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*Original Article*

# A Study of Finger Prints in Relation to ABO Blood Group and Gender

**Gunti Damodar*, Nishat Ahmed Sheikh****

**Abstract**

**Background:** Finger print (Dactylography / Dermatoglyphic) is considered as the best tool of identification. A reliable personal identification is critical in the subject of forensics as is faced with many situations like civil, criminal, commercial and latest in financial transaction frauds, where the question of identification becomes a matter of paramount importance. In this study we have made an effort to "study a relationship between pattern of fingerprint, gender and blood group". **Study Type:** Cross sectional Study. **Place of Study:** Data was being collected from school going children's of Narketpally. KIMS Narketpally. **Materials and methods:** 170 school going children participated in the study voluntarily and their finger prints were collected, of which 82 were males and 88 were females, who were aged between 11 – 16 years. Blood group of each individual was documented, if the blood group wasn't known then the blood group was identified using antiserum A, B and D. The finger-prints were taken of all ten fingers using printer's ink. Pattern of fingerprints were observed by powerful hand lens and recorded. Note was made of the sex, age, ABO blood groups. **Results:** O Rh + ve are the most common blood type, followed by B Rh + ve. High frequency of loops (61.88%), moderate whorls (27.76%), and low frequency of arches (9.88%) with composite (0.47%). Loops are predominant in blood group O and whorls are predominant in blood group B. There is an association between fingerprint patterns, blood group and gender. **Conclusion:** We may conclude that there is an association between distribution of fingerprint patterns, blood group and gender and thus prediction of gender and blood group of a person is possible based on his/her fingerprint patterns but influence regional variations, gender and genetic factors should not be overlooked.

**Keywords**: Fingerprints; Gender; ABO Blood Groups; RH Factors; Association.

## Introduction

Cummins [1] coined the term dermatoglyphic (derma=skin + glyphs=curves) to the dermal ridge configurations on the digits, palm and sole. The dermal carvings or finger prints appear for the first time on the human fingers, palm, soles and toes from 12th to 16th week of embryonic development and their formation gets completed by the 14th week i.e. about the 6$^{th}$ foetal month. The ridges thus, formed during the foetal period do not change their course or alignment throughout the life of an individual, until destroyed by decomposition of the skin after death [2]. In dermatoglyphics, the impressions made by the minute ridge patterns have exactly the same arrangement and the pattern of any individual remain unchanged throughout life. These features statistically differ among sexes, ethnic groups and age categories [3].

The ABO blood groups were discovered by Karl Landsteiner in 1901. Further studies on the ABO blood group system, by the other workers, suggested that the blood groups were inherited. But, the exact manner of inheritance of the ABO blood group was revealed by Bernstein (1924) [4]. 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 in plasma. 'Rhesus' system is classified into 'Rh +ve' and 'Rh – ve' according to the presence or absence of 'D' antigen [5].

As the inheritance of dermatoglyphic patterns is

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polygenic and also the ABO blood group inheritance is demonstrated. [6] The co-relation may exist between the dermatoglyphic patterns and the ABO blood group. The present study aimed to analyze the predominant blood groups and finger print patterns in the study population and to identify whether any correlation among the above parameters could help forensic experts in gender Identification.

## Material and Method

The present study was carried out in Narketpally of Telangana state, India, 170 school going children participated in the study voluntarily and their finger prints were collected, of which 82 were males and 88 were females, who were aged between 11 – 16 years. Blood group of each individual was documented, if the blood group wasn't known then the blood group was identified using antiserum A, B and D. The smeared palm and fingers of both hands were printed on a durable plain paper laid down on a pressure pad which consisted of ten different blocks for ten fingers of right hand and left hand respectively. Both rolled and plane prints of right and left hand were taken. After obtaining the finger prints the basic details such as name, age and sex was also gathered. Primary patterns were observed with the help of a powerful magnifying hand lens. Finger prints were classified based on Michael's and Kucken's classification. The results were statistically analyzed.

*Exclusion criteria*

For finger prints, subjects with syndromes and permanent scars on their fingers or thumbs, with any hand deformities caused by injuries were excluded.

*Study Design*

Its cross sectional Study

*Observation*

Total 170 children are measured in various age groups starting from 11 years to 16 years who are school going children. Girls are 88 and Boys are 82 among them.


**Fig. 1 Class wise Strength of Students**

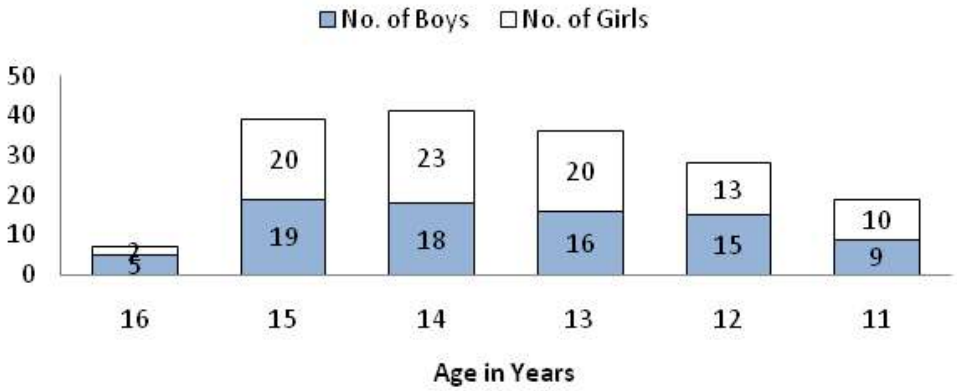


**Fig. 2 Age and Sex Distribution of the Students**

**Table 1: Showing distribution of Blood group according to gender n= 170**

| Blood group | Male | Female | Total |
|---|---|---|---|
| A | 18 | 15 | 33 |
| | 10.58% | 8.82% | 19.41% |
| B | 24 | 28 | 52 |
| | 14.11% | 16.47% | 30.58% |
| AB | 13 | 12 | 25 |
| | 7.64% | 7.05% | 14.70% |
| O | 27 | 33 | 60 |
| | 15.88% | 19.41% | 35.29% |
| Total | 82 | 88 | 170 |
| | 48.23% | 51.76% | 100% |

**Gender and Blood Group ( Table 1)**

Females (51.76%) outnumbered the Males (48.23%) in this study. Majority of cases 60 (35.29%) in the study belonged to blood group O; followed by blood group B, A and AB which were 52 (30.58%), 33 (19.41%) and 25 (14.70%) respectively.

**Table 2: Showing distribution of subjects according to Rh factor of their blood group n=170.**

| Blood group | Rh + ve | Rh – ve |
|---|---|---|
| A | 32 | 1 |
| | 18.82% | 0.58% |
| B | 50 | 2 |
| | 29.41% | 1.17% |
| AB | 24 | 1 |
| | 14.11% | 0.58% |
| O | 58 | 2 |
| | 34.11% | 1.17% |
| Total | 164 | 6 |
| | 96.47% | 3.52% |

**Rh Blood Group ( Table 2):**164 (96.47%) cases in the study had Rh positive factor, of which 58 (34.11%) belonged to blood group O and 50 (29.41%) belonged to B group. 32 (18.82%) cases were having A. Most of the Rh-negative cases 2 (1.17%) were of blood group O and B.

**Type of Finger Print ( Table 3):** It shows distribution of finger print patterns of all the fingers in both the hands. Loops were the most common pattern, registering 61.88% frequency in the study; followed by whorls (27.76%) arches (9.88%) and Composite (0.47%).

**Table 3: Showing distribution of finger prints pattern of all fingers in both hands n= 1700**

| Finger prints pattern | Total No. |
|---|---|
| Loops | 1052 |
| | 61.88% |
| Whorls | 472 |
| | 27.76% |
| Arches | 168 |
| | 9.88% |
| Composite | 8 |
| | 0.47% |
| Total | 1700 |

**Table 4: Showing No. of Fingerprints pattern among male and female.**

| Finger print pattern | Male | Female |
|---|---|---|
| Loop | 492 | 560 |
| | 46.76% | 53.23% |
| Whorls | 273 | 199 |
| | 57.83% | 42.16% |
| Arches | 97 | 71 |
| | 57.73% | 42.26% |
| Composite | 3 | 5 |
| | 37.5% | 62.5% |

**Table 4:** shows the distribution of finger print patterns among both the genders. Frequency of Loops were found to be higher in females; 560(53.23%) and Whorls and Arches were found to be higher in males; 273(57.83%), 97 (57.83%) as compared to females 199 (42.16%), 71 (42.26%) of whorls and arches.

**Table 5: Showing distribution of Finger print pattern among A,B, AB, O blood group with Rh Factor. n=1700**

| Type of pattern | A | | B | | AB | | O | |
|---|---|---|---|---|---|---|---|---|
| | **Rh +ve** | **Rh -ve** | **Rh +ve** | **Rh -ve** | **Rh +ve** | **Rh -ve** | **Rh +ve** | **Rh -ve** |
| **Loops** | 208 | 12 | 372 | 20 | 47 | 3 | 388 | 2 |
| | 60.46% | 66.66% | 62.10% | 80% | 43.11% | 50% | 65.98% | 18.18% |
| **Whorls** | 94 | 4 | 172 | 1 | 52 | 2 | 139 | 8 |
| | 27.32% | 22.22% | 28.71% | 4% | 47.70% | 33.33% | 23.63% | 72.72% |
| **Arches** | 41 | 2 | 53 | 4 | 8 | 1 | 58 | 1 |
| | 11.91% | 11.11% | 8.84% | 16% | 7.33% | 16.66% | 9.86% | 9.09% |
| **Composite** | 1 | 0 | 2 | 0 | 2 | 0 | 3 | 0 |
| | 0.29% | 0.00% | 0.33% | 0.00% | 1.83% | 0.00% | 0.51% | 0.00% |
| **Total** | 344 | 18 | 599 | 25 | 109 | 6 | 588 | 11 |

**Table 5:** shows the distribution of the finger print patterns among ABO blood groups of all the fingers. More numbers of loops were found in blood group O i. e. 65.98% followed by B i.e. 62.10% among the Rh + individuals. But the incidence of loops is found to be predominant in the blood group B in Rh individuals. Loops in Rh + individuals were equally dominant in both B and O blood groups; 194. Arches and composite were least commonly found in all the blood groups.


**Fig 1: Types of Finger Prints**

## Discussion

Finger Prints are classified and field so that they can be retrieved when needed. Michael and Kucken provided a finger print classification which included: Loop, arch, whorl and composite containing two or more forms.

O Rh +ve are the most common blood type, followed by B+. Our study also showed the same results. But this was in contrast to findings of study done by Piyush A et al., [8] Combination of O+ and loop was more prevalent in our study.

The general distribution pattern of fingerprints in our study showed high frequency of loops (61.88%), moderate whorls (27.76%), and low frequency of arches (9.88%) with composite (0.47%), which are in accordance with the study done by Bhardwaja [2].

The present study shows an association between distribution of fingerprint patterns, blood group

and gender. Similar to study done by Bhardwaja [2], there is high frequency of loops, moderate of whorls and low of arches in blood groups A, B and O. Contrary to other studies and similar to Sharma frequency of loops in our study is highest in O positive (65.98%%) compared to B positive (62.10%). Similar to Bhardwaj [2], AB positive had a higher incidence of whorls compared to other blood groups and was reverse of the results which were obtained in studies done by Bhavana et al., [9]

Mutalik et al., [10] found no correlation between lip prints, finger prints and palatal rogue patterns. In contrast to these studies, Nagasupriya et al., [11] found a significant correlation only in the combination of branched with loop, arch and whorl in males.

## Conclusion

It is known that individual parameters, i.e., finger print patterns and blood groups play an important role in forensic identification. We may conclude that there is an association between distribution of fingerprint patterns, blood group and gender and thus prediction of gender and blood group of a person is possible based on his/her fingerprint patterns but influence regional variations, gender and genetic factors should not be overlooked.

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*Ethical Approval*

Ethical approval taken from the Institutional eth ics committee.

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Nil

## Conflicts of Interest

Nil.

## Author Disclosures

Authors have no conflict of interest. This study was a part of departmental research activities of Forensic Medicine at Kamineni Institute of Medical Sciences, Narketpally.

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*Original Article*

# Utility of Multidetecter CT Images in Age Assessment from Iliac Crest Ossification: A Preliminary Study

**Rajesh Bardale*, Rajesh Umap**, Paras Patil*****

**Abstract**

Forensic age estimation is one of the concerns in living individuals especially in pubertal and post-pubertal age group. An evaluation of iliac crest using conventional projection radiography or digital radiography is common practice. However, recently few researchers have used sonography and magnetic resonance imaging for forensic age estimation with comparative results. The aim of present pilot study is to evaluate use of multidetecter CT images for iliac crest ossification.In the present study the Risser sign grading system was used. Total 56 tomograms were included consisting of 35 male and 21 female. The age group was from 11 years to 23 years. Considering the present study, fusions of iliac crest with ilium occurs earlier in females than males and are in agreement with other studies. Present study finds multidetecter CT very much helpful for assessing the ossification process.

**Key words**: Forensic; Age Estimation; CT Scan; X ray; Ossification.

## Introduction

Forensic age estimation is one of the concerns in living individuals especially in pubertal and post-pubertal age group. In this age group age is estimated based on assessments of secondary sexual characters, eruption and calcification of teeth and survey of different ossification centres.Frequently ossification of shoulder, elbow and wrist with hand are assessed. If all these centres are ossified completely then ossification of medial end of clavicle is evaluated. The ossification of iliac crest can also provide better possibilities for determining age because of relatively late completion of maturation.[1]

An evaluation of iliac crest using conventional projection radiography or digital radiography is common practice. However, recently few researchers have used sonography and magnetic resonance imaging for forensic age estimation with comparative results.[2,3] The aim of present pilot study is to evaluate use of multidetecter CT images for iliac crest ossification and to address whether the investigation by this modern means is useful and superior to conventional radiography or whether such imaging modality is complementary in assessing the age.

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## Material and Method

This is a retrospective study where multi-slice computed tomograms were evaluated. Those tomograms were originally taken at Government Medical College Hospital Miraj from 2011 to 2014 of the patients who were referred for abdominal and pelvic CT examination for various clinical reasons. Patient having pelvic skeletal deformity or having trauma were excluded from the study.Total 56 tomograms were included consisting of 35 male and 21 female. The age group was from 11 years to 23 years.

A routine abdominal and pelvic CT protocol was followed and Axial plane images were obtained and were transferred to workstation for post processing. At workstation multi-planar reformatting (MPR) of the sagittal and coronal plane images were performed and three dimensional images of the iliac crest were obtained so that an anatomical details and ossification centre could be visualized in better way. The fusion of iliac crest is visualised by utilizing spiral multislice CT machine (Somatom definition AS 128 slice CT by Siemens).

In the present study the Risser sign grading system was used. It is a six-stage system where the process of iliac crest ossification is divided into quarters. [1]Following is the scheme of Risser sign grading system.

- Stage 0 – no ossification
- Stage 1 – apophyseal ossification within the first quarter (<25%) commencing anterolaterally
- Stage 2 – apophyseal ossification extending into the second quarter (25 – 50%)
- Stage 3 – apophyseal ossification extending into the third quarter (50 – 75%)
- Stage 4 – apophyseal ossification extending into the fourth quarter (> 75%) until completion of ossification
- Stage 5 – fusion of the iliac crest apophyseal from the commencement of the process posteromedially and completion of fusion

The tomograms were evaluated by a single observer. Evaluation was done on right and left side. Statistical analysis was performed on MS Excel Windows 2007.

## Results

In all computerized tomographs (n = 56), a reliable multi-slice images in three dimensional view of iliac crest ossification are visualized on both pelvic sides. Table 1 shows number of cases in different age group. Table 2 and 3 shows the age group and fusion status

**Table 1: Age and number of cases**

| Age in years | Male | Female |
|---|---|---|
| 11 | 2 | -- |
| 12 | 3 | 1 |
| 13 | 3 | 1 |
| 14 | 1 | 1 |
| 15 | 1 | 1 |
| 16 | 2 | 2 |
| 17 | 2 | 2 |
| 18 | 6 | 1 |
| 19 | 1 | 1 |
| 20 | 5 | 4 |
| 21 | 3 | 4 |
| 22 | 4 | 2 |
| 23 | 2 | 1 |
| **Total** | **35** | **21** |

**Table 2: showing different age group and grades of iliac crest fusion in male**

| Age in years | Grade | | | | | |
|---|---|---|---|---|---|---|
| (n) | 0 | 1 | 2 | 3 | 4 | 5 |
| 11 | n = 2 | -- | -- | -- | -- | -- |
| 12 | n = 3 | -- | -- | -- | -- | -- |
| 13 | n = 3 | -- | -- | -- | -- | -- |
| 14 | n = 1 | -- | -- | -- | -- | -- |
| 15 | -- | n = 1 | -- | -- | -- | -- |
| 16 | -- | -- | -- | n = 2 | -- | -- |
| 17 | -- | -- | -- | n= 1 | n = 1 | |
| 18 | -- | -- | -- | n = 1 | n = 4 | n = 1 |
| 19 | -- | -- | -- | -- | -- | n = 1 |
| 20 | -- | -- | -- | -- | n = 4 | n = 1 |
| 21 | -- | -- | -- | -- | n = 2 | n = 1 |
| 22 | -- | -- | -- | -- | -- | n = 4 |
| 23 | -- | -- | -- | -- | -- | n = 2 |
| **Total** | **n = 9** | **n = 1** | **--** | **n = 4** | **n = 11** | **n = 10** |

**Table 3: showing different age group and grades of iliac crest fusion in female**

| Age in years | Grade | | | | | |
|---|---|---|---|---|---|---|
| **(n)** | 0 | 1 | 2 | 3 | 4 | 5 |
| 11 | -- | -- | -- | -- | -- | -- |
| 12 | n = 1 | -- | -- | -- | -- | -- |
| 13 | n = 1 | -- | -- | -- | -- | -- |
| 14 | n = 1 | -- | -- | -- | -- | -- |
| 15 | -- | -- | -- | -- | n = 1 | -- |
| 16 | -- | -- | -- | n = 1 | n = 1 | -- |
| 17 | -- | -- | -- | -- | n = 1 | n = 1 |
| 18 | -- | -- | -- | n = 1 | -- | -- |
| 19 | -- | -- | -- | -- | -- | n = 1 |
| 20 | -- | -- | -- | -- | n = 1 | n = 3 |
| 21 | -- | -- | -- | -- | -- | n = 4 |
| 22 | -- | -- | -- | -- | -- | n = 2 |
| 23 | -- | -- | -- | -- | -- | n = 1 |
| **Total** | **n = 3** | **--** | **--** | **n = 2** | **n = 4** | **n = 12** |

**Fig. 1: VRT image showing stage 0 iliac crest fusion**

in male and female subjects respectively. In male and female no ossification was noted before the age of 14 years. In male fusion begins from 15 years onwards and complete fusion was evident at 22 years. About 20% of the subjects showed complete fusion at the age of 18 and 20 years while 33.33% subjects showed complete ossification at the age of 21 years. However earliest fusion was noted at 18 years in one case. In female fusion begins from 15 years onwards and complete fusion was evident at 21 years. In 75% of the cases complete fusion was noted at the age of 20 years. However earliest fusion was noted at 17 years in one case. Figure 1 to 6 shows images at different stages.

## Discussion

Utility of modern diagnostic imaging modalities in forensic practice have potential use but the use is limited because of financial reasons. Now a days many researchers are using these novel imaging modality for investigation of age like utility of MRI scan for assessing age from wrist joint, multislic CT images for assessing age from sternum and sagittal suture and so on.[4-6] In the present study an attempt had been made to utilize spiral multislice CT scan to know fusion of iliac crest. The advantages of such techniques are considerable like one can visualize the image in Bone Window and Volume Render Technique (VRT) format; one can have three dimensional (3 D) view and therefore the image can be rotated. Thus the status between iliac crest and ilium bone can be visualised from all sides i.e. anteriorly, laterally and posteriorly. Since all work is done at work station we can preserve the image digitally, can retrieve at any time and can be transferred to anywhere if required. The preliminary observations with use of spiral multislice CT scan are encouraging.

Review of Indian literature reveals that few studies were conducted.Pillai (1936) studied 100 South Indian subjects and noted commencement of fusion at 13 to 14 years and complete fusion was noted at 18 years.[7]Galstaun(1937) noted appearance of ossification centres in female at 14 years and in male 17 years. Fusion of iliac crest was noted in females between 17 and 19 years while in male between 19


**Fig. 2: VRT image showing grade 1 fusion**

and 20 years.[8]Dasgupta et al (1974) while studying Uttar Pradesh subjects found fusion of the iliac crest in girls at 19-20 years and in boys at 21-22 years.[9]Singh (2007) noted fusion of Manipuri girls at about 19-20 years. Patel et al (2011) while studying Gujarati population concluded that complete fusion of iliac crest appeared at 18-19 years in female and 19-20 years in male population.[11]Singh et al (2011)while studying 100 Punjabi individuals noted that in 90% of cases, ossification centres appeared in the age of 16 to 17 years. Complete fusion was noted at about 20 to 21 years in both sexes.[12]

Considering the present study, fusions of iliac crest with ilium occurs earlier in females than males and are in agreement with other studies.[8,9,11] Complete fusion in female was evident at 21 years while in male complete fusion was noted at 22 years. These findings are consistent with Dasgupta et al (1974) and Singh et al (2011).[9,12]However, compared with other Indian studies[7,8,10,11],in the present study fusion in both sexes appear late. The probable reason is that all most all studies, except one that had utilized digital x rays, were conducted on conventional two dimensional radiography using x ray films.[7-10,12] The present study had utilised multidetector CT images and the images are visualized in three dimensions and one can rotate the image as per need. Therefore more precisely one can identify the fusion process. Probably this imaging modality makes the difference. Moreover, it can be inferred that multidetecter CT images are very much helpful in determination of age especially when one cannot opine whether there is complete fusion or near fusion. Certainly with use of such technique certain grey areas like this will be eliminated and helps in making right decisions. On a concluding note, this study identifies that complete fusion of

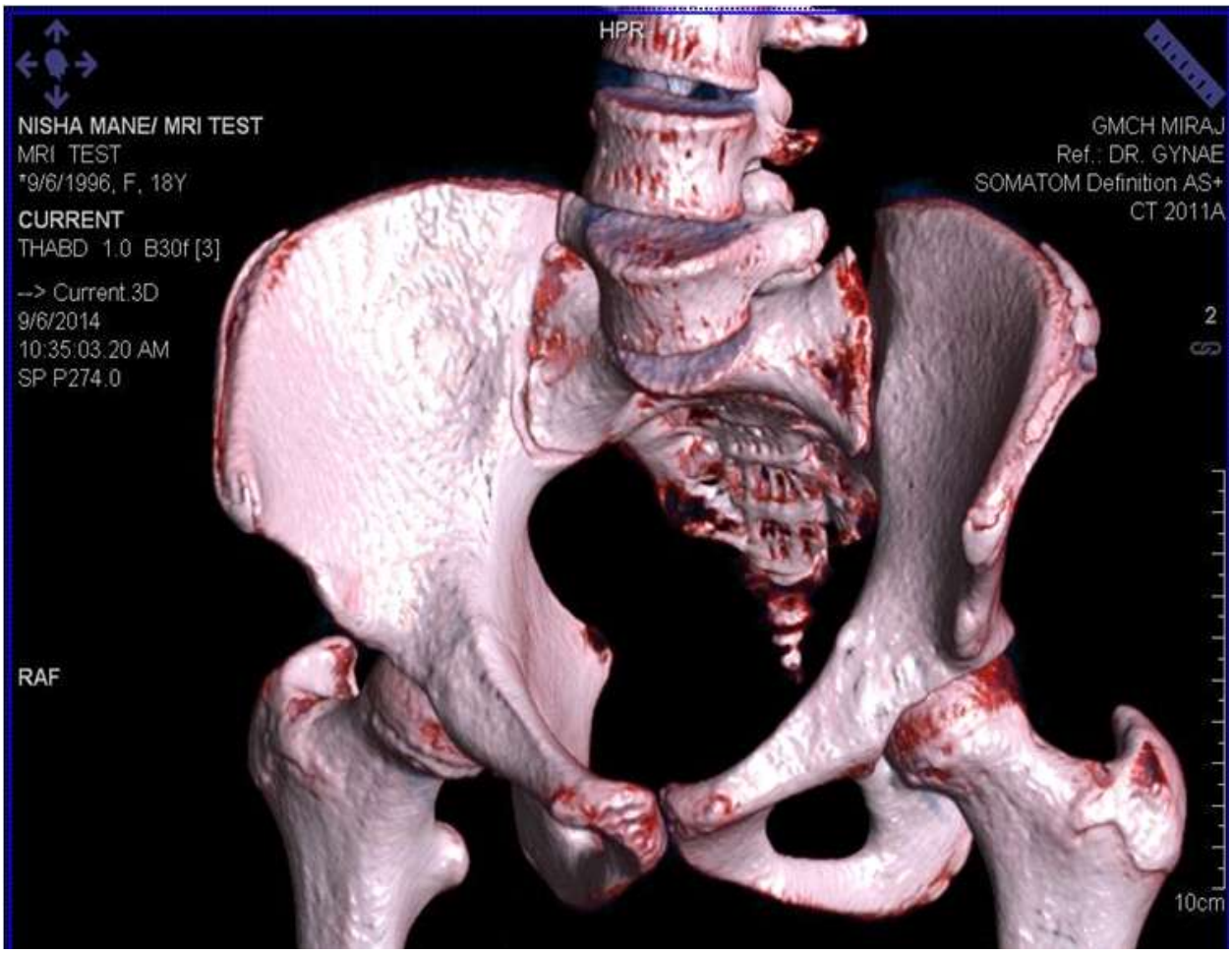


**Fig. 3: VRT image showing grade 2 fusion**

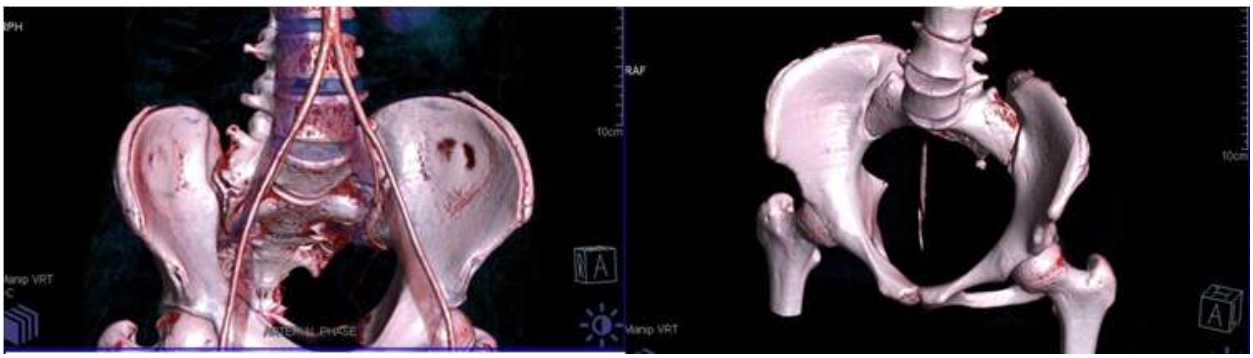


**Fig. 4: VRT image showing grade 3 fusion**

iliac crest occurs at 21 years in female and 22 years in male. However, the results should be interpreted cautiously as these are findings of a preliminary study and a more meaningful conclusion can be drawn after having large scale and population specific study. Furthermore, this study finds multidetecter CT very much helpful for assessing the ossification process.

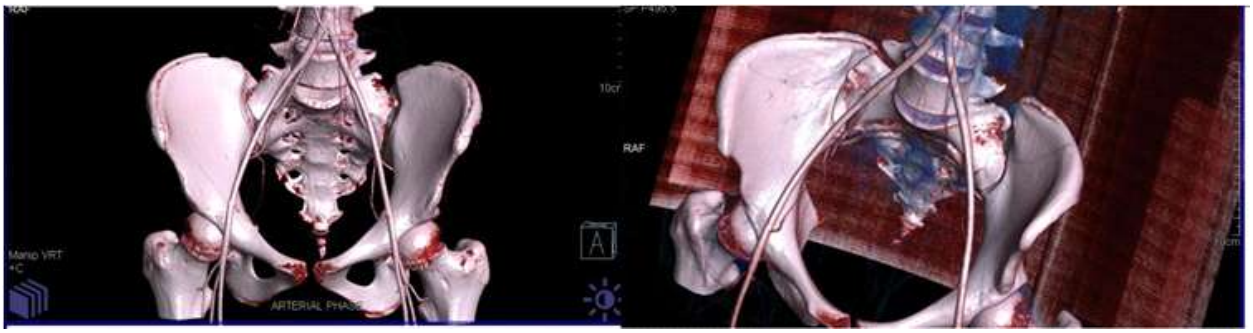

**Fig. 5: VRT image showing grade 4 fusion**

**Fig. 6: VRT image showing grade 5 fusion**

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*Case Report*

# Differential Pulse Cathodic Stripping Voltammetric Determination of Trace Level of Arsenic in Blood and Urine of A Poisoned Patient: A Case Study

**Jaiswal Ashok K.*, Mali Bhagwat D.****

**Abstract**

A simple, rapid and sensitive method is described for determination of arsenic in blood and urine of a poisoned patient at the level of µg/l based on differential pulse cathodic stripping voltammetry. Only arsenic (III) is deposited on mercury electrode in the presence of copper and selenium in hydrochloric acid medium. The total arsenic is performed by reducing As (V) to As (III) using sodium metabisulphite/sodium thiosulphate reagent stabilized with ascorbic acid. The As (III) concentration in blood and urine were found to be 9µg/l and 841µg/l respectively after about twenty five days of homicidal poisoning through food and treatment as outpatient in hospital.

**Keywords:** Arsenic; Differential Pulse Cathodic stripping Voltammetry; Microwave Digestion System; Homicidal Poisoning.

## Introduction

Arsenic is a common trace element with toxic properties known for centuries. Lethal acute intoxication by arsenic has become rare, although arsenic is still sometimes used for homicidal purposes in India. Such patients are brought to emergency room. Merely by medical examination the nature of poison cannot be decided and hence proper treatment or antidote cannot be given in time, which sometimes results in death. To overcome this problem the concerned medical officer collects the stomach wash, gastric lavage, blood, urine etc., of the poisoned patient and sent to forensic clinical toxicology division. The samples are analyzed on top priority and on the basis of report of analysis the line of treatment; an antidote is decided by the concerned medical officer and thus life of the person can be saved.

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Several instrumental methods such as spectrophotometry [1], atomic absorption spectrometry [2-4], inductively coupled plasma mass spectrometry [5-6], neutron activation analysis [7] etc., are reported in literature for quantitation of arsenic in forensic case work. The objective of this work was to develop a simple, rapid and sensitive method for determination of traces of arsenic in blood and urine by differential pulse cathodic stripping voltammetry (DPCSV). One major advantage of this technique is that the running cost of instrument is quite low compared to any other technique.

## Materials and Methods

All chemicals used were of analytical reagent grade. Milli Q water (from Millipore apparatus) was used throughout. Aqueous As(III) stock solution (1000ppm) was prepared by dissolving 0.131 gm $As_2O_3$ (Merck, India) in 100ml volumetric flask and two pellets of sodium hydroxide were added to it and made to 100ml. 0.1 ml of this solution was diluted to 100ml to give 1ppm solution. ).0.142 gm of selenium dioxide (Qualigens Mumbai) was dissolved in 100ml MilliQ water. Then 0.1 ml of this solution (1000ppm) was diluted to 100 ml to give 1ppm. 0.397 gm copper nitrate (Merck, India) was dissolved in 100 ml to give 1000 ppm solution .Aqueous solutions of 14 %( w/v) sodium meta-bisulfite, 1.4 %( w/v) sodium thiosulphate were prepared.

The reducing agent was prepared in 50 ml flask by slowly adding 5ml of 10% (v/v) sulphuric acid to 10ml of sodium meta bisulphate solution with vigorous shaking (allow to remove the gas), followed by addition of the 10ml sodium thiosulphate solution and 0.2 gm solid L-ascorbic acid, as antioxidant (Qualigens, Mumbai) and volume was made to 50 ml with Milli Q water.

**Case History**

A 51 year male patient (with puffiness eyes) was brought to hospital for nausea and vomiting since three days. The investigation of blood revealed among others serum createnine, serum bilrubin, serum albumin and serum globulin in normal except SGOT(serum glutamic oxaloacetic transaminase) and SGPT(serum glutamic pyruvic transaminase) 180 and 219 respectively; higher than their normal ranges 5.0-49.0 U/L. The chemical examination of urine revealed sugar, bile pigment, urobilinogen in normal range. The microscopic examination showed pus cells, red cells, and epithelial cells within normal range. The ultrasonography of abdomen revealed all normal organs except fatty liver. The patient was under treatment for 25 days as outpatient with no relief. He was having nausea, pain in abdomen with loose motion. A significant weight loss was observed with numbness/tingling sensation, in upper and lower limbs. The patient was feeling difficulty in walking. The patient was also referred to neurologist, where the nerve conduction studies were normal. In the mean time the patient told concerned physician that, he has dispute with his wife and claimed that she might have given him arsenic in food.

In order to rule out possibility of arsenic poisoning patient's blood, urine, hair and nail samples were sent to toxicology laboratory of the hospital, so that the line of treatment could be chalked out.

**Microwave digestion system**

Microwave digestion system (Aurora Instruments, Canada) equipped with a rotor for six teflon digestion vessels was used for the digestion of sample. Vessel of microwave digester was cleaned up by 50 % ( v/v) nitric acid and dried. One ml of blood/urine sample was transferred into the linear vessel and 1 ml

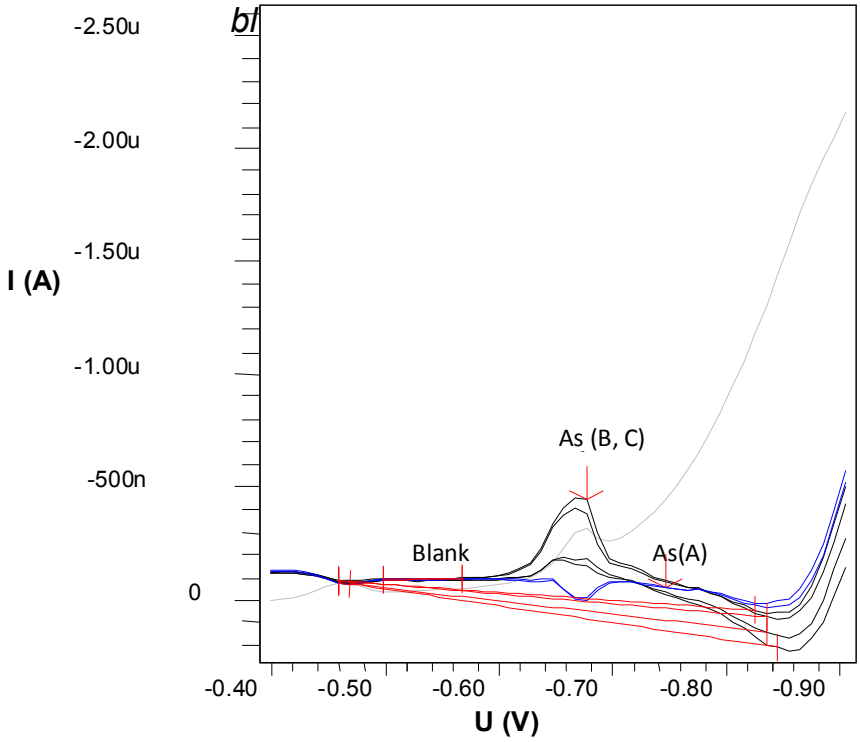


**Fig.1: Voltammogram of Arsenic in blood sample obtained from standard addition technique with number of replication being two.**

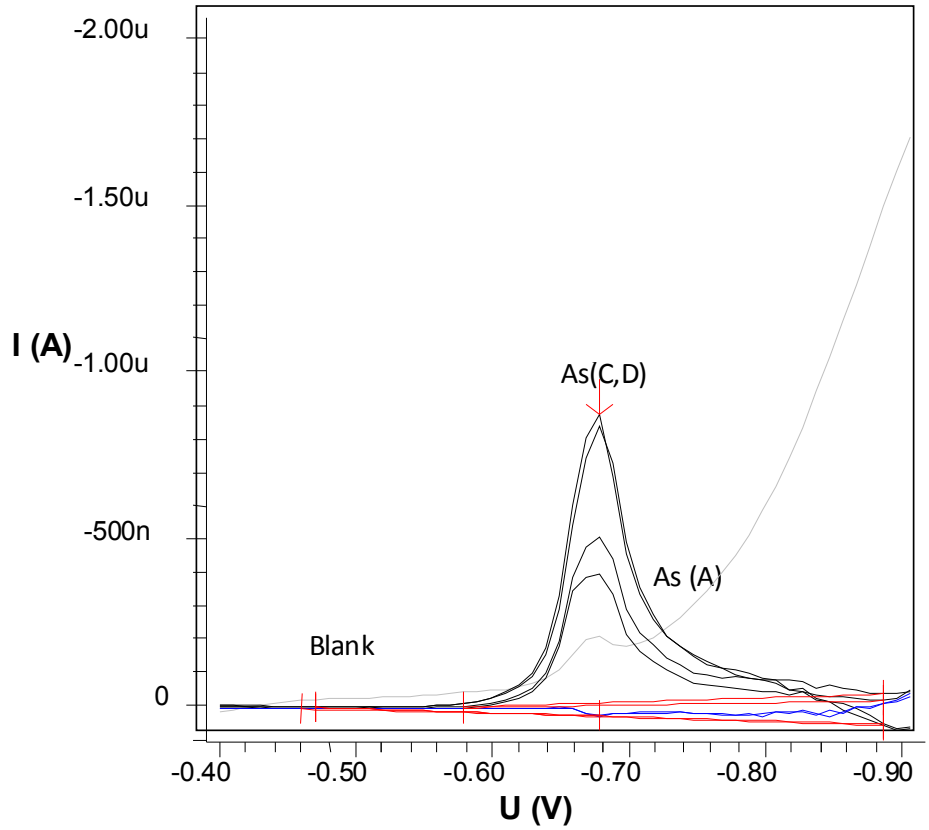


**Fig.2: Voltammogram of Arsenic in urine sample obtained from standard addition technique with number of replication being two.**

of water was added in reference vessel. 15 ml of 35% aqueous nitric acid was added to each vessel. The vessel carrousel was loaded in microwave digestion oven and digestion machine was run in three steps of temperature range of 28-100, 100-160 and 160-170 $^0$C for 210 sec, 300 sec, and 300 sec respectively. After cooling, the vessel was opened and the digested material was completely transferred in volumetric flasks and made to 50 ml with milli Q water in a standard flask.

*Voltammetric trace metal analyzer*

Trace metal analyzer (Model 797 VA Computrace from Metrohm AG Limited Switzerland) was used. The voltammetric vessel is a three electrode system. A hanging mercury drop electrode (HMDE) as working electrode, a platinum- auxiliary electrode and Ag/AgCl/ 3M KCl double –junction reference electrode were used.

*Voltammetric determination*

In all voltammetric measurements each test solution was stirred and nitrogen was purged for 5 min. 10 ml of water is taken in the measuring vessel to which 0.35 ml of reducing agent, 1 ml of conc. HCl, 80 µl of 1 ppm of selenium standard and 50µl 1000ppm copper standard solution were added and blank voltammogram is recorded from -400 mV to 900mV (Fig1 and 2). After completion of blank voltammogram 2 ml of digested sample of blood (or 0.5 ml of digested sample of Urine) was added in volumetric vessel and voltammogram is recorded under same condition (A). After completion of sample voltammogram 100 µl of 1 ppm As (III) standard was added and the voltammogram was recorded (B). Again 100 µl of 1ppm Arsenic (III) standard was added in the same vessel and voltammogram was recorded second time(C).

**Results and Discussion**

The voltammograms of blood and urine are given in Fig.1 and 2 respectively. All measurements were done by standard addition technique to avoid the

sample matrics effect. The sensitivity was calibrated by standard additions to the sample and the initial metal concentrations are calculated by extrapolation. Consequently the linear calibration range was automatically obtained as being related to quantitative mode of volumetric unit. The ultimate blank correction feature of the instrument was used to subtract the blank contribution due to chemicals, water, etc. A further increase in sensitivity of peak current was achieved by increasing deposition time to 60 sec. Under these conditions the concentration of Arsenic (III) in blood and urine sample of patient was found to be 9µg/l and 841µg/l respectively. However no arsenic was detected in nails and hair sample of patient. The symptoms of patient under study were same as described by Clarke [8] in arsenic poisoning cases. The advantages of proposed voltammetric method over other known techniques include its sensitivity, rapidity, cost effectiveness and sophistication. It was therefore concluded that DPCSV could be used rapidly and conveniently in the field of forensic toxicology in arsenic poisoning cases.

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*Case Report*

# Murder – Suicide: Remorse or Stress

**Prateek Rastogi***

**Abstract**

Murder–suicide is a severe form of interpersonal violence. It is an act in which an individual kills one or more other persons before, or at the same time as, killing oneself. The combination of murder and suicide can include: Driving a car with passengers off a bridge or intentional dashing; suicide bombing; Suicide after murder to escape punishment; Suicide after murder as a form of self-punishment; Joint suicide in the form of killing the other and oneself with consent; Murder before suicide with the intent of preventing future pain and suffering of others including family members and oneself, such as a parent killing their children before ending their own life; Murder followed by suicide by a mentally unstable person. We encountered a case in which a middle aged male administered poison to his wife and young daughter before committing suicide by hanging. History shows that the perpetrator, a businessman was under financial burden. He was unable to repay his loans and was under continuous threats and calls from his financers. His inability to repay the money, threat to future of his family and humiliation directed him towards this extreme step. This paper emphasizes on aspects and outcomes of mental stress. **Acknowledgement:** Dept. of Forensic Medicine, KMC Mangalore

**Key words:** Murder-Suicide; Financial Stress; Mental Stress.

## Introduction

According to Menninger, murder and suicide are interchangeable acts – suicide sometimes forestalling murder, and vice versa.[1] Severe repression of natural instincts due to early childhood abuse, may lead to the emergence of death instinct in a twisted form. In a research, perpetratorsof murder-suicide were found to be to be different from perpetrators of homicide alone. Murderer–suicides were found to be highly depressed males, other murderers were not generally depressed.[2] From national and international data of murder–suicide perpetrators, the key predictors of murder–suicide are: a history of substance abuse, a break-up or pending break-up, a history of battering, financial stress, family problems and many more.

Few studies in United States, estimate between 1,000 to 1,500 murder-suicide deaths per year, with the majority occurring between spouses or intimate partners with majority of perpetrators being male who will shoot the intimate partner before shooting himself. Depression, marital or/and financial problems, and other problems are general motivators.[2,3,4]

In present paper, a case is reported wherein a middle aged male administered poison to his wife and young daughter before committing suicide by hanging. The perpetrator was unable to repay his loans and was under continuous threats. Which might have directed him towards this extreme step.

## Case Report

- Dead body was of a 10 year old female child measuring 138 cms in length and weighing 26 kgs. Eyeballs were bulging, tongue protruded, face swollen, reddish tinged fluid oozing from mouth and nostrils. Face, upper limbs, front of thorax and abdomen showed greenish discoloration, marbling was present on both upper limbs, back and front of thorax and abdomen. No other external injuries were present on the body.Internally, brain was liquefied, lungs were congested, spleen and kidneys showed reddish brown discolouration, gastric contents were

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yellowish brown liquid with some abnormal odour.

- Dead body of a 32 year female, measuring 159 cms in length and weighing 65 kgs. Eyeballs were bulging, face disfigured, abdomen distended with gas, tongue protruded. Marbling was present at both shoulder, both upper limbs and right iliac fossa. Both upper limbs, back, chest and face shows greenish discolouration. Postmortem blisters were present on both upper limbs, back, face and side of trunk. Rectal prolapse was present.No other external injuries were present on the body. All internal organs showed reddish brown discolouration, brain was liquefied,gastric contents were yellowish brown liquid with some abnormal odour.
- Dead body of a 38year male, measuring 173 cms in length and weighing 85 kgs. Face, lower limbs and external genitalia showed greenish discolouration. Skin slippage was present over both hips. Postmortem blisters were present on right thigh and left leg. Face was congested, tongue was protruded and bitten. Eyeballs were bulging.

*Ligature Material*

An orange colour cotton lungi tied in the form of running noose around the neck with knot at back of neck.

*Ligature Mark*

A deep grooved pressure abrasion, measuring 39x3.5 cm incompletely encircling the neck. No other external injuries were present on the body.

All internal organs showed reddish brown discolouration, brain was liquefied,gastric contents were yellowish brown liquid with some abnormal odour.

Routine viscera was preserved for chemical analysis which was positive for cyanide ions in all three cases. Cause of death was opined as cyanide poisoning in first 2 cases and hanging followed by cyanide consumption in 3rd case.

## Discussion

Homicides followed by suicide often appear in headlines while normal suicides or homicides are rarely mentioned. This might misled the conclusion that people who are suicidal are more likely to also be homicidal.

In 18th century Denmark, people wishing to commit suicide would sometimes commit murder in order to receive the death penalty with a belief that murder followed by repentance would allow them to end their life while avoiding damnation.[1]According to a study in wales, the decision to commit suicide is taken much before the homicide act and is rarely an outcome of remorse.[5]

The combination of murder and suicide can include: Driving a car with passengers off a bridge; suicide bombing; Murder before suicide with the intent of preventing future pain and suffering of others including family members and oneself, such as a parent killing their children before ending their own life. Whatsoever may be the combination it is beyond doubt that murder suicide is a severe form of interpersonal violence. [1,6]

Reports shows that a51 year old male in Florida (US) commited suicide after shooting his adult daughter, and 6 grandchildren one of whom was an infant.[7] In another case, in Bradford (London) a 49 year old man committed suicide after killing his wife and 4 adult daughters.[8]In yet another case a 45 year old male murdered his ex-lover and committed suicide in Padubidri, Karnataka.[9]In our case, a middle aged male administered poison to his wife and young daughter before committing suicide by hanging. History shows that the perpetrator, a businessman was under financial burden. He was unable to repay his loans and was under continuous threats and calls from his financers. His inability to repay the money, threat to future of his family and humiliation directed him towards this extreme step. The act was sudden, the perpetrator poisoned his family after confirming their death he poisoned himself, the act of hanging was probably committed to ensure death. The variation in timing is shown by little advance putrefaction in wife and daughters body as compared to the dead body of perpetrator.

This shows that the stress of financial burden or may be the humiliation for himself and his family or may be the sense of social insecurity for himself and his family provoked him to take this extreme step. Remorse is ruled out looking at the planning done for the final showdown. Thus, this paper emphasizes on an important aspect and outcome of mental stress.

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*Case Report*

# Isolated Fatal Accidental Femoral Artery Injury: A Case Report

**Xalxo Biren*, Sethi Sudhansu Sekhar*, Sethi Abarnita***

**Abstract**

The authors discuss a case report of isolated femoral artery injury caused by blunt trauma with dissection of the femoral artery. A 30 year old man was received dead at the emergency ward after having sustained injury by falling in a drain while riding a bicycle carrying a beer bottle under his trouser which got crushed. The broken pieces of glass pierced his right inguinal area injuring right femoral artery. He bled profusely and was immediately shifted to SCB MCH Cuttack for further management. But he succumbed enroute and was received dead. The dead body was sent to Central morgue for post mortem examination, which revealed an isolated femoral artery injury.

**Keywords**: Bottle; Femoral Artery; Blunt Trauma; Inguinal Region.

## Case history

A 30 year old man was going on a bicycle and accidentally injured by broken pieces of beer bottle on the right inguinal region. He was carrying a bottle of beer in the right pocket of his trouser, while riding the bicycle and fell down on the roadside drain as a result of which the beer bottle got crushed, when he was giving passes to a tractor coming from the opposite side. The shards of glass from the beer bottle injured his right inguinal region resulting in profuse bleeding. He was immediately shifted to SCB MCH Cuttack where he was received dead.

## Autopsy findings

The autopsy was conducted over the dead body of 30 year old man with proper Police Requisition, Dead Body Challan and Inquest Report.

The dead body was of average built, conjunctiva pale, nail beds pale, faint post- mortem lividity on back and natural orifices were intact and free of any discharge. No signs of decomposition were present. Broken pieces of glass of beer bottle were found over the right inguinal region and under the trousers. All the garments were intact and soaked with blood.

A cut laceration of size 6 cm x 3 cm x muscle deep was present over the right inguinal region in an oblique manner. Small sharp broken fragments of glass were found in and around the wound. After careful exploration of the wound, the femoral artery was found to be lacerated. The margins of the wound were contused. All other internal organs were intact and pale. The cause of death was due to haemorrhage and shock as a result of the sustained injury.

## Discussion

Femoral artery blunt trauma is a rare event and Children are more susceptible as compared to adults[1]. The commonest mechanism of injury is penetration followed by severe blunt trauma, polytrauma, and bone fracture. The most commonly injured vessels are femoral followed by brachial [2]. Trauma can be caused by firearm, cutting weapon or femoral fracture. Femoral artery trauma corresponds to one third of all arterial traumas. Vascular injuries to groin are common and life threatening [3]. Penetrating firearm injuries are primary cause of trauma to femoral artery [4]. Wounds produced by glass may cause difficulties in interpretation in the absence of information concerning the circumstances of injury. This may mimic laceration, incised or even stab wound. The

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**Fig. 1: Broken glass bottle inside garment.**

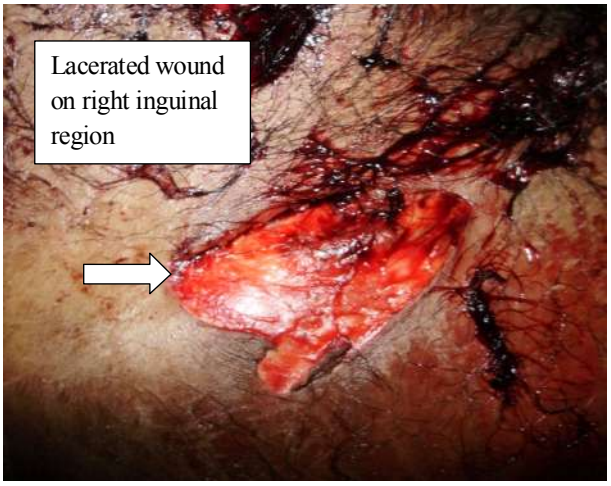


**Fig. 2: Obliquely placed wound on right inguinal region**

usual wound by a glass is an obvious laceration. The glass wound laceration should be examined under hand lens so as to look for (a) slight bruising of the margin (b) side cut which is characteristic of wound caused by glass (c) search for glass flakes or particles [5].

Injury to femoral vessels due to blunt trauma has been reported by many authors[6,7]. Bicycle handle and scooter motor handle bar are the other common offending agents; causing injuries to femoral vessels. [8,9,10].

The common femoral artery is a superficial vessel between inguinal ligament and superior pubic ramus [8].

*Two types of injuries are hypothesized*

i. A brutal deceleration with opposing force on vessels such as in high velocity driving trauma[11].

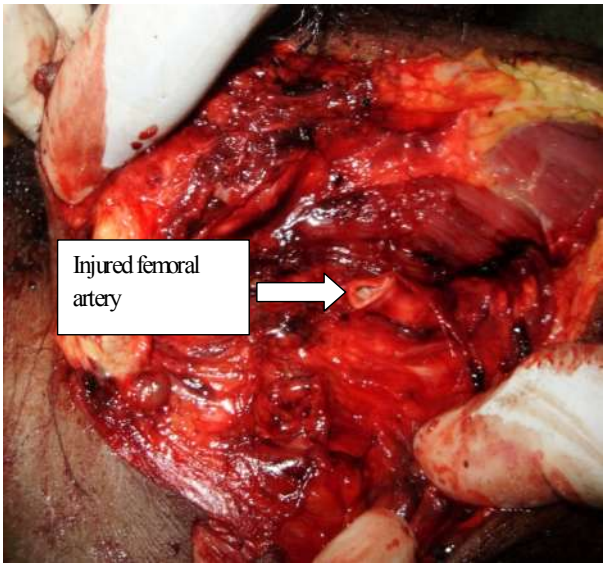


**Fig.3: PHOTO showing femoral artery injury.**

ii. Direct forceful compression of the relatively immobile vessels on the pubic ramus (as in handle bar syndrome) [12].

Various types of arterial injuries are reported including incomplete and complete transaction with pseudo aneurysm, A-V fistula, occlusion etc. [13]. Sometimes appropriate diagnosis is obtained after a latent asymptomatic period [11].The clinical symptoms caused by arterial injury are absence of pulse, ischemia of limb, haemorrhage and their complications. According to Wolosker N et al mortality related to this type of trauma is rare and is always associated to injury of other organs[14] . In our case the injury to Right Common Femoral artery is the primary and the only cause of death due to haemorrhage and shock.

Arteriography is the gold standard for topographic diagnosis of blunt trauma [15.] The simplest and earliest clinical method of investigating possible femoral artery damage is a measurement of "ankle-brachial pressure index" which is associated with 98% sensitivity [16] and such feature is seldom reported. The principle of arterial reconstruction in blunt trauma is primarily resection of diseased segment and its primary repair when the defect is < 2cm and graft interposition in other cases.

## Conclusion

Traumatic vascular injuries are rare. Femoral artery trauma if treated while the limb still maintains its vitality has a positive clinical outcome with high

rate of limb preservation. Immediate referral and treatment is needed to save life and complications and in this type of case meticulous autopsy help to solve the case in the court of law.

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