

Identifying human bite marks in children

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Abstract

Human bite marks in children are relatively common but are either not recognized as such or, when suspected, not subjected to rigorous forensic assessment. When a human bite mark on a child is identified, the explanation generally given is that it was either self-inflicted or the result of being bitten by another child. Adjudication on whether it is a child or adult bite mark must not be attempted, as there is insufficient evidence to determine this by inspection. However, the bite may show sufficient, unique dental characteristics to identify a perpetrator. Thus, it is vital that a forensic odontologist is involved from the outset. This paper describes the characteristics of human bite marks and emphasises the key role of forensic odontology in possible perpetrator identification.

Keywords bite injuries; bite marks; bite wounds; human bite marks

Introduction

Bites are a relatively common injury in children. Approximately 1 in 600 children present to unscheduled care settings having been bitten by humans. A bite mark might also be encountered during a scheduled clinical examination for another reason. The explanation most commonly given is that the bite mark is self-inflicted or the result of being bitten by another child. Whenever present they always indicate inflicted injury. Abusive bites are unique as currently they are the only physical injury that has the potential for identifying (or excluding) a specific perpetrator. This can be done from comparison of the dental characteristics of the bite mark or, if recently inflicted, from obtaining salivary DNA.

Without the benefit of a history many human bites are not initially recognised as bite marks and are interpreted as bruises. It is essential that paediatricians are familiar with the characteristic marks of bites and recognise them as such. In a thorough systematic review of the literature scanning more than 50 years, Kemp and co-workers could only find 5 case studies that confirmed abusive bites to a child. All highlighted the general characteristics of a human bite mark, namely a 2–5 cm oval or circular mark made up of 2 opposing concave arcs, with or without associated ecchymosis. Any such annular mark should

be treated as suspicious for a human bite mark and a forensic odontologist should be involved in the investigation early.

This paper will discuss the characteristics of human bite marks in children, the role of the forensic odontologist in identification of human bite marks and the importance of obtaining accurate and high quality photographic images of the residual mark to assist in perpetrator identification. Bite mark analysis will not be described in any detail as it is an ever-changing discipline and remains within the province of the forensic odontologist.

Characteristics of a human bite mark

A human bite mark classically has the appearance of two opposing arcs caused by crushing pressure from the incisors, canines and premolars and lip and tongue compression (causing bruising), cutting from the biting edges of the teeth (causing lacerations) and dragging of the teeth (causing scrapes or abrasions). In the centre of the bite mark, there may be petechial haemorrhage due to negative pressure created by the tongue and suction. The opposing arcs represent the maxillary (upper) and mandibular (lower) arches separated from one another at their base. This appearance is illustrated in [Figure 1](#). The diameter of the bite mark injury varies considerably but is usually between 25 and 40 mm.

Individual arch and teeth characteristics provide a unique human dentition to assist the forensic odontologist. The upper jaw is usually wider than the lower jaw. The bite mark characteristics help to determine which marks were made from maxillary teeth and from the mandibular teeth: for example, the maxillary central incisors and lateral incisors leave rectangular marks of which the centrals are wider than the laterals whereas the mandibular central incisors and lateral incisors produce rectangular marks of almost equal width. If the upper teeth can be distinguished from the lower teeth in this way, the position of the perpetrator with respect to the victim can be assessed.

A child's bite mark will show the uniform spacing of deciduous teeth compared with overlapping, rotated and displaced teeth of an adult's dentition. Each tooth will also have its own individual characteristics caused by attrition, damage and restoration. However, these unique patterns may not always be present, making perpetrator identification more difficult.

The bite mark is usually clearest in the early stages, becoming more blurred as it heals. Sometimes the mark becomes clearer after a few hours or days as general inflammation disappears and the colour of the lesion changes.

Not every tooth will leave a mark; the perpetrator may have a missing or shortened tooth or clothing may prevent the tooth/teeth from contacting the skin, leaving gaps between the marks. When the teeth of only one arch contact the skin during biting, only one arc of the bite mark will be seen. If the bite mark is on a limb, its detail and shape will depend on the position of the limb and whether it is moving when bitten ([Figure 2](#)).

Animal bites

The arch and teeth characteristics described above distinguish a human bite mark from animal bites. Animal bites from dogs, cats and rodents are far more common than human bites and usually result in tearing rather than compression of the flesh.

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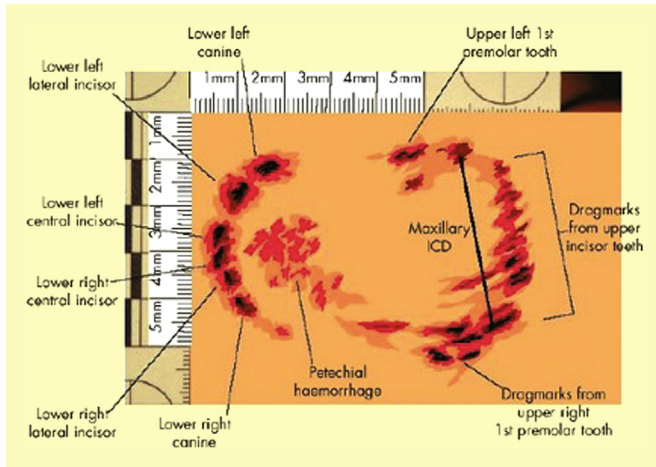


Figure 1 Characteristics of a human bite mark (reproduced with kind permission of Archives of Disease in Childhood).

Domestic dogs have four prominent canine teeth that are considerably longer than the incisor teeth. A dog bite mark consists of opposing pairs of triangular or rounded puncture wounds from the canine teeth (Figure 3). In addition, dog upper and lower dental arches are V-shaped.

Other marks that mimic human bite marks

Other patterned bruises such as that from a belt buckle (Figure 4) or shoe print (Figure 5), burns or dermatological lesions may cause confusion.

Assessment of the bite mark

Whenever the possibility of a human bite marks arises, advice must be sought from a forensic odontologist to determine whether the lesion is a human bite mark and, if so, whether it is from a child or adult. In the UK, this can be done through the British Association for Forensic Odontology website (see Further reading). If the bite mark has sufficient detail and is not too distorted the forensic odontologist will attempt to identify the perpetrator. This is a highly complex process and is dependent as



Figure 2 Bite marks on a limb.

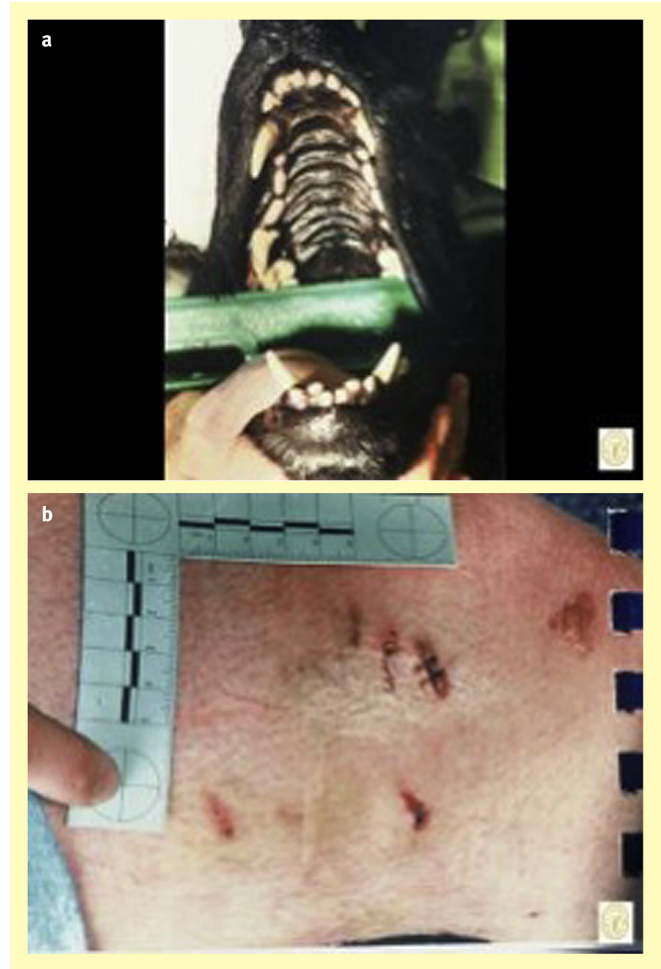


Figure 3 (a) and (b): Dog bite marks.

much on the *quality of photographic evidence* as on the skill and experience of the odontologist.

DNA extraction

DNA can be extracted from the saliva deposited onto the skin of the victim at the time the bite is inflicted. This should only be attempted when the victim presents within hours of the bite being inflicted and has not washed the area as salivary DNA degrades rapidly. This situation might arise in a case of acute sexual assault. The DNA is collected using Sweet's double swab technique (Box 1). Reference DNA from the victim is sampled using a buccal swab or blood.

All the swabs and samples are exhibits and must be appropriately marked with a reference, date, time and place that they were taken, by whom and signed. In such cases, a Police Officer and Forensic Medical Examiner in attendance will advise on technique and they will submit the samples to the appropriate laboratory.

Photography

The ability of the forensic odontologist to determine whether a child or adult has inflicted a bite and to undertake comparative analysis of potential perpetrators is highly dependent on accurate documentation of the bite mark. Digital images have now

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