

Human Bite Mark



Fagr Faiz Hassan Yousif*

Post graduate diploma in forensic odontology, India

Submission: August 24, 2017; **Published:** August 29, 2017

***Corresponding author:** Fagr Faiz Hassan Yousif; post graduate diploma in forensic odontology, Indian Foreign Service, India,
Email: dr.sudaniaa@gmail.com

Commentary

Introduction

Bite mark analysis, has been used for more than fifty years to establish a connection between a defendant and a crime [1]. Bitemarks occur primarily in sex-related crimes, child abuse cases, and offenses involving physical altercations, such as homicide [2]. Male victims are most often bitten on the arms and shoulders, while female victims are most commonly bitten on the breasts, arms, and legs [3]. The examination and analysis of bite marks is used in an attempt to scientifically link the dentition of a potential biter with a bite mark. The bite mark may be found on skin or some other material, and crime scenes must be thoroughly searched in order to find bitten objects that may link a biter to a crime scene: a bitten piece of cheese found at the murder scene, along with other evidence, helped secure a conviction of the murderer of three family members after a wedding in the UK in 1983. Bite mark evidence has been used with increasing frequency over the years, possibly due to raised awareness and recognition of such injuries (from a multidisciplinary approach), along with an increase in the number of domestic violence and abuse cases reported, many of which involve biting injuries. Bite mark analysis methods have evolved over the years to give more reliable and reproducible results. However, the behaviour of skin and the underlying tissue during the dynamic biting process is still not clearly understood and caution with the interpretation of (and conclusions drawn from) these injuries is essential if this evidence is to be useful and acceptable to the courts. A few controversial cases involving biting injuries have emphasized the need for standardised protocols, appropriate training and carefully considered opinions and conclusions [4].

Guidelines for the analysis of bite marks:

The standard of the analysis of bite marks the American Board of Forensic Odontostomatology (ABFO) 2 established the following guidelines in 1986:

- a) History - Obtain history of any dental treatment subsequent to, or in proximity to, the date of the bite mark.
- a) Photography - Extra-oral photo-graphs including full

face and profile views, intraoral should include frontal views, two lateral views and an occlusal view of each arch. Often it's useful to include a photograph of maximal mouth opening. If inanimate materials, such as food stuffs, are used for test bites the results should be preserved photographically. Place a scale beside the bite mark and make a note of distance at which photograph was taken. UV light photographs can see the damage deeper into the tissue and can capture the spacing, size and shape of teeth. A blood group determination is possible in bite marks in human tissue as well as in food stuffs on account of saliva left in bite mark.

- b) Extra-oral examination - It include observation and recording of soft and hard tissue factor that may influence biting dynamics. Measurements of maximal opening and any deviations on opening or closing should be made. The presence of facial scars or evidence of surgery should be noted, as well as the presence of facial hair.
- c) Intra-oral examination - Salivary swabs should be taken. The tongue should be examined to assess size and function. The periodontal status should be noted with particular reference to mobility. Prepare a dental chart if possible.
- d) Impressions - Take two impressions of each arch using material that meet the American Dental Association specifications. The occlusal relationship should be recorded.
- e) Sample bites - Whenever possible, sample bites should be made into an appropriate material, simulating the type of bite under study.
- f) Study casts - Casts should be prepared using Type II stone according to manufacturer's specifications, using accepted dental techniques. Additional casts should be made by duplicating the master casts.

Comparison

There is two of comparison either by a cast made from the impression of the bite; the cast will be made from variety

of material such as silicon rubber, plastic and powder. And then an impression from the suspect is taken and cast is made to compare between two casts. Another technique Image Perception Technology. The computer hardware used with this research includes an Intel® Pentium CPU PC running at 3.06 GHz, with 1.00 Gb RAM,* Microsoft® Windows® XP home edition operating system,** a 15 inch colour monitor, † an HP PSC 1350 Printer‡ and an Epson Expression 1680 Pro flatbed scanner § [5,6].

Photographs of bite marks were resized to 1:1 scale using Photoshop® of Adobe Systems.¶¶ Dental study casts were scanned using the flatbed scanner. Hollow and compound overlays were produced from these casts. The methods used for both procedures are described by Bowers and Johansen.¹² Thelife size photographs were imported into the image perception program¶¶ and processed. With image perception software, it is possible to make 256 different grayscale values visible by rendering intensity information as surface height by mapping individual pixel intensities to the z-axis. Areas of equal luminance can also be artificially colored to enhance the image information that facilitates the recognition of the individual tooth impressions in the bite mark area and thus improving diagnostic procedures. Image perception software procedure A photograph of a bite mark is opened with the image perception software, and a region of interest is then selected. After such selection, one can add colour to different grayscale areas of the image. The assigning of selected colors to levels of grey values enables the forensic odontologist to select regions with similar grey values or to enhance subtle differences of grey values in the picture. The human eye can only distinguish about 40 shades of grey in a monochrome image, but can distinguish hundreds of different colors. ¹³ This will make it easier to establish which regions of pixel intensity is part of the bite mark and which are not. By omitting certain areas of pixel intensity, it is possible to isolate the region of the image which shows the bite mark.

Image perception software procedure: A photograph of a bite mark is opened with the image perception software, and a region of interest is then selected. After such selection, one can add colour to different grayscale areas of the image. The assigning of selected colors to levels of grey values enables the forensic odontologist to select regions with similar grey values or to enhance subtle differences of grey values in the picture. The human eye can only distinguish about 40 shades of grey in a monochrome image, but can distinguish hundreds of different colors. ¹³ This will make it easier to establish which regions of pixel intensity are parts of the bite mark and which are not. By omitting certain areas of pixel intensity, it is possible to isolate the region of the image which shows the bite mark.

A detailed image of the bite mark is produced and the resolution of the image is then altered to be compatible with the resolution of the original photograph. Most bite mark images are scanned at 300dpi. Part of the ABFO No.2¶¶ scale has to

be visible to accommodate the placement of the image over the original photograph with 100% exactitude.¹⁴ The colored image of the bite mark is now layered over the original bite mark photograph using Photoshop® of Adobe Systems.¶¶ The opacity of individual layers can be increased or decreased according to the requirements of the forensic odontologist. The enhanced image can now be used to accommodate an overlay of the suspected biter's dentition. Both hollow and compound overlays can be used, depending on the amount of incisal detail. With this improved degree of information it is not uncommon to distinguish aspects previously invisible with image perception software it is also possible to depict a 2-D picture as a 3-D surface object. Different pixel intensities are converted to different surface heights, yielding additional information contained in 256 intensity values ranging from black (intensity=0) to white (intensity=256). The scale of the z-axis can be adjusted to create the best possible pseudo 3-D view. These 3-D images can be freely moved, rotated, or zoomed to any specific region of interest.

The forensic odontologist is now able to combine the information from conventional analysis and pseudo 3-D images to investigate the bite mark and attempt to establish its origin with a higher degree of certainty than would be possible using other methods

Ten Famous Criminal Cases Solved by Bite Marks

a) Ted Bundy: Although serial killer Ted Bundy was responsible for estimated 30-plus murders, there was little physical evidence to connect him to the crimes when he was arrested in 1975. Two years later, having been convicted only of kidnapping, Bundy was preparing to stand trial for murder in Colorado when he escaped and headed to Florida. There, he killed three more people early in 1978, and when he was finally captured in February of that year, the physical evidence in those cases led to his conviction. Most crucial was the matching of a bite mark on the buttock of victim Lisa Levy to the Bundy's distinctive, crooked and chipped teeth. He was convicted also of the murder of 12-year-old Kimberly Leach based on fibers found in his van that matched the girl's clothing. Bundy was put to death in 1989.

b) The Lindbergh Kidnapping: On March 1, 1932, Charles Lindbergh Jr., the 20-month-old son of the famous aviator, was kidnapped, and although a ransom of \$50,000 was paid, the child was never returned. His body was discovered in May just a few miles from his home. Tracking the circulation of the bills used in the ransom payment, authorities were led to Bruno Hauptmann, who was found with over \$14,000 of the money in his garage. While Hauptmann claimed that the money belonged to a friend, key testimony from handwriting analysts matched his writing to that on the ransom notes. Additional forensic research connected the wood in Hauptmann's attic to the wood used

in the make-shift ladder that the kidnapers built to reach the child's bedroom window. Hauptmann was convicted and executed in 1936.

c) The Atlanta Child Murders: In a two year period between 1979 and 1981, 29 people - almost all children - were strangled by a serial killer. Police staked out a local river where other bodies had been dumped and arrested Wayne Williams as he was driving away from the sound of a splash in an area where a body was recovered a couple of days later. Police didn't witness him drop the body, so their case was based largely on forensic evidence gathered from fibers found on the victims. In all, there were nearly 30 types of fiber linked to items from Williams' house, his vehicles and even his dog. In 1982, he was convicted of killing two adult victims and sentenced to life in prison, although the Atlanta police announced that Williams was responsible for at least 22 of the child murders.

d) The Howard Hughes Hoax: In 1970, authors Clifford Irving and Richard Suskind concocted a scheme to forge an autobiography of notoriously eccentric and reclusive billionaire Howard Hughes. Assuming that Hughes would never come out from hiding to denounce the book, they felt that their plan was fool-proof. Irving went to publisher McGraw-Hill claiming that Hughes had approached him to write his life story and that he was willing to correspond with only the author. As proof, Irving produced forged letters that he claimed were from Hughes. McGraw-Hill agreed, paying \$765,000 for the right to publish the book. When word of the book was made public, however, Hughes contacted reporters to denounce it as false. Not wishing to appear in public, the billionaire would talk to reporters only via telephone. Thus, a "spectrographic voiceprint analysis," measuring tone, pitch and volume, was conducted to determine if the speaker was indeed Howard Hughes. Although a handwriting expert had previously been fooled by the notes that Irving had forged, the voice analyst correctly identified the speaker as Hughes. Irving was exposed and confessed before the book was published. He spent 17 months in prison, while Suskind spent five. Irving later wrote a book about the scheme, *The Hoax*, which became a major motion picture in 2008.

e) The Night Stalker: Between June 1984 and August 1985, a Southern California serial killer dubbed the Night Stalker broke into victims' houses as they slept and attacked, murdering 13 and assaulting numerous others. With citizens on high alert, an observant teenager noticed a suspicious vehicle driving through his neighborhood on the night of August 24, 1985. He wrote down the license plate and notified police. It just so happened that the Night Stalker's latest attack took place that night in that area, so police tracked down the car. It had been abandoned, but police found a key piece of evidence inside: a fingerprint. Using new computer system, investigators quickly matched the print to

25-year-old Richard Ramirez and plastered his image in the media. Within a week, Ramirez was recognized and captured by local citizens. He was sentenced to death and currently sits in prison on death row.

f) Machine Gun Kelly: George "Machine Gun" Kelly was a notorious criminal during the Prohibition era, taking part in bootlegging, kidnapping and armed robbery. On July 22, 1933, he and another man kidnapped wealthy Oklahoma City oilman Charles Urschel. After a series of ransom notes and communications, a \$200,000 ransom was paid - the largest amount ever paid in a kidnapping to date. Urschel was released nine days later, unharmed. The oilman had shrewdly paid close attention to every detail during his ordeal and was able to relate it all to police. Although he was blindfolded, he could tell day from night and was able to estimate the time of day that he heard airplanes fly above. He also noted the date and time of a thunderstorm and the types of animals he heard in what he presumed to be a farmhouse. Using his memories, the FBI pinpointed the likely location in which Urschel was held to a farm owned by Kelly's father-in-law. What truly linked Kelly and his gang to the kidnapping, though, was Urschel's fingerprints, which he made sure to place on as many items in the house as possible. Kelly was sentenced to life in prison, where he died in 1954.

g) The Green River Killer: The Green River Killer was responsible for a rash of murders - at least 48 but possibly close to 90 - along the Green River in Washington state in the '80s and '90s. Most of the killings occurred in 1982-83, and the victims were almost all prostitutes. One of the suspects that police had identified as early as 1983 was Gary Ridgway, a man with a history of frequenting and abusing prostitutes. However, although they collected DNA samples from Ridgway in 1987, the technology available didn't allow them to connect him to the killings. It wasn't until 2001 that new DNA techniques spurred the reexamination of evidence that incriminated Ridgway. He was arrested and later confessed. Ridgway pleaded guilty to 48 murders - later confessing to even more, which remain unconfirmed - in exchange for being spared the death penalty. He was sentenced to 48 life sentences without the possibility of parole.

h) BTK Killer: The BTK ("Bind, Torture, Kill") Killer was a serial killer who terrorized the Wichita, Kansas area between 1974 and 1991, murdering 10 people over the span. The killer craved media attention and sent letters to local newspapers and TV stations, taunting investigators. It's this egotism that led to his capture, however. When he resurfaced in 2004 with a series of communications, he chose to send a computer floppy disk to the Wichita Eagle. Forensic analysts traced the deleted data on the disk to a man named Dennis at the Christ Lutheran Church in Wichita. It didn't take long for the police to arrest Dennis Rader, who confessed and was sentenced to nine life terms in prison.

i) Jeffrey MacDonald: Early in the morning of February 17, 1970, the family of Army doctor Jeffrey MacDonald was attacked, leaving the doctor's pregnant wife and two young daughters dead from multiple stab wounds. MacDonald himself was injured by what he claimed to be four suspects, but he survived with only minor wounds. Doubt was immediately cast on the doctor's story, based on the physical evidence on the scene that suggested that he was the killer. However, the Army dropped the case because of the poor quality of the investigative techniques. Several years later, though, MacDonald was brought to trial in a civilian court. Key evidence was provided by a forensic scientist who testified that the doctor's pajama top, which he claimed to have used to ward off the killers, had 48 smooth, clean holes - too smooth for such a volatile attack. Furthermore, the scientist noted that if the top was folded, the 48 holes could easily have been created by 21 thrusts - the exact number of times that MacDonald's wife had been stabbed. The holes even matched the pattern of her wounds, suggesting that the pajama top had been laid on her before during the stabbing and not used in self-defense by the doctor. This crime scene reconstruction was crucial in MacDonald's conviction in 1979. He was sentenced to life in prison for the three murders.

j) John Joubert: In 1983, two murders of schoolboys rocked the Omaha, Nebraska area. The body of one of the boys was found tied with a type of rope that investigators couldn't identify. While following up on the lead of a mysterious man scouting out a school, they traced the suspect's license plate to John Joubert, a radar technician at the local Air Force base. In his belongings, they found a rope matching the unusual

one used in the murder (which turned out to be Korean). Although DNA analysis technology was not yet an option, the extreme rarity of the rope was enough to lead to Joubert's confession. Furthermore, hair from one of the victims was found in Joubert's car. The child killer was even linked to a third murder, in Maine, when his teeth were found to match bite marks on a boy killed in 1982. Joubert was found guilty of all three murders and was put to death in the electric chair in 1996.

References

1. EH Dinkel (1973) The Use of Bite mark Evidence as an Investigative Aid. J FORENSIC Sci 535.
2. David Sweet, Gary G Shutler (1999) Analysis of Salivary DNA Evidence from a Bite Mark on a Body Submerged in Water, ("The teeth may be used as an offensive weapon during an attack, or they may be used in self-defense. Obviously, the scope of the bitemark injuries on human skin is broad depending upon the circumstances, such as the amount of force generated by the teeth, the time of interaction between the teeth and skin, and the type of tissue bitten, as well as the site on the body. Teeth may produce various types of traumatic injuries, including erythema, contusion, abrasion, laceration, or tissue avulsion."). 44 J FORENSIC Sci 1069.
3. Adam J Freeman (2011) Seven Hundred Seventy Eight Bite Marks: Analysis by Anatomic Location, Victim and Biter Demographics, Type of Crime and Legal Disposition, 50 J FORENSIC Sci 1436 (2005).
4. (2011) British Dental Journal 210: 363-368.
5. Fujitsu, Siemens Computers, Munich, Germany Microsoft Corp, Redmond, USA † Fujitsu, Siemens Computers, Munich, Germany ‡ Hewlett-Packard Company, Palo, Alto, USA § Seiko Epson Corporation, Tokyo, Japan §§ Adobe Systems Inc, San Jose, USA.
6. A van der Velden, M Spiessens, G Willems (2016) Forensic Odontology Department, Katholieke Universiteit Leuven, Leuven, Belgium.



This work is licensed under Creative Commons Attribution 4.0 License
DOI: [10.19080/JFSCI.2017.04.555647](https://doi.org/10.19080/JFSCI.2017.04.555647)

Your next submission with Juniper Publishers will reach you the below assets

- Quality Editorial service
- Swift Peer Review
- Reprints availability
- E-prints Service
- Manuscript Podcast for convenient understanding
- Global attainment for your research
- Manuscript accessibility in different formats
(Pdf, E-pub, Full Text, Audio)
- Unceasing customer service

Track the below URL for one-step submission

<https://juniperpublishers.com/online-submission>.