Introduction to Computer Forensics, Assignment 1 Paper

Forensic odontology

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Abstract

Forensic odontology can be defined as “the relation and application of dental facts to legal problems” (Farlex Partner Medical Dictionary, 2012). Over the last 100 years, forensic dentistry has evolved to become a vital part of forensic science, using dental findings to aid the legal system. Forensic dentistry now plays an essential part in the identification of human remains following major catastrophes. Teeth are also used as weapons, and can leave a great deal of information about the perpetrator. Dental professionals play a major role in maintenance of accurate dental records and are therefore able to assist the legal system in cases such as abuse and negligence.

The two main regions of forensic dentistry are bite marks and identification of human remains following mass fatalities. This report examines the use of teeth of weapons of violence and examines the role which dental professionals fulfill from the identification stage through to the presentation of evidence at court proceedings. We will also discuss an infamous case study involving the science from the 1960’s.

Keywords: evidence, forensic, bite marks, odontology, identification, dentist, legal.

1. Introduction

The first legal case recorded involving bite mark evidence occurred in 1870. In the Ohio V’s Robinson case, Ansil Robinson was accused of murdering his mistress, Mary Lunsford. The main evidence against Robinson was a very distinctive bite mark on the arm of the fatality. Despite the fact that a dentist testified in court that the marks on the victim matched the indention of the accused’s 5 only teeth, Robinson was acquitted of the crime. (Pierce, Strickland and Smith, 1990) [1]

Scientific hypothesis stems from the reality that human dentation is not identical form one person to another. In fact, most experts have the belief that the human bite is as individualistic as fingerprinting. (Forbes, 1942) [2]

Bite marks are usually discovered on the legs and breasts of female victims and mostly during sexual attacks (Dorian, 2004) [3], whereas on males the wounds most often occur on shoulders and arms. (Vale, Sognnaes, Felando et al., 1976) [4]

Biting is regularly a symbol of the attacker wanting to demean the victim while realizing complete control. Where sufficient evidence is left behind forensics may be used to identify an attacker or equally eliminate suspects of a crime. (Vale, 1996) [5]

There are some experts who believe that bite mark evidence should only be used as a tool to eliminate a suspect. Others believe that dental evidence is enough to say that someone probably committed the crime and that it should be used in conjunction with other evidence rather than being the main data source when used in a courtroom. (Freeman, 2016) [6]

**2. Identification**

Most bite marks are discovered by detectives upon arriving at a crime scene, either left behind on the offender, victim, or on a non-living entity found at the scene. Human bite marks are oval in shape usually with a focal section of bruising produced by pressure of teeth as they squeeze the tissue toward the inside from the edge of the mark. (Sweet and Pretty, 2001) [7]

It is not only at a crime scene however where evidence of bite marks can be discovered. A GP or pediatrician while examining a young child in a suspected abuse case may also identify what they ascertain to be bite marks on a victim. The examiner in this case may also call upon assistance from a dental professional to identify and recover evidence if so required.

Bite marks require a rapid response from the forensic dentist as bite marks on skin change over a period between the moment of harm and the moment of detection, the spread of the bruises and the changes connected with wounds over time may increasingly belittle the value of evidence. This applies to all victims be they alive or deceased. Therefore, the time elapsed between the identification stage of forensics and the gathering of evidence must be kept to minimum in all cases deemed to be suspicious in nature.

**2. Gathering of Evidence**

When gathering dental evidence, a depiction of the bite marks locality, form, dimensions, colour, category of injury and any other relevant information which warrants recording. Every effort should be taken to record all evidence, whether deemed significant or insignificant, as soon as possible from moment of discovery. This is the best, and in some cases of bite mark evidence, may be the only time when gathering of precise evidence is possible.

2.1 Procedures for collecting evidence

The injury should be documented to include a written description detailing physical evidence, colour, size and alignment of the injury. (Sweet, 1995) [8] Also documented should be the location of bite marks on the body, the outline and elasticity of the bite marks, extra injury types present and any scrapes, bruises or cuts which may be present.

Extensive photographs should be taken both of the scene as a whole and close-ups. An intraoral camera should be used to take both black & white and colour photographs. A ruler should be used in close-up photographs to display images to scale. Due care should be taken on the positioning of cameras used and the camera should be held perpendicular to wounds to avoid distance distortion. (Sweet2, 1995) [8]

Saliva will have been transferred during the act of biting and this will have to be gathered. Any saliva marks at the scene should also be gathered for analysis when possible. (Wright and Dailey, 2001) [9]

Impressions of all bitten surfaces should be fabricated. The impression all accurately record the curvature of the skin (Bowers and Bell, 1995) [10]

In the situation of a deceased victim, tissue incision can be carried out. In this method the skin and the underlying fatty tissue are removed. The removed skin is the examined by a trans illumination method where a bright light is shone behind the skin. (Sweet and Pretty2, 2001) [7]

2.2 Collection of evidence from suspect

By common law, a suspect has the right to decline the submission of dental evidence leaving the jury to draw their own conclusions. (Maither, 2015) [11]

Should the suspect agree to examination a forensic dentist will examine extraoral and intraoral features and record findings.

Photographs are taken, both intraoral and full facial. (Sweet and Leroy, 1996) [12]

A sample of the suspects bite should be fabricated and this also should be photographed.

A cast of the suspects teeth should also be fabricated and photographed allowing for features to be examined. (Sweet3, 1995) [8]

**3. Analysis of Evidence**

There are three steps involved in all cases of bite mark analysis:

1. Cataloging of both the bite mark and the accused’s dentation
2. Appraisal of dentation and bite mark
3. Assessment of the features of resemblance or difference

Cataloging is done by photography. For assessment the resulting photographs are developed to life size images. Comparison also takes place of any fabrications which may have been produced.

Comparison between the bite mark and the accused’s dentation can be done either directly, which involves examining the suspects dentation against the life-size image of the bite mark or indirectly through the use of transparent overlays. In more recent times it has also become commonplace for computers to be used for comparisons. (Giannelli, C, 2007) [13]

Positioning of the limb in the precise position of when the attack occurred may be necessary to re-create correct bite relationship. The healing interval of bite marks can also be useful in establishing the time of the attack. (Kubic and Petraco, 2009) [14]

**4. Presenting of evidence**

Forensic odonatologists are called to give evidence in a legal proceeding for various case types, including:

* Age estimation
* Cases involving abuse of children
* Post-mortem identification
* Bite mark analysis

Conclusions from bite mark analysiscan assist the judicial system in determining interactions between certain people at a crime scene. Therefore, a dentist’s testimony in a subsequent court case can be crucial.

The courts expect an experts evidence to be far beyond that of an average person based on knowledge, experience and training. Therefore, all expert witnesses need to instill confidence in a jury that they know what they are talking about.

Expert witnesses should be organized and be able to easily cite and locate key pieces of evidence. They must appear levelheaded at all times and always be aware, and adhere, to ethical principles of behaviour. (Wells, D. 2012) [16]

The best understanding in a case involving dental evidence is undoubtedly that of a forensic odonatologist. In some cases, evidence can be read out in court without the dentist present, however other times they may be required to give oral evidence.

A forensic odonatologist can expect to be asked the following questions when giving evidence in court:

* Can the methods used be replicated by another expert and the same conclusions be attained?
* Can the evidence be presented in an adequate manner that both the judge and jury can understand?
* What is the expert’s qualification in the forensic science field?

Techniques that may be used to give evidence can include categorized pieces of evidence, photographs and intraoral/extraoral imaging. (Claridge, J. 2015) [17]

The forensic odonatologist is permitted to generate an opinion on issues that happened out of his/her being actually present at the crime scene at the time of the incident. They may also be asked, to the best of their ability, to reconstruct events which occurred during the crime. (Bowers, 2002) [18]

**5. Case Study – The Biggar murder**

On August 7th 1967, a schoolgirl of just 15 years of age was found killed in the little Scottish town of Biggar. She had been battered and strangulated, and her right breast had what appeared to be a bite mark. Thus followed the case which became known as ‘The Biggar murder’.

Linda Peacock had gone out with friends the previous evening of the 6th. When she hadn’t returned by an agreed time, her parents contacted the police. Being a small town, the police knew right away that this was out of character for Linda and commenced a search which carried on throughout the night, but to no avail.

Her body was eventually discovered in the local church graveyard the following morning by a policeman searching on his own beat.

5.1 Identification of evidence

Although Linda had not been raped it was clear that the motive of the attack was a sexual assault due to her clothing being disturbed and the only physical evidence discovered at the scene, the bite mark on the victim’s breast.

When the forensic report was released in showed that Linda Peacock had been hit on the head with a heavy object and strangled with a rope. Her bloody and broken fingernails showed that she had put up a fight against her killer. Linda was subsequently buried in the same graveyard where she had been murdered.

Warren Harvey, who was working in Glasgow dental hospital at the time, was asked to consult on the case. It was because of the bite’s shape that it was taken to have come from a human as opposed to an animal. The position of the bite also ruled out any chance of a self-inflicted wound. It became apparent to the investigating officers that the killer had left a calling card behind.

5.2 Gathering of evidence

Upon examining the bite mark, Warren Harvey described the wound as being round shaped, small and unique. What made the bite particularly unique was the two pit marks on the body and how jagged they were. The jagged indentation was caused by a rare dental disorder called hypo calcination.

Harvey took the dental impression of 29 male residents of the Loaningdale School. This school was a residential home for young men who were sent thereby authorities due to a history of offending. One of the males tested was 17-year-old Gordon Hay. Hay had only recently moved from Aberdeen to Biggar largely due to his mischievous past. He also had hypo calcination.

5.3 Analysis of evidence

An additional warrant was requested by Warren Harvey to examine Hays teeth further, which was duly granted. The resulting testing was enough to convince Harvey that he had his man, however, he now also had to convince a jury.

To achieve this, he went on to study over 1000 teeth from over 350 boys aged 16-17. None had the unique features found in the teeth of Gordon Hay.

Hay denied the charge and claimed he was in bed in his dorm at the school at the time of the murder. The school records matched his alibi. The other residents of the school however said that Hay had slipped out of school on the night of the murder.

5.4 Presentation of evidence

On the 26th February 1968 the trial commenced. Dr. Keith Simpson a state office pathologist, was called in to collaborate Warren Harveys analysis of the bite mark. He agreed with the odonatologists findings that the bite mark was indeed unique. After over 400 hours preparing evidence Harvey found himself in the witness box for over 5 hours.

He had done enough to convince the jury and after just 2 ½ hours of deliberation Hay was found guilty of murder. As he was under 18 he the presiding judge was unable to issue a life sentence and instead he was ordered to be detained at her majesty’s pleasure.

This was the first case in Scotland where the prosecution relied on forensic odontology and also the first in the United Kingdom where a conviction was achieved as a result. (Keiser-Nielson, S, 1969) [18]

**6. Comparison with forensic pathology**

The role of the forensic pathologist is to identify a cause of death to a corpse. Examinations are performed as part of legal proceedings and involves both civil and criminal cases. These normally take the form of an autopsy with legal professionals present.

Forensic odonatologists also use both biological and physical evidence to assist the legal profession in solving cases such identifying human remains and anlaysing bite mark evidence. They are usually employed by a medical examiner to, also, assist in autopsy’s by performing post mortem dental examinations. Their findings along with the pathologists, are then carefully recorded in detailed reports.

Forensic pathologists more so than orthodontists are frequent visitors to the courtroom. It is important that both professions have a close relationship with their peers as often their findings need to be confirmed by another member of their profession.

Professionals in both fields may also be asked to assist police in other criminal cases outside of identification of bodies. A pathologist, for instance, may be asked to give evidence in assisting a defendant in a murder case, while an orthodontist could be asked to give evidence in a case involving bite mark analysis in cases such as abuse or rape.

Both of these professions play a vital role in serious aspects of criminal justice and identification. The evidence which they uncover help to identify both victim and perpetrators alike. (Royal College of Pathologists, 2016) [19]

**7. Conclusion**

Forensic odontology is a very valuable science. Dentistry plays a very important role both in identification of corpses and also in many legal cases such as abuse, murder and rape. By keeping meticulous dental archives, they are able to assist law enforcement by providing essential information when called upon.

Although bite marks are distinct to the individual, in contrast to fingerprints there are several factors which can alter the evidence of a bite mark. Any errors made through the various stages of gathering or analyzing evidence can, potentially, greatly alter the evidence which in turn have serious consequences when it comes to the courtroom and the eventual outcome of any trial. It is of utmost importance therefore that all procedures throughout the entire process, from identification to presentation of evidence, be adhered to fully and without exception to in order that a completely factual and concise testimony be heard by any jury.

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