

## Revenge by the Bites

\*Gorea R K, M.D., \*\*Jasuja O P, Ph.D, \*\*\*Aggarwal A D, M.D., \*\*\*\*Narula R, M.D.S.

\*Professor and Head, Forensic Medicine, Gian Sagar Medical College, Ram Nagar (Banur), Patiala

\*\*Professor, Forensic Science, Punjabi University, Patiala

\*\*\*Assistant Professor, Forensic Medicine, MM Medical College, Mulana.

\*\*\*\*Assistant Professor, Oral & Maxillofacial Surgery, G.N.D. Dental College, Sunam

### Abstract

Bite marks are important evidences, which are most often ignored by the investigating officers in India. Sometimes due to lack of this knowledge, let the culprit go Scot-free. Bite marks help to link the culprit with the crime. It is important scientific evidence, which if properly collected and analyzed can help, in successful prosecution of the case. Analysis of a case of bite marks is presented here by which culprit could be identified.

**Key Words:** Forensic, Odontology, Bite marks, Overlay Technique.

### Introduction:

Bite marks are found quite commonly on the crime scene mostly related with sexual offences and burglaries. They may be present on the skin of the victim or various eatables like fruits, cheese etc.

Earlier, they were not easily accepted as evidence in the courts, even in the advanced countries, but gradually bite marks analysis made their impact. Pitluck (1997) in his article mentioned more than 260 cases in which bite marks were used as evidence in various judicial proceedings. [1]

Main problem with the bite mark analysis is that this evidence is extremely subtle and unless the investigating officer takes extreme care, its value may be lost permanently. Harvesting of these bite marks and later comparing them with that of suspect's teeth may solve the crime in many cases by either comparatively easy, exclusionary path or slightly difficult, inclusionary path. Forensic odontologist has to answer the queries whether the bite mark is human, whether it is individual, does the bite mark predates the crime or is associated with the crime and is the bite mark consistent with the crime.

To answer the queries, forensic dentist has to first photograph the bite mark and then make it to the life size. A dental cast is made of the suspect and from the dental cast a transparency is made, which is then superimposed to see the similarities or dissimilarities and suspect is excluded or identified. [2] In recent times, hand-drawn acetate overlays have given way to computer assisted analytical techniques. The most recent development in the field is that of 3D/CAD supported photogrammetry (FPHG) based on tooth-to-tooth and arch-to-arch comparison. [3] Examination of the bite marks by virtue of simple visual description, stereo-photography, stereo-metric graphic plotting and reflex microscopy has also been reported. [4, 5] These methods can be used depending upon the facilities present at a particular centre. In

underdeveloped and developing countries, even simple methods of comparison may be very useful.

The bite mark analysis is based upon two assumptions i.e. human teeth are unique and sufficient details are transformed to biting surface, which aids in identification. [6] However, the validity of bite mark evidence has been challenged over the years, consequently, a healthy scientific skepticism surrounding bite marks have developed. [7,8,9]

Computer assisted bite mark analysis first came into being when it was used for establishing the dental "uniqueness", even in case of identical twins. [10,11,12]

### Case History:

In this case, a person was alleged to have bitten a woman to take revenge for the misbehavior, which the husband of the woman had done, to his wife sometime back. One night when woman was napping outdoors, the culprit came and bit the woman on face and arms.

A doctor medicolegally examined her and the police for collection of relevant samples and analysis for bite marks referred this case to the medical college.

On questioning, the culprit alleged that the husband of the woman made these marks and he is being falsely implicated due to some property dispute.

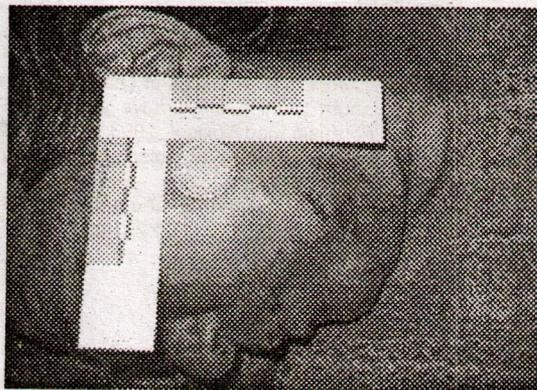


Figure 1: Bitemark on cheek with ABFO scal

**Examination and Analysis:**

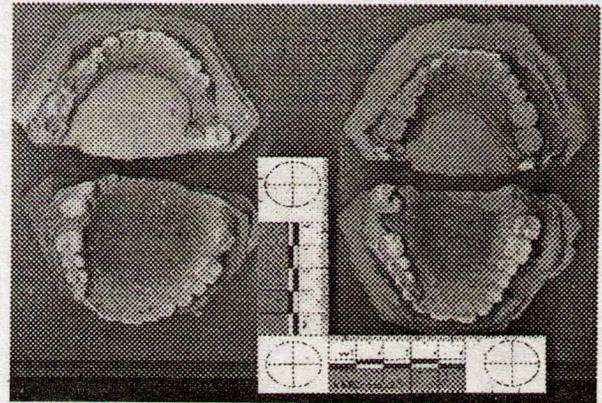
For the purpose of thorough analysis of any physical evidence, proper collection of the bite marks plays an important role in the investigation of the case. Bite marks on the cheek and forearm of the woman were photographed with a digital camera (Canon Power Shot A70) keeping the ABFO No.2 scale in the view field, which is now universally adopted by the forensic dentists and professionals; for photographing bite marks. [13] Studies have recommended the use of rigid ruler for scale, proper camera positioning in relation to scale and proper light arrangements. [14] These were made to the life size and prints were taken in colour and gray scale. Swabs were taken from the each bite mark individually for determining the blood group in the saliva, if present. Blood samples of the victim, her husband and alleged culprit were taken for blood grouping.

Dental casts of the alleged culprit and husband of the woman were prepared using Alginate powder. Dental casts were scanned (with HP psc1200) and transparencies were printed for matching with the bite marks.

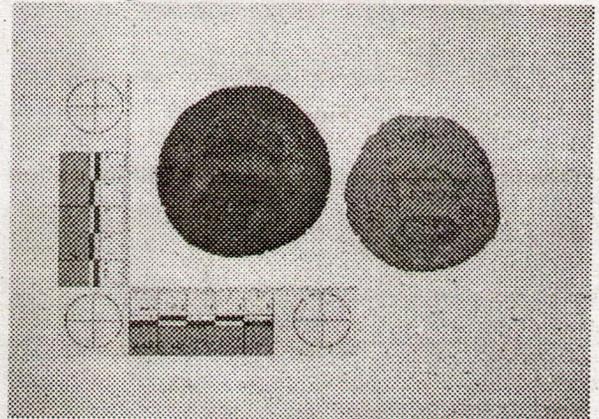
Hand-drawn transparencies were also prepared from the dental casts for overlaying and matching. Individual details of the teeth were recorded. From the casts, bite marks were taken on the plasticine material and were photographed. Impressions of the dental casts on the skin of a volunteer (one of the authors) were also taken and pattern of the impression was compared with the bite mark. Casts were also directly overlaid over the photograph of the bite marks.



**Figure 2: Gray-scale photo of bite mark**

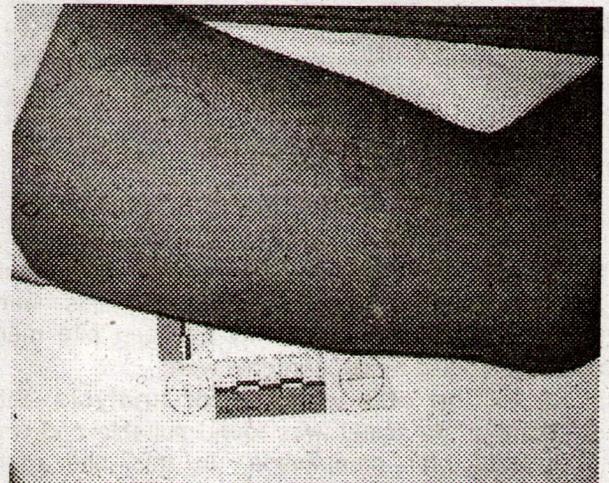


**Figure 3: Scanned dental casts**



**Figure 4:**

**Experimental bite marks from casts on clay**



**Figure 5:**

**Experimental bite marks from casts on skin**

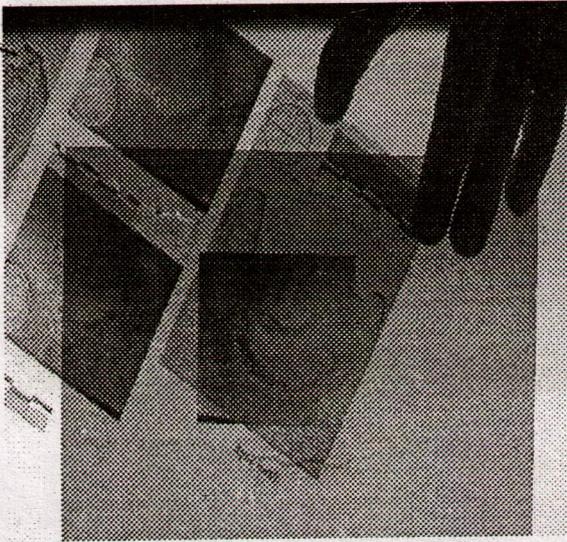


Figure 6:

**Overlaying technique using trans-illumination**

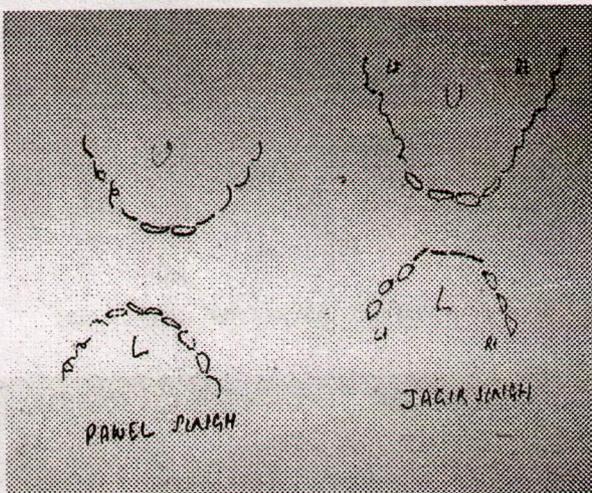


Figure 7: Hand-drawn transparency

**Observations:**

The swabs were examined scientifically at Forensic Science Laboratory and no saliva stains were detected. Features of similarity between bite mark and cast studied by experiments were:

- i. **Selection of bite mark for analysis:** Bite mark on the cheek was found suitable and was selected for comparison. In this bite mark impression of lower teeth were better with maximum identifiable features, and was further selected for comparison.
- ii. **Curvature:** Three anterior teeth of the husband were in a straight line, but the bite was in a curve, so husband of the woman

could be excluded. Arc of the teeth was comparable to the teeth of the alleged culprit, because transparency exactly matched in overlay technique.

- iii. **Number of teeth impressions:** The bite mark had five teeth impressions clearly identifiable and one irregular impression. The four middle marks matched with incisors while the lateral ones matched with canines.
- iv. **Spacing and individual features of teeth:** In the alleged culprit, all four incisors were not in a straight line, but at some angle to each other, which corresponded to the bite mark photograph. Right canine was prominent and it produced its own mark. Left canine was showing attrition and had more than one prominent areas and this explained bizarre broad mark on left of bite mark. The distance between two canines also corresponded with the distance between two canine teeth on the casts.
- v. **Prominence and attrition of canines:** Husband had canines at lower level than incisors and did not participate in bite on experimentation, so the husband could be excluded, whereas the right canine of the accused was prominent and the left canine was showing attrition, corresponding to the features in the bitemark.
- vi. **Experimentation:** Experimentation with plasticine and human skin of the volunteer, by dental cast of the alleged culprit also produced impression similar to the bite mark photograph. Impression produced by dental cast of the husband on plasticine and skin of the volunteer were dissimilar to the photograph of the bitemarks on the victim.

It was opined with reasonable medical certainty that bitemarks on face of victim matched with the dental casts of accused.

**Discussion:**

Sorup (1924) inked the plaster models of teeth and put impressions on the transparent sheet, which was later superimposed on the bite mark. [15] Humble (1933) used the transparencies for bite marks comparison. [16] Franklin and Curtis (2001) have described in detail the method of bite mark overlay technique. [17] Bernstein (1983) has described in detail about the application of photography in forensic dentistry. [18] Whittaker and MacDonald (1989) emphasizes that bite mark analysis starts with the examination of the wound. [19] Sweet (1995) is of the view that no two human bite marks can be identical. [20] Sheasby and MacDonald (2001) have described in detail about the primary

and secondary distortions in the bite marks. [21] Richard (2001) has written that unique characteristics of biter's teeth are compared with that of the bite mark on skin and which will help in identification. [22]

**Conclusion:**

It was observed that direct comparison of the casts was more helpful in reaching the conclusion and transparency overlay confirmed this. In comparing direct and indirect method of match, indirect comparison method remains inconclusive, but the direct comparison method tends to match. More study is required to find out if direct method is more sensitive than indirect comparison method [23]. Maximum help was by getting dental impression on the skin of the volunteer and second best was by biting on the plasticine material.

Direct comparison of the photograph with dental cast was more helpful than overlaying technique. Printing the photograph on thin paper or transparency helped in better comparison. Where there is a doubt noting the individual features of the teeth, provided best help and imagining and experimenting with that particular feature.

Positively, as the science continues to evolve with more precise and demonstrative methods of performing the investigations and development of research data on the individuality of human dentition, the value of bite mark analysis in legal system will continue to increase. [24] Bite mark evidence has become accepted as powerful tool in investigation of crime, and a new level of court interest is brimming, but it is most likely that forensic scientists will have to refine all the scientific techniques, presently available in the field.

**Reference:**

1. H.M. Pitluck, Bite Marks Citations, In: P.G. Stimson, C.A. Mertz (Eds): Forensic Dentistry, Boca Raton, Florida, CRC Press, 1997, pp.269 – 276.
2. D.K. Whittaker, Bite marks - the criminal's calling cards, Br Dent J., 196 (2004) 237
3. M.J. Thali, M. Braun, T.H. Markwalder, W. Brueschweiler, U. Zollinger, N.J. Malik, K. Yen, R. Dirnhofer, Bite mark documentation and analysis: the forensic 3D/CAD supported photogrammetry approach. Forensic science international, 135 (2003) 115-12.

4. G. Bang, Analysis of tooth marks in homicide case, Acta Odontol Scand, 34 (1976) 1-11.
5. A.J. Ligthelm, W.J. Coetzee, P.J. VanNiekerk, The identification of bitemarks using the reflex microscope, J Forensic Odontol, 5 (1987) 1-8.
6. I.A. Pretty, M.D. Turnbull, Lack of dental uniqueness between two bitemark suspects, J Forensic Sci., 46 (2001) 1487-1491.
7. R.W. Fearnhead, Facilities for forensic Odontology, Med Sci Law, 1 (1960) 273-277.
8. J. Furness, A new method for the identification of teeth marks in case of assault and homicide, Br Dent Journal, 124 (1968) 261-267.
9. C.O. Jonason, K.O. Frykholm, A. Frykholm, Three-dimensional measurement of tooth impression of criminological investigation, Int J For Dent, 2 (1974) 70-78.
10. R.F. Sognnaes, R.D. Rawson, B.M. Gratt, N.B. Nguyen, Computer comparison of bitemark patterns in identical twins, JADA, 105 (1982) 449-451.
11. A.S. Naru, E. Dykes, The use of digital imaging technique to Aid bite mark analysis, Science and Justice, 36 (1996) 47-50.
12. D. Sweet, M. Parhar, R.E. Wood, Computer based production of bitemark comparison overlays, J Forensic Sci., 43 (1998) 1050-1055.
13. W.G. Hyzer, T.G. Krauss, The bite mark standard reference scale – ABFO No.2, Journal of forensic science, 33 (1988) 498-506.
14. T.C. Krauss, Photographic techniques of concern in metric bitemark analysis, J Forensic Sci., 29 (1982) 633-638.
15. A. Sorup, Odontoskopie: ein Beitrag zur gerichtlichen Medizin vischer, Zahnheilk, 40 (1924) 385.
16. B.E. Humble, Identification by means of Teeth, British Dental Journal, 54 (1933) 528.
17. D.W. Franklin, D.J. Curtis, Bitemark Overlay Technique: Photocopy Technique, The Dental clinics of North America, Forensic Odontology, W.B. Saunders Company, Philadelphia, 2001, pp.395 – 397.
18. M.L. Bernstein, The Application of Photography in Forensic Dentistry, Dent Clin North Am, 27 (1983) 151.
19. D.K. Whittaker, D.G. McDonald, Bite Marks and Flesh, A Color Atlas of Forensic Dentistry, 4<sup>th</sup> edition, Wolfe Medical Publication, 1989, p.108.
20. H.F. Richard, The Dental Clinics of North America, Forensic Odontology, W.B.Saunders Company, Philadelphia, 2001, p.366.
21. D.J. Sweet, Bitemark evidence, In: C.M. Bowers, G.L. Bell, (Eds): Manual of Forensic Odontology, Colorado, ASFO, 1995.
22. D.R. Sheasby, D.G. MacDonald, A Forensic Classification of distortion in Human Bite Marks, Forensic Sci. Int., 12 (2001) 75-78.
23. R.K. Gorea, M. Jha, O.P. Jasuja, K. Vasudeva, A.D. Aggarwal, Marvelous Tools of Identification – Bite Marks, Medico-Legal Update, 5 (2005) 61-64.
24. F.D. Wright, J.C. Dailey, Human bite marks in forensic dentistry, Dent Clin North Am., 45 (2001) 365-397.