

FORENSIC ODONTOLOGY

WHAT IS FORENSIC ODONTOLOGY?

That branch of dentistry which deals with the proper handling and examination of dental evidence and the proper evaluation and presentation of dental findings in the interest of justice.

ROLE OF FORENSIC ODONTOLOGY

1. **Human Identification.** ID of human remains in various stages of decomposition.
2. **Mass Disasters.** Airplane crashes, hotel fires, floods, earthquakes, bombs, terrorist attacks, hurricanes, etc. More complicated due to larger numbers involved. Team of investigators required. Forensic training and experience important.
3. **Bite Mark Evidence.** Through history humans have used their teeth as weapons to bite their victims. Bite mark evidence has been admitted in U.S. courts for many years.
4. **Human Abuse.** Dentists are required by law to report suspected cases of abuse (child, spousal, elder). The physically abused child has consistent manifestations such as a torn frenulum, swollen lips, facial and body bruises, fractured teeth, bite marks, etc.

HISTORY OF FORENSIC ODONTOLOGY

1. **45-70 A.D.** Rome. Emperor Nero's mother had her husband's mistress killed and her head brought to her for ID by a discolored tooth. OR Nero's mistress had Nero kill his first wife and ID'd her by a canine
2. **1776.** Boston. First forensic dentistry in American history. Paul Revere ID's General Joseph Warren, a distinguished physician, who was killed during the Battle of Bunker Hill. The British stripped the body and buried it. The General's body was later ID'd by Revere by means of a dental prosthesis which he had previously adjusted.
3. **1897.** Paris. 126 perished in a fire while attending a charity ball. First text on forensic dentistry was written on this disaster.
4. **1906.** England. First known use of bite mark evidence. Suspect was convicted of a burglary because of a bite mark left in cheese at the crime scene.
5. **1945.** Berlin. Adolph Hitler and Martin Bormann were ID'd on dental evidence.
6. **1974.** Los Angeles. SLA members who perished in the SLA shoot-out ID'd by forensic odontologists.
7. **1978.** San Diego. PSA airliner collides with small private plane over residential area. 144 victims. Computer used to aid in dental ID's.
8. **1979.** Chicago. American Airlines DC10 crash. 274 died. 200 ID'd with dental evidence.
9. **1979.** Jonestown, Guyana. Massacre-suicide of 913. Victims returned to Dover AFB, Delaware.
10. **1979.** Florida. Ted Bundy, convicted of murder. Bite mark evidence was presented by the prosecution. Bundy, a serial killer, was executed in 1989.
11. **1981.** Lee Harvey Oswald, President Kennedy's assassin, was exhumed and positively ID'd by his Marine Corps dental records.
12. **1982.** Contra Costa County, CA. "America's worst tunnel fire" took seven lives.
13. **1985.** Worst year in history for air disasters. Two of the largest were the JAL crash with 520 aboard and the Arrow Airways crash in Gander, Newfoundland, with Army personnel aboard.
14. **1987.** San Luis Obispo. PSA airliner high impact crash with 43 aboard.
15. U. S. Army Central Identification Laboratory, Hickam AFB, Honolulu, Hawaii. (CILHI). Odontologists and anthropologists work full-time identifying remains of U.S. service members killed in WWII, Korean War and in Southeast Asia.
16. **1989.** Bay Area Loma Prieta Earthquake. Total of 55 deaths. Cypress Freeway in Oakland collapses claiming 41 lives. Forensic dental ID's utilized.
17. **1991.** California East Bay Firestorm. 3000+ residences destroyed and 25 perish. ID's by forensic dentistry.

18. **1994.** El Dorado County, CA. Mountain lion kills woman jogging in Sierra Nevada foothills. Bite mark on victim helps to profile and identify the responsible lion.
19. **1995.** Oklahoma City. Federal Building bombed. Victims identified by forensic dentistry.
20. **1996.** TWA flight 800 crashes into ocean off New York coast. Dental ID's utilized.
21. **2000.** Alaska Airliner crashes in ocean near Ventura. Dental identifications used.
22. **2001.** Sept. 11th. Dental ID's used for victims of WTC, Pentagon and Pennsylvania plane crashes.
23. **2001.** Presa Canario dogs maul and kill woman in San Francisco. Bites analyzed by forensic dentists.
24. **1993-2002. Dental** identifications of abducted/murdered girls in California. Polly Klaus, (Sonoma Co.); Christina Williams, (Monterey Co.); Juli Sund/Silvina Pelosso, (Yosemite); Xiana Fairchild, (Santa Clara Co.); Danielle Van Dam, (San Diego Co.).
25. **2003** California southland fires. 15 victims ID'd with dental records.
26. **2004-5** Southeast Asia Tsunami
27. **2005** Hurricane Katrina, LA.; D-Mort Teams utilized.

WHERE DOES THE FORENSIC ODONTOLOGIST WORK?

1. Medical Examiner/Coroner's office, morgue.
2. Dental office or laboratory.
3. In the field at the crime scene, disaster site, cemetery, jail, etc.
4. Courtroom, attorneys' offices.

THE NEED FOR IDENTIFICATION

1. **Death Certificate.** Necessary to consummate legal matters such as insurance, wills, business interactions, remarriage of spouse, lawsuits.
2. **Personal and Family Reasons.** After mysterious disappearance an ID can help end emotional strain of next of kin. Burial problems may result when multiple bodies of persons of different faiths.
3. **Criminal Cases.** Positive ID of victim essential in many cases. Relationship of victim to suspect is important.

METHODS OF IDENTIFICATION OF AN UNKNOWN BODY

1. **Visual.** Most frequent method. Friends or next of kin view body soon after death.
2. **Personal Effects.** Not always reliable since can be stolen or switched. May lead to subsequent ID by more reliable means. Clothing labels, glasses, jewelry, laundry markings, keys, belt buckles, etc.
3. **Fingerprints.** Most widely used scientific method in U.S. Sometimes no antemortem print records for comparison. Computerization of fingerprints has been very helpful.
4. **Dental.** Human dentition outlasts other body tissues after death. Restorations & prostheses resistant to physical & chemical deterioration. Almost infinite number of possible combinations of restorations, prostheses, missing teeth, sinus outlines, etc. X-ray exam of teeth & jaws provides objective data on restorations, root canals, pathologic processes, anatomic differences, etc.
5. **Skeletal Remains.** Age, sex, race, habits, occupation, disease status, stature. Determined by forensic anthropologist.
6. **Autopsy Findings.** Diseases, surgeries, healed fractures, arthritic changes, tattoos, needle tracts, moles, scars, etc.
7. **Association – Exclusion.** Comparison of postmortem data of the deceased with antemortem data of others.
8. **DNA Analysis.** Comparison of human genetic markers.

DENTAL IDENTIFICATIONS

Comparison of postmortem dental records to antemortem dental records.

1. **Antemortem Records.** Records of person when alive. Must have some idea of a tentative ID of the unknown in order to obtain antemortem records. In California antemortem dental records of reported missing people should be filed with the Department of Justice, Missing and Unidentified Persons' Unit (MUPS) in Sacramento. These dental records are computerized for comparison with postmortem dental records.
2. **Postmortem Records.** Records taken of the deceased body. Photographs are taken of the head, face and jaws. (Taken with a scale, case number, date). A complete dental charting is performed, preferably by two forensic dentists. Dental radiographs (x-rays) of teeth and supporting bone. Dental models, if indicated.
3. **Comparison of Records.** Odontologist should take sufficient time to make an accurate comparison of antemortem and postmortem records. He/she should seek consultation with another odontologist when necessary. Do not allow circumstances surrounding an event and media attention to pressure him/her into a premature and perhaps inaccurate ID. The odontologist should be totally objective and never enter into an investigation with preconceived ideas.

MASS DISASTERS

When and where will the next disaster occur? It WILL happen. The local medical examiner/coroner is in charge. Forensic odontology is only one division of the identification process.

The forensic dental ID team should be organized ahead of time. There should be a list of experienced odontologists willing to help in case of a disaster. These dentists should understand the ID forms, charting methods and the use of the computer CAPMI (computer assisted postmortem identification) or WINID programs. In California several forensic dentists are members of DMORT (Disaster Mortuary Operational Response Team) a federal organization that can be called to help with a disaster that is too large for the local or state authorities to manage. (e.g. Alaska Airline crash in Ventura County, WTC terrorist disaster, Hurricane Katrina). In 2002 California forensic odontologists began forming a state team for DVI (dental victim identifications) in mass disasters. CALDIT (California Dental Identification Team) is a joint effort of the California Society of Forensic Dentistry, the California Dental Association (CDA) and the state Office of Emergency Services (OEM).

BITE MARK EVIDENCE

Since the mid-seventies bite marks have been well accepted by forensic odontologists, law enforcement officers and trial and appellate courts. The known bite mark cases probably represent a small percentage of all bite mark evidence. The majority of bite mark evidence may not be recognized by investigating officers or pathologists.

Bite marks may be found on living or dead individuals. They may be found on the victims or the perpetrator of the crime. They may be found on food, wood, plastic, leather, tape, etc. They may be found on any part of the body. They are common in sexual crimes, in child abuse or in acts of self-defense.

The *American Board of Forensic Odontology (ABFO)* has established a GUIDELINES FOR BITE MARK ANALYSIS which should be followed for the collection and evaluation of bite mark evidence. Research is continually being done in the field of bite mark evidence.

BITEMARK ANALYSIS

1. What is the degree of certainty that the mark or injury is a bite mark?
2. Was the mark inflicted by a human? By an animal?
3. Can the bite mark be individualized with reasonable dental certainty?
4. Can the bite mark be connected with the time frame of the crime?
5. Is the bite mark consistent with the type of crime? e.g. sexual crime, assault, child abuse?
6. Usually analysis is performed at morgue where bite is first recognized. Sometimes done at police station, emergency room, etc.
7. Saliva washing important first to determine blood type, presence of DNA. Photographs, impressions, tissues samples are taken.
8. May need to examine teeth of suspect. (court order necessary.) Take dental impressions, photographs, wax bites.
9. Bite mark analysis should be independently performed by at least two experienced forensic odontologists.
10. Sometimes bite marks are not of sufficient quality to be linked to a specific individual.

FORENSIC DENTAL ORGANIZATIONS

1. American Society of Forensic Odontology. Entry level organization; not limited to dentists. www.afso.org.
2. American Academy of Forensic Sciences (Odontology Section). <http://www.aafs.org>.
3. American Board of Forensic Odontology (ABFO). Certifying board for forensic dentists. <http://www.abfo.org>.
4. California Society of Forensic Dentistry. Forensic dentists actively consulting for California coroners/medical examiners.
5. Northern California Forensic Odontology Group. www.ncforensicodontology.org.

FORENSIC DENTAL TEXTS

1. *Manual of Forensic Odontology*. Fifth Edition. 2013; Senn, Weems, et al. American Society of Forensic Odontology.
2. *The Dental Clinics of North America. Forensic Odontology*. April 2001. Vol. 45, Number 2; Guest Editor, R. H. Fixott. W.B. Saunders Co.
3. *Digital Analysis of Bite Mark Evidence using Adobe Photoshop*. R.J. Johansen & C.M. Bowers. 2000. Forensic Imaging Services, Santa Barbara. www.forensicsimaging.com.
4. *Forensic Dentistry*. P.G. Stimson & D. R. Senn, Editors. CRC Press. Second Edition 2010.
5. *Forensic Dental Evidence*. Second Edition C. M. Bowers. 2010. Elsevier publisher. (800) 545-2522.
6. *Bitemark Evidence*; R.B.J. Dorion. 2005. Marcel Dekker.
7. *Bioterrorism & Forensics*; Journal of the California Dental Association; Aug. 2004, Vol. 32 No. 8.