*J Forensic Sci*, Mar. 2003, Vol. 48, No. 2
Paper ID JFS2002285_482
Available online at: www.astm.org

## TECHNICAL NOTE

*Anne H. McNamee,*[1] *D.D.S and David Sweet*[2]*, D.M.D., Ph.D.*

# Adherence of Forensic Odontologists to the ABFO Guidelines for Victim Evidence Collection

**ABSTRACT:** Certifying boards for different professions have the duty to help establish standards and guidelines for methodologies routinely performed within the discipline. For forensic dentists, this responsibility is placed upon the American Board of Forensic Odontology (ABFO). The purpose of this study was to examine whether board certified and noncertified forensic odontologists adhere to the ABFO Guidelines outlined in the collection of victim bitemark evidence. A questionnaire was developed to assess the compliance and attitudes towards the typical evidence collected, the photographic documentation, and the handling of the bite site injury. The results indicate the majority of the respondents in both representative groups routinely follow the guidelines set forth by the ABFO. The lack of personally photographing the bite injury on a consistent basis is an area of concern for all examiners. The photographic evidence is an instrumental part of the investigation and often cannot be utilized due to improper procedures being followed. The film type utilized, bite site impression techniques, and excision of any tissue samples remain an individual choice and vary significantly among each forensic odontologist.

**KEYWORDS:** forensic science, forensic dentistry, bitemarks, guidelines, evidence collection

Bitemark evidence has continued to provoke controversy within the field of forensic dentistry. The differing views surrounding interpretation, methodologies, and admissibility are cornerstones of these arguments. The American Board of Forensic Odontology (ABFO) has made an effort to help bring credibility to the discipline by establishing a set of guidelines in the collection of bitemark evidence (1). These guidelines are advocated by the American Society of Forensic Odontology (ASFO) (2) as well as in the dental literature (3–7). Establishing a consensus of a standard protocol in collecting evidence aids in the unity and reliability of the profession. Board certified forensic odontologists who are Diplomates of the ABFO are required to understand and apply these practices routinely and explain any procedural deviation from the conventional guidelines (2).

The purpose of this study was to evaluate whether forensic odontologists adhere to the guidelines recommended by the ABFO in victim evidence collection. A previous study had examined the adherence in the collection of suspect evidence; however, the topic of victim evidence was not explored (3). Often, the victim evidence obtained is the key variable that directs how much detail can be examined within the investigation. Proper collection and documentation of this type of evidence will give support to the admissibility and conclusions of the examiner.

### The Guidelines

In 1994, the ABFO assembled a representative sample of forensic dental specialists to develop guidelines for bitemark case management. These included specific recommendations and were published in the ASFO Manual of Forensic Odontology (2). A summary of the guidelines for the collection of victim evidence in bitemark cases is shown in Fig. 1.

### Methods

A questionnaire was developed to solicit data from forensic odontologists regarding the standard protocol they follow during the collection of victim evidence. The survey included inquiries focusing upon the typical evidence collected, the photographic documentation of the bitemark, and the impression and/or excision of the bite site. Additionally, each subject was asked to report if they were a Diplomate of the ABFO and the average number of bitemark cases they are involved in per year. Forensic odontologists with Diplomate status are expected to act in accordance with the guidelines set forth in evidence collection. Non-Diplomates represent members of the ASFO who have not obtained voluntary certification through the ABFO. This study was carried out at the ASFO annual meeting, February 2002 during the AAFS annual meeting in Atlanta, GA.

### Results

A total of 34 questionnaires were correctly completed and returned. Those received included 8 responses from Diplomates and 26 responses from ASFO members. Table 1 shows the number of self-reported bitemark cases performed each year by the respondents. Figure 2 illustrates the percentage of respondents that collect the four types of evidence: photographs, saliva swabs, bite site impressions, and impressions of the victim's own teeth. Not all respondents reported collecting all of the types of evidence despite

[1] Masters Student, Faculty of Dentistry, Bureau of Legal Dentistry, University of British Columbia, Canada.
[2] Director, Bureau of Legal Dentistry, University of British Columbia, Canada.
Received 17 Aug. 2002; and in revised form 23 Sept. 2002; accepted 5 Oct. 2002; published 3 Feb. 2003.

- **Photography**
  Orientation and close up photographs should be obtained with and without the presence of a scale placed adjacent to the bite mark. The scale must be positioned within the same plane as the bite mark and should include a linear and circular reference to aid in eliminating possible distortion. The film resolution should be high quality with proper color balance. Serial photographs are recommended in living victims.
- **Salivary Swabbing**
  Saliva swabs should be collected in circumstances in which the bite site area has not been altered from the time when the bite was inflicted.
- **Impressions**
  Impressions of the bite site area should be taken when there is sufficient surface detail which may yield beneficial information. The material used must meet the American Dental Association specifications and suitable support should be included for proper support and reproducibility of the body site contour.
- **Tissue Samples**
  Tissue samples should be retained if it appears it may yield useful information.

FIG. 1—*ABFO guidelines for the collection of victim evidence.*

TABLE 1—*Comparison of the number of cases by ABFO Diplomates and non-Diplomates (n = 34).*

| | Average Number of Bitemark Cases Per Year | | | |
|---|---|---|---|---|
| | 0 to 2 | 2 to 5 | 6 to 10 | 11+ |
| Diplomate | 2 | 4 | 1 | 1 |
| Non-Diplomate | 13 | 11 | 2 | 0 |

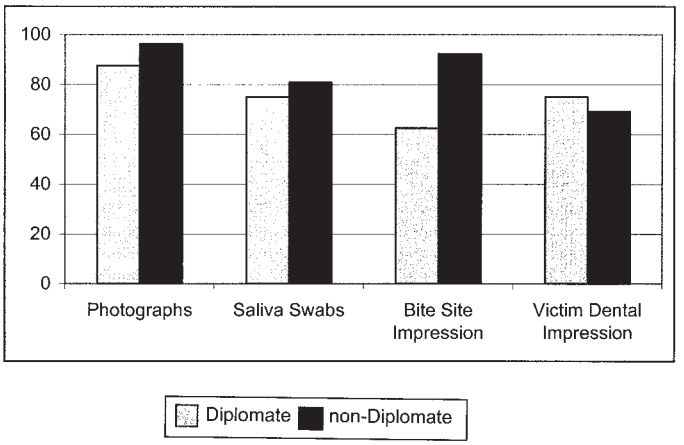


FIG. 2—*Percentages of the typical victim evidence collected as reported in the study questionnaire.*

this requirement in the ABFO Guidelines. Table 2 reports the types of photographic evidence collected and who collects it and Fig. 3 illustrates the type of film utilized. Table 3 shows the percentage of respondents who excise the bite site from deceased individuals.

## Discussion

### *Cases Completed*

The number of bitemark cases completed by non-Diplomates averaged less than five cases per year, with the majority of the respondents examining only one case or less. Diplomates' caseload averaged only slightly higher than non-Diplomates. A previous inquiry into the number of bitemark cases completed yielded similar results (3). It is worth noting that often odontologists are requested based upon their experience and expertise in bite cases. The number of cases one has examined, appearance as an expert witness and board status can strengthen professional credentials. With the relative small number of bitemark cases brought forth each year, there is a need to expose less experienced examiners to a greater frequency of case analyses. A recommendation is to request a col-

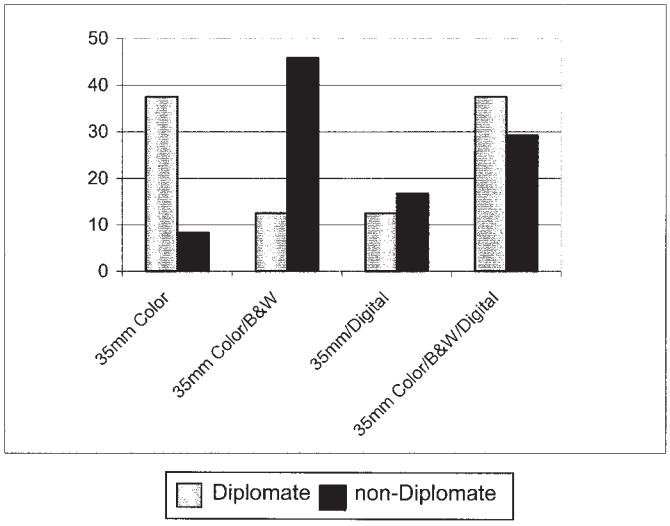


FIG. 3—*Typical film type utilized (%).*

TABLE 3—*Frequency of excising the bitemark site.*

| | Yes | Sometimes | No |
|---|---|---|---|
| Diplomate | 12.5% | 75% | 12.5% |
| Non-Diplomate | 0% | 45.8% | 54.2% |

TABLE 2—*Photographic evidence collected (%).*

| | Photographs Personally Taken? | | | Type of Photographs | | | |
|---|---|---|---|---|---|---|---|
| | Yes | Sometimes | No | Orientation | Close-up | UV | W/out Scale |
| Diplomate | 37.5 | 50 | 12.5 | 100 | 100 | 12.5 | 37.5 |
| Non-Diplomate | 50 | 43 | 7 | 100 | 100 | 12.5 | 12.5 |

league to review the evidence given for analysis and come up with separate conclusions. This second opinion could be reciprocated as a professional courtesy in future cases, to reinforce the conclusions and help aid in the experience of examiners to different bitemark cases.

*Evidence Collected*

All respondents indicated a general compliance in the collection of the standard victim evidence advocated in the ABFO guidelines. The photographic record of the bitemark had the highest observance rate with nearly 88% of Diplomates and 96% of non-Diplomates. These high values represent the extraordinary dependence upon and the need for proper photographic documentation. The collection of saliva swabs from the bite site is ranked lower for both Diplomates and non-Diplomates. This trend could be a result of the injury having been altered or tampered with prior to examination. A living victim often may have cleansed the area or treated the injury antiseptically to prevent infection. A deceased victim may have been exposed to different environmental elements, had the area affected by the postmortem investigation of the body or inaccessibility to DNA analysis.

The process that showed the greatest discrepancy between the two groups was obtaining an impression of the bitemark site. Non-Diplomates reported an observed rate of 92%; whereas Diplomates reported following the guidelines only 62% of the time. The evidentiary value of an impression of a bitemark in the absence of notable tooth indentations is low and the more experienced examiner may choose to exclude this step for efficiency sake. A non-Diplomate may opt to obtain all potentially valuable information and at a later date eliminate any non-probative evidence when it comes to their final analysis.

All respondents took the victim dental impressions on average 70% of the time. This is a frequently overlooked step that should be included in the analysis to rule out that the bite was self-inflicted. If the bitemark is located in an area that is not accessible to the victim, this step may be disregarded.

*Photography*

The importance of capturing the image of the bitemark is a critical factor in the analysis of the evidence. There are specific methods advocated in the dental literature for the production of forensic photographs (8–10). Each method stresses the importance of proper technique and orientation relating to the camera placement, a reference scale and the prevention of distortion. With such an emphasis placed on the precise technique required, it is interesting to note that only 37.5% of Diplomates and 50% of non-Diplomates are the individuals who routinely photograph the injury. When questioned as to whom would typically photograph the bitemark if not themself, the most common response was the police or the investigating agency followed by the medical examiner and other dentists. These individuals occasionally have not obtained the appropriate training involved in the capturing of forensic evidence on film; and consequently, may not record all the necessary elements required for proper analysis. Therefore, the authors recommend that additional photographs of the bite injury be taken if one has accessibility to the victim and/or the victim's consent. Although time may have elapsed since the initial photograph was taken, some elements may be captured that could aid in the interpretation and investigation.

All respondents take orientation and close up views. The presence of a reference scale is always included with 94% of the respondents stating the ABFO No. 2 scale as their standard measuring device. Surprisingly, few examiners additionally document the bite injury without the scale in place. This type of photograph is beneficial in that it can establish that no relevant areas of the bite or other evidence are concealed in the photographs where the reference scale is included. The use of UV light is routinely used by only a small percentage of both target groups. This factor may be due to the availability of the equipment necessary for this technique by many examiners. Additionally, all respondents typically take more than five photographs for each bitemark. This abundance of photographic evidence is paramount in that it allows the examiner numerous views and opportunities to capture the bite with varying lighting and focal distances.

With the advent of digital technology, the type of images used in the documentation was of interest to the authors. It was found that traditional 35 mm color film continues to be utilized. The use of black and white film was shown to be greater in the group of non-Diplomates and the use of digital film is becoming more common with almost 45% of all respondents reporting some use of digital cameras. As new analysis techniques focus more on the incorporation of computers, using a digital camera eliminates the need to scan the photographs into the computer. Another advantage of digital imaging is the availability to instantly preview the image. Most high-end digital cameras allow for the screening of each image as it is taken and direct integration into a computer-imaging program. This immediate feedback would assure the examiner that they have successfully obtained all views of the bite injury that are needed. The variability in the quality of digital cameras, however, may leave the examiner vulnerable to an inquiry regarding the accuracy of the photographic documentation. Therefore, as with any new technology introduced into the legal system, it is recommended to become familiar with the rules of evidence surrounding the admissibility of digital images in each local jurisdiction.

*Bite Site Impression*

Taking an impression of the bite site is recommended in the ABFO guidelines for those surfaces that may provide useful information. There are general recommendations given regarding the impression material and support needed to record accurately the anatomical area; however, there is no standard technique promoted. For those respondents who indicated they have taken impressions of the bite site, the technique they followed was described. All respondents specified that they used a vinyl polysiloxane (VPS) impression material, but the remainder of their methods varied significantly. The greatest number described using VPS with a Hexcelite® or Stone backing. All additional replies included using VPS with a variety of backings such as an acrylic ring, paperclip with stone, mesh wire and plaster and custom tray material. It is interesting to note that 12% of the respondents simply stated taking a VPS impression of the site without any backing. This does not adhere with the guidelines set forth which specifically suggests suitable support to replicate the body contour (2).

*Bite Site Excision*

The most controversial issue within the study was the topic surrounding the excision of the bitemark site in deceased victims. The guidelines vaguely state that retained tissue samples may be beneficial for future study. Possible uses could involve transillumination analysis, histological studies, or metric and pattern analysis. Several authors have developed techniques that are suitable for the excision and preservation of excised tissue (11,12). A further study examined the distortion of preserved skin and con-

cluded that there appears to be both contraction and expansion in different bitemark specimens (13). Despite these results, 87.5% of Diplomates and 45.8% of non-Diplomates stated that they occasionally excise the bite site. The main rationale for whether or not a bite is to be excised was the location of the bite on the victim. In addition, an equal number acknowledged the decision was not theirs to make. Rather, it is pre-determined by the medical examiner as to whether or not the excision was approved in each case. Finally, additional responses for not excising a bitemark indicated that there is no set protocol established and the procedure serves no purpose.

The techniques utilized in the excision of a bite site varied slightly. The most common response placed and secured an acrylic ring with cyanoacrylate and sutures to the bite site area. Other methods used a plastic ring with and without VPS backing, or suturing a metal ring.

## Conclusions

This study revealed that the majority of odontologists follow and adhere to the guidelines established by the certifying board in forensic odontology for the collection of victim evidence in bitemark cases. Since high quality photographic documentation cannot always be relied upon by the investigating agencies, the odontologist needs to be involved in the recording of the injury. The different types of film used was varied, with most respondents utilizing an additional medium to complement the standard 35 mm color film. The use of digital cameras appears to be gaining popularity and may continue to become more mainstream within the profession. The treatment of the bite site by different impression and excision techniques seem to be dictated largely by the personal preferences of the individual examiner. The lack of a standardized protocol in either area leads to variability within the methodologies. Further studies are needed to explore these issues.

*Acknowledgments*

The authors gratefully acknowledge Drs. Iain Pretty, Dave Hodges, and Susan Rivera for their assistance during this study. Dr. McNamee is supported by a research grant from the American Society of Forensic Odontology.

## References

1. American Board of Forensic Odontology, Inc. Guidelines for bitemark analysis. JADA 1986;112(3):383–6.
2. American Board of Forensic Odontology. ABFO guidelines and standards. In: Bowers CM, Bell GL, editors. Manual of Forensic Odontology, 3rd, ed. Colorado Springs, CO: American Society of Forensic Odontology, 1997.
3. Pretty IA, Sweet D. Adherence of forensic odontologists to the ABFO bitemark guidelines for suspect evidence collection. J Forensic Sci 2001;46(5):1152–8.
4. Rothwell BR. Bitemarks in forensic dentistry: a review of legal and scientific issues. JADA 1995;126:223–32.
5. Vale GL. Dentistry, bitemarks, and the investigation of crime. J Calif Dent Assoc 1996;24(5):29–34.
6. Sweet D, Pretty IA. A look at forensic dentistry—Part 2: Teeth as weapons of violence—identification of bitemark perpetrators. Brit Dent Journal 2001;190(8):415–8.
7. Wright FD, Dailey JC. Human bitemarks in forensic dentistry. Dent Clin of North Amer 2001;45(2):365–95.
8. Krauss TC. Photographic techniques of concern in metric bitemark analysis. J Forensic Sci 1984;29(2):633–8.
9. Wright FD. Photography in bitemark and patterned injury documentation—Part 1. J Forensic Sci 1998;43(4):877–80.
10. Hyzer WG, Krauss TC. The bitemark standard reference scale—ABFO No. 2. J Forensic Sci 1988;33(2):498–506.
11. Dorion R. Excision of bitemarks. In: Bowers CM, Bell GL, editors. Manual of Forensic Odontology, 3rd ed. Colorado Springs, CO: American Society of Forensic Odontology, 1997.
12. Sweet DJ, Bastien RB. Use of acrylonitrile-butadiene-styrene (ABS) plastic ring as a matrix in the recovery of bitemark evidence. J Forensic Sci 1991;36(5):1565–71.
13. Rothwell BR, Thien AV. Analysis of distortion in preserved bitemark skin. J Forensic Sci 2001;46(3):573–6.

Additional information and reprint requests:
Anne H. McNamee, DDS
Bureau of Legal Dentistry
University of British Columbia
146-2355 East Mall
Vancouver, BC, Canada V6T 1Z4
Phone (604) 822-8822
Fax (604) 822-8884
E-mail: boldlab@unixg.ubc.ca