

A Review of the Reliability and Forensic Role of Bite Mark Analysis in Suspect Identification

Introduction

Bite mark analysis is a branch of forensic odontology that compares patterned injuries with a suspect's dentition. For many years, courts accepted bite marks as evidence because teeth were believed to produce unique patterns. However, current research has raised major concerns about the reliability of this technique. Human skin distorts easily, expert interpretations can vary, and studies have questioned whether bite marks can accurately identify a single individual. Today, bite mark analysis remains highly controversial. While bite evidence may still provide investigative value, many experts argue it should not be relied upon as definitive identification evidence [1,3].



A Wrongful Conviction – The Case of Keith Harward

1982 - Keith Harward was convicted of rape and murder in Virginia after forensic experts testified that bite marks on the victim matched his teeth. At the time, bite mark evidence was considered highly convincing in court.

33 Years in Prison - Harward maintained his innocence for decades while serving a life sentence. The bite mark testimony became one of the key pieces of evidence used against him.

2016 - Modern DNA testing eventually identified another man, Jerry Croft, as the true offender. Harward was officially exonerated and released after spending over three decades imprisoned for a crime he did not commit [4].

Why This Case Matters - The Harward case became one of the most powerful examples of wrongful conviction linked to bite mark analysis. It revealed how forensic evidence can appear scientifically certain yet still lead to devastating errors when unsupported by strong scientific validation. This case being just one example of many such wrongful convictions.

How is a Bite Mark Analysed?

1. Injury Documentation

The suspected bite injury is photographed using forensic scales and specific lighting techniques. Swabs may also be collected to recover biological evidence such as saliva DNA.

2. Pattern Assessment

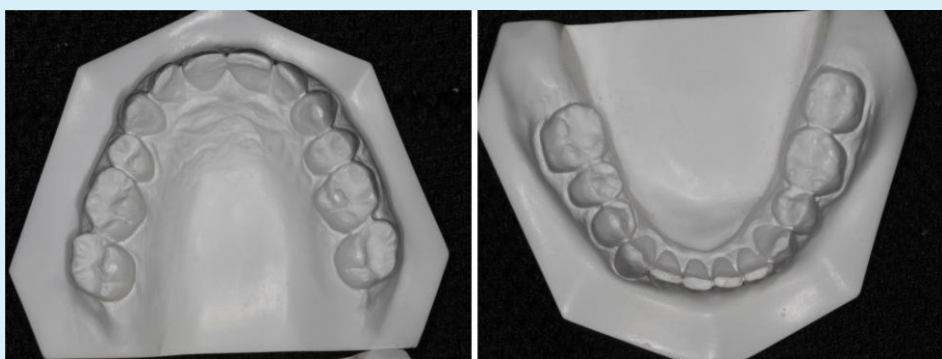
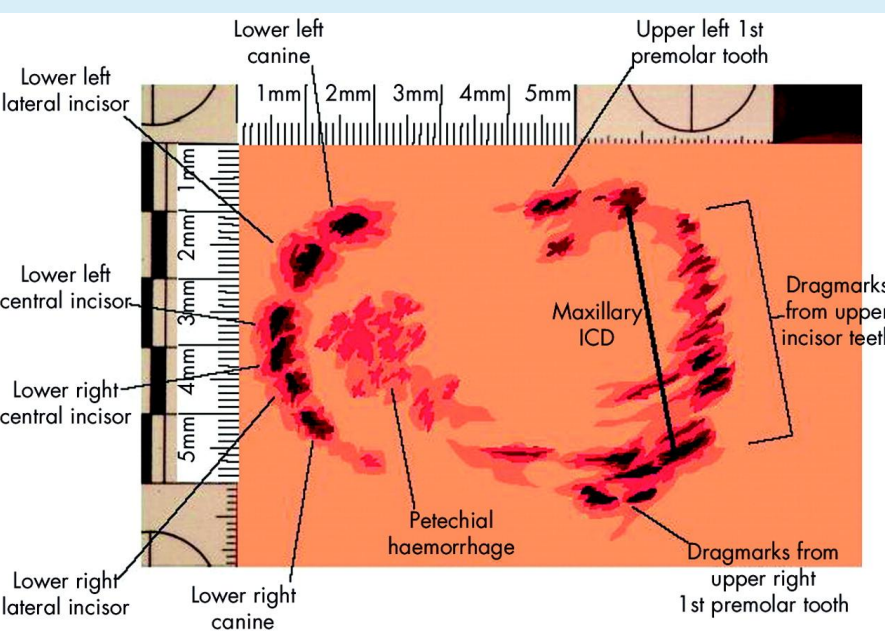
Forensic odontologists examine class characteristics within the injury pattern, including tooth spacing, arch morphology, rotations, and missing dentition.

3. Dental Impression Collection

Dental casts, intraoral photographs, or digital 3D scans are obtained from the suspect to accurately record dentition patterns.

4. Comparative Analysis

The injury pattern is compared with the suspect's dentition using metric analysis, transparent overlays, digital imaging software, and morphological assessment.



The Big Controversy – Key Draw backs

Skin Distortion

Human skin is an elastic and deformable tissue, making it a poor medium for preserving bite mark detail. Swelling, bruising, and healing processes can rapidly alter the appearance of the mark. Additional factors such as body location, skin curvature, and individual elasticity further contribute to distortion.

As a result, the final impression may not accurately reflect the original dentition, with tooth size, spacing, and alignment all potentially distorted.

Subjective Interpretation & Lack of Standards

There is no universally accepted standard for identifying or classifying a bite mark. As a result, examiner agreement is poor, with significant variability in whether injuries are even recognised as bite marks or matched to a suspect [2,5].

No Proof of Individual Uniqueness

The assumption that bite marks are unique like fingerprints is not scientifically supported. Teeth can change over time, and similar bite patterns may be produced by different individuals, making reliable identification uncertain [1,3].

When Can Bite Mark Analysis Prove Useful?

Excluding a Suspect

Bite mark comparison may assist in excluding individuals when there is a clear mismatch between the injury pattern and the suspect's dentition, particularly in closed or restricted suspect pools (e.g., family or domestic cases). In such contexts, obvious inconsistencies in tooth spacing, arch shape, or alignment can help rule out involvement, especially when supported by other forensic findings.

Cases of Abuse

Patterned injuries consistent with biting can be clinically relevant in cases of suspected physical or sexual assault, particularly in vulnerable populations such as children or dependent adults. In these contexts, bite mark documentation may assist in recording injury patterns over time and supporting multidisciplinary safeguarding assessments, especially when interpreted alongside clinical and forensic findings.

Used in Conjunction with Other Evidence

Bite mark evidence is most useful when interpreted alongside other forensic findings rather than in isolation. It may help provide context within an investigation, but its value increases when supported by DNA profiling, injury interpretation, scene examination, or witness evidence. In this combined approach, bite marks can contribute additional, but not independently conclusive, information to the overall case assessment [1,3].

A Canine's Canines

Dog bite cases often appear in both criminal and family court, especially where there is uncertainty over whether an injury was caused by a human or an animal.

Dogs have a distinctive dentition pattern, with six incisors and two prominent canines that often produce deep puncture wounds, helping differentiate them from human bites.

In forensic investigations, dogs may also be used deliberately in assaults.

Inter-canine distance may also give an estimate of animal size and sometimes help narrow down possible breeds.



The Bottom Line – Is Bite Mark Analysis Reliable?

Bite mark analysis can, in certain circumstances, provide useful forensic information, particularly in helping to exclude suspects or contribute contextual insight within an investigation. However, its ability to reliably identify a specific individual is widely regarded as scientifically uncertain.

Key limitations include the distortion of skin as a recording medium, lack of standardised interpretation criteria, and the unproven assumption that human dentition produces unique bite patterns comparable to that of a fingerprint. These factors introduce significant subjectivity and uncertainty into analysis.

As a result, bite mark evidence is now considered most appropriate as a supporting or exclusionary tool rather than a method of positive identification and is most reliable only when interpreted alongside stronger forms of forensic evidence such as DNA profiling [1,2].

References

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[5] Saks MJ, Risinger DM, Rosenthal R, Thompson WC. Context effects in forensic science: a review and application to forensic dentistry. *Jurimetrics*. 2003;43:119–128.

*(Further references included in additional document)