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Review of bite mark in child abuse cases

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Abstract
Bite mark injuries are not often unintentional and indicates genuine child abuse. In most cases, the person inflicting the bite mark is the person responsible for abusing the child. Bite marks in children represent child abuse until proven differently. Bite marks are identified by their shape and size. When necessary, serological techniques are available and may assist in identification. Bite marks in infants occur in body locations and under circumstances different from these of the preschooler, school age child, or adolescent. Bite marks tend to be punitive and are often a response to crying or soiling. As a result, bite marks may appear anywhere, but tend to be concentrated on the cheek, arm, shoulder, buttocks, or genitalia in infants. Usually there is other evidence of punishment as well, such as bruising, pinch marks, burns, etc. A time spectrum of bites may reflect repetitive abuse, with bite marks which are healed, healing, and fresh. Health professionals must be attentive to any and all signs of child maltreatment. Bite marks are one of several visual expressions of active child abuse. The efforts of forensic odontologists, in conjunction with recent technical advancements in bite mark analysis, support the uniqueness of the human dentition and have contributed to the conviction of numerous child abusers. Through recognition, proper documentation, and reporting dentists can help the forensic community use bite marks to solve cases of child maltreatment.

Keywords: bite mark, crime, evidence, forensic

Introduction

The bite marks is thought to have started with Sorup. In 1924, Sorup used transparent paper upon which 1 criminal justice system. Forensic dentists are biting edges of a suspect's dentition were rendered to compare with life size photographs 5 identify recovered human remains in addition to of a bite mark [1]. The earliest bite mark case documented by the U.S law is thought to be reported in 1870 [2]. Bites are currently the only physically abusive injury where we can potentially identify the perpetrator. This may be from the dental characteristics or additionally from salivary DNA [3]. Actually bite marks are a form of 'patterned injury', which means that the configuration is caused by a particular object. Sometimes bite marks are called as 'tool marks'. Bite mark may also be defined as a mark made by the teeth either alone or in combination with other mouthparts. Bite marks may be found in the living or the dead individuals, where the person may be a victim of the crime or the perpetrator of the crime. Bite marks may also be seen in the food substance or inanimate objects at the crime scene. Bite marks may be produced during assault, abuse of children or on adults associated with sex related crimes [4].

Human bitemarks are identified by their shape and size [5]. When necessary, serological techniques are available and may assist in identification. Frequently, there are sufficient dental similarities between the bitemark and the accused to exclude other suspects. With rare exception, identification is by exclusion rather than inclusion [5]. Although bitemarks rarely contain more features than those exhibited by the anterior teeth, the unique character of an individual's mouth as modified by race, age, nutrition, occupation, and dental treatment is reflected in the "tool marks [1].

The science of bite mark identification can be used to link a suspect to a crime. Bite mark analysis can elucidate the kind of violence and the elapsed time between its production and examination. It can show if the bite mark was produced intra vitam or post mortem and in case of several bite marks, identify the sequence of them [1]. Like fingerprints, the marks made by the human teeth can be a tool for identification. Although historically, dental identification predates finger printing, the use of bite mark analysis is just beginning to be recognised and procedures are in the process of development [8].

Classification of bite marks

a. Tooth pressure marks: These are caused by incisal edges of the anterior teeth. They are stable and subjected to minimal distortion.
b. Tongue pressure marks: Because of tongue pressure, impressions of the palatal surfaces of the teeth, cingulae or the palatal rugae may be produced. This causes distortion of the marks.
c. Tooth scrape marks: These are produced because of the irregularities in the teeth due to fractures, restorations etc.
d. Complex marks: These are a combination of the above types of marks. The shape depends on the amount of tissue taken into the mouth [9, 10].

Recognition of Bite mark: It is dependent on dynamics of bite mark, appearance, location and perpetrator.

a. Dynamics of bite mark: Beckstead [11] stated that a bite

mark "is the registration of tooth cutting edges on a substance caused by jaw closure." The duration of a bite mark is contingent upon the magnitude and duration of the bite, the resulting degree of injury, and the tissue involved. Marks left by teeth in the lower arch are more circumscribed while those of the upper arch are more diffuse. This disparity can be explained because maxillary teeth are used for holding while mandibular teeth transfer the biting force and are used for incising or cutting. Mark may be suck or thrust mark and the presence of either type of mark strongly suggests sexual abuse [5, 7].

b. Appearance: The typical bite mark is an oval or circular configuration of ecchymosis or bruising, which upon closer examination, may represent both individual teeth and arch form [12]. The specific injury configuration of bite marks in tissue usually is caused by the respective incisal or occlusal portions of the teeth involved. Incisors cause rectangular markings, while those left by canines usually are triangular. Premolar marks are either single or dual triangles or diamonds. Molars, due to their posterior placement in the arch, are seldom represented in bite marks, but when they are, they mirror the form of the specific occlusal surfaces involved. The infant or young child usually is spared this horrific degree of injury, since most bite marks inflicted upon them are due to retribution, punishment or sexual gratification [13].
c. Location of bite marks: Bite marks may be found on almost any surface of the body; specific sites are associated with specific forms of assault. The neck, breasts and shoulders are often bitten in a sexually motivated attack, while in child abuse cases, bites of the arms and the buttocks are common. Adolescent self-inflicted bites can be seen on the medial aspect of the arm [12].
d. Perpetrators: Bite marks on abused children are usually the result of uncontrollable anger by the perpetrator toward the child [13]. In infants, as previously mentioned, bite marks are more punitive in nature, a reaction to a specific behavior of the child. Bite marks in older children tend to be more reflective of physical assault or an outright attack[3]. It is important to be able to distinguish between human and animal bite marks when evaluating a child as a possible victim of abuse. Animal bites usually result in deep tissue penetration with accompanying tearing and lacerations. In comparison, human bite marks generally produce more superficial damage such as bruising or abrasions [13]. Dog bites, the animal bite found most often on children, are characterized by four puncture wounds in a V-shaped arch form, which is very different from the oval or elliptical shape of a human bite [14].

Recording of bite marks: The recording of bite marks should be done prior to removal of dead body from the scene of crime. This is because the tooth impression, redness, and bruising have a tendency to disappear very quickly in the cadaver and foodstuffs distort by loss of moisture and inappropriate temperature. In the living subject, bruises change over a period of days, pass off and lessen the mark or impression. The basic steps in the recording of bite marks are:

a. Photography: For recording the bite mark, photograph should be taken first, which does not affect any other recording like impression on models, and taking swabs etc.
b. Impression and models: After completion of the photography, impression of bite mark should be taken before shrinking to changes occur. The best way to record the details of suspect's dentition is to obtain a model of the teeth and directly compare it with the impression of the bite mark.
c. Collection of swabs: The human beings secrete 'ABO' antigens through their saliva during biting. Swabs should be taken from the bitten area, control area and oral cavity. The bitten area should be removed and preserved in 10-20% formalin solution. Before preservation of tissues, swabs should be taken.
d. UV illumination: Teeth bite marks which are not visible by naked eye examination may become visible when examined under ultraviolet light in a dark room, because, in a wound, the melanin pigment of the skin shifts to the periphery or margin of the wound, which makes the margins of the teeth bite marks prominent when UV light is focussed on the site of the bite. This technique will demonstrate invisible bite marks upto six months after infliction [15].

At present, forensic odontologists use advanced techniques to enhance and further validate accepted photographic procedures. These techniques have helped elevate the presentation of courtroom evidence to a new level and contributed to the demonstration of the uniqueness of an individual's bite. These include:

a. Scanning electron microscope
b. Videotape analysis
c. Advanced radiographic techniques including xeroradiology

4. Computerized, electronic image enhancement equipment [16].

Dental neglect: Dental neglect, as defined by the American Academy of Pediatric Dentistry [17], is "the willful failure of parent or guardian to seek and follow through with treatment necessary to ensure a level of oral health essential for adequate function and freedom from pain and infection." Dental caries, periodontal diseases, and other oral conditions, if left untreated, can lead to pain, infection, and loss of function. These undesirable outcomes can adversely affect learning, communication, nutrition, and other activities necessary for normal growth and development [17].

Failure to seek or obtain proper dental care may result from factors such as family isolation, lack of finances, parental ignorance, or lack of perceived value of oral health [18]. The point at which to consider a parent negligent and to begin intervention occurs after the parent has been properly alerted by a health care professional about the nature and extent of the child's condition, the specific treatment needed, and the mechanism of accessing that treatment [19].

The physician or dentist should be certain that the caregivers understand the explanation of the disease and its implications and, when barriers to the needed care exist, attempt to assist the families in finding financial aid, transportation, or public facilities for needed services. Parents should be reassured that appropriate analgesic and anesthetic procedures will be used to assure the child's comfort during dental procedures. If, despite these efforts the parents fail to obtain therapy, the case should be reported to appropriate child protective services [17, 19].

Conclusion

When a child has oral injuries or dental neglect is suspected, the child will benefit from the physician's consultation with a pediatric dentist or a dentist with formal training in forensic odontology. Common signs of abuse are burns or bruises in various stages of healing and object marks, which also may be present and alert us to investigate further. Protecting our children includes reporting and preventing child abuse and is the responsibility of all of society (parents, teachers, the courts, and health professionals). Bite marks must be recognized for what they truly are -- abuse. Through early detection and reporting and with the assistance of forensic odontologists, we can make a difference in the lives of many children.

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