

ABFO Bitemark Methodology Standards and Guidelines

Standards for Human Bitemark Analytical Methods

1. All Diplomates of the American Board of Forensic Odontology are responsible for being familiar with and utilizing appropriate analytical methods.
2. All evidence received or collected must be reviewed. The analyses performed and the results of those analyses must be included in the final report.
3. New analytical methods should be scientifically sound and verifiable. New analytical methods should be used in addition to existing accepted techniques listed in these guidelines.

ABFO Standards for "Bitemark Terminology"

1. Terms assuring unconditional identification of a perpetrator, or identification "without doubt", are not sanctioned as a final conclusions in an open population case.
2. Terms used in a manner different from the guidelines should be explained in the body of a report or in testimony.
3. All forensic odontologists certified by the American Board of Forensic Odontology are responsible for being familiar with the standards set forth in this document.

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Methods to Document Human Bitemark Evidence

Bitemark, Bite Mark, Bite-mark

The meaning of the terms is clear and there is no need for the ABFO to endorse a particular form.

1. Bite Site Evidence

General Considerations - The Forensic Odontologist is often not involved in the initial examination and collection of the bitemark evidence. This does not preclude the ability of the Forensic Odontologist to render a valid opinion. The methods listed below are not intended to be an all-encompassing list of documentation methods.

A. Orientation photographs should be taken prior to the collection of any bite mark evidence.

B. Saliva Swabs of Bite Site

Method - The double swab technique will maximize the possibility of recovering useful biological evidence from a bite mark site. The first sterile swab is moistened with sterile distilled water. Using medium pressure wash the surface of the bite site with the sterile moistened swab for 7–10 seconds. The dry sterile swab is immediately used with light pressure to collect the moisture left on the surface by the first swab. The two swabs must be air-dried at room temperature prior to submission to the laboratory, or inserted into a sterile container that allows air to circulate during storage.

Storage - The swabs should be submitted for analysis as soon as possible. They should be kept at room temperature if submitted within 4–6 hours, or refrigerated (not frozen) if stored longer than 6 hours.

C. Photographic Documentation of the Bite Site

The bite site should be photographed using digital photography. The photographic procedures should be performed by the forensic odontologist or under the odontologist's direction to encourage accurate and comprehensive documentation of the bite site.

Orientation and close-up photographs should be taken. Images recorded should be of high quality

Photographs of the patterned injury should be taken with and without an ABFO #2 photometric scale in place.

When the scale is used, it should be on the same plane as and adjacent to the patterned injury. The camera should be 90 degrees to the plane of the scale.

In the case involving a living person or a person recently deceased, it may be beneficial to obtain serial photographs of the bite mark over time.

Infrared, ultraviolet and alternate light photographs maybe taken when indicated in addition to conventional visible light photographs.

Video imaging may be used *in addition* to digital photography. D.

Impressions

Impressions should be taken of the surface of the bite mark when three-dimensional properties are present. The impression materials should meet American Dental Association specifications for intraoral use and should be identified by name in the report.

Suitable support should be provided for the impression material to accurately reproduce body contour.

E. Tissue Samples

In the deceased, the bite site may be excised and preserved using proper stabilization techniques prior to removal. Proper authorization should be obtained before excising any tissue.

2. Evidence Collection of Suspected Human Dentition

Prior to collecting evidence from suspected biters, the odontologist should ensure that appropriate search warrant, court order or legal consent has been obtained. A copy of these documents should be retained as part of the case record. The court document or consent should permit collection of the evidence listed below:

A. Dental Treatment Records

Whenever possible the dental records of the suspected biters should be obtained. B.

Photography

Images acquired should include:

Extraoral images Full face
Profile

Intraoral photographs with retractors and mirrors:

Anterior view in centric occlusion
Anterior view with incisal edges slightly opened , Anterior view with
mandible protruded
Anterior view demonstrating maximal open with scale in place
Lateral views, both left and right side
Occlusal view of each arch
Additional photographs that may provide other useful information.

If inanimate materials are used for test bites, the results should be preserved photographically.

Video imaging may be used to document the dentition *in addition* to digital photography.

C. Extraoral Examination

The extraoral examination should:

- Document significant soft and hard tissue features that may influence biting dynamics.
- Document temporomandibular joint function, noting any deviations in opening or closing.
- Document measurement of maximal opening of the mouth.
- Document the presence of facial scars, evidence of surgery, and the presence and nature of facial hair.
- Document facial asymmetries, muscle tone and balance.

D. Intraoral Examination:

The periodontal condition should be noted with particular reference to mobility of teeth.

Fractured and missing teeth should be documented.

Any intraoral anomaly should be documented, including tori, bifid tongue, as well as tongue or lip piercings.

E. Impressions

Whenever feasible, at least two impressions should be taken of each arch, using materials that meet American Dental Association specifications and are prepared according to the manufacturer's recommendations, using accepted dental impression techniques.

The interocclusal relationship should be recorded.

If removable prosthetics are noted, impressions should be taken with and without the prosthesis in place.

G. Sample Bites

Sample bites should be recorded using appropriate American Dental Association materials, such as Aluwax or Coprwax.

H. Study Casts

Master casts should be prepared and labeled using American Dental Association approved Type III stone prepared according to manufacturer's specifications, using accepted dental techniques. Other highly accurate resins may be used for model production.

Additional casts may be poured from the original impression and labeled to indicate each additional pour if the impression material used was polyvinylsiloxane and/or polyether American Dental Association approved materials. If the original impressions were taken in alginate or other similar materials, duplicate casts may be created from an impression of the master cast. Duplicate casts should be appropriately labeled and a record of which master cast was utilized to produce the duplicate.

Master casts should not be altered.

I. Saliva Samples

DNA samples should be collected from all suspected biters.

Human Bitemark Analysis Guidelines

Description of Bitemark

Case data should be documented. These data should include:

1. Identification Data (case number, agency, name of examiner(s), etc.)

2. Location of Bitemark

anatomical location or object bitten

surface contour: (e.g., flat, curved or irregular)

tissue characteristics

3. Injury features (size, shape, presence of abrasions, contusions, avulsions)

4. Other Information as indicated (e.g., three-dimensional characteristics, unusual conditions)

5. Bitemark Description

Identification and the orientation of the maxillary and/or mandibular teeth within the bitemark

Identification of the midline of the maxillary and/or the mandibular teeth marks

Identification of marks made by specific teeth

Identification of areas absent of a mark(s) within a dental arch forming the bitemark

Identification of features within a bitemark that may indicate rotations, translations, or other anomalies of specific teeth

Summary of the features that comprise the nature of the injury in relationship to the teeth that caused the injury

6. Analysis of the bitemark should be completed before any comparison(s) to information from suspected biter(s) is made.

Methods of Comparing Exemplars to Human Bitemarks

1. Overlays

Types of overlays

Computer generated

Images of casts printed on transparency film

Computer generated superimposition of casts over the bitemark

2. Test Bites (wax, Styrofoam, clay, skin, etc.)

3. Comparison Techniques

Exemplars of the dentition are compared to corresponding-sized photos of the bite pattern.

Dental casts to life-sized photographs, casts of the bite patterns, reproductions of the pattern when in inanimate objects, or resected tissue.

All comparisons should include incorporation of the incisal height

In cases where there is only one suspected biter, the use of a dental lineup is suggested. The ABFO supports a second opinion review from another Diplomate in bitemark cases

4. Other Methods Employed For Analysis

Transillumination of tissue

Computer enhancement and/or digitization of mark and/or teeth

Stereomicroscopy and/or macroscopy

Scanning Electron Microscopy Video

superimposition Histology

Dimensional

ABFO Bitemark Terminology Guidelines

Component Injuries Seen in Bitemarks

Abrasions (scrapes), contusions (bruises), lacerations (tears), ecchymosis, petechiae, avulsion, indentations (depressions), erythema (redness) and punctures may be seen in bitemarks.

A Characteristic

A *characteristic*, as applied to a bitemark, is a distinguishing feature, trait, or pattern within the mark. Characteristics are two types, *class characteristics* and *individual characteristics*.

Class characteristic: a feature, trait, or pattern that distinguishes a bitemark from other patterned injuries. For example, the finding of four approximating linear or rectangular contusions is a class characteristic of human incisors. Their dimensions vary in size depending upon what inflicted the injury: maxillary or mandibular teeth; and, whether primary or permanent teeth. Moreover, the overall size of the injury will vary depending on the contributor's arch dimension. Thus, a bitemark *class characteristic* identifies the group from which it originates: human, animal, fish, or other species.

Individual characteristic: a feature, trait, or pattern that represents an individual variation rather than an expected finding within a defined group. There are two types:

Arch characteristic: a pattern that represents tooth arrangement within a bitemark. For example, a combination of rotated teeth, buccal or lingual version, mesio-distal drifting, and horizontal alignment contribute to differentiation between individuals. The number, specificity, and accurate reproduction of these arch characteristics contribute to the overall assessment in determining the degree of confidence that a particular suspect made the bitemark (e.g., rotation, buccal or lingual version, mesial or distal drifting, horizontal alignment).

Dental characteristic is a feature or trait within a bitemark that represents an individual tooth variation. The number, specificity, and accurate reproduction of these dental characteristics in combination with the *arch characteristics* contribute to the overall assessment in determining the degree of confidence that a particular suspect made the bitemark (e.g., unusual wear pattern, notching, angulations, fracture).

Distinctive - This term is variably defined as either rare or unusual.

Variation from normal, unusual, infrequent.

Not one of a kind but serves to differentiate from most others. Highly specific, individualized.

Lesser degree of specificity than unique

Bitemark:

- A physical alteration in a medium caused by the contact of teeth.
- A representative pattern left in an object or tissue by the dental structures of an animal or human.

Describing the Human Bitemark

A circular or oval patterned injury consisting of two opposing (facing) symmetrical, U-shaped arches separated at their bases by open spaces. Following the periphery of the arches are a series of individual abrasions, contusions, and/or lacerations reflecting the size, shape, arrangement, and distribution of the class and individual characteristics of the contacting surfaces of the human dentition.

Variations:

1. Additional features:

Central Ecchymosis (central contusion). Linear Abrasions,
Contusions or Striations Double Bite - (bite within a bite)
Weave Patterns of interposed clothing.
Peripheral Ecchymosis

2. Partial Bitemarks

3. Indistinct/Faded Patterned Injury (e.g., fused or closed arches, solid ring pattern)

4. Multiple Bites.

5. Avulsive Bites.

Terms Indicating Degree of Confidence That an Injury is a Human Bitemark:

A. *Human Bitemark* – human teeth created the pattern.

- *Criteria:* the pattern demonstrates class and/or individual characteristics of human teeth.

B. *Not a Human Bitemark* – human teeth did not create the pattern.

- *Criteria:* the pattern does not demonstrate class and/or individual characteristics of human teeth.

C. *Inconclusive* – there is insufficient information to reach an opinion whether or not the pattern is a bitemark.

- *Criteria:* class and/or individual characteristics of human teeth are missing, incomplete, distorted, or otherwise insufficient in the pattern.

Terms Used to Relate a Questioned Dentition to a Bitemark:

A. *Excluded as Having Made the Bitemark*

- *Criteria:* the bitemark demonstrates class and/or individual characteristics that could not have been created by the dentition in question.

B. *Not Excluded as Having Made the Bitemark*

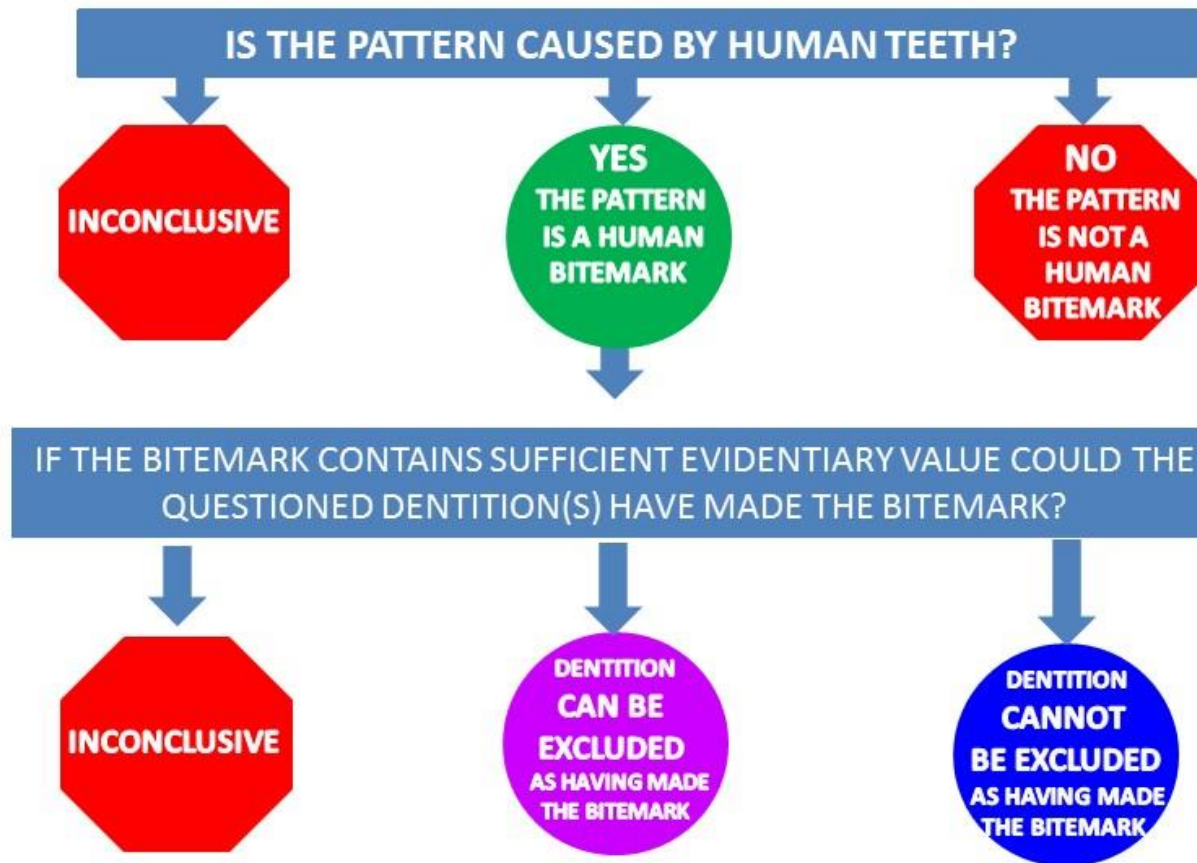
- *Criteria:* the bitemark demonstrates class and/or individual characteristics that could have been created by the dentition in question.

C. *Inconclusive*

- *Criteria:* although the analyst has concluded the pattern is a human bitemark, there is missing, incomplete, or otherwise insufficient information to form an opinion whether or not the dentition in question caused the bitemark.

ABFO Bitemark Case Review Guideline

A case review should be performed by a second ABFO Diplomate. The reviewer will not be required to provide a second opinion (but may do so if he/she wishes), but will provide an administrative review of the analysis that was done. This review should determine if the analysis and report adhered to the standards, guidelines, methodology and terminology of bitemark investigation as the required by these standards and guidelines.



ABFO Guidelines for Investigative and Final Bitemark Reports

The following ABFO Bitemark Report Writing Guidelines propose a format for written bitemark case reports. These guidelines are suggestions for the form and content of the report. Diplomates may be asked to provide preliminary or investigative reports. Those preliminary reports may follow the same general guidelines without being conclusive in nature.

Reports may be structured into the following sections:

Introduction

This section provides the background information, the “who, what, when, where and why” data related to the case.

Inventory of Evidence Received

This section lists all evidence received by the Forensic Odontologist and details the source of the evidence.

Inventory of Evidence Collected

This section lists the nature, source, and authority for evidence collected by the Forensic Odontologist.

Opinion Regarding the Nature of the Patterned Injury or Injuries

This section states the author’s opinion as to whether the patterned injuries in question are bitemarks, using ABFO terminology. Only one comparative term is used for each opinion in this part of the report.

Methods of Analysis

This section describes the analytic methods used for the patterned injuries determined to be bitemarks.

Results of Analyses

This section describes the results of the comparisons and analyses.

Opinion

This section states the author’s opinion of the relationship between one or more bitemarks and a suspected biter or biters using ABFO Bitemark Terminology. Only one comparative term is used for each opinion in this part of the report.

Disclaimer

Disclaimer statements may be included to convey that the opinion or opinions are based upon the evidence reviewed through the date of the report. The author may reserve the right to file amended reports should additional