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FORENSIC ODONTOLOGICAL EVIDENCE IN CRIME INVESTIGATION AND COURTS OF LAW

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ABSTRACT

Odontology, the study of teeth has been used extensively by palaeontologists, paleoanthropologists, archaeologists and historians in the past to study and identify fossilised teeth and skeletons of the animals including apes and man-apes. The teeth are the hardest parts of human and animal bodies which escape decay and due to the presence of dentine can resist chemical, heat and mechanical pressures. Further, morphology and alignment of teeth are dependent on genes as well as environmental factors in an individual and thus provide peculiar features for individualization. Applications of odontology in Forensic Science have been described in the present paper, which can be used for identification purposes in contemporary society and in the courts of law for the adjudication of crime cases.

Keywords: Odontology, Forensic Science, Palaeontologists, Archaeologists, Dentine, Identification, Contemporary society.

INTRODUCTION

If one happens to visit zoological and palaeontological museums and observes animal skeletons and teeth of various animals, it becomes quite clear that the bodies of different animals osteologically got evolved as per their habits and habitat. Similarly, their teeth are also evolved as per their dietary and masticatory habits. The hard and pointed structures connected to the jaw-bones are known as teeth. The structure, kind, number and arrangement of teeth are collectively called dentition. Teeth have mainly three functions to perform, to grasp and hold the prey or food in the mouth, they serve as a grinding mill for chewing food and may also serve as weapons of offence and defence. Teeth are very characteristics of mammals that their classification is largely based on dentition and hence very important for taxonomic work on mammals. The number of teeth present gives an idea of approximate age and also helps to decide the pedigree or ancestry of certain mammals [1-5].

Morphologically speaking, teeth can be of two types, that are, homodonts, which are similar in shape and heterodonts dissimilar in shape, size and function. The heterodont teeth commonly include four types of teeth, that is, incisors, canines, premolars and molars. The manner of attachment of the teeth with the jawbones differentiates the teeth among the various vertebrates[1-7]

- Acrodont: Teeth attached to the crust of the jaw bone as in shark or frog.
- Pleurodont: Teeth are attached to shelf-like indentations on the inner margin of the jaw which is common in lizards.
- Thecodont: these teeth are found in some fishes, crocodilians and mostly in mammals. In this type, teeth have one or more roots and are embedded in sockets called alveoli or theca of jawbones and a crown projects above the sockets.

According to a succession of teeth, these can be of the following types:

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- Polyphyodonts: these are found in lower vertebrates and are constantly replaced an indefinite number of times during life.
- Diphyodont: Most mammals have two sets of teeth that are deciduous and permanent which are also known as milk teeth and permanent teeth.
- Monophyodont: some of the mammals like the platypus, marsupials, moles, sirenians, and cetaceans (toothless whales) have only one set of teeth hence monophyodont.

Heterodont dentition has four types of teeth.

Incisors, flat and chisel-shaped, having a single root are used for cutting. Canines are sharp pointed teeth having a single-pointed crown and a single root, they are used for piercing and tearing the flesh of the prey. Premolars (Cheek teeth) are called grinders they have two more roots and a crown bearing complex cusps [8-11]. Molars have many cusps on their surface and based on the shapes of the cusps they have been distinguished from each other some examples are given below:

- Monocuspid: Having one cusp only.
- Bicuspid: When the tooth has two cusps.
- Tricuspid: These molars have three cusps. These are also known as trigonodont.
- Bunodont: In this type, the crown has a number of blunt or pointed cusps as in man.
- Lophodont: In these teeth, cusps are arranged in the form of ridges, for example in the Indian elephant.
- Selenodont: These are the molars having cusps in the form of the crescent for example cow and sheep.
- Secodont: In this type of molar the crown has cusps having sharp cutting edges, for example, in carnivorous mammals.
- Hypsodont: These molars have high crowns and short roots; the cusps are crescent shaped.
- Brachydont: These teeth have short crowns at the surface of the gums and are called brachydont. They also have crescent shaped cusps.

The dental formula in different mammals is different depending upon the number of teeth present.

Materials and methods: In odontology, the material for the study is the teeth/dentition of various animal forms including mammals and Homo sapiens. The specimens may be fresh or fossilised. However, in forensic odontology, the materials may be teeth/dentition or bite marks. In forensic odontology, two types of examination are involved, that is the identification of the persons from the teeth, dentures and the bite marks. The second type of case involves the identification of bite marks of the animals on the human body for diagnostic purposes and treatments and also the bite marks on the dead bodies and the living persons for the identification of animals to find out whether the cause of death is due to animal bite or otherwise [3,12].

The methods applied are usually odontological, osteological, morphological and anatomical methods pertaining to anthropological studies and the studies of other animals. Metrical examinations and observations also play a pivotal role in identification. The superimposition techniques are also applied for identification purposes, especially in human identification from the teeth and bite marks. Sometimes serological techniques are applied frequently and nowadays DNA Analysis is also carried out from the odontological sample and bitemark site in various crime cases [13].

APPLICATIONS OF ODONTOLOGY IN FORENSIC SCIENCES

- **Type of cases involved:** Estimation of age from the teeth to find out whether the person (Accused or victim) is juvenile or an adult. This type of examination is required in sexual assault cases and other heinous crimes to find out whether the case falls under POCSO Act or has to be dealt with in the provisions of IPC.

- To find out whether the death of the victim was due to animal bites/attacks or it was a homicide or accidental death.
- Identification of the person in the plane crashes when the bodies are highly burned.
- Identification of the person or victim of fatal accidents from height or in railway accidents.
- Identification of the person or mummified dead bodies extricated from glaciers which remained buried in snow due to avalanches.
- Identification of person or victims in explosions.
- Identification of lost children and long-lost persons.
- Identification of person of dowry death and the persons burnt in fire incidents.

PARAMETERS OF EXAMINATION FOR ESTABLISHING IDENTITY

Estimation of age from the eruption of deciduous and permanent teeth, arrangement of teeth,

malocclusions, teeth pigmentations. Restoration marks, surgical artefacts, habits and occupational marks, tooth fractures, dentures, tattoo marks on gums and the attrition of teeth. These parameters enable the examiners to establish identity from the teeth. Superimposition of bite marks with teeth, superimposition of incisor teeth from the skeleton with the visible incisor teeth in the lifetime photographs, serological and DNA examination, and further examination for the authentic identification of the patterns of bites and bite marks themselves permit identification in the cases of animal bites [3].

Case I

One 18 month old girl got missing from her house in a hill village around sunset. The inmates of the house searched her everywhere but could not find her. The only information given by a lady was that she has seen the girl running behind her grandmother in the evening when the grandmother was going through the forest to fetch drinking water from the natural water source. The women also told that the girl was crying bitterly.

The next morning parents of the girl went to the police station and got registered a report of the missing girl. Police searched for the girl, but, could not find her. In the meantime, the parents of the girl suspected that she could have been killed by their neighbour for witchcraft and hence they got FIR registered against three persons who lived in the adjacent house. Police interrogated all these three persons who confessed turn by turn before the police during interrogation that they have killed the girl and buried the dead body. Police dugout three indicated places and recovered skeletons alongwith teeth, which on examination by forensic experts were found to be animal skeletons. Some bones and teeth were also recovered from the forest which were also identified as reptilian bones and teeth. Some bones also belonged to the birds.

On thorough examination of the place near the water source in the forest a few human teeth, a partial mandible having two molars along with skull vault bones, ribs and a long bone were recovered from the forest. On examination by one of the authors of this paper, all the bones and teeth were found to be of a human child.

A small frock and tuft of hair along with a red ribbon tide were also recovered from a bush in the forest. The frock had putrefied blood and flesh stains and had also got multiple tears. On closer examination, some hair were found sticking on the frock which were identified to be leopard hair. All these articles recovered indicated that they could belong to the missing girl. The same were identified by the mother of the victim and were stated to be of the missing girl. The case was found to be of the killing of the girl eating the body by a leopard and was not found to be a homicide as suspected. All three suspects were released by the police after obtaining a forensic report.

Case II

A passer-by discovered a half-buried human corpse on the side of a pond along the railway track one morning. The spot was around 3 kilometres away from a village in Rohtak district, Haryana, in a woodland area. Vultures could be observed consuming flesh from the exposed lower extremities of the human corpse, which created a horrible odour. The local police station was intimated about the situation. The police investigative team arrived at the scene, accompanied by medical officers, a local magistrate, and an anthropologist. The body was dug out after initial observations were made from the exposed leg and foot bones of the corpse; a post-mortem was performed on the spot, and the bones and skull were preserved. A blood-stained knife was discovered beside a dried pool of blood, along with three glass tumblers exhibiting fingerprint impressions, in the nearby area/bushes. A blood sample was also collected from the deceased. A missing person report was obtained and pasted over the skull. The skeleton's age and stature were also estimated, and it was discovered that the skeleton belonged to the same missing person. Serological tests were performed on the blood sample stuck to the knife seized from the crime scene, as well as the one collected from the dead body. The samples were determined to be identical across 13 genetic marker systems. The bloodstains on the defendants' concealing clothes also matched the victim. The identification of the victim was confirmed beyond a reasonable doubt, and the suspects were definitively linked to the crimes. The trial court found the accused guilty based on the evidence presented. Odontological evidence also played a significant role in the investigation and trial of this case.

Odontological evidence in the courts of law: The courts in India and various other parts of the world have appreciated and accepted the results of the Forensic odontology examination for the estimation of age and for establishing human identity from the teeth and bite marks. The evidence has to be supported by the published scientific literature. As

is apparent from the meaning of the word evidence means distinctness, that is crystal clear, so the reports have to be distinctly prepared before submission to the court of law.

The evidence has been appreciated by the honourable courts in all kinds of cases including human identification in natural calamities and disasters, plane crashes when the bodies are highly burned, mummified dead bodies, sexual assault cases, homicide and the wildlife cases for the identification of animals. Thus, Odontological evidence is playing a crucial role in different kinds of cases.

Discussion and Conclusion: The forgoing narrations in the paper clearly indicate that bite marks, teeth and dentition are examined for establishing the identity of the criminals and the victims of crime. These are also used for identifying animals of various families or groups in the animal kingdom. A number of cases have been solved in India and elsewhere in the past and the evidence of odontology is playing a pivotal role in crime investigation and assisting the courts in reaching appropriate conclusions based upon this domain of scientific evidence. As the teeth escape decay and disintegration the evidence can remain preserved for a long time in the environment at room temperature. DNA samples can be taken from the dental root canals which remain un-putrefied and well reserved and are the best biological samples for DNA fingerprinting in forensic science.

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