

Title of the Paper: Application of Forensic Techniques to Identify Victims in Murder Cases

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Article History	Abstract
Received: 06 June 2023 Revised: 05 Sept 2023 Accepted: 16 Dec 2023	<i>Forensic science plays a vital role in the criminal justice system by providing fact-based information through the examination of physical evidence. The application of scientific techniques establishes a link between the Victim and the offender. It always leads to a major finding against the offender. Current developments in forensic science disciplines are useful in criminal investigations, particularly to identify the corpses of the victims of gruesome and terrible murders. The victims can be identified using a variety of forensic science disciplines such as Forensic Anthropology, Forensic Odontology, DNA Profiling, Photo superimposition, etc. Forensic anthropology mainly deals with the study of skeletal remains. Various cases have already been proved with the help of Forensic Anthropology for eg, the Sheena Bora murder case, the Tandoor murder case, etc. DNA profiling can be used to identify victims based on their distinctive genetic makeup. To identify the remains of a victim, DNA from remains found at the disaster or accident site must be matched to DNA known to be from the victim or the victim's relatives. Forensic odontology deals with the proper handling and examination of dental evidence and with the proper evaluation and presentation of dental findings. It also contributes to the detection of crime and bringing those responsible to justice. The skull photo superimposition method reconstructs the photo of an individual giving a clear picture of the face and facial features using an unknown skull.</i>
CC License CC-BY-NC-SA 4.0	Keywords: Forensic Science, DNA Profiling, Forensic Anthropology

1. Introduction

Forensic Science plays a vital role in the Criminal Justice System. Its application can be observed in every criminal case, from the investigation of the crime scene to the courtroom trial. The identity of the accused can be traced with the aid of various scientific techniques in some criminal cases, while in others, it might be useful to identify the victims. Whenever victim identification is the prime question in a criminal case, particularly in a murder case, forensic science plays a major role to find out the truth. To identify the corpse there are various scientific techniques such as DNA Profiling, Forensic Anthropology, Forensic Odontology, Skull photo superimposition, etc. These techniques would help the investigation agencies to identify the victim and also help to prove the case before the court beyond a reasonable doubt.

Forensic evidence helps to find out the answers to various questions like, who committed the crime? when did it happen? how did it happen? etc. It also helps to know the exact time of the incident and the location of the offense where the particular crime has been committed by the offender. The investigation agencies can reveal the truth by conducting proper crime scene investigations in these cases. There are few sensational cases when suicide was initially believed but later revealed to be homicide by the proper application of scientific techniques. This paper examines the role and importance of various forensic techniques which would help to identify the victims.

DNA Profiling

DNA profiling examines the human DNA that can be compared to DNA previously obtained from a specific person. It includes saliva, skin, hair, blood, sperm, and more. It can be used in criminal investigations to ascertain the biological value of evidence discovered at crime scenes, which may be

of victim or suspect. As a result, it becomes the most trustworthy and effective tool for discovering the truth in the investigation procedure. It aids in determining a person's personality traits, conduct, and occasionally even heritable disorders. The technology has made it possible to identify a person from even a small amount of tissue in crimes like homicide and sexual assault, among others. In some cases DNA Profiling will help to identify the offenders while in other cases it will help to identify the victims. In murder cases or disasters the identification of mutilated, exhumed, disfigured, burned, charred bodies can be compared with the DNA of close relatives.

DNA is a powerful investigative tool because, with the exception of identical twins, no two people have the same DNA. Therefore, DNA evidence collected from a crime scene can be linked to a suspect or can eliminate a suspect from suspicion. Earlier DNA test was not accepted as admissible evidence by Indian courts however in 1989 DNA testing has got legal validity in subject of DNA evidence in the first paternity dispute case (*Kunhiraman v. Manoj, Kerala High Court*¹). The admissibility of DNA evidence depends on accurate and proper collection, preservation and documentation which can satisfy the court. Now the DNA Evidence is admissible as per the provisions of Indian Evidence Act, 1872. In various murder cases like Arushi Talwar murder case², Neeraj Grover case³ and Tandoor murder case⁴ investigating agency has taken help of DNA test for finding out the truth.

Arushi Murder Case

The fact of the case is that 13-year-old Arushi was found dead in her bedroom in Noida with her neck slit. Hemraj, a 45-year-old employee who was hired to help out at Arushi's house, was initially the main suspect. He was also found dead one day after Arushi's murder. Arushi's bedroom was examined, and it was discovered that her throat had been cut with a sharp object, her head was on the pillow, and the bed sheet and mattress were covered in blood. The articles of the room were properly arranged and placed in order. The other articles lying on the bed were undisturbed. The crime scene also appeared to be "dressed up" and scrubbed of any evidence that would point toward the parents. After the two murders, the investigation has been initiated by the U.P Police. In this case the CBI maintained that it's investigators collected all circumstantial and "scientific" evidence but it did not go for the crucial "Touch-DNA" as it was apparently "expensive". The samples for the "Touch-DNA" test are sent to UK as there's no facility in the country to carry this sophisticated scientific tests.

Neeraj Grover Case

Neeraj Grover was a Television Executive; he had helped Maria Susairaj to establish herself in the film industry. On 6 May 2008, Neeraj Grover went to meet Maria and was never found again. In the absence of any eye witnesses forensic evidence played a crucial role in cracking the sensational Neeraj Grover murder case. The police recovered charred bones of the victim from Manor, which was impossible for identification. The forensic experts collected three teeth, femur bones and some other residue so as to extract the DNA sample from it. The collected DNA sample was then matched with that of his parents to establish whether the charred bones and teeth were indeed that of Grover.

Tandoor Murder Case

This was the first criminal case in India solved with the help of forensic science. In this case Shushil Sharma murdered his wife at home by firing three bullets in to his wife Naina Sahni. Later, the body was tried to burn in the Tandoor at Bagiya Restaurant New Delhi on 2nd July 1995, with the help of restaurant manager Keshar Kumar. Charred remains of a body in the tandoor kitchen were seized. DNA from muscle pieces attached to her charred bone were compared with that of her parents and sister. Identity was confirmed by the Centre for Cellular and Molecular Biology, Hyderabad (CCMB) by matching the DNA extracted from the charred bone with Mrs. Naina's parents' DNA.⁵

Forensic Anthropology

Forensic Anthropology is the study of human remains. It mainly focuses on skeletal remains to determine the gender, ancestry, age, and stature of unknown individuals. This description of approximate biological parameters is referred to as the biological profile, which is compared to records of missing individuals to classify the individual to whom the skeletal remains belong⁶. The role of anthropologists is much appreciable to determine the root cause of the death. By the examination of the skeletal remains, they can decide the biological profile of the deceased. A forensic Anthropologist can help law enforcement agencies by determining the sex, age, ancestry, height, length of time since death, and sometimes the evaluation of trauma observed on bones. The role of forensic anthropology is helpful when there is no other evidence to trace such as fingerprints, DNA profiling, etc. Forensic Anthropology is the only solution in circumstances where the remains are incomplete or teeth or other physical evidence are absent. In most criminal cases by investigating the crime scene itself the police

can get some clues about the offender, the modus operandi of the crime, the weapon used by the offender, etc. However, in some cases, the criminals would mislead the police for eg, if murder has been committed by the offender in some location and the body parts may be dumped in different places. In these circumstances, it would be difficult to collect the physical evidence from different locations and to find out the manner of commission of the crime, weapons, nature of the injury, time of death so on solely by relying upon the physical evidence.

Forensic Anthropologists must locate and recover human skeletal remains. In many cases, they work with other specialists such as forensic archeologists, and entomologists to find out any evidence such as plants or insects associated with the remains, which might provide vital information about the time of the death and other information. The most important duty of the anthropologist is to identify and distinguish the bone between humans and non-humans. There are many methods to distinguish human and non-human bones. Forensic anthropologists can give valuable output in establishing the spatial-temporal relationship of dead body with other evidence, analysis of fragmentary, commingled, charred or cremated remains, Interpretation of bone injuries and trauma, Identification of human and non-human remains, establishing the biological profile etc.

How can we determine Age, Sex, and other factors from Bones?

There are many methods to estimate the age at the time of death. By examining the skeletal remains experts can identify the bones of children, adults, etc. For children, dental and skeletal development are the most useful indicators. Once the long bones of the skeleton have fused around the age of 18–20 years, along with some of the sutures at the base of the skull, and certain development of the teeth has taken place, the adult skeleton can still be assessed up to the age of approximately 30 years by indicators of skeletal maturation⁷. Sex determination can be done by the examination of the skull, and pelvis. The result of childbirth can cause the female pelvis to be wider than the male pelvis in comparison. Sex estimate is not done on children, especially those who have not reached puberty. Even if there are some approaches and they might yield some results, they are too unreliable to be used.

We can trace back the application of forensic anthropology in the identification of the war victims of Korean War in 1950. It has been used in number of disasters in India such as the Gujarat Earthquake (2001), the Indian Heat Wave (2002), the Indian Ocean Tsunami (2004), the Bihar Floods (2007), the Uttarakhand Flash Floods etc. It has also been applied in various murder cases in India. Forensic anthropologists are considered to be experts within their respective field. According to section 45 of Indian Evidence Act, 1872 the definition of an expert has been explained. As per that definition the forensic anthropologists also comes within the wider perspective of the term “forensic expert”. By examining the various decided cases we can able to know the probative value of the testimony of the forensic anthropologist.

Sheena Bora Murder Case⁸

Sheena Bora was a 24 years old woman residing in Mumbai. The relationship with her mother, Indrani Mukherjee was not good. One day she went missing and her mother informed to the public that she had gone to U.S. Several years later her Skeletal remains were found in Penn Raigadh, Maharashtra. Police had exhumed remains of the body from Raigad forest. Part of Femur (thighbone) of the skeletal remains was crushed. It was claimed that the bones might belong to Sheena Bora in light of a prior confession made by one of the accused. But, it was important to know if the same was true, and here is where forensic anthropology came into picture. Forensic Anthropology is useful in determining gender and age. The anthropologist in this case, Dr. Mohite, determined the remains belonged to a female and that Sheena suited the description based on her chin, muscle attachments, and Gonial angle (angle of the mandible in the skull). Forensic scientists said the DNA extracted from the femur (thigh bone) of the skeletal remains showed a 100% match with that of Indrani's DNA. “It is proved beyond doubt that the person, whose remains were found in Raigad, was Indrani's biological child.

Nithari Case⁹

It is a crime took place in Nithari village. This case involves the acts of sexual abuse, rape, murder, necrophilia and cannibalism. After a series of missing cases reported in this village the case into light. A hand was discovered in the plastic bag in the drain behind D-5 by several boys who were playing cricket there. he matters was informed to the police who declaring the hand as an animal carcass, asked the villagers to forget about the incident as nothing was wrong. The court has orderd for an investigation based on the complaint of the father of a missing girl. later skeletal remains were found on the back side of the house. The skeletal remains (627 pieces) including skull/skull portions (19) were recovered from the nearby sewer drain, sump and the backyard of the house in which this man was residing. In addition,

soft tissues (51) were also recovered from the same sewer drain. The victims were killed over a two-year period. The cases have been proved with the help of forensic experts. In this case we can trace the application of forensic anthropology and DNA Profiling.

Forensic Odontology

The broad definition of forensic dentistry, is the application of dental science to legal and social issues in the interest of justice. Although it also applies to cases of child abuse, rape, and murder, dental trauma, research, malpractice, fraud, and misrepresentation, as well as civil and criminal action, its primary usage is in the identification of unidentified bodies. Forensic odontology always connected with forensic anthropology. The application of forensic odontology can be divided into two, personal identification and bite mark identification. Personal identification is mainly to identify the victims for those cases in which the body is not in a position to identify. Thoroughly analysing, forensic dentists can identify a person (living or dead) manipulating, examining, and judging teeth and/or dental prosthesis, as well as by examining X-rays of the jaw and teeth. Taking bite impressions of bite marks, modelling the bite and the suspected biter's teeth to check for a match, and retrieving saliva from the marks allow forensic dentists to help in situations of alleged elder or child abuse and sexual assault. Bite mark identification is to identify the offenders. try. The first published bitemark case was in Germany. There are few landmark cases are there which explains how the dentistry help to prove the

*Dr. Buck Ruxton case.*¹⁰

Buck Ruxton, an Indian-born physician who lived in Lancashire, murdered his wife Isabella and her maid Mary Rogerson, and then mutilated their bodies and scattered the parts, in an effort to make them unidentifiable. The forensic experts assembled and identified the victims by scientific techniques. The painstaking reconstruction of the bodies of Isabella Ruxton and Mary Rogerson by forensic pathologist John Glaister Jr. and anatomist James Couper Brash—and pioneering use of photographic superimpositions—was the key evidence that led to Dr. Ruxton's conviction and execution.. When police examined the remains found at Moffat where the doctor had left them, they felt they had not the slightest chance of proving who the victims were. After committing murder the doctor had adopted various techniques to conceal the evidence. The doctor had cut off the fingers to avoid identification by the prints. The doctor had removed eyes, nose and teeth of the victims. While removing the teeth there is failure on the part of the doctor. he would have been aware that the teeth extracted after death leave a completely different socket to those removed during life. This case has succeeded with the help of forensic odontologist, the forensic scientist, and the forensic pathologist.

The other famous case is the Tedd Bundy's case¹¹. One bite mark in the victim's body leads him to the death punishment. Bundy escaped from police and travelled to Florida where he raped and murdered multiple women, most notably Lisa Levy in the Chi Omega house on Florida State University's campus. Bundy had bitten Levy's buttock, leaving a mark for forensic scientists to use to their advantage. This mark was ultimately what convicted Bundy in 1979 of the murder of Levy and the other sorority woman he killed. Bundy's case is one of those that experts chalk up to being "luck." Bundy had extremely crooked lower teeth, the molds of which allowed for easy identification within the bite mark analysis. This is not typical of bite mark cases, especially when advancing technology has allowed for ease of access to teeth straightening methods, such as braces.

4. Skull Photo Super Imposition

In criminal cases, identifying the deceased from their skull is of utmost significance. Examination at the Forensic Science Labs are frequently required to identify whether a skull may have belonged to a specific person whose photograph is available. The idea that the photos of the missing person and the skull may be placed as an identification was initially put forth by Professor Brashl in 1935. There are various tests such as two-dimensional facial reconstruction Technique, three - dimensional facial reconstruction Technique and super imposition technique. In super imposition technique, In this test, images of a person associated to skeletal remains are superimposed (overlaid) with an X-ray of an unidentifiable skull. The subject's facial anatomical features would match exactly if the skull and photo belonged to the same person. Many cases have been proved in India with the help of photo super impositions. Recent developments are still going on regarding these techniques.

4. Conclusion

The application of different scientific techniques has been discussed. The DNA profiling, Forensic Anthropology, Odontology and super imposition techniques are useful to identify the victims as well as suspects. Now a days the criminals are using modern technologies to commit the crime. We have to

introduce recent developments in these fields to get more accurate and reliable scientific evidence. The proper legislations are yet to pass in India regarding DNA profiling, facial reconstruction etc., or forensic facial reconstruction, standard operating procedures (SOP) must be made available by the Ministry of Home and Family Welfare.

It is also indicated that the use of odontology in facial reconstruction aims to artistically sculpt the features of the face with a scientific foundation and real-world expertise using different tools and dental materials.

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Index of abbreviations

1. DNA: Deoxyribonucleic acid
2. SOP: standard operating procedures
3. CCMB: Centre for Cellular and Molecular Biology