Review Article

HOW DEEP IS THE BITE? – A REVIEW ON BITE MARKS IN FORENSIC ODONTOLOGY

Grover M, PhD 2nd Year, Dept of Forensic Medicine & Toxicology, JSS University, Mysore, Karnataka
Gorea RK, Director Principal, Guru Nanak Mission Medical College & Hospital, Dhahan Kaleran, SBS Nagar, Punjab.
Shivakumar GC, Professor, Dept of Oral Medicine & Radiology, BBD College of Dental Sciences, Lucknow.
Ram T, PhD 2nd Year, Dept of Forensic Medicine & Toxicology, JSS University, Mysore, Karnataka
Puri PM, Assistant Professor, Amity Institute of Forensic Sciences, Amity University, Noida
Jindal AK, Assistant Professor, Dermatology, MAMC, Mullana, Ambala

Article history
Received May 24, 2013
Recd. in revised form June 16, 2013
Accepted on June 16, 2013
Available online June 25, 2013

Corresponding author

Dr. Maneel Grover

Phone: +91-9343733731,
+91-9815969444

E-mail:
drmaneelgrover@yahoo.co.in

Abstract

Identifying human remains by dental description is a well-established component in forensic science with its distinct scientific basis. Bite marks are significant in personal identification but one of the contentious issues of forensic odontology. Bite mark identification is relatively new but potentially important field. Because of its origin, biting is a primitive type of physical attack. It is frequently used as a weapon in absence of any other defence. Bite injuries are often seen in affairs of violent rape, skirmishes among young children and direct fatal conflicts. This paper reviews bite marks analysis and its advantage in forensic investigation.

Keywords: Bite marks; teeth; forensic odontology; forensic dentistry.

Introduction

Bite mark analysis in Forensic Dentistry addresses the difficulty of identifying persons based on the properties of teeth or identifying individuals based on their bite mark impressions. It is appropriate to precisely match a bite mark impression at the crime scene. Therefore, a method which minimizes human error to carry out the evaluation would be favourable to make sure precision and shorten individual prejudice. Bite marks are often seen on the victims of assault - particularly in cases of sexual attacks. Bitemarks are also seen in cases of child exploitation and abuse. This fundamental proof over and over again goes unrecognised by the inexperienced individuals. Any approximately crescent bruise flanked by 4 and 5cm distance must be treated as suspicious and the opinion of a forensic odontologist should be sought at the very beginning of the investigation. Forensic odontologists should not merely provide an opinion, but also shall be capable to capture the photograph of the bite mark by means of diverse illumination sources to put across the bite which can lead to accurate identification **[1].**

Long time ago the use of teeth as proof in criminal matters was in practice. There is some chronological information of identification by recognizing unambiguous dental features as early as 49 A.C. On the other hand, Forensic Odontology, as a discipline, did not come into sight before 1897 when Dr. Oscar Amoedo wrote his doctoral thesis entitled "L'Art Dentaire en Medecine Legale" relating the effectiveness of dentistry in forensic medicine with meticulous importance on identification **[2].**

Even though bite marks encompass no more than freshly gained importance, there have been cases involving teeth with the investigators for more than a hundred years. A number of individuals have been documented as being the foremost bite mark analysts. Quite a few authors have mentioned Sorup as being the earliest such investigator in 1924. He used translucent paper representations of a suspect's dentition to evaluate with life size bite mark photographs **[3].**

A bite mark may be defined as having occurred as a result of either a physical alteration in a medium caused by the contact of the teeth, or a representative pattern left in an object or tissue by the dental structures of an animal or human **[4].**Each individual has unique dentition, hence the bite marks. Therefore the positive identification of the prepetrator is possible.It is for this reason , the bitemarks are also referred to as " Dental Fingerprints" **[2].**

Steps in analysis of Bite marks:

There are many steps in collecting the data of the bite mark from the victim's body. The forensic dentist should have good presence of mind to record the data in the chronological way, so that no single evidence should be missed out. The simple steps are as follows: - **[5]**

1. Recognition and initial assessment.
2. Swabs from the injury site.
3. Photographs.
4. Measurements and drawings.
5. Impressions.
6. Preservation of the skin.
7. Follow-up photographs.
8. Special techniques.

Methods of analysing Bite marks

For the sake of obtaining evidence from the human skin, a probable bite injury has got to be documented early on, as the precision and profile of the mark could transform in a pretty short moment in time, in equally living as well as the dead victims. Bitemarks are for the most part frequently formed on the skin of victims, and they may be found on more or less in all parts of the human body. Most commonly seen in females, and for the most part often bitten on the breasts and legs all the way through sexual attacks, while bites on males are frequently seen taking place the arms and shoulders **[6, 7].**

Bite marks appear generally as oval or round areas of bruise or abrasion, sporadically with associated indentations. There may possibly be avulsion of tissue, or even pieces of tissue bitten off. There may be considerable bruising and wounds that have penetrated the skin. Once the mark is primarily evaluated, it must be examined by a forensic odontologist to establish if the proportions and composition are within normal limits. In view of the fact that a huge percentage of individuals (85%) secrete the ABO blood groups in their saliva, swabbing the vicinity and a control area in another place on the body have to be concluded sooner than the remains is washed. The swabs, moistened with sterile distilled water, have to be allowed to air dry prior to their submission to a serological laboratory **[8]**. From the time when physical and biological data from a bite mark begins to get worse in a little while subsequent to the bite is inflicted, the forensic odontologist have to be well versed in the common principles of evidence collection **[7].** The swabs taken from the bitemarks can also help in DNA Profiling of the perpetrator.

Preparing the Documents:

It is necessary for the forensic odontologist to complete the documents precisely so that no details should be missed. He should record a proof of the wound, together with suggestive, description comments that document the substantial appearance, colour, dimension and point of reference of the injury **[9]**. Even though there have been descriptions by means of fingerprint "dusting" methods, photography is the most important means of recording and preserving the bite mark in documenting the evidence. In view of the fact that the skin marks modify over the time period, photographs will give the most consistent resources of preserving the information. On the other hand, photographs comprise substantial natural restrictions, and there are precise needs

concerning the accurateness of reproduction. The fundamental technical hitches entail replicating a three-dimensional thing in a two-dimensional film and producing a representation with accurate colours and spatial relations. One of the important aspects in documenting is the extra-oral and intra-oral structures that have to be examined and important findings are noted on a dental chart. Particular consideration is determined on the importance of the broad dental physical condition, occlusion and mandibulararticulation **[10]**. Photographs have to be taken by skilled photographers by means of both colour and black and white film by means of a negative size of 35 mm or larger **[5,8,10**].In adding together to the customary films, several authors have suggested ultraviolet photography.12 The method involves irradiating the bite mark with a UV light source as well as exposing black and white film all the way through a UVA filter **[12]**. As soon as there are indentations in the skin, or to safeguard the three-dimensional character of the bitten area, impressions have to be engaged to fabricate stone models **[13].** This method is prepared by fabricating custom impression trays and taking an impression of the bite mark and adjacent skin by means of a standard dental impression materials like vinyl polysiloxane or polyether. These impressions are then poured in dental stone to produce models.

Research and assessment

Close at hand is still progressing argument on the subject of the assessment of bite mark evidence and the hard work to relate it by means of an elevated quantity of assurance to particular individuals. Still if every single one of the bite information is composed carefully, the forensic odontologist impartiality and methods are significant to the eventual conclusion. An attempt to regulate the study of bite marks has resulted in strategy by the American Board of Forensic Odontology**[14].** Even though we know how to organise by way of various diminished quantity of prejudice, develop a score for a scrupulous bite mark and dentition, it have no conventional application to the extent of technical assurance. There is an assert on the meadow of bite mark analysis for investigate to stick on to additional rigorous systematic policy in order for it to be further flexible to logical analysis.

Advanced and Specialized techniques

There are some advanced methods in recording the bite marks, like 3D image reconstruction, advanced imaging modalities and DNA analysis. The 3D method describes experiments with developing a semi-automated system to evaluate 3Ddental models taken from bite mark impression descriptions left in the sight of the offence. Once the contours from the bite mark image and the 3-dimensional dental model are captured, the perfect configuration is designed by ruling the alteration which minimizes a distance measure. The most excellent counterpart is subsequently recognized by performing this association to a set of dental models**[15].**

The one more type of advanced method is from the body fluid traces recovered from a crime scene be able to potentially include DNA which, similar to fingerprints, has the maximum evidentiary importance. In the bite mark investigative ground, attempts to give an additional intention method of examination resulted in the effectiveness of saliva as a source of DNA. Other than saliva the DNA can be isolated from resources such as blood, semen, hair roots, tissue, teeth, and bone**[16].**

Conclusion

To record the bite marks from the victim, a forensic odontologist should require a certain degree of skills but should know and acknowledge their limitations. At the time of reporting on bite mark evidence, one has to generously disclose the intrinsic obstacles to correct the assessment and be appropriate with the bite mark authentication with reliable methodical ethics. In the midst of the planned realistic improvement of techniques next to systematic outline, bite mark data will be capable of strengthening and making big in its reverberations and coherent foundation to punish the real culprit in the court of law.

Conflict of Interest

None Declared

References

1. Walther RA. An examination of the psychological aspects of bite marks. Am J Forensic Med Pathol. 1984; 5:25-9.
2. Bernstein, M. Forensic Odontology. In: Eckert WG. (Ed). Introduction to Forensic Sciences. 2nd ed. Boca Raton, FL: CRS Press; 1997.
3. Strom F. Investigations of bite marks. J Dent Res 1963;42:312.
4. American Board of Forensic Odontology Diplomates Reference Manual. Section 3: Policies, Procedures, Guidelines &Standards. 2013 Available at: http://www.abfo.org/wp-content/uploads/2012/08/ABFO-Reference-Manual-1-22-2013-revision.pdf. Accessed May 15, 2013.
5. Rothwell BR. Bitemarks in forensic dentistry: a review of legal and scientific issues. J Am Dent Assoc. 1995 Feb;126(2):223-32.
6. Vale GL, Noguchi TT. Anatomical distribution of human bitemarks in a series of 67 cases. J Forensic Sci 1983; 28:61-69.
7. Pretty IA, Sweet D. Anatomical locations of bitemarks and associated findings in 101 cases from the United States. J Forensic Sci 2000; 45:812-4.
8. Johnson LT, Cadle D. Bite mark evidence. Recognition, preservation, analysis and courtroom presentation. NY State Dent J 1989 Mar;55:38-41.
9. Sweet D. Human bitemarks: examination, recovery and analysis. In Bowers CM, Bell GL (ed) 3rd ed. Manual of Forensic Odontology. P148-170.Colorado Springs: American Society of Forensic Odontology, 1995.
10. Pretty IA. Bitemark overlays- and analysis of effectiveness. Master thesis. Vancouver: University of British Columbia, March 2000.
11. Krauss TC, Warlen SC. The forensic science use of reflective ultraviolet photography. J Forensic Sci 1985; 30:262-8.
12. Barsley PE, West MH, Fair JA. Forensic photography. ultraviolet imaging of wounds on skin. Am J Forensic Med Pathol 1990; 11(4):300-8.
13. Benson BW, Cottone JA, Bomberg TJ, Sperber ND. Bite mark impressions: a review of techniques and materials. J Forensic Sci 1988;33(5):1238-43.
14. American Board of Forensic Odontology, Inc. Guidelines for bite mark analysis. J Am Dental Assoc 1986; 112:383-6.
15. Heras SMdl, Valenzuela A, Ogayar C, Valverde AJ and Torres J. C. Computer-based production of comparison overlays from 3D-scanned dental casts for bite mark analysis. J Forensic Sci 2005; 50(1):127-33.
16. Walsh DJ, Corey, AC, Cotton, RW, Forman L, Herrin GL, Word CJ and Garner D. Isolation of deoxyribonucleic acid (DNA) from saliva and forensic science samples containing saliva. J Forensic Sci 1992; 37:387-95.

This article can be cited as:
Grover M, Gorea RK, Shivakumar GC, Ram T, Puri PM, Jindal AK. How deep is the bite? – a review on bite marks in forensic odontology. J Punjab Acad Forensic Med Toxicol 2013;13(1):49-52.