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Investigation of Sexual Assault Cases through Bite Marks Identification – A Review Study

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ABSTRACT

Bite marks can be recorded in violent crimes such as sexual offences, homicides, child abuse cases, Rape cases, and during sports events. Although bite marks of an individual do have uniqueness due to specific characteristics and arrangement of the teeth, when it comes to bite mark analysis, it is complicated by numerous factors, being presented as a challenge to the Forensic Odontologist. Forensic odontology has gained wide acceptance in the field of criminal justice because no two people have identical teeth. These are considered to be an expression of dominance, rage and animalistic behavior. The science of bite mark identification can be used to link a suspect to a crime. These marks are seen when teeth are used as weapons of anger, excitement and destruction. During struggles between assailants and victims, mostly skin of victims bear bite marks. The specific pattern of marks on victim's body gives a clue about the type of abuse.This paper also aims to address the physical, biological and psychological aspects of this important tool of evidence from the crime scene.

Keywords *- bite marks, forensic odontology, homicide, criminal trial,* psychological.

INTRODUCTION

The bite marks is thought to have started with Sorup. In 1924, Sorup used transparent paper upon which 1 criminal justice system. Forensic dentists are biting edges of a suspect's dentition were rendered to compare with life size photographs 5 identify recovered human remains in addition to of a bite mark **[1].**The earliest bite mark case documented by the U.S law is thought to be reported in 1870. Charged of murdering his mistress, Ansil Robinson was acquitted despite the fact that evidence matching his teeth mark on the victim's arm was presented**[2].** "The criminal may lie through his teeth though the teeth themselves cannot lie" **[3].** . Bite marks analysis is based on the principle that 'no two mouths are alike'. A bite mark may be defined as a mark having occurred as a result of either a physical alteration in a medium caused by the contact of teeth, or a representative pattern left in an object or tissue by the dental structures of an animal or human **[4,5].** The science of bite mark identification can be used to link a suspect to a crime. Bite mark analysis can elucidate the kind of violence and the elapsed time between its production and examination. It can show if the bite mark was produced intra vitam or post mortem and in case of several bite marks, identify the sequence of them**[1].**Human bites are common on the face with the frequency second to that of the upper extremity; and are usually seen on prominent locations of the face such as the ears, nose and lips**[6].** Generally, bite marks consist of superficial abrasion, and/or sub-surface hemorrhage, or bruising of the skin because

of the bite (Endris 1979). Though the mechanism is not clearly understood, the pattern of the injury is affected by the force and length in time of the bite, in combination with other mechanical and physiologic factors. Barbenel and Evans (1977) have discussed the influence of the lineages of the skin **[7].** Bite marks can be found in cases of sexual violence in typical areas of the human body – genitals and breasts -, but also in cases of child abuse. In such cases the number of the bites obtained can be very high. Trube Becker (1973) reported a case with 17 bite marks **[8].**These are encountered in a number of crimes especially in homicides, quarrels, abduction, child abuse cases, sexual assaults, during sports events and sometimes intentionally inflicted to falsely frame someone. While bite marks on the body are intentionally caused, those found on food articles are usually unnoticeably left by the offenders at the scene of crime **[9].** In order to identify the offender, the dental casts of suspected persons are prepared using dental material and matched. Bite marks if analyzed properly can prove the involvement of a particular person or persons in a particular crime **[10].**According to the Manual of American Board of Forensic Odontology (ABFO) **[11].** A class characteristic is a feature, characteristic, or pattern that distinguishes a bite mark from other patterned injuries. It helps to identify the group from which the bite mark originates. While evaluating the bite marks, the first step is to confirm the presence of class characteristics. The 'tooth class characteristics' and the 'bite mark characteristics' are the two types of class characteristics **[12].** It help in determining if the marks were from maxillary teeth or the mandibular teeth. According to the bite mark characteristics, the maxillary central incisors and lateral incisors make rectangular marks of which the centrals are wider than the laterals and the maxillary cuspids produce round or oval marks. The mandibular central incisors and lateral incisors also produce rectangular marks but these are almost equal in width, whereas the mandibular cuspids produce round or oval marks **[13].**

Individual characteristics of bite marks may be affected by the type, number and peculiarities of the teeth, occlusion, over a period of time as the injury undergoes a healing process in the skin of a living individual **[14].**

Bite Mark Analysis and Identification

The first stage of analysis is to determine if the injury is a bite mark, and then to provide a statement on the forensic significance **[15].** While evaluating the bite mark firstly the cause of the mark has to be determined, since bite marks may be caused by nonhumans or humans**[16].** The exact identification of a living person using individual traits and characteristics of the teeth and jaws is the basis of forensic science **[17].** The bite marks left on a person may be used to identify the perpetrator. Bite mark identification is based on the individuality of a dentition, which is used to match a bite mark to a suspected person. One can exactly match the bite marks to the accused biter's dentition **[18].** The most important step in bite mark analysis is to recognize a patterned injury as a human bite mark followed by pattern analysis of the bite mark which provide the individual information about the suspect or an offender and relate the person who is involved in the crime. Bite marks with high evidence value that can be used in comparisons with the suspects' teeth will include marks from specific teeth that record different characters. The surface abrasion or subsurface hemorrhage caused by human bites appears as an arch. They are caused by the incisors, canines and premolars. Contusions are the most common type of bite mark. It can be determined from the type of bleeding under the skin whether the victim was alive or dead at the time the bite mark was delivered **[19,20].**

Bite Marks in Sexual Assault and Child Abuse

A wide spectrum of bite mark evidence exists within the confines of child abuse. Bite marks found on infants tend to be in different locations than on older children or adolescents and reflect punitive measure **[21, 22].** Older children tend to exhibit bite marks falling into 2 categories: assault, in which bites are inflicted in a rapid, random, enraged manner; and sexual abuse in which a well-defined bite mark is evident and frequently associated with a "suck" mark **[23, 24].** The sexual category also includes defense bite marks, on either the victim or the assailant. Bite marks can be found in cases of sexual violence in typical areas of the human body – genitals and breasts. Bite mark injuries are rarely accidental and are good indicators of genuine child abuse.' Where bite mark evidence exists it usually is possible to exclude all but one person as the assailant. In most cases, the person inflicting the bite mark is the person responsible for abusing the child **[25].**

Human Bite Mark as Biological Evidences

The potential for human bite marks to yield biological evidences has been known for many years **[26].**Initially this evidence was limited to the blood typing of saliva stains using ABO antigen group **[27].**Later Sweet found that saliva deposited by a biter could be collected, using a double swab technique and would yield DNA for forensic analysis**[28].**Now, it is possible to retrieve and analyze DNA from bites on victims who have been subjected to extreme environmental conditions **[29].**The advent of the polymerase- chain reaction (PCR) technique has ensured DNA analysis will play an increasingly consuming, and absorbing life essences from crucial role in the investigation of bite injuries **[28].** The victim. DNA analysis avoids many of the pitfalls associated with physical bite mark comparisons, but it does not represent a forensic panacea. Contamination, degradation, expense, and environmental assaults may restrict the use of aspect of bite marks. In essence the theory DNA analysis. However, DNA analysis maintains represents the most scientific, and defensible method of bite mark analysis currently available behavior to the forensic investigator **[30].**

Human Bite Mark as Physical Evidences

This type of evidence can yield significant information about the nature and circumstances of a crime. Bite marks and tool marks are described as impression evidence in Saferstein's classification **[31].** The examination of physical evidence by a forensic scientist is usually undertaken to identify its origin, and this is also true of bite marks. The analysis regimen for bite marks is broadly split into two main components. First is the metric analysis that involves the measurement of specific traits and features. Secondly, the comparison of the configuration evidence pattern of the bite injury to that of the suspect's teeth. This comparison is referred to as pattern association **[32].**Using measurements, a bite mark can be described as having been created by a child or an adult. Individualizing characteristics on teeth can be divided into two main categories: developmental and acquired. Developmental features that can be considered unique include prominent marginal ridges, additional cusps, talon cusps, macro-or-trauma microdontia and genetic abnormalities of tooth form. Acquired characteristics include restorations, fractures, occlusal adjustment, occlusal wear **[33-35].** These characteristics provide the odontologist with the necessary detail to enable a single person to be identified as the biter. It should be remembered that some of dentitions are likely to be highly unique, exhibiting numerous individual characteristics while others, possibly in younger suspects, may offer fewer individualizing features.

Human Bite Mark as Psychological Evidences

Walter RA elaborated the psychological aspects of bite marks and in doing so, elucidated three motivational dimensions: anger-impulsive evidence, sadistic biting, and ego-cannibalistic biting. The anger-impulsive bite is said to often result from frustration and incompetence in dealing effectively with conflict situations on the part of the perpetrator and is "governed by time, location, situation, and type of anger." The sadistic bite is said to satisfy the need for power, domination, control, and omniscience. The ego-cannibalistic biter bites in an attempt to satisfy ego demands by annihilating consuming, and absorbing life essences from victim **[36].**Current theories suggest that psychological techniques, such as personal construct theory, may also be applied to this aspect of bite marks **[37, 38].** In essence the theory maintains, "If we want to understand other people, their thoughts, their feelings or their behavior we have to know how these people allocate meaning to the things that happen"**[38].**It follows, therefore, that if we are able to elicit, examine, and explore what influences the personal construct systems of offenders who have bitten, they should tell us something new and highly relevant regarding the dimensions of the behavior we wish to understand. It should be noted that personal construct psychology and the methodological techniques contained therein have been employed with offenders whose behavioral profile is most likely to include biting behavioral violent offenders. **[39].**

Bite Marks and DNA

Use of DNA in bite marks was pioneered in an effort to eliminate the subjectivity associated with conventional analyses **[40].** While the recovery of DNA from saliva has been reported, it is not always assured. It has been proposed that the presence of nucleic acid degrading enzymes (nucleases) within saliva can readily degrade DNA, especially if it is on a living victim, as the skin's ambient temperature accelerates the process**[41].** As human mouth contains over 500 distinct species of bacteria, and every individual will have a slight different combination, dependent on oral hygiene status, dental status and presence or absence of prosthesis. One research group has suggested that the genotypic identification of oral streptococci may be of use in bite mark analysis **[42].** Therefore, it appears that the technique is a valuable addition to forensic dentistry although its use will be limited by the access to the expertise and equipment to undertake it **[41].**

Discussion

Since 1950, bite mark evidence and dentists have played a role in judicial system **[43].**The scientific basis of bite mark analysis is rooted in the premise of individuality of human dentition, the belief that no two humans have identical dentitions in regard to size, shape and alignment of teeth **[44, 45].**The investigators dealing with analysis of bite marks should also have the knowledge of any mark or bruise which have characteristics which closely resemble the injuries produced by teeth as determination of an injury being produced by human teeth requires substantial information **[46, 47].** Tooth markings may also be found on foods like chocolates, vegetables, chewing gums, Styrofoam cups, cigarette but and even on steering wheel of a car **[43, 48].** A case of a murder in which the bite marks in a piece of cheese was recorded **[49].** Bite marks left in substances which are malleable like cheese have a more potential for accurate identification **[46, 50].** A characteristics in a human bite mark is a distinguish feature, trial or pattern within the bite mark and is delivered as a class or an individual characteristic **[43, 51].** The serious nature of the crimes in which bite marks are found frequently dictates that the highest level of Forensic standards must be applied and need forqualified and experienced individuals in the recognition, collection and examination of this type of evidence is increasing. Examination of such injuries should only be undertaken if unique or, in certain circumstances where class characteristics exist. With recent advances in research, more objective methods of bite mark examination like salivary DNA recovery and bacterial genotyping have become the main stay of examination in such crimes.

Conclusion

Bite mark investigation play a significant role in forensic dentistry that is invaluable in solving crimes and in identification of persons involved in criminal activities. The human bite mark is proficient of bearing the extreme conditions of the environment and is a ready source of evidence that can be identified even in the deceased individual. The science of bite mark identification is relatively new and possibly valuable. Bite marks if analysed properly not only can prove the involvement of a particular person or persons in crime but also help in exoneration of the innocent. The field of bite mark science is continuing to progress, and so is the need for those who are trained and knowledgeable in the identification with respect to the cases involving the bite marks.

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