Bite Marks: Normal or Abnormal?

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ABSTRACT

It is not easy for criminals to escape the long arm of the law. Usually a suspect leaves a clue in a crime scene. From a dentist perspective mostly it will be a bite marks. Bite mark is a pattern made by teeth on a substrate. By comparing the dental status and DNA analysis it is possible now to identify a criminal. Scientific approach always requires a proper observation, recording and analysing when inspecting a clue. When analysing a bite marks it is necessary to follow the same scientific approach.It becomes a need for a dentist to know the normal bite marks and its variation. Present article throws a light on these aspects and adds little bit on way of presenting it.

Key words: Bite marks, Variations, Scientific approach.

INTRODUCTION

One of the most commonly encountered crime scene investigations by a dentist is bite marks. Bite marks are not only seen in rape and abuse, it can be seen in homicide and robberies. ABFO defines bite-marks as "a pattern left in an object or tissue by the dental structures of an animal or human,".Whereas Mac Donald described it "as a mark caused by the teeth either alone or in combination with other mouth parts".[1-4]

Owing to its significance, it toasts a necessity for any dentist to acquire knowledge on bite marks and protocol. Females are more prone for bite marks than males. Females are commonly bitten in breast, arm and leg, while males are commonly bitten on hand, back and face. It is not to be forgotten that children are no exception with bite marks more commonly in their genitals[2]

Anatomical location and mobility of an organ is of great importance on investigation. Breast is a difficult area to be examined as it is a highly mobile area. Occasionally bite marks are also obtained from foods like chocolate, chewing gum, fruits and vegetables[3,4]

The main purpose of the article is to know the normal bite marks, with a note on how to record and its variations.

Classification of bite marks

Though there are various classificationsMac Donald system is commonly.

Mac Donald's classification[5]

1. Tooth Pressure Marks: Marks produced on tissues as a result of direct application of pressure by teeth. These are generally produced by the incisal or occlusal surfaces of teeth.

2.   Tongue Pressure Marks: When sufficient amount of tissue is taken into mouth, the tongue presses it against rigid areas.

3.   Tooth Scrape Marks: These are caused due to scraping of teeth across the bitten material. They are usually caused by anterior teeth and present as scratches or superficial abrasions

Ideal bite marks

An ideal human bite mark is doughnut shaped with two U shaped arches representing the maxillary&mandibular arches separated from one another at their base. The diameter of a bite mark injury usually varies between 25-40 mm in diameter. The size of an injury must fall within the known parameters from a pediatric through mixed & adult dentition.

At the centre of a bite mark injurythere is extra vascular bleeding with bruising, due to the pressure created by the biting teeth and by the negative pressure created by tongue and suction. Bruising changes colour over a period of time in a process of healing[3, 6-8]

Terminologies
Class Characteristics

In a bite mark first step is to confirm the class characteristic which helps us to identify its origin.According to the manual of ABFO a class characteristic is a feature, trait, or pattern that distinguishes a bite mark from other patterned injuries (e.g. the finding of four approximating linear or rectangular contusions is a class characteristic of human incisors). Their dimensions vary in size depending whether it is inflicted by maxillary or mandibular arch and corresponding to the dentition either it is a deciduous or a permanent[6-8]

Individual Characteristics

Dentition varies from person to person and hence it can serve a tool to identify an individual. It may be further distinguishedas arch &dentitionalcharecteristics.

Arch characteristics

Arch characteristic follows a pattern of tooth arrangement within the diameterof a bitemark (e.g. a combination of rotated teeth, buccal or lingual version, mesio-distal drifting, and horizontal alignment) that contribute to differentiation between individuals. The number, specificity and accurate reproduction of these arch characteristics contribute to the overall assessment in determining the degree of confidence that a particular suspect made the bitemark (e.g. rotation, buccal or lingual version, mesial or distal drifting, and horizontal alignment).

Dental characteristics

Dental characteristics are features or traits within the diameter of a bitemark that represent individual tooth variation. The number, specificity, and accurate reproduction of these dental characteristics (in combination with the arch characteristics) contribute to the overall assessment in determining the degree of confidence that a particular suspect made the bitemark (e.g., unusual wear pattern, notching, angulations, and fracture)[6-8]

Distinctive characteristics

This term may be variably defined rare or unusual. It can be explained as a variation from normal, unusual, infrequent and not one of a kind but serves to differentiate from rest of the others. It can also be defined as one that is highly specific, individualized having a lesser degree of specificity than unique.

Algorithm for bite mark analysis

Algorithm of a bite mark investigations are as follows:
1.   Photograph the lesion as noted above; always use a scale.
2.   Confirm the lesion is traumatic or not.
3.   Confirm the lesion is a bitemark (by analyzing the presence class characteristics).
4.   Confirm the lesion is a human bitemark (by analyzing the class characteristics).
5.   Analyze and try to minimize the distortions
6.   Analyze the variants and their effect on the quality of the bitemark.
7.   Analyze the presence of individual characteristics and their usefulness.
8.   Use all other techniques that can bring supplemental information about the perpetrator (saliva, DNA, impressions, etc)

It is to be noted that the investigation is to be shortened as early as possible on a viable tissue because there may either be healing with no evidence or a distortion at that site[9-12]

Variations from standard bite marks

Rarely a bitemark present all class characteristics with no variation or distortion. Any modification in a bitemark is referred to as distortion. There are of two types namely
1.   A Primary variation determined by actual bitemark event.
2.   A Secondary variation due to incorrect bitemark examination or recording.

Primary distortion

They are seen almost in every bitemark with a varying degree. They have two main components:
1.   Dynamic distortionthat occurs due to movements during biting. Dynamic distortion occurs mainly due to victim movements, biting force, tongue and lips use, victim's clothes, associated traumatic lesions. Examples of dynamic distortions are central ecchymosis, tongue thrusting, partial bite marks, faded bite marks, avulsive bite etc.
2.   Tissue distortion which is due to skin characteristics. It can be physiological, pathological or post traumatic characteristics. Acute inflammatory reaction, healed bite marks are some of the examples for tissue distortion[13-15]

Secondary distortion

As mentioned earlier secondary distortions are altering events that occur after biting. The alterations often are not permanent as they can be corrected by modifying evidence examination and/or recording.

Three main types of secondary distortion are frequently met in practice they are
1.   Time related distortion: usually bite marks are to be examined as soon as possible as they might change with time. Mechanisms associated with it are extensive bruising that can alterbitemark's shape and tissue scarring, in deep lesions, with subsequent contractions.
2.   Postural distortion: This type of distortion occurs due to recording the bite marks in a position different from the one it was made. In order to minimize it during recording the body should be in a position close to the biting position.
3.   Recording distortion:which is due to incorrect bitemark recording. The most frequent is photographic distortion but others are also possible such as impression distortion, histological distortion, etc[13-15]

Analysing a bite marks and deriving conclusion

The stepping stone of the analysis is to determine if the injury is a bitemark. The American Board of Forensic Odontology provides a range of conclusions to describe whether or not an injury is a bitemark. These are:
1.   Exclusion – The injury is not a bitemark.
2.   Possible bitemark – An injury showing a pattern that may or may not be caused by teeth, could be caused by other factors but biting cannot be ruled out.
3.   Probable bitemark – The pattern strongly suggests or supports origin from teeth but could conceivably be caused by something else.
4.   Definite bitemark – There is no reasonable doubt that teeth created the pattern.

Second stage of an analysis is to provide a statement on the forensic significance. If one or more suspect's dental casts are available, and the bitemark is suitable for analysis, then an overlay comparison can be conducted.Bite mark overlay can be obtained by hand tracing, photocopier, digital and radiographic methods. The overlays are then placed over the scaled 1:1 photographs of the bite injuries and a comparison is done. The obtained results may be as follows;
1.   Excluded – There are discrepancies between the bitemark and suspect's dentition that exclude the individual from making the mark.
2.   Inconclusive – There is insufficient forensic detail or evidence to draw any conclusion on the link between the suspect's dentition and the bitemark injury.
3.   Possible biter – Teeth like the suspect's could be expected to create a mark like the one examined but so could other dentitions.

4. Probable biter – Suspect most likely made the bite; most people in the population would not leave such a bite.
5. Reasonable medical certainty – Suspect is identified for all practical and reasonable purposes by the bitemark – any expert with similar training and experience, evaluating the same evidence, should come to the same conclusion of certainty.

Third stage of analysis would be the collection of saliva for DNA analysis. Sweet recommends 'double swabbed technique', where the first swab is taken by moistened bud with distilled water and the second being dry. It is thought that the wet swab rehydrates the salivary constituents, releasing more epithelial cells from the dried compost[6,9]

CONCLUSION

Observation, recording and analysing are the three main steps in bite mark investigation. Identifying the characteristics of the bite marks helps in narrowing down the list of suspects. Distortions always occurs while recording a bite marks, by identifying the type of distortion we can get a proper documentation. Analysing is an important segment, as the court always needs this to come a conclusion. These step wise procedure makes the bite marks as an important tool of identification in forensic odontology.

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