

Identification from Bite marks on Nakh (Pear)

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Abstract: Bite marks are the injuries or impressions visible on any surface when teeth come across a surface with a certain amount of force which is sufficient to alter the appearance of that surface. This force will differ from material to material. Less force is needed to leave a bite mark on cheese as compared to intact apple and still more force is needed to leave a bite mark on skin. Bite mark is important evidence, which a criminal may leave at the crime scene unintentionally. Though out of 32 teeth in adults and 20 teeth in children only limited number of teeth e.g. incisors and canines play a definite role in bite marks yet no two bite marks are identical in the absolute sense. This is due to the reason that bite marks show indefinite variations which help in identification of the person who have produced these bite marks. In many cases, several partially consumed leftovers may be available at the crime scenes. This may make available an excellent opportunity to the investigating officer. Bite marks may be present on a variety of eatables as cheese, fruits, bread and chocolates. Fruits may offer a tremendous opportunity to study the bite marks and identify the person who has left that bite mark over that fruit.

Keywords: Bite marks, identification, bite marks on fruits

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INTRODUCTION

The criminals leave bite marks at the crime scene. We can find the bite marks in a variety of the situations. Thieves going to a home to steal the things and find house is locked. They break open the locks and finish their job but feel hungry. They open the refrigerator and select a few things to eat. There is plenty to eat and they leave behind some eatables which may include fruits on which they have left their bite marks. When a person bites an object he usually will leave a dental pattern unique to that set of teeth depending on the consistency of the object.¹

Foodstuff as substrate for bite marks has been reported by many researchers.^{2,3,4,5} Fruit as a base for bite marks analysis have also been reported but these studies have been reported on apple.^{5,6,7}

It is essential for those involved in the investigation that bite marks should be recorded as early as possible as the changes take place rapidly in the appearance of bite marks, both in human tissue and in foodstuffs, because of the effects of time.⁸ Experimental studies on eatables have been reported where one could get good bite marks for comparison.⁹

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If the investigating officer knows about bite marks he will pick up these items which will help in the identification of the thieves otherwise these valuable evidences will go to the trash. In many cases, these may be the only clue that the criminal investigator is to depend upon to identify the perpetrator of the crime.⁹ The first such case in India to the best of our knowledge is where one of the suspects was identified by comparing the bite marks on the cheek of a female victim with the dentition of the suspects.¹⁰

In addition to these bite marks are also observed in sexual assault cases when bite marks may be present at breasts, cheeks, abdomen or inner side of thighs in rape cases and may be present on shoulders, back or buttocks in cases of sodomy.

MATERIAL AND METHOD

In this study 14 people volunteered and their informed consent was taken to participate in this research project. They were asked to bite on surface of Nakh with a force so that they could produce bite marks on that surface. These bite marks were photographed immediately with a digital camera (Cannon Power shot A70). Photographs were taken with inbuilt flash and without flash. Tripod stand was used in majority of the cases for taking photographs. While taking photographs, a five rupee coin and a rigid plastic scale were put in the field along with other bitten objects so that later on to get the life size photograph was not difficult. Later on when ABFO scale became available this was used instead of five rupee coin and the rigid plastic scale.

These photographs were made life size using AdobeTM Photoshop software. Steps for the setting of a photo in Photoshop 7 involved opening Photoshop 7

software. After going to file menu, opened the image from particular folder, where photographs were stored. In view menu, rulers were selected (short cut Control R). On the ruler, right button of the mouse was clicked for the change of scale in mm. On keyboard pressed simultaneously (control & +) till the better view of image was obtained. Picked zero pointer to the zero of scale in image. After going to image menu selected image size. This image is now X. Select new size to convert to life size image (while doing this always constrain promotion menu was checked). By this image was converted to life size (i.e. Y). Press simultaneously (control & -) till actual image was viewed. Crop command in image was used to cut the extra view. After going to file on tool bar, file was saved. For better quality inserted 12 (maximum) when saving option required choice for the JPEG options.

Prints were taken on the photographic papers. For Final Output at Photo Lab, Image was opened, and on Image menu Canvas size was selected, where Width 8" and Height 12" was selected, enter button was pressed, file was saved and software was closed.

Dental casts of the volunteers were made using best materials for this purpose. After choosing the right sized metallic dental plates, negatives were prepared with the alginate powder and positives were prepared with the dental stone powder as per the instructions on the packet of the manufacturer. Plaster of Paris and plastic moulds were used to make the bases of these casts. These dental casts were labelled giving them numbers.

Then from these casts transparent overlays were prepared. Hand drawn transparencies were prepared. Hand drawn transparencies were prepared from the casts using fine tipped sign pen.

Life size photographs were superimposed by transparent overlays and compared. The comparison of the bite marks was performed by studying dental arches, teeth and spaces between them along with individual characteristics of teeth to reach at the conclusions. When size of the arches and four or more teeth, their spacing with individual characteristics matched with the bite marks, result was considered as medically certain (virtual certainty). If size of the arches and three teeth, their spacing with individual characteristics matched with the bite marks, result was considered as probable (more likely than not). If size of the arches and less than three teeth, their spacing with individual characteristics matched with the bite marks, result was considered as possible. If there was a poor bite mark on the object left by the volunteer or photograph was not showing details of the bite mark result was considered as insufficient evidences. In case

of disproportion of size of teeth and spaces or arches, result was considered as exclusion. This was the most practical and simple way, considering the number of teeth involved in most of the bite marks remained 6-8 in this study. Medical certainty, probable, possible, insufficient and exclusion classification was selected from ABFO guidelines and standards of 1984 workshop of ABFO.¹¹ (http://www.geocities.com/gforensics/downloads_files.htm).

This study was done in the Department of Forensic Medicine, Government Medical College at Patiala and Department of Forensic Science, Punjabi University, Patiala.

OBSERVATIONS

This was an experimental study which was done on a fruit (Nakh - a variety of pear) in 14 cases.

Table 1

Results of comparison of bite marks produced by Maxillary teeth on Nakh

Result	Number of cases
Certain	3
Probable	4
Possible	7
Insufficient	0
Excluded	0
Total studied	14

Table 2

Results of comparison of bite marks produced by Mandibular teeth on Nakh by different methods

Result	Number of cases
Certain	7
Probable	4
Possible	2
Insufficient	1
Excluded	0
Total studied	14

Table 3

Results of comparison of bite marks produced on Nakh by mandibular and maxillary teeth

Results	Maxillary	Mandibular
Certain	3	7
Probable	4	4
Possible	7	2
Insufficient	0	1
Excluded	0	0

Medically certain results of comparison of bite marks impression produced by mandibular teeth were better (7 cases) than maxillary teeth by hand drawn overlays (3 cases).

Table 4

Results of medico legal significant cases by different methods of bite marks produced on Nakh

Bite mark	Number	%age
Maxillary	3	21.42
Mandibular	7	50

DISCUSSION

In 21.42% cases of maxillary impressions and in 50% of mandibular impressions we could link volunteer to the bite mark as medically certain where as in the study done by Gorea et al (2005) on the fruit contributory results were seen in 84% of cases¹. This difference is probably due to different fruits in that study. Water content being different in different fruits probably affects the appearance of bite marks. Certain fruits like Melons are particularly deceiving; the juices usually obscure the bite mark.²

It was observed generally in this study that if photography is not done correctly or if camera is of not of a good quality this can hamper the comparison process. This was also observed in another study where photography was responsible for non-contributory cases in 8% of cases.³

In the present study we have used hand drawn overlays and found it quite useful though James (1988) is of the opinion that currently very important issue in bite mark identification is the use and abuse of overlays—hand drawn or otherwise produced—of occlusal surfaces placed on top of photographs of a bite mark as evidence of the “consistency” of the two.⁴

In a survey done by Pretty (2003), he observed that transparent bitemark overlays are one of the more popular methods. 63% of the respondents (93% of ABFO Diplomates) stated that they used overlays routinely, 18% never used overlays and 20% used them occasionally. 18% of individuals reported that they used at least two of these techniques in tandem.⁵

Learnhead (1960) made the overlay by holding the acetate sheet over the material and drawing the details.⁶ These can also be made by tracing the incisal edges from life sized photographs of the incisal edges.¹⁶ Acetate overlay tracings are then compared with the patterned injury, usually by observing the bite injury as depicted

in a photograph viewed through the overlay.¹⁷

In our view hand drawn overlays have a lot of value as it is very simple method, requires very little instrumentation and is very easy and cheap and still gives good results. So in an economy like ours and other developing countries, it can prove very useful done with care.

Our results were based upon arch size, size a pattern of teeth. Rawson et al (1986) are also of the opinion that the comparison and analysis involves scoring bite mark for arch size, shape, and tooth positions with the arch. Studies showed a high degree of reliability among raters using this system and an ability distinguish varying degrees of match.¹⁸

CONCLUSIONS

Bite marks are important physical evidences, which may solve the crime, but regrettably the investigating office are not utilizing these and very valuable evidence lost permanently due to ignorance of the investigating officer. In foreign countries this evidence is being used commonly and we will have to develop this field by educating the investigating officers and researching and publishing Indian data so that it may become acceptable to courts.

Conflict of interest: none

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