fracture sites involving skull vault were present [Table 6]. Commonest type of fracture present in the skull vault was fissured fracture (55%) constituting 68 out of 124 sites [Table 6]. There were 51 victims with 68 fracture sites of the base of skull [Table 6]; commonest type being fissured fracture (75%). Commonest fossa involved was the middle cranial fossa (49%) [Table 6].

Table 1: Profile of fracture of bones:

<table>
<thead>
<tr>
<th>Type of bone</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skull</td>
<td>85</td>
<td>85.00</td>
</tr>
<tr>
<td>Cervical vertebrae</td>
<td>8</td>
<td>8.00</td>
</tr>
<tr>
<td>Hyoid bone</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Thoracic vertebrae</td>
<td>6</td>
<td>6.00</td>
</tr>
<tr>
<td>Sternum</td>
<td>20</td>
<td>20.00</td>
</tr>
<tr>
<td>Rib/s</td>
<td>41</td>
<td>41.00</td>
</tr>
<tr>
<td>Lumbar vertebrae</td>
<td>5</td>
<td>5.00</td>
</tr>
<tr>
<td>Pelvis</td>
<td>12</td>
<td>12.00</td>
</tr>
<tr>
<td>Clavicle</td>
<td>30</td>
<td>30.00</td>
</tr>
<tr>
<td>Scapula</td>
<td>2</td>
<td>2.00</td>
</tr>
<tr>
<td>Humerus</td>
<td>8</td>
<td>8.00</td>
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<tr>
<td>Forearm bone/s</td>
<td>13</td>
<td>13.00</td>
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<tr>
<td>Wrist and hand bone/s</td>
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<tr>
<td>Patella</td>
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</tr>
<tr>
<td>Leg bone/s</td>
<td>50</td>
<td>50.00</td>
</tr>
<tr>
<td>Foot bone/s</td>
<td>25</td>
<td>25.00</td>
</tr>
</tbody>
</table>

Table 2: Fracture of bones in Pedestrians Vs Offending vehicle

<table>
<thead>
<tr>
<th>Type of bone</th>
<th>Offending vehicle</th>
<th>Total (40)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Motor cycle (17) Light Motor Vehicle (10)</td>
<td>Medium Motor Vehicle (20) Heavy Motor Vehicle (7) Unknown (4)</td>
</tr>
<tr>
<td>Skull</td>
<td>15(68.23%) 8 (80%) 2(100%) 7 (100%) 4 (100%)</td>
<td>36</td>
</tr>
<tr>
<td>Cervical vertebrae</td>
<td>— — — —</td>
<td>1(14.28%) 1 (25%)</td>
</tr>
<tr>
<td>Hyoid bone</td>
<td>— — — —</td>
<td>— —</td>
</tr>
<tr>
<td>Thoracic vertebrae</td>
<td>— — — —</td>
<td>1(14.28%) 2 (50%)</td>
</tr>
<tr>
<td>Sternum</td>
<td>— — 1 (50%)</td>
<td>4(57.14%) 3 (75%)</td>
</tr>
<tr>
<td>Rib/s</td>
<td>4 (23.5%) 2 (20%) 2(100%) 5(71.42%) 2 (50%)</td>
<td>15</td>
</tr>
<tr>
<td>Lumbar vertebrae</td>
<td>— 2 (20%) — — —</td>
<td>2</td>
</tr>
<tr>
<td>Pelvis</td>
<td>— 3 (30%) — —</td>
<td>1(14.28%) 2 (50%)</td>
</tr>
<tr>
<td>Clavicle</td>
<td>6 (35.29%) — 1 (50%)</td>
<td>4(57.14%) 4 (100%)</td>
</tr>
<tr>
<td>Scapula</td>
<td>— — —</td>
<td>2(28.57%)</td>
</tr>
<tr>
<td>Humerus</td>
<td>— — 1 (50%)</td>
<td>4(57.14%)</td>
</tr>
<tr>
<td>Forearm bone</td>
<td>— — 1 (50%)</td>
<td>4(57.14%)</td>
</tr>
<tr>
<td>Wrist &amp; hand bone/s</td>
<td>— — 1 (50%)</td>
<td>1(14.28%)</td>
</tr>
</tbody>
</table>
Table 2: Fracture of bones in Pedestrians Vs Offending vehicle (Contd.)

<table>
<thead>
<tr>
<th>Type of bone</th>
<th>Offending vehicle</th>
<th>Total (40)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Motor cycle (17)</td>
<td>Light Motor Vehicle (10)</td>
</tr>
<tr>
<td>Femur</td>
<td>—</td>
<td>3 (30%)</td>
</tr>
<tr>
<td>Patella</td>
<td>3(17.64%)</td>
<td>4 (40%)</td>
</tr>
<tr>
<td>Leg bone/s</td>
<td>9(52.94%)</td>
<td>9 (90%)</td>
</tr>
<tr>
<td>Foot bone/s</td>
<td>3(17.64%)</td>
<td>3 (30%)</td>
</tr>
</tbody>
</table>

Table 3: Fracture of bones in Pedal cyclists and Motorcyclists Vs Offending vehicle:

<table>
<thead>
<tr>
<th>Type of bone</th>
<th>Pedal cyclists (5)</th>
<th>Motor cyclists (33)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Offending vehicle</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>Light Motor Vehicle (2)</td>
<td>Medium Motor Vehicle (2)</td>
</tr>
<tr>
<td>Skull</td>
<td>1 (100%)</td>
<td>2 (100%)</td>
</tr>
<tr>
<td>Cervical vertebrae</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Hyoid bone</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Thoracic vertebrae</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Sternum</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Rib/s</td>
<td>1(50%)</td>
<td>1 (50%)</td>
</tr>
<tr>
<td>Lumbar vertebrae</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Pelvis</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Clavicle</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Scapula</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Humerus</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Forearm bone/s</td>
<td>—</td>
<td>1 (50%)</td>
</tr>
<tr>
<td>Wrist/hand bone/s</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Femur</td>
<td>—</td>
<td>1 (50%)</td>
</tr>
</tbody>
</table>

* Others include collision with stationary objects like wall, tree, electric pole etc.

Table 4: Fracture of bones in occupants of Motor vehicle and Animal driven vehicle Vs Offending vehicle:

<table>
<thead>
<tr>
<th>Type of bone</th>
<th>Driver (13)</th>
<th>Front seat Rear seat passenger (7)</th>
<th>Rear seat passenger (1)</th>
<th>Occupant of Animal Driven Vehicle (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Offending vehicle</td>
<td>Total No. %</td>
<td>Offending vehicle</td>
<td>Total No. %</td>
</tr>
<tr>
<td>Skull</td>
<td>Light Motor Vehicle (1)</td>
<td>1 (100%)</td>
<td>68.00</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>Cervical vertebrae</td>
<td>—</td>
<td>2(25%)</td>
<td>5(25%)</td>
<td>3</td>
</tr>
<tr>
<td>Hyoid bone</td>
<td>—</td>
<td>1(12.5%)</td>
<td>1</td>
<td>1.76</td>
</tr>
<tr>
<td>Thoracic vertebrae</td>
<td>—</td>
<td>1(12.5%)</td>
<td>1</td>
<td>1.76</td>
</tr>
<tr>
<td>Sternum</td>
<td>—</td>
<td>2(25%)</td>
<td>6(75%)</td>
<td>10</td>
</tr>
<tr>
<td>Rib/s</td>
<td>—</td>
<td>2(25%)</td>
<td>6(75%)</td>
<td>2</td>
</tr>
<tr>
<td>Lumbar vertebrae</td>
<td>—</td>
<td>2(25%)</td>
<td>6(75%)</td>
<td>3</td>
</tr>
<tr>
<td>Pelvis</td>
<td>—</td>
<td>2(25%)</td>
<td>6(75%)</td>
<td>3</td>
</tr>
<tr>
<td>Clavicle</td>
<td>—</td>
<td>2(25%)</td>
<td>6(75%)</td>
<td>3</td>
</tr>
<tr>
<td>Scapula</td>
<td>—</td>
<td>2(25%)</td>
<td>6(75%)</td>
<td>3</td>
</tr>
<tr>
<td>Humerus</td>
<td>—</td>
<td>2(25%)</td>
<td>6(75%)</td>
<td>3</td>
</tr>
<tr>
<td>Forearm bone/s</td>
<td>—</td>
<td>2(25%)</td>
<td>6(75%)</td>
<td>3</td>
</tr>
<tr>
<td>Wrist/hand bone/s</td>
<td>—</td>
<td>2(25%)</td>
<td>6(75%)</td>
<td>3</td>
</tr>
</tbody>
</table>
Table 4: Fracture of bones in occupants of Motor vehicle and Animal driven vehicle Vs Offending vehicle: (Contd.)

<table>
<thead>
<tr>
<th>Type of bone</th>
<th>Driver (13)</th>
<th>Front seat</th>
<th>Rear seat passenger (7)</th>
<th>Rear seat</th>
<th>Occupant of Animal Driven Vehicle (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Light Motor Vehicle</td>
<td>Total</td>
<td>Offending vehicle</td>
<td>Total</td>
<td>Offending vehicle</td>
</tr>
<tr>
<td></td>
<td>Medium Motor Vehicle</td>
<td>(2)</td>
<td>(1)</td>
<td>(8)</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>Heavy Motor Vehicle</td>
<td>(8)</td>
<td>(6)</td>
<td>(1)</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Other (2)</td>
<td>(2)</td>
<td>(10)</td>
<td>(6)</td>
<td>(1)</td>
</tr>
<tr>
<td>Femur</td>
<td>—</td>
<td>—</td>
<td>1 (12.5%)</td>
<td>1 (50%)</td>
<td>2</td>
</tr>
<tr>
<td>Patella</td>
<td>—</td>
<td>—</td>
<td>4 (50%)</td>
<td>2 (100%)</td>
<td>6</td>
</tr>
<tr>
<td>Leg bone/s</td>
<td>—</td>
<td>—</td>
<td>4 (50%)</td>
<td>2 (100%)</td>
<td>6</td>
</tr>
<tr>
<td>Foot bone/s</td>
<td>—</td>
<td>—</td>
<td>3 (37.5%)</td>
<td>1 (50%)</td>
<td>4</td>
</tr>
</tbody>
</table>

* Others include collision with stationary objects like wall, tree, electric pole etc.

Table 5: Distribution of skull fractures:

<table>
<thead>
<tr>
<th>Site</th>
<th>No. of cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vault alone</td>
<td>31</td>
<td>36.47</td>
</tr>
<tr>
<td>Base alone</td>
<td>10</td>
<td>11.78</td>
</tr>
<tr>
<td>Vault &amp; base</td>
<td>41</td>
<td>48.23</td>
</tr>
<tr>
<td>Facial bones</td>
<td>3</td>
<td>3.52</td>
</tr>
<tr>
<td>Total</td>
<td>85</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 6: Fractures of the vault and base of skull:

<table>
<thead>
<tr>
<th>Type</th>
<th>No. of fractures</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear</td>
<td>68</td>
<td>54.83</td>
</tr>
<tr>
<td>Comminuted</td>
<td>40</td>
<td>32.25</td>
</tr>
<tr>
<td>Depressed</td>
<td>13</td>
<td>10.48</td>
</tr>
<tr>
<td>Sutural</td>
<td>3</td>
<td>2.43</td>
</tr>
<tr>
<td>Total</td>
<td>124</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site</th>
<th>Linear</th>
<th>Comminuted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior cranial fossa</td>
<td>15</td>
<td>6</td>
<td>21 (30.88%)</td>
</tr>
<tr>
<td>Middle cranial fossa</td>
<td>25</td>
<td>8</td>
<td>33 (48.54%)</td>
</tr>
<tr>
<td>Posterior cranial fossa</td>
<td>11</td>
<td>3</td>
<td>14 (20.58%)</td>
</tr>
<tr>
<td>Total</td>
<td>51 (75%)</td>
<td>17 (25%)</td>
<td>68 (100%)</td>
</tr>
</tbody>
</table>

DISCUSSION

In the present study, deaths due to RTA accounted for maximum number of autopsies done. Difference in the number of deaths due to RTA observed in different studies may be due to the factors like geographical area, condition of environment, category of road users, condition of road etc.

Skull fracture was present in maximum number of victims and same was the result in other studies. In pedestrians, motorcyclists and pedal cyclists the secondary impact and secondary injuries are invariably to the head irrespective of site of primary impact. In India, use of seatbelts by the occupants of motor vehicle is less; due to this, head of the front seat occupants usually strikes the windscreen and head rest in case of rear seat occupants, due to the forward movement of the body following collision. In a study on non-fatal RTAs, fracture of bones of lower limb was seen in majority of the victims (43%), but skull fracture was present in only 5.4% of victims. This indicates that skull fracture is generally associated with high mortality.

Skull fracture was found in majority of pedestrians (90%) which is similar to results of other studies. However, the number of cases with skull fracture is significantly high in our study. Fracture of leg bones was more common in accidents involving light motor vehicles; whereas, skull and ribs fracture in medium motor vehicle; and skull fracture in heavy motor vehicle. Higher occurrence of fracture of pelvis, femur and tibia was observed in accidents involving light motor vehicles and relatively more skull fracture, thoracic cage fracture and fracture of upper limb bones were seen in accidents involving medium and heavy motor vehicles.

In the present study, majority of motorcyclists had fracture of skull (91%) followed by fracture of leg bones (49%). Even in pedal cyclists majority had fracture of skull (80%) and leg bones (80%). Higher incidence of skull fracture in both pedal cyclists and motor cyclists
is also observed in other studies. 3,9,10 Motorcycles involved in accidents always eject their operators or passenger, which may lead to fracture of skull along with injury to other parts. In motorcyclists, most part of the body is unprotected and legs are the most common part which can have impact with offending vehicles. Injuries to the pedal cyclists form a less severe counterpart of motorcycle injuries, as the pedal cycle has the same instability but for lower speed.

In drivers of motor vehicle, fracture of ribs was most common (85%), followed by sternum (77%). In front seat passengers, most common was skull fracture (71%), followed by fracture of forearm bones (29%). High percentage of fracture of ribs and sternum in drivers compared to the front seat passengers may be due to the fact that unrestrained drivers move forward after collision and chest strikes the steering wheel. Impact of the chest with rigid steering wheel can result in fracture of bones of thoracic cage. Relatively lesser percentage of skull fracture among drivers may be due to the slight protection offered by the steering wheel to the drivers and thus reducing the collision of head against windscreen. Another factor may be that the drivers constantly give their attention to the road and so has warning of an impending crash, compared to the front seat passengers. In a study 9, fracture of ribs was more common in car drivers (47%) than car passengers (23%). Occurrence of skull fracture was relatively higher in front seat passengers (55%) than drivers.14

In the present study, fracture of vault of skull was more common than the base, but, combination of vault and base was significantly more than vault alone. Commonest type of fractures present in the skull vault was fissured fracture. Similar results were observed in other studies. 4, 15

CONCLUSION

Victims of fatal RTA usually sustain fracture of one or the other bone. In majority of victims, fracture contributes to death either directly or indirectly. Most of the skull fractures and intra cranial injuries cannot be treated successfully, even in tertiary level hospitals. This may be because of their anatomical configuration. Hence, fatalities due to skull fracture and fracture of other bones can be reduced by preventing the occurrence of such fractures. Therefore, the old saying, “Prevention is better than cure” holds good even here. RTA is a complex event and an organized teamwork by people of many disciplines like education, engineering, medical, law enforcement agencies is required for effective prevention of RTAs.

ACKNOWLEDGMENT

We profoundly thank Dr (Late). F.S. Kuligod, Professor, Dept. of Forensic Medicine, J N Medical College, Belgaum, for his guidance and support during the study.

Conflict of interest: NIL

Source of funding: NIL

Ethical clearance: Obtained from Institutional Ethical Committee

REFERENCE

A Unique Case of Suicide Pact by Smothering: A Case Report

YS Prasad¹, T Millo²

¹Senior Resident, ²Additional Professor, Department of Forensic Medicine and Toxicology, AIIMS, New Delhi, India

ABSTRACT

A suicide pact is an agreement between two or more people to kill themselves. We are reporting a unique case of suicide pact by smothering of a family consisting of a 38 year old husband, a 34 year old wife and a 2 ½ year old daughter wherein the wife and the daughter were smothered to death by the husband who himself attempted suicide by slashing of wrists. A partner in a suicide pact giving voluntary consent to be smothered has never been reported in the literature and hence we felt the need to report such a unique case.

Keywords: Suicide Pact, Smothering, Suicide Note, Attempted Suicide

INTRODUCTION

Suicides are a considerable problem in the society. People commit suicide due to a number of factors like social, economic, political, ideological, etc. Most of the people commit suicide when they are in a state of depression. The common methods of suicide are poisoning, hanging, drowning, shooting or self-stabbing. Most suicides are solitary and private, but a few result from a pact between people to die together⁴. A suicide pact is an agreement between two or more people to kill themselves. Suicide pacts constitute 0.6-4.0% of all suicides¹. The Suicide pacts are rare and despite its rarity this form of suicide is of uncommon interest. Of 20,788 completed suicides in England between 1955 and 1958 there were only 58 pacts accounting for 0.28% of the total. Forty two were made by husbands and wives whose mean ages were 60 and 56 years, respectively⁴. The frequency of suicide pacts was found to be greatest in Japan. Lovers’ pacts were found to be typical in Japan, spouse pacts in Dade County, USA, and England, and friends’ pacts in Bangalore City, India⁵. People who commit suicide in a pact are more likely to be female, older, married, and of a high social class⁴. In general, suicide pact victims choose non-violent suicide methods which permitted painless, synchronized death while together; commonly used methods are poisoning by a car exhaust or overdosing with medicine. In majority of pacts both members of each pair use same method³. The victims of a suicide pact form an encapsulated unit, who under the threat of dissolution undertake such a pact⁷. The fateful decision is usually reached by both together from the start; they decide independently at first, and then jointly. The grim secret is carefully guarded, if necessary for weeks or months before the appointed day. Very rarely the plan miscarries and one partner to the pact survives, but mostly the preparations for death are so meticulous that both partners perish⁴. If one of the partners survives the other person is charged with abetment to suicide or culpable homicide depending on the circumstances. There is also an element of coercion involved in suicide pacts. One of the partners is dominant and the other is passive¹¹. One of the persons of the pair may become the instigator of the idea of the suicide pact and persuade the other to co-operate. When the idea of the suicide pact is not equally shared by the pact members it is hypothesized that a murderous impulse, conscious or unconscious, is in operation on the part of the instigator⁸. Hemphill
claimed that one member of the “encapsulated unit” is dominant and the other dependent. The dominant member plans the act. The dependent member may ask the dominant member to kill him/her first, to avoid the possibility of survival alone after a failed attempt. A characteristic finding in majority of the suicide pacts is suicide notes when compared to individual suicides.

In the present case the husband smothered the wife and the daughter to death, and then he himself attempted suicide unsuccessfully by slashing of wrists. There were two separate suicide notes written one each by the husband and the wife.

CASE REPORT

On 4th September 2008 at about 2.15 pm the police received information about a family, consisting of three members, lying unconscious in their bedroom. The three members included the husband, the wife and the daughter. The husband was found to have signs of life and hence immediately shifted to hospital, whereas the wife and the daughter were found dead on the bed. The husband was 38 year old, the wife 34 years and the daughter 2 ½ years. Both the wife and the daughter were found on the bed (double cot) lying side by side in supine position (Fig.1). The husband was lying unconscious on the floor at the side of the bed with blood stains on wrists, abdomen and neck. The room was found undisturbed except for blood stains on the floor and at one corner of the bed. Two suicide notes were also recovered from the room one written by the husband and other by the wife (Fig. 4). There was a blood stained knife and razor lying on the floor (Fig. 2 and 3). The husband was alleged to have attempted suicide using the knife and the razor blades.

The couple got married 6 years back. Theirs was a love marriage and was against the wishes of both families because they belonged to different religions. The husband belonged to Islamism and the wife belonged to Hinduism. Since they married against the wishes of the families, they suffered social isolation. The husband was a real estate trader and the wife was a housewife. Both had high educational attainments. The monthly income of the husband was quite high. However due to the ongoing financial crisis around the globe the husband’s real estate business suffered huge losses. He incurred huge debts which became unbearable burden on him. This led the couple to take the extreme step. The previous evening they had dinner at a friend’s place and there was no hint of any such idea being contemplated. The friends and other acquaintances expressed shock and disbelief on hearing the news.

AUTOPSY FINDINGS

On external examination of the wife, the clothes were intact without any tear or signs of struggle. Rigor mortis was complete and postmortem lividity present on back. The face, neck and upper chest were congested. Palms, soles, nail beds of fingers and nail beds of toes were cyanosed. Pinpoint petechial hemorrhages were present in conjunctivae, supraclavicular regions on both sides, upper back above scapular spines on both sides and lateral aspects of neck. Both lips were dry and bluish in colour. On internal examination there were petechial hemorrhages under the scalp in frontal and parietal regions. There were subpleural petechial hemorrhages on the surface of middle lobe of right lung and upper lobe of left lung. On cut section both the lungs were deeply congested. The brain, liver and kidneys were congested. All other organs were found to be within normal limits. The viscera had been sent to Forensic Science Laboratory for toxicological analysis.

On external examination of the daughter, the clothes were intact without any tear or signs of struggle. Rigor mortis was complete and postmortem lividity present on back. The face and neck were congested. The palms, soles, nail beds of fingers and nail beds of toes were cyanosed. Pinpoint petechial hemorrhages present in conjunctivae and on anterior and lateral aspects of neck. A bluish contusion of size 1.5 cm x 1 cm was present on the chin. On internal examination there were petechial hemorrhages under the scalp in frontal region. There were subpleural hemorrhages on the surface of middle and upper lobes of right lung and upper lobe of left lung. On cut section both the lungs were deeply congested. The brain, liver and kidneys were congested. All other organs were found to be within normal limits. The viscera had been sent to Forensic Science Laboratory for toxicological analysis.

The toxicology reports of the wife and the daughter were negative for any poisons or chemicals. The cause of death in both the cases was given as asphyxia due to smothering with a pillow. The lack of any signs of struggle, negative toxicology report and the suicide note of the wife rules out the possibility of murder and indicate the voluntary consent given by the wife.
CLINICAL FINDINGS

The husband was shifted to AIIMS Trauma Centre, New Delhi, in an unconscious state. On examination in the casualty the airway was patent, breathing was spontaneous, respiratory rate was 30 per minute, chest was clear, blood pressure was 140/90 mm Hg, pulse rate was 94/min, Glasgow Coma Scale (GCS) was E1 V1 M1 with a score of 3/15 and temperature was normal. He was intubated initially and put on ventilation in view of the poor GCS, subsequently he responded well and was extubated the same day. There were three lacerated wounds on the neck with following description. (1) A 3 x 0.5 cm wound on anterior aspect transversely, (2) A 3 x 0.5 cm wound on right lateral aspect of neck and (3) A 2 x 0.5 cm wound on left lateral aspect of neck. There were multiple superficial wounds of varying dimensions of sizes 4-5 cm x 0.2 cm numbering more than 30 over anterior chest wall and more than 70 over anterior abdominal wall. There were 5 superficial wounds of size 4 x 0.2 cm each over anterior aspect of right wrist. There were 3 superficial wounds of size 4 x 0.3 cm each over anterior aspect of left wrist. He was managed conservatively and was discharged after 6 days. During the hospital stay psychiatric consultation was also taken.

DISCUSSION

A suicide pact is very rare. As a result there have been very few studies on suicide pacts. However there have been some occasional case reports of suicide pacts in the literature. Most of the victims of suicide pacts had chosen methods of suicide like poisoning, hanging, gas exhaust etc. In a study of 20 suicide pacts from Dade County, USA, gun was used as a method of suicide in 40% of cases followed by overdose in 27.5%, carbon monoxide in 25%, hanging in 5% and stabbing/slashing in 2.5%. The suicide pact victims in Bangalore and Japan were much more likely than those in England or Dade County to choose poisoning as a method of suicide. In the present case smothering as a method of suicide in a suicide pact is unique. The suicide pact victims were typically skilled or unskilled workers, the majority of whom were out of work or retired and 38% victims of spouse pacts were not working. In the present case the husband was self-employed who suffered huge losses in his business.
driving the family to debt and the situation is similar to being out of work. In a study it has been reported that the average age of husbands and wives was 60.2 years and 56.2 years respectively. In the same study it has also been reported that the average age of males and females was 44.1 years and 50.1 years respectively. The average age of the Bangalore husbands in suicide pacts was 38 years versus 60.2 and 60 years for husbands in England and Dade County, respectively. The age of the husband in present case is 38 years and that of the wife is 34 years. The age of the husband is similar to the average age in Bangalore husbands as reported by Fishbain. Leaving a suicide note may be one of the characteristics of suicide pacts. The suicide pact victims from Dade County were much more likely to leave a suicide note than Bangalore suicide pact victims. Suicide pact victims are much more likely to leave a suicide note than single suicide victims. It has been reported that suicide notes were found in 84% of the pacts. It has also been also reported that both partners signed the note in 63% pacts and one partner in 36%. In the present case both the husband and the wife had written suicide notes. The suicide pact victims take a great deal of care to cope with the problems that would be created by their death. In the present case the husband wrote two detailed suicide notes one to the police and other to his business partners. In the suicide note addressed to the police he elaborated the reasons for taking the extreme step. In the suicide note addressed to his friends he expressed gratefulness to some of his friends and also left instructions as to what to do with his share of business. He also wrote about where some of the important documents had been kept. The wife wrote a brief suicide note indicating her wish to be buried along with her husband and according to the customs of Shia rites. But it was an unfortunate event for their innocent child who became a forced victim of their suicide agreement.

In the instant case the suicide pact was an unsuccessful one as the husband survived the attempt. As per the law the husband has been charged with homicide. The attempted suicide is also punishable as per the Indian law. Had the method of suicide been hanging or poisoning the charge on the husband would have been abetment of suicide inviting lesser punishment compared to homicide. However since there was no signs of struggle or violence as per the autopsy findings it was a case of assisted suicide. In India as per law there is no provision for assisted suicide and the husband was charged with homicide.

**CONCLUSION**

The present case is unique because of the method adopted to commit suicide, that is smothering, which is a very violent method. Though the wife had it voluntarily consented to be smothered but under the law it is a case of homicide. And also the child was a non consenting partner. Had the husband’s attempt been successful it would have been very difficult to arrive at the correct cause of death. Since the husband survived, arriving at the cause of death was helped by circumstantial evidence.

**Acknowledgement:** Nil

**Conflict of Interest:** Nil

**Source of Funding:** Self

**Ethical Clearance:** Obtained

**REFERENCES**

Deadly Robbery - A Case Report

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**ABSTRACT**

Here we report about a male corpse aged 32 years, which was actually brought to the mortuary as death due to accidental traumatic asphyxia. Asphyxia was the definitive mode of death in this case, but trauma was not the cause for the asphyxia instead, by the presence of electrical injury. The different types of lesions were caused due to struggle to get down together with the electrocution. Of all the lesions diagnosed at post mortem examination, one needs a special mention, the subarachnoid hemorrhage, which resulted due to electrocution. Based on postmortem finding, the time since death was given as 12 -24 hours prior to the post mortem examination and the Cause of death was given as "ELECTROCUTION".

**Keywords:** Electrocution, Asphyxia, Subarachnoid Haemorrhage

**INTRODUCTION**

Electrocution can cause lesions of variable severity according to the type and intensity of the current, the length and method of exposure, and some individual physiologic and pathologic features. The result may be lesions of the skin and organs or death.¹ Death may be caused by different mechanisms like cardiac conducting system abnormalities, asphyxia, bulbar paralysis or secondary trauma.

The total number of accidental deaths in India in the year 2012 was 3,94,982 out of which 8750 (2.2%) were because of electrocution.² Here we are presenting a case of electrocution death, which was actually brought to mortuary as death due to accidental traumatic asphyxia.

**CASE REPORT**

A male corpse aged 32 years was brought to the mortuary. As per the inquest report the body was found in a hanging position, trapped in between the anglers used for supporting the tin roof of a wine shop. The history of the case according to the inquest report is after removing the tin roof with screwdriver & cutting pliers the deceased tried to enter into the wine shop through the narrow 6” gap between the anglers, which are used for supporting the roof. In an unsuccessful effort to get down the deceased was trapped in between the anglers and subsequently died due to traumatic asphyxia.

The following injuries were recorded in the inquest report:

1. Abrasion over the right side of the front & back of the chest.
2. Blood stained abrasions present on both elbows.
3. Multiple large abrasions on both thighs.
4. A large abrasion over the right frontal aspect of leg below knee.

**Postmortem findings**

**External examination**

Identified body of middle aged male, 173 cm in height with normal built fair complexion

The body was dressed in brown half sleeves shirt with dark blue stripes, dark blue colored pant and light blue under wear.
The following postmortem changes are noted:

1. Greenish discoloration over both iliac fossae, rigor mortis was partially present in the lower limbs and postmortem lividity was seen on distal parts of both the lower limbs.

The following ante mortem injuries are noted:

1. Mild ecchymosis was seen around the left eye with congestion of the conjunctiva.
2. Multiple small abrasions over an area of 38'33 cm involving front of chest and abdomen, reddish brown in color and leathery in texture.
3. Grazed abrasion 145 cm on anterolateral aspect of right side of chest, 5cm below the armpit reddish brown in color.
4. Grazed abrasion 106 cm on back of left side of chest, 15cm below the left shoulder blade reddish brown in color.
5. Grazed abrasion 206 cm on front & outer aspect of right hand involving the arm, elbow & forearm reddish brown in color.
6. An electrical injury, a round pale shallow crater 2cm in diameter on the outer aspect of proximal part of hypothenar eminence of left palm with averted edges and red peripheral discoloration.
7. Grazed abrasion 18´8 cm on outer aspect of left hand involving the arm, elbow & forearm reddish brown in color.
8. Grazed abrasion 7´3 cm on left loin reddish brown in color.
9. Multiple grazed abrasions of varying size over an area of 16´10 cm on upper outer aspect of right buttock reddish brown in color.
10. Abrasions measuring 85cm on front and lower part of scrotal sac reddish brown in color.
11. Grazed abrasion 2010 cm on anteromedial aspect of left thigh reddish brown in color.
12. An electrical injury, a round shallow crater measuring 4'3 cm on front of upper 3rd of right leg with averted edges and red peripheral discoloration.
13. An electrical injury, a round shallow crater measuring 4'3 cm on front of middle 3rd of right leg with averted edges and red peripheral discoloration.
14. An electrical injury, a round shallow crater measuring 2'1/2 cm on tip of right great toe and 1cm diameter on tip of second toe with averted edges and red peripheral discoloration.

Internal examination

Both cerebral hemispheres were having diffuse subarachnoid hemorrhage.

Fracture of 7th, 8th, & 9th ribs on left side under the injury 4. The fractured ribs were showing infiltration of blood with laceration of underlying pleura.

Heart chambers filled with frothy fluid with blood stained pericardial fluid.

Stomach – about 100ml of semi digested food with no obnoxious smell, mucosa of stomach congested. Kidneys both are congested. Testicles contused

All other visceral organs are congested.

No tissues were preserved for further examination.

Taking into account the above findings the time since death was given as 12 -24 hours prior to the post mortem examination and the Cause of death was given as “ELECTROCUTION”.

DISCUSSION

This case report analyzes the dynamics and circumstances surrounding the death of a man engaged in robbery with electrocution.

The mechanisms resulting in death can be of different types, according to the intensity of the electric current and its path through the body. The first, most important cause is abnormalities of cardiac conducting system. The second type is respiratory and occurs when the current affects the chest, provoking first spasm and then tetanic contraction of the intercostal muscles and diaphragm, resulting in asphyxia. The third cause is paralysis of the bulbar nerve centers. Other rare mechanisms are secondary trauma, drowning and individual damage of organ.3

Asphyxia was the definitive mode of death in this case, but trauma was not the cause for the asphyxia instead, by the presence of electrical injury and the study of crime scene, which helped us to come to an opinion about the mode of death as asphyxia due to the tetanic contractions of the intercostal muscles and diaphragm due to electrocution.
The deceased in an attempt to get down from the roof while cutting open the tin sheets of the roof has caused sufficient damage to the electrical wire connected to the tube light, which was the source of electrocution, which produced the electrical injuries. The injuries 12, 13, 14 are the entry electrical injuries with injury 6 being the exit. The multiple abrasions where produced due to the friction with the tin sheets and iron rods of the roof during the struggle to get down. The fracture of ribs may be due to the violent spasms due to the electrocution together with the restrictive force from the rods in which the deceased was trapped.

But the presence of subarachnoid hemorrhage left us with dilemma.

On reviewing the literature we found that the major cause of subarachnoid hemorrhage is rupture of aneurysm and most of the new aneurysms are not detected until they rupture. We also found a case study showing rupture of aneurysms leading to subarachnoid hemorrhage on electrocution. In that particular study they have quoted that out of 483 cases of electrocution they found 12 patients presented with de novo aneurysms. The rupture of intracranial aneurysm in connection with electrocution is probably a rare event.

The other mechanism for the subarachnoid hemorrhage can be, the physical and emotional state of the victim at the time of robbery is active, where the adrenal response is present, with muscle tone, heart rate and blood pressure are increased by catecholamine’s and it is likely reason to raise the internal blood pressure in a weak aneurysm is a far more potent reason for rupture than a blow on the head.

Another mechanism for subarachnoid hemorrhages may be due to the violent spasms of neck muscles from electrocution associated with increased intracranial pressure due to the fixation of the body in a hanging position.

With all the above considerations the cause of death was given as electrocution.

**CONCLUSION**

In all cases of suspected electrocution, there should be an examination of the alleged source of the electrical current including electrical devices the individual was handling at the time of death. In low-voltage electrocutions, examination of the device rather than
examination of the body will often provide the cause of death, because burns may not be present. Thus, one can make a diagnosis of electrocution without an electrical burn, based on the circumstances of the death, negative autopsy findings and the examination of the electrical device in use. In high-voltage electrocution, tissue from the victim may be adherent at the point of contact with the source of the current.\(^5\)

The following important points to be remembered in cases of suspected electrocution

1. Thorough examination of the body to find the electrical injury.
2. Absence of external electrical injury doesn’t exclude electrocution.
3. In cases where there are no definitive external signs of electrocution, circumstantial evidence is crucial.
4. Don’t blindly rely on Inquest report.
5. Visiting the crime scene when & where required / at least request the IO for crime scene photographs, which are taken without disturbing the scene of offence.

Acknowledgments: Nil

Conflict of Interest: There is no conflict of interest, publishing with academic interest.

Source of Funding: Nil

Ethical Clearance: As identity of the deceased has not been revealed & as it is a retrospective case report with no risk involved, ethical clearance is not applicable.

REFERENCES

2. ncrb.nic.in/publications/accidental deaths & suicides/2012/accidental deaths in india/figure 1.5.
4. Bernard knight, Pekka Saukko, Knight’s Forensic Pathology, Third edition, Chapter 5, Pg199
Pattern of Fatal Head Injuries in Road Traffic Accidents at SMS Hospital, Jaipur - An Autopsy Based Study

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ABSTRACT

Background: Head Injury is the single most common cause of mortality in vehicle accidents. Its outcome is a product of different mechanisms, types and amounts of head injuries and their anatomical locations.

Objective: To analyze the pattern of fatal head Injury in road traffic accidents at SMS Hospital, Jaipur; a tertiary care centre.

Subjects: Cases of Road Traffic Accidents with fatal head injury subjected to medico-legal autopsy at the Department of Forensic Medicine, SMS Medical College and Hospital Jaipur, Rajasthan, India - a tertiary care center.

Main outcome: Young adults (both males and females) in their most productive years of life are especially prone to head injury, as a result of vehicle accidents. The use of helmets as preventive measure has checked the external and bony injuries to skull region but there is an urgent need to plan further prevention in such cases to check internal brain injuries caused due to movement of brain in cranial cavity.

Results: Males clearly outnumbered females with male to female ratio as 4.7:1. Motor-cyclists were the commonest group of victims. Head injury was the commonest cause of death comprising 53.5% cases. Intracranial hemorrhage of one or more vascular components was the commonest type of injury. The most frequent pattern was a combination of subdural, subarachnoid and intracerebral hematomas i.e. 23 (34.9%). This was followed by Subarachnoid and Intracerebral 13 (19.7%) and subdural and subarachnoid 09 (13.6%). Out of 16 (24.24%) single compartment hemorrhage, the most frequent was intracerebral 08 (50%), followed by subdural 5 (31.25%) and subarachnoid 2 (12.5%) hemorrhage.

Conclusion: Prompt treatment should be instituted to all cases of trauma particularly head injury to prevent fatality. Also there is a need to plan preventive measures.

Keywords: Fatal Head Injury, Road Traffic Accidents, Intracranial Hemorrhages

INTRODUCTION

Road traffic accidents are one of the major causes of death in developed as well as developing countries¹. Although, this problem has been controlled very much in developed countries but in developing countries like India, condition is still worsening. India being one of the fastest developing nations in the world with a huge population density, the road traffic density is also increasing. India accounts for about 10% of road accident fatalities worldwide². The head being the most vulnerable part of the body is involved frequently and lead to morbidity and mortality in road traffic accidents.

Head injury has been defined as, “a morbid state, resulting from gross or subtle structural changes in the scalp, skull, and/or the contents of the skull, produced
by mechanical forces. Depending upon whether or not the duramater was torn, the head injury may be termed as open or closed type. The extent and degree of injury to the skull and its content is not necessarily proportional to the quantum of force applied to the head. Head injury may lead to skull fractures, various extents of brain parenchymal injuries and traumatic vascular injuries.

According to Munro, any type of cranio-cerebral injury is possible with any kind of blow on any sort of head.

Severe head injury, with or without peripheral trauma, is the commonest cause of death and/or disability up to the age of 45 years in developed countries. Death due to head injury depends upon various factors including intensity of impact on head, degree of deceleration, pattern of skull bones fractured, degree and sites of parenchymal and vascular injuries, time spent from the time of injury to the specialized health care at hospital and how efficiently life support measures were given. Unless some safety and preventive measures are strictly implemented death toll will continue to increase and will cause significant loss of precious lives. In this paper, recent trends in patterns of fatal head injury in road traffic accidents with regards to age, sex, frequency of occurrence, anatomical sites involved were analyzed and presented.

MATERIAL & METHOD

The present study was carried out prospectively in the Department of Forensic Medicine & Toxicology, SMS Medical College, Jaipur, Rajasthan over a period of two months during June and July, 2013. Total 137 cases of road traffic accidents were autopsied during this period out of which fatal head injury was present in 80 cases. The information regarding age, sex, residence, date and time of accident and of death was gathered from police inquest report, relatives, dead body challan and clinical details from hospital records. During autopsy, detailed examination was carried out and data regarding both external and internal injuries was carefully recorded analyzed and presented in this paper.

OBSERVATIONS

Age and Sex Distribution

The highest incidence was seen in the age group of 21-30 years comprising of 26 (32.5%) cases followed by 31-40 years comprising of 20 (25%) cases. The lowest incidence was seen in >60 years age group comprising of only 1.25% cases. The majority of the victims subjected to fatal head injury were males (82.5%) with male: female ratio of 4.7:1.

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total (%)</th>
<th>Sex Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>01</td>
<td>02</td>
<td>03 (3.75)</td>
<td>0.5:1</td>
</tr>
<tr>
<td>11-20</td>
<td>13</td>
<td>0</td>
<td>13 (16.25)</td>
<td>13:0</td>
</tr>
<tr>
<td>21-30</td>
<td>25</td>
<td>01</td>
<td>26 (32.5)</td>
<td>25:1</td>
</tr>
<tr>
<td>31-40</td>
<td>13</td>
<td>07</td>
<td>20 (25)</td>
<td>1.86:1</td>
</tr>
<tr>
<td>41-50</td>
<td>10</td>
<td>02</td>
<td>12 (15)</td>
<td>5:1</td>
</tr>
<tr>
<td>&gt; 60</td>
<td>03</td>
<td>02</td>
<td>05 (6.25)</td>
<td>1.5:1</td>
</tr>
<tr>
<td>Total (%)</td>
<td>66 (82.5)</td>
<td>14 (17.5)</td>
<td>80 (100)</td>
<td>4.7:1</td>
</tr>
</tbody>
</table>

Place of Death

The maximum number of victims (25%) died while on the way to hospital, followed by victims died in the hospital (65%). The number of victims who died on the spot was 10%.

Profile of victims

The motor-cyclists were the commonest group of victims, comprising 32(40%) cases, out of which 29 were drivers, followed by Light Motor Vehicle users comprising 28 (35%) cases of which 23 were occupants. Pedestrians constituted 20 (25%) of the cases. Overall, the drivers of vehicles (34%) outnumbered the occupants of the vehicles (26%).

Offending Vehicle

In the present study, truck was the commonest offending vehicle being involved in 52 (65%) cases, followed by Light Motor Vehicle (20%) and buses (15%).

Site of Injury

Pedestrians, occupants of two wheelers and light motor vehicles sustained maximum injuries on extremities, followed by on head, neck and face. Four wheeler users had maximum injuries on head, neck and face region, followed by on extremities.

Cause of Death

Head injury was the commonest cause of death comprising 53.5% cases. In drivers, head injury was the commonest cause of death observed in 28 cases. In occupants of the vehicles, injury to vital organs was
the commonest cause of death seen in 17 cases. In pedestrians, shock and hemorrhage was predominant cause of death seen in 14 cases.

Head Injury

A combination of multiple injuries in the form of skull fractures, intracranial hemorrhage and/or injury to brain with or without external injury was predominantly seen in more than 90% cases, including a combination involving scalp injury and intracranial hemorrhage (62.5%) and those involving combination of skull fractures and intracranial hemorrhages with or without brain injury (28.75%).

Fifty two (65%) cases had no skull bone fractures at all, 23 (28.75%) patients sustained skull bone fracture of single bone and rest 05 (6.25%) had fractures of more than one skull bone. Out of the total 23 (28.75%) subjects which received single skull bone fracture, the most frequent bone fractured was frontal (39.3%), followed by parietal (17.8%), occipital (14.3%) and temporal (10.7%) each. Rest cases showing skull fractures had multiple bony injuries. Out of the 23 cases of skull fractures, in 11 cases there was isolated fracture of the vault, fractures of the vault and bases of skull were seen in 5 cases and in rest of the 7 cases, there were only basal fractures. In cases of basal fractures, fractures of the anterior cranial fossa were the commonest and the fractures of posterior cranial fossa were the least common.

Table 2: Showing Anatomical location of Skull fractures

<table>
<thead>
<tr>
<th>Site of skull fracture (bone)</th>
<th>No. of cases</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontal</td>
<td>11</td>
<td>39.3</td>
</tr>
<tr>
<td>Temporal</td>
<td>03</td>
<td>10.7</td>
</tr>
<tr>
<td>Parietal</td>
<td>05</td>
<td>17.8</td>
</tr>
<tr>
<td>Occipital</td>
<td>04</td>
<td>14.3</td>
</tr>
<tr>
<td>Frontal + Temporal</td>
<td>01</td>
<td>03.6</td>
</tr>
<tr>
<td>Temporal + Occipital</td>
<td>01</td>
<td>03.6</td>
</tr>
<tr>
<td>Frontal + Temporal + Parietal</td>
<td>03</td>
<td>10.7</td>
</tr>
<tr>
<td>Total cases of Skull fractures</td>
<td>28</td>
<td>35</td>
</tr>
</tbody>
</table>

Out of the total 80 cases, more than half (62.5%) subjects presented with hemorrhage in more than one vascular compartment. The most frequent pattern was a combination of subdural, subarachnoid and intracerebral hematomas i.e. 23 (34.9%). This was followed by Subarachnoid and Intracerebral 13 (19.7%) and subdural and subarachnoid 09 (13.6%). Out of 16 (24.24%) single compartment hemorrhage, the most frequent was intracerebral 08 (50%), followed by subdural 5 (31.25%) and subarachnoid 2 (12.5%) hemorrhage.

Table 3: Showing the pattern of Intracranial Hemorrhages in cases

<table>
<thead>
<tr>
<th>Type of Hemorrhage</th>
<th>No. of Cases</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDH only</td>
<td>01</td>
<td>1.5</td>
</tr>
<tr>
<td>SDH only</td>
<td>05</td>
<td>7.6</td>
</tr>
<tr>
<td>SAH only</td>
<td>02</td>
<td>03</td>
</tr>
<tr>
<td>ICR ONLY</td>
<td>08</td>
<td>12.1</td>
</tr>
<tr>
<td>EDH + SDH</td>
<td>05</td>
<td>7.6</td>
</tr>
<tr>
<td>SDH + SAH</td>
<td>09</td>
<td>13.6</td>
</tr>
<tr>
<td>SAH + ICR</td>
<td>13</td>
<td>19.7</td>
</tr>
<tr>
<td>SDH +SAH + ICR</td>
<td>23</td>
<td>34.9</td>
</tr>
<tr>
<td>Total</td>
<td>66 (82.5%)</td>
<td>100</td>
</tr>
</tbody>
</table>

There were no injuries to other body parts in 22 (27.5%) cases. Out of the remaining 58 (72.5%) cases, there were 10 (17.24%) cases with rib fractures, 7 (12%) cases with lung lacerations, 13 (22.4%) with injuries to the extremities, 20 (34.4%) with abdomino-pelvic injuries, 5 (8.6%) with facial bone fractures and 3 (5.1%) with spinal injuries. A total of 28 (35%) cases received more than two injuries other than head injuries.

DISCUSSION

In this study, Males clearly outnumbered females with male to female ratio as 4.7:1. This is in almost in accordance with the studies of Kumar A et al2, Singh YN et al9, Tripude BH et al10, Singh H et al11, Sharma BR et al12, Biswas G et al13 and Tandle RM et al14. In the age group analysis of the victims, maximum incidence was in age group of 21-30 years and least in group 0-10 years. Similar findings were observed by other researchers10-14.

The maximum number of victims (65%) died in the hospital, followed by victims who died while on the way to hospital (25%). The number of victims who died on the spot was 10%. This is not consistent with the studies of Sharma BR et al12 Tandle RM et al14, Menon A et al13 and Chandra J et al16. The reason for this inconsistency may be due to the differences in the severity of head injuries and other associated injuries in the various studies of comparison.

The motor-cyclists were the commonest group of victims (40%) followed by Light Motor Vehicle users (35%). Pedestrians constituted a quarter of the cases. Our findings are quite similar to those of Tandle RM et al14 and Pathak A et al17. In our study the drivers were reported more than occupants.
Head Injury was the predominant cause of death in drivers while shock and hemorrhage resulting from injuries to other vital organs remained the predominant cause of death in occupants of light motor vehicles and pedestrians. Our findings are similar to those reported by Tandle RM et al\textsuperscript{14}, Chandra J et al\textsuperscript{16} and Kumar A et al\textsuperscript{2}.

In our study abdomino-pelvic region suffered maximum injuries (34.4%), followed by thorax (29.24%) and extremities (22.4%). Least numbers of injuries were observed on spine (5.1%). Though there was a component of head injury in each case, still facial injuries were seen in only 8.6% cases. Our findings are in slight discordance with those of Singh H et al\textsuperscript{13}, Tandle RM et al\textsuperscript{14} and Dhillon S et al\textsuperscript{18}. This variability may be due to variations of study population and also because of the increasing use of helmets which protect the head and face region from external injuries.

Intracranial hemorrhage of one or more vascular components was the commonest type of injury seen in 66 of the total 80 cases of head injuries, followed by injury to the brain (45) and skull fractures (28). Injury to brain was observed in 45 cases. The findings are slightly variable from the studies of Menon A et al\textsuperscript{15}, Dhillon S et al\textsuperscript{18} and Tandle RM et al\textsuperscript{14}.

Out of the 28 cases of skull fractures, in 11 cases there was isolated fracture of the vault, fractures of the vault and bases of skull were seen in 5 cases and in rest of the 7 cases, there were only basal fractures. In cases of basal fractures, fractures of the anterior cranial fossa were the commonest and the fractures of posterior cranial fossa were the least common. Out of the total 23 (28.75%) subjects which received single skull bone fracture, the most frequent bone fractured was frontal (39.3%), followed by parietal (17.8%), occipital (14.3%) and temporal (10.7%) each.

**CONCLUSION**

Most of the cases of death due to head injury in vehicular accidents were males of productive age group because this is the population more in motion from one place to others. Majority of the victims were motorcyclists and drivers who sustained fatal head injury because of falls and probably due to head on collisions. The pattern of head injuries is different from other studies as intracranial hemorrhages and internal injuries to brain were predominantly seen. Rather in other studies external and bony injuries were more commonly seen. This is probably due to the strictness in traffic rules for compulsion of helmets so that the injuries due to direct impact are prevented, however, the injuries resulted from movement of brain inside the cranial cavity. Thus we conclude that additional preventive measures should be planned and implemented to prevent head injuries.

**Acknowledgements:** To the victims on whom the work was carried out

**Conflicts of Interest:** Nil

**Source of Funding:** Nil

**Ethical Clearance:** Not required

**REFERENCES**


3. Dr. K H Chavli, Dr. B R Sharma, Dr. D Harish, Dr. Anup Sharma. Head injury: The principal killer in road traffic accidents. JIAFM, 2006:28(4) ISSN: 0971-973.


11. Harnam Singh, S K Dhattarwal. Pattern and distribution of injuries in fatal road traffic accidents in Rohtak (Haryana); Journal of Indian Academy of Forensic Medicine, 2004; 26(1), ISSN 0971-0973.


Determination of the Toxic Lead and Copper Levels in Cosmetic Hair-Dye Powders by Flame Atomic Absorption Spectrophotometry

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ABSTRACT

Metal toxicity in humans is a result of long term or high level exposure to toxic metals which enter the body through common media as air, water, and food. More recently, with the increase in regular use of numerous cosmetic products, which have been reported to contain heavy metals as contaminants, human bodies are being exposed to them on a daily basis. A number of dermal absorption studies have been conducted which satisfy the assumption that harmful chemicals get absorbed into the blood stream through skin.

Hair-dye powders are one of the most commonly used cosmetic products by all- young and old these days and are applied on a regular basis. If contaminated, direct application on hair and scalp can increase chances of absorption of toxic metals as lead and copper and can potentially add up to significant exposure levels as these have cumulative effect. This has drawn our attention to assess the levels of these metals in nine samples of common hair-dye powders available in markets of Delhi. The levels of these metals were determined by Flame Atomic Absorption Spectrophotometer after a wet digestion method for sample preparation. Lead and Copper were detected in different concentrations in all the studied samples, the highest being 1.42 ± 0.0814 ppm and 0.75 ± 0.0693 ppm for lead and copper respectively.

Keywords: Toxic, Lead, Copper, Hair-Dye, Flame AAS

INTRODUCTION

Lead is a highly toxic substance, exposure to which can produce a wide range of adverse health effects.¹ There are many ways in which humans are exposed to lead: through deteriorating paint, household dust, bare soil, air, drinking water, food, ceramics, home remedies, hair dyes and other cosmetics. Much of this lead is of microscopic size, invisible to the naked eye.

Heavy metals are found naturally in the environment in rocks, soil and water, and therefore exist in the manufacture of pigments and other raw materials in all industries including the cosmetics industry. Some of these metals have been used as cosmetic ingredients in the past. Example includes the progressive hair dye lead acetate. Oral exposure can occur for cosmetics used in and around the mouth, as well as from hand-to-mouth contact after exposure to cosmetics containing heavy metal impurities.²

Exposure to environmental lead as reflected by its accumulation in hair has been studied by various researchers. In addition to this, variables which affect the accumulation of lead in hair have also been discussed.³

Apparently, in the use of lead acetate hair dyes, some lead is absorbed systemically from the scalp.⁴ As stated earlier, though heavy metals might not cause immediate health problems but their cumulative effect due to repeated application cannot be ignored. Dermal
absorption of heavy metals\textsuperscript{[5]} through skin of hands, scalp and face due to prolonged use of cosmetics containing lead is a matter of concern.

Copper has been assessed for its presence and concentration in various cosmetic and herbal products by various researchers. Saeed M. et. al. have stated, “Copper has both beneficial and toxic effects depending on its level of consumption. Monitoring of copper limit is essential as it is beneficial in low concentrations but exhibit various toxic effects above the safety limit\textsuperscript{[6]}\textsuperscript{[7]}

Health Canada’s “Draft guidance on heavy metal impurities in cosmetics, (2009)” has acknowledged that heavy metal impurities in cosmetic products are unavoidable due to the ubiquitous nature of these elements, but should be removed wherever technically feasible. Heavy metal concentrations in cosmetic products are seen to be technically avoidable when they exceed a certain limit e.g. Lead: 10 ppm\textsuperscript{[8]}

The aim of this project was to determine the toxic lead and copper levels in popular cosmetic hair-dye powders randomly selected from the market of Delhi by Flame Atomic Absorption Spectrophotometry.

\section*{MATERIALS AND METHOD}

\subsection*{Sample Collection}

Nine samples of popular cosmetic hair-dye formulations (black only) were randomly collected from markets of Delhi. The brand names were blinded and given the codes HD1 to HD9.

\subsection*{Apparatus and Chemicals}

Instrument: Atomic absorption spectrophotometer (EC Electronics Corporation of India Limited AAS4129) was used for determination of the metals-lead (Pb) and copper (Cu) with deuterium lamp for background correction. The hollow-cathode lamps for Pb and Cu which modulate the light of 285 Hz for the respective metals were employed as radiation source. The flame used was air/acetylene. Nitrogen was used as carrier gas.

Chemicals: Nitric acid and hydrogen peroxide used were of analytical grade and were 99.99 \% free from the presence of the metals under analysis (J. T. Baker). The water used in all experiment was ultrapure water obtained from Milli-Q-water purification system (Ranken Rion Ltd, India).

\subsection*{Preparation of standard solutions}

Lead standard solution (1000 ppm) was diluted to prepare stock solution of 10 ppm. Nine calibrator solutions of different concentrations (2.0 ppm, 3.0 ppm, 4.0 ppm, 5.0 ppm, 6.0 ppm, 7.0 ppm, 8.0 ppm and 9.0 ppm were prepared by serially diluting the stock solution of 10 ppm of lead immediately before use, whereas 10.0 ppm stock solution was used as the ninth calibrator solution.

Similarly, copper calibrator solutions were also prepared.

\subsection*{Sample preparation \textsuperscript{[9]}}

Sample preparation was done according to the method followed by Kumar S. et. al.

Samples were digested by the wet digestion method. 10 ml of nitric acid was added to 2 g of accurately weighed dried sample in a 100 ml beaker and was heated at 95°C for 15 min. The digest was cooled and 5 ml of concentrated nitric acid was added and heated for additional 30 min at 95°C. The last step was repeated and the solution was reduced to about 5 ml without boiling. The sample was cooled again and 2 ml of deionized water and 3 ml of 30\% hydrogen peroxide was added. With the beaker covered, the sample was heated gently to start the peroxide reaction. If effervescence becomes excessively vigorous, sample was removed from the water bath and 30\% hydrogen peroxide was added in 1 ml increments, followed by gentle heating until the effervescence subsided. 10 ml of deionized water was added and the sample was heated for additional 15 min without boiling. The sample was cooled and filtered through a Whatman No. 42 filter paper and diluted to 50 ml with deionized water.

\subsection*{Sample analysis}

Calibration lead and copper standards were prepared fresh every day prior to each analysis. Digested samples were analyzed for Lead and Copper using flame atomic absorption spectrophotometer which was done using a manual standard addition procedure where all nine hair-dye samples were divided into two batches each - (A) for Lead analysis and the (B) for Copper analysis. In batch (A) samples, known concentration of standard aqueous solution of Lead was added to each sample from HD1 to HD9 and the ‘test’ samples so prepared were then subject
to AAS analysis for quantification of Lead. Similarly batch (B) ‘test’ samples were analysed for quantification of Copper. Control samples were also analyzed.

All the measurements were made in triplicate for the samples and standard solutions. The instrumental conditions during the analysis of trace and heavy metals are listed in Table 1 giving details about parameters which are defined for Lead and Copper.

**Quality assurance** [10] [11] [12]

Reliability of the results was ensured by carrying out appropriate quality assurance procedures and precautions. Due to the unavailability of certified material for hair-dye analysis, the accuracy of the method was determined by measuring the recovery of lead and copper in the matrix containing known concentration of lead and copper solutions. The method of standard addition which is considered as a validation method was used to demonstrate the validity of the method used.

A recovery test was performed using method of standard addition. The recovery and reproducibility of the method was carried out by spiking and homogenizing several already analyzed samples with varied amounts of standards solutions of lead (Pb) and copper (Cu) and processed as previously described. These ‘spiked’ samples were run with the ‘test’ samples using the same analytical procedure. The analytical recovery for nine ‘spiked’ hair-dye samples with lead and copper are given in Table 4.

**RESULTS**

Regression data for the standard calibration plots

There was a good linear relation between absorbance and standard concentration of lead and copper. The regression equations, Pearson’s correlation coefficients and coefficient of determinations obtained for each calibration plot are summarised in Table 2. Linearity was evaluated by calculating the Pearson’s correlation coefficients (r) for three runs of ‘spiked’ hair-dye samples each for lead and copper.

Determined metal concentration in each hair-dye sample

The spectrophotometer automatically determined the concentration of Lead and Copper present in the ‘test’ samples by extrapolating the calibration curve in parts per million. All samples were run in triplicate and the mean values were used along with the respective standard deviation values for statistical analysis. Table 3 shows the data. Calculations were made to determine the weight of lead and copper and their percentage in hair-dye powders (Table 5). Figure 1 shows the graph of quantity of the respective metals found in hair-dye powders.

Table 6 summarises the statistics of the present study.

**DISCUSSION**

Lead and Copper poisoning by regular use of hair-dye powders is a matter of concern. Lead poisoning occurs when lead builds up in the body, often over a period of months or years. Lead containing hair-dyes whether applied a number of times a day or on daily basis can contribute to significant lead exposure levels. Even small amounts of lead can cause serious health problems. In adults, lead can increase blood pressure and cause fertility problems, nerve disorders, muscle and joint pain, irritability, and memory or concentration problems. When a pregnant woman has an elevated blood lead level, that lead can easily be transferred to the fetus, as lead crosses the placenta. In such cases, the baby is born with an elevated blood lead level. [1]

Previously published works have mentioned [2]: “Latest study shows that there is no safe level of lead exposure. The Centre for Disease Control and Prevention (CDC) has even gone so far as to recommend that parents should avoid using cosmetics on their children as that could be contaminated with lead…”

Similarly, toxicity may occur as a result of regular use of products such as hair-dyes containing Copper.

**CONCLUSION**

Various brands of hair-dyes manufactured by reputed firms are available in the Indian market which are claimed as safe for consumer-use. As per Chapter IV of Drugs and Cosmetics Rules 1945, Rule 144, the permitted synthetic organic colours and natural organic colours used in the cosmetic shall not contain more than 20 ppm of lead calculated as lead and 100 ppm of heavy metals other than lead calculated as the total of respective metals. Rule 145 prohibits use of lead and arsenic compounds in cosmetics for the purpose of colouring. Rule 135 prohibits import also of cosmetics containing lead or arsenic compounds for the purposes
of colouring. U/S Section 27A, manufacturing, selling, etc, of cosmetics in contravention to Drugs and Cosmetics Act, 1940 and/or Rules 1945 calls for imprisonment up to three years and with fine.

It has already been brought to notice by earlier researchers-[2]

“None of the heavy metals are listed on the labels of the cosmetic products. Provision should be made in the act for compulsory disclosure of the heavy metal concentration on the cosmetic labels esp. on the colour cosmetics. Furthermore, manufacturers and importers must ensure that products are safe and do not pose a risk to the users. Misbranded and Spurious cosmetics are defined u/s-9-C and 9-D respectively in the Drugs and Cosmetics Act for the purpose of import to India. Adulterated cosmetics are not defined for the purpose of import….. The proposed US Safe Cosmetics Act (2010) suggests that all ingredients, including those currently protected by trade secret laws (i.e. fragrance) unless protected as a trade secret by other laws, will have to be labelled on cosmetics. It is recommended that India take a similar approach.”

The aim of this study was to highlight and bring into notice the importance of the necessary disclosure of toxic metals (e.g. Pb, Cu etc.) content in hair-dye powders and other cosmetic products on the respective labels by manufacturers.

### Table 1: Instrumental Conditions for Analysis of Samples (Hair-Dye Powders)

<table>
<thead>
<tr>
<th>Element</th>
<th>Current (mA)</th>
<th>Slit Width (nm)</th>
<th>$\bar{E_{\text{max}}}$ (nm)</th>
<th>Flame Color</th>
<th>Flame Type</th>
<th>AA Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pb</td>
<td>5 mA</td>
<td>1.0</td>
<td>217.7</td>
<td>Blue</td>
<td>Air/C$_2$H$_2$ Flame</td>
<td></td>
</tr>
<tr>
<td>Cu</td>
<td>5 mA</td>
<td>0.5</td>
<td>324.7</td>
<td>Orange</td>
<td>Air/C$_2$H$_2$ Flame</td>
<td></td>
</tr>
</tbody>
</table>

### Table 2: Regression data for the analysis of the standard solutions

<table>
<thead>
<tr>
<th>S. No.</th>
<th>AAS calibration</th>
<th>Regression equation</th>
<th>Coefficient of determination ($R^2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Pb-1st run</td>
<td>$y = 0.0251x + 0.2009$</td>
<td>0.9926</td>
</tr>
<tr>
<td>2.</td>
<td>Pb-2nd run</td>
<td>$y = 0.0251x + 0.1979$</td>
<td>0.9969</td>
</tr>
<tr>
<td>3.</td>
<td>Pb-3rd run</td>
<td>$y = 0.0278x + 0.1951$</td>
<td>0.9975</td>
</tr>
<tr>
<td>4.</td>
<td>Cu-1st run</td>
<td>$Y = 0.1691x - 0.0826$</td>
<td>0.9931</td>
</tr>
<tr>
<td>5.</td>
<td>Cu-2nd run</td>
<td>$Y = 0.1784x - 0.1703$</td>
<td>0.9956</td>
</tr>
<tr>
<td>6.</td>
<td>Cu-3rd run</td>
<td>$Y = 0.1472x - 0.0245$</td>
<td>0.9936</td>
</tr>
</tbody>
</table>

### Table 3: Toxic Metal Content (Pb & Cu) in Spiked Samples (Hair-Dye Powders)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Sample</th>
<th>Lead in ppm (Mean±SD)</th>
<th>Copper in ppm (Mean±SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>HD1</td>
<td>3.90±0.0624</td>
<td>3.21±0.0473</td>
</tr>
<tr>
<td>2.</td>
<td>HD2</td>
<td>3.89±0.0458</td>
<td>3.16±0.0643</td>
</tr>
<tr>
<td>3.</td>
<td>HD3</td>
<td>3.80±0.0551</td>
<td>3.22±0.0557</td>
</tr>
<tr>
<td>4.</td>
<td>HD4</td>
<td>3.74±0.0586</td>
<td>3.24±0.0529</td>
</tr>
<tr>
<td>5.</td>
<td>HD5</td>
<td>3.80±0.0153</td>
<td>3.18±0.0153</td>
</tr>
<tr>
<td>6.</td>
<td>HD6</td>
<td>3.81±0.0577</td>
<td>3.22±0.0569</td>
</tr>
<tr>
<td>7.</td>
<td>HD7</td>
<td>3.87±0.0551</td>
<td>3.24±0.0493</td>
</tr>
<tr>
<td>8.</td>
<td>HD8</td>
<td>3.98±0.0351</td>
<td>3.20±0.0203</td>
</tr>
<tr>
<td>9.</td>
<td>HD9</td>
<td>3.71±0.0416</td>
<td>3.25±0.0693</td>
</tr>
</tbody>
</table>

### Table 4: Recovery studies for heavy metal (Pb) and trace element (Cu)

<table>
<thead>
<tr>
<th>Metal</th>
<th>Base Value (ppm)</th>
<th>Quantity Added (ppm)</th>
<th>Quantity Detected* (ppm)</th>
<th>Recovery (%)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pb</td>
<td>1.400 ± 0.0624</td>
<td>5.0</td>
<td>6.36</td>
<td>99.2</td>
</tr>
<tr>
<td>Cu</td>
<td>0.75 ± 0.0693</td>
<td>5.0</td>
<td>5.66</td>
<td>98.2</td>
</tr>
</tbody>
</table>

Recovery test, * Mean value (n = 3). * 100×[(found-base)/added].
Table 5: Actual Concentration of Lead and Copper found in Hair-Dye Powders by Atomic Absorption Spectrophotometry

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Sample Name</th>
<th>Pb content (ppm)*</th>
<th>Pb content (mg)</th>
<th>Cu content (ppm)**</th>
<th>Cu content (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>HD1</td>
<td>1.40 ± 0.0624</td>
<td>0.070</td>
<td>0.66 ± 0.0781</td>
<td>0.033</td>
</tr>
<tr>
<td>2.</td>
<td>HD2</td>
<td>1.36 ± 0.0321</td>
<td>0.068</td>
<td>0.66 ± 0.0643</td>
<td>0.033</td>
</tr>
<tr>
<td>3.</td>
<td>HD3</td>
<td>1.27 ± 0.0819</td>
<td>0.064</td>
<td>0.72 ± 0.0557</td>
<td>0.036</td>
</tr>
<tr>
<td>4.</td>
<td>HD4</td>
<td>1.24 ± 0.0586</td>
<td>0.062</td>
<td>0.69 ± 0.0808</td>
<td>0.034</td>
</tr>
<tr>
<td>5.</td>
<td>HD5</td>
<td>1.27 ± 0.0700</td>
<td>0.064</td>
<td>0.68 ± 0.0153</td>
<td>0.034</td>
</tr>
<tr>
<td>6.</td>
<td>HD6</td>
<td>1.31 ± 0.0608</td>
<td>0.066</td>
<td>0.71 ± 0.0635</td>
<td>0.036</td>
</tr>
<tr>
<td>7.</td>
<td>HD7</td>
<td>1.37 ± 0.0551</td>
<td>0.068</td>
<td>0.74 ± 0.0493</td>
<td>0.037</td>
</tr>
<tr>
<td>8.</td>
<td>HD8</td>
<td>1.42 ± 0.0814</td>
<td>0.071</td>
<td>0.73 ± 0.0603</td>
<td>0.036</td>
</tr>
<tr>
<td>9.</td>
<td>HD9</td>
<td>1.21 ± 0.0416</td>
<td>0.060</td>
<td>0.75 ± 0.0693</td>
<td>0.038</td>
</tr>
</tbody>
</table>

* Actual lead content present in hair-dye powder obtained by subtracting the spiked concentration value of lead standard solution from total concentration value shown by AAS instrument.

** Actual copper content present in hair-dye powder; obtained by subtracting the spiked concentration value of copper standard solution from total concentration value shown by AAS instrument.

Fig. 1. Graph showing the quantity of lead and copper found in hair-dye powders by AAS analysis

Table 6: Summary of statistics of metal analysis.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Parameter</th>
<th>Lead (Pb)</th>
<th>Copper (Cu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Number of samples analysed</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>2.</td>
<td>Number of samples with detectable metal</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>3.</td>
<td>% of samples with detectable metal</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>4.</td>
<td>Minimum conc. of metalion detected (ppm)</td>
<td>1.21 ± 0.0416</td>
<td>0.66 ± 0.0781</td>
</tr>
<tr>
<td>5.</td>
<td>Maximum conc. of metalion detected (ppm)</td>
<td>1.42 ± 0.0814</td>
<td>0.75 ± 0.0693</td>
</tr>
</tbody>
</table>

ACKNOWLEDGEMENT

The authors are thankful to Shri Kamlendra Prasad, IPS, Director of LNJN NICFS (MHA) for encouraging the analysis and providing facilities to undertake this work.

REFERENCES


Individualisation of the Biological Remains from Anthropological Perspective-A Case Study

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ABSTRACT

A teenage boy went to see a wrestling bout in nearby village and disappeared mysteriously. On presumption of death under suspicious circumstances, the parents lodged a complaint and a murder case was registered in police station under section 302, 34 IPC. The incidence caused lot of unrest and protesting villagers blocked roads. After about two weeks, the skeletal remains of a human body were found on the bank of Pong Dam Lake in Himachal Pradesh. The police visited the spot and collected the skeletal remains for post-mortem examination. After about two weeks of death, a team of forensic experts from RFSL, Dharamshala visited and scientifically examined the spot and skeletal remains kept in the mortuary, collected and photographed the clue materials/physical evidences. The skeletal remains were found nibbled by wild animals indicating that the body got exposed after water level at the dam receded. The wild animals attacked and nibbled the remains and gnawing marks were seen on bones, metatarsal and heel region. In the present case, diatom analysis, study of skeletal remains, hair and faecal matter examination and DNA fingerprinting was done to ascertain the real cause of death, age, sex and identity of the person. For establishing identity and estimating the age and sex from the skeletal remains, forensic experts examined the skull, mandible and maxilla for dental eruption, pelvis and long bones on the basis of osteological, anthroposcopic, morphological and anatomical examination/assessment and the remains were found to be of Homo sapiens (Human) which were morphologically and anatomically consistent with male individual under 18 years of age. For examining the drowning case, water sample, in which possible drowning took place and femur bone sample was used for detection of diatoms. Acid digestion test was used and a correlation was established between diatoms detected in water and bone sample indicated ante-mortem drowning. In DNA fingerprinting blood samples of the parents matched with the DNA extracted from the bones which proved identity. After morphological and microscopic examinations the black hair embedded in the soil and brown hair with animal droppings collected from the spot revealed that black hair were human head hair and animal dropping was a mixture of human and animal hair probing that some wild animal have eaten the body and passed the droppings.

Keywords: Osteological, Morphological, Anatomical, DNA, Diatom, Age, Sex, Hairs and Bones

INTRODUCTION

Skeletal remains of a human body always pose challenges in determination of age, sex, identity and cause of death. If the skeletal remains are found nibbled by wild animals and scattered on the bank of any dam, it further poses challenge whether death is due to ante-mortem or post-mortem drowning. In death due to drowning the combination of the autopsy findings and the diatom test is a good compromise in arriving at a conclusion1. A medico-legal/algological collaboration lasting several years aimed at developing methods for dealing with dead bodies found in water where the circumstances are not clear, has led to an interdisciplinary procedure. To enable algological analysis, sample preservation and preparation must
be free from contamination or carry-over at the beginning of the autopsy, although it should be noted that the demands on the digestion method are very high. One or more water samples from the site of drowning should be taken. Microscopic-algological analysis should record quantitative, qualitative and morphological details for every sample. Diatoms are unicellular, eukaryotic micro-organisms measuring from 5 micron to 3 mm. They appeared in the prehistoric era, colonize all aquatic or simply moist environments and can also be found in dust. The first observation of diatom was made in 1703 by an English country gentleman with a simple microscope. His paper was communicated to the Royal Society of London and published in its Philosophical Transaction. The most distinctive feature of this unicellular organism is its extra cellular coat or frustules, which is composed of silica. The vast structural diversity of the frustules leads to a remarkable number of morphologically distinctive varieties of diatoms. Diatoms may be extremely abundant in both freshwater and marine ecosystems; it is estimated that 20% to 25% of all organic carbon fixation on the planet is carried out by diatoms. This is possible because they contain chlorophyll. Diatoms are thus a major food resource for marine and freshwater micro-organisms and animal larvae, and are a major source of atmospheric oxygen.

Identification means absolute fixation of the individuality of a person. Identification of the individual whether living or dead is of paramount importance in day to day practice. After the identity of the individual is established it opens up the channel for successful crime investigation. In case where the body is skeletonized age and sex determinations are always crucial and problematic especially when incomplete skeleton is received and when there is no other means available to identify the body. The primary factors that helpful in the identification include age, sex and stature.

The determination of age relies on the assessment of the physiological age of the skeleton. The physiological age is based upon relative growth patterns, and is hoped to give an accurate estimate of chronological age, but environmental, nutritional, and disease stresses often cause changes in the skeleton which will mask the true age of the individual.

Gender has long been determined from skull, pelvis and the long bones with epiphysis and metaphysic in unknown skeletons.

Anthropometry is an early tool of physical anthropology and has been used for identification. Forensic anthropometry is a scientific specialization emerged from the discipline of anthropology dealing with identification of human remains with the help of metric techniques.

The use of anthropometry may arise under several sets of circumstances i.e., natural, intentional and accidental (air crash, train accidents, flood, drowning, fire etc) of the dead body. Sex of an individual can be identified accurately in 80% of cases using skull alone and 98% cases using pelvis and skull together. The understanding that there is a relationship between age, the appearance of the cranial sutures and the joints between the bones of the cranium is ancient. Hippocrates, Aristotle, and Galen were acquainted with the fact that some human crania show a multiplicity of sutures whereas others are almost or totally devoid of sutures.

**MATERIAL AND METHOD**

The water body sample, in which possible drowning took place and a femur bone sample, hair and animal droppings were received for examination in the RFSL, NR, Dharamshala, Himachal Pradesh, India.

The methods used were based upon the degree of closure, union or ossification of the cranial sutures. These methods have until recently been considered inaccurate, but Meindel and Lovejoy have introduced new evidence to indicate parietal ectocranial sutures are reliable indicators of age over 40 years. In addition, Mann have offered the four maxillary sutures and their rates of closure as reliable age estimator.

The diatom analysis, study of skeletal remains, hair and faecal matter examination and DNA fingerprinting was done to ascertain the real cause of death, age, sex and identity of the person. On the basis of osteological, anthroposcopical, morphological and anatomical examination/assessment forensic experts examined the skull, mandible and maxilla for dental eruption and estimation of age. The pelvis and long bones for examined for establishing identity and estimation of sex.
For examining the drowning case, water sample, in which possible drowning took place and femur bone sample was used for detection of diatoms. Acid digestion test was used to ascertain a correlation between diatoms detected in water and bone sample. Acid digestion method \(^{20}\) was used for digestion the bone sample i.e., femur and water sample. For detection of diatoms in water sample, it was centrifuged three times on centrifuge with 4000 rpm for 8 minutes in 20 ml of centrifuge tubes. The supernatant was discarded residue was put on slides. The slide was put on warm hot plate. Similarly for detection of diatoms in bone sample i.e., femur, it was digested in concentrated HNO\(_3\). Solution was heated until its colour turned and finally cleared. Now samples were put for cooling in whole night. It was centrifuged three times on centrifuge at 4000 rpm for 10 minutes in 20 ml of centrifuge tubes. It was centrifuged with distilled water (washing of resultant suspension of silica diatoms) at 4000 rpm for 10 minutes in 20 ml of centrifuge tubes. The supernatant was discarded and residue was placed on slide. The slide was placed on warm hot plate. Finally the slides were mounted with DPX and observed under the optimum 100X of microscope. After detection the diatoms in both samples, a correlation of diatoms between the water sample and bone sample was established.

Further, blood samples of the parents were taken for matching the same with the DNA extracted from the bones and was used for DNA fingerprinting. The black hair embedded in the soil and brown hair with animal droppings collected from the spot was examined morphologically and microscopically.

RESULTS:

Establishing identity

The identity of skull was established on the basis of osteological, anthroposcopical, morphological and anatomical examination. The globular, forwarded directed orbits, foramen magnum at the base of the skull, well defined sutures, U shaped/parabolic dental arch and reduced size of nasal bones indicated that skull belong to Homo sapiens (Human) and the skeletal remains belong to single human being.

Estimation of sex

Sloping/slanting forehead, pronounced glabella, prominent supra-orbital and brow ridges, squared shaped eye orbits, larger mastoid process and prominent occipital protuberance morphologically and anatomically suggestive of male sex. Further, larger size mastoid process, rough and heavy bones and teeth larger in size and larger muscular impressions on bones indicated male sex.

Pubic symphyeal morphology

In pelvis bone, narrow and deep greater sciatic notch, larger acetabulum, oval shaped obturator foramen, heart shaped pelvic inlet and pubic angle less than 90 degree indicated male sex.

Estimation of age: skull and dental eruption

Skull was grossly intact, sagittal suture were not fused, basi-sphenoid and basi-occipital bones were not completely fused. Basi-sphenoid suture not completely fused was suggestive of age below 18 years. Sagittal, coronal and lambdaoid sutures were not fused which indicated age less than 25 years. Coronal suture not obliterated near temporal region indicated age below 28 years.

Mandible showed eleven empty sockets, first left premolar, left first molar caries, right second molar caries and on both side un-erupted third molar present in respective sockets. In maxilla 11 empty sockets were right 1\(^{st}\) molar, right second molar and left first molar present. Right third molar non-erupted and on left side second retro-molar space is evident. The third molar (wisdom tooth) erupts after 15-16 years but is so variable in age of eruption. The eruption of third molar was seen indicating age below 18 years. In dental arch, total six teeth and 22 empty sockets were present.

Skull was pierced at basi-occipital region and left zygomatic bone was seen broken, mandible fractured showed lacerations, irregular/nibbled sternal end of the clavicle, broken vertebral column with some ribs attached to it indicated pressed and eaten/nibbled by some wild animals. The right foot having skin and soft tissue attached and some hairs adhered to it. Gnawing marks were present on metatarsal and heel region. The heel and toes of the right foot were seen nibbled by wild animals.

Diatom test

The diatoms detected in bone marrow extracted from the femur bone were comparable with the control water sample and a correlation was established between diatoms detected in water and bone indicating ante-mortem drowning.
DNA fingerprinting:

DNA fingerprinting showed that blood samples of the parents matched with the DNA extracted from the skeletal remains which proved identity.

Animal droppings with hairs

After morphological and microscopic examinations the black hairs embedded in the soil were identified as human head hairs and the hairs with animal droppings were identified as mixture of human and animal hairs probing that some wild animals have eaten/nibbled the body and passed the droppings.

CONCLUSION:

Sex could be determined very well from the cranium using anthropometry. The parameters like nasal height, nasal width and mastoid process length can be used as predictors to determine gender.

Estimating a person’s age at the time of death depends on two fundamental life processes: growth and decline. Growth and developmental changes are based largely on the degree and location of bone growth and dental formation and eruption from the gums in immature individuals.

Osteological examination of skeletal remains indicated that skeletal remains were morphologically and anatomically consistent with male individual having less than 18 years of age.

Forensic scientists mostly analyze head hairs, pubic hairs, facial hairs and other body hairs for comparison. Morphological and microscopic examinations revealed that embedded hairs were human head hairs. The animal droppings with brown hairs were identified as mixture of human and animal hairs indicating nibbling by some wild animals.

The diatom test for drowning is one of the most often applied and studied application of diatom analysis in forensic investigations and become an established forensic technique because diatoms have many attributes that are applicable to forensic science. The basic principal of the diatom test in drowning is based on inference that diatoms are present in the medium where the possible drowning took place and that the inhalation of water causes penetration of diatoms into the alveolar system and blood stream, and thus, their deposition into the brain, kidneys and other organs. Diatom test conducted in the laboratory revealed that diatoms in the water sample and femur bone were of the same species which indicated ante-mortem drowning. Similarly, DNA fingerprinting from the bones of the deceased and blood samples of his parents matched with each other indicating same parental lineage.

By using interdisciplinary tools and techniques forensic experts solved the mystery by uncovering the truth of death of a teenage boy.

ACKNOWLEDGEMENTS

I express my thanks to Mr. Mam Raj Sharma, Scientific Officer (Document and Photography Division), Mr. Rajesh Jamwal (Scientific Assistant (Chemistry and Toxicology Division) and Mr. Ajay Rana, Scientific Assistant (Biology and Serology Division) RFSL, Dharamshala for their constant support to carry out this work.

Conflict of Interest: I (we) certify that there is no conflict of interest regarding the data discussed in the manuscript.

Source of Funding: No funding was taken from any source.

Ethical Clearance: Not applicable.

REFERENCES


Study of Cases Filed Under Consumer Protection Act at an Apex Tertiary Care Teaching Hospital in India

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¹Deputy Medical Superintendent, SIMH, Pt. BD Sharma University of Health Sciences, Rohtak, ²Professor, ³Additional Professor, ⁴Assistant Professor, Department of Hospital Administration, AIIMS, New Delhi

ABSTRACT

Introduction: The doctor-patient relationship is one of the most unique and privileged relations and in our country, it has been complicated over the past few decades. The Consumer protection Act 1986 & its Medical Profession related Provisions of 1995 is a unique legislation which provides for speedy and economical redressal in a simple manner.

Objectives: To identify and describe the issues which have a direct or indirect bearing in the filing of these cases. To analyze role/responsibility of respondents and assess the status of cases.

Material and method: Retrospective study of CPA cases of ten years from the year 1998 to 2007 was done and there analysis was done. All current cases of alleged medical negligence were studied as motioned below. a) Case files in establishment section (legal cell) including complaints and legal notices were retrieved, reviewed and analyzed. b) Case sheets and discharge summary in admitted patients were reviewed. c) Outpatient and casualty records in selected cases wherever required were referred.

Results: The total numbers of cases was found to be sixteen. Case filling distribution was made as per District Forum, State consumer Disputes Redressal (SCDR) Commission and National consumer Disputes Redressal (NCDR) Commission and was 4, 7 and 5 respectively. Study showed more cases were from surgery department. Role and responsibility analysis showed that 3 cases were direct responsibility, 12 cases were joint responsibility and 6 cases were shared responsibility. Status of cases showed that 15 cases were pending in forum and commissions.

Conclusion: The prime object of the Medical Profession is to render service to humanity; reward in the shape of material term or anything is a subordinate consideration. Gradually doctors are realizing that CPA may be beneficial in the long run. There would be more trust and transparency in doctor-patient relationship. Expected outcomes of studied cases filed against AIIMS of the topic are likely to be decided in favour of AIIMS.

Keywords: Doctor-Patient Relationship, Consumer Protection Act, Service, Redressal, District Forum, Medical Negligence, AIIMS
influence of money in the lives of people. There is industrialisation, liberalization policy of the government, a fast pace of commercialization and globalization on all spheres of life and the medical profession is no exception to these phenomena. As a result, the doctor-patients relationship has deteriorated considerably. Damage on doctor-patient relationship can be attributed to increased number of patients, technological advancements, change in value system, the materialistic outlook and declined communication leading to increased cost of health care.

Traditionally, patients in India have unquestioning trust in their doctors. Most doctors really deserve it. But unfortunately, in some cases, medical negligence has resulted in severe harm in terms of physical, mental and financial aspects. Medical profession is a noble profession and should be above money and fascination. Doctors have been liable to prosecution in civil court, but few malpractice victims sue for compensation, fearing years of costly litigation. The need for a simpler and quicker access to redressal to consumer grievances was felt and accordingly, it lead to the legislation of the Consumer Protection Act (CPA), 1986.

The Consumer protection Act 1986 is a unique legislation which provides for speedy and economical redressal in a simple manner. Consumer Protection Act 1986 & its Medical Profession related Provisions came after the Judgment of Honorable Supreme Court of India dated 13-11-95. In this year the Supreme Court decreed the medical profession to be a “service” under the Consumer Protection Act, 1986. It set aside a writ Petition challenging the same by the Indian medical Association. Previously, doctors were covered by various laws, i.e. the Law of Torts, IPC etc., but since the passing of the Consumer Protection Act in 1986, litigation against doctors is on the increase.

The medical profession is definitely perturbed by this and a transformation is crucial on standards of medical practice or ‘defensive medicine’. Physicians/Surgeons busy themselves in acquiring knowledge, perfecting operative techniques and incorporating the newest technologies that are evolving so rapidly. Sometimes the course of the disease or therapeutic decisions does not run along predictable lines.

The motive of Consumer Protection Act is to ensure better protection of consumers from exploitation and for the purpose to make provisions for the establishment of consumers’ councils and other authorities for the settlement of consumers’ dispute and for matters connected herewith. It is the milestone in the history of socio-economic legislation and directed towards public welfare and public benefit.

**OBJECTIVES**

1. To identify and describe the issues which have a direct or indirect bearing in the filing of these cases.
2. To analyse the role/responsibility of the various respondents named in the cases.
3. To assess the status of the cases of the study conducted.

**MATERIAL AND METHOD**

This study is the retrospective study and it was conducted by retrieving the case files in establishment section (legal cell) of All India Institute of Medical Sciences (AIIMS) main hospital. CPA cases of ten years from the year 1998 to 2007 were studied and analysed. All current cases of alleged medical negligence were studied as mentioned below.

- a) Case files in establishment section (legal cell) including complaints and legal notices were retrieved, reviewed and analysed.
- b) Case sheets and discharge summary in admitted patients were reviewed.
- c) Outpatient and casualty records in selected cases wherever required were referred.

The cases were sorted out according to case filing distribution, departmental distribution, year wise distribution, respondent distribution, individual distribution, status of the cases, period limitation distribution, causative factor for litigation, role and responsibility analysis and other salient findings.

**OBSERVATION & RESULTS**

CPA cases of ten years from the year 1998 to 2007 were extensively studied and the following observations were made. The total numbers of cases were found to be sixteen. Case filing distribution was made as per District Forum, State consumer Disputes Redressal (SCDR) Commission and National consumer Disputes Redressal (NCDR) Commission.
Table: 1 RESULTS (n = 16)

A. CASE (FILING) DISTRIBUTION

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Forum</th>
<th>Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NCDR Commission</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>SCDR Commission</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>District Forum</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

Table : 2

B. DEPARTMENTAL DISTRIBUTION

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Department Involved</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Obstetrics &amp; Gynaecology</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Orthopaedics</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Surgery</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>G.I. Surgery</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Haematology</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>ENT</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Emergency (beds not available)</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

Table: 3

C. YEAR-WISE DISTRIBUTION

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Year</th>
<th>No. of Cases (Including Appeal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1998</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>1999</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>2000</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>2001</td>
<td>NIL</td>
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<tr>
<td>5</td>
<td>2002</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>2003</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>2004</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>2005</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>2006</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>2007</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

D. RESPONDENT DISTRIBUTION

I. AIIMS DISTRIBUTION

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>First Respondent</td>
<td>9</td>
</tr>
<tr>
<td>Second Respondent</td>
<td>NIL</td>
</tr>
<tr>
<td>Third Respondent</td>
<td>3</td>
</tr>
<tr>
<td>Fourth Respondent</td>
<td>NIL</td>
</tr>
<tr>
<td>Fifth Respondent</td>
<td>NIL</td>
</tr>
<tr>
<td>Sixth Respondent</td>
<td>1</td>
</tr>
<tr>
<td>Seventh Respondent</td>
<td>NIL</td>
</tr>
<tr>
<td>Eighth Respondent</td>
<td>1 (Medical Superintendent)</td>
</tr>
</tbody>
</table>

II. INDIVIDUAL DISTRIBUTION (whenever mentioned)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Director AIIMS</td>
<td>10</td>
</tr>
<tr>
<td>MS, AIIMS</td>
<td>2</td>
</tr>
<tr>
<td>Doctor, AIIMS</td>
<td>9</td>
</tr>
<tr>
<td>Paramedical Staff</td>
<td>NIL</td>
</tr>
<tr>
<td>Nurses</td>
<td>NIL</td>
</tr>
<tr>
<td>Group ‘D’ Staff</td>
<td>NIL</td>
</tr>
</tbody>
</table>

E. STATUS OF CASES

- Pending: 15
- Judgement Reserved: NIL
- Dismissed & Re-opened: 1*
  *(Dismissed and appeal made)
- Total: 16

F. LIMITATION PERIOD DISTRIBUTION (Between occurring of event and filling of complaint)

- Less than 6 months: NIL
- 7 months – 12 months: 1
- 13 months – 18 months: 4
- Beyond 24 months: 11
- Total: 16

G. Causative Factors For Litigation

- Failure of sterilisation operation: 2 cases.
- Wrong Diagnosis in ultrasound: 1 case.
- Delaying treatment: 1 case.
- Other treatment option not informed: 2 cases.
- Non-availability of beds; denied admission: 2 cases.
- Negligent treatment of chronic disease: 1 case.
- Referred to other hospital, delayed treatment: 1 case.

H. Role And Responsibility Analysis (N # 16)

- Direct responsibility: 3
- Joint (combined) responsibility: 12
- Other institution involvement (Shared responsibility): 6

I. Salient other Findings

- Average no. of hearings: 2-3 hearings/ year
- Time gap between filing and notice to opposite parties: 3 months to 2 years
- Compensation claimed: Rs. 5 lakhs to Rs. 80 lakhs
- Average time between two dates: 5-8 months.
- Time gap between legal notice and filing of case (some cases): 2-3 months

G. EXPECTED OUTCOMES

- Likely to go in favour of AIIMS - ALL

Recommendations

There should be standard operating procedures in the hospital for Emergency, OPDs and In-Patient Departments and all doctors should adhere to the protocols strictly.

There should be proper record keeping especially of medico-legal cases. Legibility of signature with seal...
of name and designation should be appropriately affixed while signing in the case sheets and medico-legal case sheets. Critical documentation should be made immediately without delay.

There should be better communication channels between doctor and patient. Policy disclosure regarding prognosis, treatment options should made and thereafter be properly conveyed to the patients & attendants. Communication skills, (Soft skills) of the treating doctors should be improved.

There should be implementation of “in house” grievance redressed mechanism. The designated nodal officer should respond promptly to queries/complaints and give viable suggestions.

The involvement of third party arbitration can curb litigation as faith and trust increases. So arbitrator can be considered and he should be a person of repute and absolute integrity. This solves the litigation.

Above all there should be meticulous documentation, proper maintenance of medical records, well informed consent, and practicing of evidence based medicine, effective communication, emphasis on patient safety, accountability, transparency, and prompt grievances redressal mechanism to evade from CPA cases.

CONCLUSION

Consumer Protection Act, 1986 a historical perspective. An intense debate has been going on relating to the pros and cons of the application of the Consumer Protection Act, 1986 to the Medical Profession. After inclusion of medical profession under Consumer Protection Act, the doctors are against the inclusion of patients under the category of consumers, because of the feeling that there would be a spurt in false and harassment-oriented complaints thereby diverting them from their prime duty. In this age of information technology, increased awareness, weakening trust, respect and intolerance will cause cases under CPA to rise in future. Gradually doctors are realizing that it may also be beneficial in the long run as it will lead to systemic improvements. There would be more trust and transparency in doctor-patient relationship. The prime object of the Medical Profession is to render service to humanity; reward in the shape of material term or anything is a secondary consideration. Expected outcomes of studied cases filed against AIIMS of the topic are likely to be decided in favour of AIIMS.

ACKNOWLEDGEMENT

The authors are thankful to Dr DK Sharma, Medical Superintendent, AIIMS, New Delhi for making possible of this study by facilitating to retrieve the old files from establishment section (legal cell) of AIIMS main hospital.

Conflict of Interest: None

Source of Funding: None. The study was done as part of research during Junior Residency programme

Ethical Clearance: The study is based on dissertation done during Residency programme. It involved collection data from records. Also no patients were interviewed and nor were any interventions done. Hence ethical clearance was not required.

REFERENCES

1. RK Sharma, Medico-legal Aspects of Patient Care, 3rd ed. Peepee Publishers and Distributors (P) Ltd., 2008
Study of Pattern of Deaths at Work Place- A Postmortem Study Done in Tertiary Care Hospital

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1Assistant Professor, Department of Forensic Medicine, Adichunchangiri Institute of Medical Sciences, 2Professor and H.O.D., 3Professor, Department of Forensic Medicine, M. S. Ramaiah Medical College, Bangalore

ABSTRACT

Pattern of deaths at work place cases among autopsies conducted at M.S.Ramaiah Medical College Hospital, Bangalore during October 2006 to January 2008, was studied. The aims of this study were to study the cause and pattern of deaths at work place, the distribution of such deaths in various occupational settings, age and sex distribution. Total numbers of 52 cases were studied. Detailed information regarding the deceased and circumstances of death was collected from the police and relatives by a questionnaire. Complete autopsy of the body was carried out in each case.

Maximum number of work place related deaths occurred in the age group 21-30 years. Males were more than females. Most of the deaths at work place occurred during morning times followed by afternoon hours. Majority of the deaths occurred among construction workers. Pre existing medical conditions were the precipitating factors in few cases. Vast majority of deaths occurred at work site. Allegation of homicide was made in few cases prior to conduction of post mortem examination, which was disproved later by police investigations. Maximum numbers of deaths were due to unnatural causes followed by natural causes. Among unnatural, accidental deaths were more. The maximum numbers of deaths were due to fall from height at work site, followed by electrocution.

Keywords: Occupation, Work Place, Death, Autopsy

INTRODUCTION

As per International Labour Organization, work place means any plant, yard, premises, room, house hold or any other place where an employee or employees are engaged in the performance of labour or service for either monitory or non-monitory gains.

The World Health Organization estimates occupational health risks as the tenth leading cause of morbidity and mortality. Globalization and rapid industrial growth (about 7% annual economic growth) in the past few years have added further to complexities of occupational health related issues. Despite the efforts by the government at the central and state level to ensure safety at work places, the number of deaths of workers on duty is on the rise.

Lack of space at the prime localities, gradual shift in social concept of isolated home towards more sophisticated apartments, newer generations inclination towards the well equipped flat culture, are giving rise to construction of more and more sky scrapers which are in turn leading to more mishaps. It is noticed that deaths due to fall from height is increasing yearly as many work activities involve working at height. Many workers in maintenance, construction and many other people in a variety of jobs could be at risk of falling from height, examples include painters, decorators, window cleaners and those who undertake one off jobs without proper training, planning or equipment.

Thus in the present situation study of deaths at work place assumes a greater importance and it is absolutely essential to lay more emphasis on it.
Aims and objectives:
1. To study the cause of death in cases of deaths at workplace.
2. To identify the pattern of deaths at work place.

MATERIALS AND METHOD

This study titled “THE PATTERN OF DEATHS AT WORK PLACE” has been carried out in department of forensic medicine, M.S. Ramaiah medical college and hospital, Bangalore during the period October 2006 to January 2008, of all the cases of deaths at work place subjected for medico legal autopsy. A total number of 52 cases with the history of work place incident and died at hospital while on treatment were studied. In the present study work place means any plant, yard, premises, room, house hold or any other place where an employee or employees are engaged in the performance of labour or service for either monitory or non-monitory gains.

RESULTS AND DISCUSSIONS

Of the total 1125 medico legal autopsies conducted during the study period (October 2006 to January 2008), death at work place constituted 52 cases (4.62 %).

Table No. 1: Distribution of the study population according to age and sex

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Age group</th>
<th>Male</th>
<th>Percentage</th>
<th>Female</th>
<th>Percentage</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>0-10</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
</tr>
<tr>
<td>02</td>
<td>11-20</td>
<td>06</td>
<td>11.54</td>
<td>03</td>
<td>5.77</td>
<td>09</td>
<td>17.31</td>
</tr>
<tr>
<td>03</td>
<td>21-30</td>
<td>17</td>
<td>32.69</td>
<td>02</td>
<td>3.85</td>
<td>19</td>
<td>36.54</td>
</tr>
<tr>
<td>04</td>
<td>31-40</td>
<td>12</td>
<td>23.08</td>
<td>01</td>
<td>1.92</td>
<td>13</td>
<td>25.00</td>
</tr>
<tr>
<td>05</td>
<td>41-50</td>
<td>08</td>
<td>15.38</td>
<td>01</td>
<td>1.92</td>
<td>09</td>
<td>17.30</td>
</tr>
<tr>
<td>06</td>
<td>51-60</td>
<td>02</td>
<td>3.85</td>
<td>00</td>
<td>00</td>
<td>02</td>
<td>03.85</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>45</td>
<td>86.54</td>
<td>07</td>
<td>13.46</td>
<td>52</td>
<td>100.00</td>
</tr>
</tbody>
</table>

From the above table it is observed that maximum number of deaths at work place were in the age group 21-30 years (36.54%), and the least among 51-60 years (3.85%). The youngest and the oldest being 14 years and 58 years respectively. The reason for maximum number in the middle age group (21-40) could be attributed to the very fact that it is the most productive age and encompass the largest in any working sector, so also are entrusted with hazardous work, take risks, and have little regard for safety precautions hence are more prone.

In the study males (86.54%) outnumber females (13.46%) as much of the works in many Industries are male oriented viz construction works, electrical works, machinery works etc. Heartening to note is that there are no incidence of deaths below 14 years of age, attributable to the strict Child Labour Act.

Similar findings were observed in the studies conducted by Stephen MP, Behera C, Patro BK, Sharma RK, Takala J, and Ince H, Ince N, Ozyildirim BA.

In the study maximum numbers of deaths at work place were from the lower socio economic status -15 cases (28.85%), as ours is a developing country and much of the people fall in this group, also the changing social trends of nuclear families, illiteracy, financial problems, etc.

Table No.2: Distribution of the study population based on type of occupation.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Occupation</th>
<th>Number of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Construction worker</td>
<td>25</td>
<td>48.08</td>
</tr>
<tr>
<td>02</td>
<td>Security worker</td>
<td>06</td>
<td>11.55</td>
</tr>
<tr>
<td>03</td>
<td>Supervisor</td>
<td>04</td>
<td>07.69</td>
</tr>
<tr>
<td>04</td>
<td>House maid</td>
<td>03</td>
<td>05.77</td>
</tr>
<tr>
<td>05</td>
<td>Factory worker</td>
<td>03</td>
<td>05.77</td>
</tr>
<tr>
<td>06</td>
<td>Garment factory</td>
<td>02</td>
<td>03.85</td>
</tr>
<tr>
<td>07</td>
<td>Road construction worker</td>
<td>02</td>
<td>03.85</td>
</tr>
<tr>
<td>08</td>
<td>Lift operator</td>
<td>01</td>
<td>01.92</td>
</tr>
<tr>
<td>09</td>
<td>Chef</td>
<td>01</td>
<td>01.92</td>
</tr>
<tr>
<td>10</td>
<td>Plumber</td>
<td>01</td>
<td>01.92</td>
</tr>
<tr>
<td>11</td>
<td>Sanitary worker</td>
<td>01</td>
<td>01.92</td>
</tr>
<tr>
<td>12</td>
<td>Manager</td>
<td>01</td>
<td>01.92</td>
</tr>
<tr>
<td>13</td>
<td>Police</td>
<td>01</td>
<td>01.92</td>
</tr>
<tr>
<td>14</td>
<td>Painter</td>
<td>01</td>
<td>01.92</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>52</td>
<td>100.00</td>
</tr>
</tbody>
</table>
It is observed from the above table that deaths have taken place in almost all forms of occupation in the study population and alarmingly high amongst those employed in construction work which constitutes 25 cases (48.08%).

The reason for such a high rate amongst the construction worker is because of rapid urbanization of the city of Bangalore, with a boom in the construction sector.

Similar findings were observed in the studies conducted by Yanai O et.al, (8) Syed AT et al, (10) and in contrast to observations mentioned in falls in the workplace. (11)

Table No. 3: Distribution of study population according to time of incident.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Time of incident</th>
<th>Number of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Morning</td>
<td>19</td>
<td>36.54</td>
</tr>
<tr>
<td>02</td>
<td>After Noon</td>
<td>14</td>
<td>26.92</td>
</tr>
<tr>
<td>03</td>
<td>Evening</td>
<td>12</td>
<td>23.08</td>
</tr>
<tr>
<td>04</td>
<td>Late Night</td>
<td>07</td>
<td>13.46</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>52</td>
<td>100</td>
</tr>
</tbody>
</table>

In the study it was observed that numbers of deaths is highest in the morning 19 (36.54%) and 14 (26.92%) followed in the afternoon. As these are the productive hours in any given occupation, as can be observed from the table number 2 the construction workers are engaged during these hours.

Factors like medication for some form of ailment, viz hypertension, diabetes, or anxiolytics for stress or depression, based on the information provided by the police and relatives, and in case of history of alcohol consumption was later confirmed by laboratory tests. Which emphasises that proper screening of workers at work place periodically for any diseases, addictions, abuse would go in a long way in preventing such deaths.

Table No.4: Distribution of study population according to manner of death

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Manner of death</th>
<th>Number of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Accident</td>
<td>37</td>
<td>82.22</td>
</tr>
<tr>
<td>02</td>
<td>Alleged homicide</td>
<td>02</td>
<td>04.45</td>
</tr>
<tr>
<td>03</td>
<td>Suicide</td>
<td>06</td>
<td>13.33</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>45</td>
<td>100</td>
</tr>
</tbody>
</table>

In the study of the 52 cases, 7 cases were deaths due to natural causes and the remaining 45 cases were due to unnatural causes which are tabulated in the above table.

Of the 45 deaths, those due to accidents at work place constituted 37 cases(82.22%), followed by suicides 6(13.33%), and there was alleged history of homicide in 2(4.45%).

Table No. 5: Distribution of study population according to pattern of death.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Pattern of death</th>
<th>Number of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Fall from height</td>
<td>19</td>
<td>36.54</td>
</tr>
<tr>
<td>02</td>
<td>Electrocution</td>
<td>08</td>
<td>15.38</td>
</tr>
<tr>
<td>03</td>
<td>Fall of object/masonry</td>
<td>07</td>
<td>13.48</td>
</tr>
<tr>
<td>04</td>
<td>Hanging</td>
<td>05</td>
<td>09.61</td>
</tr>
<tr>
<td>05</td>
<td>Cardiac causes</td>
<td>05</td>
<td>09.61</td>
</tr>
<tr>
<td>06</td>
<td>Road traffic accidents</td>
<td>03</td>
<td>05.77</td>
</tr>
<tr>
<td>07</td>
<td>Respiratory causes</td>
<td>02</td>
<td>03.85</td>
</tr>
<tr>
<td>08</td>
<td>Snake bite</td>
<td>01</td>
<td>01.92</td>
</tr>
<tr>
<td>09</td>
<td>Gunshot</td>
<td>01</td>
<td>01.92</td>
</tr>
<tr>
<td>10</td>
<td>Machinery</td>
<td>01</td>
<td>01.92</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>52</td>
<td>100</td>
</tr>
</tbody>
</table>

From the above table it is observed that the pattern of death had a wide spectrum ranging from falls, electrocution to the most bizarre form of death viz. snake bite to gunshot. Of which fall from height constituted 19(36.54%) which were mainly amongst construction workers, followed by electrocution 8(15.38%) and suicides by hanging.

Similar findings were observed in the studies conducted by Yanai O et.al (8) and in contrast to observations mentioned in Foreman electrocuted at southeast workplace. (12)

Table No.6: Distribution of study population according to various sections applied to the cases in our study.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Manner of death</th>
<th>Number of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>304(A) IPC</td>
<td>14</td>
<td>26.92</td>
</tr>
<tr>
<td>02</td>
<td>304(A), 337 IPC</td>
<td>02</td>
<td>03.85</td>
</tr>
<tr>
<td>03</td>
<td>304(A), 288 IPC</td>
<td>02</td>
<td>03.85</td>
</tr>
<tr>
<td>04</td>
<td>304(A), 279 IPC</td>
<td>03</td>
<td>05.77</td>
</tr>
<tr>
<td>05</td>
<td>174(c) Cr PC</td>
<td>02</td>
<td>03.85</td>
</tr>
<tr>
<td>06</td>
<td>304(A), 279, 337 IPC</td>
<td>01</td>
<td>01.92</td>
</tr>
<tr>
<td>07</td>
<td>174 Cr PC</td>
<td>28</td>
<td>53.84</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>52</td>
<td>100</td>
</tr>
</tbody>
</table>

The above table enlists the various IPC sections that were applied to the 52 cases in the study population, only 7 deaths were due to natural causes so
discounting them, in the remaining 45 cases only Sl. No. 1, 2, 3, 4 and 6 that is a total of 22 cases were the sections 304(A) - causing death by negligence were applied and only in 2 cases was there a ground for suspicious death (Sl. No. 5) which all put together would amount to 24 cases and the remaining 21 cases were registered under 174 CrPC which is a clear case of under reporting.

CONCLUSION

Deaths at work place subjected for medico legal autopsy contributed for 4.62% of total autopsies conducted.
Most cases of deaths at work place were accidental in nature (82.22%).

Deaths at work place most frequently seen among construction workers (48.08%).

In two cases there was allegation of homicide.

Most of the cases were from lower socio-economic status (69.23%).

Fall from height was the commonest form of deaths at work place that is 36.54% cases.

Males (86.54%) outnumbered females (13.40%).

Deaths were more commonly in morning.

21-30 years age group contributed the highest number (36.54%).

There were no cases in the age group 0-14 years, which shows strict child labour attributed.

Work places like factories/ construction work sites etc lacked basic first aid facilities or any nearby hospitals attached to them.

Acknowledgement: Nil

Conflict Interests: The authors declare that they have no competing interests. All the authors have read and approved the final manuscript.

Consent: Written informed consent was obtained from the relatives of the deceased.

Ethical Clearance: Taken from... Medical Education Committee, MS RMC

Source of funding: Nil

REFERENCES


Fatal Stab Injuries: A Murder Mystery Revealed by Exhumation

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ABSTRACT

Literally the term ‘exhume’ is a verb that means ‘to dig out something that is buried’, especially a corpse from the ground. The word exhumation is derived from Latin exhumare; ex-out of + humus – ground 1. Many of the culture are against exhumation; the norm is that the dead body should not be disturbed. However, many early traditional societies placed the corpse in the ground and exhumed it later for religious rituals. In historical context the French philosopher and death expert Philippe Aries, discussed necrophilia’s who disinterred dead bodies for sexual purpose 2.

Exhumation is also done when family members want to move the body to different location, in case if cemetery is closing or if the family buys a new burial plot or wishes to re-enter the deceased elsewhere with the permission of other family members.

For medico legal purposes, exhumation is done to establish its identity, cause of death and manner of death both in civil and criminal cases. In such cases exhumation is done after receiving order from magistrate. It is carried out under the supervision of the police and ideally in the presence of a magistrate, who sees to it that witnesses are present who can identify the body 3. There is practically no limit of time in either India or English law to the utility of an exhumation.

The present paper discusses a case of 45 year lady who was killed by her brother-in-law and later buried stating accidental death by the relatives. But later complaint was filed by co-sister of the deceased about the murder by her brother-in-law. Circle Police Inspector ordered for exhumation to reveal the truth.

CASE REPORT

The deceased was 42 year old lady, whose husband died few years earlier and she was murdered by brother-in-law as she did not cooperate for his ill intention. She was stabbed to death on 01/09/2005 at 5.00am in the bathroom by her brother-in-law. Relatives did not file a case in police station because of fear of death and assault by the accused. And the body was buried stating it as a natural death by the relatives. But later complaint was filed by co-sister of the deceased about the murder by her brother-in-law. Circle Police Inspector ordered for exhumation to reveal the truth.
relatives of the deceased and panchas of the village. Grave yard was identified by the help of relatives. Digging was done and body was situated 122-126cms depth beneath the ground surface, in supine position. Body was covered in white coloured cotton cloth. Cloths present on the body were; blue coloured synthetic saree with purple and white coloured flower designs and blue coloured blouse. Body was identified by the relatives by seeing the belongings of the deceased. On removal of the clothes and mud particles from the dead body, features of adipocere formation were seen all over the body except over the top of the skull, face, right hand, lower half of both legs and both feet. Dried blood stains were seen over the front of the abdomen, left hypothenar, cleft of the left middle and ring finger, left iliac and left hip region.

External injuries

1) Penetrating injury present obliquely over the front aspect of upper part of left side of abdomen measuring 2.5 x 0.5cms x abdominal cavity deep, situated 23cms above the level of pubic symphysis. Margins of the injuries were clean cut with upper outer end is sharp and inner lower end is blunt.

2) Penetrating injury present obliquely over the upper part of front of right side of abdomen measuring 2.5cms X 0.5cms X abdominal cavity deep, situated 21cms above the level of right iliac crest. On dissection, lower margin of the right 11th rib was showing sharp cut.

3) Penetrating injury measuring 2.5cms x 0.5cms x 3cms deep in to the muscle tissue present vertically over the outer aspect of the left shoulder.

On dissection of the injuries, the soft tissues surrounding all the above mentioned penetrating injuries were showing blackish brown pigmentation indicating blood extravasations. Hence it was concluded that “all injuries were ante mortem in nature”.

Further later on 09/09/2006, we received one weapon i.e., Single sharp edged foldable knife, alleged to be used as weapon of offence in this case. On examination of this knife, the cutting blade was measuring 12.5cm in length, 2.5cm in its maximum breadth and 0.3cm in thickness, having single sharp cutting edge with a tapering pointed tip for a length of 5cm. Thus, it was opened that the all the penetrating were possible on infliction by the alleged weapon examined.

DISCUSSION

Exhumation is digging out buried body from the grave or it is also called disinterment. There is no time limit for exhumation in India. However, some countries like France, Germany, Scotland etc., have fixed time limit for exhumation.

Objectives of exhumation include

- Identification of the person in any civil or criminal cases after burial.
Whenever foul play is suspected exhumation may be ordered by appropriate authority on request by public or relative of the deceased, to know the cause of death, manner of death and nature of death.

When the first autopsy report is being challenged or is ambiguous, then the second autopsy is ordered to clear the doubts by appropriate authorities.

Karger et al identified following main indication for exhumation:

1. Primary suspicion of intoxication
2. Primary suspicion of homicide
3. Possible medical malpractice
4. Accidents including road traffic accidents
5. To establish cause of death as well as identification.

Exhumation should be carried out after getting the orders from appropriate authorization. The exhumation is done under the supervision of medical officer, magistrate in presence of police officer. It should be preferably carried out in early morning to avoid public, so that the whole process of digging autopsy can be satisfactorily completed during the natural light. The grave site should positively identified with identifying features such as location, headstone, grave marks and with the help of relatives or villagers. The burial should be uncovered 10-15cms and condition of the soil, water content and vegetation growth should be noted, which helps to comment on rate and type of decomposition. The burial pit should be opened up to 30cms on all the sides of the body and body should be exposed with help of soft brush or whisk broom. Then it is photographed in the position in which it is found and then autopsy is conducted. In case of suspected poisoning, around 3.5kg of earth in contact with body is collected. Sites include earth in contact with body, above, below and from each side of the body should be collected.

In one report there is description of 3 and half year war in Bosnia-Herzegovina in the year between 1992-1995, when bodies of the killed person were buried in Clandestine mass graves, dumped into rivers, wells, septic tanks, caves or simply left unburied in the fields, meadows and forests. To establish identity of more than 20,000 victims were exhumed to the end of 2008 and this process of exhumation and identification will be completed by the year 2015.

Exhumations carried out mainly to establish the cause of death when foul play is suspected and relatives request for exhumation in most of the countries.

In many instances previously, exhumation for medico-legal purposes proved the cause of death beyond doubt when it had been ambiguous or unsatisfactory to the relatives. In the present case it has proved beyond doubt that the cause of death is due to penetrating injuries over the abdomen. This supports the history narrated by the relatives and the accused person was convicted on the basis of post mortem report.

In many cases exhumation for medico-legal purposes has positively identified the missing person. For example, a girl was missing for a period of about 2 years. The accused person admitted of committing the crime of sexual assault, strangulating and then buried the victim to evade detection at a later date. On exhumation the body was identified with the help of personal belongings and later confirmed by DNA fingerprinting from long bones. Exhumation is even done for non-medico-legal purposes, in some culture remains may be exhumed and reburied en masse, when a cemetery is relocated, once local planning and religious requirement are metallic. In the history there are many instances to answer historical question notable individual’s body were exhumed. Even exhumation helps archaeologists to search the remains to better understand human culture.

CONCLUSION

Exhumation helps in fixing the identity of an individual. It helps in solving unresolved crime cases at times. If done meticulously with the use of modern ailments, in difficult scenarios, it helps in definitively fixing the exact cause and manner of death, as in this case. Exhumation may also provide valuable information or evidence by which innocence of suspected persons may be proved or it may establish the guilty of the crime.

Acknowledgment: Department of Forensic Medicine, Bangalore Medical College, Bangalore.

Conflict of Interest: None
Ethical Clearance: Ethical clearance was obtained.

Source of Support: Department of Forensic Medicine, S.S.Institute of Medical Sciences and Research Centre, Davangere. The corresponding author confirms that he had full access to all the data in the study and had final responsibility for the decision to submit for publication.

REFERENCES

INTRODUCTION

The World Health Organization (WHO) estimates that 50 to 100 million infections occur yearly, including 500,000 DHF cases and 22,000 deaths, mostly among children. India has recorded over 47,019 dengue cases including 242 dengue deaths in 2012 up till 27th Dec 2012, the highest number in a year so far. Dengue fever has varying clinical presentations ranging from asymptomatic infection to dengue shock syndrome. Neurological complications in Dengue fever is unusual. We report a case of a dengue fever with thrombocytopenia and subarachnoid hemorrhage.

CASE HISTORY

A 30 year male presented with moderate grade fever with chills for four to five days. On physical examination patient was febrile and vitally stable (blood pressure: 110/82 mmHg, pulse 94/min, respiratory rate: 20/min, SpO2 of 96%, arterial blood gas analysis (ABGA): normal). Respiratory and per-abdominal examination was unremarkable. Neurological examination was unremarkable. Tourniquet test was positive. Laboratory investigations showed total leucocyte count 3,900/Cmm, platelet count 30,000/Cmm with hemoglobin 17.2 Gm% and hematocrit 51.8 %. Serum electrolytes and renal function tests were within normal limit. Peripheral smear for malarial parasite and rapid malarial antigen test was negative. The test for dengue specific IgM antibody was positive. Liver enzymes SGOT (233 IU/dl), SGPT (122 IU/dl) were moderately raised, with Ultrasoundography of abdomen suggestive of hepatosplenomegaly. The prothrombin time (PT), cloting time (CT) were normal. Bleeding time (BT) was 6 min 40 sec. Blood culture was sterile. Patient was treated symptomatically. After three days of admission he started getting headache, vomiting, convulsions and petechie over trunk and extremities. Clinically patient had right sided hemiplegia with bilateral extensor plantar response. CT scan brain was done which was suggestive of hyperdensity in left sylvian fissure suggestive of grade three subarachnoid hemorrhage (figure no. 1). CT angiography revealed no evidence of intracranial aneurysm or AV malformation. There was no history of head injury in recent past. Clinical scenario favored diagnosis of dengue fever (DF), with hemorrhagic manifestation (subarachnoid haemorrhage) without shock with thrombocytopenia. We treated patient conservatively with platelet concentrate, fluid resuscitation according to central venous pressure, antibiotics, proton pump inhibitors, decongestive and anticonvusant drugs. Patients neurological status worsened and he became stupors. Patient was referred to higher neurosurgical center and decompressive craniotomy was done for the same. He was operated with left fronto-parieto-temporal decompression craniotomy. Postoperatively patient was on ventilator for 20 days. On discharge patient improved clinically and neurologically to some extent with residual right sided hemiparesis.

ABSTRACT

This is case report of 30 year male, presented with fever and thrombocytopenia, diagnosed as Dengue fever. Worsened neurologically three days after admission and developed subarachnoid hemorrhage. Patient was treated with platelet concentrate transfusion. Patient underwent decompression hemicraniotomy for increased intracranial pressure. Patient had some improvement at the end of 20 days. Although neurological complications reported for dengue fever are unusual, it is reasonable to consider these manifestations for immediate management and better outcome of patient.

Keywords: Dengue Fever, Subarachnoid Hemorrhage, Thrombocytopenia, Neurological Complications

RARE CASE OF DENGUE FEVER COMPLICATED WITH SUBARACHNOID HEMORRHAGE

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DISCUSSION

Today about 2.5 billion people, or 40% of the world’s population, live in areas where there is a risk of dengue transmission. Dengue is endemic in at least 100 countries in Asia, the Pacific, the Americas, Africa, and the Caribbean. DHF was first documented only in the 1950s during epidemics in the Philippines and Thailand.2 Dengue, also known as break bone fever, due to the extreme pain caused in bones and muscles, is a mosquito-borne infection transmitted through the bite of an infected female *Aedes aegypti* mosquito. There are four serotypes of the virus that cause dengue - DEN-1, DEN-2, DEN-3 and DEN-4. Having recovered from one virus strain provides lifelong immunity against that particular serotype, but cross-immunity i.e. being infected by a different serotype increases risk of developing severe dengue which can be fatal (DHF / DSS). In 2011 revised WHO guidelines, dengue was divided into dengue fever (DF), dengue hemorrhagic fever (DHF) without shock or with shock (DSS) and expanded dengue syndrome 3. Dengue in its initial stage is not deadly. However, ignoring symptoms or being infected again by a different serotype of virus or having another chronic disease can up complication risks and may result in dengue hemorrhagic fever (DHS) or dengue shock syndrome (DSS).3

Symptoms usually last for 2–7 days, after an incubation period of 4–10 days. The characteristic symptoms of dengue include sudden-onset of fever (40°C/ 104°F) which is usually biphasic in nature, breaking and then returning for one or two days. The other constitutional symptoms are headache, nausea, vomiting retro-orbital pain, muscle and joint pains, swollen glands or skin rash. When dengue advances into the critical stage it can result in bleeding, low levels of blood platelets in case of hemorrhagic fever (DHF), or dangerously low blood pressure in case of dengue shock syndrome (DSS). According to WHO, DHF patient should fulfill following criteria: Acute sudden onset of high fever for 2–7 days, hemorrhagic manifestations with at least a positive tourniquet test, platelet count <1,00,000/cm3, haemoconcentration, or other evidence of plasma leakage—for example, ascites, pleural effusions, low level of serum protein/ albumin.3

Organ dysfunction and severe bleeding, typically from the gastrointestinal tract may present. Respiratory distress, rapid breathing, fatigue, restlessness, severe abdominal pain and hematemesis is observed in Dengue infection with severe thrombocytopenia. Treatment is mainly supportive care in order to maintain the body fluid levels and platelet transfusion3 in case it drops to extremely low. In case of neurological manifestations neurosurgical interventions are also available which can improve patients condition and survival rate4,5,6. There is no known vaccine to treat dengue; prevention is the only way to keep away from the virus. The first global vaccine for the prevention of dengue is in the final stages of development, currently in phase three clinical trial in humans, being tested for efficacy across several countries.

Patient in present case report admitted with clinical features suggestive of Dengue fever which complicated with subarachnoid hemorrhage, requiring decompressive craniotomy along with supportive line of management including platelet transfusion. Patient survived and recovered with residual right sided hemiparesis. Present case highlights a rare complication of Dengue fever with subarachnoid haemorrhage which may require timely neurosurgical intervention and intensive care management for better outcome.

Patey O et al7 reported a dengue fever with unusual neurologic manifestations like our case a focal subarachnoid hemorrhage that was associated with transient thrombocytopenia. This case was probably a post-infectious syndrome associated with dengue virus who recovered with Conservative line of treatment. Similar to our case report MDPR Fernando et al8 reported a case of DHF with subarachnoid, retinal and vitreous haemorrhages. Jensenius et al9 reported the case of a Norwegian traveler returned with apparently mild dengue fever but with an extensive...
erythematous exanthema that spread and darkened (perhaps indicative of bleeding), who died of a subarachnoid hemorrhage, for which at autopsy no local vascular cause could be found. They refer to the term “dengue fever with hemorrhage,” which has been used for adults who bleed but do not fulfill the criteria for DHF. In our patient there was no neurological AV malformation. We transfused platelet concentrate and packed cell volume. Patient underwent left FTP decompression craniotomy and survived. According to our experience timely diagnosis and intervention can thus save many precious lives. Lee I-K et al also reported DSS with subarachnoid hemorrhage.

There are cases presented in the literature are of cerebral hemorrhage also cases of subdural hematoma associated with Dengue fever. Here, we are reporting a rare case of subarachnoid hemorrhage which was associated with Dengue fever with thrombocytopenia. Kumar R et al reported an case of acute subdural hematoma in a child with dengue hemorrhagic fever occurring during convalescence who made a successful recovery following surgery. Cam et al reported dengue associated encephalopathy with intracranial hemorrhage.

CONCLUSION

Although neurologic complications reported in dengue fever are uncommon, it is reasonable to consider possibility of complication like subarachnoid hemorrhage as neurological manifestations should not be misinterpreted as fever delirium or toxic encephalopathy. Immediate investigations and timely management including neurosurgical decompressive craniotomy may require for better outcome. Clinician should aware of such unusual complication like subarachnoid hemorrhage in endemic area of dengue infection in relevant clinical scenario. It is also mandatory to rule out other causes of thrombocytopenia like complicated malaria, leptospirosis, gram negative septicemia and disseminated intravascular coagulation or dual infection by relevant investigation.

ACKNOWLEDGMENT

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This case report is approved by ethical committee.

Conflict of Interest: Nil

Financial Support: Nil

REFERENCES

Dielema in Deciding Manner of Death in a Case of Drowning: A Case Report

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ABSTRACT

Once the cause of death is declared as drowning, question before the investigating officer is "Was the drowning accidental, suicidal or homicidal"? If there is an eyewitness, manner of death will be obvious. In unwitnessed cases, it is very difficult to provide correct answer to above question particularly when the place of drowning is unusual. Case report discussed can give some clues to the investigating officers as well as Forensic Pathologist to decide manner of death in cases of drowning in such type of cases.

Keywords: Drowning, Manner of Death, Intoxicated, Incapacitated, Immersion

INTRODUCTION

Drowning is a very common cause of death amongst unnatural deaths. About 1,50,000 people die of drowning over the world. Shetty M.¹ has studied cases of drowning in Mangalore, coastal city of Karnataka during 1999 to 2004. He studied 350 cases of Drowning. Rate of drowning here is 15.15 per lakh population. All asphyxia deaths were studied by Azmak & Derya² in Department of Forensic Medicine, Trakya University, Edirne, Turkey during 1984 to 2004. These constitute 15.7 % of all medicolegal deaths. Out of these 30.5% deaths were of Drowning. Accidental drowning can be proved without any doubts on the basis of circumstantial evidence. However it is very difficult to prove homicidal drowning in absence of eyewitness. For proving homicidal drowning, investigating officer will require help of Forensic pathologist, chemical analyzer and also the circumstantial evidence.

Forensic pathologist will have to observe minutely injuries on other parts of body and will also be able to decide whether injuries are ante mortem or postmortem. Pathologist also has to observe any pathology deceased was suffering from, which is sufficient to cause death of a person or which made him incapacitated before drowning. He has to search for injuries on body which might have been caused during scuffle in homicidal attack.

Chemical analyzer’s role will be to analyze viscera and to comment on whether person has consumed certain drugs or substances so that he might have been incapacitated before drowning.

Circumstantial evidences to be observed on the spot visit by investigating officer and preferably in presence of Forensic Pathologist will be

a) depth of water column where body was found
b) projecting parts inside the well or in the lake.
c) Personal belongings of deceased
d) Condition of clothes e.g loss of bottons, torn sites, etc,
e) From above observations and on basis of postmortem examination, investigating officer can decide manner of death in drowning as homicidal after taking into consideration statements of eyewitnesses if any.

CASE REPORT

A male person, aged about 40 years, was found dead in a iron barrel containing water at about 02.15 hours. Barrel was kept in a balcony of a the residential flat on 2nd floor of an apartment. The incidence was reported by younger brother of the deceased, who is a doctor by profession. Investigating officer visited spot in early morning.
As per spot inquest, the barrel in which body was found was closed to half of its circumference (Fig No 1). Remaining half was open. Height of barrel was 3 & ½ feet. There was no water inside the barrel. However water was logged in the floor of balcony. Body was already taken out of barrel by the relatives. As per statement of brother of deceased, body was removed after making the barrel in slanting position thereby draining out water from barrel. He gave history that deceased was suffering from some mental illness for which he was taking certain medication as per advice of psychiatrist.

External: I) Injuries : 1) Abrasion on Right cheek, 3 X 3 cm. 2) Abrasion over dorsum of Right hand, 3mm X 3 mm, 3) Abrasion over back of Right fore arm, 3 X 2 mm, 4) Abrasion over back of Left elbow, 3 X 3 mm, 5) Abrasion over back of Left fore arm, 3 X 5 mm, 6) Abrasion over Left Forehead, 3 X 3 mm, All injuries were fresh and ante mortem.

II) White fine froth at the nostrils.

Internal: 1) Trachea full of froth.

2) Precordial area was obliterated with lungs.

3) Both lungs were voluminous, oedematous & congested described as emphysema aquosum. (Fig 2). On cutting, free oozing of frothy fluid was seen. 4) About 100 cc of yellowish fluid in stomach without abnormal smell with normal mucosa.5) There was no obvious pathology on gross, neither any internal injury. Considering external & internal findings, cause of death was opined as “Asphyxia due to Drowning”. Routine viscera was preserved for chemical analysis.

**DISCUSSION**

With drowning as cause of death, question before Investigating Officer is

1) What is cause and manner of injuries on body?

2) Whether this is a case of accident, suicide or homicide?

Whether is it possible for normal average built man of height 5 & ½ feet to get himself drowned in water in a barrel of height 3 & ½ feet? To answer this question one should consider mechanism of drowning.

According to J.Chr.Gierstsen 3, during stages of drowning of human being, person involuntarily makes attempt to come on surface of water due to various forces and reflexes of body. Giersten conducted experiments on dog. According to him, same stages do occur in human beings. In the said case, height of a person is 5&1/2 feet and water column of 3 & ½ feet. Unless the person is intoxicated or drugged or debilitated due to certain reason, it seems very difficult to get drowned in absence of external pressure. Investigating officer tried to produce evidence of intoxication by subjecting viscera for chemical analysis (In this case reported as negative). Also in this case there was no injury to make person incapacitated to prove homicidal manner of death.
As per spot inquest, edges of barrel were rough. Most of injuries are on exposed and prominent parts of body and might be possible while struggling to come out of barrel or while entering inside the barrel.

Relatives residing with the deceased were also examined medically for presence of injuries on the body. However there were no injuries on the body of relatives, which are expected during scuffle if drowning is homicidal.

According to Dr. Anil Aggrawal, the manner of death depends much upon evaluation of circumstances. In India, homicidal drowning is extremely rare except in cases of infants & children. It is very difficult to drown an adult person until and unless he is attacked unawares or was first stupefied by giving some narcotic drug. If legs are tied, it is presumed that death is homicidal except in cases of swimmers who committed suicide by tying legs to avoid instinctive self preservation. If injuries are there whose cause can not be explained, it can be case of homicide.

Taylor has divided cases of alleged drowning into three main groups.

I) Bodies with typical finding of drowning. These are further subdivided into
   A) Without injuries
      i) Deceased entered into water voluntarily
      ii) He entered water involuntarily while under influence of alcohol or drug
      iii) With natural disease such as Ischaemic Heart disease or epilepsy.
   B) With injuries
      i) deceased was injured by another person or persons and put into water while unable to save himself thereby drowning.
      ii) The injuries did not involve other persons and were caused when the deceased struck some projection while entering into water.

II) Those cases in which signs of drowning are not demonstrable.
These are further subdivided into
   A) Without injuries- shows some inhibitory process e.g. cold with immersion like death.
   B) With injuries- Fallen into water due to some natural disease and injuries being sustained at that time.

III) Death because of violence and body disposed off by immersion.

Most of cases of indoor drowning in shallow water are accidental. Often natural disease is found such as cerebro-vascular disease or coronary artery disease or epilepsy. Often fault with water heater is also found. Taylor has given illustrative examples of homicidal drowning in case of R.v. Smith where he murdered three women by lifting the legs up and pushing the head under water. He has described many such cases at unusual sites but there is not a single case described in literature as is described here.

In this case, site where body was found is an iron barrel. Obviously this rules out accidental manner of death. Investigating Officer has proved beyond doubt that it is not a case of homicidal drowning by utilizing methods as described above. In this case, there is a evidence of attempted suicide by the deceased three months back in the form of discharge card of hospital where deceased consumed sedative drug to commit suicide. Taking into consideration all the findings and evidence, in this case manner of death is suicidal.

It will be clear from foregoing discussion that this is an area of forensic practice in which the pathologist is unable to give an opinion which is sufficiently positive as to satisfy the requirements usually demanded in a medico-legal investigation. Hence detail investigation is must in such type of cases.

Acknowledgements: None

Source of Funding: There was no need of funds for preparing this case paper.

Conflict of Interest: There is no conflict of interest involved in this case amongst the authors.

Ethical Clearance: There is no need of ethical clearance in this case as per guidelines of local ethical clearance committee of GMC, Nagpur.

REFERENCES
American J of Forensic Medicine and Pathology, June 2006; 27:2.


4. Aggrawal Anil, Column by Dr. Anil Aggrawal, ‘Death by Drowning’ available at net search.

Sudden Death due to Congenital Heart Disease- A Case Report

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1Senior Resident, 2Assistant Professor, Dept. of Forensic Medicine, VMMC & SJ Hospital, New Delhi, 3Director Professor & Head, Dept. of Forensic Medicine, VMMC & SJ Hospital, Delhi

ABSTRACT

Birth defects have become the most important cause of mortality and morbidity in the perinatal period. Congenital heart disease (CHD) is the most common birth defect which includes varying forms of cardiac abnormalities with an incidence of 1 per 100 live births. We present a case where 6 month old Afghan national male baby brought to India for higher treatment with a history of failure to thrive and rapid heart beating. He was diagnosed with Atrio-Ventricular Septal Defect, Pulmonary artery hypertension and advised pulmonary artery banding as soon as possible. Baby fell unconscious on board and shifted to Safdarjung hospital where he was declared brought dead and post mortem examination confirmed the diagnosis. Here an attempt has been made to put forward such a case with relevant discussion on such potentially life-threatening malformations which warrant careful clinical follow-up both in antenatal and postnatal period.

Keywords: Atrio-Ventricular Septal Defect (AVSD), Congenital Heart Disease (CHD), Atrial Septal Defect (ASD), Ventricular Septal Defect (VSD)

INTRODUCTION

Congenital malformations of the heart are among the most frequent of all congenital anomalies detected during 1st year of life. They constitute one of the major causes of infant mortality and morbidity in childhood and in later adult life. Extra cardiac anomalies occur in 15–45% of cases with CHD. Defects range in severity from tiny pinholes between chambers that may resolve spontaneously to major malformations that can require multiple surgical procedures before school age and may result in death in utero, in infancy, or in childhood. Congenital heart defects may be broadly grouped into two major categories: 1) morphological abnormalities, including developmental defects resulting in structural malformations; and 2) functional abnormalities, including cardiac rhythm disturbances and cardiomyopathies. Patients with atrio-ventricular septal defect typically develop tachypnea, repeated respiratory infections, poor feeding, and failure to thrive in the first few months of life. Pulmonary vascular disease results from damage caused by excessive pulmonary flow and elevated pulmonary artery pressure due to the associated VSD.

We describe a similar case in which a 6 month old male infant presented with failure to thrive, rapid heart beating and was diagnosed with AVSD and pulmonary artery hypertension.

CASE REPORT

A 6 month old Afghan male baby brought to India for higher treatment with a history of failure to thrive and rapid heart beating. He was diagnosed with Atrio-Ventricular Septal Defect, Pulmonary artery hypertension and advised pulmonary artery banding as soon as possible. Baby fell unconscious on board and brought to Safdarjung hospital where he was declared brought dead in emergency. Body was sent to forensic medicine department for post mortem examination.
External examination

The body was that of a 6 month old male infant wrapped in white coloured hospital cloths. Rigor mortis was fully established. Post-mortem hypostasis was present over the dependent areas (Fig 1). There were no features of decomposition. No external injuries present over the body except for deformity of the chest characterized by a protrusion of the sternum and ribs i.e. Pigeon Chest (Fig 2).

Internal Examination

The autopsy showed significant degree of right atrium and right ventricle dilatation and hypertrophy with atrio-ventricular septal defect. Ventricular part of the heart had a characteristic globular appearance. Main pulmonary artery was also dilated (Fig 3 & 4). Lungs showed mild pulmonary oedema. Respiratory passages were congested and contained frothy exudates. All other internal organs were congested. No abnormality was detected in rest of the body systems.

Echocardiographic findings in inquest papers revealed situs solitus, normal systemic and pulmonary venous connection, complete atrio-ventricular septal defect, large ostium primum atrial septal defect with left to right shunt, moderate size ventricular septal defect, mild to moderate right and left AV valve regurgitation and dilated main pulmonary artery. X-ray showed cardiomegaly with prominent lung vasculature.

Based on the findings of the autopsy and the investigation reports, Cause of death was given as congenital heart disease and its sequelae.
Atrioventricular septal defects (AVSDs) are anatomic defects that arise from faulty development of the embryonic endocardial cushions. This spectrum ranges from a primum atrial septal defect and cleft mitral valve, known as a partial atrioventricular septal defect (partial AVSD), to defects of both the primum atrial septum and inlet ventricular septum and the presence of a common atrio-ventricular valve, referred to as complete atrio-ventricular septal defect (complete AVSD). These defects, particularly the complete form, typically present in the foetal or neonatal period and are an important source of cardiac morbidity and mortality in this age group. The effects from AVSD are caused by the holes in the heart walls and leakage from the abnormal valve. The holes allow blood in the heart’s left side to leak back to the heart’s right side. This results in a large amount of blood that the right side of heart must pump again to the lungs. As a result of the extra workload, most babies with AVSD develop signs of congestive heart failure such as rapid breathing, feeding problems, slow weight gain, low energy, and cold, clammy sweating. Another possible health effect of AVSD is pulmonary artery hypertension. This problem develops more slowly and is caused by the extra pulmonary blood flow. The pulmonary arteries that take blood from the heart’s right side to the lungs are not well suited to the increased pressure caused by the extra blood flow. Over time, if the problem is not corrected, the pulmonary arteries become thick and stiff which makes the heart have to work even harder.

Trisomy 21 (Down syndrome) is the most frequently associated genetic abnormality with complete atrio-ventricular septal defect, although it may also occur in association with trisomy 13 and trisomy 18. In patients without trisomy 21 who have common atrio-ventricular canal (CAVC) defects, a genetic locus on chromosome 1 can account for the disorder in some families. Interstitial deletion on chromosome 16 can also be associated with atrioventricular septal defect.

Early diagnosis and treatment is always a prerequisite in any heart diseases and congenital heart diseases are always associated with significant morbidity and mortality. Immediate intervention is required to save the life of child. Thorough antenatal check-ups should be done in all the cases and if any congenital defect is detected, it should be closely followed during the child birth and early neonatal period. Surgical intervention, if required should be done as soon as possible. In our case doctor had advised for pulmonary artery banding as soon as possible. The child would have been saved if early intervention was done.

CONCLUSION

Congenital heart disease is assuming increasing importance as a cause of perinatal and infant mortality. Despite some improvements in the outlook of prenatally diagnosed AVSD, the overall prognosis remains considerably worse. If deaths from unrecognised heart disease are not taken into account, a falsely low picture of the prevalence of serious congenital heart disease will be obtained. So identification of such undiagnosed cardiovascular anomalies and better awareness of the problem will improve epidemiological evaluation of CHD and more importantly, earlier recognition of treatable abnormalities further reduces the mortality.

Acknowledgements: Nil
Conflict of Interests: Nil
Source of Funding: Not Applicable
Ethical Clearance: Not required

REFERENCES

Stature of an individual came into discussion when a primitive mammal changed its posture from pronograde to orthograde.

The study of human evolution, racial differences, inheritance of body traits, growth and decay of human organism is called physical anthropology. These informations are of interest to an anatomist and also helpful in medico-legal works. The problem is encountered in cases of mass disasters, explosions, and assault cases where the body is dismembered to conceal the identity of the victim.

The estimation of height from various parameters has been done by various workers Singh and Sohal (1951), Inderjit Singh & Shamer Singh (1956), Charnalia (1961), Ahawale (1963), Patel et al (1964), Qamara et al. (1979) & Shroff & Vare (1979).

Morphology of human head is influenced by combined effects of heredity and lifestyle. Telkka (1950) opined that each racial group will need a different formula, and regional studies of the subjects are very much needed.

The purpose of the present study is to analyze the anthropometric relationship between dimensions of the head length with stature and to devise regression formulae to estimate height from head length of known sex from residents of western maharashtra as it is essential to build a context of reference for a given population.

This study was carried out to estimate the relationship between head length and stature using simple linear regression analysis based on a sample of male and female of Western Maharashtra. Measurements of the head length and stature were taken from 150 subjects (75 male, 75 female). Obtained data was analysed and attempt was made to find out correlation between the head length and stature of an individual. A good correlation of height was observed with head length and it was statistically significant. The results of the present study would be useful for anthropologists and forensic medicine experts.

**Keywords**: Stature, Head Length

**INTRODUCTION**

Stature of an individual came into discussion when a primitive mammal changed its posture from pronograde to orthograde.

The study of human evolution, racial differences, inheritance of body traits, growth and decay of human organism is called physical anthropology. These informations are of interest to an anatomist and also helpful in medico-legal works. The problem is encountered in cases of mass disasters, explosions, and assault cases where the body is dismembered to conceal the identity of the victim.


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The purpose of the present study is to analyze the anthropometric relationship between dimensions of the head length with stature and to devise regression formulae to estimate height from head length of known sex from residents of western maharashtra as it is essential to build a context of reference for a given population.

**METHODOLOGY**

Present study has been carried out on 150 residents of western maharashtra (75 male; 75 female) aged between 8-12 years. All the subjects were healthy and free from any apparent symptomatic deformity of spine. Measurement Technique

**Stature**: is measured as the vertical distance between the vertex and the floor. The subject was made to stand bare foot in an erect posture against a wall with both feet kept close together, buttocks & occiput touching the wall and hands hanging down on the sides.

**Head length**: measures the straight distance between glabella and opisthocranion.

**Glabella**: It is the point on protuberance of lower forehead above nasal root and between the eyebrow ridges intersected by mid sagittal plane.
OPISTHOCRANION

Opisthocranion is the most posterior point on the occipital protuberance of head in the mid sagittal plane. This point is determined where the head length shows maximum reading.

Three measurements were taken to avoid measuring errors. Mean of three measurements was calculated and noted.

Measurements were taken using blunt ended spreading caliper. Instrument held in such a manner that the tips of the caliper were free to touch the head.

Undue pressure was avoided while taking the measurement.

OBSERVATIONS AND RESULTS

Table 1: Comparison of stature between male and female

<table>
<thead>
<tr>
<th></th>
<th>male</th>
<th>female</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean</td>
<td>136.81</td>
<td>136.01</td>
<td>0.72</td>
</tr>
<tr>
<td>range</td>
<td>(116-161.5)</td>
<td>(110.8-161.4)</td>
<td></td>
</tr>
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</table>

Table 2: Comparison of head length between male and female

<table>
<thead>
<tr>
<th></th>
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<th>female</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean</td>
<td>17.39</td>
<td>17.07</td>
<td>0.03</td>
</tr>
<tr>
<td>range</td>
<td>(15.4-18.9)</td>
<td>(16-18.8)</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Pearson correlation of head length and body height.

<table>
<thead>
<tr>
<th></th>
<th>male</th>
<th>female</th>
<th>All cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>+0.41</td>
<td>+0.3</td>
<td>+0.35</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Regression analysis for prediction of total height in males and females

<table>
<thead>
<tr>
<th></th>
<th>Equation</th>
<th>S.E.E.</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>=9.3+7.3(head length)</td>
<td>10</td>
<td>0.4</td>
</tr>
<tr>
<td>Female</td>
<td>=67.8+3.9(head length)</td>
<td>9.4</td>
<td>0.3</td>
</tr>
<tr>
<td>All cases</td>
<td>=46.78+5.2(head length)</td>
<td>9.69</td>
<td>0.35</td>
</tr>
</tbody>
</table>

S.E.E.: standard error of estimate, R: correlation coefficient

DISCUSSION

Table 1 and table 2 shows that both stature and head length has higher values among males than in females.

Very less work has been done for estimation of stature from head length. Saxena et al (1981), who derived a regression equation between head-length and height in Agra population (U.P.). Their correlation coefficient between head-length and height was +0.2048. According to Glaister (1957), nasion-inion length (head-length) is 1/8 of the total height of an individual.

In present study the correlation Co-efficient between height and head length is +0.35 which is significant.

CONCLUSION

From the above facts, it is clear that if either of the measurement (head length or total height) is known the other can be calculated and this fact may be of practical use in Medico-legal investigations and in Anthropometry.

Acknowledgement: Nil

Source of Funding: Self

Conflict of Interest: Nil

Ethical Clearance: From Ethical Committee of D.Y. Patil Medical College, Kolhapur

REFERENCES

6. Suneel Qamara, Inderjit and Deodhar SD. A model for reconstruction of height from foot
measurements in an adult population of northwest India Indian Journal of Medical Research 1980;71:77-83
Mechanical Injuries by Blast effect a Case Report

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ABSTRACT

Explosions caused by industrial accidents and terrorist devices are infrequent, but unpredictable events in developed countries. Therefore, civilian doctors may be required to deal with large numbers of blast injured subjects with little warning in chaotic and difficult circumstances. Explosions and the injuries caused by them are the subjects of this paper.

This case is presented here because the real incidence of injuries caused by blast of O2 cylinder in a chemical manufacturer company was concealed in the inquest with history of found injured in that company and the fact was revealed during autopsy.

Keywords: Industrialization, Explosion, Terrorism, Injuries

INTRODUCTION

The blast wave is a shot without a bullet, a slash without a sword. It is present everywhere within its range. Blast would be as dreaded a weapon as chemical warfare, if its range, when explosives are used were not limited to small areas. However it would be premature to believe that this situation will always remain the same.” [1]

Theodor Benzinger 1950

The incidence of injuries resulting from explosions has increased throughout the twentieth century. This has been caused in part by industrial expansion. More significant has been the proliferation of explosive weapons and their increased use world-wide. Injuries caused by explosions are not confined to the battlefield. The International Committee of the Red Cross has estimated that throughout 70 countries, at least 2,000 people (predominantly civilians) are killed or injured every month by anti-personnel mines. [1]

A bomb is a container filled with an explosive mixture and missiles, which is fired either by detonator or a fuse. Terrorist bombs often involve 2–10 kg of explosives. When an explosion occurs, produces large amount of gases and energy while the pressure generated is up to 1000 tones/sq”. [2]

Explosions have the capability to cause multisystem, life-threatening injuries in single or multiple victims simultaneously. These types of events present complex triage (abrasions, contusions and punctured lacerations), diagnostic, and management challenges for the health care provider. Explosions can produce classic injury patterns from blunt and penetrating mechanisms to several organ systems, but they can also result in unique injury patterns to specific organs including the lungs and the central nervous system.

Blast injury will also produce scattered foci of small hemorrhages in the substances of lungs, liver, spleen, kidneys, adrenals, brain, mesenteries, air passages etc. as a result there is bloody froth in the mouth. [3]

CASE

A 35 yr old male having history of giddiness followed by fall, injury to head while working in a chemical manufacturer company and then brought dead to GMCH Aurangabad, Maharashtra for medico legal post mortem.

Post mortem findings: [6]

EXTERNAL EXAMINATION: All cloths were stained with blood and blackish dust. T-shirt showed multiple tiny holes on it’s back. Trousers stained with blackish dust, having torn on right leg near knee region. (Fig.4.)
Facial features were injured and disfigured on right side of body. The skin was stained with blackish dust at face and neck area, both upper limbs distal to lower 1/3rd of arms up to fingers and both thighs below lower one third up to feet.

Lacerated wound was present over right parieto-temporal area of size 10x8 cm x bone deep with avulsion of skin and comminuted fracture of underlying bone. (Fig.1.) Brain matter was exposed. There was presence of blood infiltration and irregular margins.

There were multiple abrasions and punctured lacerations of varying sizes ranging from diameters of 0.1 cm to up to 1 cm, over right side of face and upper chest, left upper limb, right lower thigh. (Fig. 2 & 3.)

**Internal Examination:** Under scalp contusion was present over right fronto-parieto-temporal area of scalp, irregularly with evident depressed comminuted fracture of right fronto-parieto-temporal bones, associated with torn meninges at fractured sites. There was laceration of brain over right parietal region of size 4.5x2.5x1.5 cm, with irregular margins. Subarachnoid hemorrhages were present over both hemispheres, more over right side. Lungs showed sub pleural patchy hemorrhages, sub pleural blebs as a result of shock waves of the blast.

**DISCUSSION**

Knowledge of the mechanisms of blast injury, the associated pathophysiology, the clinical diagnosis and recommended management of the resulting complex trauma are the keys for helping casualties.

By convention, blast injuries are classified according to the mechanism by which they are produced.
Table No. 1. Show classification of blast injuries. [5]

<table>
<thead>
<tr>
<th>Category</th>
<th>Injury caused by</th>
<th>Primary target organ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary blast injury</td>
<td>Blast wave</td>
<td>Ears, lungs, GI tract, CNS</td>
</tr>
<tr>
<td>Secondary blast injury</td>
<td>Victim struck by flying debris</td>
<td>Skin, CNS, eyes, musculoskeletal system</td>
</tr>
<tr>
<td>Tertiary blast injury</td>
<td>Acceleration + Impact with stationary objects</td>
<td>Abdominal viscera, CNS, lungs, skin, musculoskeletal system</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Inhalation of dust, toxic gases, burns radiation, psychological impact</td>
<td>Lungs, skin, musculoskeletal system</td>
</tr>
</tbody>
</table>

The air-containing organs (like ear, lungs, digestive tract etc.) are extremely vulnerable to the unique primary blast effect. Familiarity with the effects that explosions exert on these organs, their consequences and treatment, together with a high index of suspicion, are crucial for medical professionals to obtain the best outcome for exposed victims. [4]

All of the injuries presented in this case are due to blast injuries. At the conclusion of autopsy, cause of death was formed as “Head injury associated with blast injuries”. Whereas histopathology of lung tissues supported the opinion of cause of death as diffuse alveolar damage secondary to acute lung injury.

**CONCLUSION**

Blast injury is becoming more common in the non-military population but it is still rare to see such injuries and deaths unrelated to terrorist acts. The exact mechanisms involved in blast injuries are unclear. Civilian physicians and surgeons need to have a basic understanding of the patho-mechanics and physiological effects of blast injuries.

Although terrorism has been present for years, the number of serious terror incidents is more than tripled in recent years. Access to information on the internet has facilitated tremendous technological advancement in terrorists’ destructive capabilities. This underscores the importance of appropriate education within the medical system and the need for careful advanced planning to cope with terror attacks. Because of the increasing incidences of explosions, physicians must become familiar with the characteristics of contemporary explosive devices and the spectrum of injuries inflicted by blasts and explosions. [4]

**ACKNOWLEDGEMENT**

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**Conflict of Interest:** No conflict of interest observed during this study.

**Source of Funding:** Self.

**Ethical Clearance:** This study is carried out in accordance with declaration of Helsinki.

**REFERENCES**

4. Ami Mayo and Yoram Kluger. Blast-induced injury of air-containing organs. ADF Health April 2006: Vol. 7 No. 1
6. P. M. No. 1276/10, dated. 17/7/10.
INTRODUCTION

The autopsy room has always been a potential source of infection. The autopsy surgeons, forensic pathologists and other persons engaged directly or indirectly in conducting postmortem examination are at greater risk of exposure to blood-borne viruses and other infections like human immunodeficiency virus (HIV), Hepatitis B virus (HBV), Hepatitis C virus (HCV), Hepatitis D and G viruses, Non-A, Non-B Hepatitis, tuberculosis, Creutzfeldt Jacob disease, herpes, hanta virus pulmonary syndrome, small pox, human T-cell lymphotropic virus type 1 and infection from other pathogenic organisms. Many studies have confirmed that with the cessation of life, certain pathogenic bacteria are released, which if left unchecked, may prove hazardous to the personnel dealing with them. Medicolegal autopsies being a basic legal requirement to ascertain the cause and manner of unnatural deaths have registered an overall increase throughout the country.

It has long been recognized that the dissectors, observers and other persons in close proximity to an autopsy are at a high risk of contracting infectious diseases from the dead bodies. Studies in British clinical laboratories between 1970 and 1989 established that the highest rate of laboratory-acquired infections was in autopsy workers. It has been reported that resident doctors working in pathology sustained a percutaneous injury with a blood exposure in 1 in 11 autopsies whereas the experienced pathologists in 1 in 55 autopsies. Scalpel blades made majority of these cuts. However, many other objects such as broken glass, needle fragments, bone pieces, and fragmented projectiles can injure the autopsy personnel. Weston and Lober have documented that approximately

ABSTRACT

Forensic medical personnel are at risk of exposure to blood-borne viruses including HIV, Hepatitis B and Hepatitis C virus. The aim of this study was to determine seropositivity of HIV, HBV and HCV among a cadaver population at the SMS hospital, Jaipur. The study group consists of four hundred eighteen randomly picked subjects over a period of one year from October 2008 to September 2009. These cadavers were screened for HIV antibodies, HBs Antigen (hepatitis B surface antigen) and HCV antibodies (hepatitis C virus antibodies) by applying ELISA Test. For HIV antibodies initial reactive tests were confirmed by Tridot Test and SD Bioline test as per NACO guideline. The maximum numbers of deceased in the present study group were in the age range of 15-44 years being 295 in number (70.58%). Out of these, 224 (75.9%) were males and 71 (24.06%) were females. In all 46 (11.0%) samples out of 418 were seropositive for HIV, HBV and HCV infections. From 418 subjects, 10 were seropositive for HIV (2.39%). all of them males. Seropositivity for HCV was found in 7 (1.67%); males only. Out of 29 subjects seropositive for HBV, majority i.e. 17 (58.62%) were in age range of 15-44 years. In the serological status of HBV, 29 (6.94%) subjects showed positive results. Among them 21 were males and 8 were females. All forensic cadavers should be treated as potentially infectious and universal precautions should be taken.

Keywords: HIV, HBV, HCV, Cadaver

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8% surgical gloves get punctured during autopsy and about 1/3rd of these remain undetected by the pathologist, thus causing any pre-existing hand injuries to be bathed in infectious blood for a prolonged period of time. The guidelines for handling of cadavers and for performing autopsies on infected subjects are available along with the recommendations for application of universal precautions in all cases. But, with the increasing pressures of work and ignorance in our set up, not much of the available rules are implemented religiously in day to day working. The main objectives of this study were to firstly examine the distribution of serological markers for HIV, HBV and HCV infection in medicolegal cases which included all causes of death; secondly to evaluate the risk of potential infection to personnel involved in medicolegal incidents and procedures; and thirdly to increase the awareness among personnel involved in medicolegal work about the risks of transmission of these infectious diseases and their prevention thereof.

METHODS AND MATERIAL

The study was carried out from 14 October 2008 to 19 September 2009. Samples of blood were collected from 418 bodies at autopsy, carried out within 2 hours to 45 days of death; 322 were males and 96 females. The subjects were selected to be included in the study group were picked up randomly from the autopsies performed at department morgue during the study period. There were no inclusion or exclusion criteria for the selection of subjects except the consent. In all the cases included, a well informed consent was obtained from next of kin, relatives of the deceased or whatsoever was in charge of the dead body and was categorized on the basis of demographic profile and the cause of death. Case records and relatives were consulted as fully as possible to determine whether there was antemortem knowledge of actual or potential risk of infection. Blood sample were collected from the femoral vein of all the subjects with sterile precautions. Serum were separated and subjected to different tests to detect the presence of antibodies to HIV and HCV along with detection of HBsAg. Commercially available microbiology kits were used to test cadaveric serum for HIV antibodies, HBsAg and HCV antibodies. HIV testing was performed as per NACO guidelines.

RESULTS

A total of 418 blood specimens were collected in a sequential manner from selected cases, via femoral vein with sterile precautions during autopsy at the mortuary. The age of cadavers of this study group ranged from 0-87 years. The maximum numbers of deceased in the present study group were in the age range of 15 – 44 years being 295 in number (70.58%). Out of these, 224 (75.9%) were males and 71 (24.06%) were females. The mean age for male cadavers included in the study group was 35.38±14.68 and the mean age for the female cadavers included in the study was 32.54±13.98 (Table-1).

<table>
<thead>
<tr>
<th>Age group (In Yrs)</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>0-4</td>
<td>3</td>
<td>0.71</td>
<td>1</td>
</tr>
<tr>
<td>5-9</td>
<td>5</td>
<td>1.20</td>
<td>2</td>
</tr>
<tr>
<td>10-14</td>
<td>3</td>
<td>0.71</td>
<td>1</td>
</tr>
<tr>
<td>15-44</td>
<td>224</td>
<td>53.60</td>
<td>71</td>
</tr>
<tr>
<td>45+</td>
<td>87</td>
<td>20.82</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td>322</td>
<td>77.04</td>
<td>96</td>
</tr>
</tbody>
</table>

Mean age ± Sd (Male cadaver) = 35.38 ± 14.68
Mean age ± Sd (Female cadaver) = 32.54 ± 13.98

Out of 10, 5 (50%) subjects seropositive for HIV fell in age range of 15-44 years and remaining 5 (50%) fell in age range of more than 45 years. Out of 29 subjects seropositive for HBV, majority i.e. 17 (58.62%) were in age range of 15-44 years. 5 (74.13%) subjects seropositive for HCV were in age range of 15-44 years and 2 (28.57%) subjects were more than 45 years of age (Table-2).
Table 2. Serological markers of HIV, HBV and HCV in relation to age

<table>
<thead>
<tr>
<th>Age group (In Yrs)</th>
<th>Communicable disease</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HIV</td>
</tr>
<tr>
<td>0-4</td>
<td>0(0.00)</td>
</tr>
<tr>
<td>5-9</td>
<td>0(0.00)</td>
</tr>
<tr>
<td>10-14</td>
<td>0(0.00)</td>
</tr>
<tr>
<td>15-44</td>
<td>5(50.00)</td>
</tr>
<tr>
<td>45+</td>
<td>5(50.00)</td>
</tr>
<tr>
<td>Total</td>
<td>10(100.00)</td>
</tr>
</tbody>
</table>

From 418 subjects, all 10 (2.39%) subjects seropositive for HIV were males. Similarly all 7 (1.67%) subjects seropositive for HCV were males. In the serological status of HBV, 29 (6.94%) subjects showed positive results and 389 (93.06%) showed negative results. Among them, 21 (72.4%) were males and 8 (27.6%) were females (Table-3).

Table 3. Serological markers for HIV, HBV and HCV in relation to sex

<table>
<thead>
<tr>
<th>Sex</th>
<th>HIV</th>
<th>HBsAg</th>
<th>HCV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+ ve</td>
<td>- ve</td>
<td>Total</td>
</tr>
<tr>
<td>Male</td>
<td>10(2.39)</td>
<td>312(74.640)</td>
<td>322(77.03)</td>
</tr>
<tr>
<td>Female</td>
<td>0(0.00)</td>
<td>96(22.97)</td>
<td>96(22.97)</td>
</tr>
<tr>
<td>Total</td>
<td>10(2.39)</td>
<td>408(97.61)</td>
<td>418(100.00)</td>
</tr>
</tbody>
</table>

χ², df=1 = 0.170, P > 05, NS

Out of 418 subjects, 290 accidental deaths were registered. In them 3 (1.03%) were seropositive for HIV, 24 (8.28%) were seropositive for HBV and 5 (1.72%) were seropositive for HCV i.e. a total of 32 (11%) subjects of accidental deaths were seropositive for at least one of the blood borne viral agents. Of the 70 suicidal deaths, no subject was seropositive for HIV, 4 (5.71%) subjects were seropositive for HBV and 1 (1.43%) subject was seropositive for HCV. Rest 65 (92.8%) subjects of suicide deaths were seronegative for HIV, HBV and HCV. All 20 subjects of Homicidal deaths were seronegative for HIV, HBV and HCV (Table-4).

Table 4. Serological markers for HIV, HBV and HCV in relation to manner of death

<table>
<thead>
<tr>
<th>Mode of death</th>
<th>HIV</th>
<th>HBsAg</th>
<th>HCV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+ ve</td>
<td>- ve</td>
<td>Total</td>
</tr>
<tr>
<td>Accidental</td>
<td>3(1.03)</td>
<td>28(98.97)</td>
<td>29(100.00)</td>
</tr>
<tr>
<td>Suicidal</td>
<td>0(0.00)</td>
<td>70(100.00)</td>
<td>70(100.00)</td>
</tr>
<tr>
<td>Homicidal</td>
<td>0(0.00)</td>
<td>20(100.00)</td>
<td>20(100.00)</td>
</tr>
<tr>
<td>Natural</td>
<td>7(18.42)</td>
<td>31(81.58)</td>
<td>38(100.00)</td>
</tr>
<tr>
<td>Total</td>
<td>10(2.39)</td>
<td>408(97.61)</td>
<td>418(100.00)</td>
</tr>
</tbody>
</table>

DISCUSSION

For a health care worker, the average risk for HIV infection after a percutaneous needles tick injury with HIV-infected blood is estimated to be 0.3%. The study group comprised of 418 subjects, ranging from 0 to 87 years of age. Most of the subjects were in the range of 15-44 years being 295 in number accounting for 70% of total population of the study group. There were 295 (70.6%) subjects in the age range of 20-49 years and 225 (53.8%) subjects in age range of 20-39 years. This age range of 20-49 years comprises of bread winning members of the family making them socially vulnerable to Medicolegal incident of different types. Cattaneo C et al carried out a similar study for prevalence of HIV and hepatitis C markers among a cadaver population. Their ages ranged from 16-50 years. They reported that most subjects were in the 21-40 years age range covering 68.3% population. In another study done by Zadeh HS, the ages of cadavers of study group ranged from 2 to 78 years and there were 74.4% subjects between 20-49 years. Li L et al carried out a study on 414 autopsy cases, 135 (32.6%) had serologic evidence of at least one viral marker. There were 23 serum samples positive for HIV-1 (5.6%), 96 positive for anti-HBc (23.2%), 79 for HCV (19.1%).
Prevalence of HIV-1 infection in both male and female was similar in this population, male 5.7% and female 5.2% but in our study all HIV cases belongs to males only. In the study of Li L et al, there was no significant difference in HBV infection by sex. The incidence of HCV infection in males was at least two times higher than that of females (21.8% to 10.3%) while in our study prevalence of HBV in males is 5.02% and 1.91% in females. In our study all positives for HCV were males (1.67%) which is also not similar to Li L et al study.

There were 322 males in our study population comprising 77.04% and 96 females accounting for 22.96%. The males outnumbered the females in our study population which is easily explainable in our society, which is still male dominant, especially in the rural regions. This is quite similar to 82.6% males and 17.3% females (Cattaneo C et al, Milan, 1997) and 83.2% males and 16.8% females (Zadeh HS, Tehran, 2001). The manner of death in our study population was predominantly accidental in nature accounting for 64.8% deaths. 16.8% deaths were suicidal in nature; 4.6% were homicidal and in 13.8% deaths, no medico-legal manner could be established, death occurred probably due to some pathological manifestations while in Li L et al study, natural (37.2%), accidental (18.8%), homicidal (18.1%), suicidal (13.8%) and undetermined (12.1%) comprise study population. Comparing it to the other studies, we observe the following pattern (Table-5):

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV</td>
<td>2.4%</td>
<td>5.6%</td>
<td>16.3%</td>
<td>11.0%</td>
<td>0.0%</td>
<td>0.4%</td>
</tr>
<tr>
<td>HBV</td>
<td>6.93%</td>
<td>23.2%</td>
<td>-</td>
<td>8.0%</td>
<td>4.6%</td>
<td>0.5%</td>
</tr>
<tr>
<td>HCV</td>
<td>1.67%</td>
<td>19.1%</td>
<td>28.7%</td>
<td>1.0%</td>
<td>4.0%</td>
<td>-</td>
</tr>
</tbody>
</table>

The reason for the slight variation in our study from the studies conducted by Sharma BR et al; du Plessis et al regarding HBV and HCV and Zadeh HS may be due to the variations in the case selection of study group in the four studies.

CONCLUSION

High prevalence of various infectious diseases in the population poses a great risk of occupational hazards to the forensic pathologist/autopsy surgeon and other staff involved in the postmortem examination. They may be exposed to a wide variety of infectious agents such as HIV, Hepatitis B, C viruses, Mycobacterium tuberculosis, etc. For transmission of HIV, HBV, and HCV; blood is the single most important source of infection. Furthermore, practically, it is almost impossible to know the medical status (whether HIV/HBV/HCV etc, present or not) of each and every deceased person. It is therefore prudent to consider all the dead bodies to be potential carriers of infection and follow the Universal Precautions, while conducting autopsy on them. Proper assessment, personal protective equipment, appropriate autopsy procedures and infrastructural modifications can substantially reduce the risks of occupational health hazards in the autopsy rooms. Accordingly, periodic training and education in safe postmortem procedures, prevention of sharp’s injuries and other kinds of exposures should be imparted to the forensic personnel regularly. They should be aware of the potential transmission of these infections and the use of preventive measures. Non-availability of the vaccination for some of these deadly infections alerts that avoidance to such an exposure is the only prevention by the use of universal precautions while at work.

ACKNOWLEDGEMENT

The authors are thankful to Dr. B.M. Gupta Professor Department of Forensic Medicine and Toxicology, SMS Medical College Jaipur for kindly help to carry out this work.

Conflicts of Interest: Nil

Source of Funding: Nil

Ethical Clearance was sought from appropriate authorities before the commencement of this work.

REFERENCES

Retrospective Analysis of the Occupational Injuries in Eye Patients in E.S.I. Hospital

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¹Head of Eye Department, ²C.M.O. Eye Department, E.S.I. Hospital, Basaidarapur, New Delhi

ABSTRACT

The E.S.I. Scheme has the largest medical infrastructure under one umbrella, in India. Medical care is provided through its huge network of 150 hospitals, 1403 E.S.I. Dispensaries/ISM Units, 1447 Panel clinics and 6536 IMOs. The E.S.I. Corporation incurred about Rs. 2689.62 crore on the delivery of medical care in year 2012-13. Eye trauma is number one cause of vision loss in industrial workers. We are presenting a retrospective analysis of eye injuries coming in the EYE DEPARTMENT of E.S.I. Hospital, basaidarapur, New Delhi 110015.

Keywords: Employee State Insurance (E.S.I.), Occupational, Injuries, Eye Trauma

INTRODUCTION

Employee State Insurance Act(1948) envisages social protection of workers in the organized sector in contingencies such as sickness, maternity, death or disablement due to employment injury and occupational disease. Based on the principle of “pooling of risks and resources”, the unique, multidimensional health insurance scheme guarantees a fair deal to the covered members by providing full medical facilities to the beneficiaries, besides adequate cash compensation to insured persons for loss of wages or earning capacity in times of physical distress arising out of sickness or employment injury or unemployment.

The main benefits provided under E.S.I. Scheme are

- Sickness benefit
- Disablement benefit
- Dependant benefit
- Maternity benefit
- Medical benefit

Besides the above, other benefits being provided to the beneficiaries are Confinement Expenses, Funeral Expenses, Vocational Rehabilitation, Unemployment Allowance and Skill up gradation training.

In E.S.I.C., Comprehensive medical care ranging from OPD, medical attendance, treatment, drugs specialist consultation, hospitalization of insured persons (IPs) and their family members to super-specialty treatment are provided under the scheme. Medical benefit is available to the INSURED PERSON (IP) and his family members from the day he enters the insurable employment. There is no ceiling on the expenditure on individual medical care.

MATERIAL AND METHOD

This is a retrospective study. We are presenting the number of patients coming to EYE DEPARTMENT with various occupational injuries in the last 3 years i.e. 2010, 2011, and 2012. The various eye conditions with which patients present to EYE DEPARTMENT with occupational injuries;

- Embedded corneal foreign body
- Chemical injuries (Acid/Alkali)
- Welding arc light corneal injury
- Blunt injury
- Penetrating injury
- Traumatic cataract (<40 years)
FINDING

The total number of patients coming to EYE DEPARTMENT of E.S.I. Hospital, BASAIDARAPUR, and NEW DELHI 110015 with occupational injuries in the last 3 years i.e. 2010, 2011 and 2012 is summarized in the following table:

Table 1: Patients with Occupational Injuries
Presented to Eye Opd, E.S.I. Hospital, Basaidarapur, New Delhi In Last 3 Years I.E. 2010,2011 and 2012

<table>
<thead>
<tr>
<th></th>
<th>Year 2010</th>
<th>Year 2011</th>
<th>Year 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embedded corneal foreign body</td>
<td>35</td>
<td>42</td>
<td>46</td>
</tr>
<tr>
<td>Chemical injury(acid / alkali injury)</td>
<td>23</td>
<td>28</td>
<td>19</td>
</tr>
<tr>
<td>Welding arc light corneal injury</td>
<td>12</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Blunt injury</td>
<td>17</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>Penetrating injury</td>
<td>16</td>
<td>14</td>
<td>09</td>
</tr>
<tr>
<td>Traumatic cataract (&lt;40 years)</td>
<td>17</td>
<td>15</td>
<td>11</td>
</tr>
</tbody>
</table>

The percentage injury of the patients with occupational injuries 4 in the last 3 years i.e. 2010, 2011 and 2012 is summarized in table 2.

Table 2: Percentage Vision Loss in Patients with Occupational Eye Injuries Presented to Eye Opd, E.S.I. Hospital, Basaidarapur, and New Delhi in Last 3 Years I.E. 2010, 2011 and 2012

<table>
<thead>
<tr>
<th></th>
<th>Year 2010</th>
<th>Year 2011</th>
<th>Year 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vision loss 10%</td>
<td>37</td>
<td>35</td>
<td>44</td>
</tr>
<tr>
<td>Vision loss 30%</td>
<td>34</td>
<td>47</td>
<td>38</td>
</tr>
<tr>
<td>Vision loss 40%</td>
<td>44</td>
<td>40</td>
<td>42</td>
</tr>
</tbody>
</table>

CONCLUSION

The magnitude of vision loss due to industrial injuries is a great loss of earning capacity. The E.S.I.C. is the biggest provider of social security scheme in this country. Every vision loss is compensated duly for the loss of earning capacity.

ACKNOWLEDGEMENT

We thank all the patients who participated in the study.

Conflict of Interest: There is no conflict of interest.

Source of Funding: E.S.I.C. funded the study

Ethical Clearance: Ethical clearance has been taken

REFERENCES

Histopathological Study of Carotid Arteries in Deaths due to Hanging

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²Professor and Head, Dept. of Forensic Medicine, ³Assistant Professor, Dept. of Pathology, T.N. Medical College &
B. Y. L. Nair Ch. Hospital, Mumbai

ABSTRACT

We studied the influence of various parameters on carotid artery in cases of deaths due to hanging. In 60 hanging deaths autopsied, the various details were gathered, analyzed and interpreted. Histopathology examination revealed the incidence of carotid artery injury to be 47% (28 cases). Out of these maximum cases (17%) showed disruption of intimal layer from medial layer followed by 15% cases intimal tear, 8% cases perivascular congestion and 7% cases subintimal haemorrhages. We concluded that age, type of hanging, position of knot and ligature materials were the parameters which influence carotid artery injury.

Keywords: Hanging, Intimal Tear, Carotid Artery, Histopathology

INTRODUCTION

Human suicidal behavior has always been a source of dread and wonder to mankind and its history goes back at least to the earliest human records. Hanging remains to be one of the common method of committing suicide. The thought of hanging oneself may come progressively or as an impulse. In India suicide by hanging was the second most commonly adopted mean of committing suicide i.e.31.5% in the year 2009. Hanging is the most preferred method of suicide along with consumption of poisons in Maharashtra.¹

It is very much necessary for us to know the various postmortem findings that help us in establishing that death was due to hanging. Age, gender, physical condition of the individual, visit to the scene of crime, injuries on the body, type of ligature mark and knot, may all help to decide the death occurred due to hanging. Hence, an attempt is made in this study to know how far these changes are evident in postmortem examination.², ³, ⁴

MATERIAL & METHOD

The present study was conducted at post-mortem center attached to the University teaching hospital in Mumbai. The cases of deaths due to hanging in which autopsy have been conducted at this post-mortem center during study period from July 2009 to June 2011 (2 years) were included in this study. During the specified period of 2 years, 60 cases were studied with respect to different age groups and gender. The details about victims regarding the circumstances of death, type of ligature material, manner and apparent cause of death were recorded from police requisition letter and inquest (Panchanama) report. In addition, the history was taken from relatives about the incidence.

The detailed post mortem examination was carried out in each case comprising of an external and an internal examination. For the study we personally attended autopsy, dissected the neck structures by taking ‘V’ shaped incision, collected the segments of carotid arteries separately from both sides below the ligature mark and subjected them to histopathological study with the help of Pathology Department of this institute.
OBSERVATIONS AND RESULTS

The analyzed group consisted of 60 cases of deaths due to hanging and all cases were suicidal in nature. In the group of 60 cases of hanging, there were 46 men (77%) and 23 women (23%), aged between 16 and 85. Of the 60 deaths due to hanging we observed that 47% (28) cases showed damage to carotid arteries either in one side or bilaterally whereas 53% (32) cases did not show any change. Histopathological examination of carotid arteries showed disruption of intimal layer from medial layer in maximum cases (17%) followed by intimal tear (15%), perivascular congestion (8%) and 7% showed subintimal haemorrhages (Table 1).

The maximum incidence was recorded in third decade of life. The average age of the individual was 50 years. Men ranged from 18 to 85 years and women from 16 to 57 years. The association of carotid artery damage was increased as the age increased. The highest number of cases (60%) showed carotid damage in age the group 61 to 90 years followed by 52% cases in age group 31 to 60 years and 40% in 1 to 30 years. The association between individual weight and the occurrence of damage to carotid arteries was not discovered (Table No-2).

Out of 60 cases we observed 83% cases of complete hanging whereas 17% cases of partial hanging. The histopathological finding in carotid arteries were seen in both complete and partial hanging however findings seen maximum in complete hanging (36%) as compared to partial hanging (10%) (Table No-3).

In present study, the nature of ligature material was soft (saree, dupatta, etc.) in 55% cases whereas hard (nylon rope, electric wire etc.) in 45% cases. The most common ligature material used by victim for hanging was Nylon rope in majority cases (42%) and it was mainly preferred by male victims. Dupatta / Odhani were preferred as ligature material in 30% cases and it was mainly preferred by female victims. The histopathological finding in carotid arteries more frequently seen in hard ligature (16 cases) material as compared to soft ligature (12 cases) material. Intimal tear was most common in hard ligature material whereas disruption of intimal layer was equally common in both hard and soft ligature materials (Table No-4).

The position of knot in most of the cases was on right side of neck (37 cases) followed by left side of neck (19 cases) and in 4 cases it was on occipital region. No case was reported with knot on anterior aspect of neck. Damage to carotid arteries in cases of lateral hanging (knot on either right or left side of neck) were more commonly observed on the side contralateral to the position of knot. i.e. at the point of the major pressure acting upon neck organs due to ligature. Only one case showed bilateral damage to carotid arteries in which the position of knot was over occipital region (Table No-5).

### Table No.1. Histopathological findings in carotid arteries

<table>
<thead>
<tr>
<th>Findings in carotid artery</th>
<th>No. of cases</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intimal tear</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>Sub-intimal haemorrhage</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Disruption of intimal layer from medial layer</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>Peri-vascular congestion</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>No change</td>
<td>32</td>
<td>53</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>100</td>
</tr>
</tbody>
</table>

### Table No.2. Age group wise findings in carotid arteries

<table>
<thead>
<tr>
<th>Age group</th>
<th>Damage</th>
<th>1 to 30</th>
<th>31 to 60</th>
<th>61 to 90</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>12(40%)</td>
<td>13(52%)</td>
<td>3(60%)</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>18</td>
<td>12</td>
<td>2</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>25</td>
<td>5</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

### Table No. 3. Injuries to carotid arteries in relation to suspension of body

<table>
<thead>
<tr>
<th>Type of hanging</th>
<th>Intimal tear</th>
<th>Subintimal haemorrhages</th>
<th>Disruption of intimal layer</th>
<th>Perivascular congestion</th>
<th>No change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete(50 cases)</td>
<td>8</td>
<td>3</td>
<td>7</td>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td>Partial(10 cases)</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>4</td>
<td>10</td>
<td>5</td>
<td>32</td>
</tr>
</tbody>
</table>
Table No.4. Injuries to carotid arteries in relation to nature of ligature material

<table>
<thead>
<tr>
<th>Type of hanging</th>
<th>Intimal tear</th>
<th>Subintimal haemorrhages</th>
<th>Disruption of intimal layer</th>
<th>Perivascular congestion</th>
<th>No change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard (27 cases)</td>
<td>7</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>Soft (33 cases)</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>4</td>
<td>10</td>
<td>5</td>
<td>32</td>
</tr>
</tbody>
</table>

Table No.5. Injuries to carotid arteries in relation to position of knot

<table>
<thead>
<tr>
<th>Position of knot</th>
<th>Findings Present</th>
<th>Absent</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Right</td>
<td>Left</td>
<td>Bilateral</td>
</tr>
<tr>
<td>Occipital</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Right side of neck</td>
<td>3</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Left side of neck</td>
<td>9</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Anterior</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td>14</td>
<td>1</td>
</tr>
</tbody>
</table>

1. Intimal layer tear,
2. Subintimal haemorrhages,
3. Disruption of intimal layer from medial layer,
4. Perivascular congestion
5. No change

The abovementioned changes in carotid arteries are evident due to traction and direct pressure of the ligature on the neck. The acting pressure of ligature probably leads to fixation and deformation of the part of artery below the ligature to the deeper tissue structures of the neck. Section of the artery below the point of its fixation due to pressure of ligature is exposed to traction forces that lead to downward stretching of this part of the artery. A combination of forced compression of the artery and its longitudinal stretching could be the most frequent mechanism leading to occurrence of tears in the intimal layer of carotid arteries in hanging deaths. The subintimal haemorrhage and perivascular congestion appears to be more due to direct trauma due to pressure of ligature, whereas intimal tear and disruption of intimal layer from medial layer are the result of traction forces. So these findings in carotid arteries are possible due to direct and indirect trauma in the form of crushing and traction forces.

Autopsy study of carotid arteries in deaths due to hanging established the information that tear of the intimal layer of carotid arteries suggest more frequently in individuals of older age groups. This study most possibly relates to the advancement of age.

DISCUSSION AND CONCLUSION

In this study on external examination, the carotid arteries did not show any appreciable gross findings. The histopathological findings in carotid arteries were grouped under five heading as follows:

1. Intimal layer tear,
2. Subintimal haemorrhages,
3. Disruption of intimal layer from medial layer,
4. Perivascular congestion
5. No change

Fig. 1. Disruption of medial layer from intimal layer (H&E 40X)

Fig. 2. Intimal Haemorrhage (H&E 100X)
related degenerative and atherosclerotic changes in carotid arteries. However, the exact relationship between the severity of degenerative, atherosclerotic changes and the occurrence of injuries to the intimal layer of carotid arteries was not studied and is subject to further study.¹⁰

CONCLUSION

1. Findings in carotid arteries are caused due to direct and indirect trauma in the form of crushing and traction forces.
2. Disruption of intimal layer from medial layer is the most common finding followed by intimal tear in histopathology of carotid arteries in deaths due to hanging.
3. The association of carotid artery damage was increases as the age increases, this possibly relates to the advancement of age related degenerative and atherosclerotic changes in arteries.
4. The carotid artery damage was seen maximally in cases of complete hanging (36%) as compared to partial hanging (10%).
5. Damage to carotid arteries were more commonly seen in hard ligature as compared to soft ligature. Intimal tear most common in hard ligature whereas disruption of intimal layer was equally common in both hard and soft ligature.
6. Damage to carotid arteries in cases of lateral hanging were more commonly observed on the side contralateral to the position of knot.
7. Bilateral damage to carotid arteries was generally seen due to crushing and stretching on both side of the neck when the position of knot was over occipital region.

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REFERENCES

Informed Consent: A Myth of Ethical Spirit and Legal Paradigm in Medical Profession

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ABSTRACT

Informed consent may not be major significance in medical malpractice litigations but, it is one of the critical issues in modern medicine. The development of informed consent has given rise to two major perceptions of ethical and legal foundations in health care system. The principle of informed consent is applicable to surgical operations, medical treatment and diagnostic procedures involving intentional interference with the patient. No doubt, medico-legal issues are more common in the western part of the world, the autonomy of the patient along with other principles of informed consent followed regularly in the west. In India lack of disclosure and negligence of not following seriously informed consent in health care is commonly seen. Institutional policies and procedures in obtaining medical consent may form a legal document but, may not necessarily achieve the goal of informed consent, patient or relatives for instance may sign documents, they do not understand. Medical professionals should consider the need to achieve informed consent in two symbiotic senses: the ethical sense and the legal sense.

Keywords: Informed Consent, Ethical, Legal Paradigm, Health Care

INTRODUCTION

Medical professionals till the beginning of 20th century, traditionally had the high status and carried the tag of ‘extensions of God’ particularly surgeons obtained assent, the agreement of the patient to have procedure but not consent. It was the mutually accepted practice of the doctors with their patients care in accordance with the principle of Hippocratic Oath of beneficence and informed consent was not legally required. The first land mark of judgment from New York justice, Benjamin Cardoza upheld the patient’s right was documented in a case of Schloendoff in the year 1914. Mrs. Schloendoff had agreed to examine for fibroid uterus to exclude malignancy under anaesthesia. But, surgeon was found guilty as he had removed uterus which patient had not agreed. In the middle of the 20th century, the Salgo’s malpractice case in1957 introduced the current concept of informed consent. Followed; by Natson case in1960 for lack of disclosure to the reasonable doctor standard, Canterbury case in1972 for insufficient disclosure to the reasonable patient’s standard, and in 1978 for right to refuse treatment and to respect autonomy for self determination of the individual in a case of Candura. Each of these cases contributed to the evolution of modern informed consent with five ideal elements like2,3: 1. Disclosure of information to patients and research voluntaries. 2. Understanding to optimize the patients. 3. Voluntariness of participation in treatment and research. 4. Competence of the individual and 5. Consent in final to indicate valid agreement. But, the application of ideal informed consent remains more of subjective than objective in health care system.

The earliest evidence in legal expression for fundamental principle to preserve autonomy is found in the 1947 Nuremberg Code. The Nuremberg Code was created immediately after World War II, doctors in Nazi Germany were conducting horrifying research
on prisoners in concentration camps. The research was done on millions of involuntary participants who usually died as a result of unethical and illegal experiments. After the war when international tribunal was ordered, many of these doctors were tried at the Nuremberg trials for their crimes. The code makes it mandatory to obtain voluntary and informed consent of human subjects before to experiment.

Similarly, The Belmont Report (1979) is one of the leading works concerning ethics and health care was followed after unethical Tuskegee syphilis research study from United States (1932-1972). The study was conducted among the poor American blacks without their knowledge and voluntary consent. Later the research work was published as ‘long term effects of syphilis’ and not being treated by the National Health Care doctors though penicillin, the treatment for syphilis was available from 1947. The Belmont Report introduced the act of protection to participants in clinical trials and research studies. The Belmont Report consists of three basic principles: 1. Respect for persons. 2. Beneficence (Hippocratic Oath) and 3 Justice.

Some of the American shocking violated research studies were reviewed through the Belmont Report led to the development of ethical regulations of research guidelines. In fact, ethical responsibility was well appreciated and seen on May 16th, 1997 when U.S (then) president Bill Clinton offered an emotional apology to the eight remaining survivors after 65 years of Tuskegee syphilis research study. The 1964 Declaration of Helsinki meeting made by the World Medical Association had also emphasized the importance of obtaining freely given informed consent. Since, then the Declaration of Helsinki has undergone several revision updates to accommodate advances in medical science in safeguarding research and ethical problems.

Informed Consent in Developing countries and Indian Law

It is difficult to find documented landmark on informed consent in developing countries. Informed consent is a modern American ritual not applied properly in medical profession, its implementation of individual voluntary consent in developing countries remains controversial and sometimes it is not straightforward. Informed consent in the Asian subcontinent is beset with dilemma of ethical spirit and legal paradigm with difference. Despite legal issues are more common and strict in the western part of the world, the autonomy of the patients has been reviewed regularly and principles of informed consent are rectified in two. Symbiotic senses; ethical sense and legal sense. In India lack of disclosure and negligence of not following seriously informed consent in health care is commonly seen. The probable reasons could be due to; large cultural differences, lack of awareness with the illiterate masses, inadequate health care development and casual aptitude of medical professionals not contemplating potential litigations.

India being the largest democratic country in the world, the principle of autonomy is enshrined in the article 21 of the constitution, which deals with the right to the life and personal liberty also applies to the medical science. The application of common law with informed consent is difficult in India, but dealt with the principles of Indian Contract Act (ICA) and Indian Penal Code (IPC). Some of the obligations are maintained between medical professional and his patient in accordance with the Indian Majority Act; if individuals have attained the age of 18, patients with sound mind, and if individuals are not disqualified by the law. Of course, these obligations may differ from country to country and developing to developed countries; for instance in U.K consenting age is 16 years old and young person can be treated as an adult if a person can have capacity to decide. In case of competent child refuses treatment, a parent or court may authorize investigation or treatment in the interest of child welfare. In India when the patient is unable to give consent himself, the medical professionals may proceed with treatment by taking the proxy consent of any relative of the patient or even an attendant. For instance wife can give consent to her husband undergoing bypass surgery for the hospital formalities.

In a case of strained couple family history if one of them under goes sterilization by giving false history to the doctor for the sake of National scheme of monitory benefit, after the operation if one of their relative complains against the doctor and claims their consent was not valid because of their unsound mind, the law protects medical professionals in such a situation. Health care providers need not sense false history or doubt about the capacity of the patient. A doctor acting reasonably under normal circumstances is always protected by the law. The legal development of patient’s consent in clinical practice, the supreme court of India recently ruled, that it is not just the ‘consent’ or ‘informed consent’ but it shall also be ‘prior informed consent’ with exception to some specific
cases of emergency. Hence, written consent has become essential to the medical profession for proving consent in case of litigation. For instance, the doctor had done sterilization without the consent as patient was in general anesthesia for some other operation. It was observed that when one speaks of consent, that should be informed consent. Therefore doctor was liable in the legal sense. In case of negligence on the part of the doctor the law always assumes the principle of consent.

In one of the legal case, a patient gave consent for appendicitis operation and the surgeon after opening the abdomen found appendix was normal. However, in the interest of the patient, the surgeon removed her gangrenous gall bladder. Subsequently, patient suffered with renal complications. The doctor was held liable as he had operated without the valid consent. In such cases the law always maintains the right of autonomy of the patient however the error of diagnosis is pardonable.

A lady having the son and daughter both minors underwent Medical Termination of Pregnancy (MTP) with the written consent. After the operation the husband was informed that the uterus was removed in order to save the life of the patient. The husband, the complainant filed a case alleging that no consent for removal of uterus was obtained either from the patient or from him. In this case, operating surgeon had taken the second opinion and help of other eminent gynecologist in order to save the life of patient on emergency basis as there was continuous bleeding and patient was deteriorating. Thus no negligence regarding removal of uterus was found in the part of the doctors. So consent was done away because of emergency life saving situation. However, the practice of obtaining high risk consent from the patient’s party should not aim for stopping the complainant claiming damages, rather to be presumed for the responsible consequences of medical procedures or anesthesia being administered. In these circumstances one of the Indian State Commission observed that the signing of the consent form does not exclude doctor’s responsibility if he is negligent in carrying his duties.

In southern state of India, a case of perforated appendix with peritonitis was admitted in general hospital. But, even after two days no operation was done, eventually patient died. The patient’s wife filed a case against hospital saying that the doctor demanded money for performing surgery. Furthermore, the surgeon was busy in attending an outside private nursing home for some other operations and came back only after the death of the patient. The explanation of the doctor was that surgery could not be done as patient did not consent for operation. Therefore, the patient was treated conservatively and the patient condition got deteriorated and died. Finally, the court delivered a verdict in favor of the plaintiff’s stating that consent under such an emergency situation is not necessary and observed that the surgeon has a duty to inform him of the dangers ahead of the risks involved by going without an operation at the earliest time possible.

To standardize the medical practice, the Medical Council of India (MCI) has laid down guide lines and issued a regulation in regard to informed consent.

<table>
<thead>
<tr>
<th>Type of consent</th>
<th>Procedures/Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implied consent</td>
<td>For routine or ordinary medical examination like; inspection, palpation &amp; auscultation-during clinical diagnosis.</td>
</tr>
<tr>
<td>Oral consent</td>
<td>For detailed types of treatment including vaginal examination.</td>
</tr>
<tr>
<td>Written informed consent</td>
<td>For complex types of treatment requiring incisions and using certain dangerous instruments.</td>
</tr>
</tbody>
</table>

The parental consent is necessary for medical treatment on the minor. Local guardian can give consent on behalf of a person only if the treatment is an emergency one. In an emergency involving children, when their parent or guardian are not available, school teacher/principal can give consent for treating child who become sick during picnic away from the hometown. Husband or wife has no right to refuse consent to any operation in the interest of the health of the partner. Unconscious or unknown patient when admitted in hospital, the medical superintendent/ in-charge of hospital can give consent for treatment. Pathological autopsy should not be carried out without the consent of next of kin of the deceased. In case of consent for donation of organ after death the will of the deceased is enough. Not taking consent is considered as deficiency in medical services under the section 2 (1) of the Consumer Protection Act -1986 India. The Act becoming applicable to the ‘for profit’ health care system in India, physicians are treated as service providers and patients as consumers. Patients may now make claims on the basis of a lack of informed consent.
consent is taking ground in most of the developing countries and doctors are likely to be litigated with legal actions. However, there is a possibility of misusing Consumer Protection Act for legal necessity rather than reality.

In the United States most of the jurisdictions observe either professional practice standard or the reasonable patient standard. If the disclosure in informed consent did not meet standard of care, then it may be considered as breach of duty. In U.K informed consent in medical procedure requires proof of standard of care before it is accepted as standard care of acceptable professional practice. Breach of duty is decided by the objective test (Bolam Test); the defendant is expected to meet the standard of a reasonable person.

In the western law a lady having 4 children can refuse family planning procedure if her religious belief did not permit. Similarly, a competent adult has a right to refuse treatment even if others, including concerned doctors believe that the refusal is neither in his/her best interest nor reasonable if autonomy is to have meaning. In case of Jehovah’s Witness patient who refuse blood transfusion can be avoided by making use of other available alternative treatment modalities to save the patient.

Refusing to provide care because a patient is infected with the human immunodeficiency virus (HIV) is unethical. The American Medical Association’s council on judicial affairs has stated “A physician may not ethically refuse to treat a patient whose condition is within the physician’s current realm of competence solely because the patient is seropositive for HIV”. However, the need for seropositive health-care providers to inform patient may depend on the kind of care being rendered and the hospital and its jurisdiction. Anesthesiologists refusing to provide care should document their actions in medical records.

CONCLUSION

Voluntary informed consent is one of the critical issues in the area of medical treatment today. Tribunal Code, Belmont report reviews and revisions of Helsinki declaration for safety medical practice have improvised informed consent in the west. Very soon informed consent may take routes in Indian medical practice, especially since the enforcement of the Consumer Protection Act (CPA). The written consent should refer to one specific procedure and not blanket permission on admission to hospital. It is always safer side to take consent of spouse if operation destroys or limits sexual functions. In good faith one can consult relatives though legally not necessary. During an emergency a doctor can treat a patient to preserve health of well being or life of the patient. Informed consent is an ongoing process that includes the exchange of information and development of choices. This does not say that the same should be in writing. Modern informed consent is beset with a dilemma between ethical and legal sense. It is natural for doctors to feel pulled in one direction or another. It is always advisable to be vigilant in the fundamentals of interacting ethically with the patients and one should have adequate knowledge about patient’s consent to achieve goal of valid informed consent in medical profession.

ACKNOWLEDGEMENT

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Sources of Support or Grants: Nil
Institutional Ethical Clearance: Institutional Ethical Committee (Human)

REFERENCES

7. President Clinton’s apology for the Tuskegee Syphilis Experiment to the eight remaining survivors, All Politics,May 16, 1997
12. TT Thomas (Dr.) vs. Elisa. AIR 1987 Ker. 52.’
13. Paschim Banga Khet Mazdoor Samity and Ors v State of West Bangal and Another. 1996. 4SCC 37
INTRODUCTION

Since prehistoric times, thoraco-abdominal cavity has been looked upon as one of the most vulnerable region of the body and injuries involving it have always been considered serious. Thoraco-abdominal region involvement in any form of blunt force trauma can be related to the anatomical location of this region which makes it easily susceptible to impact by a wide variety of reasons like road traffic accidents, railway accidents, industrial mishap, assault, fall from height etc. Thoraco-abdominal injuries provide a major contribution to death because the bony thoracic cage contains vital organs of circulation and respiration and trauma to these organs challenges the integrity and viability of entire human body, similarly abdomen is the third commonest region of body that is injured in civilian trauma, as human abdomen is largely unprotected by bony structure which contains numerous important vital organs like liver, spleen, kidney, pancreas and hollow viscous like stomach, intestines and urinary bladder etc.

Road traffic accident is most common cause of death below the age of 50 years because males are usually the earning members of the families making them vulnerable to accidents and other mishaps as compared to females who are mostly indulged in household works.

MATERIAL AND METHOD

The study was Hospital based Descriptive Observational Study conducted during October 2011 to September 2012 in the Department of Forensic Medicine, S. M. S. Medical College, Jaipur, Rajasthan and includes 200 cases of blunt thoraco-abdominal traumatic deaths.

A detailed victimologic profile was made which contain data related to incidence which include fact finding interviews of the relatives, friends and eye witnesses to collect the data such as place of incidence, time of incidence etc., bed head treatment record during hospitalization, police inquest documents and analyze the fatal blunt thoraco-abdominal injuries.

In few cases adequate information could not be obtained and such cases were put under ‘others’ group.

OBSERVATIONS AND RESULTS

Observations and Results of the study are shown in the following tables.
Table No. 1. Distribution of Cases according to Age & Sex of Total Fatalities n=200

<table>
<thead>
<tr>
<th>Age group (Years)</th>
<th>Sex</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>0-9</td>
<td>2 (1.00%)</td>
<td>4 (2.00%)</td>
</tr>
<tr>
<td>10-19</td>
<td>17 (8.50%)</td>
<td>4 (2.00%)</td>
</tr>
<tr>
<td>20-29</td>
<td>58 (29.00%)</td>
<td>2 (1.00%)</td>
</tr>
<tr>
<td>30-39</td>
<td>32 (16.00%)</td>
<td>9 (4.50%)</td>
</tr>
<tr>
<td>40-49</td>
<td>21 (10.50%)</td>
<td>8 (4.00%)</td>
</tr>
<tr>
<td>50-59</td>
<td>19 (9.50%)</td>
<td>3 (1.50%)</td>
</tr>
<tr>
<td>60 +</td>
<td>13 (6.50%)</td>
<td>8 (4.00%)</td>
</tr>
<tr>
<td>Total</td>
<td>162 (81.00%)</td>
<td>38 (19.00%)</td>
</tr>
</tbody>
</table>

Out of 200 fatal cases, 60 victims (30%) were in the age range of 20-29 years and 41 (20.5%) in 30-39 followed by 14.5% cases in 40-49 years age range and 11% between 50-59 years of age. A total of 142 cases (71%) of fatalities were from the productive age group of 20-59 years with predominance of male population accounting for 130 (65%) of total cases. Out of the remaining cases 13.5% subjects were of less than 20 years and 10.5% above 60 years of age. The lesser preponderance of total traumatic fatalities (24%) obvious for these age groups on account of their lesser mobility. Amongst the 200 cases, 81% subjects were male and remaining only 19% were female, which is an obvious figure owing to preponderant active participation of males in socio-economic activities.

Table No. 2. Distribution of cases according to the Region

<table>
<thead>
<tr>
<th>Region</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>91</td>
<td>45.50</td>
</tr>
<tr>
<td>Urban</td>
<td>105</td>
<td>52.50</td>
</tr>
<tr>
<td>Unknown</td>
<td>4</td>
<td>2.00</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>100.00</td>
</tr>
</tbody>
</table>

The fatalities included in the study population were almost equally received from the urban and rural region.

Table No. 3. Distribution of cases according to Mode of Injury

<table>
<thead>
<tr>
<th>Mode of Injury</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road Accident</td>
<td>148</td>
<td>74.00</td>
</tr>
<tr>
<td>Fall From Height</td>
<td>23</td>
<td>11.50</td>
</tr>
<tr>
<td>Train Accident</td>
<td>19</td>
<td>9.50</td>
</tr>
<tr>
<td>Assault</td>
<td>5</td>
<td>2.50</td>
</tr>
<tr>
<td>Land Slide</td>
<td>3</td>
<td>1.50</td>
</tr>
<tr>
<td>Machine Injury</td>
<td>1</td>
<td>0.50</td>
</tr>
<tr>
<td>Unknown Mode of Injury</td>
<td>1</td>
<td>0.50</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>100</td>
</tr>
</tbody>
</table>

Maximum i.e. three quarter of fatalities (74%) were due to road accidents followed by 23 subjects (11.5%) who succumbed of an episode of fall from height further followed by 9.50% casualties owing to train accidents and only 5% casualties occurred as a result of an episode of assault or land-slide or machine injury. In a single case mode of injury remained undetermined.

Table No. 4. Distribution of Road Traffic Fatalities according to Type of Vehicle and position of the victim in the Vehicle

<table>
<thead>
<tr>
<th>Type of Vehicle &amp; Position of Victim</th>
<th>Number of victims</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>34</td>
<td>22.81</td>
</tr>
<tr>
<td>2W Driver</td>
<td>57</td>
<td>38.25</td>
</tr>
<tr>
<td>2W Pillion</td>
<td>25</td>
<td>16.77</td>
</tr>
<tr>
<td>LMV Driver</td>
<td>10</td>
<td>6.71</td>
</tr>
<tr>
<td>LMV Occupant</td>
<td>19</td>
<td>12.75</td>
</tr>
<tr>
<td>HMV Driver</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>HMV Occupant</td>
<td>3</td>
<td>2.01</td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
<td>0.67</td>
</tr>
<tr>
<td>Total</td>
<td>149</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Classifying the cases of Road Accidents according to the victim vehicle, there were 34 (22.8%) pedestrians, 82 (55%) two-wheelers and 32 (21.5%) four-wheelers and in 1 case the position of victim remained unknown. Among the two wheeler riders 57 (69.5%) were riders and 25 (30.5%) were pillion riders. Also, there were 29 light motor vehicles with 10 drivers and 19 occupants. There were only 3 cases of heavy motor vehicle with all the victims being occupants.

Table No. 5. Distribution according to Mode of Injury & Cause of death of study subjects

<table>
<thead>
<tr>
<th>Mode of Injury</th>
<th>Shock</th>
<th>Coma</th>
<th>Peritonitis</th>
<th>Traumatic Asphyxia</th>
<th>Decapitation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road accidents</td>
<td>132</td>
<td>16</td>
<td>0 (0.00)</td>
<td>1 (0.68)</td>
<td>0 (0.00)</td>
<td>149</td>
</tr>
<tr>
<td>Fall</td>
<td>19</td>
<td>41</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>23</td>
</tr>
<tr>
<td>Train accident</td>
<td>16</td>
<td>5</td>
<td>1 (5.26)</td>
<td>0 (0.00)</td>
<td>1 (5.26)</td>
<td>19</td>
</tr>
<tr>
<td>Assault</td>
<td>3</td>
<td>1</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>5</td>
</tr>
<tr>
<td>Land slide</td>
<td>3</td>
<td>0</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>3</td>
</tr>
<tr>
<td>Machine Injury</td>
<td>1</td>
<td>0</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>174</td>
<td>22</td>
<td>2 (1.00)</td>
<td>1 (0.50)</td>
<td>1 (0.50)</td>
<td>200</td>
</tr>
</tbody>
</table>
Maximum (87%) fatalities occurred as a result of hemorrhagic shock, 11% deaths resulted due to head injury. 0.5% case each were cases where death occurred as a result of traumatic asphyxia and head decapitation. In 1% cases, death occurred as a result of peritonitis.

**DISCUSSION**

In this study, males (81%) outnumbered the females (19%) in the ratio of 4:1 which is explainable by the fact that males are usually the earning members of the families, more indulgent in social activities making them more vulnerable to mishaps as compared to females who are mostly indulged in household works. These findings are similar to those of Chandra J et al (1978)2, Bergvist D et al (1983)3, Adeyemo AO et al (1984)4, Brainard BJ et al (1989)5, Albekesten SB et al (1989)6, Guirguis EM et al (1990)7, Sathiyasekaran BW (1991)8, Gosh PK (1992)9, Croce MA et al (1992)10, Boulanger BR (1993)11, Meera Th et al (2005)17. Jha et al (2004)15 and Kaul et al (2005)19 have reported a slightly lower male-female ratio of 3:1 while a higher male-female ratio of 6:1 has been reported by Husaini N et al (2009)21 and a still higher ratio of 9:1 has been reported by Singh H and Dhattarwal SK (2004)18. This variation can be attributed to the differences in the social setup at the different places where these studies were carried out. The cases were almost equally received from rural and urban regions, this being a tertiary care referral center.

In the present study, it was observed that the maximum numbers of victims were in the age group of 20-29 years (30%). Similar findings have been reported by Chandulal R (1971)1, Chandra J et al (1978)2, Bergvist D et al (1983)3, Sharma AK (1986)5, Sathiyasekaran BW (1991)8, Croce MA et al (1992)10, Boulanger BR (1993)11, Meera Th et al (2005)17, Jha et al (2004)15 and Kaul et al (2005)19 have reported a slightly lower male-female ratio of 3:1 while a higher male-female ratio of 6:1 has been reported by Husaini N et al (2009)11 and a still higher ratio of 9:1 has been reported by Singh H and Dhattarwal SK (2004)18. This variation can be attributed to the differences in the social setup at the different places where these studies were carried out. The cases were almost equally received from rural and urban regions, this being a tertiary care referral center.

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Majority of two wheelers being involved in thoraco-abdominal fatalities of road traffic accidents can be explained by firstly, the fact that two wheeler riders are the most common victims of road traffic accidents as has been reported by many authors like-Kaul A et al (2005)19 and Shetty BSK et al (2012)22. The reason for this can be attributed to higher numbers of two wheelers and their utility as also proposed by Jha N et al (2004)15 and Shetty BSK et al (2012)22. However, our study reports the two wheeler driver to be most common victims in disagreement to Jha N et al (2004)15 and Shetty BSK et al (2012)22 who report the two wheeler
occupants to have remained as most common victims of road traffic accidents. Secondly, the preponderance of two wheeler riders among fatal thoraco-abdominal traumatic cases of road accidents can also be explained by the strict traffic protocol as regards to safety measures being advocated in recent days. The increasing awareness and strictness regarding the use of helmets has decreased the toll of deaths resulting from head injury in this category, leaving the thoraco-abdominal region unprotected and vulnerable to sustain injuries resulting in such fatalities.

Keeping in view the results of study, the mortality in road traffic accident and fall from height victims can be reduced with following recommendations:

- Encroachments on roads should be dealt with strictly.
- Separate tracks should be made alongside the main roads for cyclists and pedestrians.
- Strategies that increase the use of seat belts or child restraints will result in fewer injuries.
- Stricter enforcement of speed limits will result in fewer injuries. The overall contribution of speed to accidents is not known but is widely quoted to be one third of all fatalities.
- Safer design of roads and roadside environments will result in fewer injuries as a result of trauma.
- Roadside guardrails (crash barriers) and crash cushions will reduce injury severity.
- Area wise traffic management schemes should be targeted at areas with high injury rates which will reduce pedestrian injury rates. The provision of crossing patrollers, measures to redistribute traffic and the design of roads to reduce speeds are effective in reducing pedestrian injuries.
- The roads should be properly planned and maintained with widening of narrow section of roads. Building of flyovers or underpasses at required sites and four-laning of highways should be done.
- As far as pedestrians and slow moving vehicles are concerned, complete segregation from the highway should be carried out.
- The vehicles should be well designed with newer technology and vehicles should be inspected regularly for mechanical faults and properly maintained.
- The driving licenses should be issued only after strict testing of his/her driving skills, medical fitness including strict vision checking and knowledge of traffic rules.
- The government should bring in the suitable legislations and strictly enforce them for the prevention of accident.
- Advanced Trauma Care Centre with well equipped infrastructure supported by a team of trauma surgeons especially neurosurgeons & vascular surgeon at major Government Hospitals.
- Carefully review initial investigation reports of each trauma patient.
- Awareness campaigns stressing on the need for safety practices and screening of people working at heights, to emphasize on supervision / restriction of people on the roof top of public buildings.

ACKNOWLEDGEMENTS

Thanks to Dr. Shiv Kochar, Professor, Department of Forensic Medicine, for being a source of inspiration.

Conflict of Interest

Blunt thoraco-abdominal trauma is one of the leading causes of morbidity and mortality in traumatic episodes, hence this study was undertaken to analyse the victim profile in fatal blunt thoraco-abdominal trauma at our tertiary care centre to look for preventive and remedial measures to reduce the mortality in such incidents.

Source of Funding:

Dissertation work of the author

Ethical Clearance:

Ethical Clearance was sought from the Research Review Board of the Institution prior to the commencement of the dissertation work.

REFERENCES


The Study of Cephalic Phenotype based on Cephalic Index in Medical Students from Southern Parts of India

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1Professor and Head, Department of Forensic Medicine, 2Assistant Professor, Department of Forensic Medicine, Aarupadai Veedu Medical College, Puducherry

ABSTRACT

Cephalic Index (C.I.) or cranial index is used anthropologically to find out racial difference from the cephalic phenotype (shape of the skull). This study was conducted to bring out the significance of anthropometric indices in forensic medicine for determination of identity of an individual. In the present study, 305 (142 males and 163 females) medical under graduate students studying in Aarupadai Veedu Medical College, Puducherry, who were born and brought up in Southern Parts of India (Puducherry, Tamil Nadu, Karnataka, Kerala and Andhra Pradesh) were measured for maximum head length, maximum head breadth and C.I. The mean C.I. for the study population was 79.20, mean C.I. for male was 78.72 and mean C.I. for female was 79.68. The predominant cephalic phenotype based on C.I. in the studied population was Mesocephalic (36.4%).

Keywords: Cephalic Phenotype, Cephalic Index, Maximum Head Length, Maximum Head Breadth

INTRODUCTION

Among the metric studies used to compare the size and shapes of skulls; the most frequently used is breadth/length ratio, known as Cranial index [Cephalic index in the living]. It is often been used to classify skull types because of high degree of variability within and between populations1. Cephalic index (C.I.) is among the different parameters of craniometry, which helps to determine the identity of the individual.

Based on the C.I. cephalic phenotypes are classified as Doliococephalic / Dolicoocranic [C.I. – less than 74.9], Mesocephalic / Mesocranic [C.I. – 75.0-79.9] and Brachycephalic / Brachycranic[C.I. – more than 80.0]1,2. Skulls with C.I. 85.0 to 89.9 are classified as Hyperbrachycephalic3-5. Few researchers follow the classification of cephalic phenotypes as: Ultradoliococephalic [C.I. – 55.0-59.9], Hyperdoliococephalic [C.I. – 60.0-64.9], Doliococephalic [C.I. – 65.0-74.9], Mesocephalic [C.I. – 75.0-79.9], Brachycephalic [C.I. – 80.0-84.9], Hyperbrachycephalic [C.I. – 85.0-89.9] and Ultrabrachycephalic [C.I. – 90.0-94.9]6,7.

Franz Boas’s study, Changes in bodily form of descendants of immigrants, (American Anthropologist 14:530–562, 1912) is a landmark in the history of anthropology in which he studied Cephalic index among children of immigrants to the United States. Boas challenged the value of this method noting that C.I. of the children differed significantly from C.I. of their parents implying that local environmental condition has a significant impact on the development of the head shape. Re-analysis of Boas’s immigrant data confirmed this finding8.

There are three main racial groups – Caucasian, Mongoloid and Negroid while all others are derived from these and skeletally cannot be distinguished. There are no ‘pure’ Negro skulls, ‘pure’ Mongolian, or ‘pure’ Caucasian skulls. However, there are only skulls, which to a greater or lesser degree present a combination of traits that suggests the race category2.

Also, there is sheer ambiguity about the race of the Indian population as mentioned in standard textbooks of forensic medicine. Few authors opine that Indians are Caucasians with few Negroid morphological
features. While some authors state that North Indians & North West Indians are Caucasians, East Indians & North East Indians are more of Mongoloid while South Indians belong to Negroid race. Considering these facts and the findings of Boas, it cannot be reasonably expected to formulate a uniform standard of C.I. for determination of race in Indian population owing to effects of varied climatic, dietetic, hereditary and geographical factors. Present study was done to determine the C.I. and the cephalic phenotypes in medical students of Aarupadai Veedu Medical College, Puducherry, hailing from Southern part of India.

MATERIALS AND METHOD

For the present study, 305 medical students, 142 males and 163 females studying in Aarupadai Veedu Medical College, Puducherry were selected at random as subjects. The age of these students ranges from 18 to 25 years. Only the students who were born and brought up in Tamil Nadu, Puducherry, Karnataka, Kerala and Andhra Pradesh were included. Students from other states and countries were excluded from the study. Also students with parents from other states and countries were excluded from the study. The selected students were confirmed free from congenital or acquired faciocranial deformities.

With the help of spreading calipers the maximum head length (maximum AP diameter) was measured from glabella to inion and maximum head breadth (maximum transverse diameter) was measured between two parietal eminences. All the measurements were taken with the subject sitting in chair, in relaxed condition and head in anatomical position. The C.I. was calculated and the data was subjected to statistical analysis.

RESULTS

Occurrence of different cephalic phenotypes in the present study is shown in Table 1. The predominant cephalic phenotype as per C.I. in the studied population was Mesocephalic (36.4%) followed by Brachycephalic (34.7%), Dolicocephalic (17.7%) and Hyperbrachycephalic (11.1%).

Table 1: Cephalic phenotypes based on Cephalic index (C.I.)

<table>
<thead>
<tr>
<th>Cephalic phenotype</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dolicocephalic</td>
<td>29</td>
<td>25</td>
<td>54</td>
<td>17.70%</td>
</tr>
<tr>
<td>Mesocephalic</td>
<td>56</td>
<td>55</td>
<td>111</td>
<td>36.39%</td>
</tr>
<tr>
<td>Brachycephalic</td>
<td>46</td>
<td>60</td>
<td>106</td>
<td>34.75%</td>
</tr>
<tr>
<td>Hyperbrachycephalic</td>
<td>11</td>
<td>23</td>
<td>34</td>
<td>11.15%</td>
</tr>
<tr>
<td>Total</td>
<td>142</td>
<td>163</td>
<td>305</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

As shown in Table 2 and Table 3, in males the head breadth was noted to be a minimum of 12.8 cms to maximum of 16.8 cms with mean reading of 14.5 cms. Head breadth in females was in range of 12.5 cms to 15.5 cms with mean as 13.9 cms. Head length in males varied from 16.4 cms to 19.7cms with mean value of 18.5 cms. For females head length ranged between 15.7 cms to 19.7 cms with mean value of 17.4 cms.

Table 2: Range of Head length, Head breadth and Cephalic index (C.I.)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head breadth (in cms)</td>
<td>Minimum</td>
<td>12.8</td>
<td>12.5</td>
</tr>
<tr>
<td></td>
<td>Maximum</td>
<td>16.8</td>
<td>16.6</td>
</tr>
<tr>
<td>Head length (in cms)</td>
<td>Minimum</td>
<td>16.4</td>
<td>15.7</td>
</tr>
<tr>
<td></td>
<td>Maximum</td>
<td>22.0</td>
<td>19.7</td>
</tr>
<tr>
<td>Cephalic Index</td>
<td>Minimum</td>
<td>65.02</td>
<td>69.44</td>
</tr>
<tr>
<td></td>
<td>Maximum</td>
<td>92.68</td>
<td>91.71</td>
</tr>
</tbody>
</table>
Table 3: Mean of Head breadth, Head length and Cephalic index (C.I.)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>14.5</td>
<td>13.9</td>
<td>14.2</td>
</tr>
<tr>
<td>Female</td>
<td>18.5</td>
<td>17.4</td>
<td>17.9</td>
</tr>
<tr>
<td>Total</td>
<td>78.72</td>
<td>79.68</td>
<td>79.20</td>
</tr>
</tbody>
</table>

Table 2 shows that the minimum C.I. for the study population was 65.02 and maximum C.I. was 92.68. Mean C.I. of this population was 79.20. Mean C.I. for males was 78.72 while for females it was 79.68. (Table 3)

**DISCUSSION**

In the present study, the predominant cephalic phenotype for South Indian population was noted to be Mesocephalic (36.39%) and it is same as that observed in other Indian studies by Salve VM et al\(^\text{13}\) in Andhra region, Shah & Jadhav\(^\text{14}\) in Gujarathi population and Anitha MR et al\(^\text{16}\) in North Indians. On the contrary, Brachycephalic phenotype was predominantly noted in Punjabi students by Mahajan A et al\(^\text{17}\), in East Indian population by Vijayanath V et al\(^\text{18}\) and in Manipal by Yagain VK et al\(^\text{19}\).

Mean C.I. for the South Indians in present study was 79.20 and it is consistent with findings by Yagain VK et al\(^\text{19}\) in Manipal ( mean C.I.-79.38), Anitha MR et al\(^\text{16}\) in North Indians (mean C.I.-79.72), Shah & Jadhav\(^\text{14}\) in Gujarathis (mean C.I.-80.2) and Jadhav HR et al\(^\text{15}\) for Gujarathi population (mean C.I.-80.81). Mean C.I. was higher than present study in Punjabis (mean C.I.-85.53) as reported by Mahajan A et al\(^\text{17}\) while it was observed to be lower than present study in Andhra region (mean C.I.-76.94) by Salve VM et al\(^\text{13}\).

In comparison with the different studies done on population of different countries, the mean C.I. of the present study population (C.I.-79.20) was found nearly same as that observed for Ibibios of Nigeria (mean C.I.-79.11) by Oladipo GS et al\(^\text{20}\) and C.I. for South Brazilian males (mean C.I.-80.93) and North Brazilian males (mean C.I.-79.06) by Alves HS et al\(^\text{21}\). On the contrary, the mean C.I. among Gurung community of Nepal (mean C.I.-83.7) as studied by Lobo SW et al\(^\text{22}\) and C.I. among Ogonis of Nigeria (mean C.I.-92.63) as studied by Oladipo GS et al\(^\text{20}\) was found higher than the present study (mean C.I.-79.20).

Majority of population from Gurung community Nepal and Ogonis of Nigeria had Brachycephalic phenotype, contrary to the present study. While for Ibibios of Nigeria and South and North Brazilian males, the predominant cephalic phenotype was Mesocephalic which was same as the present study.

Table 4: Comparison of Cephalic index and cephalic phenotype among various Indian studies

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Population</th>
<th>Authors</th>
<th>Sample size</th>
<th>Mean Cephalic Index</th>
<th>Cephalic Phenotype (Majority)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gujarathi</td>
<td>Shah GV, Jadhav HR (2004)</td>
<td>302</td>
<td>80.81</td>
<td>Mesocephalic</td>
</tr>
<tr>
<td>2</td>
<td>Punjabi</td>
<td>Mahajan A et al (2009)</td>
<td>400</td>
<td>85.53</td>
<td>Brachycephalic</td>
</tr>
<tr>
<td>3</td>
<td>East Indians</td>
<td>Vijayanath V et al (2010)</td>
<td>100</td>
<td>80.74</td>
<td>Brachycephalic</td>
</tr>
<tr>
<td>4</td>
<td>North Indians</td>
<td>Anitha MR et al (2011)</td>
<td>100</td>
<td>79.72</td>
<td>Mesocephalic</td>
</tr>
<tr>
<td>5</td>
<td>Gujarathi</td>
<td>Jadhav HR et al (2011)</td>
<td>180</td>
<td>80.2</td>
<td>—</td>
</tr>
<tr>
<td>6</td>
<td>Andhra Region</td>
<td>Salve VM et al (2011)</td>
<td>320</td>
<td>76.94</td>
<td>Mesocephalic</td>
</tr>
<tr>
<td>7</td>
<td>Manipal</td>
<td>Yagain VK et al (2012)</td>
<td>100</td>
<td>79.38</td>
<td>Brachycephalic</td>
</tr>
<tr>
<td>8</td>
<td>South Indians</td>
<td>Present Study</td>
<td>305</td>
<td>79.2</td>
<td>Mesocephalic</td>
</tr>
</tbody>
</table>

Table 5: Comparison of Cephalic index and cephalic phenotype among various Foreign studies with present study

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Population</th>
<th>Authors</th>
<th>Sample size</th>
<th>Mean Cephalic Index</th>
<th>Cephalic Phenotype (Majority)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ibibios of Nigeria</td>
<td>Oladipo GS et al (2010)</td>
<td>800</td>
<td>79.11</td>
<td>Mesocephalic</td>
</tr>
<tr>
<td>2</td>
<td>Gurung of Nepal</td>
<td>Lobo SW et al (2005)</td>
<td>267</td>
<td>83.7</td>
<td>Brachycephalic</td>
</tr>
<tr>
<td>3</td>
<td>Ogonis of Nigeria</td>
<td>Oladipo GS et al (2009)</td>
<td>800</td>
<td>92.63</td>
<td>Brachycephalic</td>
</tr>
<tr>
<td>4</td>
<td>South Brazil</td>
<td>Alves HA et al (2011)</td>
<td>56</td>
<td>80.93</td>
<td>Mesocephalic</td>
</tr>
<tr>
<td>5</td>
<td>North Brazil</td>
<td></td>
<td>54</td>
<td>79.06</td>
<td>Mesocephalic</td>
</tr>
<tr>
<td>6</td>
<td>South Indians</td>
<td>Present Study</td>
<td>305</td>
<td>79.2</td>
<td>Mesocephalic</td>
</tr>
</tbody>
</table>
CONCLUSION

Mean C.I. of medical students from Southern parts of India is 79.20. Mean C.I for males is 78.72 and for females is 79.68. The predominant cephalic phenotype of this population is Mesocephalic. Data presented in this study can be used for determination of identity of an individual. If similar studies are carried out in different parts of India, it may throw light on the cephalic phenotype distribution in Indian population.

ACKNOWLEDGEMENT

The authors are very thankful to the undergraduate students of Aarupadai Veedu Medical College, Puducherry, who participated in this study.

Ethical Clearance: The clearance was obtained from the College Ethical Committee.

Source of Funding: This study was self funded.

Conflict of interest: None.

REFERENCES

INTRODUCTION

A reliable personal identification is critical in many situations like civil, criminal, commercial and latest in financial transaction frauds, where the question of identification becomes a matter of paramount importance. The various identification data used are finger-prints, handwriting, bite marks, DNA fingerprinting etc.1

"Man can change, his behaviour can alter, thought can diversify but the dermatoglyphics pattern will remain the same forever". Fingerprints are constant and individualistic and form the most reliable criteria for identification. Fingerprint patterns are genotypically determined and remain unchanged from birth till death.2 The term dermatoglyphics has its origin from Greek work ‘derma’ means skin and ‘glyphics’ means curved. Dermatoglyphics is defined as the scientific study of epidermal ridges and their configuration on the volar aspect of the palmar and plantar regions.3

Blood group system was discovered way back in 1901 by Karl Landsteiner. So, for 19 major groups have been identified which vary in their frequency of distribution amongst various races of mankind. Clinically, only ‘ABO’ and ‘Rhesus’ groups are of major importance. ‘ABO’ system is further classified as A, B, AB, O blood group types according to presence of corresponding antigen. ‘Rhesus’ system is classified into ‘Rh positive and ‘Rh negative according to the presence or absence of ‘D’ antigen.4

There has been extensive research work on palmar dermatoglyphics and blood group system independently; but studies where the two entities are correlated are very few. Hence an effort has been made to correlate fingerprint with sender and blood group of an individual.

MATERIALS AND METHOD

The present prospective study was conducted in the Hymamshu Jyothi kalapeetha students, Bangalore. 100 male and 100 female students with known blood groups (ABO and Rh) were randomly selected for the study. Subjects with deformities of hand, scars on the fingers, extra fingers etc were excluded from the study.

Palmar Dermatoglyphics in ABO Blood Groups

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ABSTRACT

Fingerprint is one of the oldest, reliable and mature biometric technologies and is considered one of the best, cheapest and legitimate proofs of identification. A correlation between physical characteristics like fingerprints and blood group was demonstrated in previous studies.

Objective: To correlate between palmar dermatoglyphics patterns in ABO, Rh blood groups and evaluate their significance.

Methodology: A total of 200 Hymamshu Jyothi kalapeetha students with known blood groups were selected. Fingerprints were obtained by printing method. The distribution of dermatoglyphic fingertip patterns in both hands of individuals and its relationship with gender and different ABO and Rh blood groups was evaluated and analysed statistically.

Results: Blood group O positive is the dominant blood group and AB negative is the rarest. The commonest pattern of fingerprint was loops. Percentage of whorls, loops is highest in AB and O group respectively. The distribution pattern of the fingerprint was of the same order in individuals with A, B, AB and O blood groups i.e high frequency of loops, moderate of whorls and low of arches.

Keywords: Fingerprint, ‘ABO’ system, Loops, Arches, Whorls
The subjects were asked to wash their hands thoroughly with soap and water and dry it with towel. They were asked to dip their finger in the stamp pad, from each finger 2 prints were taken on a white paper in the respective blocks. The first print was taken by rolling the fingers from radial to ulnar side to include all the patterns. The other one was taken by pressing the finger in the respective block. In the second print care was taken to avoid sliding of fingers to prevent smudging of the print. Then this paper was coded with name, age, sex and ABO and Rh blood grouping. The fingerprint patterns were studied with the help of a magnifying lens and were classified into loops, whorls and arches based on the ridge pattern. The distribution of dermatoglyphic fingertip patterns in both hands of individuals and its relationship with gender and different ABO and Rh blood groups was evaluated and analysed statistically.

RESULTS AND DISCUSSION

Table 1. Distribution of subjects according to sex and ABO blood groups.

<table>
<thead>
<tr>
<th>Sex</th>
<th>A</th>
<th>B</th>
<th>AB</th>
<th>O</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>28</td>
<td>34</td>
<td>5</td>
<td>33</td>
<td>100</td>
</tr>
<tr>
<td>Female</td>
<td>18</td>
<td>30</td>
<td>6</td>
<td>46</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
<td>64</td>
<td>11</td>
<td>79</td>
<td>200</td>
</tr>
</tbody>
</table>

In the present study 200 students were taken, out of which 100 were males and 100 were females. Most of the subjects in the study belonged to O (79) blood group followed by B (64), A (46) and AB (11). B blood group was the most common among males, while O blood group predominated in females. (Table 1)

This is in agreement with the study done by Prateek Rastogi et al but it does not correlate with the study done by A. Bharadwaja et al and Amit A. Mehta et al.

Table 2. Distribution of cases according to Rh factor.

<table>
<thead>
<tr>
<th>Blood groups</th>
<th>Rh positive</th>
<th>Rh negative</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>43 (93.48%)</td>
<td>3 (6.52%)</td>
<td>46 (23%)</td>
</tr>
<tr>
<td>B</td>
<td>61 (95.31%)</td>
<td>3 (4.69%)</td>
<td>64 (32%)</td>
</tr>
<tr>
<td>AB</td>
<td>11 (100%)</td>
<td>0</td>
<td>11 (5.5%)</td>
</tr>
<tr>
<td>O</td>
<td>77 (97.47%)</td>
<td>2 (2.53%)</td>
<td>79 (39.5%)</td>
</tr>
<tr>
<td>Total</td>
<td>192 (96%)</td>
<td>8 (4%)</td>
<td>200 (100%)</td>
</tr>
</tbody>
</table>

Finger print analysis showed that the loops were the most common (56.45%) followed by whorls (38.1%). Arches constituted only a small (5.4%) percentage.

The present study also reveals that frequency of loops is greater in females as compared to a higher frequency of whorls in males. Arches were found to be more frequent in females. (Table 3)

Table 4. Distribution of pattern of fingerprint among subjects of A, B, O and Rh blood groups.

<table>
<thead>
<tr>
<th>Blood groups</th>
<th>Whorls</th>
<th>Arches</th>
<th>Loops</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>172 (37.39%)</td>
<td>23 (5%)</td>
<td>265 (57.61%)</td>
<td>460</td>
</tr>
<tr>
<td>B</td>
<td>249 (38.9%)</td>
<td>49 (7.66%)</td>
<td>342 (53.44%)</td>
<td>640</td>
</tr>
<tr>
<td>AB</td>
<td>51 (46.36%)</td>
<td>5 (4.54%)</td>
<td>54 (49.1%)</td>
<td>110</td>
</tr>
<tr>
<td>O</td>
<td>290 (36.71%)</td>
<td>32 (4.05%)</td>
<td>468 (59.24%)</td>
<td>790</td>
</tr>
<tr>
<td>Total</td>
<td>762</td>
<td>109</td>
<td>1129</td>
<td>2000</td>
</tr>
</tbody>
</table>
In our study, percentage of whorls were highest in AB blood group (46.36%) and lowest in O blood group (29.02%). Similarly, Bharadwaja et al observed higher percentage of whorls in AB blood group and lower percentage in A blood group.

Which was contrary to the findings of Mahajan et al and Kshirsagar et al who observed higher percentage of whorls in O blood group and lower percentage in AB blood group.

Amit Mehta et al observed that the frequency of whorls were maximum in B group and least in O group.

Percentage of arches was highest in B group (7.66%) and least in O (4.05%) group in the present study. Bharadwaja et al observed percentage of whorls were highest in B blood group (43.25%) and lowest in O blood group (29.02%).

The contrary results were observed by Mahajan et al, Kshirsagar et al and Amit Mehta et al, who observed Percentage of arches in AB blood group was highest as compared to lowest in B blood group.

In our study, percentage of loops were highest in O blood group (59.24%) and lowest in AB blood group (49.1%) which correlates with the finding of Bharadwaja et al.

However, Mahajan et al and Kshirsagar et al observed higher percentage of loops in B and AB blood groups respectively; while lower percentage in O blood group.

The distribution pattern of the fingerprint was of the same order in individuals with A, B, AB and O blood groups i.e high frequency of loops, moderate of whorls and low of arches. Similar findings were seen in Rh-positive and Rh-negative individuals except in blood group O negative where whorls predominated. This reveals that there is an association between distribution of fingerprint, and blood group. (Table 4)

CONCLUSION

Blood group O positive is the most common and AB negative is the rarest.

Blood group B was found to be the most common among males and blood group O was the most commonly seen blood group in females.

Loops are the most common pattern of finger-print pattern and Arches are the least common.

The distribution pattern of the fingerprint was of the same order in individuals with A, B, AB and O blood groups i.e high frequency of loops, moderate of whorls and low of arches.

Higher percentage of whorls are seen in AB blood group.

Loops are common in O blood group.

Arches are seen maximum in B group.

Males have a higher incidence of whorls and females have a higher incidence of loops.

Recommendations

Improvements for this study would include increasing the size of sample to get more accurate representation of the population and need for more similar studies in other regions so that comparative study can be done.

Conflict of Interest: None

Funding: Self Financing

Ethical Clearance: Obtained

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REFERENCES


5  J Indian Acad Forensic Med, 32(1), A study of fingerprints in relation to gender and blood group *Dr. Prateek Rastogi, **Ms. Keerthi R Pillai, 11-14.


A Scrupulous Autopsy Can Unravel the Mystery of time Since Death

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ABSTRACT

Estimation of time since death especially in a putrefied body is one of the common problems faced by the forensic experts. Unfortunately, it is also one of the most difficult issues to resolve throughout the world. Lack of proper and systemic examination of each and every part of the body can lead to the wrong estimation of time since death.

Generally, it is believed that decomposition to skeleton remains may occur in less than six weeks in moderate summer and in less than two months in winter conditions in a tropical country like India. But on certain occasions, moderate to severe scavenging activity by insects or animals may hasten the process of skeletonization to even less than 24 to 48 hours period. Here, we are going to discuss a postmortem case of a mutilated skeletonized body in multiple pieces which was being referred to us from a nearby city and later on which was proved to be a tricky one mainly for ascertaining the time since death. Hopefully, this case will enlighten you that how a detailed/ scrupulous autopsy could solve the uncertainty principle of estimating post mortem interval.

Keywords: Skeletonization, Gnawing, Time Since Death, Scavenging, Post Mortem Interval

INTRODUCTION

In most jurisdictions the time of death is legally defined as the time that the person is declared or recognized to be dead. Thus, a decomposed body or skeletonized remains, clearly deceased for significant periods of time, may have an official time of death that is days, weeks, months, or even years after the actual death of the individual¹.

Establishing the time of death or the interval between the times of death and when a body is found (post-mortem interval) typically cannot be determined with certainty. Unless death is witnessed, the exact time of death cannot be determined; however, sufficient information is often available to allow estimation of a range of time encompassing the actual moment of death. In general, the shorter the post-mortem interval, the narrower the estimated time ranges. Conversely, a longer post-mortem interval entails a broader range estimate and often a greater chance for error. No single observation about a dead body is a reliable or accurate indicator of the post-mortem interval².

No problem in forensic medicine has been investigated as thoroughly as that of determining the time of death on the basis of post mortem findings. Apart from its obvious legal importance, its solution has been so elusive as to provide a constant intellectual challenge to workers in many sciences. In spite of the great effort and ingenuity expended, the results have been meagre³.

CASE REPORT

On a morning of September, a dead body was referred to the Department of Forensic Medicine, PGIMS, Rohtak from a nearby District Hospital due to that hospital doctors inability to ascertain the identity of deceased, cause of death and the post mortem interval as the dead body was in the form of jumbled up skeletal remains. The dead body which
was found by the investigating agencies in the bushes of a secluded area, where his plastic foot wear and greyish color lower were also recovered along with it. According to the police official, the body parts were lying scattered at several places in multiple pieces. The body parts were thus collected and taken to the district Hospital from where it was referred to our department.

**OBSERVATIONS**

*(Post-mortem Findings)*: The skeletonized dead body was jumbled up in appearance with multiple pieces (later on found to be nine in number) and was wrapped in a white sheet of cloth (Fig1).

All the teeth in both jaws showed mild grinding over their occlusal surface and no loosening of teeth was present.

Right humerus and right ulna articulated at the right elbow joint were also received loosely.

Pelvic bone along with sacrum and the bones of lower extremities except the right fibula were also received loosely as a single piece. Both the femurs, both tibias and left fibula were articulated at their respective joints. The feet were not skeletonized and showed post-mortem bullae at places. Skin and subcutaneous tissues were missing over the lateral aspect of the right foot with evidence of gnawing effect visible. Gnawing effects were also appreciable all over the available bones at places with remnants of putrefied soft tissues still attached to them at places. The available bones were also smudged with mud, blood like material and were of typical male in character.

Skin portion of the anterior abdominal and chest wall was present with the part having umbilicus in it. The skin showed gnawing effect at places.

Two pieces of the bones appearing to be non-human were also received loosely with the body.

On examination of the skeletonized part of the body i.e. whole skeleton except the foot, time since death appeared to be 4-6 weeks but on examination of the soft tissues on the foot and the skin portion from chest and abdominal wall it was found that the skin was healthy and only post-mortem bullae were present. Epidermis was not peeled off (Fig 2).

After scrupulous examination it was opined that all the available bones except two (animal bones) were of a single male individual of age 16-17 years. The time since death was determined as 24-72 hours which later
on also correlated with the finding of the investigating authorities.

Thus in this case if the portion of the body which was having soft tissues would not have been received the time since death might have been given in weeks. A detailed autopsy helps in determination of exact time since death.

**DISCUSSION**

The time required for skeletonization is a matter of debate on many occasions. It is again clearly evident from the above mentioned case that it is very difficult to estimate the time required for skeletonization even by the condition of the bones and available tissues because of the role of scavengers.

Time of death is a question which is almost invariably asked by police officers, sometimes with a touching faith in the accuracy of the estimate. Determining the time of death is extremely difficult, and accuracy is impossible The exact time of death cannot be fixed by any method, but only an approximate range of time of time can be given, because there are considerable biological variations in individual cases.

The time necessary for skeletonization of a body is also variable. In areas where the body is exposed to the elements and scavengers, it can proceed quite rapidly, occurring in 9–10 days. In rare instances, it may be even faster than this The type of predation varies greatly with geography, season, and whether the dead body is indoors or out in the open. If it is lying in the countryside, large predators will cause prompt and severe damage, even complete destruction being possible in a short time Offensive odour, wet and humid state of bones, will indicate that the death was recent. Bodies lying exposed in open atmosphere will get skeletonised in 7-14 days; this can occur even in few days, when the body has been attacked by birds and animals. The body may get mutilated by dogs, jackals, vultures, rats, vermins etc. specially when left exposed in open places, to the extent of non-recognition of body features or skeletonization.

**CONCLUSION**

Estimation of time since death mainly depends on the experience of the expert, his careful examination of the body and also on the comparison that he will make with the previously documented cases that might had shown similar characteristics. Through this case we want to emphasize that panicking and haphazard examination of the dead body by forensic expert will lead to nothing but a sincere and systemic approach if applied along with common sense may not only help in the estimation of time since death but also cause of death and in some cases to bring justice to the demised. It also clearly illustrates that when a skeletonized body is brought for post-mortem examination, then each and every part of body should be taken into consideration while pronouncing the opinion regarding the cause and time since death.

**Acknowledgement**: Nil

**Source of Funding**: Self

**Conflict of Interest**: Nil.

**REFERENCES**

INTRODUCTION

Telemedicine has been defined by Wootton as health care at a distance. In essence; it is the use of communications technology to support health care delivery. The growth of technological innovations such as high-capacity digital networks, powerful computer hardware and software, high-resolution digital image compression and the Internet has had a great impact on the process of health care delivery.

Closely associated with telemedicine is the term “telehealth,” which is often used to encompass a broader definition of remote healthcare that does not always involve clinical services. Videoconferencing, transmission of still images, e-health including patient portals, remote monitoring of vital signs, continuing medical education and nursing call centres are all considered part of telemedicine and telehealth. Since the first documented use of telemedicine at the University of Nebraska College of Medicine in 1959, telemedicine has been growing progressively.

A survey by the US Healthcare Information Management Systems Society (HIMSS) found that 34% of the responding health care executives reported that their organizations currently use telemedicine, 10% plan to use telemedicine within the next year, and 28% are investigating its use in the future.

Major areas of telemedicine that have been adopted worldwide are Tele-consultation, Tele-diagnosis, Tele-treatment; patient with the local doctor consults the specialist. For Continuing Medical Education, training for doctors & paramedics Tele-education and Tele-training have been initiated. Regular monitoring for intensive care & emergency care via Tele-monitoring while Support during disaster management is carried out via Tele-support.

Professional concerns about telemedicine

Many potential benefits of telemedicine can be envisaged especially an improved access to information for health professionals, for patients and for the population in general. If we consider the socioeconomic perspective, telemedicine has contributed to providing health care to previously
under-served regions with provision of care which was not previously deliverable.7-9

a. Medical

Telemedicine may improve access in primary care and in secondary care. In primary care, telemedicine facilitate communication with the General Practitioner; it also improves access for patients at home such as monitoring and treatment of wide range of diseases especially of the elderly and chronically ill. Devices connected to specialized computer modems can reliably measure and transmit physiological parameters such as blood pressure, heart rate, blood glucose level, and pulse oximetry data using ordinary phone lines.10 Thereby, reducing the healthcare cost along with improved quality and continuity of care.8

In secondary care, it improves access both between and within hospitals; services by videolink have been established for emergency situations at sea, on aircraft and as part of rescue operations in major civil disasters.7,11 Inter and intra-hospital access to information via audiovisual presentations can enable surgeons and pathologists to discuss the best site from which to take a tissue biopsy and jointly review any frozen section taken; consultants could supervise junior medical staff, providing them with a second opinion on wards, in outpatient clinics and the Emergency department; pathologists and radiologists could provide an immediate service ‘at the point of care’.13,14 Other fields such as dermatology and psychiatry also make use of the technology for diagnosis and treatment. However, for all these services, the quality of images requires standardisation in order to avoid any wrong interpretation and misdiagnosis. Also, the delay in transmission of data which is of critical importance should be reduced to minimum.9

b. Legal

There are certain drawbacks associated with telemedicine in terms of legal and ethical issues particularly with regards to liability, responsibility and accountability to the patients.15 Regardless of the fact that an individual is receiving health care through some electronic medium, Telemedicine has the potential, to destroy the Physician-patient privilege which is one of the oldest and most important safeguards that law offers. There is always an inherent risk of a third party intercepting communication in terms of accessing an electronic medical record.16 Thus, the issue arises whether electronic communications are confidential and, therefore, entitled to protection under the physician-patient privilege.

Case laws in countries like U.K and U.S.A have established that a doctor who practices telemedicine is bound by the same duty of care as a doctor in a face-to-face consultation and therefore will have to meet the same legal standards and behave reasonably thereafter.7-10

Furthermore, as telemedicine often requires physicians to cross state lines and possibly international borders via electronic communication, the issues related to the licensure and regulation of physicians practicing telemedicine deserve an analysis.

Interstate telemedicine particularly raises questions, such as whether physicians can be practicing telemedicine in a remote state in which they do not have a practicing license. Different states in the U.K and U.S prohibit practice of telemedicine without a telemedicine certificate issued by the state Board of Medical Examiners while some allow out-of-state physicians to obtain extraterritorial licenses to account for circumstances in which one physician regularly consults with a physician from another state. However, if a tele-physician renders direct patient diagnosis and treatment, then multiple licensure may be required, regardless of the states involved.20,21 Failure to adhere to the requirements stipulated may be grounds for revocation or suspension of one’s license.20 Therefore, when physicians use telemedicine across state lines, they must be aware of the medical licensure laws in each of those states so as to safeguard themselves from unintentional illegal practise.15

Also, the organizational and bureaucratic issues are manifold along with facility of reimbursement for telemedicine services because of the absent or inconsistent policies.7

c. Ethical

The critical question is whether the practice of telemedicine increases or diminishes the level of patient care from an ethical point of view. To determine this, evaluation can be done by the basic ethical principles of respect for persons, beneficence, nonmaleficence and justice.16 However, despite the numerous advantages, critics of telemedicine argue that technology can have the potential to dehumanize patients and reduce them to mere objects.22
Telemedicine in Indian scenario

In 1999 Department of Information Technology at the Ministry of Communications and Information Technology (Government of India) launched a pilot project entitled ‘Development of Telemedicine Technology’ with the objective of reinforcing the national healthcare delivery system.23

Another Pilot Project in the year 2001, linking Apollo Hospital at Chennai with the Apollo Rural Hospital at Aragonda village in the Chittor district of Andhra Pradesh was successfully completed. The valuable experience gained during these subsequent projects encouraged ISRO (Indian Space Research Organization) to further endeavour for enabling specialty healthcare delivery to the rural population.6,9

The first international Conference on Telemedicine organized by ISRO on behalf of the Government of India was held in Bangalore in March 2005, and proved that Indian telemedicine had come of age.6

Presently, about 500 telemedicine centres linked with about 50 specialist hospitals across the country are actively providing medical care.24 The government’s 11th Five-Year-Plan (2007–2012) allocated 2000 million rupees (about US$50 million) for the development of telemedicine in the country.25

‘Telemedicine society of India’ (TSI) is an independent body that has been formed since 2001; the International Society for Telemedicine and e-Health, has now recognized TSI as the official national society representing Telemedicine activities in India.26 Initiatives have been made from various Ministries of Government such as Department of Information Technology (IT) & ISRO, Ministry of Health and Family Welfare (MoH & FW), Defense Services, Indian office of World Health Organization (WHO). Various corporate as well as Academic Organizations playing active role in telemedicine include Apollo, AIIMS(New Delhi), SGPGI(Lucknow), Tata Memorial Hospital(Mumbai), Sir Ganga Ram Hospital(New Delhi), Pandit Bhagwat Dayal Sharma Post Graduate Institute of Medical Sciences(PBDSPGIMS, Rohtak, Haryana).9

As the practice of telemedicine spreads, maintaining standards, security and privacy will still remain a challenge especially with regard to legal and regulatory measures. The legal status of telemedicine based diagnosis and treatment needs to be further established in India and constantly updated in terms of rapidly changing scenario of this growing field.27

CONCLUSION

Since, the various fields of telemedicine are actively practised worldwide and have enormous potential in the future; it also becomes apparent that it will open up more questions that are only now beginning to be considered. Hence, it becomes necessary that the interests of healthcare professionals as well as patients are safeguarded against the legal pitfalls so that this technology can be used to the benefit of all. However, this could only be accomplished by ensuring the effective implementation of the guidelines relating to the relevant issues.

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Conflict of Interest: Nil
Source of Funding: Nil
Ethical Clearance: Not required

REFERENCES


INTRODUCTION

Subcutaneous emphysema (SE) is a nonlethal condition seen following chest and neck trauma and after thoracic surgical procedures. Once air enters the subcutaneous space of the chest wall, it dissests into the soft tissues of the face, neck, upper chest, and shoulders resulting in cosmetic deformities but rarely results in any physiologic problems such as tension pneumomediastinum, pneumothorax, or pneumopericardium. It is usually self-limiting, requiring no specific treatment. Massive SE, however, should be treated at the earliest both to reduce discomfort and to prevent respiratory embarrassment. Usually a patent functioning chest tube in the pleural space on high suction alleviates the problem. However, sometimes this also fails to eradicate the problem. Some then find it necessary to create a small incision at the base of the neck and chest which serves as a “pop-off valve” through which air can be pressed out.1

We describe a case in which such small subcutaneous surgical incisions were made which was very difficult to interpret at post-mortem examination as it was mimicking homicidal injury at first instance.

CASE SUMMARY

A 20-year-old man with history of road traffic accident developed SE of neck and thorax three days after the incident. Initially patient had history of loss of consciousness, seizures, nasal and oral bleeding. Later he developed swelling in the neck and infraclavicular region gradually leading to severe respiratory distress. Immediate endotracheal intubation was done and he was put on ventilator support. Intercostal drainage tube was introduced on both side of chest cavity and connected to water seal bag. Chest x-ray showed left side pneumothorax. Bronchoscopy showed laryngeal and tracheal damage with epiglottic swelling and narrowing of laryngeal introitus. Tracheostomy was performed as the patient was in severe respiratory distress. After cleansing the anterior chest and infiltrating the infraclavicular skin with local anaesthetic, multiple bilateral 2.5cm subcutaneous surgical incisions were made on both side of chest cavity to alleviate massive subcutaneous emphysema. In spite of all these procedures, patient went on to cardiorespiratory arrest and expired on 5th day following the accident. Body was sent for post-mortem and treatment records were deposited in medical record section of the hospital.

External examination

The body was that of a well-nourished, male wrapped in white coloured hospital cloths. Rigor mortis was fully established. Post-mortem staining was present over the dependent areas. There were no

Blow Holes - A Surgical Artefact

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ABSTRACT

Post-mortem artefacts are commonly encountered in forensic practice. They are sometimes very confusing for forensic experts to interpret and wrong interpretation may mislead the course of justice. A case is presented where a patient developed severe subcutaneous emphysema after a road traffic accident and was treated with multiple subcutaneous bilateral “blowhole” incision on the chest and upper part of abdomen. Confusion arose on autopsy about injuries whether they were therapeutic or homicidal in origin.

Keywords: Subcutaneous Emphysema, SE, Blow Holes, Surgical Incised Wounds

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features of decomposition. Tracheostomy wound was present over the front of neck in midline, below the thyroid cartilage. Intercostal drainage wounds were present over both side of chest cavity along the 4th intercostal space in mid-axillary line. Multiple spindle shaped incised wounds (7 in number) of size 2.5cm in length, subcutaneous deep present over both the side of thoracic cavity and upper part of abdomen.(Fig.1& 2). Margins were regular, clean cut and well defined. 3 grazed reddish brown abrasions, measuring 6cm x 4cm, 5cm x 3cm and 3cm x 2.5cm were present over the left infra-clavicular region, anterior and posterior axillary line below the left axilla respectively.

**Internal examination**

**Chest and neck**

On removing the chest cavity, no injuries corresponding to the incised wounds were present underneath (Fig 3 & 4). Fracture of left clavicle at middle third and fracture of left 4rd to 6th rib along the posterior axillary line were present. Extravasation of blood present around the fractured site. Pleural cavity contained about 400ml of blood mixed fluid on both sides. Both the lungs were congested and oedematous. Trachea and larynx were congested, and oedematous with fractured tracheal rings.

No abnormality was detected in rest of the body systems.
DISCUSSION

SE, though it may not be fatal, it adds significant morbidity and associated with extreme discomfort, disfigurement, and respiratory failure. In most cases it is due to air leak from the lung parenchyma and is self-limiting, requiring no specific treatment. Massive SE, however, should be treated at the earliest to prevent the complications.2

There are many methods of treating subcutaneous emphysema. Simple subcutaneous emphysema that does not compromise respiration can be treated with conservative management (bed rest, oxygen, analgesia, antibiotic prophylaxis, reassurance and close monitoring). More severe subcutaneous emphysema is an emergency and methods of management include infra-clavicular surgical incisions or “blow holes”, placement of 14G fenestrated subcutaneous catheters, insertion of subcutaneous drains, tracheostomy or subcutaneous chest tubes. Bilateral infra-clavicular surgical incisions are a simple, quick, effective and reliable method. However the procedure’s utility is limited by scab formation, infection, residual scars, and is time-consuming.3

Surgical incised wounds or blow holes is one of the uncommon finding encountered at autopsy for forensic specialists as these are very rarely used procedure in treatment of subcutaneous emphysema. Whether these are homicidal or therapeutic in nature is very difficult to differentiate at first instance and without prior history. These blow holes are usually done bilaterally in infra-clavicular region. In this case, these were present bilaterally but extending up to upper part of abdomen and these blow holes were not showing any classical features of stab or homicidal incised wounds which were misleading us in forming the diagnosis.

Medical records played a vital role as there was no proper history and previous medical records available with us. After the autopsy, we tried to access previous treatment records which were available with relatives and in medical record section of our hospital. After going through these records we corroborated our post-mortem findings with the available treatment records which helped us in ruling out possibility of homicide.

Taking proper history from police, relatives and referring previous medical records in unusual cases carries lot of importance while framing the diagnosis. So it is imperative that all unusual findings must be meticulously examined, photographed and if needed, history and prior treatment records may be looked upon prior to autopsy.

CONCLUSION

False interpretation of post-mortem findings could be disastrous from medico-legal point of view as it can change the whole course of investigation and ultimately lead to miscarriage of justice. Before deriving any conclusion at post-mortem, proper history, and treatment records should be looked upon to eliminate most of doubts and also helps in corroborating the findings at autopsy. Doctors concerned with medico-legal work, especially autopsies, should be well versed with these artefacts while concluding their opinions and to aid in the administration of justice.

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Ethical approval: No ethical approval is needed.

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REFERENCES

A Rare Case of Survival after Homicidal Laryngo Pharyngeal Transaction Cut Throat Injury

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ABSTRACT

The neck contains a lot of vital organs and great vessels which make the patients with injuries to the neck to present most times as emergency. The management of cut throat injuries is bedeviled with complications which can be reduced to the barest minimum if managed well by the specialists. We report the survival of an extremely rare case of complete laryngo pharyngeal transaction following incision trauma with knife. The clinical record underlines the importance of prompt airway management immediate neck exploration and medico legal implications in such cases.

Keywords: Cut Throat Injury, Homicide, Grievous Injury, Patient Care

INTRODUCTION

A Male 26 yr old patient auto driver by occupation was brought to the causality with alleged history of cut throat injury. He was said to have attacked by 2 men at around 8.30 pm at his residence. Revenge was the primary motive by police inquest. The case was booked as Medico-legal case (MLC) under section 143, 147, 148, 307, 342, 323 and 326 Indian penal codes.

ON EXTERNAL EXAMINATION

The victim was conscious. The cut lacerated wound which measured 14cm x 5 cm neck structures deep across upper part of front and sides of neck.

The wound was situated 5cm below the left mastoid process, 6 cm below the chin at the level of thyroid cartilage and 5 cm below the right mastoid process. The injury was clean cut through subcutaneous tissue, anterior neck muscles, nerves, larynx and pharyngeal mucosa. Margins of the injury were clean cut and the wound was filled with blood and blood clots.

On auscultation, decreased air entry in right lung. When patient made attempts to swallow saliva whole larynx and pharynx moved and could see the saliva dribbling into pharynx through the wound.

Fig 1: Anatomy of Neck
MANAGEMENT

The patient was shifted to emergency operation theatre with the intention of securing airway through tracheostomy as early as possible.

Thorough examination of the injury on the operation table revealed that the wound was clean cut lacerated wound measuring 10-12 cms at the level of thyroid cartilage extending from sternocleidomastoid muscle on either side. The strap muscles at the level of thyroid cartilage cut, thyroid cartilage was cut through and through just above the true vocal cords and bilateral arytenoids cut exposing hypopharyngeal mucosa, whole of laryngopharynx moved with deglutination.

OPERATIVE NOTES

The patient was prepared for tracheostomy and primary wound closure. Tetanus prophylaxis was given to him from the referring hospital. Tracheostomy was performed under local anaesthesia below the cut lacerated wound at the level of thyroid gland isthmus; patient was awake during this procedure. Portex tracheostomy tube was used for the procedure. This helps to secure airway even if post-operative laryngeal oedema occurs.

Then the patient was induced general anaesthesia through the tracheotomy tube while the pharyngeal mucosa was reconstructed. Thyroid cartilage and strap muscles were sutured in layers with 3-0 vicryl absorbable suture. Ryle’s tube passed, Bleeding vessels were identified and ligated, haemostasis achieved. Skin was sutured with ethilon 3-0; one point of compatible blood was transfused during the procedure. Patient was fine at the end of the procedure.

Post Operative Notes

On the 1st post operative day, surgical emphysema developed in upper part of neck and was managed conservatively. Baseline blood investigations were done and Ryle’s tube feeding was started. Following drugs administered:

- Inj dexamethasone 8mg 3times daily for first 5 days
- Inj ceftriaxone 1gm twice daily started for two week
- Inj diclofenac intramuscular 2 times daily given for first 3 days
Sutures were removed on the 11th post-operative day and Portex tube was changed to fuller’s metallic tracheotomy tube under general anaesthesia.

On the 13th post operative day oral feeds started. Consequently the oral feed started appearing in the sutured wound resulted in pharyngo cutaneous fistula. Higher antibiotics were started intravenously. Gradually the fistula healed in few days.

A psychiatry reference was taken. His voice was low pitched shallow whispering voice at the time of discharge and Speech therapy was advised for it. He was discharged after re-establishment of phonation, swallowing and nasal breathing. Otolaryngologic and psychiatric follow up has been uneventful for 30 months.

INJURIES RELATED SECTIONS

Section 44 of IPC: Definition of Injury

Any harm whatever illegally caused to any person in body, mind, reputation or property.

Section 319 IP C: Hurt

Hurt means bodily pain, disease or infirmity caused to any person.

Section 320 IP C: Grievous Injury

321 IP C: Defines “Voluntarily Causing Hurt”
322 IP C: Defines “Voluntarily Causing Grievous Hurt
323 IP C: Describes Punishment for voluntarily Causing Hurt.
324 IP C: Describes Punishment for Voluntarily Causing Hurt by dangerous weapon
325 IPC: Describes Punishment for Voluntarily Causing Grievous Hurt.
326 IP C: Describe s Punishment for Voluntarily Causing Grievous Hurt by dangerous weapon or means.

351 IP C: Defines Assault

Assault: Threat/attempt to apply force. Whoever makes any gesture, or preparation intending or knowing it to be likely that such gesture, or preparation will cause any person present to apprehend that he who makes the gesture or preparation is about to use criminal force to that person, is said to commit an assault.

The present case was booked under 143, 147, 148, 307, 342, 323 and 326 Indian penal codes.

143 IPC Describe punishment

“Whoever is a member of an unlawful assembly, shall be punished with imprisonment of either description for a term which may extend to six month, or with fine, or with both”

147 IPC - Punishment for rioting

Whoever is guilty of rioting shall be punished with imprisonment of either description for a term which may extend to two years, or with fine, or with both.

148 IPC - Rioting, armed with deadly weapon

Whoever is guilty of rioting, being armed with a deadly weapon or with anything which, used as a weapon of offence, is likely to cause death, shall be punished with imprisonment of either description for a term which may extend to three years, or with fine, or with both.

307 IPC - Attempt to murder

Whoever does any act with such intention or knowledge, and under such circumstances that, if he by that act caused death, he would be guilty of murder, shall be punished with imprisonment of either description for a term which may extend to ten years, and shall also be liable to fine; and, if hurt is caused to any person by such act, the offender shall be liable either to 1[imprisonment for life], or to such punishment as is hereinbefore mentioned. Attempts by life-convicts. - 2[When any person offending under this section is under sentence of 1[imprisonment for life], he may, if hurt is caused, be punished with death.]

Illustrations (a) A shoots at Z with intention to kill him, under such circumstances that, if death ensued A would be guilty of murder. A is liable to punishment under this section

(b) A, with the intention of causing the death of a child of tender years, exposes it in a desert place A has committed the offence defined by this section, though

342 IPC - Punishment for wrongful confinement

Whoever wrongfully confines any person shall be punished with simple imprisonment of either description for a term which may extend to one year, or with fine which may extend to one thousand rupees, or with both.
**323 IPC** - Punishment for voluntarily causing hurt.

Whoever, except in the case provided for by section 334, voluntarily causes hurt, shall be punished with imprisonment of either description for a term which may extend to one year, or with fine which may extend to one thousand rupees, or with both.

**326 IPC** - Voluntarily causing grievous hurt by dangerous weapons or means.

Whoever, except in the case provided for by section 335, voluntarily causes grievous hurt by means of any instrument for shooting, stabbing or cutting, or any instrument which, used as a weapon of offence, is likely to cause death, or by means of fire or any heated substance, or by means of any poison or any corrosive substance, or by means of any explosive substance, or by means of any substance which it is deleterious to the human body to inhale, to swallow, or to receive into the blood, or by means of any animal, shall be punished with imprisonment for life, or with imprisonment of either description for a term which may extend to ten years, and shall also be liable to fine.

**DISCUSSION & CONCLUSION**

Deaths associated with cut throat injuries are common in our society. Majority succumb to their injuries. The motives and triggering factors vary with each case. In suicidal, cut throat attempts familial troubles, psychiatric illness and poverty are the main triggering factors while the motives of homicide includes political conflict, sex related crimes, familial, land related disputes. Poor socioeconomic status and poverty are also associated with a high incidence of cut throat injuries.

Cut throat injury can be homicidal or suicidal, but rarely accidental. Accidental cut throat injury, though possible in road traffic collision, are also reported in forensic literatures. The pattern of injuries such as tentative cuts at the beginning of the wound may serve as a guide to differentiate suicidal and homicidal cut throat injuries.

Suicidal cut throat without any hesitation marks are extremely rare and only few cases have been reported in the forensic literature.

Under Sections 324 & 326 of Indian Penal Code, 1860 instruments for cutting causing sharp injuries on human body have been described as dangerous weapons and the punishments for causing grievous hurt with these weapons is more than resulting in simple hurt or grievous hurt without using dangerous weapons on human body.

In the present case, the weapon used was Barber’s knife. The total length of blade was 5 cms, width is 1.2cms and 0.5 thickness. The handle of knife was made of plastic and was red in colour. The total length of the handle was 6 cm. Dried red stains were present all over the handle and blade.

Death from a cut throat depends on the nature and extent of local damage to the neck. (Fig 1) Severe haemorrhage from the jugular veins, or less often the carotid arteries, may lead to death from exsanguination. If the larynx or trachea is opened, then even relatively minor haemorrhage from local vessels may cause blockage of the airways by blood and clot, though many slashed air-passage victims survive. A rare cause of death is air embolism, caused by embolization into cut jugular veins while standing or sitting with the neck at a higher level than the thorax.

In this present case, the incised wound had transsected larynx and hypo pharynx. Margins of the injury were clean cut and all soft tissues of the neck were cut. The injury was clean cut through subcutaneous tissue, anterior neck muscles, nerves, and laryngo-pharynx. Margins of the injury were clean cut and the wound is filled with blood clots.

This case is survival of an extremely rare case of complete laryngo pharyngeal transaction following incision trauma with knife. The clinical record underlines the importance of prompt airway management immediate neck exploration and medico legal implications in such cases.

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**Conflict of interest:** None to declare

**Source of Funding:** None to declare

**Ethical Clearance:** Taken

**REFERENCE**

1. Indian Penal Code 1860


6. Dr. D.S. Bhullar, Dr. K.K. Aggarwal, Medico Legal Diagnosis & Pattern of Injuries with Sharp Weapons, JIAFM, 2007 - 29(4); ISSN: 0971-0973
Profile and Pattern of Incidence of Women Death during the Year 2011 (Jan-Dec) in BTGH (Basaveswar Teaching and Government Hospital), Gulbarga, Karnataka - A Retrospective Study

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ABSTRACT

In 1998, India was the only country in the world where fire (burns) was classified among the 15 leading causes of death. High mortality in young married women from burns has already become an alarming and contentious medical problem in India. The incidences of burn mortality by age, sex, residence, marital status; manner and reasons have been reported from the different (urban and rural) parts of India. From a total of 43/88 female cases that were autopsied at BTGH were studied during the period from Jan 2011 to Dec 2011 at Dept of Forensic Medicine and Toxicology M. R. Medical College Gulbarga. The data was analyzed with regard to age, marital status, religion, mode of infliction, cause and manner of death. The cases represented approximately 50% of all autopsies done during the same period. The age ranged from 3yrs to 60 yrs, with mean age 27 yrs & standard deviation 10.85 31 (72%) cases are due to burns, 7 (16%) are due to O.P.poisoning, 5 (12%) are due to other causes like hanging, fall from height, RTA, etc. 29 (67%) were married and 14 (33%) unmarried. Among 43 female cases, 38 (88%) are Hindus and 5 (12%) are Muslims. All the victims were hospitalized in BTGH after the incident and in majority of them cause of death was septicemia.

Keywords: Women death, Childbearing-age, Burns, Septicemia, and Poisoning

INTRODUCTION

Women died more from “injuries” in a given year than while giving birth - injuries, it; “appear to be indicator of violence against women”. Deaths from fire-related incidents, is a major cause. Each year more than 100,000 women are killed by fires in India. The researchers say many cases could be linked to demands over a dowry leading to women being set on fire. They face discrimination, prejudice, and violence and neglect all their lives, as single or married women. In 1998, India was the only country in the world where fire (burns) was classified among the 15 leading causes of death. High mortality in young married women from burns has already become an alarming and contentious medical problem in India. The incidences of burn mortality by age, sex, residence, marital status; manner and reasons have been reported only infrequently from the all parts of India. Death due to burns, Communicable diseases, injury and poisoning and cancers are the major killers among reproductive age group women. Several factors responsible for accidents and suicides are also contributed substantially to the mortality load among these women. Majority of the maternal deaths were seen in reproductive age group especially in married Hindus indicating the need to strengthen, the maternal physical and mental health

MATERIAL AND METHOD

During the year Jan2011-to-Dec2011 total 88 autopsies were conducted at BTGH Gulbarga, that were admitted and died in BTGH during the same
period. Detail analysis of the cases was done based on medical records and evaluation of autopsy reports.

**FINDINGS**

Total postmortem conducted are-88, out of which 43 are women. Married are-29 and 14 are unmarried. 38 women are Hindus, and 5 are Muslims.

**CAUSES OF DEATH**

Due to OP Poisoning-7, Burns-31 (23-septicaemia, 8-hypovolumic shock), and Hanging-1 (due to complication of hanging-i.e. cerebral edema & pulmonary edema,) and Surgery-1 (Thromboembolism leading to acute right ventricle failure.). Fall-1(blunt trauma abdomen leading to liver rupture) RTA-1(hypo volumic shock secondary to crush injury and multiple fractures of right femur, tibia and fibula).Trauma-1(hypo volumic shock secondary to thoraco-abdominal injury& SDH).

**MANNER OF DEATH**

Suicidal-33(77%), Accidental-8(19%), Homicidal-2(4).

**Age-wise distribution of cases**

Age-Less than 10yrs -1case, 11-20yrs -10 cases, 21-30yrs -18cases, 31-40yrs -9cases, 41-50yrs -3cases. 51-60 yrs -2 cases. Total =43 cases

**DISCUSSION**

A total no of 43 female cases that were autopsied at BTGH were studied during the period from Jan 2011 to Dec 2011 at Dept of Forensic Medicine and Toxicology M.R.Medocal College Gulbarga. Deaths from fire-related incidents are a major cause. The cases represented approximately 50% of all autopsies done during same period. The age ranged from 3yrs to 60yrs,with mean age 27years &standard deviation10.85. 31(72%) cases are due to burns,7(16%)are due to O.P.poisoning ,5(12%) are due to other causes like hanging, fall from height ,RTA,etc. 29(67%) were married and 14(33%) unmarried. 38(88%)are Hindus and 5(%) are Muslims. 33(77%) cases are of suicidal in nature,8(19%) are accidental and 2(4%) are homicidal. All the victims were hospitalized after the incident and in majority of them, cause of death was septicemia. High mortality in young married women from burns has already become an alarming and contentious medical problem in India. Deep-rooted changes in social attitudes are needed to make India’s women more accepted and secure. Suicide death rates in India are among the highest in the world. A large proportion of adult suicide deaths occur between the ages of 15 years and 29 years, especially in women.

**Conclusion and preventive measures**

In India, suicide is the cause of about twice as many deaths as is HIV/AIDS, and about the same number as maternal causes of death in young women. In 1998 India was the only country in the world where fire (burns) was classified among the 15 leading causes of death. However, unlike these two other causes of death, suicide attracts little public health attention. Most Indians do not have community or support services for the prevention of suicide and have restricted access to care for mental illnesses associated with suicide, especially access to treatment for depression, which has been shown to reduce suicidal behaviors. Majority of the maternal deaths were seen in rural and urban areas indicating the need to strengthen the maternal physical and mental health care and economical independence of women.

Efforts should be made with the implementation of comprehensive and evidence-based suicide prevention and Urgent research is needed to explore the reasons for suicide in young people and the large regional variations seen in this study strategies.

Public health interventions such as restrictions in access to pesticides might prevent many suicide deaths.

**Acknowledgement:** The opinions expressed in this Article is those of the authors

**Conflict of Interest:** We declare that we have no conflicts of interest.

**Ethical clearance:** Not necessary

**Source of Funding:** Personnel from salary

**REFERENCES**

1. Study on Causes of Death by Verbal Autopsy in India www. icmr.nic.in/ final / causes death / Contents %20NCD.pdf
2. Burn mortality: recent trends and socio cultural determinants in rural India Batra AK.Source Department of Forensic Medicine & Toxicology,


7. Cause of death among reproductive age group women in Maharashtra, India. Kulkarni R, Chauhan S, Shah B, Menon G.
Comparative Study of Finger Print Pattern in Vitiligo Population of Vidarbha Region of India

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ABSTRACT

Background: Dermatoglyphics is the scientific study of epidermal ridges which can be used in predictions of genetic disorders since epidermal ridge patterns are under genetic influence. This study attempts to analyze whether any specific pattern exist for Vitiligo population of Vidarbha region of Maharashtra India or not.

Materials and Method: A total of 200 cases, 100 each of Vitiligo and control were enrolled for the study. Dermatoglyphic prints were taken by "Ink method". Detailed dermatoglyphic analysis was done with the help of magnifying hand lens and ridge counting was done with the help of a sharp needle.

Results: Vitiligo patients exhibited increase percentage of whorl pattern on first finger followed by second finger in both the sexes. Loops pattern is more common in females compared to males. Increased percentage of arches on first and third digits in males and fifth in females is also observed

Conclusion: There are specific differences in the dermatoglyphic patterns in Vitiligo patients as compared with normal general population of the region.

Keywords: Dermatoglyphics, Finger ridge, Vitiligo

INTRODUCTION

Dermatoglyphics is the scientific study of epidermal ridges and their configurations on the palmer region of hand and fingers and plantar region of foot and toes. Dermatoglyphics depends upon the cornfield layer of epidermis and dermal papillae. The epidermal ridges are differentiated in their definitive forms during third and fourth month of foetal life hence they are the significant indicators of conditions existing several months prior to the birth of individual. The original ridge characteristics are not disturbed unless the skin is damaged to a depth of about one millimeter 1.

There are thousands of diseases known to be caused by abnormal genes. If there is any abnormality in the genetic make-up of parents, it is inherited to the children and is reflected in dermatoglyphic pattern 2. Dermatoglyphics can be used in predictions of genetic disorders 3 since epidermal ridge patterns are under genetic influence 4, 5. Abnormal dermatoglyphic patterns are known to occur with genetic disorders like Mongolism, Turner’s syndrome and Kleinfelter’s syndrome 6, 7, 8. It indicates that dermatoglyphics shows definite diagnostic changes in those disorders which shows genetic basis. Moreover, characteristics of individual epidermal ridges are highly variable; they cannot be duplicated in a finger, palm or sole, in another region or in different individual which are permanent and unchanging.

Genetic control of positional information as revealed by patterns of skin pigmentation in Vitiligo, an inherited disorder, is characterized by patchy disappearance of epidermal melanocytes. Vitiligo patterns on opposite sides of the body and in pairs of identical twins are generally similar, as would be expected in genetically determined clonally based positioning system, but there are differences suggesting, that pattern development is modified during somatic growth, that the Vitiligo mutations are unstable and liable to further mutation 9.

In many regions, dermatoglyphics studies in Vitiligo patients conducted and specific differences
were observed. But regional differences can exists that’s why this study was undertaken with the intentions to analyze whether any specific pattern, exist for Vitiligo patients? And whether those serve as an early diagnostic tool?

MATERIAL AND METHOD

The prospective study was conducted in Government Medical College Nagpur. Cases were included from various parts of Vidarbha region of Maharashtra India. A total of 200 cases, 100 each of Vitiligo and control were enrolled. In both the groups 60% male and 40% female were parts of the study. In Vitiligo group, cases were diagnosed by dermatologists of the institute by clinical histories, family histories, clinical examinations, laboratory investigations and past medical records. In control group, normal healthy volunteers of Vidarbha region of Maharashtra were included after complete general, systemic examinations and laboratory investigations.

Dermatoglyphic prints were taken by “Ink method” in which subjects were asked to clean and dry their hands with some moisture on the hands. Thin film of ink was applied over the palm with the help of inked rubber roller taking care of uniformity on digits, hollow of the palm and flexor crease of wrist. Then print was taken by placing the hand over a sheet of white paper from proximal to distal end which was kept over a pressure pad. Same procedure was adopted for another hand. Detailed dermatoglyphic analysis was done with the help of magnifying hand lens and ridge counting was done with the help of a sharp needle.

Ridge Counting: Ridge counting indicates the pattern size. It is primarily utilized on finger tips as a way of expressing the distance between digital triradii to the ridge density in a given area (Figure -1).

Fig. 1. Ridge counting in various finger tip pattern types. The counting is done along a straight line connecting the triradial point to the point of core. Ridges containing triradial point and point of core are excluded. In case of whorl with two triradii and at least one point of core, two different counts are made, one from each triradii. Each count is made along a line drawn between the triradial point and the nearer point of core. The two counts are specified as first radial and second ulnar counts. The dermatoglyphic patterns are analyzed according to sex and bi-hand. They are subjected to nonparametric statistical tests to evaluate significant pattern of identifiable differences between the Vitiligo and control groups. For qualitative analysis chi-square test was used.

Total Finger Ridge Count (TFRC): TFRC represents the sum of ridge counts of all ten digits, where only the larger count is used on those digits with more than one ridge count. It expresses size of pattern.

Absolute Finger Ridge Count (AFRC): AFRC is the sum of the ridge counts from all the separate triradii on the fingers. It reflects the pattern size as well as pattern intensity, which depends on the pattern type.

RESULTS

We found frequency distribution of absolute finger ridge count (AFRC) in the range of 26 to more than 350 (Table-1) in all the groups. We also observed increased in the mean values of AFRC in Vitiligo males and females and also in Vitiligo males and females combined series when compared with controls and there was statistically significant difference in the mean values of AFRC in all the comparison groups (Table-2).

The frequency distribution of total finger ridge count (TFRC) was observed in between the range of 26 to more than 350 (Table-3). We found statistically significant increase in the mean values of TFRC in Vitiligo males and females and also in Vitiligo males and females combined series (Table-4). All the tables indicate that there are significant differences in the mean values of AFRC and TFRC in Vitiligo compared to controls.

Moreover, Vitiligo patients exhibited increase percentage of whorl pattern predominantly on first finger and then on second fingers in both the sexes while increased percentage of loops on the second
finger in both the sexes. As far as arches are concerned, in the present study we observed increased percentage of arches on the first and third digits in males and fifth in females.

Table 1: Frequency distribution of AFRC

<table>
<thead>
<tr>
<th>Class Interval</th>
<th>Vitiligo</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>0-25</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>26-50</td>
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<td>0.00</td>
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<tr>
<td>51-75</td>
<td>2</td>
<td>5.00</td>
</tr>
<tr>
<td>76-100</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>101-125</td>
<td>6</td>
<td>15.00</td>
</tr>
<tr>
<td>126-150</td>
<td>9</td>
<td>22.50</td>
</tr>
<tr>
<td>151-175</td>
<td>3</td>
<td>7.50</td>
</tr>
<tr>
<td>176-200</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>201-225</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>226-250</td>
<td>3</td>
<td>7.50</td>
</tr>
<tr>
<td>251-275</td>
<td>8</td>
<td>20.00</td>
</tr>
<tr>
<td>276-300</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>301-325</td>
<td>5</td>
<td>12.00</td>
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<tr>
<td>326-350</td>
<td>0</td>
<td>0.00</td>
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<tr>
<td>Above 350</td>
<td>3</td>
<td>7.50</td>
</tr>
</tbody>
</table>

Table 2: Mean values of AFRC

<table>
<thead>
<tr>
<th>Subject</th>
<th>Mean(SD)</th>
<th>CV (%)</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitiligo Male</td>
<td>197.78 (92.54)</td>
<td>46.79</td>
<td>5.078</td>
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</tr>
<tr>
<td>Control Male</td>
<td>116.33 (41.71)</td>
<td>35.85</td>
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<tr>
<td>Vitiligo Female</td>
<td>182.93 (74.44)</td>
<td>40.69</td>
<td>7.17</td>
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<tr>
<td>Control Female</td>
<td>106.78 (35.13)</td>
<td>32.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitiligo Total</td>
<td>188.87 (82.03)</td>
<td>43.43</td>
<td>8.66</td>
<td>Significant</td>
</tr>
<tr>
<td>Control Total</td>
<td>110.60 (37.98)</td>
<td>34.34</td>
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Table 3: Frequency distribution of TFRC

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<th>Class Interval</th>
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<th>Controls</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>Female</td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>0-25</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>26-50</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>51-75</td>
<td>03</td>
<td>07.50</td>
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<td>00.00</td>
</tr>
<tr>
<td>Above 350</td>
<td>05</td>
<td>12.50</td>
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</tbody>
</table>
Table 4: Mean values of TFRC

<table>
<thead>
<tr>
<th>Subject</th>
<th>Mean(SD)</th>
<th>CV (%)</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitiligo Male</td>
<td>130.30(43.05)</td>
<td>33.04</td>
<td>07.17</td>
<td>Significant</td>
</tr>
<tr>
<td>Control Male</td>
<td>76.40 (20.20)</td>
<td>26.44</td>
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<tr>
<td>Vitiligo Female</td>
<td>136.37(36.74)</td>
<td>26.94</td>
<td>11.28</td>
<td>Significant</td>
</tr>
<tr>
<td>Control Female</td>
<td>77.43 (16.97)</td>
<td>21.91</td>
<td></td>
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<tr>
<td>Vitiligo Total</td>
<td>133.94(38.29)</td>
<td>29.33</td>
<td>13.14</td>
<td>Significant</td>
</tr>
<tr>
<td>Control Total</td>
<td>77.02 (18.29)</td>
<td>23.68</td>
<td></td>
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</table>

(SD) Standard Deviation, (CV) Coefficient of Variance

DISCUSSION

In the present study Absolute Finger Ridge Count (AFRC) is significantly increased in Vitiligenous male and female patients and a significant difference is found when Vitiligenous male and female combined series is compared to controls. In case of Total Finger Ridge Count (TFRC), Vitiligo males and females also show a significant increase as compared to controls and a significant difference is found in male and female combined series compared to those of the controls. But our findings do not coincide with the findings of Kapur and Verma 11, Verma and Jain 12 and Sahasrabuddhe et al 13. It is suggested that increased AFRC and TFRC values in the present study is due to increase in sample size, whorls and loops.

Our study shows that Vitiligo patients have increased percentage of whorl pattern more on first finger followed by second fingers in both the sexes. Kapur and Verma 11 also found the similar results as whorl pattern was common on 1st finger followed by 2nd finger in their study. On the fifth finger there is an increase in percentage of whorls in case of Vitiligo males than females which is a contradictory finding in comparison to observations of Sahasrabuddhe et al 13 as they have not observed increase percentage on 5th finger and probably it is due to variation in sample size.

Though there is an increase in percentage of loops in cases of Vitiligo cases but this increase is statistically insignificant. Kapur and Verma 11 and Singh et al 10 also opined the same after their study. Vitiligo cases showed predominance of ulnar loops compared to radial loops which is a similar finding like Kapur and Verma 11. In our region overall percentage of loops in females are more compared to males and Singh et al 10 also observed female predominance in their study although with some marginal differences. We observed increased percentage of loops on the second finger in both the sexes. This finding correlates with Sahasrabuddhe et al 13 they also observed increase number of loops on the 2nd finger. In case of females there is an increase in percentage of loops on the third digit which is identical to the findings reported by Verma and Jain 12 and also increased loops on fifth fingers in females. But Verma and Jain 12 reported increase in loops on fifth fingers irrespective of the sex.

We found frequency of arches is decreased in both the sexes. Sahasrabuddhe 13 reported decrease in frequency in males while Verma and Jain 12 reported decrease in females. In our study increased percentage of arches observed on the first and third digits in males and fifth in females. These findings partially tally with that of Kapur and Verma 11. The variation in between both studies is most probably due to the less number of cases of Vitiligo and absence of sex wise distribution in their study.

CONCLUSION

Our regional Vitiligo population has increased absolute finger ridge count and total finger ridge count in both the sexes. They have increased percentage of whorl pattern in first and second fingers. Males also have increase percentage of whorls on the fifth finger. Percentage of loops is more in Vitiligo population in both the sexes. Specifically the percentage is more in second digit in both the sexes and in third and fifth digits in case of females. Frequency of arches decreases in both the sexes with increase percentage in first and third digits of males and in fifth digit of females.

Acknowledgement: Nil

Conflict of Interest: Nil.

Source of Support: Nil financial support.

Ethical Clearance: Obtained.
REFERENCES

Stature Estimation from the Length of Humerus in Vidarbha Region of Maharashtra

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ABSTRACT

Background: Estimation of stature from length of long bones plays an important role in identifying unknown bodies. Stature of an individual can be estimated from measurements of long bones with the help of established formulae which plays an important role in medico-legal practice. Each worker has derived his own formula for calculating the stature from the length of long bones but no universally applicable formula has been derived as the relationship between stature and long bone length differ according to race, sex, age and side of body. It is proved beyond doubt that each race requires its own formula. Hence present study is undertaken to derive formulae for stature estimation for individuals of Vidarbha region of Maharashtra state.

Material and Method: The material consists of fully ossified 116 humeri belonging to 58 dissection hall cadavers, from Government Medical College Nagpur, out of which 42 were males and 16 were females of known sex and stature. The linear relationship between the living stature and length of humerus of each side was worked out in the form of regression equation and Multiplication factor. With the help of these regression equations, stature was calculated.

Results: Stature estimated with the help of regression equation showed the average error of 3 cm in males and less than 1 cm in females and with multiplication factor it was less than 2 cm in both the sexes.

Conclusion: The regression formulae and multiplication factor can be used to predict the stature from the length of humerus. The accuracy of multiplication factor in estimating the stature in the region is very high.

Keywords: Cadaver, Humerus, Living Stature, Multiplication Factor, Regression Equations

INTRODUCTION

Anthropometric work in this field has been in progress in various countries, since the last decades of the nineteenth century. Anatomists and forensic experts have been consulted frequently regarding identification of skeletal remains found under suspicious circumstances and are asked to pronounce an opinion which may form an important evidence in the court. Stature is one of the parameter of biological profile used to confirm or exclude presumptive identification. Applying the knowledge of human biological variation as it relates to developing biological profiles for unknown victims is a crucial component for the increasing number of anthropologists working globally investigating crimes against international humanitarian law 1.

Examinations of the skeletal samples of the burials are often fragmentary and are found in mixed lots. Some authors have used fragments of long bones but most of the times long bones have been used in the determination of stature because they provide relatively better accuracy in prediction of stature. For this reason there is a need for developing a technique for stature estimation from skeletal parts which are...
durable. Pearson \textsuperscript{2} established formulae through regression equations which are utilized widely. But there is no universally applicable formula to express relationship between stature and long bones of an individual. It has been observed that there are variations in the length of limb bones relative to stature, according to race, climate, heredity and nutritional status \textsuperscript{3,4}. In these backgrounds the present study was undertaken to derive population specific formula (regression equations) to estimate stature from length of humerus for the population of Vidarbha region of Maharashtra state of India. This method would be of help when regional problem of identification of unknown skeletal remains will encounter.

**MATERIAL AND METHOD**

The Material consist of 116 fully ossified humeri belonging to 58 dissection hall cadavers out of which 42 were males and 16 females of known sex and stature collected from Government Medical College Nagpur. The bones of each side of both the sexes were numbered and kept separately. The bones showing pathological deformities were excluded. The bones along with their articular cartilages intact were measured on the osteometric board and recorded separately.

The cadaveric stature was measured in centimeters (cm) and the living stature was obtained by deducting 1.5 cm for male and 2 cm for females from the length of cadavers \textsuperscript{2,5}. The linear relationship between the living stature and length of humerus of each side was worked out in the form of regression equations and the goodness of it was tested by applying chi-square test. Similarly multiplication factor derived for stature estimation is compared with various authors worked on various populations at different places.

**RESULTS**

In the present work there is no significant difference in the length of humerus of right and left side in both the sexes (Table-1).

<table>
<thead>
<tr>
<th>Sex</th>
<th>Humerus</th>
<th>No. Bones</th>
<th>Range in cm</th>
<th>Mean</th>
<th>SD</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Right Humerus</td>
<td>42</td>
<td>28.5 – 34.4</td>
<td>31.52</td>
<td>1.32</td>
<td>0.2</td>
</tr>
<tr>
<td>Male</td>
<td>Left Humerus</td>
<td>42</td>
<td>28.0 – 34.3</td>
<td>31.25</td>
<td>1.32</td>
<td>0.2</td>
</tr>
<tr>
<td>Female</td>
<td>Right Humerus</td>
<td>16</td>
<td>25.1 – 31.2</td>
<td>28.35</td>
<td>1.91</td>
<td>0.4</td>
</tr>
<tr>
<td>Female</td>
<td>Left Humerus</td>
<td>16</td>
<td>25.2 – 31.0</td>
<td>28.12</td>
<td>1.91</td>
<td>0.4</td>
</tr>
</tbody>
</table>

(SD) Standard Deviation, (SEM) Standard Error of Mean

It is observed that mean living stature in males was 158.93 cm and in females 145 cm which was calculated after deducting 1.5 cm in males and 2 cm in females from the measurement of cadaveric stature (Figure-1 & Table-2).

<table>
<thead>
<tr>
<th>Sex</th>
<th>No</th>
<th>Range</th>
<th>Mean</th>
<th>SD</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>42</td>
<td>148.3 - 171.5 cms</td>
<td>158.93</td>
<td>6.8</td>
<td>1.05</td>
</tr>
<tr>
<td>Female</td>
<td>16</td>
<td>138.2 - 153.2 cms</td>
<td>145.00</td>
<td>4.45</td>
<td>1.114</td>
</tr>
</tbody>
</table>

(SD) Standard Deviation, (SEM) Standard Error of Mean

The Regression formulae for both males and females are derived and the goodness of it was tested by applying chi-square test. All the values of chi-square have probabilities greater than 5%, showing that the fitted regression lines are representative of the relationship between the stature and the humerus. From these regression equations, the stature calculated showed the average error of 3 cms in males and less than 1 cm in females (Table-3).
**Table 3: Regression formulae**

<table>
<thead>
<tr>
<th>Sex</th>
<th>Side</th>
<th>Regression Formulae</th>
<th>Chi-Square (d.f.)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Right</td>
<td>$S=46.05+3.58XH$</td>
<td>$X^2=6.23$ (40)</td>
<td>P&gt;0.05.N.S.</td>
</tr>
<tr>
<td></td>
<td>Left</td>
<td>$S=45.17+3.64XH$</td>
<td>$X^2=6.07$ (40)</td>
<td>P&gt;0.05.N.S.</td>
</tr>
<tr>
<td>Female</td>
<td>Right</td>
<td>$S=123.325+0.76XH$</td>
<td>$X^2=1.30$ (14)</td>
<td>P&gt;0.05.N.S.</td>
</tr>
<tr>
<td></td>
<td>Left</td>
<td>$S=99.315+1.62XH$</td>
<td>$X^2=1.055$ (14)</td>
<td>P&gt;0.05.N.S.</td>
</tr>
</tbody>
</table>

*S-living stature of adult, H-humerus, d.f.- Degree of freedom, P-Probability N.S.-Not significant*

The average multiplication factor is 5.1 for humerus in Vidarbha region. With the help of this multiplication factor the stature calculated which showed the average error less than 2 centimeters in both sexes (Table-4).

**Table 4: Multiplication factor (MF)**

<table>
<thead>
<tr>
<th>Sex</th>
<th>Bones</th>
<th>MF</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Rt. Humerus</td>
<td>5.04</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>Lt. Humerus</td>
<td>5.08</td>
<td>42</td>
</tr>
<tr>
<td>Female</td>
<td>Rt. Humerus</td>
<td>5.11</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Lt. Humerus</td>
<td>5.15</td>
<td>16</td>
</tr>
</tbody>
</table>

**DISCUSSION**

In the present study the average living stature found in males was 158.93 cm, close to the finding 161.5 cm of Bhargava and Kher on the population of Barelas and Bhils in Madhya Pradesh. The living stature of adult male population of Vidarbha region was found to be shorter compared to 163.11 cm in Western Maharashtra (Athawale) and 165.78 cm from Marathwada Region (Kolte and Bansal). It is further revealed that 166.6 cm, the finding of Bose on the population of East Bengal, 163.6 cm the finding of Siddiqui and Shah, 163 cm of Singh and Sohal on the population of Punjab and 162.3 cm of Charnalia on the population of Pondicherry are much higher than the finding of 158.93 cm of the present work.

The average living stature of 145 cm in females in the present study is shorter, compared to 149 cm, the findings of Patil et al and 149.72 cm, the finding of Kolte and Bansal in Marathwada region. The present data on living adult female stature could not be compared thoroughly as there is insufficient data regarding the studies in female population.

The resultant regression formulae in the present study thus obtained for Indian bones of Vidarbha region definitely show a different value for the two sexes. In addition it reveals that they also differ significantly from Pearson’s formulae, derived from English bones commonly used in India for forensic opinions. From the above regression formulae, in the present study the stature was calculated which showed the average error of 3 cm in males and less than 1 cm in females.

Similar studies were conducted by Patil et al and showed that regression formulae can be used to estimate the stature from length of humerus. The regression equations of male bones in the present study are very close to the regression equations of Kate and Muzumdar who worked on Indian population for Amritsar and Nagpur areas.

It has been further observed that the regression formulae in the present study differ significantly from the findings of Breitinger who worked on German population, Telkka on Finnish population, Dupertuis and Hadden and Pearson on British population (Table-5). Kolte and Bansal and Trotter and Gleser have found that the regression formulae differ according to race, sex, age, side of the body and nutritional status of the people. Siddiqui and Shah discouraged the use of regression formulae of population of one region for reconstruction of stature for population of another region. Kate and Muzumdar stated that Pearsonian regression equations do not give exact results in India. They stated that there are variations in correlations between stature and length of long bones of individuals of different regions and their use in not sound and satisfactory. Thus the regression equations obtained by different workers differ significantly according to sex, race, climatic conditions, and nutritional states of the individuals, rendering their results incomparable.

**Table 5: Regression Formulae by various authors**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Sex</th>
<th>Regression Formulae</th>
<th>Race</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breitinger</td>
<td>Male</td>
<td>$S=83.21+2.71XH$</td>
<td>German</td>
</tr>
<tr>
<td>Telkka</td>
<td>Male</td>
<td>$S=77.28+2.8XH$</td>
<td>Finnish</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>$S=75.8+2.7XH$</td>
<td>Finnish</td>
</tr>
<tr>
<td>Dupertuis &amp; Hadden</td>
<td>Male</td>
<td>$S=73.57+2.97XH$</td>
<td>General</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>$S=64.97+3.14XH$</td>
<td>General</td>
</tr>
<tr>
<td>Stevenson</td>
<td>Male</td>
<td>$S=81.57+2.81XH$</td>
<td>Chinese</td>
</tr>
<tr>
<td>Perarson</td>
<td>Male</td>
<td>$S=70.64+2.89XH$</td>
<td>British</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>$S=71.47+2.75XH$</td>
<td>British</td>
</tr>
</tbody>
</table>
Table 5: Regression Formulae by various authors (Contd.)

<table>
<thead>
<tr>
<th>Authors</th>
<th>Sex</th>
<th>Regression Formulae</th>
<th>Race</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kate et al</td>
<td>Male</td>
<td>S=51.76+3.61xH</td>
<td>Indian</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>S=49.80+3.70xH</td>
<td>Indian</td>
</tr>
<tr>
<td>Patil et al</td>
<td>Male</td>
<td>S=91.98+2.28xH</td>
<td>Indian</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>S=71.89+2.75xH</td>
<td>Indian</td>
</tr>
<tr>
<td>Present Study</td>
<td>Male (Rt.H)</td>
<td>S=46.05+3.58xH</td>
<td>Indian</td>
</tr>
<tr>
<td></td>
<td>Male (Lt.H)</td>
<td>S=45.17+3.64xH</td>
<td>Indian</td>
</tr>
<tr>
<td></td>
<td>Female (Rt.H)</td>
<td>S=123.32+0.76xH</td>
<td>Indian</td>
</tr>
<tr>
<td></td>
<td>Female (Lt.H)</td>
<td>S=99.315+1.62xH</td>
<td>Indian</td>
</tr>
</tbody>
</table>

The Multiplication factor 5.1 which is equal in both the sexes is similar with the findings of Pan 17, Nat 18, Siddiqui and Shah 9 and Kate and Muzumdar 13 who worked at different places in Indian population. Pan 17 also noted that Multiplication factor is same in both the sexes (Table- 6).

Table 6: Multiplication Factor

<table>
<thead>
<tr>
<th>Authors</th>
<th>Multiplication Factor</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pan</td>
<td>5.3</td>
<td>Indian</td>
</tr>
<tr>
<td>Nat</td>
<td>5.3</td>
<td>Indian</td>
</tr>
<tr>
<td>Siddiqui &amp; Shah</td>
<td>5.0</td>
<td>Indian</td>
</tr>
<tr>
<td>Kate &amp; Muzumdar</td>
<td>5.3</td>
<td>Indian</td>
</tr>
<tr>
<td>Present Study</td>
<td>5.1</td>
<td>Indian</td>
</tr>
</tbody>
</table>

With the help of this Multiplication factor in the present study the stature was calculated which showed the average error less than 2 cm in both sexes. Siddiqui and Shah 9 have shown the accuracy of multiplication factor in estimating the stature. They worked on Punjabi bones and showed the average error about 3 cm for both the sexes. Thus the study of multiplication factor reveals two very important findings. Firstly the proportion of humerus to the stature is almost the same as worked out by different workers on different races, regions, and at different times and secondly this proportion is same in both sexes. This gives a value which is constant, irrespective of race, sex or region and thus an easy method for reliable forensic work. This therefore, becomes a “ratio for man” with an element of consistency. A similar finding and conclusion was drawn by Kate and Muzumdar 13 and postulated a “theory of proportion in the human body” which is termed as “Autometry”.

CONCLUSION

The regression formulae and multiplication factor can be used to predict the stature from the length of humerus. Multiplication factor is a better guide for calculating the height, when it is not definitely known as to which part of the country, the individual belongs. Thus this study will definitely be useful to the Anatomists and Forensic experts when a bone or piece of bone is subjected to the medico-legal examination.

ACKNOWLEDGEMENT

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Ethical Clearance: After taking clearance from local Ethical committee, we, the authors declare that the Research work submitted for publication was conducted on Dissection Hall Cadavers that comply with the current laws of medical research of India in which it was performed.

REFERENCES


Identification of Gender from Dimensions of Palate

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ABSTRACT

Determination of deceased sex is first step in skeletal analysis since estimation of age, race, and stature depends on sex of deceased. Total 100 adult human skulls (50 male and 50 female) available in the Department of Forensic Medicine and Toxicology and Department of Anatomy of M. R. Medical College and K. B. N. Medical College Gulbarga, Karnataka are studied. The demarking point (D.P.) and identification point (I.P.) of both measurements were calculated and then percentage of bones identified by D.P. and I.P. was recorded. Though, the Demarking Point of a single parameter may not identify sex in all the bones but the accuracy is nearly 100% in the bones, which are identified. Percentage of skulls identified by IP of palatal breadth in males is more as compared to palatal length where as identification from DP is equal. Percentage of skulls identified by IP and DP of palatal length in females is more as compared to palatal breadth. So palatal length gives better prediction of sex as compared to palatal breadth in case of females where as in case of males palatal breadth is better predictor of sex.

Keywords: Palatal length, Palatal breadth, Demarking point, Identification point, Sexing of Cranium

INTRODUCTION

Qualitative sex differentiation using many bones is been done by many forensic experts, but sexing from single bone is difficult task. Almost all the elements of human skeleton show some degree of sexual dimorphism, but reliable indicators can be obtained from specific bones like hip bone, skull and sacrum. The determination of deceased sex is first step in skeletal analysis since estimation of age at death, race, and stature depends on sex of deceased.

The measurements of the skeleton bones, mainly the neurocranium (brain case) and viscerocranium, suffer influences of various factors; however, they are often used for human population morphological studies of age estimation, stature, ethnicity, which are relevant aspects of forensics investigation and anthropological examinations of unknown individuals¹.

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Recent studies report that morphometry is a fast and efficient method for the evaluation of morphological characteristics, such as ethnicity, gender, age, genetic factors, dietary habits, and regional variations which can alter the shape and size of bone structures. These aspects are significantly important in determining the anthropometric changes between different populations and genders².

Traditional method is non-metrical and morphological. Morphological features of bones depend upon nutrition, occupation, race and geography of the region, so the traditional method is not reliable in the study of bones.

In this study length and breadth of palate were studied. They were analysed statistically by applying routine statistical data like identification point and demarking point.

MATERIALS AND METHOD

The materials for the present study consisted of 100 adult human skulls of known sex (50 male and 50 female) available in the Department of Forensic Medicine and Toxicology and Department of Anatomy of M. R. Medical College and K. B. N. Medical College.

DOI Number: 10.5958/j.0974-1283.14.1.032
Gulbarga, Karnataka. Following parameters were studied:

1. Palatal length (PL): Palatal length is the distance between staphylion and orale. It was recorded with the help of sliding vernier caliper.

2. Palatal breadth (PB): Palatal breadth is the distance between endomolare. It was recorded with the help of sliding vernier caliper.

As the first part of the study, all the values were tabulated and analyzed statistically by routine statistical methods.

The value of Range, Mean, Standard Deviation (SD), Calculated Range (mean ± 3SD), Demarking Point and Identification Point were obtained. Maximum value of female range is considered as identification point for male. Minimum value of male range is considered as identification point for female. Maximum value of female calculated range is considered as demarcation point for male. Minimum value of male calculated range is considered as demarcation point for female. In case where female range/calculated range maximum value of male range/calculated range is considered as Identification point/Demarcation point for female and minimum value of female range/calculated range is considered as identification point/demarcation point for male. Subsequently ‘t’ is applied to both parameters.

**OBSERVATIONS**

The Range, Mean, Calculated Range (mean + 3 S.D.), Demarking Points (DP), Identification Point (IP) and the percentage of bones in which sex could be identified by them, are given in table no. 1 and 2.

**Table No 1. Statistical analysis of palatal length of skull.**

<table>
<thead>
<tr>
<th>Details of measurements</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>44.72</td>
<td>41.68</td>
</tr>
<tr>
<td>SD</td>
<td>3.98</td>
<td>5.56</td>
</tr>
<tr>
<td>Range</td>
<td>38-55</td>
<td>24-51</td>
</tr>
<tr>
<td>Identification point(IP)</td>
<td>&gt;51mm</td>
<td>&lt;38</td>
</tr>
<tr>
<td>% of bones identified by IP</td>
<td>04%</td>
<td>16%</td>
</tr>
<tr>
<td>Standard error</td>
<td>0.56</td>
<td>0.79</td>
</tr>
<tr>
<td>Calculated range</td>
<td>32.76-56.67</td>
<td>24.99-58.37</td>
</tr>
<tr>
<td>Demarking point(DP)</td>
<td>&gt;58.37</td>
<td>&lt;32.76</td>
</tr>
<tr>
<td>% of bones identified by DP</td>
<td>0%</td>
<td>08%</td>
</tr>
</tbody>
</table>

Percentage of skulls identified by IP alone was 04% of males and 16% of females. The percentage of skulls identified by DP alone was 0% of males and 08% of females. ‘t’ test was significant with p<0.05.

**Table No 2. Statistical analysis of palatal breadth of skull.**

<table>
<thead>
<tr>
<th>Details of measurements</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>34.36</td>
<td>32.02</td>
</tr>
<tr>
<td>SD</td>
<td>5.70</td>
<td>4.97</td>
</tr>
<tr>
<td>Range</td>
<td>23-45</td>
<td>23-40</td>
</tr>
<tr>
<td>Identification point(IP)</td>
<td>&gt;40mm</td>
<td>&lt;23mm</td>
</tr>
<tr>
<td>% of bones identified by IP</td>
<td>14%</td>
<td>0%</td>
</tr>
<tr>
<td>Standard error</td>
<td>0.81</td>
<td>0.70</td>
</tr>
<tr>
<td>Calculated range</td>
<td>17.25-51.46</td>
<td>17.11-46.93</td>
</tr>
<tr>
<td>Demarking point(DP)</td>
<td>&gt;46.93</td>
<td>&lt;17.25</td>
</tr>
<tr>
<td>% of bones identified by DP</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Percentage of skulls identified by IP alone was 14% of males and 0% of females. The percentage of skulls identified by DP alone was 0% of males and 0% of females. ‘t’ test was significant with p<0.05.

**DISCUSSION**

The female skull retains the gracile attributes seen in prepubescent skull. Male cranium becomes markedly rougher in adulthood, the differentiating features of sex become more prominent after puberty, again towards old age there occurs blurring of sexually dimorphic traits. So the determination of sex from bones should ideally be limited to 15-55 years of age. Krogman WM (1978) analyzed 750 skeletons and came to a conclusion that the determination of sex is possible with accuracy of about 100% if whole skeleton is available, 92% when skull alone and 98% when both pelvis and skull are available. A great number of measurements of the skull have been proposed and used by different investigators during the past. Martin and Saller used eighty one measures; Howell described seventy; Hrdlicka lists thirty two; Bass gives twenty three.

In the present study both length and breadth of palate are statistically significant. The results are compared with those of previous workers as shown in table no. 3 & 4.
Table No 3. Showing comparison of palatal length with other workers.

<table>
<thead>
<tr>
<th>Sl</th>
<th>Name of worker</th>
<th>Male N</th>
<th>M</th>
<th>SD</th>
<th>Female N</th>
<th>M</th>
<th>SD</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hong Wei Song 1992</td>
<td>30</td>
<td>43.2</td>
<td>3.3</td>
<td>30</td>
<td>42.3</td>
<td>4.6</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>2</td>
<td>Deshmukh(2003)</td>
<td>40</td>
<td>45</td>
<td>3.08</td>
<td>34</td>
<td>44</td>
<td>3.37</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>3</td>
<td>Present study (2009)</td>
<td>50</td>
<td>44.72</td>
<td>3.98</td>
<td>50</td>
<td>41.68</td>
<td>5.56</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

Where N – no. of skull, M – Mean, SD – Standard deviation, SS- Statistical significance, scale in mm.

Table No 4. Showing comparison of palatal breadth with other workers.

<table>
<thead>
<tr>
<th>Sl</th>
<th>Name of worker</th>
<th>Male N</th>
<th>M</th>
<th>SD</th>
<th>Female N</th>
<th>M</th>
<th>SD</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hong Wei Song 1992</td>
<td>30</td>
<td>36.2</td>
<td>3.1</td>
<td>30</td>
<td>35.4</td>
<td>3.8</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>2</td>
<td>Deshmukh(2003)</td>
<td>40</td>
<td>35</td>
<td>1.50</td>
<td>34</td>
<td>34</td>
<td>2.73</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>3</td>
<td>Present study (2009)</td>
<td>50</td>
<td>34.36</td>
<td>5.70</td>
<td>50</td>
<td>32.02</td>
<td>4.97</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

The findings of present study are similar with most of them, but Hong Wei Song (1992) in his study on Chinese skulls found this parameter to be statistically insignificant. It may be due to racial factor as shown in table 4.

CONCLUSION

Palatal dimensions can help in identification of sex of the individual. Among both parameters statistically analyzed, considering the Demarking Point and Identification point, the most reliable parameter is palatal length as compared to the palatal breadth in case of females whereas palatal breadth is better predictor for sex determination in case of males.

ACKNOWLEDGEMENT:

I thank Dr. Mallikarjun B., dean M. R. Medical College, Gulbarga for encouraging and securing me the all the required facilities for the work.

I express my humble gratitude to all the staff members of Dept. Of Forensic Medicine and Toxicology, M. R. Medical College, Gulbarga for their motivation and constructive ideas during the study.

I thank Mr. Sangam statistician, for his assistance and positive feedback during statistical analysis.

Source of Funding: Self

Ethical Clearance: Taken

Conflict of Interest Statement: “The undersigned author / authors hereby declare that the article is original, neither the article nor a part of it is under consideration for publication anywhere else and has not been previously published anywhere. We have declared all vested interests. We have meticulously followed the instructions. The article, if published, shall be the property of the Journal and we surrender all rights to the Editors. We agree to provide the latest follow up of cases prior to the publication of case reports when requested”.

REFERENCES

Study on Pattern of Unintentional Transportation Injury Cases Reported at Casualty of a Tertiary Health Care Centre

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¹Dept of Forensic Medicine and Toxicology, BIMS, Belgaum, ²Professor and Head, ³Assistant Professor, Dept. of Forensic Medicine and Toxicology, JNMC, KLE university, Belgaum

ABSTRACT

Injury is probably the most under recognized major public health problem India is facing today. Injuries have always been part of human existence and they comprise a critical health problem throughout the world. In spite of safety legislation and attempt to raise public awareness of the injuries, the rate of motor vehicle crashes, fall from height, suicide, drowning, violence etc. still remains high.

Unintentional injuries are the largest source of premature morbidity and mortality and a major burden to the society all over the world. Further transportation injuries constitute the bulk of unintentional injuries. Hence this study was aimed and undertaken to know the prevalence, pattern of injury, morbidity and mortality in unintentional transportation cases coming to our tertiary care centre casualty set up.

The study was conducted from October 2011 to March 2012 analyzing a total of 753 unintentional cases out of which transportation injuries constituted the maximum number i.e, 609 (80.8%) cases.

The victims, injuries, causative factors, type of vehicles, were studied and analysed and a comprehensive analysis was done. Mortality and morbidity burden was calculated.

The present study result is useful in interpreting the causative factors, and burden of mortality and morbidity. Accordingly, a strategic plan of various preventive measures can be employed to minimize the burden of unintentional transportation cases for the benefit of the community and people at large.

Keywords: Unintentional, Injuries, transportation, Mortality, Morbidity

INTRODUCTION

Injury has been defined as any harm whatever illegally caused to any person in body, mind, reputation or property, vide sec.44 IPC¹. According to WHO, an injury is defined as a ‘body lesion at the organic level resulting from acute exposure to energy (mechanical, thermal, electrical, chemical or radiant) interacting with the body in amounts or rates that exceed the threshold of psychological tolerance’².

The term “unintentional injury” is preferred to “accidents” as the latter implies events are inevitable and unavoidable whereas a high proportion of these incidents are now regarded as being preventable.

Injury is the most under recognized major public health problem India is facing today. Although modern medicine is able to withstand many of the dangerous complications, the injuries that occur without anyone’s intentions i.e, unintentional injuries like transportation injuries, fall from height, thermal injuries, unintentional poisoning and drowning/ suffocation represents serious risk to health, reducing work efficiency and costing money¹.
In India, there is no availability of sufficient data regarding the mechanism and causes of falls to understand the details of unintentional transportation injuries, thus requiring this type of study/research.

The growth of the motor vehicle industry, liberalized economic policies of successive governments, aggressive media promotion, increasing purchasing power of people, easy availability of loans and poor public transport systems have possibly contributed to increasing motorization and a changing transportation scenario in India.

Keeping this in mind the study was undertaken at the casualty of our tertiary care center. Data available in our study regarding the pattern of unintentional injury cases are mostly from the northern parts of Karnataka. This study presents evidence that unintentional transportation injuries pose a significant health burden.

**METHODOLOGY**

Data was collected from victims/patients of unintentional injuries brought to casualty of KLE’s Dr. Prabhakar Kore hospital & MRC, Belgaum and cases of transportation injuries were analysed in the study from October 2011 to March 2012.

All the victims/patients of unintentional transportation injury cases coming to the casualty of KLE’s Dr. Prabhakar Kore hospital during the study period were included in study. Cases of intentional injuries/deaths (suicidal, assault and homicidal), Industrial accidents and other unintentional injury cases were excluded.

Procedure: Data was collected in a pretested proforma and necessary details needed for the study which included a detailed description of all general data of the victims/patients and details of unintentional fall cases were analyzed.

**RESULTS:**

Among the victims in transportation injuries, majority of them were rider and pillion rider of a two wheeler 283 & 75 cases (58.78%) followed by occupants of LMV 103 (16.9%) cases; pedestrian 72 (11.82%) cases; HMV occupant 42 (6.89%) cases.

Based on the manner of accident of transportation injuries, it was noted in our study that majority of the unintentional transportation injuries occurred due to hit by/to another vehicle 371 (60.9%) cases, followed by skid/slip 196 (32.18%) cases. Injuries due to toppling of the vehicle were 28 (4.59%) cases and due to hit to a stationary object were 14 (2.29%) cases.

### Table 1: Distribution of transportation injuries according to type of victims.

<table>
<thead>
<tr>
<th>Victim</th>
<th>Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>72</td>
<td>11.82%</td>
</tr>
<tr>
<td>Bicyclist</td>
<td>16</td>
<td>2.62%</td>
</tr>
<tr>
<td>Two wheeler pillion rider</td>
<td>75</td>
<td>12.31%</td>
</tr>
<tr>
<td>Two wheeler rider</td>
<td>283</td>
<td>46.47%</td>
</tr>
<tr>
<td>Three wheeler occupant</td>
<td>9</td>
<td>1.47%</td>
</tr>
<tr>
<td>LMV occupant</td>
<td>103</td>
<td>16.91%</td>
</tr>
<tr>
<td>HMV occupant</td>
<td>42</td>
<td>6.89%</td>
</tr>
<tr>
<td>Others (Bullock cart)</td>
<td>9</td>
<td>1.47%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>609</td>
<td>100%</td>
</tr>
</tbody>
</table>

Out of the 371 cases in the transportation injuries which were due to hit by/to another vehicle or agent, majority of the offending agent was HMV in 146 (39.4%) cases followed by:

- 2-wheeler in 97 (26.1%) cases, LMV in 80 (21.6%) cases, unknown vehicles in 18 (4.8%) cases, animal intervention in 16 (4.3%) cases, and 3-wheeler in 14 (3.8%) cases. Out of the 609 transportation injury cases seen in our study 242 (39.7%) victims had superficial injuries; 206 (33.8%) victims suffered with skeletal injuries, 153 (25.1%) victims suffered with head injury among which 11 (1.8%) victims had spinal cord injury; and 49 (8%) victims had visceral injuries. The mortality rate in the transportation injuries was 8.5% (52 cases).
Table 3: Distribution of pattern of injuries in transportation injury cases:

<table>
<thead>
<tr>
<th>Pattern of injuries</th>
<th>Number of cases</th>
<th>Percentage</th>
<th>Total no. of transportation injury cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superficial</td>
<td>242</td>
<td>39.7%</td>
<td>609</td>
</tr>
<tr>
<td>Visceral</td>
<td>49</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Skeletal</td>
<td>206</td>
<td>33.8%</td>
<td></td>
</tr>
<tr>
<td>Head injury</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With spinal cord</td>
<td>11</td>
<td>1.8%</td>
<td></td>
</tr>
<tr>
<td>Without spinal cord</td>
<td>142</td>
<td>23.3%</td>
<td></td>
</tr>
<tr>
<td>Mortality</td>
<td>52</td>
<td>8.5%</td>
<td></td>
</tr>
</tbody>
</table>

DISCUSSION

In the present study unintentional injury cases constituted to more than 70% of the injury cases which came to the casualty of our tertiary care centre; and among them unintentional transportation injury cases constituted the bulk i.e 81% of the total.

While the most common offending vehicle/ agent involved was HMV (39.4%) followed by two-wheeler (26.1%) and LMV (21.6%); majority of the injuries occurred due to hit by another vehicle (61%) followed by self fall by slip/skid (32.2%). Similar results were seen according to BISP report 2008, where two wheeler rider and pillion formed the majority (51%) of the victims in transportation injuries. But it differed from study by Naci H, Chisholm D, Baker TD wherein 60% of injuries occurred in LMV occupants in high income countries and pedestrians 45% in LMIC.

The reason for this could be the fact that due to urbanization and growing economy, easy availability of funds/ loans from the banks have made easier for a common man to afford a two wheeler. Even a low income family will be having a two wheeler for commuting. With an increase in the number of vehicles on the roads, as well as vehicular speed, along with lack of knowledge about traffic rules, rash & negligent drive, non usage of safety measures, unchecked road crossings, etc., the burden of road traffic injuries are definitely to increase.

Regarding pattern of injuries, external injuries 39.7% and skeletal injuries 33.8% formed the majority in transportation injuries, followed closely by head injury (25%). This could be because of clothing pattern and invisibility of blunt injuries due to wheatish and dark skin complexion and deeper contusion.

Adults constituted the bulk with majority of the case load in the age group of 20-49yrs. Males were the majority with morbidity ratio for male to female being 4:1 and mortality ratio is 2.8:1.

The total mortality rate in our study is 12% (91 cases) of the total cases 753 seen. The major contributors for this mortality were from transportation injuries 57.1% (52 cases) A similar pattern of mortality rate due to transportation injuries was seen in the studies of Bener A, Hyder AA, Schenk E and Colorado dept of public health. But differed from the studies of J Jagnoor, L Keay, R Ivers, W Suraweera, P Jha; M Cardona, R Joshi, R Q Ivers, S Iyengar, et al and WHO report 2007 and BISP 2007. Pattern of mortality rate due to falls in WHO report 2007 is similar to present study; but are very low when compared to the results from J Jagnoor, L Keay, R Ivers, W Suraweera, P Jha and M Cardona, R Joshi, R Q Ivers, S Iyengar, et al.

The reason for transportation injuries forming the bulk of the unintentional injuries in our study could be due to the fact that urbanization and modernization have affected the lifestyle to a great extent. Today even an average/ low income family owns a two wheeler contributing to ever increase in number of vehicles hitting the road especially in the cities, highways, etc. In other hand, the decreased usage of pump stove and increased usage of safer gas stoves has decreased the unintentional injuries due to thermal injuries.

CONCLUSION

In the present study unintentional injury cases constituted to more than 70% of the injury cases which came to the casualty of our tertiary care centre; with majority consisting of adult males, with a total mortality rate of 12%. Transportation injuries contributed to 80.8% of morbidity and 57% of mortality of the total unintentional injury cases. Transportation injuries being the main culprit for the morbidity and mortality burden of unintentional injuries, our study sheds light on the causative factors, mode; pattern of injuries, and the morbidity and mortality burden which is very significant. Knowing the cause is one of the prime mottos to carry out preventive measures.

Preventive measures

A major reduction in injury deaths and hospitalizations may be reduced by combined approaches of

- Strict enforcement of stringent safety laws and regulations,
Continuous teaching and awareness programs through social media; Increasing awareness in the society to accept safety as a pattern of life.

Developing combinations of educational strategies, environmental modifications, legislation, and engineering techniques together with improvement of existing data sources by hospital- and population-based studies.

Setting safety standards and strict implementation of traffic rules.

Strengthening of trauma care systems for early care, and Public awareness activities on importance of following safety standards.

Hence, the results of the present study could be useful in interpreting the types and patterns of transportation injuries and then strategic planning can be made accordingly for the benefit of the community at large. Comprehensive approaches combining policy implementation, environmental changes, as well as health education are needed in order for effective prevention of injuries. A surveillance programme of the present nature provides clues on changing patterns and profiles, identifies broad characteristics and shows directions for programme implementation, monitoring and evaluation, along with identifying areas for further research.

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We sincerely thank the casualty medical officers, staff nurses, administrative officers and other staffs of KLE hospital for their cooperation and supports. The authors are grateful to the Principal, J.N.Medical College, KLE University, Belgaum for his guidance and support.

We make the following declaration – Ethical clearance for the study was obtained from Ethical Review Board of K.L.E University. No financial support was sought. There is no conflict of interest.

REFERENCES

1. Injury surveillance guidelines, URL: http://www.who.int/violence_injury_prevention/index.html: Published in conjunction with the Centers for Disease Control and Prevention, Atlanta, USA, by the World Health Organisation.

2. G. Gururaj: “Road traffic deaths, injuries and disabilities in India:Current scenario”: The national medical journal of India; vol. 21, no. 1, 2008


A Profile of Two Wheeler Road Traffic Accidents and Head Injuries in Bangalore

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ABSTRACT

Road Traffic accident is an unplanned event occurring suddenly, unexpectedly and inadvertently in an unforeseen circumstance. Low Income and middle income countries accounts for 85% of the death, and for 90% of the annual disability adjusted life years lost because of road traffic injuries. Incidences are more common among the two wheeler vehicles. Head is the most common site to be injured in road traffic accidents. Factors and events contributing to accident may arise from man, machine and environment, may occur either before, during or after accident. Hence the present study was conducted to know the patterns of accident and head injuries involving riders and pillion riders of two wheelers. This study was conducted from 1st April 2009 to 30th Sept 2010 at Victoria Hospital Mortuary, Bangalore. A total of 245 cases of deaths due to two wheeler accidents were reported for the autopsy. Riders constituted (76.33%) and pillion riders (23.67%). Most victims were male (87.75%), 20 to 39 years constitutes 70.20% of victims, most of the accidents have occurred during 6PM - 12midnight, Helmets used by the victims (64.17%), skull fractures (67.75%) were observed in the two wheeler accidental death. Subdural hemorrhage was the commonest intracranial hemorrhage and rib injuries were commonly associated with head injuries.

Keywords: Road Traffic Accidents, Riders, Pillion Riders, Two Wheelers, Skull Fractures, Rib Injuries

INTRODUCTION

Road Traffic Accidents are one of the leading causes of deaths, hospitalizations, disabilities and socioeconomic losses in India. With liberalized economic reforms, industrialization, migration and changing values of the large middle class - young and middle age sections of the society, the motorization phenomena in Karnataka has been rapid and marked. Head was the most common site to be injured in RTA. The exponentially increasing number of automobile vehicles, poor adherence to traffic rules and regulations such as maintaining lane discipline, driving in zigzag patterns by public, poorly maintained and congested roads, abuse of alcohol and lack of awareness about helmets and new generation of high speed vehicles are all together responsible for accidents. In spite of the advancement of the technology and medical sciences dead and deformity following road traffic accidents is yet to be controlled successfully. In this study a sincere effort has been made to study the Patterns of road traffic accidents and head injuries involving riders and pillion riders of two wheelers and to suggest measures to be taken to decrease the road traffic accidents involving two wheelers.

MATERIALS & METHOD

A cross sectional study of total of 245 cases of deaths due to fatal road traffic accidents involving riders and pillion riders of two wheelers have been studied.

Inclusive Criteria: All cases of deaths due to head injuries in fatal road traffic accidents involving riders and pillion riders of two wheeler of both sexes all age groups, treated and untreated, irrespective of duration of survival was included in the study.

Exclusive Criteria: Cases other than two wheeler road traffic accidents to Victoria Hospital Mortuary.

Detailed autopsy examination was done on the request from the investigating officer in annexure 146(i) and (ii). Relevant information was collected from police, relatives and friends of deceased.
enmass evisceration technique was followed in conducting the autopsy.  

Then with all these findings, post mortem conclusion as to the cause of death in each case was drawn and analyzed.

**OBSERVATIONS AND RESULTS**

A total number of 245 cases of two wheeler road traffic accidents were recorded. There were 187 (76.33%) two wheeler riders and 58 (23.67%) were pillion riders. The cases are seen more in the male victims (87.75% as compared to females (12.25%). (Table 1)

Our study showed that the two wheeler road traffic accidents are more in the third (47.75%) & fourth decades (22.44%) of total 245 victims. It was followed by 20 to 39 years constitutes 70.20% of total victims. (Table 2)

Most of the accidents have occurred during 6PM – 12midnight for Riders (43.52%) & Pillion riders (44.55%) and least during 12midnight – 6AM for Riders (18.06%) & Pillion riders (16.83%). (Table 3)

It was found 11.02% of victims died on spot, while 48.16% of RTA victims were survived and was treated in the hospital. 13.56% victims died within 6hours of admission to hospital. 22.04% died within 6 to 12 hours after admission to hospital. 18.64% died within 12 to 24 hours of hospital admission. 18.64% died within 24 to 48 hours of admission to hospital. 27.12% had survived for more than 48 hours in the hospital after accidents. (Table 4)

Study shows the frequency of RTA was more in the urban areas (74.29%) than compared to rural areas (25.71%). (Table 5)

Among the total 187(100%) RTA cases involving riders, the evidence of alcohol was recorded in 42(22.46%) of the victims who had consumed alcohol at the time of death, while 145(77.54 %) did not have it. Out of 58 pillion riders 14 victims had consumed alcohol at the time of conduction of postmortem examination. None of the female riders and pillion riders had consumed alcohol at the time of examination. (Table 6)

Among the total 187 RTA cases involving Riders, the evidence of Helmets used was recorded in 120 (64.17%) of the victims while 67 (35.83%) did not use it. None of the pillion riders were wearing helmets at the time of accidents. (Table 7)

Basal plus Linear fracture of Vertex constituted 44 cases (23.53%), out of 187 riders and 11cases out of 58(18.97%) pillion riders, linear fracture of vertex only comprised 26(13.90%) cases in riders, 11(18.97%) cases in pillion riders followed by fractures of the base only in 21 cases (11.23%) in riders and 08 cases (13.79%) in pillion riders, Depressed fractures of vertex was found 07 (5.60%) in riders and 02 (4.87%) in Pillion riders. Commuted fractures were the least common in both riders and pillion riders. No fracture of skull was found in 62 cases, out of 187 riders and 17 cases out of 58 pillion riders. (Table 8)

The commonest variety of Intra Cranial Hemorrhage found was subdural hemorrhage followed by Sub arachnoid hemorrhage, Intracranial hemorrhage and least is Extra dural hemorrhage both in riders and pillion riders. Rib fractures were the most common injury seen in 54.40% in riders and 61.11% cases in pillion riders associated with head injuries followed by long bone fractures in 16.00% in riders and 16.67% cases in pillion riders. (Table 9)
Table 4: Place of death of RTA Victims

<table>
<thead>
<tr>
<th>Place of Death</th>
<th>Number of Victims %</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPOT</td>
<td>27(11)</td>
</tr>
<tr>
<td>On the way to Hospital</td>
<td>100(40.8)</td>
</tr>
<tr>
<td>At Hospital</td>
<td>118(48.2)</td>
</tr>
<tr>
<td>Total</td>
<td>245</td>
</tr>
</tbody>
</table>

Table 5: Place of Accident

<table>
<thead>
<tr>
<th>Rural/Urban</th>
<th>Rural (%)</th>
<th>Urban (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 9</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>10 – 19</td>
<td>3(4.8)</td>
<td>13(7.1)</td>
</tr>
<tr>
<td>20 – 29</td>
<td>26(41.3)</td>
<td>91(50.0)</td>
</tr>
<tr>
<td>30 – 39</td>
<td>19(30.1)</td>
<td>36(19.8)</td>
</tr>
<tr>
<td>40 – 49</td>
<td>5(7.9)</td>
<td>14(7.7)</td>
</tr>
<tr>
<td>50 – 59</td>
<td>8(12.7)</td>
<td>18(9.9)</td>
</tr>
<tr>
<td>60 – 69</td>
<td>2(3.2)</td>
<td>6(3.3)</td>
</tr>
<tr>
<td>≥70</td>
<td>0(0.0)</td>
<td>4(2.2)</td>
</tr>
<tr>
<td>Total (n=245)</td>
<td>63</td>
<td>182</td>
</tr>
</tbody>
</table>

Table 6: Evidence of Alcohol in Riders

<table>
<thead>
<tr>
<th>Alcohol Used</th>
<th>Used %</th>
<th>Not Used %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 9</td>
<td>0(0)</td>
<td>0(0)</td>
</tr>
<tr>
<td>10 – 19</td>
<td>3(7.1)</td>
<td>8(5.5)</td>
</tr>
<tr>
<td>20 – 29</td>
<td>25(59.5)</td>
<td>65(44.8)</td>
</tr>
<tr>
<td>30 – 39</td>
<td>10(23.8)</td>
<td>35(24.1)</td>
</tr>
<tr>
<td>40 – 49</td>
<td>1(2.3)</td>
<td>14(9.6)</td>
</tr>
<tr>
<td>50 – 59</td>
<td>3(7.1)</td>
<td>15(10.3)</td>
</tr>
<tr>
<td>60 – 69</td>
<td>0(0)</td>
<td>4(2.7)</td>
</tr>
<tr>
<td>≥70</td>
<td>0(0)</td>
<td>4(2.7)</td>
</tr>
<tr>
<td>Total (n=187)</td>
<td>42(22.46)</td>
<td>145(77.54)</td>
</tr>
</tbody>
</table>

Table 7: According to Evidence of Using Helmets among Riders

<table>
<thead>
<tr>
<th>Helmets Used</th>
<th>Used (%)</th>
<th>Not Used (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 9</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
</tr>
<tr>
<td>10 – 19</td>
<td>7(5.8)</td>
<td>3(2.5)</td>
</tr>
<tr>
<td>20 – 29</td>
<td>59(49.1)</td>
<td>31(25.8)</td>
</tr>
<tr>
<td>30 – 39</td>
<td>31(25.8)</td>
<td>14(11.7)</td>
</tr>
<tr>
<td>40 – 49</td>
<td>10(8.3)</td>
<td>5(4.1)</td>
</tr>
<tr>
<td>50 – 59</td>
<td>8(6.7)</td>
<td>10(8.3)</td>
</tr>
<tr>
<td>60 – 69</td>
<td>3(2.5)</td>
<td>2(1.7)</td>
</tr>
<tr>
<td>≥70</td>
<td>2(1.7)</td>
<td>2(1.7)</td>
</tr>
<tr>
<td>Total (n=187)</td>
<td>120(64.1)</td>
<td>67(35.9)</td>
</tr>
</tbody>
</table>

Table 8: Types of Skull fractures in RTA Involving Riders & Pillion Riders

<table>
<thead>
<tr>
<th>Types of Skull Fracture</th>
<th>Riders (%)</th>
<th>Pillion Riders (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear Fracture of vertex</td>
<td>26(13.9)</td>
<td>11 (18.9)</td>
</tr>
<tr>
<td>Comminuted Fracture of vertex</td>
<td>4(3.2)</td>
<td>2(4.9)</td>
</tr>
<tr>
<td>Depressed fracture of vertex</td>
<td>7(5.6)</td>
<td>2(4.9)</td>
</tr>
<tr>
<td>Basal Fracture</td>
<td>21(11.2)</td>
<td>8(13.8)</td>
</tr>
<tr>
<td>Basal Fracture + linear fracture of vertex</td>
<td>44(23.5)</td>
<td>11(19.0)</td>
</tr>
<tr>
<td>Crush fracture of skull</td>
<td>22(12.3)</td>
<td>7(12.0)</td>
</tr>
<tr>
<td>No Fracture</td>
<td>62(33.1)</td>
<td>17(29.3)</td>
</tr>
<tr>
<td>Total</td>
<td>187(76.3)</td>
<td>58(23.7)</td>
</tr>
</tbody>
</table>

Table 9: Injuries in Vital Organs other than Head Injuries in Riders & Pillion Riders

<table>
<thead>
<tr>
<th></th>
<th>Riders (%)</th>
<th>Pillion Riders (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ribs Fractures</td>
<td>68(34.4)</td>
<td>22(61.1)</td>
</tr>
<tr>
<td>Long Bones Fractures</td>
<td>20(16.0)</td>
<td>6(16.7)</td>
</tr>
<tr>
<td>Pelvis Fracture</td>
<td>2(1.6)</td>
<td>2(5.6)</td>
</tr>
<tr>
<td>Vertebral Fracture</td>
<td>10(8.0)</td>
<td>3(8.3)</td>
</tr>
<tr>
<td>Visceral Lacerations</td>
<td>25(20.0)</td>
<td>3(8.3)</td>
</tr>
<tr>
<td>Total</td>
<td>125(77.6)</td>
<td>36(22.4)</td>
</tr>
</tbody>
</table>

DISCUSSION

In the present study, motorcycle riders included 187(76.33%) and pillion riders comprised 58(23.67%) of 245 cases. Jan mohammadi. N et al [3] study showed that 84.3% of motor cyclist riders and 15.7% pillion riders. Findings have been reported by Fitzharris.M et al [4] showed 66.7% of riders and 33.3% of pillion riders. Male preponderance was noted, as most of the motorcyclists were Male accounting for 215(87.75%) and Females accounting for 30(12.25%) similar to the findings of studies of Kumar et al [5] were males belonging to 88.22% and females 11.77%.

Most Vulnerable age groups is the active population of the study resulting were those persons of third decade 48.13% followed by fourth decades 24.06% showing 72.20% of riders and 63.80% of pillion riders similar to the studies by Kumar A et al [5]. Peak timing of occurrence of RTA is 06.00 PM to 12.00 midnight followed by 12.00noon to 06.00PM which is probably due to heavy and unequal distribution of the traffic at these closing hours of the people. And the rider is generally exhausted after day work. Sirathanont [6] demonstrated most of motorcycle crashes were between 06.00 PM – 09.00 PM. Ding.et al [7] reported most of the head injuries occurred between 04.00 PM – 11.00 PM peaking at 9.00 PM.

Considering the place of death of the victims we have observed that 27 cases (11.02%) died on spot. A Total of 118 cases (48.7%) of RTA victims have been admitted in the Hospital whereas 100 cases (40.82%) have died on the way to hospital. Similar findings were observed in the studies of Singh B et al [8] where more hospital deaths were recorded. It is observed that incident were more in the Urban areas this reveals the common outdoor working time of the urban regions. It was observed out of 245 cases 63 victims (25.71%) were from rural areas and 182(74.29%) are from urban areas. Findings observed in Singh Y N et al [9] found 16.98% of victims from rural areas.
Helmet use was infrequent among Motor cyclists in our study. 67(35.82%) Riders, among 187 riders have not been wearing a helmet at the time of accident. Study in Mumtaz B et al [10] where frequency of helmet use is 56.6% and that of non users in 43.3%. Use of an approved helmet at the time of collision significantly reduces the likely hood of sustaining head injuries, severe traumatic brain injuries, intracranial lesions and serious neuro-motor disability as suggested by Cawich SO et al [11]. None of the pillon riders wore the helmets, to reduce the incidence of head injury in pillion riders they should wear crash helmet as suggested by Modi (2001) [12]. It is seen out of 187 riders the evidence of alcohol was recorded in 42 cases (22.46%). In female riders none of them showed evidence of alcohol. The rest of Male riders 145 (77.44%) did not have it. Anna.N. Taylor et.al [13,14] observed that alcohol intoxication increases the risk of TBI and may affect the morbidity and mortality associated with head injury.

On detailed analysis it may be observed that head injuries constituted as a major pathology behind the death of the deceased, similarly studies by Bairagi K.K et al [15] observed head injury was the major cause of death. The most of the head injuries are associated with skull fractures which increases the fatality of victims Kraus JF et al [16]. Skull fractures are not a dictum to be present in all fatal head injury cases. In this study skull fractures were present in 166 (67.75%) cases, compared to 69.63% of cases in the study by Kumar A. et al [5]. The dominant type of skull fractures found was the linear (fissured) fracture in 55.43% cases followed by Basal fracture in 17.47%, Crush fracture in 18.07%, Comminuted fracture in 5.42% and depressed fracture in 3.62%. Fissure fracture was the most commonly observed fracture (57%) in study of Menon A.et al [17].

The commonest variety of Intra Cranial Hemorrhage found was subdural hemorrhage followed by sub archnoid hemoharage, Intra cerebral hemorrhage and least is extra dural hemorrhage similarly in study by Pathak et al [18].The most common cause of death which was Intra Cranial Haemorrhage from head injury in study by Nzegwu.et al [19]. A fracture of the skull with associated brain injury is the most common cause of death in our study. We found multiple injuries in most of cases involving other systems a typical feature of fatal motor cycle accidents as mentioned by Parikh CK [20] Apart from the head injuries, other system injuries were also noted. Rib fractures were commonest other system injury found in 44.44% of cases, similar to the study by Kumar.A et al [5] where 33.62% had rib injuries.

CONCLUSION & PREVENTIVE MEASURES

From the present study following conclusions have been derived. The two wheeler Road Traffic Accidents continue to be a growing menace, incurring heavy loss of valuable man power and human resources along with a corresponding drain of potential economic growth. In this study it has been observed that the human error is mainly responsible for fatal RTA. Sincere efforts have been made in this direction which can reduce the mortality and morbidity. Helmets offer protection to two-wheeler riders and pillions. Development of policies and their strict implementation based on these risk factors, upgrade road infrastructure and lastly to strengthen the heath facilities for the victims can reduce severity and burden of head Injuries in India.

ACKNOWLEDGEMENT

Work attributed to Department of Forensic Medicine at the Bangalore medical college, Bangalore, Karnataka Their assistance is gratefully acknowledged.

Conflict of interest Statement: None.

Source of funding: Self

Ethical clearance: obtained from the institutional ethical committee.

REFERENCES

17. Menon A, Nagesh KR. Pattern of fatal head injuries due to vehicular accidents in Manipal, Journal of Indian Academy of Forensic Medicine, 2005, 27(1); 19-22.
Foot Length and Hand Length: Most Reliable Parameters to Estimate the Gestational Age

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ABSTRACT

Background & Objective: Estimation of gestational age of fetus is of great medicolegal significance. As the civilization developed the laws related to prevent abortions, sexual assaults and illegal pregnancy came forth. The need to know the age of the abortus was indispensible in such cases. The objective of the present study is to determine the accuracy in estimating gestational age using hand and foot length.

Material and method: The present study was conducted in the Department of Forensic Medicine and Toxicology, Indira Gandhi Government Medical College, Nagpur having sample size of 100 foetuses. Fetal foot length and hand length were measured and regression analysis was used for analyzing the collected data.

Result: A statistically significant linear relationship was observed between fetal foot length (FL) and gestational age (GA) \[ r = 0.996, p < 0.0001 \] and also statistically significant linear relationship found between fetal hand length (HL) and gestational age (GA) \[ r = 0.985, p < 0.0001 \]

Conclusion: Foot length and hand length of the fetuses has shown a highly significant correlation with gestational age, which reflects the accuracy of this study. Thus it can serve as highly reliable parameter in the assessment of gestational age.

Keywords: Foetus, Gestational Age Estimation, Foot Length, Hand Length

INTRODUCTION

Foeticide especially female is on rise in recent times as compared to older era. With evolution man learned the methods of abortions. As the civilization developed the laws related to prevent abortions, sexual assaults and illegal pregnancy came forth. The need to know the age of the abortus was indispensible in such cases. As the humanity is evolving; the fetus needed to be studied not only for the prevention of the crimes but also to know the influence of the regional, maternal, nutritional, environmental and other factors on the development of tissues and the fetus as a whole.

Estimation of gestational age of fetus is of great medicolegal significance\(^1\). It plays vital role to support a charge of infanticide to know that the baby was born alive and had a separate existence from the mother and that a wilful act of commission or omission caused its death\(^2\). Various physical parameters like crown heel length, crown rump length, head circumference, biparietal diameter, chest circumference, abdominal circumference, femur length, weight and appearance
of ossification centres has been utilized for the estimation of gestational age. The objective of the present study is to determine the accuracy in estimating gestational age using foetal hand and foot length. The current study was carried out, to help the investigating authorities to solve legal problems in relation to foetuses. In addition, accurate fetal age estimation is very important in obstetric and pediatric clinical practice.

**MATERIAL AND METHOD**

The current study was carried out in the Department of Forensic Medicine and Toxicology, Indira Gandhi Govt. Medical College, Nagpur from November 2007 to November 2009. Present study includes a sample size of 100 fetuses. The source of these fetuses were from the womb of deceased pregnant women, labor room & fetuses brought for medicolegal postmortem examination. The embryos of less than 10 weeks were excluded from this study. Last menstrual period and ultrasonography report were used for intrauterine Gestational age of foetus. The parameters considered for the current study includes gestational age, foot length and hand length of fetus. All measurements were recorded in centimeters and on the right side. Fetal hand length was taken on palmer surface in longitudinal plane from wrist crease to the tip of the middle finger while foot length was measured in the planter and longitudinal plane from the posterior heel to the tip of longest toe and regression analysis was used for analyzing the collected data.

**OBSERVATIONS**

The present study was carried out in Department of Forensic Medicine and Toxicology, in this Medical College, from December 2007 to November 2009. Total 100 cases were studied for estimation of fetal age out of which 45 were males, 51 were females and 04 cases were of unrecognizable sex.

<table>
<thead>
<tr>
<th>G. Age (weeks)</th>
<th>Males</th>
<th></th>
<th>Females</th>
<th></th>
<th>Un-recongised</th>
<th>Total</th>
<th>Mean foot length</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>0.8-0.9(0.83)</td>
<td>04</td>
<td>0.825</td>
</tr>
<tr>
<td>12</td>
<td>00</td>
<td>—</td>
<td>00</td>
<td>—</td>
<td>00</td>
<td>00</td>
<td>—</td>
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<td>13</td>
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<td>1.3-1.5(1.4)</td>
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<td>00</td>
<td>02</td>
<td>1.4</td>
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<tr>
<td>14</td>
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<td>—</td>
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<td>1.6-1.8 (1.7)</td>
<td>00</td>
<td>—</td>
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</tr>
<tr>
<td>15</td>
<td>03</td>
<td>2-2.1(2.03)</td>
<td>03</td>
<td>2-2.1(2.03)</td>
<td>00</td>
<td>—</td>
<td>06</td>
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<td>16</td>
<td>00</td>
<td>—</td>
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<td>—</td>
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<td>—</td>
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<td>02</td>
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<tr>
<td>18</td>
<td>00</td>
<td>—</td>
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<td>00</td>
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<td>—</td>
</tr>
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<td>19</td>
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<td>3(3.0)</td>
<td>00</td>
<td>—</td>
<td>07</td>
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<tr>
<td>20</td>
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<td>03</td>
<td>3.4-3.5(3.47)</td>
<td>00</td>
<td>—</td>
<td>06</td>
</tr>
<tr>
<td>21</td>
<td>01</td>
<td>3.8</td>
<td>02</td>
<td>3.3-3.7(3.5)</td>
<td>00</td>
<td>—</td>
<td>03</td>
</tr>
</tbody>
</table>
Table No 1. Distribution of cases according to gestational age, foot length and sex of fetuses. (n=100) (Contd.)

<table>
<thead>
<tr>
<th>G. Age (weeks)</th>
<th>Males</th>
<th>Females</th>
<th>Un-recognised</th>
<th>Total</th>
<th>Mean foot length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Foot length (mean)</td>
<td>N</td>
<td>Foot length (mean)</td>
<td>N</td>
</tr>
<tr>
<td>22</td>
<td>05</td>
<td>4.1(4.02)</td>
<td>04</td>
<td>4.1(4.03)</td>
<td>00</td>
</tr>
<tr>
<td>23</td>
<td>02</td>
<td>4.3-4.4(4.35)</td>
<td>01</td>
<td>4.2</td>
<td>00</td>
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<tr>
<td>24</td>
<td>00</td>
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<td>03</td>
<td>4.5</td>
<td>00</td>
</tr>
<tr>
<td>25</td>
<td>04</td>
<td>4.8-5(4.88)</td>
<td>03</td>
<td>4.8-5(4.9)</td>
<td>00</td>
</tr>
<tr>
<td>26</td>
<td>02</td>
<td>5.2</td>
<td>00</td>
<td>—</td>
<td>00</td>
</tr>
<tr>
<td>27</td>
<td>02</td>
<td>5.4-5.5(5.45)</td>
<td>05</td>
<td>5.4-5.5(5.46)</td>
<td>00</td>
</tr>
<tr>
<td>28</td>
<td>01</td>
<td>5.7</td>
<td>02</td>
<td>5.8</td>
<td>00</td>
</tr>
<tr>
<td>29</td>
<td>03</td>
<td>6</td>
<td>05</td>
<td>6-6.1(6.04)</td>
<td>00</td>
</tr>
<tr>
<td>30</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>31</td>
<td>02</td>
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<td>6.2-6.3(6.2)</td>
<td>00</td>
</tr>
<tr>
<td>32</td>
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<td>6.5</td>
<td>03</td>
<td>6.5-6.6(6.53)</td>
<td>00</td>
</tr>
<tr>
<td>33</td>
<td>00</td>
<td>—</td>
<td>02</td>
<td>6.8-7(6.9)</td>
<td>00</td>
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<tr>
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<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>35</td>
<td>00</td>
<td>—</td>
<td>02</td>
<td>7.1-7.2(7.15)</td>
<td>00</td>
</tr>
<tr>
<td>36</td>
<td>02</td>
<td>7.5</td>
<td>01</td>
<td>7.5</td>
<td>00</td>
</tr>
<tr>
<td>37</td>
<td>04</td>
<td>7.6-7.8(7.75)</td>
<td>01</td>
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<td>00</td>
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<tr>
<td>38</td>
<td>00</td>
<td>—</td>
<td>00</td>
<td>—</td>
<td>00</td>
</tr>
<tr>
<td>39</td>
<td>03</td>
<td>8.2</td>
<td>01</td>
<td>8.2</td>
<td>00</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td>51</td>
<td>04</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Table no 01 shows distribution of cases according to gestational age, foot length and sex of the fetuses.

Maximum number of fetuses were present in 22 weeks consisting of 9 cases followed by 8 cases which were present in 29 weeks and no cases were present in 12, 16, 18, 26, 36 and 38 weeks. Maximum numbers of male fetuses were present in 22 weeks having 5 cases followed by 4 cases in 19, 25 and 35 weeks and no cases seen in 11, 12, 13, 14, 16, 17, 18, 24, 32, 33, 36 and 38. Female fetuses were maximum in 27 and 29 weeks consisting of 5 cases each. Next in sequence was 22 weeks having 4 cases and no cases were seen in 11, 12, 13, 16, 18, 26, 36 and 38. The non recognized 4 cases were noted in 11th gestational weeks. The mean foot length was 0.825, 1.4, 1.7, 2.03, 2.6, 3.025, 3.45, 3.65, 4.025, 4.275, 4.5, 4.89, 5.2, 5.455, 5.75, 6.02, 6.225, 6.515, 6.9, 7.15, 7.775 and 8.2 in 11, 13, 14, 15, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 37 and 39 gestational weeks respectively. The mean foot length progressively increased with increase in gestational age and also measurements were same in male and female fetuses.

Table No 2: Distribution of cases according to gestational age, Hand Length of fetuses. (n=100).

<table>
<thead>
<tr>
<th>Gestational age in weeks</th>
<th>No. ofcases</th>
<th>Hand Length</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Range</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>04</td>
<td>0.6 - 0.8</td>
<td>0.68</td>
</tr>
<tr>
<td>12</td>
<td>00</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>13</td>
<td>02</td>
<td>1-1.1</td>
<td>1.05</td>
</tr>
<tr>
<td>14</td>
<td>02</td>
<td>1.4</td>
<td>1.4</td>
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<tr>
<td>15</td>
<td>06</td>
<td>1.4-1.6</td>
<td>1.55</td>
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<td>16</td>
<td>00</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>17</td>
<td>02</td>
<td>2-2.1</td>
<td>2.05</td>
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<td>18</td>
<td>00</td>
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<td>19</td>
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<td>1.6-2.8</td>
<td>2.44</td>
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<td>06</td>
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<td>3.05</td>
</tr>
<tr>
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<td>09</td>
<td>2.5-3.5</td>
<td>3.03</td>
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</table>
Table No 2: Distribution of cases according to gestational age, Hand Length of fetuses. (n=100) (Contd.)

<table>
<thead>
<tr>
<th>Gestational age in weeks</th>
<th>No. of cases</th>
<th>Hand Length</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Range</td>
<td>Mean</td>
</tr>
<tr>
<td>23</td>
<td>03</td>
<td>3.5-3.6</td>
</tr>
<tr>
<td>24</td>
<td>03</td>
<td>3.4-3.5</td>
</tr>
<tr>
<td>25</td>
<td>07</td>
<td>3.7-4.2</td>
</tr>
<tr>
<td>26</td>
<td>02</td>
<td>3.9-4.3</td>
</tr>
<tr>
<td>27</td>
<td>07</td>
<td>4.3-5</td>
</tr>
<tr>
<td>28</td>
<td>03</td>
<td>4.3-4.6</td>
</tr>
<tr>
<td>29</td>
<td>08</td>
<td>4.3-5.2</td>
</tr>
<tr>
<td>30</td>
<td>——</td>
<td>——</td>
</tr>
<tr>
<td>31</td>
<td>05</td>
<td>5.5-5.3</td>
</tr>
<tr>
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<td>4.8-5.6</td>
</tr>
<tr>
<td>33</td>
<td>02</td>
<td>5.6</td>
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<td>——</td>
</tr>
<tr>
<td>35</td>
<td>02</td>
<td>5.6-6.5</td>
</tr>
<tr>
<td>36</td>
<td>02</td>
<td>6.1-6.5</td>
</tr>
<tr>
<td>37</td>
<td>05</td>
<td>6-6.8</td>
</tr>
<tr>
<td>38</td>
<td>——</td>
<td>——</td>
</tr>
<tr>
<td>39</td>
<td>04</td>
<td>6.5-6.8</td>
</tr>
</tbody>
</table>

Table no 02 depicts that the average hand length (HL) was 0.68 cm, 1.05 cm, 1.4 cm, 1.55 cm, 2.05 cm, 2.44 cm, 2.65 cm, 3.05 cm, 3.03 cm, 3.47 cm, 3.89 cm, 4.1 cm, 4.49 cm, 4.47 cm, 4.78 cm, 5.18 cm, 5.22 cm, 5.6 cm, 6.05 cm, 6.27 cm, 6.24 cm and 6.6 cm in 11, 13, 14, 15, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 37 and 39 weeks respectively.

Statistical analysis of the study

Table No 03: Coefficients of dependable variables of foot length.

<table>
<thead>
<tr>
<th>Model Coefficients</th>
<th>Unstandardized Coefficients</th>
<th>Coefficients</th>
<th>t</th>
<th>Sig.</th>
<th>95% Confidence Interval for B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
<td>Lower Bound</td>
</tr>
<tr>
<td>1 (Constant)</td>
<td>-1.875</td>
<td>0.059</td>
<td>-31.972</td>
<td>.000</td>
<td>-1.991</td>
</tr>
<tr>
<td>G. AGE</td>
<td>0.265</td>
<td>0.002</td>
<td>0.996</td>
<td>117.953</td>
<td>.000</td>
</tr>
</tbody>
</table>

Table No 04: Coefficients of dependable variables of hand length.

<table>
<thead>
<tr>
<th>Model Coefficients</th>
<th>Unstandardized Coefficients</th>
<th>Coefficients</th>
<th>t</th>
<th>Sig.</th>
<th>95% Confidence Interval for B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
<td>Lower Bound</td>
</tr>
<tr>
<td>1 (Constant)</td>
<td>-1.664</td>
<td>0.100</td>
<td>-16.605</td>
<td>.000</td>
<td>-1.863</td>
</tr>
<tr>
<td>G. AGE</td>
<td>0.218</td>
<td>0.004</td>
<td>0.985</td>
<td>56.963</td>
<td>.000</td>
</tr>
</tbody>
</table>

Table No 05: Model Summary of relationship between the Gestational age (Predictors) and foot length (Dependent Variable).

<table>
<thead>
<tr>
<th>Model</th>
<th>r</th>
<th>r Square</th>
<th>Adjusted r Square</th>
<th>Std. Error of the Estimate</th>
<th>Change Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>r Square Change</td>
<td>F Change</td>
<td>df1</td>
<td>df2</td>
<td>Sig. F Change</td>
</tr>
<tr>
<td>1</td>
<td>0.996</td>
<td>0.993</td>
<td>0.993</td>
<td>0.16473</td>
<td>0.993</td>
</tr>
</tbody>
</table>
Table No 06: Model Summary of relationship between the Gestational age (Predictors) and hand length (Dependent Variable).

<table>
<thead>
<tr>
<th>Model</th>
<th>r</th>
<th>r Square</th>
<th>Adjusted r Square</th>
<th>Std. Error of the Estimate</th>
<th>Change Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>r Square Change</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F Change</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>df1</td>
</tr>
<tr>
<td>1</td>
<td>0.985</td>
<td>0.971</td>
<td>0.970</td>
<td>0.28152</td>
<td>0.971</td>
</tr>
</tbody>
</table>

r = Correlation coefficient, F = Variance ratio, df = Degrees of freedom, T = Derived from Student’s T test.

Scatter Diagram No. 01

Showing Linear Co-relationship of Hand Length to Gestational Age

Mathematical formula for calculating gestational age in weeks from foot length and hand length.

1) \( \text{GA} = \frac{(1.875 + \text{FL})}{0.059} \quad \text{Std. Error of the Estimate} = 0.16 \)

2) \( \text{GA} = \frac{(1.664 + \text{HL})}{0.218} \quad \text{Std. Error of the Estimate} = 0.28 \)

\( \text{GA} = \) Gestational age in weeks,

\( \text{FL} = \) foot length in cm,

\( \text{HL} = \) Hand length in cm.

A statistically significant linear relationship was observed between fetal foot length (FL) and gestational age \( (r = 0.996, p < 0.0001) \) and also statistically significant linear relationship found between fetal hand length (FL) and gestational age \( (r = 0.985, p < 0.0001) \)

DISCUSSION

Gestational age estimated by foot length in current study coincide well with that of Hern W. M\(^{13}\), Mercer M et al\(^{14}\), Platt L D et al\(^{15}\), Goldstein I et al\(^{09}\) and Chatterjee M S\(^{16}\) et al while it is more or less similar to the findings obtained from study of Munsick A\(^{17}\), Kumar G.P et al\(^{02}\), Archie J G et al\(^{18}\), and B.Manjunath et al\(^{19}\) with difference of less or equal to 0.5 cm.

Similarly fetal age estimation using hand length in present study matched well with that of Kumar G.P et al\(^{02}\) and John G et al\(^{18}\) with difference of less or equal to 0.5 cm.

Most of the findings of this study were consistent with the study of other authors, while some findings were deviating owing to the difference in amount of data and population, samples of study; genetic and environmental factors who affects foetal development and interfere with the right age estimation related to the particular studied area.

CONCLUSION

Foot length and hand length of the fetuses has
shown a high correlation with gestational age, which reflects the accuracy of present study. Thus it can serve as highly reliable parameter in the assessment of gestational age especially in fragmented remains of foetus, where other parameters like crown heel length, weight, etc. cannot be assessed. Similarly in certain ill new born babies, premature babies nursed in incubators, and receiving intensive care, foot and hand are usually readily accessible for measurement of its length. Other advantages are this method is non invasive, no need for any special training to calculate gestational age as it is simple to perform, less time consuming and more economical especially in rural areas in developing countries like India.

ACKNOWLEDGEMENT

We would like to thank Dr. M.B. Shrigiriwar, Prof & Head, FMT Dept., SVNGMC, Yavatmal, Dr.A.N.Keoliya, Prof & Head, FMT Dept, IGGMC, Nagpur & Dr.A.G.Wankhede, Prof, FMT Dept, SKNMC, Pune for their valuable guidance and constant encouragement.

Conflict of interest: None.

Source of support: Self.

Ethical clearance: Institutional ethical committee clearance of Indira Gandhi Govt. Medical College, Nagpur, Maharashtra on November 2007.

REFERENCES

2. Kumar GP, Kumar UK. Estimation of gestational age from hand and foot length. Medicine, science and law; 1993; Vol.33, No.4, 48-50.
16. Platt L. W. et al, Fetal foot length: Relationship to menstrual age and fetal measurements in the
Foramena Magnum Dimensions: An Aid in Identification of Gender

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ABSTRACT

Determination of deceased sex is first step in skeletal analysis since estimation of age, race, and stature depends on sex of deceased. Total 100 adult human skulls (50 male and 50 female) of Hyderabad-Karnataka region are studied. Measurements like foramena magnum length and foramena magnum breadth were measured. The demarking point (D.P.) and identification point (I.P.) of both measurements was calculated and then percentage of bones identified by D.P. and I.P. was recorded. Though, the Demarking Point of a single parameter may not identify sex in all the bones but the accuracy is nearly 100% in the bones, which are identified. Percentage of skulls identified by IP and DP of foramena magnum length is more as compared to foramena magnum breadth. So foramena magnum length gives better prediction of sex as compared to foramena magnum breadth.

Keywords: Foramena magnum length, Foramena magnum breadth, Demarking Point, Identification Point, Sexing of Cranium

INTRODUCTION

Several forensic anthropologists have described qualitative sex differentiation using many bones, but sexing from single bone is difficult task. Almost all the elements of human skeleton show some degree of sexual dimorphism, but reliable indicators can be obtained from specific bones like hip bone, skull and sacrum. The determination of deceased sex is first step in skeletal analysis since estimation of age at death, race, and stature depends on sex of deceased.

The measurements of the skeleton bones, mainly the neurocranium (brain case) and viscerocranium, suffer influences of various factors; however, they are often used for human population morphological studies of age estimation, stature, ethnicity, which are relevant aspects of forensics investigation and anthropological examinations of unknown individuals1.

Recent studies report that morphometry is a fast and efficient method for the evaluation of morphological characteristics, such as ethnicity, gender, age, genetic factors, dietary habits, and regional variations which can alter the shape and size of bone structures. These aspects are significantly important in determining the anthropometric changes between different populations and genders2.

Traditional method is non-metrical and morphological. Morphological features of bones depend upon nutrition, occupation, race and geography of the region, so the traditional method is not reliable in the study of bones.

In this study length and breadth of foramena magnum were studied. They were analysed statistically by applying routine statistical data like identification point and demarking point.
MATERIALS AND METHOD

The materials for the present study consisted of 100 adult human skulls of known sex (50 male and 50 female) available in the Department of Forensic Medicine and Toxicology and Department of Anatomy of M. R. Medical College and K. B. N. Medical College Gulbarga, Karnataka. Following parameters were studied:

1. Foramena magnum length (FML): Foramena magnum length is the distance between basion and opisthion. It was recorded with the help of sliding vernier caliper.

2. Foramena magnum breadth (FMB): Foramena magnum breadth was measured at the broadest part of foramena magnum with the help of sliding vernier caliper.

As the first part of the study, all the values were tabulated and analyzed statistically by routine statistical methods.

The value of Range, Mean, Standard Deviation (SD), Calculated Range (mean ± 3SD), Demarking Point and Identification Point were obtained. Maximum value of female range is considered as identification point for male. Minimum value of male range is considered as identification point for female. Maximum value of female calculated range is considered as demarcation point for male. Minimum value of male calculated range is considered as demarcation point for female. In case where female range/calculated range maximum value of male range/calculated range is considered as Identification point/Demarcation point for female and minimum value of female range/calculated range is considered as identification point/demarcation point for male. Subsequently ‘t’ is applied to both parameters.

OBSERVATIONS

The Range, Mean, Calculated Range (mean ± 3 S.D.), Demarking Points (DP), Identification Point (IP) and the percentage of bones in which sex could be identified by them, are given in table no. 1 and 2.

Table No 1. Statistical analysis of foramena magnum length of skull.

<table>
<thead>
<tr>
<th>Details of measurements</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>33.46</td>
<td>29.62</td>
</tr>
<tr>
<td>SD</td>
<td>5.04</td>
<td>2.01</td>
</tr>
<tr>
<td>Range</td>
<td>26-43</td>
<td>24-34</td>
</tr>
<tr>
<td>Identification point(IP)</td>
<td>&gt;34</td>
<td>&lt;26</td>
</tr>
<tr>
<td>% of bones identified by IP</td>
<td>38%</td>
<td>06%</td>
</tr>
<tr>
<td>Standard error</td>
<td>0.71</td>
<td>0.28</td>
</tr>
<tr>
<td>Calculated range</td>
<td>18.33-48.59</td>
<td>23.59-35.65</td>
</tr>
<tr>
<td>Demarking point(DP)</td>
<td>&gt;35.65</td>
<td>&lt;18.33</td>
</tr>
<tr>
<td>% of bones identified by DP</td>
<td>34%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Percentage of skulls identified by IP alone was 38% of males and 06% of females. The percentage of skulls identified by DP alone was 34% of males and 0% of females. ‘t’ test was highly significant with p<0.001.

Table No 2. Statistical analysis of foramena magnum breadth of skull.

<table>
<thead>
<tr>
<th>Details of measurements</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>29.86</td>
<td>27.64</td>
</tr>
<tr>
<td>SD</td>
<td>2.09</td>
<td>2.35</td>
</tr>
<tr>
<td>Range</td>
<td>25-36</td>
<td>23-33</td>
</tr>
<tr>
<td>Identification point(IP)</td>
<td>&gt;33</td>
<td>&lt;25</td>
</tr>
<tr>
<td>% of bones identified by IP</td>
<td>02%</td>
<td>08%</td>
</tr>
<tr>
<td>Standard error</td>
<td>0.30</td>
<td>0.33</td>
</tr>
<tr>
<td>Calculated range</td>
<td>23.6-36.13</td>
<td>20.6-34.7</td>
</tr>
<tr>
<td>Demarking point(DP)</td>
<td>&gt;34.7</td>
<td>&lt;23.6</td>
</tr>
<tr>
<td>% of bones identified by DP</td>
<td>02%</td>
<td>02%</td>
</tr>
</tbody>
</table>
Percentage of skulls identified by IP alone was 02% of males and 08% of females. The percentage of skulls identified by DP alone was 02% of males and 02% of females. ‘t’ test was highly significant with p<0.001.

**DISCUSSION**

The female skull retains the gracile attributes seen in prepubescent skull. Male cranium becomes markedly rougher in adulthood, the differentiating features of sex become more prominent after puberty, again towards old age there occurs blurring of sexually dimorphic traits. So the determination of sex from bones should ideally be limited to 15-55 years of age. Krogman WM (1978) analyzed 750 skeletons and came to a conclusion that the determination of sex is possible with accuracy of about 100% if whole skeleton is available, 92% when skull alone and 98% when both pelvis and skull are available. A great number of measurements of the skull have been proposed and used by different investigators during the past. Martin and Saller used eighty one measures; Howell described seventy; Hrdlicka lists thirty two; Bass gives twenty three.

In the present study both length and breadth of foramen magnum are statistically significant. The results are compared with those of previous workers as shown in table no. 3 & 4.

<table>
<thead>
<tr>
<th>Sl</th>
<th>Name of worker</th>
<th>Male</th>
<th>Female</th>
<th>SS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N</td>
<td>M</td>
<td>R</td>
</tr>
<tr>
<td>1</td>
<td>Keen (1950)</td>
<td>50</td>
<td>36.3</td>
<td>30-44</td>
</tr>
<tr>
<td>2</td>
<td>Hong Wei Song 1992</td>
<td>30</td>
<td>34.1</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Deshmukh(2003)</td>
<td>40</td>
<td>34</td>
<td>26-40</td>
</tr>
<tr>
<td>4</td>
<td>Present study (2009)</td>
<td>50</td>
<td>33.46</td>
<td>26.43</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sl</th>
<th>Name of worker</th>
<th>Male</th>
<th>Female</th>
<th>SS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>1</td>
<td>Hong Wei Song 1992</td>
<td>30</td>
<td>27.5</td>
<td>2.4</td>
</tr>
<tr>
<td>2</td>
<td>Deshmukh(2003)</td>
<td>40</td>
<td>29</td>
<td>1.97</td>
</tr>
<tr>
<td>3</td>
<td>Present study (2009)</td>
<td>50</td>
<td>29.86</td>
<td>2.09</td>
</tr>
</tbody>
</table>

Catalina-Herrera (1987) indicated that the sagittal and transverse dimensions of the foramen magnum were significantly higher in men’s skulls. Zaidi & Dayal (1988) classified a sample of Indian skulls according to the shape and dimensions of the foramen magnum, reporting differences between the skulls of male and female, which was similar to the findings of Henriquez-Pino et al. (1995) in the Brazilian skulls.

**CONCLUSION**

Among both parameters statistically analysed, considering the Demarking Point and Identification point, the most reliable parameter is foramen magnum length as compared to the breadth of foramen magnum. So foramen magnum length gives better prediction of sex as compared to the breadth of foramen magnum.

**ACKNOWLEDGEMENT**

I thank Dr. Mallikarjun B., dean M. R. Medical College, Gulbarga for encouraging and securing me the all the required facilities for the work.

I express my humble gratitude to all the staff members of Dept. Of Forensic Medicine and Toxicology, M. R. Medical College, Gulbarga for their motivation and constructive ideas during the study.

I thank Mr. Sangam statistician, for his assistance and positive feedback during statistical analysis.

**Source of funding:** Self

**Ethical clearance:** Taken

**Conflict of Interest Statement:** “The undersigned author / authors hereby declare that the article is
original, neither the article nor a part of it is under
consideration for publication anywhere else and has
not been previously published anywhere. We have
declared all vested interests. We have meticulously
followed the instructions. The article, if published, shall
be the property of the Journal and we surrender all
rights to the Editors. We agree to provide the latest
follow up of cases prior to the publication of case
reports when requested”

REFERENCES

1. ISCAN, MY. Global forensic anthropology in the
21st century. Forensic Science International. 2001,

2. HUMPHREY, LT., DEAN, MC. and STRINGER,
CB. Morphological variation in great ape and

Toxicology, 14th edition, Paras Publication, Page
No.56 (2004).

4. Krogman WM. The human skeleton in forensic
medicine. Charles C, Thomas, Springfield,
Illinois, 1962; USA.

5. Keen JA (1950) “Sex differences in skull”, APJA,
8(1), Page No.65-79.

6. Hong Wei Song, Zi, Qing Lin and Jing Tao Jia.
Sex diagnosis of Chinese skulls using multiple
stepwise discriminant functional analysis.

7. Deshmukh AG & Deverthi DB comparison of
Cranial Sex determination by univariate and
multivariate analysis, Joint Anatomy Society of
India 55 (2), Page No.48-51,(2006).

8. Catalina-Herrera, C. J. Study of the anatomic
metric values of the foramen magnum and its
1987.

of foramen magnum in Indian skulls. Anat. Anz.,

10. Henríquez-Pino, J.; Cricenti, S. V. & Didio, L. J.
A. Morfometría del foramen magno y su relación
con el tipo de cráneo en individuos brasileños.
INTRODUCTION

Mysteries, particularly the homicidal have often created ripples in the history of Forensic Science, raising so many questions, most important being "Time of death" (or "time since death"). Establishing the times of an assault and death has a direct bearing on the legal questions of alibi and opportunity. The physical changes in the deceased are the important criteria to give a fair range of time since death. The present study was carried out in Shri. Vasantrao Naik Government Medical College, Yavatmal, Maharashtra, India. The detail postmortem examination of the deceased forwarded for autopsy had been carried out and the postmortem changes were noted. Vitreous humor samples were collected from the eyes of 152 deceased from the autopsies conducted in mortuary at Shri. Vasantrao Naik Government Medical College, Yavatmal and analyzed for Magnesium levels. Main objective of this study is to investigate the utility of vitreous magnesium levels and physical changes after death for determination of time since death. The approximate time of death can be estimated from physical changes after death in human. It is evident that the longer the time interval between death and the examination of the body the wider will be the limits of probability. The level of Magnesium in the vitreous humour after death is not a reliable criterion for determination of time since death.

Keywords: Time Since Death; Death Changes; Vitreous Humor; Magnesium

MATERIALS AND METHOD

Materials

The study was carried out in Shri. Vasantrao Naik Government Medical College, Yavatmal. The dead
bodies brought to the mortuary at Shri. Vasantrao Naik Government Medical College, Yavatmal were used as material for study purpose. The information regarding exact time of death was gathered from police inquest report, dead body challan, clinical details from hospital records; correlated and checked from relatives, friends and attendants of the deceased. Cases where exact time of death was not known were not included in this study. The autopsies conducted in mortuary at Shri. Vasantrao Naik Government Medical College, Yavatmal. Vitreous humor samples were collected from the eyes of 152 deceased from the autopsies conducted in mortuary at Shri. Vasantrao Naik Government Medical College, Yavatmal. After vitreous sample collection detailed postmortem examination carried out and the general relevant findings were documented in the proforma with details of postmortem lividity, rigor mortis, external and internal sign of decomposition. All the information about the deceased i.e. age, sex, address, cause of death, exact time of death, temperature recorded. The ambient temperature ranged 20-35°C before the samples were taken.

The vitreous samples drawn from the eyes of deceased at the beginning of postmortem examination of dead body to the mortuary, (only the clear samples will be taken, samples having any particulate matter discarded). Vitreous humour was collected at autopsy from the posterior chamber of the each eye, slowly and gradually avoiding tearing of loose fragments of tissues by needle aspiration through a puncture made 5-6 mm away from the limbus (sclero-corneal junction) using 10 ml sterile syringe and 20 gauze needle and poured in a rubber stoppered vial. The liquid paraffin gel was injected in posterior chamber of each eye for cosmetic purposes.

**Biochemical analyses**

Presterilized syringe was used and rubber stoppered glass vials washed with deionised double distilled water and dried in hot air oven. The samples after collection in a rubber stoppered vial was labeled and transported to the biochemistry laboratory for analysis. The vitreous samples were centrifuged at 3000 rpm for 10 minutes; biochemical analysis for magnesium was carried out immediately using a Beckman Coulter LX20 Automated Analyzer.

**Statistical methods**

The statistical analyses for the data were carried out using the Statistical Package for Social Sciences (SPSS®) for Windows™ Version 13.0.

**RESULTS**

The study includes total 152 samples. Out of 152 cases, 96 subjects in all were males and 56 were females in the age group of 07 to 80 years (Mean ± SD, 35.38 years ± 14.37 years) and the known postmortem interval ranges from 1.6 hours to 39.2 hours (Mean ± SD, 13.01± 7.22 hours).

**Appearance of Early And Late Death Changes**

Out of the 152 subjects, postmortem lividity appeared in patches in 26 cases, well formed in 121 cases. It was not fixed in 75 cases, fixed in 72 cases and dispersed in 5 cases. Out of the 152 subjects, rigor not appeared in 05 cases, appeared in 45 cases and well marked in 87 cases. It starts disappearing in 12 cases, passed off in 03 cases.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Rigor Mortis</th>
<th>PM lividity (NF/F)</th>
<th>Ext.s/o decom.</th>
<th>Int.s/o decom.</th>
<th>Duration (Hours)</th>
<th>No. of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Not appear</td>
<td>In patches (NF)</td>
<td>Absent</td>
<td>Absent</td>
<td>00 to 03</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>Appeared</td>
<td>In patches (NF)</td>
<td>Absent</td>
<td>Absent</td>
<td>01 to 04</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>Appeared</td>
<td>Well formed (NF)</td>
<td>Absent</td>
<td>Absent</td>
<td>03 to 08</td>
<td>31</td>
</tr>
<tr>
<td>3</td>
<td>Well marked</td>
<td>In patches (NF)</td>
<td>Absent</td>
<td>Absent</td>
<td>03 to 09</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Well marked</td>
<td>Well formed (NF)</td>
<td>Absent</td>
<td>Absent</td>
<td>04 to 09</td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>Well marked</td>
<td>Well formed (F)</td>
<td>Absent</td>
<td>Absent</td>
<td>08 to 18</td>
<td>51</td>
</tr>
<tr>
<td>6</td>
<td>Well marked</td>
<td>Well formed (F)</td>
<td>Present</td>
<td>Absent</td>
<td>12 to 24</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>Well marked</td>
<td>Well formed (F)</td>
<td>Absent</td>
<td>Present</td>
<td>12 to 24</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Well marked</td>
<td>Well formed (F)</td>
<td>Present</td>
<td>Present</td>
<td>18 to 36</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>Start disapp.</td>
<td>Well formed (F)</td>
<td>Absent</td>
<td>Absent</td>
<td>12 to 24</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>Start disapp.</td>
<td>Well formed (F)</td>
<td>Present</td>
<td>Absent</td>
<td>18 to 36</td>
<td>0</td>
</tr>
</tbody>
</table>
Table No. 1. Time since death using death changes in different subgroups and number of cases in those subgroups.

(Contd.)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Rigor Mortis</th>
<th>PM lividity (NF/F)</th>
<th>Ext.s/o decom.</th>
<th>Int.s/o decom.</th>
<th>Duration (Hours)</th>
<th>No. of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Start disapp.</td>
<td>Well formed (F)</td>
<td>Absent</td>
<td>Present</td>
<td>18 to 36</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>Start disapp.</td>
<td>Well formed (F)</td>
<td>Present</td>
<td>Absent</td>
<td>24 to 36</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>Start disapp.</td>
<td>Dispersed</td>
<td>Absent</td>
<td>Absent</td>
<td>18 to 36</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>Start disapp.</td>
<td>Dispersed</td>
<td>Present</td>
<td>Absent</td>
<td>24 to 48</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>Start disapp.</td>
<td>Dispersed</td>
<td>Absent</td>
<td>Present</td>
<td>24 to 48</td>
<td>0</td>
</tr>
<tr>
<td>16</td>
<td>Start disapp.</td>
<td>Dispersed</td>
<td>Present</td>
<td>Present</td>
<td>24 to 72</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>Passed off</td>
<td>Well formed (F)</td>
<td>Absent</td>
<td>Absent</td>
<td>18 to 24</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>Passed off</td>
<td>Well formed (F)</td>
<td>Absent</td>
<td>Present</td>
<td>18 to 36</td>
<td>0</td>
</tr>
<tr>
<td>19</td>
<td>Passed off</td>
<td>Well formed (F)</td>
<td>Absent</td>
<td>Present</td>
<td>18 to 36</td>
<td>0</td>
</tr>
<tr>
<td>20</td>
<td>Passed off</td>
<td>Well formed (F)</td>
<td>Present</td>
<td>Present</td>
<td>24 to 48</td>
<td>0</td>
</tr>
<tr>
<td>21</td>
<td>Passed off</td>
<td>Dispersed</td>
<td>Present</td>
<td>Absent</td>
<td>24 to 48</td>
<td>0</td>
</tr>
<tr>
<td>22</td>
<td>Passed off</td>
<td>Dispersed</td>
<td>Absent</td>
<td>Present</td>
<td>24 to 48</td>
<td>1</td>
</tr>
<tr>
<td>23</td>
<td>Passed off</td>
<td>Dispersed</td>
<td>Present</td>
<td>Present</td>
<td>24 to 72</td>
<td>1</td>
</tr>
</tbody>
</table>

Abbreviation

Start disapp. – start disappearing, NF- not fixed, F- fixed, Ext. s/o decom.- external signs of decomposition, Int. s/o decom. – internal signs of decomposition.

Vitreous Humor Magnesium Concentration

Out of the estimated concentration in the vitreous humor samples collected from 152 subjects the minimum value for vitreous Magnesium concentration was 1.2 mmol/L and the maximum value of 4.5 mmol/L hours with an average of 2.7204 mmol/L (Mean ± SD, 2.7204 ± 0.9193; SEM, 0.0746) shown in table no. 2.

Table 2: The observed concentrations of vitreous humor Magnesium.

<table>
<thead>
<tr>
<th>Constituents</th>
<th>n</th>
<th>Magnesium concentration (mmol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td>Magnesium</td>
<td>152</td>
<td>1.2</td>
</tr>
</tbody>
</table>

The vitreous magnesium against increasing PMI is represented in Graph No. 1. The linear regression correlation of vitreous magnesium and PMI was found to be statistically insignificant (n, 152; R, 0.01; P, NS) vide table no. 3.

Table 3: The observed linear regression analyses correlation of the vitreous humor Magnesium with PMI

<table>
<thead>
<tr>
<th>Constituents</th>
<th>n</th>
<th>r value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium</td>
<td>152</td>
<td>0.01</td>
<td>Non significant (NS)</td>
</tr>
</tbody>
</table>

Graph no. 1.

Graphical representation of the vitreous magnesium concentration against increasing PMI (PMI in hours on X- axis and Mg++ concentration value in mmol/L on Y- axis).

DISCUSSION

Many physico-chemical changes begin to take place in the body immediately or shortly after death and progress in a fairly orderly fashion until the body disintegrates.
Appearance of Death Changes

Rigor mortis is conventionally a postmortem change. Its occurrence suggests that death has occurred at least a few hours ago. In general, rigor appears within 01 to 03 hours after death, establishes (well marked) in 09 to 12 hours, persists for 12 to 24 hours, start disappearing after 18 to 36 hours and passed off in 24 to 36 hours after death.

PM lividity appears in patches in 01 to 03 hours after death, get coalesce within 04 to 06 hours. It is not fixed up to 08 hours after death and get fixed in between 08 to 12 hours after death. It gets dispersed in 24 to 48 hours. The external signs of decomposition appear as greenish discoloration in right iliac fossa in 18 to 36 hours and become generalized in next 24 hours.

Table no.4 (a to d): Appearance of Death Changes (Duration in Hours)

<table>
<thead>
<tr>
<th></th>
<th>4 a. Rigor Mortis</th>
<th>4 b. Postmortem Lividity</th>
<th>4 c. External signs of decomposition</th>
<th>4 d. Internal signs of decomposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigor appears</td>
<td>Established (Well marked)</td>
<td>Persists</td>
<td>Start disappearing</td>
<td>Passed off</td>
</tr>
<tr>
<td>01 to 03</td>
<td>09 to 12</td>
<td>12 to 24</td>
<td>18 to 36</td>
<td>24 to 36</td>
</tr>
<tr>
<td>In patches</td>
<td>Patches coalesce</td>
<td>Not fixed</td>
<td>Fixed</td>
<td>Dispersed</td>
</tr>
<tr>
<td>01 to 03</td>
<td>04 to 06</td>
<td>upto 08</td>
<td>08 to 12</td>
<td>24 to 48</td>
</tr>
<tr>
<td>Right iliac fossa</td>
<td>Greenish discoloration confined to</td>
<td>Generalized</td>
<td>Marbling</td>
<td>Blisters</td>
</tr>
<tr>
<td>18 to 36</td>
<td>24 to 48</td>
<td>24 to 48</td>
<td>36 to 72</td>
<td></td>
</tr>
<tr>
<td>Intimal discoloration</td>
<td>Visceral softening</td>
<td>Brain liquefaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 to 36</td>
<td>24 to 48</td>
<td>36 to 72</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The result of this study are similar with the most of the available literature vide table no. 4. But, each change has its own time factor or rate. Unfortunately, these rates of development of post mortem changes are strongly influenced by unpredictable endogenous and environmental factors. Consequently, the longer the post mortem interval, the wider is the range of estimate as to when death probably occurred. In other words, the longer the post mortem interval, the less precise is the estimate of the time of death.

Vitreous Humor Magnesium:

The vitreous magnesium concentrations observed in the present study are very similar to the concentrations previously reported. The present study did not find a significant correlation between vitreous magnesium and PMI. Out of the estimated concentration in the vitreous humor samples collected from 152 subjects the minimum value for vitreous Magnesium concentration was 1.2 mmol/L and the maximum value of 4.5 mmol/L hours with an average of 2.7204 mmol/L.

PM lividity appears in patches in 01 to 03 hours after death, get coalesce within 04 to 06 hours. It is not fixed up to 08 hours after death and get fixed in between 08 to 12 hours after death. It gets dispersed in 24 to 48 hours. The external signs of decomposition appear as greenish discoloration in right iliac fossa in 18 to 36 hours and become generalized in next 24 hours.

The present study results are in variance with the earlier reported utility of vitreous magnesium in PMI predictions. However these reports were based on data in only particular groups of death like asphyxia and deaths due to Phenobarbital intoxications. Our results are consistent with the earlier findings that reported no significant correlation between vitreous magnesium and PMI.

CONCLUSIONS

The approximate time of death can be estimated from physical changes after death in human. It is evident that the longer the time interval between death and the examination of the body the wider will be the limits of probability. However, even if it gives approximate and fair idea of the time since death it is always beneficiary to forensic expert to guide and help investigating authorities in rural India for investigation into time of death. Also till date there are no other criteria which completely substitute the usual method of collecting information on death changes of the dead body. The level of Magnesium in the vitreous humour
after death is not a reliable criterion for determination of time since death.

**Conflict of Interests:** None.

**Source of Funding:** Self.

**Ethical Clearance:** Approved by institutional ethical committee of Shri. V N Govt. Medical College, Yavatmal.

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**REFERENCES**


21. Tedeschi, forensic Medicine: study of trauma and environmental hazards, Vol II, Postmortem...
chemistry of blood, cerebrospinal fluid and vitreous humour, 1033-1060.


INTRODUCTION

Palatal rugae, also called plicae palatinae transversae and rugae palatina refer to the ridges on the anterior part of the palatal mucosa, each side of the median palatal raphe and behind the incisive papilla. As an entity they form the rugae pattern. Anatomically, the rugae consist of around 3 to 7 rigid and oblique ridges that radiate out tangentially from the incisive papilla.¹

Once formed, they do not undergo any changes except in length, due to normal growth, remaining in the same position throughout an entire person’s life. Not even diseases, chemical aggression or trauma seem to change palatal rugae form.⁴ It is also seen that changes that occurs from orthodontic movements, extraction, aging and palatal expansion do not modify the rugae enough to hamper identification.⁴

Classifications of Palatal Rugae:

Thomas palatal rugae classification⁵

<table>
<thead>
<tr>
<th>Classification</th>
<th>Rugae type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Diverge</td>
</tr>
<tr>
<td>2</td>
<td>Converge</td>
</tr>
<tr>
<td>3</td>
<td>Curve</td>
</tr>
<tr>
<td>4</td>
<td>Wavy</td>
</tr>
<tr>
<td>5</td>
<td>Straight</td>
</tr>
<tr>
<td>6</td>
<td>Circular</td>
</tr>
</tbody>
</table>

Da Silva simple palatal rugae classification¹

<table>
<thead>
<tr>
<th>Classification</th>
<th>Rugae type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line</td>
</tr>
<tr>
<td>2</td>
<td>Curve</td>
</tr>
<tr>
<td>3</td>
<td>Angle</td>
</tr>
<tr>
<td>4</td>
<td>Circle</td>
</tr>
<tr>
<td>5</td>
<td>Wavy</td>
</tr>
<tr>
<td>6</td>
<td>Point</td>
</tr>
</tbody>
</table>

A Study on Identification of Palatal Rugae Pattern among Males and Females of Lucknow City

Renuka Verma¹, Ridhi Narang⁷, Anil Singh³, Rohit Jaiswal⁴
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ABSTRACT

Palatoscopy, or palatal rugoscopy, is the name given to the study of palatal rugae in order to establish a person’s identity. Palatal rugae have been shown to be highly individual and consistent in shape throughout the life. It is well established fact that the palatal rugae pattern is unique to human, as his fingerprints. Rugae patterns have been studied for various purposes, mainly in the fields of anthropology, comparative anatomy, genetics, forensic odontology, prosthodontics and orthodontics.

Keywords: Palatal Rugae, Human Identification, Forensic Odontology, Palatoscopy

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AIM

The aim of this study is to identify and compare the rugae pattern in males and females of Lucknow city.

MATERIAL AND METHOD

Total number of 60 subjects, 30 males and 30 females were selected. All subjects were healthy individuals free of congenital abnormalities, inflammation and trauma. Irreversible hydrocolloid impression material was used along with appropriate perforated impression tray for the maxillary arch. The impression was then poured into dental stone. Care was taken that all casts must be free of air bubbles or voids especially at the anterior third of the palate.

The method of rugae identification was based on the classification of Thomas et al. (1983). This classification includes number, shape and size. The shapes are classified into curved, wavy, straight and circular. Fragmented rugae are those which have length less than 5 mm. All the identification and measurements were done by one examiner and the readings were repeated three times for each cast. The intraexaminer reliability coefficient was found out to be 0.84. Fragmented type of rugae of size less than 5 mm were ignored. Calcorrugoscopy was placed on the cast and the measurement in mm was done using a metallic ruler & divider.

RESULTS

The present study comprised on 60 subjects of whom 30 were males and 30 were females. No significant difference was found among gender according to the number of rugae.

Table 1: Comparison of size of rugae in two genders

<table>
<thead>
<tr>
<th>Sex</th>
<th>Less Than 5 Mm</th>
<th>5-10 mm</th>
<th>More Than 10 Mm</th>
<th>Total No. of Patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>MALE</td>
<td>16</td>
<td>5.7</td>
<td>138</td>
<td>49.1</td>
</tr>
<tr>
<td>FEMALE</td>
<td>30</td>
<td>11.0</td>
<td>116</td>
<td>42.6</td>
</tr>
<tr>
<td>χ²</td>
<td>5.159</td>
<td>2.325</td>
<td>0.071</td>
<td></td>
</tr>
<tr>
<td>p</td>
<td>0.023</td>
<td>0.127</td>
<td>0.790</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: This table shows gender size distribution of subjects classified according to the size of the rugae. Females had significantly more rugae of size less than 5 mm as compared to males (p=0.023). No significant difference among gender was observed for rugae size of 5-10 mm or more than 10 mm.

Table 2: Comparison of different shapes of Rugae in two genders

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>Shape</th>
<th>MALE (N=281)</th>
<th>FEMALE (n=272)</th>
<th>χ²</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Converge</td>
<td>10</td>
<td>3.56</td>
<td>16</td>
<td>5.88</td>
</tr>
<tr>
<td>2</td>
<td>Diverge</td>
<td>13</td>
<td>4.63</td>
<td>16</td>
<td>5.88</td>
</tr>
<tr>
<td>3</td>
<td>Curve</td>
<td>87</td>
<td>30.96</td>
<td>69</td>
<td>25.37</td>
</tr>
<tr>
<td>4</td>
<td>Wavy</td>
<td>89</td>
<td>31.67</td>
<td>112</td>
<td>41.18</td>
</tr>
<tr>
<td>5</td>
<td>Straight</td>
<td>76</td>
<td>27.05</td>
<td>58</td>
<td>21.32</td>
</tr>
<tr>
<td>6</td>
<td>Circular</td>
<td>6</td>
<td>2.14</td>
<td>1</td>
<td>0.37</td>
</tr>
</tbody>
</table>
Table 2: This table shows gender wise distribution of subjects based upon different shapes of rugae pattern. Wavy pattern was found to be more in females as compared to males and the difference was statistically significant (p=0.020) whereas circular pattern was more in males as compared to females and the difference was again statistically significant (p=0.043).

**DISCUSSION**

The anatomical position of the palatal rugae inside the oral cavity is surrounded by cheek, lips, tongue, teeth and buccal pad of fat. Rugae are amongst the best protected, morphologically individualizing soft tissue structure in the body, which are preserved after death and also accessible during life.6

The earlier references to the palatal rugae occur in various works on general anatomy. Winslow(1732) seems to have been the first to describe them in an anatomy text. Palatal rugae was first illustrated by Santorin in 1775 in Tabula VII of his septemdiciem Tabulae, a drawing depicting three continuous wavy lines which cross the midline of the palate. Palatal rugoscopy was first proposed in 1932, by a spanish investigator called Trobo Hermosa.7,8,9

There are several ways to analyse palatal rugae. Intraoral inspection is probably the most used and also the easiest and the cheapest. However, it can create difficulties if a future comparative exam is required.10 A more detailed and exact study, as well as the need to preserve evidence may justify oral photography or oral impression.11

_Calcorrugoscopy_, or the overlay print of palatal rugae in a maxillary cast, can be used in order to perform comparative analysis. By using _stereoscopy_, for example, one can obtain a three dimensional image of palatal rugae anatomy. It is based on the analysis of two pictures taken with the same camera, from two different points, using special equipment. Another technique is the _sterophotogrammetry_ which, by using a special device called Traster Marker, allow for an accurate determination of the length and position of every single palatal ruga. However, due to its simplicity, price and reliability, the study of _maxillary dental casts_ is the most used technique.1

The method used in this study (Thomas et al, 1983) was found to be the most practical and easiest to apply compared with other methods.

In the present study no significant difference was found among males and females according to the number of rugae. Similar results were obtained by Kapali et al. (1997)12 whereas according to Dohke M and Osato S (1994) females had fewer rugae than males and contrastingly Palatinas et al. (2009)13 found that number is slightly higher in males than females.

In the present study Wavy and Curve form are most common and straight and Circular type is least common. Wavy pattern was found to be more in females and circular pattern more in males and the difference was statistically significant. According to Fahmi et al. (2001)5 there was no significant difference in the number & size of rugae seen in converge type (females) and circular type (males).

**CONCLUSION**

Palatal rugae appear to possess the features of ideal forensic identification parameters, i.e. uniqueness, postmortem resistance, & stability. Thus, in certain situations, if teeth are lost due to any reason, the most common of which is trauma, then the use of human palatal rugae can be suggested as an alternative method for identification.

**Support:** None

**Conflicts of Interest:** None

**Acknowledgement:** None

**Ethical Clearance:** Institutional Ethical Committee.

**REFERENCES**


Superstitious Belief Leading to a Torturous Killing: A Case Study

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ABSTRACT
Worldwide weird religious rituals are still prevalent in almost all the societies. The various forms of application of this magical spells for the so called benefit of humans have evolved according to the cultural context. Black Magic, Paganism, Maleficium, witchcraft and superpower are various such evolution of practicing magic. A case of such inhuman torture with such belief from the state of Uttar Pradesh in India is discussed, where a 14 years young girl was allegedly beaten to death by her own father on the pretext of being possessed by some evil power. The postmortem examination findings were analyzed with respect to the history provided.

Keywords: Rituals, Witchcraft, Evil Power, Torture

INTRODUCTION
Witchcraft human practices are not new to the present day society, various literatures have confirmed the same and they are prevalent mainly in the underdeveloped and developing society especially among uneducated rural class. In a society, inhuman activities like self-torture or injuring human beings to the extent of sacrificing your own loved ones are carried out in a belief of ending their misfortunes and mishappenings. Witchcraft is a practice of magical faculties on human for their misfortunes.

Similarly various forms of rituals are followed to get rid of evil possessed body. These rituals sometimes involve gruesome acts to the extent of killing the person during those torturous activities. Here we present a case of such brutality, which was referred to our institute for a specialized treatment, but finally died due to head injury.

CLINICAL HISTORY
A young girl of about 14 years of age was brought to the PGIMER emergency trauma center by her neighbors with multiple injuries all over her body. As it was informed by the investigating officer and the relatives, the deceased was suffering from some viral eruptions for the past few days. Due to some religious belief, her father suspected the same to be the result of some evil power. She was tortured by her father, inflicting sharp edged injuries with a knife and blunt trauma with a wooden plank. She was rescued by her neighbors and brought to the hospital, where she succumbed to the injuries. Peculiar pattern of the injuries were corroborating with the alleged suspicion of torturing her with some religious belief.

Autopsy Findings
Deceased was 145cm in length and weighed 42.7 kg. 16 injuries were caused by blunt weapon and one by sharp weapon was present on the body of the deceased.

A clean cut incised wound involving nostrils with nasal bone cut was present. Seven lacerated wounds of varying sizes were present over the face. Two lacerated wounds with contused margins were present on the scalp. Reddish blue contusions of varying sizes were noted around both ears, both arms and left thigh.

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Reddish abrasions of various sizes and shapes were noted over right arm and over upper part of abdomen.

On internal examination, skull showed coronal and sagittal sutural separation. A thick layer of subdural hemorrhage was noticed over left cerebral lobes. Patchy subarachnoid hemorrhage was present all over the cerebral lobes. Multiple petechial hemorrhages were present in the parenchyma of both cerebral and cerebellar lobes. Brain was edematous, with gyri flattened and sulci narrowed. Unci and tonsils were grooved. Right lobe of liver showed two superficial lacerations. The cause of death was given as Cranio cerebral damage consequent to blunt trauma to head.

DISCUSSION

Wounds that are caused with intention of homicide are usually single, deep stab wound, mainly seen over chest, neck, head and neck. Features of self-inflicted wounds usually involve accessible body parts; particularly the neck, wrists and chest wall and follow the contours of the body. Injured parts are ‘less sensitive’ i.e. rarely involving lips, ears. Tentative or hesitation marks are highly characteristic of self-inflicted wounds.

Wounds that are inflicted during torture tend to be deliberately delivered to cause pain and humiliation rather than incapacitation, and are often found on the face and they may be associated with more damaging injuries, such as blunt force trauma to the head.

In this case on analyzing the wound pattern and their region, most of the wounds were clustered in around the face of the deceased. The incised wound over the nose indicates most likely to be caused with a purpose of humiliating the victim. The lacerated wounds over the scalp were the fatal injuries. Such rituals do not primarily intend to kill a person, but just to inflict pain on the possessed body, so that the evil spirit possessing the body will free it. The bruises and contusions present over the arms would have been mostly happened when the victim is forcefully restrained. All these features suggest the torturous nature of the wounds.

The belief in and the practice of magic has been present since the earliest human cultures and continues to have an important religious and medicinal role in many cultures today. Belief in and practice of witchcraft in Europe can be traced to classical antiquity and has continuous history during the Middle Ages, culminating in the Early Modern witch hunts and giving rise to the fairy tale. The belief in possession by jinn, witchcraft, and the effects of the “evil eye” are mainstream Islamic beliefs. According to Islamic scholars, witches must be executed without hesitation.

In Indian history, the Iron Age Atharvaveda is a collection of charms and spells classically associated with witchcraft, with purposes such as harming an enemy or winning a sweetheart. Belief in the supernatural is strong in certain parts of India, and counter killing for witchcraft are reported from time to time.

In remote parts of India when a woman is accused of practicing witchcraft, she is forced to undergo a ‘pareeksha’ (test). They will take the accused women to a deserted location and will force her to pick a silver
coin from a vessel containing boiling oil. In Jamshedpur, a group of villagers attacked a woman and beheaded her for practicing black magic.

In a poor district of Chhattisgarh state, 250 miles from the capital Raipur 50 women were attacked with sticks and cut off their hair after accusing them of witchcraft. In Chhattisgarh, more than 100 women are tortured, paraded naked or harassed in the state annually as they are accused of practicing witchcraft and dozens of women are killed every year on suspicion of being witches or witch doctors in India. The state passed a Witchcraft (Prevention) Act in 2005 to counter a rise in witch hunts. Offenders face jail terms of up to five years. There were 160 such cases reported in Chhattisgarh in 2007.

5 Muslim widows are dragged out of their huts by a mob, then taken to a playground, stripped naked, beaten and forced to eat human excrement in front of hundreds of villagers after being labeled as witches. In 2 separate incidents, male villagers suspected to be involved in sorcery are attacked. One of them is beaten to death, while the other is hospitalized from injuries he gained from a group of villagers. A 12-year-old boy was brutally murdered allegedly by his stepmother in Saharanpur district and the investigators had established the murder as a case of human sacrifice. The present case is also from the same district in UP.

5 Muslim widows are dragged out of their huts by a mob, then taken to a playground, stripped naked, beaten and forced to eat human excrement in front of hundreds of villagers after being labeled as witches. In 2 separate incidents, male villagers suspected to be involved in sorcery are attacked. One of them is beaten to death, while the other is hospitalized from injuries he gained from a group of villagers. A 12-year-old boy was brutally murdered allegedly by his stepmother in Saharanpur district and the investigators had established the murder as a case of human sacrifice. The present case is also from the same district in UP.

The practice of witchcraft and counter killing of witches are highly associated with lack of education, lack of parental care while growing up, deep-rooted cultural beliefs and use of undesirable addictive agents like alcohol, tobacco and drugs. Poverty, unemployment and illiteracy were common factors in all these states of India with high prevalence of such practices.

CONCLUSION

Though these types of cases are prevalent in all the societies, they pose a great difficulty for the law administrators as well as to the forensic personals dealing with such cases. They are legally categorized under homicides or murders, though defendants take the plea otherwise. Documentation and studies involving such unique cases of inhuman acts definitely increases the confidence of a forensic pathologist to pick up such torture wound patterns of witchcraft. In order to curb such social evils in the name of religious beliefs, more strict laws should be formulated and implemented with vigilance. A multimodal approach involving religious bodies, law enforcing agents, medical and social reformers has to be formulated to overcome this inhuman practice.

Authors contributions:

Dr Y S Bansal: Substantial contributions to conception and design, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published.

Dr Sunil S: Substantial contributions to conception and design, Drafting the article, Final approval of the version to be published.

Dr Senthil K R: Substantial contributions to conception and design, Drafting the article, Final approval of the version to be published.

Kumaran M: Substantial contributions to conception and design, Drafting the article, Final approval of the version to be published.

Guarantor: The corresponding author is the guarantor of submission.

Ethical issues: No Ethical issues involved.

Conflict of Interest: Authors declare no conflict of interest.

Source of Funding: No funding involved.

ACKNOWLEDGEMENT

We are thankful to the technical staff and photographer of the Department forensic medicine and toxicology, PGIMER, Chandigarh.

REFERENCES

4. Purdue B.N. Cutting and piercing wounds. The pathology of trauma; 2000
Case Report can Firearm Lead to Motor Vehicle Accident: A Unique Case

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¹Resident, ²PHOD, Department of Forensic Medicine and Toxicology, Dr. S. N. Medical College, Jodhpur, Rajasthan

ABSTRACT

Death from the accident by slipping of vehicle is not uncommon¹. Here we report a case of death of a young male due to firearm injury. According to police inquest, death was due to fall from the bike & internal head injury. Death was due to firearm, which was confirmed after autopsy report.

Keywords: Motor Bike, Firearm, Abrasion Collar

INTRODUCTION

• A case of death of a young boy who died due to firearm is reported.

• The unique feature of this case is that body has history of accident. According to police inquest, death was due to internal head injury due to slipping of bike.

• When autopsy done carefully it becomes a case of firearm.

CASE REPORT

A 24 years old healthy male was going with his friend on the bike at 6pm on 7th September 2012. The deceased was driving the bike. During driving, the bike suddenly slipped & fell down. They were brought to the emergency. The driver was declared dead and his friend was admitted in semiconscious condition at 7.20pm.

Autopsy Report

Postmortem done after 14 hours of death.

External findings

• Abrasion of size 1 x 0.5 cm present on the left foot dorsum near the ankle joint.

• Abrasion of size 0.5x0.5 cm present on the left knee cap region.

• On examination, a 1.5x1cm lacerated wound was present on the left side of his chest wall laterally, 4 cm below the axilla, with minimal oozing of blood.

• The police told that wound was due to iron rods at accident site.

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Fig. 1. External wound with abrasion collar
• Suspicion arised when an abrasion collar was found .body immediately sent for x-ray examination.in the x-ray bullet like structure seen in the right side chest.
Internal findings

1. Scalp, cranium & abdomen - healthy
2. Thorax -
   - Left side pleural cavity - 1.5 litre blood
   - Right side pleural cavity - 500 ml blood
   - Inner side of external lacerated wound in the left side chest plugged with partially clotted blood & muscle tags.
   - Ribs & heart - healthy

Left lung -
- Had an entry wound & exit wound with surrounding contused area in the lower lobe.

Right lung -
- Had an entry wound & exit wound with surrounding contused area in the middle lobe.

Fig. 2 x-ray showing bullet in the right side chest

Track of Bullet -

Final opinion -

The cause of death was shock and hemorrhage as a result of injury to both lungs due to firearm injury. Bullet in a sealed container handed over to the accompanied police person for ballistic examination.

DISCUSSION

- Bleeding from the wound was minimum like simple lacerated wound.
- The present case highlights the importance of the autopsy surgeon because simple accident case changed into the murder case.
- Interestingly no major injuries were present even fall from the bike.
Increased control over procurement and possession of guns may help to limit such fatalities.\textsuperscript{2,3}

**CONCLUSION**

- Road traffic accidents are a common mode of unnatural death.
- In the present case, the history was very dissimilar with the postmortem report. Sometimes police also want to modify the case.
- But the forensic doctors should keep alert on all facts during postmortem examination, because any accident case can be a murder.

**ACKNOWLEDGEMENT**

Dr. Arvind Mathur, Principal & Controller, Dr. S. N. Medical College, Jodhpur,

Dr. Jagdish Jugtawat, Department of Forensic Medicine and Toxicology, Jodhpur

**Conflict of Interest:** Nil

**Source of Funding:** None

**Ethical Clearance:** This case report not disclosing the identity of victim & no active intervention was done in the live object. So we think that ethical clearance not required.

**REFERENCES**

Quantification of Coronary Arterial Narrowing in Autopsy Cases

S S Dalal1, S K Dhattarwal2, Pankaj Chhikara1, Kuldeep Panchal1, Yogesh Vashist1
1Asstt . Professor, Deptt. of Forensic Medicine, SGT Medical College, Budhera Gurgaon, 2Professor, 1Demonstrator, 1Resident, Deptt. of Forensic Medicine PGIMS, Rohtak

ABSTRACT
Coronary artery disease (CAD) is a major cause of human mortality and morbidity in the world and has been a matter of great concern for continuing research and its management. The principle cause of CAD worldwide is coronary atherosclerosis. Various studies conducted globally have revealed marked variations in incidence and extent of CAD. The initiation of the atherosclerotic process starts at a very tender age in the aorta; however the clinical presentations and manifestations are seen later on. The basic pathological process involved in CAD is stenosis of the coronary lumen which is quantified in living patients by coronary angiography. The present study quantifies the coronary luminal stenosis with the help of necropsy histo-pathological study in autopsy cases which has distinct advantage of being able to measure cross-sectional area of the artery concerned. The findings of present study with relation to defining and quantifying the coronary artery dia and cross-sectional area in necropsy specimens of an Indian population will be discussed in this paper.

INTRODUCTION
Coronary artery disease is a major cause of human mortality and morbidity the world over. Zeek1 had already concluded in 1930 that arteriosclerosis can occur at any age. Atherosclerosis begins very early, progressing slowly in a silent manner until approximately the fifth or sixth decade, when complications with clinical and pathological damage start.

Traditionally, fatty streaks have been considered to be the earliest manifestations of atherosclerosis, because they represent the earliest macroscopic lipid-containing lesion. They consist of extracellular lipids with scattered macrophages2.

In the live patients coronary angiography is the gold standard of CAD diagnosis. Severity or degree of stenosis is measured in cath-lab by comparing the area of narrowing to an adjacent normal segment and as a percentage of reduction3. The measurement and quantification of coronary arteries by necropsy histo-pathological studies is found to be more accurate as it measures the cross sectional area in addition to measurement of luminal diameter alone by angiography. More so, it has been shown than 75% of cross sectional area narrowing is equivalent to 50% diameter reduction in the coronary arteries. Therefore, a difference of >25% i.e. the degree of narrowing found by angiography during life and that by histology after death is invariably present which is termed as angiographic error. The grading of atherosclerotic narrowing of coronary arteries was performed according to the following method: at postmortem examination, the coronary arteries were transected at 2 mm intervals and the encroachment upon the lumen by atherosclerotic material was graded from 0 to IV; grade 0 meant no lesion; grade I, 25% narrowing of the lumen; grade II, 50%; grade III, 75%; and grade IV, complete occlusion.. (M Claude)

The present study was conducted to define and quantify the coronary artery diameter and cross sectional area in necropsy specimens of Haryanvi population and to demonstrate the significance of quantifying these changes at necropsy.

MATERIALS AND METHOD
Material of this study has been obtained from medico legal autopsies done at various places in Haryana and submitted to departments of Forensic
medicine and Pathology at Pt. B.D. Sharma PGIMS, Rohtak for histo-pathological examination. One hundred cardiac autopsy specimens with intact different age and sex group were subjected to morbid anatomical examination. Individual data including name, age, sex, heart weight and COD were recorded for each autopsy specimens.

Coronary arteries were examined with the heart intact following fixation. Epidermal portions of coronary anterior were examined along their anterior length by making transverse cuts every 2 mm with a sharp scalpel. One block was obtained from LMCA. The RCA, LAD, LCX were divided into proximal middle and distal segments. Decalcification of calcified vessels were taken before cutting. Representative tissue blocks were taken from right left ventricle walls and intravenous septum and from areas showing hemorrhage, discoloration and scars. The section obtained were stained with H&E as routine stain; section of arteries were subjected to Verhoff’s staining to delineate the internal elastic lamina.

Luminal diameters were measured using a micrometer (Nikken, Tokyo Scale 0.01mm) and then cross sectional area was calculated accordingly using standard formula.

Cross sectional area (circle) = \(\pi r^2\)

= \(\frac{22}{7} \times \frac{1}{4} (\text{dia})^2\)

= 0.79 \times (\text{dia})^2

The average of the two readings was used to calculate the cross sectional area. Residual luminal diameters were similarly measured using the endothelial lining cells as the reference point. Observations were then tabulated and results were compared.

For comparison the following normal coronary luminal diameters were taken. LM 2.0 to 5.5mm (mean 4mm); LAD 2.0 to 5.0mm (mean 3.6mm); LCX 1.5 to 5.5mm (mean 3.0); and RCA 1.5 to 5.5mm (mean 3.2mm)

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<tr>
<th>Sr. No.</th>
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<th>Female</th>
<th>%</th>
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<td><strong>13%</strong></td>
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<td>No. of Segments</td>
<td>%</td>
<td>No. of Segments</td>
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<td>26%</td>
<td>74</td>
<td>74%</td>
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<td>RCA (Middle)</td>
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<td>3</td>
<td>LM</td>
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<td>45%</td>
<td>55</td>
<td>55%</td>
</tr>
<tr>
<td>4</td>
<td>LAD (Proximal)</td>
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<tr>
<td>5</td>
<td>LAD (Middle)</td>
<td>31</td>
<td>31%</td>
<td>69</td>
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<td>6</td>
<td>LCX (Proximal)</td>
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<td>16%</td>
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<td><strong>Total</strong></td>
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<td><strong>487</strong></td>
<td><strong>69.6%</strong></td>
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Table IV. Showing morphological types of atherosclerotic plaques in various coronary segments (Eccentric Stenosis)

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<th>Sr. No</th>
<th>Coronary Segments</th>
<th>No. of Segments</th>
<th>Non-complicate plaques</th>
<th>Complicated plaques (Type of complications)</th>
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<td>Fibrofatty</td>
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<td>%</td>
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<td>3</td>
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<td>4.5</td>
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<td>LAD (Middle)</td>
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<td>3</td>
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<td>3.5</td>
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<td>213</td>
<td>16</td>
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Table V. Showing morphological types of atherosclerotic plaques in various coronary segments (Concentric Stenosis)

<table>
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<tr>
<th>Sr. No</th>
<th>Coronary Segments</th>
<th>No. of Segments</th>
<th>Non-complicate plaques</th>
<th>Complicated plaques (Type of complications)</th>
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</thead>
<tbody>
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<td></td>
<td></td>
<td></td>
<td>Fibrous</td>
<td>Fibrofatty</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Frequency</td>
<td>%</td>
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<td>RCA (Proximal)</td>
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<td>48</td>
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Table VI. Showing number of segments and degree of coronary arterial narrowing (diameter)

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Coronary Segments</th>
<th>No.of Segments</th>
<th>Grade I 0-25</th>
<th>%</th>
<th>Grade II 6-50</th>
<th>%</th>
<th>Grade III 1-75</th>
<th>%</th>
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<td>RCA (Proximal)</td>
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<td>12</td>
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<td>1</td>
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<tr>
<td>2</td>
<td>RCA (Middle)</td>
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<td>63</td>
<td>63</td>
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<td>30</td>
<td>5</td>
<td>5</td>
<td>2</td>
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<tr>
<td>3</td>
<td>LM</td>
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<td>57</td>
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Table VII. Showing number of segments and degree of coronary arterial narrowing (cross sectional area)

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<th>Coronary Segments</th>
<th>No.of Segments</th>
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<th>%</th>
<th>Grade II 6-50</th>
<th>%</th>
<th>Grade III 1-75</th>
<th>%</th>
<th>Grade IV &gt; 76</th>
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<td>14</td>
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Table VIII. Showing the frequency of eccentric and concentric lesions in various segments of coronaries arteries.

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<th>Fibrous %</th>
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<th>Concentric</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RCA (Proximal)</td>
<td>3.85</td>
<td>32.4</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>RCA (Middle)</td>
<td>9.15</td>
<td>33.35</td>
<td>21.15</td>
</tr>
<tr>
<td>3</td>
<td>Left Main</td>
<td>3.4</td>
<td>25.45</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>LAD (Proximal)</td>
<td>2.25</td>
<td>26.8</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>LAD (Middle)</td>
<td>4.85</td>
<td>31.9</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>LCX (Proximal)</td>
<td>1.75</td>
<td>31.7</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>LCX (Middle)</td>
<td>3.10</td>
<td>35.1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>3.75</td>
<td>31.4</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Complicated %</th>
<th>Eccentric</th>
<th>Concentric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eccentric</td>
<td>23.95</td>
<td>15.2</td>
</tr>
<tr>
<td>Concentric</td>
<td>22.3</td>
<td>3.4</td>
</tr>
</tbody>
</table>

P value > 0.05 < 0.05 <0.01

DISCUSSION

Coronary artery disease (CAD) is a major health problem in the world. Atherosclerosis which is the permanent cause of coronary stenosis underlies the spectrum of manifestations of ischemic heart disease. There are number of published reports from western countries which quantify coronary artery narrowing. Despite considerable research only stray reports have appeared from the Indian subcontinent.

Angiography is unable to define plaque morphology or delineate the internal elastic lamina and thus cannot actually be a method for measurement of the true lumen. Measurement and quantification of coronary stenosis by histo-pathological studies has been more accurate than angiographic quantification. The present study was aimed at defining and quantifying the coronary artery diameter/ cross sectional area and to determine the relation of coronary artery measuring with the presence of morphological evidence of ischemic heart disease.

In present study, of the total 100 subjects, 29 cases either showed evidence of myocardial infarction. It was observed that normal luminal diameters varied in different age groups and showed definite increase as age advanced in all the seven segments studies (Table IV). Microscopically two types of stenotic lesions were observed, eccentric and concentric. Concentric lesions outnumbered the eccentric lesions in frequency. It was also observed that fibrous plaque was the hallmark of concentric narrowing whereas the fibro fatty plaque was hallmark of eccentric narrowing (Table XI). Quantification was carried out in terms of observed diameter as well as cross sectional (XSA) narrowing. It was found that diameter measurement yielded a higher frequency of coronary segmental narrowing in grade I, whereas XSA quantification of luminal stenosis revealed higher frequency of segment in grades II, III, IV (Table VII, VIII, IX). Table XII clearly demonstrates that diameter measurement is not a true assessment of actual coronary luminal stenosis and it actually underestimates lesions which could be a crucial factor for coronary baseline quantification. Besides this, cross section area quantification was found to be a superior method for measurement of luminal narrowing.

Table IX clearly demonstrates that the frequency of grade I and II lesions declined with the advancing age and frequency of grade III and IV lesions increased with the advancing age.

In subjects dying of non-cardiac causes coronary artery narrowing (XSA) was found to be 18.3% in grade I, 55.7% in grade II, 19.5% in grade III and 6.9% in grade IV. The frequency of involvement in different grades has also been reported by some workers in their studies (Table XIII).
It was observed that in all the coronary segments studied in cardiac groups; 10.8% were grade I lesions, 44.3% were grade II; 29.1% were grade III; 15.8% were grade IV. Other workers have also reported the prevalence of each grade in their studies.

Cross sectional area narrowing was quantified in coronary segments of cases dying of cardiac causes and compared with others who had no evidence of any cardiac illness. It was well evident from Table XV that moderate to severe narrowing (Grade III and IV) was observed in high frequency in the cardiac group.

It is clearly evident from our study that coronary luminal diameter measurement underestimated the degree of narrowing and XSA measurement is a better method for quantification of stenosis. Coronary arterial cross sectional narrowing revealed that advancing age was directly proportional to grades of narrowing. The presence of morphological evidence of ischemic heart disease was directly related to the coronary arterial quantification grading.

### Table X. Frequency of high grade coronary artery narrowing (> 50% XSA) in cardiac group vs. non-cardiac group

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of coronary segment</th>
<th>Cardiac Group %</th>
<th>Non Cardiac group %</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RCA (Proximal)</td>
<td>44.8</td>
<td>30.9</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>2</td>
<td>RCA (Middle)</td>
<td>37.9</td>
<td>28.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>3</td>
<td>LM</td>
<td>44.8</td>
<td>39.4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>4</td>
<td>LAD (Proximal)</td>
<td>48.0</td>
<td>31.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>5</td>
<td>LAD (Middle)</td>
<td>48.2</td>
<td>19.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>6</td>
<td>LCX (Proximal)</td>
<td>48.3</td>
<td>26.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>7</td>
<td>LCX (Middle)</td>
<td>41.3</td>
<td>16.9</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

### CONCLUSION

To sum up, it can be said that atherosclerosis is an integral component of the coronary artery luminal stenosis and it was present in all the segments we studied. Both concentric and eccentric lesions were observed with former being in higher frequency. The hallmark of the eccentric narrowing was found to be the fibro-fatty plaque whereas the hallmark of concentric narrowing was fibrous plaque. It is clearly evident from our study that coronary luminal diameter measurement underestimated the degree of narrowing and XSA measurement is a better method for quantification of stenosis.

Coronary arterial cross sectional narrowing revealed that advancing age was directly proportional to the grades of narrowing. The presence of morphological evidences of IHD was directly related to the coronary arterial quantification grading. Hemiquantum of (XSA) coronary arterial narrowing is a significant tool for establishing a baseline for preventive cardiology and a diagnostic tool in sudden deaths in forensic practice.

### REFERENCES

4. GRONDIN MC et al: Discrepancies Between Cineangiographic and Postmortem Findings in Patients with Coronary Artery Disease and Recent Myocardial Revascularization, http://circ.ahajournals.org/
6. Dresseller FA, Malekzedech S, Robets WC. Quantitative analysis of amounts of coronary...
INTRODUCTION

Anthropometry, the typical and the traditional tool of physical anthropology, provides the scientific methods for estimating the various measurements and the observations on the living as well as the skeleton of man. Physical anthropologists have been mainly concerned with the study of the human origin and human evolution as well as the varieties of mankind in different parts of the world. Estimation of stature has a significant importance in the field of forensic anthropology. To assess the height of an individual, from measurements of different parts of the body, has always been of immense interest to Anatomists, Anthropologists and Forensic experts.

ABSTRACT

Estimation of stature has a significant importance in the field of forensic anthropometry for the identification of an individual. Study was carried out to assess and correlate hand length, foot length and the stature and to predict the stature of an individual by hand length and foot length using regression analysis. Total 300 (150 males and 150 females) medical students of SMS medical college, Jaipur (Rajasthan) were selected. Foot length, hand length and height of the individual were measured. Correlation coefficient between height & foot length were r=0.92 for male and r= 0.899 for female. Correlation coefficient between height & hand length were r=0.961 for male & r= 0.94 for female. Regression equations were derived to calculate height from foot length and hand length. Present study has established definite correlation between stature and foot-length & hand length. If either of the measurement (foot length or total height or hand length) is known, the other can be calculated and this would be useful for Anthropologists and Forensic Medicine experts.

Keywords: Anthropometry, Stature, Hand length, Foot length, Identity of individual

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It is well known that there is a definite relationship between the height of the person and various parts of the body like head, trunk and lengths of upper and lower limbs. The relationship between body segments has been used to compare and highlight variations between different ethnic groups and to relate them to locomotor patterns, energy expenditure, and lifestyle. Prediction of the dimensions of body segments is useful in many areas of modern science. For example, in growth and development the use is made of the relationships between body segments in the assessment of normal growth as well as in specific syndromes. Body proportions and the dimensions of various body segments, including the long bones of the limbs and the bones of the hand and foot have been used to estimate stature. The long bones of the limbs, however, have been the most widely studied.

Estimation of stature of an individual from the skeletal material or from the mutilated or amputated limbs or parts of limbs has obvious significance in the personal identification in the events of the murders, accidents or natural disasters mainly concerns with
the forensic identification analysis. The relationship between specific body dimensions / proportions can be used to help solve crimes in the absence of complete evidence. For example, it has been proved that stature can be estimated from imprints of the hand, foot or footprints or from a shoe left at the scene of a crime. Similarly, the stature of a victim can be estimated when a part of body, such as a long bone, or hand, is all that remains.

Despite the relationships between body parameters that have been determined, it has been emphasized that these vary from population to population and ethnic origin to ethnic origin due to differences in nutrition and levels of physical activity. To the best of our knowledge such data are not available for population of Rajasthan. Therefore, this study was carried out to assess and correlate the hand length, foot length and the stature and to predict the stature of an individual by hand length, foot length using regression analysis.

MATERIALS & METHOD

For present study, total 300 subjects (150 males and 150 females) asymptomatic, apparently healthy medical students of SMS medical college, Jaipur (Rajasthan) were selected. The age ranged between 18 – 25 years. A slow decline in the height is known to occur as the age advances and therefore older subjects were not studied. The left foot was selected for measurement as per recommendation of the international agreement for paired measurements at Geneva (1912).

Foot length was measured as a direct distance from the most prominent posterior point of back of the heel to the tip of hallux or to the tip of second toe (when the second toe was longer then hallux). Hand length was measured from midpoint of interstyloid line to tip of middle finger. Height of the individual was measured in standing erect anatomical position. It is the vertical distance between vertex and heel touching the floor (ground surface). The measurements were taken at fixed time between 2 to 5 p.m. to eliminate the discrepancies due to diurnal variation and by the same person to avoid personal error in methodology. To minimize subjective errors, all the measurements were taken three times and then mean was taken. The armamentarium comprised of stature meter, spreading caliper (blunt ended) and vernier caliper. The obtained data was analyzed to find out mean, standard deviation (S.D.), coefficient of correlation. Regression equations were derived to calculate height of unknown individual from foot length and hand length.

RESULTS

Table 1: Observations of hand & foot length, correlation coefficient and regression equations.

<table>
<thead>
<tr>
<th>Hand</th>
<th>Foot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Mean Length (CM.)</td>
<td>16.91±1.85</td>
</tr>
<tr>
<td>Correlation coefficient(r)</td>
<td>0.961</td>
</tr>
<tr>
<td>Regression Equation</td>
<td>Y=124.89+2.665X</td>
</tr>
<tr>
<td>X=Hand length (cm)</td>
<td>X=Foot length (cm)</td>
</tr>
</tbody>
</table>

Here Y=Estimated height.

Linear regression analysis was done to estimate the stature from foot length & hand length as an independent variables. Pearson's correlation coefficient was used to find the relationship between the foot length & personal height and between hand length & personal height. Correlation coefficient between height & hand length were r=0.961 for male & r= 0.94 for female. Correlation coefficient between height & foot length were r=0.92 for male and r= 0.899 for female. It means that there is strong positive correlation between height and hand & foot length of study population. The regression equation for estimation of height from foot length and hand length were derived. [Table-1]
DISCUSSION

Table 2: Estimation of stature from Hand length (Comparative Analysis)

<table>
<thead>
<tr>
<th>No. of cases</th>
<th>Age gp (yr.)</th>
<th>Year</th>
<th>Mean hand length(cm.)</th>
<th>Mean total height(cm.)</th>
<th>Correlation coefficient(r)</th>
<th>Regression equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunil et al.11</td>
<td>150 (M-75, F-75)</td>
<td>18-22</td>
<td>2005</td>
<td>19.5+/-1.2(M)-Lt 18.1+/-1.0(F)-Lt</td>
<td>169.0+/-7.8(M) 158.0+/-5.8(F)</td>
<td>0.6(M)-Lt 0.7(F)-Lt</td>
</tr>
<tr>
<td>Chikhalkar BG et al.12</td>
<td>300 (M-147, F-153)</td>
<td>19-23</td>
<td>2009</td>
<td>19.38+/-1.88</td>
<td>167.26+/-8.49</td>
<td>0.902</td>
</tr>
<tr>
<td>Ilayperuma I et al.13</td>
<td>258 (M-140, F-118)</td>
<td>20-23</td>
<td>2009</td>
<td>17.88+/-0.93(F)</td>
<td>170.14+/-5.22(M) 157.15+/-5.75(F)</td>
<td>+0.58(M) +0.59(F)</td>
</tr>
<tr>
<td>Santosh SV et al.14</td>
<td>249 (M-125, F-124)</td>
<td>&gt;23yrs</td>
<td>2011</td>
<td>16.26+/-0.85(F)</td>
<td>151.77+/-4.96(M) 147.87+/-5.51(F)</td>
<td>0.68(M) 0.53(F)</td>
</tr>
<tr>
<td>Present study</td>
<td>300 (M-150, F-150)</td>
<td>18-25</td>
<td>2012</td>
<td>16.91+/-1.85(M) 16.94+/-1.25(F)</td>
<td>170.42+/-4.6(M) 157.32+/-3.58(F)</td>
<td>+0.961(M) +0.94(F)</td>
</tr>
</tbody>
</table>

Table 3: Estimation of stature from Foot length (Comparative analysis).

<table>
<thead>
<tr>
<th>No. of cases</th>
<th>Age gp (yr.)</th>
<th>Year</th>
<th>Mean hand length(cm.)</th>
<th>Mean total height(cm.)</th>
<th>Correlation coefficient(r)</th>
<th>Regression equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patel SM et al.16</td>
<td>502 (M-278, F-224)</td>
<td>17-22</td>
<td>2007</td>
<td>24.44+/-0.99(M) 22.34+/-1.12(F)</td>
<td>170.96+/-5.13(M) 156.14+/-5.13(F)</td>
<td>+0.65(M) +0.80(F)</td>
</tr>
<tr>
<td>Chikhalkar BG et al.32</td>
<td>300(M-147, F-153)</td>
<td>19-23</td>
<td>2009</td>
<td>24.098</td>
<td>167.265</td>
<td>+0.6102</td>
</tr>
<tr>
<td>Shende MR et al.17</td>
<td>391 (M-165, F-226)</td>
<td>18-22</td>
<td>2010</td>
<td>25.83+/-1.27(M) 23.42+/-1.08(F)</td>
<td>170.12+/-6.99(M) 156.15+/-11.10(F)</td>
<td>+/-0.755(M) +/-0.335(F)</td>
</tr>
<tr>
<td>Sudhir P et al.20</td>
<td>212 (M-107, F-105)</td>
<td>18-25</td>
<td>2011</td>
<td>25.46+/-1.02(M) 22.24+/-1.26(F)</td>
<td>170.09+/-5.19(M) 155.80+/-6.63(F)</td>
<td>+0.530(M) +0.715(F)</td>
</tr>
<tr>
<td>Vikram P et al.21</td>
<td>100 (M-50, F-50)</td>
<td>-</td>
<td>2012</td>
<td>23.43(M)</td>
<td>168(M)</td>
<td>-</td>
</tr>
<tr>
<td>Pawar PK et al.20</td>
<td>98 (M-46, F-52)</td>
<td>17-19</td>
<td>2012</td>
<td>25.92+/-0.96(M) 23.49+/-1.33(F)</td>
<td>171.23+/-6.07(M) 156.61+/-5.25(F)</td>
<td>0.588(M) 0.442(F)</td>
</tr>
<tr>
<td>Mansur DI et al.21</td>
<td>440 (M-258, F-182)</td>
<td>17-25</td>
<td>2012</td>
<td>23.89+/-2.09(M) 22.64+/-1.36(F)</td>
<td>165.66+/-8.34(M) 156.70+/-6.16(F)</td>
<td>0.688(M) 0.587(F)</td>
</tr>
<tr>
<td>Present study</td>
<td>300 (M-150, F-150)</td>
<td>18-25</td>
<td>2012</td>
<td>24.16+/-1.4(M) 22.79+/-1.13(F)</td>
<td>170.42+/-4.6(M) 157.32+/-3.58(F)</td>
<td>0.92(M) 0.899(F)</td>
</tr>
</tbody>
</table>

Here; M=Male, F=Female, T=Total population (Male&Female), Y=Height (Estimated), X=foot length (cm), Lt=Left.

In forensic examinations and anthropological studies, prediction of stature from incomplete and decomposing skeletal remains is vital in establishing the identity of an unknown individual.22 Height estimation by measurement of various long bones, head measurements, hand, foot length etc. has been attempted by several workers with variable degree of success. Each researcher has derived his own formula for calculating the stature from these parameters. However, hand and foot measurement has not frequently been used for this. It was Rutishauser who for the first time showed that reliability of prediction of height from foot length was as high as that from long bones.16

Krishna K, et al. has been studied on 252 Koli male adolescents from North India and suggested that all the cephalo-facial measurements are significantly correlated with stature.23

Kumar Set al measured length of forearm and hand of 200 male medical students age ranging 18-25 years in India and developed a formula.24 Bhavna et al have been studied on 503 male Shiah Muslim of Delhi, India and reported a body dimension which correlates highly with stature.25 Ebite LE, et.al in their study on 109 healthy adults (45 male and 66 female) at Nigeria and derived a formula based on Ulna length.22
The available data about morphometry of the hand and foot usually apply to Caucasians in Europe or North America. Only few studies of other racial groups exist which emphasize the need to establish standards in different ethnic populations.

Correlation coefficient between stature and hand & foot length was found to be statistically significant and positive indicating a strong relationship between these parameters. Regression equation for stature estimation was formulated and their accuracy checked by comparing the estimated stature and the actual stature. The results indicate that hand and foot length provides an accurate and reliable means in reconstructing the stature of an unknown individual.

Chikhalkar BG et al. (2009)12 derived a regression equation between hand length & height. Their correlation coefficient was +0.59. Ilayperuma I et al. (2009) conducted study on 258 medical students Galle, Sri Lanka. Their correlation coefficient between hand length & height was +0.58(male), & +0.59(Female) and derived regression equation for their population13. Various other researchers also studied these parameters and derived regression equations for their populations to estimate height from hand length11,14,15. In present study correlation coefficient were 0.96 for males and 0.94 for females for hand length & stature. [Table-2]

Patel SM et al. (2007) conducted study on 502 medical students in Sri Lanka. The age of subjects ranged from 17-22 years. Their correlation coefficient b/w foot length & height was +0.65 in male, & +0.80 in female16. Chikhalkar BG et al. (2009)12 derived a regression equation b/w foot length & height. Their correlation coefficient between foot length & height was +0.61. Various other researchers also studied these parameters and derived regression equations for their populations to estimate height from foot length17,18,19,20,21. In present study correlation coefficient were 0.92 for males and 0.89 for females for foot length & stature. [Table-3]

Trotter M et al. (1958) stated requirement of different regression equations among different races after studying different races for relationship between lengths of long bones and stature. It is important to note that every race of particular age group and sex should have its own table for estimation of height using various parameters.26 The formulae designed to estimate stature from various anatomical dimensions in one population do not apply to another. Furthermore, the need for the alternative formulae for the genders is also proved as the rate of skeletal maturity in males and females varies during development.13

This is a study of the first kind in the Rajasthan region. It will help in medico-legal cases in establishing identity of an individual when only some remains of the body are found as in mass disasters, accidents etc. It will also help in establishing identity in certain civil cases. Significant and positive correlation coefficient has been shown to exist between stature and measurements of hand and foot length. The results of the current study further highlight the ethnic differences in the anatomical dimensions and its relation to stature. Taken together the evidence suggests that the relationship between hand & foot length and stature is of practical use in medico-legal, anthropology and archeological studies when such evidence provides the investigator the only opportunity to gauge that aspect of an individual’s physical description.

CONCLUSION

The present study has established definite correlation between stature and foot-length & hand length and also regression equations have been established. If either of the measurement (foot length, Hand length or total height) is known, the other can be calculated and this would be useful for Anthropologists and Forensic Medicine experts. There are lot of variations in estimating stature from limb measurements among people of different region & race. Hence there is a need to conduct more studies among people of different regions & ethnicity so that stature estimation becomes more reliable & identity of an individual is easily established.

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Ethical Clearance: Not required.
REFERENCES


Estimation of the Length of Femur from its Proximal Fragments

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ABSTRACT
Skeletal remains are often presented for forensic evaluation. Time and again they are in fragments which make it difficult for the forensic investigator to derive parameters of biological and medico legal significance. Thus forensic anthropologists have been trying to develop techniques that will enable them to overcome these problems. Earlier methods notably by McKern and Steel were not successful when it was put to actual practice. This was because the ambiguous nature of some of the crucial anatomical landmarks. To overcome these, Simmons et al came up with a new approach. We adopted this technique to estimate length of femur from its proximal fragments by analyzing 128 adult intact femora. The regression formulae thus obtained can be used while analyzing skeletal remains from North Indian population.

Keywords: Maximum Femur Length, Fragmentary Femur, Anthropometry, Regression Equations

INTRODUCTION
Forensic anthropology is “best conceptualized more broadly as a field of forensic assessment of human skeletonized remains and their environments”.¹ This assessment includes both the identification of the physical characteristics and cause and manner of death from the skeleton. The two most commonly used methods in forensic anthropology are the metric and the morphological assessment under anthropometry and anthroposcopy respectively.² We reiterate that proper analysis of the skeletal remains include determination of the species, race, sex, age and stature of the individual as well as possible cause of death and time since death.³⁴⁵⁶ Determination of some of these parameters requires the presence of one or more ‘complete’ and ‘intact’ long bones, a condition that frequently dodges the investigator. This is increasingly common because of rapidly changing scenario a forensic investigator encounters.⁷⁸⁹ A few examples, which may be observed, are

- Deliberate mutilation of the dead bodies for destroying evidence as seen in recent Nithari serial murder in Noida, Uttar Pradesh, India in the year 2006.¹⁰
- Mass disasters e.g., plane crashes, earthquake, etc.
- Terrorist bomb attacks with improvised high explosive devices.
- Many a times, the exhumed remains are in fragmentary state.
- Bones recovered in forensic situations may be lying on the surface or under water, mutilated by the residing fauna.

In humans, the femur is the longest and largest bone. It is also one of the strongest bones in the body.¹¹¹² Femur (along with feet) is one of the bones most frequently recovered from aviation accidents. It is a
large, durable bone protected by both large amounts of soft tissue and the seat & harness mechanisms of the aircraft. By studying the femur, one can get a fair idea about the age, sex, stature and sometimes race of an individual.  This with other corroboratory evidence would be essential in the identification of deceased. But as discussed above, in many conditions forensic investigators have an uphill task to analyze fragmentary skeletal remains to draw inferences of biological and medico legal importance. One of the ways to overcome this hurdle is to estimate the total length of the long bone from fragmentary remains and later employ them in statural formulae to get reasonably accurate stature. This was first attempted by Steele and McKern (1969) and Steele (1970) outlined a number of landmarks establishing four segments in the femur, four in humerus and five in the tibia. Even in India V R Mysorekar et al (1980 to 1984) proposed estimation of stature form parts of femur, tibia, humerus, radius and ulna based on Steele’s method.

Over a period of time, when these data were actually put on practice, many shortcomings were noticed. Most practicing Forensic Anthropologists faced practical difficulties in locating precise anatomical landmarks in fragmentary remains of bones because of the ambiguous nature of the anatomical landmarks. Thus the crucial parameters necessary for determination of the total length were flawed; stature thus estimated was significantly inaccurate and the medico legal importance was ominously eroded. This was envisioned by none other than Steele himself. So an alternate, pragmatic and holistic approach to this problem was required.

Thus in the year 1989 Tal Simmons et al proposed a new revised method which was published in Journal of Forensic Sciences. This study attempted to overwhelm the pitfalls in Steele’s method by using standard, clearly defined measurements taken on the proximal, distal and the mid-shaft region of the femora. They thus tried to overcome the difficulties which plagued the earlier approach by using clearly defined measurements. Most of these measurements were already in use by physical anthropologists. This approach was followed by many researchers chief among them was Mubarak Ariyo Bidmos who studied estimation of stature and femoral length using fragmentary femur in indigenous South Africans in the early part of 2007. Since these studies are population specific, a study was conducted around the world. Since these research values are population centric we cannot employ them for local population.

OBJECTIVES OF RESEARCH

- To assess the feasibility of estimation of maximum femoral length from metric study of its proximal fragments.
- To correlate various measurements of fragments of femur with its maximum length.
- To compare the results obtained with similar studies.

MATERIALS AND METHOD

The present study was conducted in Department of Forensic Medicine and Department of Anatomy, Lady Hardinge Medical College, New Delhi along with Department of Anthropology, University of Delhi. Total of 128 intact adult dry femora were studied.

STUDY DESIGN

A total of 128 adult dry femora were studied from the museum collections of Department of Forensic Medicine, Department of Anatomy of Lady Hardinge Medical College and Department of Anthropology of Delhi University.

This whole pool of femora (prior to sexing them) was considered as “unknown-sex”.

Later the femora were grouped into male and female based on sexual dimorphism established through metric evaluation.

By using osteometric board and Mitutoyo 8-in Dial calipers, following measurements (predictor variables) were taken

1. Maximum Femoral Length
2. Vertical Diameter of the Femoral Head
3. Vertical Diameter of the Femoral Neck
4. Upper Breadth of Femur
5. Transverse Diameter of the Mid-shaft

All the measurements were taken as per the standards recommended by Martin and Saller.
Data were entered to SPSS Ver.14 (Statistical Package for the Social Sciences) software. Using this software, correlation between FML and predictor variables and univariate and multivariate regression analyses were done.

RESULTS

Correlation between the measurements of the fragments of the femur with its maximum length (FML) are scripted in Table 1. They are described under males, females and unknown sex.

When correlation coefficients of individual measurements with Maximum Femoral Length are determined in ‘unsexed’ femora, all of them show good degree of association.

After sexing them, we can see that individual measurements of the fragments of male femora show better correlation than those of the female.

Table 1. Correlations of Measurements of Fragments of Femur with Maximum Length of Femur (FML)

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>FML (unknown Sex)</th>
<th>FML (males)</th>
<th>FML (females)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VHD</td>
<td>0.914(**)</td>
<td>0.707(**)</td>
<td>0.659(**)</td>
</tr>
<tr>
<td>VND</td>
<td>0.881(**)</td>
<td>0.749(**)</td>
<td>0.630(**)</td>
</tr>
<tr>
<td>VHA</td>
<td>0.943(**)</td>
<td>0.866(**)</td>
<td>0.701(**)</td>
</tr>
<tr>
<td>WSD</td>
<td>0.778(**)</td>
<td>0.633(**)</td>
<td>0.436(**)</td>
</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level (2-tailed)**

Table 2 presents the slopes, intercepts and standard errors of estimates for male, female or unknown sex group for estimation femoral length (FML). The values obtained are by linear regression analysis of the individual predictor variables with the Maximum Femoral Length (FML).

Table 2 Regression Constants for Estimating FML from Femur Fragments

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Slope (b)</th>
<th>Intercept (a)</th>
<th>S.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>VHD</td>
<td>5.419</td>
<td>19.847</td>
<td>1.343</td>
</tr>
<tr>
<td>VND</td>
<td>4.197</td>
<td>23.612</td>
<td>1.075</td>
</tr>
<tr>
<td>VHA</td>
<td>6.104</td>
<td>16.551</td>
<td>1.271</td>
</tr>
<tr>
<td>WSD</td>
<td>5.221</td>
<td>31.360</td>
<td>1.470</td>
</tr>
</tbody>
</table>

Table 3 elaborates the regression equations that can be used to determine FML, when only “proximal segment” of the femur is recovered. They are classified under male, female and unknown sex. The correlation coefficient and the standard error of estimate of the equations are also mentioned.

Three measurements are present in the proximal segment of the femora:

1. Upper Breadth of Femur (VHA)
2. Vertical Diameter of Head (VND)
3. Upper Breadth of Femur (VHA)

Table 3 Equations for estimation of FML when only its proximal end is recovered

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Equations</th>
<th>Correlations</th>
<th>SEE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Male</strong></td>
<td>21.130 - 0.561 (VHD) + 1.125 (VND) + 2.362 (VHA)</td>
<td>0.762</td>
<td>0.941</td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td>21.155 + 2.133 (VND) + 1.6 (VHA)</td>
<td>0.537</td>
<td>0.980</td>
</tr>
<tr>
<td><strong>Unknown</strong></td>
<td>5.405 + 1.148 (VHD) + 0.872 (VND) + 2.209 (VHA)</td>
<td>0.898</td>
<td>1.008</td>
</tr>
</tbody>
</table>

DISCUSSION

All the fragmentary measurements presented positive correlations with the FML (Table 1). Correlation is a measure of association between two variables, in our case; it is the strength of association of the maximum femoral length (FML) with its fragments. As a thumb rule, we shall consider correlation coefficients between 0.00 and 0.30 are considered weak, those between 0.30 and 0.70 are moderate and coefficients between 0.70 and 1.00 are considered high.

In males, all parameters show a high degree of correlation with the exception of WSD, which display moderate degree of correlation. However, in females, only VHD shows high degree of correlation, whereas
all the remaining parameters show moderate degree of correlation.

In males, the measurements showing the degree of correlation with FML in descending order are VHA, VND, VHD and WSD. In females, the measurements showing degree of correlation with FML in descending order are VHA, VHD, VND and WSD.

In unknown samples, all the measurements demonstrate high degree of correlation.

When only a “small fragment” of femur is available for the medico legal investigation, for instance like head of the femur (with or without the neck), the Maximum Femoral Length can be calculated from the metric evaluation of that fragment.

In the simple linear regression equation \( Y = a + bX \), \( Y \) is the FML, \( a \) is the intercept (or constant), \( b \) is the slope. \( X \) is the measurement of the predictor variable.

The Standard Error of Estimate (SEE) is the standard deviation of the differences between the actual values of the FML and the predicted FML.

Table-2 shows the regression constants for estimating Maximum Femoral Length from its individual fragmentary remains, based on the sex.

The calculated length can be used to estimate the stature of the individual by the regression equations, tables or the multiplication factors already established by the various studies.

Likewise, when a “proximal segment” of femur is recovered, we can determine the Maximum Femoral Length by the multivariate regression analysis of their respective measurements.

If the only proximal segment is recovered, we can obtain following measurements,

- a) Vertical Diameter of Head (VHD)
- b) Vertical Diameter of Neck (VND)
- c) Upper Breadth of Femur (VHA)

After multi-vartiate analysis of these measurements, the regression equations thus obtained can be used for estimation of Maximum Femoral Length (given in Table 3). The equations are grouped under male, female and unknown sex.

Equations derived for male samples presented a higher correlation (0.762 – 0.537) compared for that of females which exhibited moderate correlation (0.542-0.537), whereas in unknown-sex samples it was highest (0.898).

The Standard Error of Estimate obtained for the estimation of FML ranged from 0.937 to 0.941 in males, 0.985 to 0.980 in females and 1.008 in unknown-sex samples.

We can compare the results of our study with that of three similar studies.

1) Simmons et al (1990)

We will be comparing the correlation of the fragmentary measurements with the Maximum Femoral Length between present study and the above mentioned studies.

Table 4. Comparison of Correlation Coefficients between Simmons et al. and the Present Study.

<table>
<thead>
<tr>
<th>STUDY</th>
<th>VHD</th>
<th>VND</th>
<th>VHA</th>
<th>WSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simmons Et Al.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White Males</td>
<td>0.526</td>
<td>0.384</td>
<td>0.606</td>
<td>0.281</td>
</tr>
<tr>
<td>Black Males</td>
<td>0.454</td>
<td>0.315</td>
<td>0.592</td>
<td>0.276</td>
</tr>
<tr>
<td>White Females</td>
<td>0.596</td>
<td>0.409</td>
<td>0.632</td>
<td>0.295</td>
</tr>
<tr>
<td>Black Females</td>
<td>0.585</td>
<td>0.422</td>
<td>0.513</td>
<td>0.277</td>
</tr>
<tr>
<td>Present study</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>0.707</td>
<td>0.749</td>
<td>0.886</td>
<td>0.633</td>
</tr>
<tr>
<td>Females</td>
<td>0.659</td>
<td>0.630</td>
<td>0.701</td>
<td>0.436</td>
</tr>
</tbody>
</table>

Table 4, shows the correlation coefficients of comparable measurements of the femur in the present study and those of Simmons et al.

- In males all the six measurements, the correlation reported in this study is higher than that of Simmons et al.
• In females, VHD, VND and VHA showed better correlation than those in Simmons et al. However, correlation of BCB in our study sample is lower than that of Simmons et al.

• FDL in our study shows higher correlation than that in Black female group, but it was lower than that in White female group of Simmons et al.

Table 5. Comparison of Correlation Coefficients form Bidmos MA and The Present Study

<table>
<thead>
<tr>
<th>STUDY</th>
<th>VND</th>
<th>VHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bidmos MA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAED Males</td>
<td>0.478</td>
<td>0.610</td>
</tr>
<tr>
<td>IND SA Males</td>
<td>0.542</td>
<td>0.653</td>
</tr>
<tr>
<td>SAED Females</td>
<td>0.544</td>
<td>0.623</td>
</tr>
<tr>
<td>IND SA Females</td>
<td>0.681</td>
<td>0.799</td>
</tr>
<tr>
<td>Present study</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>0.749</td>
<td>0.866</td>
</tr>
<tr>
<td>Females</td>
<td>0.630</td>
<td>0.701</td>
</tr>
</tbody>
</table>

SAED- South Africans of European Decent SA- Indigenous South Africans

Table 5 shows the correlation coefficients of comparable measurements of the femur in the present study and those of Bidmos M A.

• In males all the six measurements, the correlation reported in this study is higher than that of Bidmos M A.

• In females, with the exception of VND, all the other five measurements, the correlation described in our study is lower than those of Bidmos M A’s study.

• Correlation of VND in our study is better than that of South African of European Females but lower in Indigenous South Africans.

CONCLUSION

• All the fragmentary measurements in our study show positive correlations with the FML. Therefore, Maximum Femoral Length (FML) and stature of the individual can be estimated from fragmentary remains of the proximal femur.

• In males, the measurements showing the degree of correlation with FML in descending order are VHA, VND, VHD and WSD.

• In females, the measurements showing degree of correlation with FML in descending order are VHA, VHD, VND and WSD.

ACKNOWLEDGEMENTS

We would like to acknowledge Dr Yashoda Rani and Dr S K Naik, Department of Forensic Medicine, LHMC, New Delhi and Dr Surinder Nath, Ex-Prof and Head, Department of Anthropology, Delhi University for their constant encouragement and guidance.

Source of Funding: None

Ethical Clearance: Issued by the Institutional Ethics committee, Lady Hardinge Medical College, New Delhi., prior to MD dissertation thesis.

Conflict of Interest: None

REFERENCES


INTRODUCTION

Poisoning is a major problem in children. However, the offending agent and the associated morbidity and mortality vary from place to place and change over a period of time. With the control of infectious diseases, the contribution of poisoning to childhood mortality has been increasing in developing countries. In contrast, paediatric poisoning incidence in developing countries is poorly documented. Likewise in India limited data are available on morbidity and mortality related to poisoning in children, in particular the changes in its pattern over the years. Many studies have been done relating to the age incidence; sex incidence; seasonal distribution; type of poison consumed; manner of poisoning and outcome of cases. The present study was undertaken to determine poisoning in children with respect to age, sex, type of poison, habitat, manner of poisoning, seasonal distribution and outcome of the cases admitted in KIMS Karad.

MATERIAL AND METHOD

This retrospective study was carried out at KIMS Karad, over a period of 3 years from Jan 2010 to Dec 2012 in the age group 0 to 14 years. All cases of poisoning admitted in the study period where analysed and studied accordingly, the data obtained from hospital and medical record section.

ABSTRACT

Poisoning is a major problem in the paediatric population. The offending substances used vary from place to place. The present study was undertaken to determine poisoning in children with respect to age, sex, habitat, seasonal distribution, type of poison, outcome and manner of poisoning. This is a retrospective analysis of 3 years from Jan 2010 to Dec 2012 of all childhood poisoning cases admitted in Krishna Institute of Medical Sciences, Karad in the age group of 0 to 14 years. A total of 152 cases were studied with male to female ratio of 2.3:1. Most common age group involved was 10-14 yrs with the incidence being more common in rural areas (86.1%). Most common poisoning was animal bite (63.8%) followed by kerosene (7.8%) pesticide (6.5%), drug (3.2%) and other substance (18.7%) ingestion. Rainy season was found to be the most vulnerable period for poisoning. All cases were accidental except one which was homicidal in nature. There was a mortality rate of 0.65 % whereas 4 cases were discharged against medical advice. As most of the cases were accidental in nature, so access prevention and health education campaign should be instituted to reduce the incidence of accidental poisoning in children.

Keywords: Accidental Poisoning, Paediatric Poisoning, Animal Bite

Pattern of Paediatric Poisoning - A 3 Year Retrospective Study in Krishna Institute of Medical Sciences, Karad, Maharashtra

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Fax No: 02164 242170

DOI Number: 10.5958/j.0974-1283.14.1.044
RESULTS

A total of 152 poisoning cases of 14 years of age were studied at KIMS Karad. 42.7% were under 10-14 years of age and 70.6% male (Male to female ratio was 2.3:1) (Table 1). Incidence was more common in rural areas (86.1%) as compared to urban areas (13.9%) (Table 2) and there was no significant season-wise variation observed (Table 3). Animal bite and kerosene were the most common offending agents, both accounting for 71.8% cases (Table 5). All cases were accidental except one case was due to homicidal in nature (Table 4). All cases improved except 1 which expired due to unknown poisoning and 5 cases were discharged against medical advice (Table 6).

Table 1: Age and Sex wise distribution.

<table>
<thead>
<tr>
<th>Age(yrs)</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>32(21%)</td>
<td>16(10.5%)</td>
<td>48(31.5%)</td>
</tr>
<tr>
<td>5-10</td>
<td>28(18.4%)</td>
<td>11(7.2%)</td>
<td>39(25.6%)</td>
</tr>
<tr>
<td>10-14</td>
<td>47(33.8%)</td>
<td>18(11.8%)</td>
<td>65(42.7%)</td>
</tr>
<tr>
<td>Total</td>
<td>107 (70.3%)</td>
<td>45 (29.6%)</td>
<td>152</td>
</tr>
</tbody>
</table>

Table 2: Habitat wise distribution.

<table>
<thead>
<tr>
<th>Habitat</th>
<th>No of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>21(13.8%)</td>
</tr>
<tr>
<td>Rural</td>
<td>131(86.1%)</td>
</tr>
</tbody>
</table>

Table 3: Season wise distribution.

<table>
<thead>
<tr>
<th>Type of poisoning</th>
<th>Summer</th>
<th>Rainy</th>
<th>Winter</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snake bite</td>
<td>13(8.5%)</td>
<td>36(23.6%)</td>
<td>19(12.5%)</td>
<td>68(44.7%)</td>
</tr>
<tr>
<td>Unknown bite</td>
<td>5(3.2%)</td>
<td>2(1.3%)</td>
<td>12(7.8%)</td>
<td>19(12.5%)</td>
</tr>
<tr>
<td>Kerosene</td>
<td>7(4.6%)</td>
<td>2(1.3%)</td>
<td>3(1.9%)</td>
<td>12(7.8%)</td>
</tr>
<tr>
<td>Scorpion sting</td>
<td>3(1.9%)</td>
<td>5(3.2%)</td>
<td>2(1.3%)</td>
<td>10(6.5%)</td>
</tr>
<tr>
<td>Unknown</td>
<td>3(1.9%)</td>
<td>1(0.6%)</td>
<td>5(3.2%)</td>
<td>22(14.4%)</td>
</tr>
<tr>
<td>Organophosphorus</td>
<td>2(1.3%)</td>
<td>1(0.6%)</td>
<td>3(1.9%)</td>
<td>6(3.9%)</td>
</tr>
<tr>
<td>Others</td>
<td>19(12.5%)</td>
<td>8(5.2%)</td>
<td>10(6.5%)</td>
<td>15(9.8%)</td>
</tr>
<tr>
<td>Total</td>
<td>52(34.2%)</td>
<td>55(36.1%)</td>
<td>45(29.6%)</td>
<td>152</td>
</tr>
</tbody>
</table>

Table 4: Manner of poisoning.

<table>
<thead>
<tr>
<th>Manner of poisoning</th>
<th>No of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accidental</td>
<td>151(99.3%)</td>
</tr>
<tr>
<td>Suicidal</td>
<td>00(0.0%)</td>
</tr>
<tr>
<td>Homicidal</td>
<td>01(0.7%)</td>
</tr>
</tbody>
</table>

Table 5: Outcome of various poisons.

<table>
<thead>
<tr>
<th>Type of poison</th>
<th>Improved</th>
<th>Unchanged</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal bites</td>
<td>96(63.1%)</td>
<td>1(0.65%)</td>
<td>0.0%</td>
</tr>
<tr>
<td>Kerosene</td>
<td>9(5.9%)</td>
<td>3(1.9%)</td>
<td>0.0%</td>
</tr>
<tr>
<td>Organophosphorus</td>
<td>5(3.2%)</td>
<td>1(0.65%)</td>
<td>0.0%</td>
</tr>
<tr>
<td>Others</td>
<td>45(29.6%)</td>
<td>0.0%</td>
<td>1(0.65%)</td>
</tr>
</tbody>
</table>

Table 6: Type of poison distribution.

<table>
<thead>
<tr>
<th>Sl.no</th>
<th>Type of poison</th>
<th>No of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>Household products</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kerosene</td>
<td>12(7.8%)</td>
</tr>
<tr>
<td></td>
<td>Turpentine oil poisoning</td>
<td>01(0.65%)</td>
</tr>
<tr>
<td></td>
<td>Castor oil poisoning</td>
<td>08(5.2%)</td>
</tr>
<tr>
<td></td>
<td>Colour poisoning</td>
<td>01(0.65%)</td>
</tr>
<tr>
<td></td>
<td>Rat poisoning</td>
<td>01(0.65%)</td>
</tr>
<tr>
<td></td>
<td>Engine oil poisoning</td>
<td>01(0.65%)</td>
</tr>
<tr>
<td></td>
<td>Camphour poisoning</td>
<td>01(0.65%)</td>
</tr>
<tr>
<td>2)</td>
<td>Animal bites</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Snake bite</td>
<td>68(44.7%)</td>
</tr>
<tr>
<td></td>
<td>Unknown bite</td>
<td>19(12.5%)</td>
</tr>
<tr>
<td></td>
<td>Scorpion sting</td>
<td>10(12.5%)</td>
</tr>
<tr>
<td>3)</td>
<td>Pharmaceutical products</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Paracetamol poisoning</td>
<td>01(0.65%)</td>
</tr>
<tr>
<td></td>
<td>Carbamezepine poisoning</td>
<td>02(1.3%)</td>
</tr>
<tr>
<td></td>
<td>Cefixime poisoning</td>
<td>01(0.65%)</td>
</tr>
<tr>
<td></td>
<td>Iron poisoning</td>
<td>01(0.65%)</td>
</tr>
<tr>
<td>4)</td>
<td>Agricultural products</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Organophosphorous poisoning</td>
<td>06(3.9%)</td>
</tr>
<tr>
<td></td>
<td>Permethrin poisoning</td>
<td>02(1.3%)</td>
</tr>
<tr>
<td></td>
<td>Malathion poisoning</td>
<td>01(0.65%)</td>
</tr>
<tr>
<td></td>
<td>Organo carbamate poisoning</td>
<td>01(0.65%)</td>
</tr>
<tr>
<td>5)</td>
<td>Plant products</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Semicarpus anacardium poisoning</td>
<td>01(0.65%)</td>
</tr>
<tr>
<td>6)</td>
<td>Food products</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Food poisoning</td>
<td>04(2.6%)</td>
</tr>
<tr>
<td>7)</td>
<td>Unknown compound</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unknown compound Poisoning</td>
<td>10(6.5%)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>152</td>
</tr>
</tbody>
</table>
DISCUSSION

The childhood poisoning death rates have declined over the past decade, largely due to parental awareness and appropriate interventions. However children continue to be at significantly greater risk than adults for poisoning, because they have faster metabolic rates and are less able to physically handle toxic chemicals. In addition natural curiosity and their desire to put everything in their mouth increase their poisoning risks.

The incidence, age, sex, nature and type of poison consumed vary from area to area. Present study noted that the most vulnerable age group for poisoning is 10-14yrs, because early adolescent playful period mostly outdoors making the child vulnerable for animal bites. Study also observed that increased incidence of animal bites in 10-14yrs age group. Studies by Patil V C et al and Inamdar et al concluded snake bite is a common life threatening emergency in the study area.

There was a male preponderance in our study which is consistent with Rashid AKM (2007) in a study by G N Lucas (2006) who studied 243 children which showed male to female ratio (148:95); studies by Hussein AB and Ahmed AB (2007) showed similar results; Queensland injury surveillance unit studied childhood poisoning (2000) which showed male preponderance in their studies; similarly a study at All India Institute of Medical Sciences, New Delhi by Gupta S K et al (2003) showed male : female sex ratio of 63.11%: 36.88%.

Present study observed predominance of poisoning in rural children due increasing incidence of snake bites in the rural area. A retrospective study done by Sharma N et al in PGI Chandigarh showed an increasing incidence of snake bites in rural area with a ratio of (urban:rural-1:4.7) (2006) which is in agreement with Patil V C et al and Inamdar et al.

The study noted that, rainy season was the most vulnerable period when maximum cases were reported. This can be explained on the basis of more snakes coming out during rainy season due to filling of water in their burrows and thus increasing the human snake interaction resulting in more number of snake bites during the season, while summer being a dry season, thirst causes an increased attraction towards liquids thus increasing cases of accidental poisoning especially Kerosene poisoning which was the commonest poisoning in summer season. This was consistent with various studies from Syeda Akhtar et al (2006) & Gupta S K et al (2003). This can be attributed to the use of kerosene oil as a fuel especially in lower income group, its storage in easily accessible places & its colour which is often mistaken for soft drink.

All the cases studied were accidental except a 3 month old child who was homicidal with organophosphorous compound. The studied showed that all the cases improved except one which expired due to unknown poisoning and 5 cases were discharged against medical advice. Age and sex are the factors to be considered in evaluating a child’s risk for poisoning. In addition, developmental and environmental factors may contribute to the risk of a poisoning event.

CONCLUSION

Most common age group involved was 10–14 yrs and more frequent in males population of rural areas. Rainy season is the most vulnerable period, when maximum cases of snake bites were reported while kerosene poisoning is the most frequently reported household poisoning. 0.65% of cases proved to be fatal due to unknown compound poisoning and animal bites are responsible for most of the cases due to geographical distribution. All cases were accidental except 1 case which was homicidal in nature. Thus we recommend establishment of regional toxicological centres which help guide hospitals in the quick identification of poisons and provide guidelines for treatment. There is also a need to initiate public awareness campaigns to attempt to decrease morbidity and mortality from this eminently preventable problem.

ACKNOWLEDGEMENT

We thanks to the Dr Sunil Armani- Associate Professor, Department of Forensic Medicine and Toxicology KIMS Deemed University, who facilitates our mission at the University.

Ethical Approval: Ethical approval taken from the university ethics committee.
REFERENCES


Profile of Poisoning at a Teaching Hospital in Shillong (Northeast India)

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1Associate Professor, 2Senior Resident, Department of Forensic Medicine, NEIGRIHMS, Shillong

ABSTRACT

Background: Every incident of poisoning is fraught with medico-legal and ethical implications. Knowledge of the poisoning profile in a particular area is helpful to ensure better management and prevention of such episodes in future.

Method: All cases admitted to the emergency department of the hospital between July 2009 and June 2012 with suspicion of acute poisoning (from the history and clinical findings) were included in the study. Data was obtained retrospectively from the Casualty Medico-Legal Case (MLC) Registers for that period and analyzed using Microsoft Excel 2007.

Results: Males in the age group 21 to 30 years were most commonly affected. The mode of poisoning was mainly an overdose of drugs and medicinal substances. The majority of cases were suicidal attempts.

Conclusion: A multidisciplinary approach is needed to deal with the problem of suicidal poisoning, especially in the vulnerable age group of young adults and adolescents in the northeast region. The misuse of prescription drugs calls for health education and enforcement of laws to curb illicit sale and trafficking of medicinal substances.

Keywords: Poisoning, Suicidal, Northeast Region
were included in the study. Cases of snake and insect bite, food poisoning and allergic reaction to drugs were excluded from the study. Data was obtained from the Medico-Legal Case (MLC) Registers for the period July 2009 to June 2012. A total of 79 cases were included in the study. The parameters considered were sociodemographic factors, agents and route of intake, and manner of poisoning. The particulars of every case were recorded on a proforma, entered in a computer database and analyzed using Microsoft Office Excel 2007.

Ethical clearance for the study was obtained from the institutional ethics committee (IEC).

RESULTS

The results are shown in Tables 1 to 4 and Figures 1 to 3. Out of the total number of 2074 medico-legal cases registered in the emergency department during the study period, 3.8% are attributed to known or suspected poisoning. The agents comprised a wide range of prescription medicines, pesticides, drugs of abuse and household chemicals. Most of the poisons were ingested orally (96.2%) except for heroin (intravenous), cannabis (inhalation) and an unknown drug injected intravenously. Five patients (6.3%) consumed more than one agent. The vulnerable age group was found to be 21 to 30 years in both sexes (Male: Female=1.6:1). In more than half of the cases, incidents of poisoning were self-inflicted. However, no fatalities were recorded in the present study. Only 16.5% of patients arrived in hospital within the ‘golden hour’, i.e. the first 60 minutes after exposure to the poison.

Table 1: Age and sex distribution of cases.

<table>
<thead>
<tr>
<th>Age group</th>
<th>Total</th>
<th>Percentage</th>
<th>Number of male(s)</th>
<th>Number of female(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10 years</td>
<td>3</td>
<td>3.8</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>11-20 years</td>
<td>18</td>
<td>22.8</td>
<td>6</td>
<td>12</td>
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<tr>
<td>21-30 years</td>
<td>37</td>
<td>46.8</td>
<td>23</td>
<td>14</td>
</tr>
<tr>
<td>31-40 years</td>
<td>14</td>
<td>17.7</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>41-50 years</td>
<td>4</td>
<td>5.1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>51-60 years</td>
<td>1</td>
<td>1.3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>&gt;60 years</td>
<td>2</td>
<td>2.5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>79</td>
<td>100</td>
<td>43</td>
<td>36</td>
</tr>
</tbody>
</table>

Table 2: Manner of poisoning (n=79).

<table>
<thead>
<tr>
<th>Manner</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suicidal</td>
<td>43</td>
<td>54.4</td>
</tr>
<tr>
<td>Accidental</td>
<td>25</td>
<td>31.6</td>
</tr>
<tr>
<td>Homicidal</td>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td>Uncertain</td>
<td>9</td>
<td>11.4</td>
</tr>
</tbody>
</table>

Table 3: Type of poison (n=79)

<table>
<thead>
<tr>
<th>Poison</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenol</td>
<td>9</td>
<td>11.4</td>
</tr>
<tr>
<td>Pesticide</td>
<td>14</td>
<td>17.7</td>
</tr>
<tr>
<td>Drug/Medicine</td>
<td>26</td>
<td>32.9</td>
</tr>
<tr>
<td>Alcohol and spirits</td>
<td>10</td>
<td>12.6</td>
</tr>
<tr>
<td>Dettol</td>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td>Kerosene</td>
<td>3</td>
<td>3.8</td>
</tr>
<tr>
<td>Diesel</td>
<td>1</td>
<td>1.3</td>
</tr>
<tr>
<td>Battery acid</td>
<td>1</td>
<td>1.3</td>
</tr>
<tr>
<td>Datura</td>
<td>6</td>
<td>7.6</td>
</tr>
<tr>
<td>Shampoo</td>
<td>1</td>
<td>1.3</td>
</tr>
<tr>
<td>Unknown</td>
<td>6</td>
<td>7.6</td>
</tr>
</tbody>
</table>

Table 4: Substances of abuse.

<table>
<thead>
<tr>
<th>Substance</th>
<th>No.of cases</th>
<th>Route of administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spasmoproxyvon (SP)*</td>
<td>3</td>
<td>Oral</td>
</tr>
<tr>
<td>Cannabis</td>
<td>1</td>
<td>Inhalation</td>
</tr>
<tr>
<td>Alcohol</td>
<td>3</td>
<td>Oral</td>
</tr>
<tr>
<td>Alcohol and SP</td>
<td>2</td>
<td>Oral</td>
</tr>
<tr>
<td>Heroin</td>
<td>1</td>
<td>Intravenous</td>
</tr>
</tbody>
</table>

* A capsule of Spasmoproxyvon contains 10 mg of Dicyclomine (Dicycloverine) 400 mg of Acetaminophen and 65 mg of Dextropropoxyphene

Fig 1. Marital status of poisoned patients

Fig 2. Medicines involved in poisoning
DISCUSSION

This hospital-based study shows that the majority of poisoning cases admitted were suicidal in nature. The prevalence of substance abuse and psychological problems among the youth of our region are some of the factors behind intentional or accidental overdosage of drugs. According to reports, a significant proportion of overdose cases comprise suicide attempts. It is estimated that among adolescents, suicide accounts for a third of all unnatural deaths, while in college students, suicide is the second leading cause of unnatural death1. Alcohol dependence is strongly associated with an increased risk of suicide10.

The route of exposure was predominantly oral as observed by other authors11. Males in the age group 21 to 30 years were most commonly affected, which is consistent with the findings of similar studies based in Mangalore12 (south India) and Yavatmal (western India)13. The vulnerable age group comprised young adults who were either addicted to drugs or mentally disturbed owing to relationship issues. Married individuals outnumbered unmarried in attempts to harm themselves, probably due to emotional upheavals between spouses.

The consumption of medicines and prescription drugs which are readily available over the counter may have been an easy way out of unbearable life situations. Some of the suicidal attempts have coincided with examinations or college admissions during the months of March, April and August, and have happened within the campuses of educational institutions. In a study from Ecuador, only 26% of the reported poisoning cases were drug related14, whereas in the present study the figure was 32.9%. Among the non-medicinal substances were pesticides, which comprised 17.7% of all poisonings, contrary to other parts of India where these substances usually topped the list of toxic exposures15.

It has been observed that analgesics (paracetamol, mfenamic acid, diclofenac), psychoactive drugs such as sedatives (alprazolam, diazepam and clonazepam) and antidepressants (escitalopram) ranked high in the preferred group of pharmaceutical agents by youngsters. Most self poisoning attempts are impulsive, so if fewer psychotropic drugs were available they might less often be abused in this way16. Hence, greater caution should be exercised by physicians and psychiatrists while prescribing medicines for their patients, especially those belonging to the adolescent age group17.

There were no fatalities recorded in this study, possibly due to the fact that poisons were consumed in suboptimal quantities and the majority of patients did not wish to die. However, all survivors of intentional poisoning have to undergo compulsory psychiatric evaluation in order to reduce the risk of self harm in future18.

Our hospital is a tertiary care centre situated 12 km from the heart of Shillong town. The Emergency Department started functioning in July 2009. Its geographical location and recent history may partly explain the apparent paucity in the total number of poisoning cases, although patient load is gradually increasing year by year. However, the bulk of medico-legal cases report to the State Civil Hospital situated in the hub of town.

It may be mentioned that the relatively small sample size and remote location of our hospital were the limitations of this study. Moreover, cases of animal/insect bites and food poisoning were not classified as medico-legal on emergency admission. In some parts of India, a significant proportion of toxic exposures in children are due to bites and stings19. Therefore, the figures projected here may not reflect the actual magnitude of the problem of poisoning in Shillong. In this regard, further studies have to be undertaken in other government and private hospitals in order to find
out the reasons for self poisoning, obtain a better representation of the affected population, and thereby formulate preventive measures for the same. In addition, chemical analysis to categorize the type of poison would help to corroborate clinical findings and institute specific line of treatment for a particular agent.

CONCLUSION

As the age groups involved are mostly young adults and adolescents, it is concluded that a multidisciplinary approach is needed to address the issue of self poisoning. Explicit guidelines and policies must be in place so that pharmacies cannot dispense medicines over the counter without a proper prescription from a registered medical practitioner. Enforcement of laws to curb illicit sale and trafficking of drugs is the need of the hour. Awareness-raising campaigns for rational use of medicines and social programs for suicidal patients should also help decrease the frequency of such cases.

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Conflict of Interest: None to declare

Source of Funding: Nil

REFERENCES:


Cardiac Rupture Following Myocardial Infarction - A Case Report

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ABSTRACT

Ventricular wall rupture occurs in 1-3% cases with acute myocardial infarction (AMI) and is the third most common cause of death caused by AMI. This most severe mechanical complication of the AMI often remains undiagnosed and constitute a necropsy finding. Acute free wall rupture complicating AMI is defined as an abrupt and complete transmural rupture of the infarcted region, causing cardiac tamponade and death within 30 minutes. Ventricular free wall rupture occurs up to ten times more frequently than septal or papillary muscle rupture. The pathophysiological process involves thinning of the myocardial wall with the intensity of necrosis occurring at the terminal end of the vessel (watershed area) where there is often poor collateral flow. Here we described in brief about this fatal complications presentation, pathophysiology and diagnosis.

Keywords: Acute Myocardial Infarction, Ventricular Wall Rupture, Cardiac Tamponade

INTRODUCTION

“It seems that a person dies from a broken heart, not in young adult life from a great grief or emotion, but usually in old age, on account of diseased coronaries…”

Krumbhaar and Crowell¹

Ventricular wall rupture occurs in 1-3% cases with acute myocardial infarction (AMI) and is the third most common cause of death caused by AMI. This most severe mechanical complication of the AMI often remains undiagnosed and constitute a necropsy finding.² Acute ventricular free wall rupture may present by chest pain, or by the classic features of cardiac tamponade, namely, shock with hypotension, pulsus paradoxus, elevated venous pressure, quiet heart sounds and sinus bradycardia, or frank electromechanical dissociation. Death usually ensues in a matter of minutes to hours.³ The pathophysiological process involves thinning of the myocardial wall with the intensity of necrosis occurring at the terminal end of the vessel (watershed area) where there is often poor collateral flow.⁴

CASE DESCRIPTION

A 58 years old male patient non-smoker and non-alcoholic, without the previous history of any cardiac disease was brought to the emergency department of Indira Gandhi Govt. Medical College, Nagpur in early morning. There was history of collapse while he was in toilet without any preceding complains such as chest pain or breathlessness. On examination by attending physician, patient was unconscious and cardiopulmonary resuscitation measures were ineffective so the patent declared as brought dead. The dead body sent to mortuary for post-mortem examination.

At autopsy, it was a dead body of a male, obese built (weight 98kg) and external examination was unremarkable. During internal examination a large blood clot about 350ml was present in the pericardial cavity.(Photograph - 1) Heart was enlarged weighing 400gm. Coronary arteries were tortuous, thickened and hardened, showing blockage of about 70 to 80%. A tear

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was present at anterior wall of left ventricular cavity measuring about 1.5cm X 0.8cm having irregular margins (Photograph – 2). Hyperemia of ventricular wall was present. Rest of internal examination was insignificant.

The cause of death was given as “Death due to cardiac tamponade following myocardial infarction”.

DISCUSSION

Cardiac rupture is an early and predominantly fatal complication of acute MI that occurs in approximately 1% of patients but is responsible for nearly 15% of all deaths. Acute free wall rupture complicating AMI was defined as an abrupt and complete transmural rupture of the infarcted region, causing cardiac tamponade and death within 30 minutes. It typically happens in the subacute setting after a myocardial infarction in which the infarcted muscle of the heart thins out and tears. Myocardial rupture is more likely to happen in elderly individuals who suffer from their first heart attack and not revascularized. In patients, who experienced the first myocardial infarction and were not in heart failure, electromechanical dissociation has a very high sensitivity and specificity as a sign of left ventricular free wall rupture. It is particularly common in women and elderly, with higher mortality in women compared to men. William Harvey in 1647 described cardiac rupture as a finding at autopsy of a knight who suffered severe chest pain. In 1765, G. Morgagni reported it as a necropsy finding. O’Rourke first classified free ventricular wall rupture as acute, subacute and chronic.

Ventricular free wall rupture occurs up to ten times more frequently than septal or papillary muscle rupture. Opinions differ as to the most common site of the left ventricular wall rupture. It was suggested that a lateral wall infarction is more likely to rupture than an anterior or inferior infarction. However, anterior myocardial infarctions are more frequent than lateral myocardial infarctions and thus the anterior wall is the most common site. However, in terms of pressure gradient, the right ventricle is not subject to strain comparable to the left ventricle, and hence the much lower frequency of right ventricular rupture. This is not the only factor that protects the right ventricle. The right ventricle has better collateral circulation and thinner wall, allowing better perfusion of myocardium and decreasing the likelihood of transmural infarction. Anterior and lateral wall ruptures of the left ventricle are much more prevalent than posterior wall ruptures, probably because of the protection afforded by the adherent pericardium.

Acute ventricular wall rupture may present by chest pain, or by the classic features of cardiac tamponade, namely, shock with hypotension, pulsus paradoxus, elevated venous pressure, quiet heart sounds and sinus bradycardia, or frank electromechanical dissociation. Death usually ensues in a matter of minutes to hours. Cardiopulmonary resuscitation maneuvers are unsuccessful in these cases.

The pathophysiological process involves thinning of the myocardial wall with the intensity of necrosis occurring at the terminal end of the vessel (watershed area) where there is often poor collateral flow. Collection of blood in the pericardial sac interferes with
ventricular dilation during diastole and compresses the great veins and the right atrium. As the arterial blood pressure falls and the venous pressure rises, there is a progressive failure of the circulation. As little as 150-300ml is sufficient to cause death due to cardiac tamponade.9

Purcaro et al10 described six pathologic types of ruptures encountered in their series of 28 patients. They were as follows:

1. Through and through straight rupture of normal thickness myocardium;
2. Similar but through the thin necrotic myocardium;
3. Multiple small perforations;
4. Rupture of outer layer only;
5. Subepicardial haematoma without free rupture into the pericardial sac; and
6. Hemorrhagic infarct with wall integrity but leaking surface

Traneseophageal echo is diagnostic for this condition and is a gold standard. Initial management is hemodynamic stabilization followed by blood transfusion, pericardiocentesis, inotropic support and use of an intra-aortic balloon pump but ultimately prompt surgical repair is required.4

CONCLUSION

The patient presentation i.e. collapse with no preceding symptoms coupled with the fact that he was suffering a silent AMI with no prior indication of ischemic heart disease eg. Angina, shortness of breath etc and the rapid subsequent development of left ventricular free wall rupture in young age made this quite an unusual case.

DECLARATION

I hereby submit the original research paper entitled “Cardiac Rupture following myocardial infarction – a case report”. The manuscript represents valid work and that neither this manuscript nor one with substantially similar content under the present authorship has been published or is being considered for publication elsewhere and the authorship of this article will not be contested by anyone whose name(s) is/are not listed here. The order of authorship as placed in the manuscript is final and accepted by the coauthors.

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Conflict of Interest: None

Source of Funding: Self

Ethical Clearance: Not required

REFERENCES

6. Mehmet S Ülgen1, Önder Öztürk2, Mehmet Kayrak1, Ahmet Soyulu1 M Akif Düzenli1, Fatih Koc A lethal but treatable complication: free wall...
rupture after acute myocardial infarction, 
European Journal of General Medicine, 2006, Vol 3(1), P 41-44
Comparative Study of Placenta in Hypertensive Pregnancies in the Population of Vidarbha Region of Maharashtra India

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1Assistant Professor in Anatomy, Government Medical College (GMC) Nagpur, 2Associate Professor in Anatomy, DMIMS, Sawangi, 3Professor & Head GMC Kolhapur, 4Associate Professor in Anatomy, 5Professor & Head GMC Nagpur

ABSTRACT

This study was carried out to compare the placentae of normal and hypertensive pregnancies in terms of weight, number of cotyledons, surface area, volume and presence of infarcted areas and attachment of umbilical cord. Then an attempt was made to correlate the hypertensive disease with foetal outcome. 230 Fresh placentae were collected immediately after delivery of the newborn, washed in running tap water, dried with blotting paper and then weighed. Surface area and volume was also calculated. The weight of the newborn was noted in both the groups. The results of this study indicate significant reduction in weight, surface area and volume of the hypertensive placentae as compared to the normal placentae. We conclude that placenta of hypertensive mothers have associated morphological changes.

Keywords: Foetal outcome, Hypertensive pregnancies, Placentae

INTRODUCTION

Placenta is a matter of interest and curiosity for ages. Many workers have unfolded several aspects of it since many years. Still then it is the topic of interest because of its incomparable importance in the intrauterine development of human body. The growth of the placenta is directly influenced by the maternal health conditions and accordingly it affects the intrauterine status of the foetus 1.

Now a day, the hypertensive diseases complicating pregnancies are very common and such hypertensive pregnancies are one of the commonest causes of maternal and foetal mortality and morbidity. In these diseases, there is increased resistance to flow in utero-placental circulation of blood which adversely affects the growth of placenta in terms of weight, surface area, and volume. These placental abnormalities ultimately results in reduction of foetal weight 2.

All these findings are helpful in the immediate and later management of the mother and the infant. So here, we have made an attempt to correlate and compare the morphological changes in the placenta of normal and hypertensive pregnancies in respect of placental weight, surface area, volume, infarcted areas and attachment of umbilical cord and correlate it with the birth weight of the baby.

MATERIALS AND METHOD

The fresh placentae collected from normal pregnant cases and cases of preeclampsia-eclampsia syndrome admitted, diagnosed and delivered in the department of obstetrics and gynaecology, Government Medical College Nagpur, Maharashtra (India) were included in the study. Overall 230 cases were included in the study, which were divided into two main groups:

Group 1 or control group: Normal control cases and their respective placentae (figure 1). This group includes 80 cases.

Group 2 or study group: Hypertensive pregnancies which were diagnosed as pre-eclampsia (figure2), eclampsia or gestational hypertension and their
respective placentae. 150 cases were included in this group.

Criteria for selection of cases for group 1 (control group) as per Chesley 1985

1. Registered cases whose present and past history was uneventful and who were attending ante-natal clinics regularly.
2. Whose haemoglobin level is above 10mg%.
3. Whose B.P. is below 140/90mm Hg throughout the pregnancy °.

1. Blood pressure of mother after completion of 20 weeks of gestation was 140/90mm of Hg or greater.
2. Albumin in urine (proteinuria)- 300mg or more of urinary proteins during 24 hours period or 100mg/dl or more in atleast 2 random urine samples collected 6 hours apart or more °.

The placentae from both these groups were collected immediately after delivery from labour rooms or O.T. They were first washed, and then dried with blotting paper and then weighed in weighing machine. The diameter and central thickness of the placentae were measured to calculate the surface area and volume of the placentae. Number of cotyledons on the maternal surface was calculated. Also presence of infarcted areas and attachment of umbilical cord is noted. The weights of the newborn babies were noted °. The mean birth weight in Kg of the babies from study and control group was calculated. The mean placental weights in gram of placentaes from both groups were calculated and the foeto-placental ratio is calculated. Statistical analysis is done using statistical software.

RESULT

Table-1 indicates that the mean placental weight and the mean birth weight of babies are significantly lower in hypertensive group as compared to control group, but mean foeto-placental weight ratio is significantly higher in control group than hypertensive group.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Study Group (n=80)</th>
<th>Control Group (n=150)</th>
<th>Z-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean birth weight of babies in Kg</td>
<td>2.73±0.42</td>
<td>2.26±0.54</td>
<td>7.14*</td>
</tr>
<tr>
<td>Mean placental weight in grams</td>
<td>405.75±59.20</td>
<td>317.56±69.23</td>
<td>10.13*</td>
</tr>
<tr>
<td>Mean foeto-placental weight ratio</td>
<td>6.72±0.49</td>
<td>7.18±1.18</td>
<td>4.14*</td>
</tr>
</tbody>
</table>

*Indicates p value significant

Table 1: Placental Morphometric Study

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Study Group (n=80)</th>
<th>Control Group (n=150)</th>
<th>Z-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean no of cotyledons per placenta</td>
<td>16±2.01</td>
<td>14.41±2.59</td>
<td>5.12*</td>
</tr>
<tr>
<td>Mean placental area in sq cm</td>
<td>214.59±57.44</td>
<td>175.63±57.41</td>
<td>4.90*</td>
</tr>
<tr>
<td>Mean placental volume in cu. Cm</td>
<td>461.76±137.46</td>
<td>356.85±44.90</td>
<td>5.40*</td>
</tr>
</tbody>
</table>

*Indicates p value significant

Table 2: Gross Anatomy of Placenta

Fig. 1. Full term placenta

Fig. 2. Placenta from a case of pre-eclampsia

Criteria for selection of cases for group 2 (study group) as per Chesley (1985)
Mean number of cotyledons per placenta, mean placental area, and mean placental volume, all parameters are found to be lower in study group in comparison to normal group (Table-2).

Out of the 80 cases of control group only 3 cases (3.75%) showed infarcted areas while out of 150 cases of the PIH group 27 cases (18%) showed infarcted areas in the placenta (figure 3). Thus infarcted areas are significantly common in the hypertensive group than the control group. (P=0.00017, significant) (Table-3).

Table 3: Infarcted areas in both the groups

<table>
<thead>
<tr>
<th>Infarcted Areas</th>
<th>Study Group</th>
<th>Control Group</th>
<th>Fisher’s Exact test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>03</td>
<td>27</td>
<td>P=0.0017*</td>
</tr>
<tr>
<td>Absent</td>
<td>77</td>
<td>123</td>
<td>Non significant</td>
</tr>
</tbody>
</table>

*Indicates p value significant

We found that in normal pregnancies out of 80 cases, only single case (1.25%) shows marginal attachment of umbilical cord while in hypertensive group 23 cases (15.33%) out of 150 cases showed marginal attachment of umbilical cord (figure 4) to Fisher’s Exact test these are significant findings (Table-4).

Table 4: Attachment of umbilical cord in both the groups

<table>
<thead>
<tr>
<th>Umbilical cord attachment</th>
<th>Study Group</th>
<th>Control Group</th>
<th>Fisher’s Exact test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>79</td>
<td>127</td>
<td>P=0.0004*</td>
</tr>
<tr>
<td>Marginal</td>
<td>01</td>
<td>23</td>
<td>Non significant</td>
</tr>
</tbody>
</table>

*Indicates p value significant

Fig. 4. The marginal attachment of umbilical cord is shown in the following

DISCUSSION

Although many studies have been undertaken on examination of placenta and foetal outcome in hypertensive pregnancies, a very few studies have actually used parameters which are comparable with each other. In the present study, the mean placental weight in hypertensive group is measured as 317.56±69.23 gm which is significantly lower than the control group. This finding is in conformity with Adair and Theelander [1925], Udainia and Jain [2001] and Majumdar [2005].

Similarly weight of the newborn baby in the hypertensive group is measured as 2260±54 gm which is lower than the control group. Similar findings were observed in studies of Baird and Thomson [1957], AP Chakravorty [1967] and Majumdar [2005].

Majumdar et al recorded that mean foeto-placental weight ratio was higher in the hypertensive group than the control group. Similarly, in the present study, the mean foeto-placental weight ratio in the hypertensive group is higher, i.e., 7.18±1.18 than that of the control group, i.e., 6.72±0.49. Damania [1989], Rathand Garg [2000] and Majumdar [2005] observed that mean placental area, mean placental volume and mean
number of cotyledons per placenta in the normal control group are significantly higher than that of the study group. Similar findings are observed in the present study.

Udainia et al and Majumdar et al recorded that infarcted areas are commonly present in the hypertensive placentae as compared to the hypertensive placentae. In the present study, infarcted areas are seen in 18% cases of study group while in normal pregnancies, it is seen in only 3.75% cases.

Parceival 1980 had reported that 73% cases of hypertensive group shows eccentric attachment of umbilical cord. Similarly Rath G et al showed marginal attachment of umbilical cord in 42% cases of study group. In the present study, 23 out of 150 cases (15.33%) cases of study grouped showed marginal attachment of umbilical cord.

CONCLUSIONS

We conclude that foetus and placenta of the women having pregnancy induced hypertension weighed less than that of the normal pregnancies. Foeto-placental weight ratio is more in the hypertensive group than the control group. The mean surface area and mean volume of the placenta is also less in pregnancy induced hypertension. The hypertensive placenta has less number of cotyledons. Presence of infarcted areas is a common finding in hypertensive placentae and marginal attachment of umbilical cord more common in hypertensive group.

Conflict of Interest: Nil

Source of Funding: Nil

Acknowledgement: Nil

Ethical Clearance: Obtained

REFERENCES

Pattern of Fatal Vehicular Accidents Involving Head Injuries in Southern Marathwada Region of Maharashtra

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ABSTRACT
Fatal vehicular accidents mostly involve Head injury. Present study is done to understand the pattern of Vehicular Accidents involving head injuries. This is hospital based cross sectional study at mortuary of Govt. Medical College, Latur, where 202 cases of Vehicular accidents involving head injuries were occurred during period of 1st December 2010 to 31st November 2012. Majority of victims are males between 21-40yrs age group. Maximum accidents occurred between 06.00pm to 09.00pm. Two-wheeler driver were the most vulnerable victims.

Keywords: Head Injury, Male, 21-40yrs, Two-wheeler Drivers, Southern Marathwada

INTRODUCTION
World is facing two major wars nowadays, civil and regional war on one hand whereas road war on the other hand. The automobile was the reply to the 19th century dream of self-propelling the horse-drawn carriage (1). Twentieth century was revolutionary in production of automobiles with satisfying the needs of the people. Hence forth tremendous increase in sales and production seen in this duration. Though there are tremendous benefits of the roads and vehicles, there are certain drawbacks and dark side began to emerge as congestion increases on roads.

According to definition given by World Health Organization, Accident has been defined as: “unpremedicated event resulting in recognizable damage”. Accidents represent major epidemic of non-communicable disease in present century (2). In 1896, two deaths were registered in Great Britain due to motor vehicle. One was registered in United States in 1899 (3). From these small beginnings terrible stream of deaths and injuries has followed. In India Road traffic injury projected to become second leading cause of death by the year 2020 (4). Head injury forms important aspect of forensic work, which can further applied to study various factors involved in its causation. No such study has been conducted so far in Southern Marathwada region of Maharashtra. A main purpose of this study was to collect pattern of Fatal vehicular accidents involving head injuries, their correlation with factors such as age, sex, time of incidence, seasonal variations, condition of roads, type of vehicle involved etc.

MATERIAL AND METHOD
The current study is two years cross sectional study conducted from 1st December 2010 to 31st November 2012 which include the cases of vehicular accidents involving head injuries brought to Govt. Medical College, Latur for medico-legal autopsy. Detailed history was taken from the relatives as well as from the eye witnesses if available at the time of post-mortem examination and also from other injured patients involved in the same accident about the incidence of accident. Thorough persual of case papers including investigation, medico-legal register and police records were referred to collect relevant information. To test the statistical significance, appropriate statistical tests were applied by using SPSS version 20.

OBSERVATION AND RESULTS
Table 1: Distribution according to cause of death

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head injury alone</td>
<td>143</td>
</tr>
<tr>
<td>Polytrauma</td>
<td>28</td>
</tr>
<tr>
<td>Head injury with thoracic injury</td>
<td>10</td>
</tr>
<tr>
<td>Head injury with fracture of long bones</td>
<td>09</td>
</tr>
<tr>
<td>Head injury with abdominal injury</td>
<td>07</td>
</tr>
<tr>
<td>Haemorrhagic shock</td>
<td>03</td>
</tr>
<tr>
<td>Complications of Head injury</td>
<td>02</td>
</tr>
</tbody>
</table>
Table 1 shows head injury (70.79%) alone was the sole cause of death in most of cases, followed by polytrauma (28%). Head injury associated with thoracic injury, long bones, abdominal injury shows 4.95%, 4.45%, 3.46% respectively. Death due to complications of head injury is seen in 0.99% cases.

Table 2: Age and sex wise distribution of victims of fatal vehicular accidents involving head injuries

<table>
<thead>
<tr>
<th>Age group</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>06(03.0)</td>
<td>01(0.5)</td>
<td>7(3.5)</td>
</tr>
<tr>
<td>11-20</td>
<td>10(05.0)</td>
<td>00(0.00)</td>
<td>10(5)</td>
</tr>
<tr>
<td>21-30</td>
<td>51(25.2)</td>
<td>07(03.5)</td>
<td>58(28.7)</td>
</tr>
<tr>
<td>31-40</td>
<td>53(26.2)</td>
<td>03(1.55)</td>
<td>56(27.7)</td>
</tr>
<tr>
<td>41-50</td>
<td>30(14.9)</td>
<td>03(1.5)</td>
<td>33(16.3)</td>
</tr>
<tr>
<td>51-60</td>
<td>16(07.9)</td>
<td>03(1.5)</td>
<td>19(9.4)</td>
</tr>
<tr>
<td>&gt;60</td>
<td>17(08.4)</td>
<td>02(1.0)</td>
<td>19(9.4)</td>
</tr>
<tr>
<td>Total</td>
<td>183(90.6)</td>
<td>19(9.4)</td>
<td>202(100)</td>
</tr>
</tbody>
</table>

Table 2 clearly demonstrates the male preponderance (90.6%) of head injury in all age groups in fatal vehicular accidents. The peak incidence was observed in the age group 21-40 years comprising 56.4% cases. Least number of cases was seen in extremes of ages. Male preponderance with 90.6% and 9.4% female contribution.

Table 3: Season wise distribution

<table>
<thead>
<tr>
<th>Season</th>
<th>Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
<td>87</td>
<td>43.1</td>
</tr>
<tr>
<td>Rainy</td>
<td>60</td>
<td>29.7</td>
</tr>
<tr>
<td>Winter</td>
<td>55</td>
<td>27.2</td>
</tr>
<tr>
<td>Total</td>
<td>202</td>
<td>100</td>
</tr>
</tbody>
</table>

From Table 3, largest number of the accidents took place during the summer months of March, April, May and June (43.1%). Next in order of frequency of the number is rainy season which includes July, August and September (29.7%), followed by winter season (27.7%).

Table 4: Area wise distribution

<table>
<thead>
<tr>
<th>Area</th>
<th>Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>47</td>
<td>23.3</td>
</tr>
<tr>
<td>Rural</td>
<td>155</td>
<td>76.7</td>
</tr>
<tr>
<td>Total</td>
<td>202</td>
<td>100</td>
</tr>
</tbody>
</table>

From the table 4, it is clear that the majority of victims are from rural areas 76.7% whereas urban population is involved in 23.3% of cases.

Table 5: Distribution on the basis of time of incidence and sex fatal vehicular accidents involving head injury

<table>
<thead>
<tr>
<th>Time of incidence</th>
<th>Cases</th>
<th>Male</th>
<th>Females</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>00.01am-03.00am</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>3.46</td>
</tr>
<tr>
<td>03.01am-06.00am</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>1.48</td>
</tr>
<tr>
<td>06.01am-09.00am</td>
<td>11</td>
<td>11</td>
<td>0</td>
<td>5.44</td>
</tr>
<tr>
<td>09.01am-12.00pm</td>
<td>29</td>
<td>23</td>
<td>6</td>
<td>14.35</td>
</tr>
<tr>
<td>12.01pm-03.00pm</td>
<td>22</td>
<td>16</td>
<td>6</td>
<td>10.89</td>
</tr>
<tr>
<td>03.01pm-06.00pm</td>
<td>29</td>
<td>26</td>
<td>3</td>
<td>14.35</td>
</tr>
<tr>
<td>06.01pm-09.00pm</td>
<td>61</td>
<td>58</td>
<td>3</td>
<td>30.19</td>
</tr>
<tr>
<td>09.01pm-12.00am</td>
<td>40</td>
<td>40</td>
<td>0</td>
<td>19.80</td>
</tr>
<tr>
<td>Total</td>
<td>202</td>
<td>183</td>
<td>19</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 5 depicts that the maximum number of fatal vehicular accidents with head injuries sustained between 06 pm to 09 pm followed by next peak in 9 pm to 12 am. Thus maximum cases are seen during night between 6 pm to12 am. Whereas least cases are seen between 3 am to 6 am. Most of the female victims are seen between 9 am to 3 pm.

Table 6: Distribution of victims of fatal vehicular accidents involving head injury according to type of road user (Deceased)

<table>
<thead>
<tr>
<th>Type of Road User</th>
<th>No of Cases</th>
<th>Total(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>60</td>
<td>29.7</td>
</tr>
<tr>
<td>Driver</td>
<td>106</td>
<td>52.5</td>
</tr>
<tr>
<td>Passenger</td>
<td>36</td>
<td>17.8</td>
</tr>
<tr>
<td>Total</td>
<td>202</td>
<td>100</td>
</tr>
</tbody>
</table>

From the table 6, it is seen that, in the present study, about half of victims (52.5%) were drivers followed by pedestrians (29.7%) and then passengers (17.8%).

Table 7: Distribution of type of vehicle and type of deceased

<table>
<thead>
<tr>
<th>Vehicleinvolved</th>
<th>Driver</th>
<th>Passenger</th>
<th>Pedestrian</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicycle</td>
<td>8(4)</td>
<td>0(0)</td>
<td>0(0)</td>
<td>8(4)</td>
</tr>
<tr>
<td>Bullock cart</td>
<td>1(0.5)</td>
<td>1(0.5)</td>
<td>0(0)</td>
<td>2(1)</td>
</tr>
<tr>
<td>Two wheeler</td>
<td>93(46)</td>
<td>19(9.4)</td>
<td>8(4)</td>
<td>120(59.4)</td>
</tr>
<tr>
<td>Three wheeler</td>
<td>0(0)</td>
<td>4(2)</td>
<td>0(0)</td>
<td>4(2)</td>
</tr>
<tr>
<td>Four wheeler</td>
<td>4(2)</td>
<td>12(5.9)</td>
<td>24(11.9)</td>
<td>40(19.8)</td>
</tr>
<tr>
<td>Railway</td>
<td>0(0)</td>
<td>0(0)</td>
<td>4(2)</td>
<td>4(2)</td>
</tr>
<tr>
<td>Not known</td>
<td>0(0)</td>
<td>0(0)</td>
<td>20(9.9)</td>
<td>20(9.9)</td>
</tr>
<tr>
<td>Total</td>
<td>106(52.5)</td>
<td>36(17.8)</td>
<td>60(29.7)</td>
<td>202(100)</td>
</tr>
</tbody>
</table>

Table 7 shows that the victims associated with two wheelers were the commonest group, comprising 59.4% cases, driver of these motorized two wheelers were most common victim being 46% among all cases.
Pedestrian ranks second comprising 29.7%; most of them are hit by motorized four wheelers. Among railway accidents all were crossing the railway track and hit by train. Passengers are least involved, comprising 17.8%, most of them were on two wheelers (9.4%).

**Table 8: Condition of road involved in vehicular accidents**

<table>
<thead>
<tr>
<th>Condition of road</th>
<th>Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>131</td>
<td>64.9</td>
</tr>
<tr>
<td>Bad</td>
<td>44</td>
<td>21.8</td>
</tr>
<tr>
<td>Under construction</td>
<td>23</td>
<td>11.4</td>
</tr>
<tr>
<td>Not applicable</td>
<td>04</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>202</td>
<td>100</td>
</tr>
</tbody>
</table>

The table 8 shows the relation of road factors with fatal road traffic accident. Maximum number of deaths was on roads which were in good condition (64.9%), followed by bad condition (21.8%). The under construction roads constituted 11.4% cases.

**DISCUSSION**

In the present study, head injury alone was the sole cause of death in most (70.79%) of cases, followed by polytrauma (28%). Head injury associated with thoracic injury, long bones, abdominal injury shows 4.95%, 4.45%, 3.46% respectively. Death due to complications of head injury seen in 0.99% cases. Chaudhary B, Wasnik R, Kaul A, Mark Fitzgerald, reported similar findings.

The age of the victims varied from 1-90 years. The peak incidence was observed in the age group 21-30 years. Collectively 56.4% of cases found in the age group of 21-40 years. Males comprised a majority of cases (90.6%) as compared to females (9.4%). The male to female ratio in the study was 9.63:1 (Male=183, Female=19). Amongst female victims the highest number of deaths was observed in age group 21-30 years (3.5%).

Due to the fact that this is one of the active periods of life in males who work outdoors and therefore most commonly exposed to traffic accidents. The least common affected age group is 0 – 10 years (3.5%). This is due to the fact that young children are less exposed to the traffic environment. Similar observations were noted by Eke N, Etebu E, Nwosu S, Menon A, Sharma B, Shinde J, Chaudhary B, Singh H and Kaul A.

Most of the accidents took place during summer (43.1%), followed by rainy (29.7%), and winter season (27.7%). Summer is the season for marriages, harvesting and marketing of the grains and vacation period, eventuated by increase movement of people from one place to another through the road transport. During rainy season slippage on the wet roads and raining may cause improper visualization of vehicle. Festive months of Diwali, harvesting months for the autumn crops, foggy weather during winter leads to improper visualization. Similar findings were observed by Adhya S and Jha S, while Singh H and Kaul A observed maximum number of cases during winter season.

The majority of victims are from rural areas (76.7%) as compared to urban population (23.3%). Kumar D observed majority of victims from urban population.

Most of the incidents of vehicular accidents occurred between 6 pm to 9 pm (30.19%) and a large percentage of cases 49.99% occurred between 6 pm to 12 mid night, followed by 25.24% between 9 am to 3 pm. The least number of incidents occurred between 3am to 6am (1.48%). Congestion is more on the roads as everybody is in hurry to return back to home from jobs during evening periods and lighting conditions are poor on most of the roads on the outskirts of city as well as surrounding sub urban and rural areas. Menon A, Singh H and Gupta S also reported the similar findings.

Most of the victims were drivers (52.5%), followed by pedestrian (29.7%) and passengers (17.8%). Most involved vehicles were motorized two wheelers (59.4%). Among all drivers and passengers, occupants of motorized two wheelers were most common (87.73% and 52.77 respectively). None of the occupants was wearing helmet. Pedestrians were most commonly hit by four wheelers in 40% cases. Similar findings were noted by Deepak Sharma and Khare Neeraj, while Hetal C. Kyada reported maximum victims as pedestrians.

Maximum number of deaths was on roads which were in good condition (64.9%), followed by bad condition (21.8%) and under construction (11.4%). This shows that in majority of cases carelessness is major factor. Probable cause may be the speed and recklessness of driver in case of good roads which lead to loss of control and increase in accidents. On the other hand, in case of bad or under-construction road though
the frequency of road traffic accident are more but they are comparatively less fatal in nature. None of the studies shows comparison between condition of road and fatal head injuries in road traffic accidents.

CONCLUSIONS

More than half of cases comprised of age group of 21-40 years in the study. The lowest incidences were seen in extremes of ages. Male preponderance clearly seen as they are more exposed to traffic. Most of the incidents of vehicular accidents occurred between 6 pm to 9 pm as traffic is more congested during this period and lighting conditions are also poor in this region. Largest number of the accidents took place during the summer, which could be attributed to the fact that this is the season for marriages, vacation and harvesting season.

Driver’s involvement was hallmark of all vehicular accidents, followed by pedestrian and passengers. Motorized two wheelers were most commonly involved as neither driver nor passenger of motorized two wheelers were wearing helmet and two wheelers are less protected as well.

RECOMMENDATIONS:

Keeping in view the results of study, the mortality in road traffic accident victims can be reduced with following recommendations: Multi factorial approach is needed to prevent road traffic accident and to minimize their consequences.

Safety education

- Safety education must begin with school children. Mass media can also be used in this regard.
- Children and youth involvement in various social programmes for awareness among common masses regarding vehicular accidents, safe driving and first aid.

Enforcement of law

- Good enforcement of law is an integral part of road safety; legislation embodies codified set of rules. These are enforced by state to prevent accidents.

Measures to reduce environmental risk factors

- Avoid poor lighting, overloaded, overcrowded vehicles and illegal transport system and prefer public transport.

Trauma Centre

- Advanced Trauma Care Centre with well equipped infrastructure supported by a team of trauma surgeons especially neurosurgeons & vascular surgeon at major Government Hospitals is the cornerstone for the management of road traffic accident cases. Well-equipped trauma care centers should be developed in all tertiary care centres in major cities and rural areas.
- Seeking ways to make environment safer; and evaluating more precisely the efficiency of control measures.

Acknowledgment: Nil

Ethical Clearance: Taken from Govt.Medical.College, Latur. Ethical Committee.

Source of Funding: Self

Conflict of Interest: nil

REFERENCES

INTRODUCTION

Oral cancer accounts for approximately 3.5% of all human cancer, of which almost 96% are carcinomas. Oral conditions with increased melanin pigmentation are common; however, melanocytic hyperplasias are rare. Head and neck mucosal melanomas are rare entity accounting for less than 1% of all melanomas and less than 10% of head and neck melanomas.

Melanomas are malignant neoplasms arising from uncontrolled growth of melanocytes derived from the neural crest cells that constitute melanin pigmented cells found in the basal layer of the epidermis and mucous membrane. Like their cutaneous counterparts, oral melanomas are believed to arise either from nevus, pre-existing pigmented areas, Hutchinson’s premalignant lentigo or denovo (30% cases). These areas of hyper pigmentation may represent an initial phase characterized by radial growth persisting for months or years followed by a phase of invasion of the underlying tissues which is called as “vertical growth phase”. Melanoma is a potentially aggressive tumour being the third most common malignant tumor of skin accounting for less than 0.5% of all oral malignancies.

The primary malignant melanoma of oral cavity was first described by Weber in 1859. All races can be affected by oral mucosal melanomas. Indian subcontinent, Africans and Japanese have higher incidence than people of the western countries. Oral melanomas are more predominantly found in males, with male to female ratio of 2:1. Onset is usually between 41 to 60 years of age with an average of 55 years and it is rare before 20 years. The main sites affected are the hard palate followed by the maxillary gingiva. Less common locations in order of decreasing incidence include buccal mucosa, mandibular gingiva, lips, tongue and floor of mouth.

The oral mucosal melanomas are classified by histopathological pattern as in situ, invasive and combination of in situ and invasive. Criteria for diagnosing primary oral mucosal melanomas are (1) demonstration of oral mucosa in melanoma; (2) presence of junctional activity; and (3) inability to demonstrate extra oral melanoma.
Malignant melanoma with its myriad histological patterns and varied manifestations is a perpetual diagnostic problem. The oral melanoma is more aggressive and the abundant blood supply of the oral cavity may permit blood vessel invasion and haematogenous dissemination early in the course of the disease. Regional lymphadenopathy may be present and connotes a poor prognosis. The present article reports a case of 42-year-old female with primary malignant melanoma of maxillary gingiva.

**CASE HISTORY**

A female patient aged 42 years presented with the chief complaint of an irregular pigmented swelling in the right upper gums. The swelling was present for the last six months. There was no relevant medical or family history. Oral examination revealed blackish brown growth on the buccal aspect of right maxillary alveolus involving marginal, attached and interdental gingival in the anterior region, extending infero-superiorly from marginal gingiva to vestibular sulcus and antero-posteriorly from canine to second premolar region, measuring 1.5cm in width and 2cm in length (Figure 1). The growth was firm in consistency, non-tender with an intact and irregular surface. Two submandibular lymph nodes on both right and left side were palpable, stony hard in consistency and tender on palpation (Figures 2). On the basis of history and clinical examination, a provisional diagnosis of oral malignant melanoma was considered.

Radiographic examination revealed erosion of maxillary alveolus along with bilateral lymph node involvement. Fine needle aspiration cytology of the lesion and the involved submandibular lymph nodes was done and smears showed anisocytosis, anisonucleosis and atypical melanocytes suggestive of malignant melanoma. A punch biopsy of the lesion was done under local anaesthesia and was sent for histopathological examination in 10% formalin solution.

On microscopic examination, 5 μm thick haematoxylin and eosin stained paraffin based sections revealed numerous atypical melanocytes with or without melanin pigment in the connective tissue (Figure 3). Well vascularised tumor tissue extensively infiltrated by sheets and nests of large cells with pleomorphic nuclei, prominent nucleoli and abundant cytoplasm with brown pigment, confirmed the diagnosis of malignant melanoma. Immunohistochemical analysis demonstrated that the tumor cells had strong, diffuse, granular cytoplasmic reactivity for HMB-45 (Figure 4) and S-100 (Figure 5), thus strongly supporting the diagnosis of malignant melanoma.
DISCUSSION

The initial symptom and sign of oral melanoma is often a pigmented growth or swelling. The surface may be smooth, with an intact or ulcerated overlying mucosa. Satellite foci may surround the primary tumor. The color may be uniformly brown or black or may show variation of color, with black, brown, grey, purple, and red shades, or depigmentations. Other presenting signs and symptoms include bleeding, ill-fitting dentures, pain, increased mobility of teeth, and delayed healing of extraction sockets. Clinically, oral melanomas are classified into five types: pigmented nodular, non-pigmented nodular, pigmented macular, pigmented mixed, and non-pigmented mixed.

Lymph node metastases account for nearly two third of these cases in most of the series with axillary lymph nodes being the most common site. The so-called ABCDE checklist which includes ‘Asymmetry’, ‘Border irregularity’, ‘color variation’, ‘Diameter greater than 6 mm’ and ‘Evolving’, commonly used in the identification process of cutaneous melanoma could also be of some help in the diagnosis of oral melanoma. When an oral pigmentation cannot be confidently diagnosed as benign on clinical grounds, a biopsy is mandatory. An excisional biopsy with 1 to 2 mm margin for small lesions or an incisional biopsy through the thickest or the most suspicious part of the tumor in case of a large lesion is required. Radiological examination through computed tomography, magnetic resonance imaging or positron emission tomography (PET) could be useful for evaluation of primary tumour and regional or distant metastases. Immunohistochemical staining with S - 100, HMG - 45, Melan - A, vimentin can also be helpful in diagnosis. Special stains like Masson Fontana and melanin bleach can also be used.

Malignant cells of oral melanoma show a wide range of shapes, including spindle, plasmocytoid, clear cell, and epithelioid ones. These malignant cells possess considerable pleomorphism with large, irregular hyperchromatic nuclei, and prominent nucleoli, and have readily detectable mitotic activity. A simple TNM clinical staging, recognizing three stages, has shown to be of prognostic value. A recent histopathological microstaging for stage subclassifies it into three levels:

Stage I: Primary tumour present only (Tany N0 M0).
Level I: pure in situ melanoma without evidence of invasion or in situ melanoma with “microinvasion,”
Level II: invasion up to the lamina propria,
Level III: deep skeletal tissue invasion into skeletal muscle, bone, or cartilage.

Stage II: Tumour metastatic to regional lymph nodes (Tany N1M0).

Stage III: Tumour metastatic to distant sites (Tany Nany M1).
In this case, melanoma showed invasive melanoma with an in situ component. Since it metastasized to regional lymph nodes it was categorized under stage II.

Treatment of oral melanoma is still controversial. Excision of the primary lesion, preferably using an intraoral approach and involving at least 1.5 cm of healthy tissue, is recommended. Patients with primary oral melanoma present lymph node metastasis in 25% of cases. Neck dissection should be reserved for cases with preoperatively confirmed lymph node metastases and the choice of the neck dissection modality should be guided by the extent and the level of the nodes. Surgery could be combined with radiotherapy, chemotherapy, or immunotherapy even though the effectiveness of such therapies is mostly unknown.

CONCLUSION

It is well known that early diagnosis and treatment of melanoma can reduce mortality rate. If diagnosed early, when the malignant cells are limited to the epidermis or invasion is minimal, melanoma is either 100% curable by excision (for in situ lesion) or is associated with a 5-year survival rate of 95% (for lesions < 1 mm in thickness without ulceration). A tumor thickness greater than 5 mm, presence of vascular invasion, necrosis, polymorphous tumor cell morphology and the inability to properly resect the lesions with negative margins have been associated with poor survival in patients with primary oral melanoma. For melanoma in the oral cavity, the prognosis is much worse: the 5-year survival rate is generally in the range of 10% to 25%, partly because detection is more difficult as pigmented lesions in the oral cavity are less visible than on the skin. Recurrences may occur even 10–15 years after primary therapy. For this reason, the dental profession plays an important role in the early diagnosis of oral melanoma.

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Ethical Clearance: Nil (not required)

REFERENCES


A Study of Socio-Demographic Profile and Outcome of Poisoning Cases Reported at Tertiary Care Teaching Hospital of Northern India

Sukhbir Singh, Brijender Singh, Latika, Vivek Kumar, Ashok Chauhan

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ABSTRACT

Aim & Objective
1. To Study the Socio-Demographic profile of poisoning cases reported at PT.B.D.S. PGIMS, Rohtak
2. To study the outcome of poisoning cases reported at PT.B.D.S. PGIMS, Rohtak

Material & Method: This is a retrospective record based hospital study. The case files of patients admitted with poisoning in the hospital w. e. f. 1st July 2012 to 31st December 2012 were retrieved from the Medical Record Department. The data was collected on a prescribed Performa; keeping in view various factors viz. age, sex, marital status, address, type of poison, time of ingestion and hospitalization and outcome etc. Whole of data was entered in the excel sheet and various tables were prepared.

Result: A total 92 cases of poisoning reported in the hospital over a period of six month are included in the study. Majority of the poisoning patients were males (57%). Most of the patients (37%) were in the age group of 21-30 years followed by (20%) in the age group of 11-20 years. The lowest number of patients (1.09%) were in the age group of 61-70 years. Out of total sample size, most of them (73%) were from the rural area. Out of total patients, most of them (35%) were suffering from the celphos poisoning followed by snake bite (17%). It was revealed from the study that Celphos is the most lethal poison as most of the deaths (75%) were reported in the patients of celphos poisoning followed by the death due to unknown poisonous substances. 61% patients survived (Discharged/ Relived/ LAMA/ Absconded etc.) and around 39% patient died due to poisoning.

Keywords: Pesticides, Organophosphorus, Poisoning, Snake Bite

INTRODUCTION

Any substance that causes a harmful effect when administered, either by accident or by design to a living organism is known as poison.1 World wide intentional poisoning is increasing day by day due to changes in the life style and social behavior. One of the most common cause of intentional death is poisoning.

Accidental poisoning is due to various stings and bites.2,3 In Asian regions particularly in rural areas, agriculture pesticides are used for self poisoning with a fatality range of 10-20%. The cases of pesticide exposures are mostly seen in middle and low income countries due to increase use/ accessibility of agrochemicals in their agriculture sector.4 The data from poison information centre of AIIMS, New Delhi reveals that highest incidence of poisoning cases was found in the age group of 14-40 years with male preponderance5. Majority of Indian population inhabits rural areas and depends largely on agriculture. The pesticides are very commonly used in agriculture and are easily available from the market for agriculture purpose. Hence pesticide is an easily accessible source for suicidal poisoning6,7. In southern region most of
the self-poisoning deaths are due to organophosphorus compounds and farmers form a significant proportion of the population who commonly use organophosphorus compound as insecticide. Therefore due to easy accessibility or improper handling of these compounds, a large number of suicidal cases are reported in this region. In tropical and subtropical countries with heavy rainfall and humid climate snake bite is a common acute medical emergency faced by the rural population. Snake bite is a common cause of morbidity and mortality in India which causes around 35000-50000 deaths per year.

This study is planned in PT.B.D.S. PGIMS, Rohtak, a tertiary care hospital of Northern India to see the socio demographic profile and outcome of the poisoning cases reported in hospital.

**AIM & OBJECTIVE**

1. To Study the Socio-Demographic profile of poisoning cases reported at PT.B.D.S. PGIMS, Rohtak

2. To study the outcome of poisoning cases reported at PT.B.D.S. PGIMS, Rohtak

**MATERIALS AND METHOD**

This is a retrospective record based hospital study. The case files of patients admitted with poisoning in the hospital w.e.f. 1st July 2012 to 31st December 2012 were retrieved from the Medical Record Department. The data was collected on a prescribed Performa; keeping in view various factors viz. age, sex, marital status, address, type of poison, time of ingestion and hospitalization and outcome etc. Whole of data was entered in the excel sheet and various tables were prepared.

**RESULT SECTION**

<p>| Table 1: Distribution of Sample size on the basis of Sex |
|-----------------------|---------------------|---------------------|</p>
<table>
<thead>
<tr>
<th>No.</th>
<th>Sex</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Male</td>
<td>57</td>
</tr>
<tr>
<td>2</td>
<td>Female</td>
<td>34</td>
</tr>
<tr>
<td>3</td>
<td>Not Known</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Total</td>
<td>92</td>
</tr>
</tbody>
</table>

Above Table depict that majority of the poisoning patients were males (57%).

<p>| Table 2: Distribution of sample size on the basis of Age group and Sex |
|-----------------------|---------------------|---------------------|</p>
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Age Group(In Years)</th>
<th>Male</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&gt;01</td>
<td>1</td>
<td>1.75</td>
</tr>
<tr>
<td>2</td>
<td>1-10</td>
<td>10</td>
<td>17.54</td>
</tr>
<tr>
<td>3</td>
<td>11-20</td>
<td>9</td>
<td>15.79</td>
</tr>
<tr>
<td>4</td>
<td>21-30</td>
<td>22</td>
<td>38.60</td>
</tr>
<tr>
<td>5</td>
<td>31-40</td>
<td>9</td>
<td>15.79</td>
</tr>
<tr>
<td>6</td>
<td>41-50</td>
<td>3</td>
<td>5.26</td>
</tr>
<tr>
<td>7</td>
<td>51-60</td>
<td>3</td>
<td>5.26</td>
</tr>
<tr>
<td>8</td>
<td>61-70</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>Age Not Known</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>57</td>
<td>100%</td>
</tr>
</tbody>
</table>

Most of the patients (37%) were in the age group of 21-30 years followed by (20%) in the age group of 11-20 years. The lowest number of patients (1.09%) were in the age group of 61-70 years

<p>| Table 3: Distribution of Sample size as per Locality |
|-----------------------|---------------------|</p>
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Area</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rural</td>
<td>67</td>
</tr>
<tr>
<td>2</td>
<td>Urban</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>Not Known</td>
<td>05</td>
</tr>
</tbody>
</table>

Out of total sample size, most of them (73%) were from the rural area.
Table 4: Distribution of sample size as per Type of Poison and outcome of Patient

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Type of Poison</th>
<th>Patients</th>
<th>Out Come</th>
<th>Remarks</th>
</tr>
</thead>
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<tr>
<td></td>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>1</td>
<td>Acid</td>
<td>1</td>
<td>1.09%</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Mosquito All Out</td>
<td>1</td>
<td>1.09%</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Alprazolam</td>
<td>1</td>
<td>1.09%</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>CO Poisoning</td>
<td>2</td>
<td>2.17%</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Clonazepam</td>
<td>1</td>
<td>1.09%</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Food Poisoning</td>
<td>3</td>
<td>3.26%</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Kerosene Oil</td>
<td>6</td>
<td>6.52%</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Lakhsman Rekha</td>
<td>2</td>
<td>2.17%</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>Mehandi Oil</td>
<td>1</td>
<td>1.09%</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>Mosquito Coil</td>
<td>1</td>
<td>1.09%</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>Olanzapine</td>
<td>1</td>
<td>1.09%</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>Opiate</td>
<td>1</td>
<td>1.09%</td>
<td>-</td>
</tr>
<tr>
<td>13</td>
<td>Organo Phosphorus</td>
<td>2</td>
<td>2.17%</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>Petrol</td>
<td>1</td>
<td>1.09%</td>
<td>-</td>
</tr>
<tr>
<td>15</td>
<td>Sedative</td>
<td>1</td>
<td>1.09%</td>
<td>-</td>
</tr>
<tr>
<td>16</td>
<td>Seizure Disorder</td>
<td>1</td>
<td>1.09%</td>
<td>-</td>
</tr>
<tr>
<td>17</td>
<td>Snake Bite</td>
<td>17</td>
<td>18.48%</td>
<td>-</td>
</tr>
<tr>
<td>18</td>
<td>Celphos Poisoning</td>
<td>32</td>
<td>34.78%</td>
<td>27</td>
</tr>
<tr>
<td>19</td>
<td>Un Known Poison</td>
<td>17</td>
<td>18.48%</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>92</td>
<td>100%</td>
<td>36</td>
</tr>
</tbody>
</table>

Out of total patients, most of them (35%) were suffering from the celphos poisoning followed by snake bite (17%). It was revealed from the study that Celphos is the most lethal poison as most of the deaths (75%) were reported in the patients of celphos poisoning followed by the death due to unknown poisonous substances. 61% patients survived (Discharged/ Relived/ LAMA/ Absconded etc.) and around 39% patient died due to poisoning.

Table 5: Distribution of Sample size as per nature of Poisoning

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Mode of Ingestion</th>
<th>No. of Patients</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Accidental</td>
<td>33</td>
<td>35.87%</td>
</tr>
<tr>
<td>2</td>
<td>Suicidal</td>
<td>40</td>
<td>43.48%</td>
</tr>
<tr>
<td>3</td>
<td>Un Known</td>
<td>19</td>
<td>20.65%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>92</td>
<td>100%</td>
</tr>
</tbody>
</table>

Most of the poisoning cases (43%) were suicidal in nature and 36% cases were due to accidental ingestion of poison.

DISCUSSION

In our present study, it is revealed that most of the poisoning cases were due to the Organophosphorus poison, as out of total poisoning cases, around 35% cases were due to Organophosphorus poison. This may be due to the reason that our society is broadly agriculture based and Organ phosphorus poison is the most commonly used pesticide in our farms. The findings of few other studies\textsuperscript{10-12} conducted in various regions also support this fact. Most of the patients in our study were males (62%). In our study it comes out that most of the poisoning cases (73%) were from the rural area, it may be explained on the simple fact that most of the rural communities are involved in agriculture. In our study majority of the patients (36.96\%) were in the age group of 21-30 years followed by 19.57\% of patients in the age group of 11-20 years. This may be explained on the basis that physically, mentally and socially this age group is most active and hence more prone to stress and high vulnerability to accidents. The various other studies\textsuperscript{11, 13-14} also have...
similar results. 43% cases of poisoning were suicidal in nature. The reason for suicidal tendency may be stress, lack of employment or domestic reasons. In other studies\textsuperscript{10,13-14} conducted in different areas it comes out that most of the poisoning cases were suicidal in nature.

**CONCLUSION**

It is easy to understand that younger generation is working under different stressful conditions. So, it is essential to strengthen the measures for preventing the poisoning incidences like

- Educating people through mass awareness programmes through different media viz Electronic/ TV/ Print media etc.
- Easy availability of counseling centers and introduction of appropriate health education programme by the Government.
- Strict laws should be made to restrict the availability of poisonous substances in the open market.
- Availability of separate toxicological units in big hospitals and upgrading the skill of medical/ Para medical staff posted at PHC/CHC’s in handling the poisonous cases.

**REFERENCES**

4. Jesslin J, Adepu R, Churi S. Assessment of prevalence and mortality incidence due to poisoning in a South Indian tertiary care teaching HOSPITAL. Indian J. Pharm. Sci 2010; 72(5); 587-591
5. Prakash J, Singh PK, Kotwal A, Ramakrishna TS. Unknown poisoning amongst serving personnel. MJAFI 2009;65:41-3
11. Sinha US, kapoor AK, Agnihotri AK, Srivastava PC. A Proffiel of The Poisioniing Cases which were admitted to the SRN Hospital, Allahabad, with a special reference to aluminium phosphide poisoning. J. Forensic Med. Toxicol.1999;16(1): 40-43
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- Conclusion
- Acknowledgements
- Interest of conflict
- References in Vancouver style.
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