Recognition of bite marks in child abuse cases

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Abstract

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. (Pediatr Dent 16:336–39, 1994)

Introduction

The manifestations of child maltreatment (abuse and neglect) take many forms and vary widely in degree of severity. Dorion[1] stated that child abuse should be listed among those human activities associated with bite-mark evidence. Almost 20% of all children requiring autopsies in New York City exhibit bite marks inflicted before death.[2] Many dentists have seen a child in the office and not recognized or not related observed bite marks with child abuse. This oversight may, in the future, cost the child dearly. This article attempts to educate health professionals about bite marks to increase the likelihood of proper recognition, interpretation, and documentation.

Overview of child maltreatment

The four types of child maltreatment include physical abuse, sexual abuse, emotional abuse, and neglect.[3] Physical abuse is defined as any nonaccidental injury or trauma to the body of a child by a parent, guardian, or sibling. It may be the result of a single episode or a generalized pattern of behavior. Sexual abuse describes sexual activity with or exploitation of a minor for the pleasure of someone else, usually by someone familiar to the child. Emotional abuse is a pattern of behavior that retards a child's development and self-esteem, including unreasonable demands, constant belittling or criticizing, as well as withholding love and guidance.[3] Neglect occurs when an adult knowingly allows a child to endure pain or suffering or fails to provide the basic prerequisites for proper maturation.[4]

For abuse to occur, three components are necessary — an individual, usually an adult, a susceptible child, and the environment necessary to provoke the abusive action. Bite marks, when viewed as manifestations of the physical or sexual abuse of a child, support this premise and may even help the practitioner to diagnose maltreatment at an early stage.

Bite mark recognition

Dynamics of bite marks

Beckstead[5] 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.[6,7] In addition to marks left by teeth, other tissue disturbances may be found at the injury site. A suck mark occurs when skin is drawn into the mouth in a forceful manner and held, resulting in a bruise or area of hemorrhage in the center of the bite mark. A thrust mark, which further compounds a suck mark, occurs when the tongue is pushed against the lingual aspect of the teeth with the skin located between the two.[5] The presence of either type of mark strongly suggests sexual abuse.

Appearance

Bite marks may take numerous shapes and forms, each dependent, to some degree, upon the circumstances or intent under which they were inflicted. Many times they are incorrectly diagnosed as mere bruises and dismissed as a normal happenstance of childhood.[8] 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. In some instances, an area of hemorrhage, representing a suck or thrust mark, may be found between the markings left by the teeth.[9]

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.[10]

Bite marks vary in severity from a bite that leaves only the outline of the teeth involved, with little or no bruising, to the complete avulsion of tissue. Portions of nose or ears, as well as fingers or toes, have been lost in more violent assault cases.[11] Fortunately, 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.[12]

Location

Due to the abuser's marked advantage of mobility and strength, the entire body of an infant or small child is susceptible to biting. It is reasonable to assume then that bite marks would be found randomly on the body of an abused child. Although sometimes this is the case, bite marks on an infant or young child are usually found on the cheeks, back, side, arms or buttocks.[13,14] They may range from a single occurrence to multiple bites over an extensive area of the body.[14]

When evaluating bite marks on children, it is important to remember that certain areas of the body are inaccessible for self-infliction, including the head, neck, back, and buttocks.[1,15] Bite marks found here are never accidental and should arouse a strong suspicion of abuse.[12] Rawson[11] stated that nearly two-thirds of all bites involving children are observed easily without having the child undress.

Perpetrators

Bite marks on abused children are usually the result of uncontrollable anger by the perpetrator toward the child.[10] 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.[12]

A very small number of people have the opportunity to bite a particular child. Evidence supports the belief that the person who inflicted the bite usually is responsible for the overall abuse of the child.[6,13] After determining that the bite is human, an evaluation of arch size — more specifically canine to canine width — may be helpful in determining whether the perpetrator is an adult or a child. If the canine to canine width of the bite mark is 3.0 cm or less, the bite was probably inflicted by a child.[12,16] After determining whether the perpetrator is an adult or child, other individual dental characteristics such as missing, rotated, or fractured teeth, abnormal wear patterns, dental restorations, and arch form represented in the bite mark can eliminate all but the guilty party.[6] One must not lose sight of the fact that children, be they siblings or playmates, also have been responsible for bites inflicted during play or as an act of jealousy.[14] In such assaults, bite marks are often located on the cheek of the victim.

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.[10] 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.[9,15]

Upon discovering a bite mark injury, one must always consider the possibility of self-infliction, either accidental or intentional. Sporting accidents and seizures often can result in accidental self-inflicted bite marks. Intentional self-inflicted bite marks may occur when a victim places or is forced to place a body part into his or her mouth during an assault or, simply, to unjustly incriminate another person.[1] Questioning the child and parent as to the cause of the injury, as well as reviewing the child's medical history, may help identify the cause.

Documentation and reporting

After recognizing an intentional human bite mark, the documentation and preservation of evidence is critical. Initially, as is customary with suspicion of all forms of child abuse, the child and parent should be interviewed separately as to the cause of the injury. If there is a discrepancy between the history given and the clinical findings or if the bite mark is located in an area unreachable by the child, further documentation should be performed.

The appearance of a bite mark will change with time as swelling subsides and tissue begins to repair itself. This is especially true in children because of their rapid healing capabilities.[17] On the other hand, characteristics of the bite may become more discernible as the inflammatory process diminishes.[15,18] Therefore, photographs to document the bite mark are critical and should be the next step in evidence collection. Black and white as well as color photographs should be taken, for each has a specific role in the presentation of courtroom evidence. A millimeter rule placed adjacent to the bite mark will allow future comparison with a suspect's dentition.[19] The plane of the film should be parallel to the injured surface and the millimeter rule to obtain the best possible photographic results. In cases where the bite has occurred on an extremely curved surface, it may be necessary to take separate photographs of each arch configuration.[15]

Finally, the affected area should be swabbed in a circular manner with a cotton applicator moistened with saline in the hope of detecting secretory antigens left by the saliva of the perpetrator. As more than 80% of the population are secretors, the presence of specific A, B, and O blood group antigens found in their saliva can aid in the investigation of a particular suspect.[19] A second or control swabbing should be done on an area of the child's skin away from the bite mark. Both swabs should then be placed in separate vials and sent to a serology laboratory for testing.

It is important that a dentist know his or her limitations concerning the gathering of accurate bite mark evidence. If proper documentation cannot be made due to a lack of equipment or sufficient experience, the child should be referred to a forensic odontologist. The importance of meticulous photography and serological testing from a medicolegal standpoint cannot be minimized.

If after evaluating all available evidence, strong suspicion of abuse remains, a report must be filed with the appropriate authorities, including the name, age, and address of the abused, the nature and extent of the child's injuries, the person or persons potentially responsible for the abuse, and any evidence of previous abuse.[20] A dental professional uncertain about whom to report to may call the National Child Abuse Hotline (1-800-422-4453).

All 50 states have laws granting immunity from prosecution to voluntary reporters of child maltreatment acting in good faith. In most states, health professionals are legally required to report abuse or neglect. Failure to do so can result in a lawsuit against that individual for negligence with substantial fines.[21]

Keep in mind that the function of reporting is twofold: first and foremost, to protect the child from any further abuse and second, to assist the family in obtaining professional help to correct their abusive habits and minimize the chances of reoccurrence.

Techniques of comparison and their legal implications

A study by Rawson[22] employing a mathematical evaluation of a general population illustrates the uniqueness of the human dentition. The results of an investigation comparing the bite mark patterns of identical twins by Sognnaes[23] further validates this view. Bite mark evidence has been important in the conviction of a number of suspects charged with child abuse. Such evidence indicates that the suspect was with the victim at or around the time of the crime (opportunity) and that the suspect's actions were both aggressive and violent in nature (intent).[9,24]

Although bite mark analysis had been accepted widely by the courts, the American Board of Forensic Odontology (ABFO) realized the need to standardize the collection of bite mark evidence and, in 1984, published its *Guidelines for Bite Mark Analysis*.[24] The publication and subsequent use of these guidelines by those involved in forensic dentistry have enhanced both the acceptance and effectiveness of bite mark evidence.

The most influential case to date was that of Ted Bundy, where a single bite mark on the buttocks of one of his victims was used as evidence to gain his conviction. Bite mark evidence has become so effectual that today many defendants, when informed of the respective bite mark evidence against them, either plead guilty or agree to accept a lesser charge, thus forgoing a trial.[2]

The ABFO did not dictate specific methods of bite mark analysis within its guidelines, thus allowing individual investigators the freedom to use whatever approach they preferred. Prior to today's sophisticated technology, a popular method for bite mark comparison was the transparent overlay technique, which compares tracings of the bite marks taken from photographs of the affected area with those of the biting surfaces of the suspect. In this way, individuals could be either included or excluded as possible suspects.[5] The use of a wax (Aluwax — Aluwax Dental Products Co, Grand Rapids, MI) bite to replicate the incisal and occlusal surfaces of a suspect's dentition in conjunction with dental casts and photographs also has been successful.[10]

West et al.[25] proposed using human skin as a template for reproducing and comparing bite marks. They believed that the substrate used for comparison should closely resemble the tissue bitten with respect to elasticity and compressibility and questioned whether nonelastic materials, such as dental waxes or Styrofoam, being relatively flat in form, could duplicate the bite patterns found on skin, which is usually curved. The use of human skin (either that of the victim or a physically similar volunteer) as a template in conjunction with the dental models of a suspect's teeth may allow for a more accurate duplication of a bite mark injury, as well as enable the investigator to form a better mental image of how the injury actually occurred.[25] Clinicians need to recognize that applying this technique to an abused child requires careful consideration to avoid additional psychological trauma.

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:[5,18]

1. Scanning electron microscope
2. Videotape analysis
3. Advanced radiographic techniques including xeroradiology
4. Computerized, electronic image enhancement equipment.

Summary

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. As Fontana[26] stated "when they fail, we all fail, and children suffer." 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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