IDENTIFICATION AND SIGNIFICANCE OF BITE MARKS IN FORENSIC SCIENCE

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Abstract
A bite mark is a patterned injury in skin or a pattern in an object caused by the biting surfaces of human or animal teeth. Bite mark identification typically involves examining patterned injuries left on a victim or object at a crime scene, recognizing those injuries as bite marks, and comparing those marks with dental impressions from a person of interest. Bite marks are unique to an individual – such as distance and angles between teeth, missing teeth, fillings and dental work. This type of impression evidence can be left in the skin of a victim and also can be in food, chewing gum and other miscellaneous items such as pens and pencils. Bite mark analysis involves comparing bite marks on a victim or object to the dental patterns of a suspect to help with identification in criminal cases like assault, homicide, or child abuse. The forensic significance of bite marks comes from the unique and individual characteristics of a person's teeth, which can be a powerful alternative to fingerprints or DNA in some situations. The process includes detailed documentation through photography, taking impressions of the bite and comparing the evidence to the suspect's dental records.
Keywords: - *Bite mark, human or animal, identification, analysis, forensic significance.*

Introduction

Bite mark is defined as a mark caused by the teeth either alone or in combination with other parts of the mouth. It might be viewed as an identical representation of the arrangement and characteristics of dentition. Bite marks are either left on the victim, on the culprit or an inanimate object found at the crime location. The classification of Bite marks is discussed in detail in (Table 1).

Bite marks analysis is based on the principle that 'no two mouths are alike'. Bite marks are thus, considered as valuable alternative to fingerprinting and DNA identification in forensic examinations. A bite mark is a mark created by teeth either alone or in the combination with other oral structures. In other words, 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.

The common sites being the face, neck, arm, hand, finger, shoulder, nose, ear, breast, legs, buttocks, waist, and female genitals. In cases of sexual assault, face, lips, breasts, shoulder, neck, thigh, genitals and testicles are mostly involved. Bite mark impression can be left on skin, chewing gum, pencils, pens and may also be found on musical instruments, cigarettes, cigar, food material like cheese, fruit, potato, and chocolate etc.

Table: 1. Classification of Bite marks.

Cameron and Sims Classification	Agents:	Human
		Animal
	Materials:	Skin
		body tissue
		Food stuff
		Other materials
Mc Donald's Classification	Tooth pressure marks - caused by incisal edge/ occlusal surface of teeth	
	Tongue pressure marks - seen as impression of the palatal surface	
	Tooth scrape marks - may be scratches and abrasions that can indicate irregularities in the teeth such as incisal fractures, restorations or attrition	
	Complex marks - are a combination of all the above, occasionally complicated by multiple bites	
Websters classification	Type 1 – Food item fractures readily with limited depth of tooth penetration. E.g.: hard chocolate	
	Type 2 –Fracture of fragment of food item with considerable food penetration of teeth. E.g.: apple and firm fruits	
	Type 3 – Complete or near complete penetration of food item with slide marks. E.g.: cheese	

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. 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.

The present paper describes the classification, characteristics, identification and significance of bite mark injuries and analysis of the bite marks.

Factors Affecting Bite Marks in Skin:

1. The size and shape of bite-mark is affected by its location on the body, because certain areas of the body bend distorting the surface area of the skin due to high viscoelasticity.
2. Some marks are made through clothing. Hence clothing is considered a potential source of bite mark impressions and biological evidence from transferred saliva.
3. Loose skin/subcutaneous fat lead to a poor bite mark. Whereas areas of fibrous tissue or high muscle content bruise less easily and demonstrate good bite mark.

Characteristics of a Bite Mark:

The bite mark varies from case to case. First it is important to determine which teeth made the marks. The term 'characteristic', is a distinguishing feature, trait, or pattern within the mark. It is of two types, class characteristic & individual characteristic. Class characteristic is a feature, pattern, or trait which reflects a given group and is not related to a particular individual. The biting surfaces of teeth are related to their function like incising, tearing or grinding. Front teeth are the primary biting teeth in bite marks. The two upper central incisors are wide, lateral incisors are narrower and cuspids are cone shaped. The two lower centrals and two laterals are uniform in width and lower cuspids are cone shaped. The upper jaw is wider than the lower jaw. The characteristics of individual teeth are

1) Incisors: Rectangular shaped mark, sometimes with perforations at the incisal angle areas

2) Canines: Triangular markings with apex towards labial and base towards lingual

3) Premolars: Single or dual triangle with bases of triangles facing each other or coming together as diamond shaped

4) Molars: Rarely leave bite marks, usually quadrilateral markings.

Bite Mark Identification

It involves two steps, first the discovery and preservation of evidence and second involves evaluation, comparison and findings of the recovered evidence. In identification bite-marks, first it should be determined if the injury is a bite-mark and whether it is caused by human teeth. Consistency of marks with the time of the crime should be determined. To standardize the analysis of bite marks the American Board of Forensic Odontology (ABFO) established the following guidelines in 1986:

1) History: Thorough history of any dental treatment carried out after the suspected date of the bite mark should be taken.

2) Photography: Extra oral photographs including full face and profile views, intraoral should include frontal views, two lateral views and an occlusal view of each arch, a photograph of maximal mouth opening.

3) Extra-oral Examination: Soft tissue and hard tissue factors that may influence biting dynamics. Measurements of maximal opening and any deviations on opening or closing should be noted

4) Intraoral Examination: Examination of tongue and periodontal status like mobility of teeth. In case of recent marks, they should be swabbed for DNA from saliva left in the wound.

5) Impressions: Two impressions of each arch using materials that meet the American Dental Association (ADA) specifications. The occlusal relationship should be recorded.

6) Sample Bites: Sample of suspects bite in centric occlusion using wafer of base plate wax or silicone putty material. The sample is photographed immediately & used for future comparison

Conclusion

The identification of Bite marks carry a high Forensic value based on the characteristics of the bite marks that are similar to the defendant's. Such evidence is as conclusive as DNA and fingerprint evidence in Forensic sciences Bite mark identification is an important aspect of forensic dentistry that is invaluable in solving crimes and in identification of persons involved in criminal activities The field of bitemark science is quite new and potentially valuable with an increase in need for trained individuals who are experienced in the recognition, collection and analysis of this type of evidence

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