

Anatomical Location of Bitemarks and Associated Findings in 101 Cases from the United States

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ABSTRACT: The purpose of this paper is to update and confirm previous studies that examined the anatomical location of human bitemarks. This information is useful to forensic odontologists and pathologists, physicians, and coroners who must be familiar with the most likely locations of bitemarks. The data are also useful for those involved in bitemark research.

Using the legal database "Lexis," 101 bitemark cases were identified from the United States Courts of Appeal. Cases were included in the study if they provided details concerning the bitemark, such as anatomical location, number of injuries, and information concerning the victim. Information on 148 bites was collated. These data are presented in tabular and graphical form to allow comparisons between males and females, victims and perpetrators, adults and children, and the crime types associated with human bites.

KEYWORDS: forensic science, bitemarks, distribution, legal

In 1983, Vale and Noguchi (1) published a paper describing the anatomical location of 164 bitemarks in a series of 67 cases. The current study aims to update these findings 16 years after the original study and add additional information to the demographics of bite injuries as part of the vigorous scientific method to which forensic scientist must subscribe. Familiarity with the location of bitemarks is pertinent information to all those that deal with the victims of violent crimes, and those conducting research into the techniques and methods used to analyze this evidence. Forensic odontologists and pathologists must carefully search the bodies of deceased victims and emergency room physicians must examine living victims to find such marks. A knowledge of the locations where bitemarks are most commonly found will assist this process.

Vale and Noguchi (1) describe hospital-based studies that examined bite location (2–4). The hospital data indicated that the upper extremities (especially hands) were most commonly bitten, which further studies have confirmed (5). This finding was contrary to the data available from coroner's cases as described by Harvey (6). Harvey found a higher percentage of bites to the breasts (31%) and a smaller percentage to the extremities (13%) in a series of 74 bitemarks.

¹ Graduate student, Faculty of Graduate Studies, University of British Columbia, Vancouver, B.C., Canada V6T 1Z4.

² Director, Bureau of Legal Dentistry, University of British Columbia, Vancouver, B.C., Canada V6T 1Z4.

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Methodology

The Lexis legal database was searched using the Freestyle™ search engine to obtain information regarding bitemarks from the Library of U.S. Appeals (Mega). The following keywords were used in the search: bite, mark, odontologist, and forensic. The case limit was set to 300. From these, 101 court cases that included specific details of a bite injury were selected. The cases spanned the time period 1972–1999. Descriptions of the bite varied; some included exhaustive details of the injury while others simply stated that a bitemark was found. This variation is reflected in the numerical data, which varies for some descriptors. In each case, details of the type of crime involved, based upon the appellants' charges, were included.

The total number of bitemarks included in the study was 148. Four bites were found on non-human substrates (apple, cheese, paper towel, and sandwich). These bites on objects were included in the study to demonstrate the occurrence and relative importance of bites on inanimate objects.

The number of actual bitemarks described in the cases was entered whenever these data were available. When the case described "multiple bites" with no other information about the actual number, a conservative sample of two bitemarks was entered.

Results

Figure 1 shows the anatomical distribution of all the bites in this study with no control for sex, age or other variable. The anatomical locations are described as found in the Lexis database. Figure 2 shows the same data grouped according to the locations described by Harvey (6). Table 1 shows the results of the current study compared to those of Vale and Noguchi and Harvey.

More than one bitemark was present in 48% of all the bite cases studied. Bitemarks were found on adults in 81.3% of the cases and on children under 18 years-of-age in 16.7% of cases. Bitemarks were associated with the following types of crimes: murder, including attempted murder (53.9%), rape (20.8%), sexual assault (9.7%), child abuse (9.7%), burglary (3.3%), and kidnapping (2.6%).

Discussion

Vale and Noguchi describe a discrepancy between their results and those of Harvey and a similarity with respect to the bitemarks from hospital cases in which bites to the extremities were more common than bites to the breasts or other sites. Results of the current study demonstrate that bitemarks on the breasts are the most frequent, representing a total of 31.3% (see Table 1). This result is similar to that of Harvey (32.4%). Differences between hospital and forensic cases can be explained by the severity of the bite,

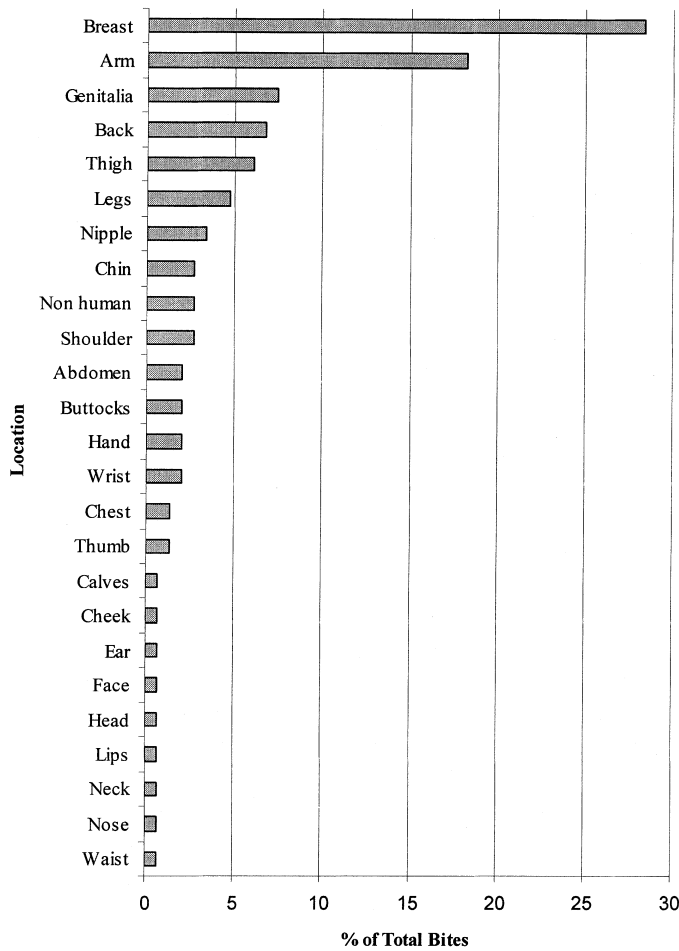


FIG. 1—Anatomical location of 148 bitemarks, including bites in non-human substrates.

the infection potential (e.g., bites to the hand are the most likely to have an infective sequel) and the circumstances under which the bite occurred (e.g., embarrassing or legal ramifications may prevent reporting).

It is important to realize that the results dealing with the type of crime associated with bitemarks may be biased due to the research strategy employed. By using cases from the U.S. Courts of Appeal, this study examined some of the most serious cases in the U.S. legal system. Many “lesser” crimes involving biting behavior may have been resolved by plea or simply were not appealed and they

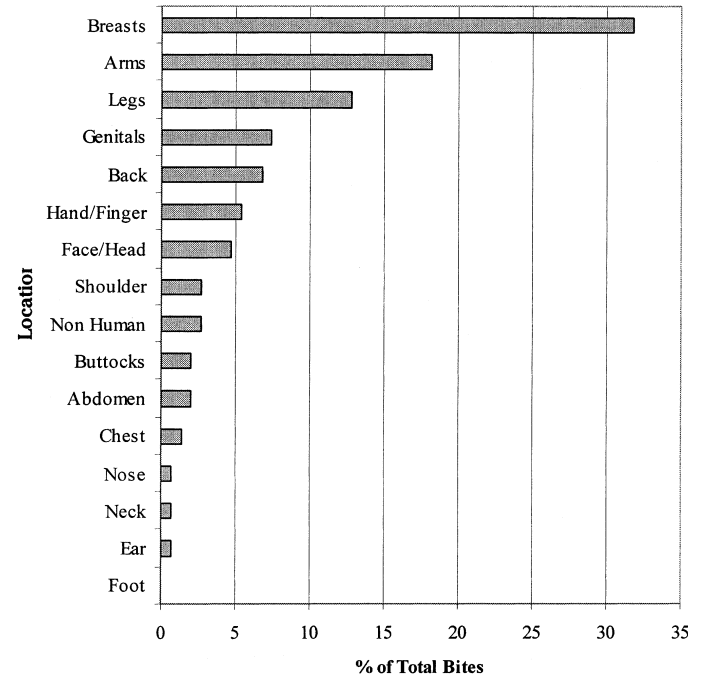


FIG. 2—Anatomical distribution of 148 bitemarks using the Harvey classification system.

NOTE: Four “non-human” bites are included in this table, they represent human bites in foodstuffs or similar substrates.

TABLE 1—Current study compared to Vale and Noguchi and Harvey.

Anatomical Location	Vale and Noguchi		Harvey		Pretty and Sweet	
	Number of Bitemarks	Percent of 164 Marks	Number of Bitemarks	Percent of 71 Marks	Number of Bitemarks	Percent of 144 Marks
Abdomen	12	7.3	10	14.1	3	2.1
Arms	32	19.5	5	7.0	27	18.8
Back	20	12.2	0	0.0	10	6.9
Breasts	17	10.4	23	32.4	45	31.3
Buttocks	8	4.9	3	4.2	3	2.1
Chest	7	4.3	0	0.0	4	2.7
Ears	1	0.6	1	1.4	1	0.7
Face/Head	13	7.9	12	16.9	7	4.9
Feet	2	1.2	0	0.0	0	0.0
Genitalia	9	5.5	3	4.2	11	7.6
Hand/Fingers	4	2.4	5	7.0	8	5.5
Legs	23	14.0	1	1.4	19	13.1
Neck	5	3.0	1	1.4	1	0.7
Nose	3	1.8	1	1.4	1	0.7
Shoulder	8	4.9	6	8.4	4	2.7
	164		71		144	

are not included in these data. It is interesting to note that the results of this study when interpreted by crime type do not differ significantly from those of Vale and Noguchi, so this bias may have little effect.

Male Victims and Perpetrators

It is not uncommon for a victim of a crime to bite their attacker in self-defense in which case a bitemark can be discovered on the body of a suspect in the crime. Results indicate that 17% of bitemarks are found on males, of which 52% were appellants in the criminal trials. Therefore, well-defined bitemarks may provide a useful link between the victim and the suspect. It is recommended that suspects always be examined for such injuries, especially if a living victim describes biting the attacker.

It was discovered that 28% of the male victims were children, all of whom had suffered child abuse. All the male children had suffered bites to the genitalia. Adult victims (20% of the total number of males) suffered bites to the arm and back, usually in the case of a murder or physical assault. Male perpetrators were most often bitten on the hand, arm, and shoulders. These findings are similar to those of Vale and Noguchi in which the extremities were the most common sites bitten. Table 2 provides details of the distribution of bites on the adult victims.

Female Victims and Suspects

Bitemarks were found on females in 83% of the cases. The subjects were less than 18 years-of-age in 7.5% of the cases. None of the female subjects were appellants in the court cases. Adult female victims were bitten predominately on the breasts (40%), arms and legs (27.4%), face and neck (13%), and genitalia (6%). Results indicate that bites are common in the following types of crimes against women: rape, sexual assault, and homicide. Female children were bitten at almost all locations, including the face (21%), legs (17%), arms (17%), and buttocks (12%).

Combinations of Bitemarks

Multiple bitemarks were often found in the same anatomical location (e.g. five bites on the left breast). Vale and Noguchi noted that many cases had multiple bites to different anatomical locations, but they found too few cases with consistent locations for analysis. Results of the current study indicate that over 71% of the 69 cases involved bites on the breast in combination with other lo-

TABLE 2—Anatomical location of bitemarks on adult males versus adult females.

Anatomical Location	Females (%)	Male Perpetrators (%)	Male Victims (%)
Abdomen	2.8	0	0
Arms	13	36.4	27.2
Back	7.5	0	9.1
Breast	40	0	0
Thigh	5.6	0	0
Face or Head	6.6	0	0
Foot	0	0	0
Genitals	6.6	0	0
Hands/Fingers	3.8	18.2	0
Legs	7.5	0	0
Neck	6.6	0	0
Shoulder	0	0	9.1
	100	100	

cations, including the genitalia (29%), neck (23%), and face and head (12%). Although these data are also insufficient for a determination of the most likely location of multiple bites, they do highlight the need for extreme vigilance. When one bitemark has been found as it is highly probable that more bites may be found elsewhere on the victim.

Conclusions

The results of this study demonstrate that human bitemarks can be found at almost every anatomical location, although there is clearly a bias toward certain areas. The crime type, age and sex of the subject impacts on the likely anatomical location of a bite injury. Unfortunately, there is insufficient data to enable an analysis of the impact of crime type on bite location. The issue is further complicated by the fact that many of the appellants were charged with multiple offenses and it is difficult to establish during which specific crime the bitemark was inflicted. Crimes commonly associated with biting are homicide, rape, sexual assault, robbery, assault, and child abuse.

Females are four times more likely to be bitten than males, and the bites are concentrated on the breasts, arms, and legs in descending order of frequency. Female children may suffer a multitude of bites to many body locations, but primarily to the face, legs, and arms. Males are most frequently bitten on the arms, back, and hands. A significant proportion of male bitemark victims are themselves the perpetrators of a violent crime. This study found that male children were exclusively bitten in the genital area, although it is important to note that male victims of child abuse can be bitten in different locations (7,8). It is common to find more than one bitemark on a victim, often in a different anatomical location from the first. These results are in broad agreement with earlier studies.

This study has shown the value of the Lexis legal database to obtain data for forensic study and, in particular, bitemark evidence. This system provides data for the U.S., Canada, the United Kingdom, and other Commonwealth countries. Despite the fact that some bias is introduced by using such data sets, namely that the appeals system typically only considers the most serious cases and those in which the basis for an appeal has been established, the use of a library system for bitemark research has many advantages. It is fast, accurate, detailed, and easy to access.

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Additional information and reprint requests:

Dr. David Sweet
Bureau of Legal Dentistry
146-2355 East Mall
Vancouver, BC
Canada
V6T 1Z4