

September 28th, 2023

Forensic Odontology and Bitemark Analysis

Richard M. Scanlon, D.M.D

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Dr. Scanlon is a nationally recognized expert in the field of Forensic Odontology. He has served as a Chief Deputy Coroner, a Regional Forensic Odontologist, and a member of various sub-committee and review panels, to include the FBI's Dental Image Repository Review Panel and the American Society of Cold Case Investigations. Dr. Scanlon has served as a Chairman on various hospital Executive Committees and was the President of the Medical Staff at Lewistown (PA) Hospital for 2 years. He has co-directed the dental identification of many mass-casualty events, including United Flight 93 (September 2001) and Hurricane Katrina (August 2005). He has over 4,500 hours of forensic continuing education and received a U.S. Army Scholarship while attending the University of Pittsburgh, where he graduated with his doctorate in 1974. Dr. Scanlon is also a Fellow of the American Academy of Forensic Sciences and the International College of Dentists.



WARNING

This presentation contains graphic images that are sensitive in nature which may be considered triggering to some audiences.

Forensic Odontology

Is the area of overlap between the dental and legal professions, involving the recovery and analysis of dental evidence, and presentation of those relevant findings in courts of law.



Forensic Odontology – What Does It Entail?

- Dental Identification
- Bitemark Evidence
- Mass Disaster Identification
- Missing Persons
- Human Abuse



The History of Forensic Odontology In America

America's First Forensic Dentist



As a silversmith, Paul created pieces ranging from simple spoons to full tea sets. When times become hard, he advertised as a dentist. He not only cleaned teeth, but also wired in false teeth carved from walrus ivory or animal teeth.

Battle of Bunker (Breed's) Hill General Joseph Warren



The shooting on June 17, 1775, lasted less than one hour but only because the Patriots ran out of ammunition. Warren had been shot in the back of the head and thrown to the ground. His body was thrown in a ditch by a British officer and buried with others. It was discovered months later and identified by Paul Revere who recognized a false tooth he had made for Warren.

Importance of Identification

In the adjudication or resolution of death, whether in a criminal or a civil case, body identification is the first and one of the most important aspects of any investigation.

Chicago OCME Office



Legal Forms of Identification

- Fingerprints
- Dental
- DNA

Forensic Identification Evidence

- “Soft” Subjective Evidence – visual, wallet, car registration, clothing, jewelry
- “Hard” Objective evidence – Dental, DNA, Fingerprints

Dental Identification

The identification of the human body, by the comparison of the dentition of the deceased, with putative antemortem dental records potential individuals to affect a legal and verifiable positive identification.



When Do You Need Dental Identification

- Burn victims
- Decomposed – skeletonized victims
- Severe trauma
- Criminal cases
- Any doubtful identification

Lewistown Sentinel - Nov. 29, 2001

Dead firefighter from World Trade Center misidentified, buried by the wrong family

“This mistake has caused a lot of grief,” Maureen Santora told The New York Times.

Santora’s body will be exhumed for a funeral on Saturday. Guadelupe’s body is still missing.

“It’s an incredible sequence of events,” Borakove said Wednesday. “I don’t know what the odds are: two people from the same fire-house, with the same congenital anomaly, dying in the same tragedy.”

- Recovered on the 22nd of September
- Wore a distinctive flat gold neck chain
- Had a congenital cervical anomaly
- Requests to have dental data taken were denied
- Unfortunately, honor guard did not consider that two firefighters from their station were so much alike.
- “Guadelupe” was buried on 1st of October
- Not until the 28th of November was the error discovered when DNA testing had been completed that the remains were identified as Chris Santora

Lewistown Sentinel – Nov 29, 2001



Dentition can survive
severe heat and trauma.

Importance of Forensic Odontology

- 45-80% of victims involving fire, severe trauma, or decomposition are identified by forensic odontologists.
- DNA can take 4-6 weeks or months, dental identification in 1-3 days.
- Minimal cost to coroners/medical examiners. Reduces family trauma.
- Accurate, verifiable, and legal means of identification.



Even with just one tooth,
a positive identification can be made.

- Can also be shared with the family of victims
- Insurance companies
- Legal counsel for the family
- Law enforcement agencies

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Comparison of Antemortem
Radiographs of N. M. and
DMORT Specimen # 1242



DMORT
Specimen # 1242

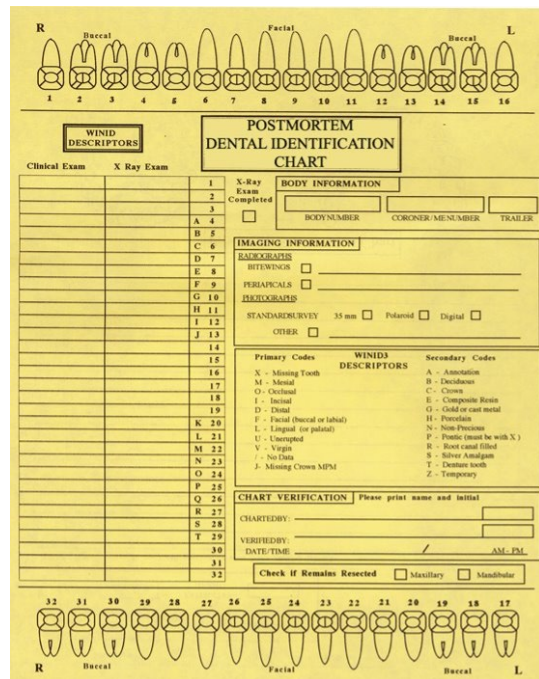


M. N.
January 2001

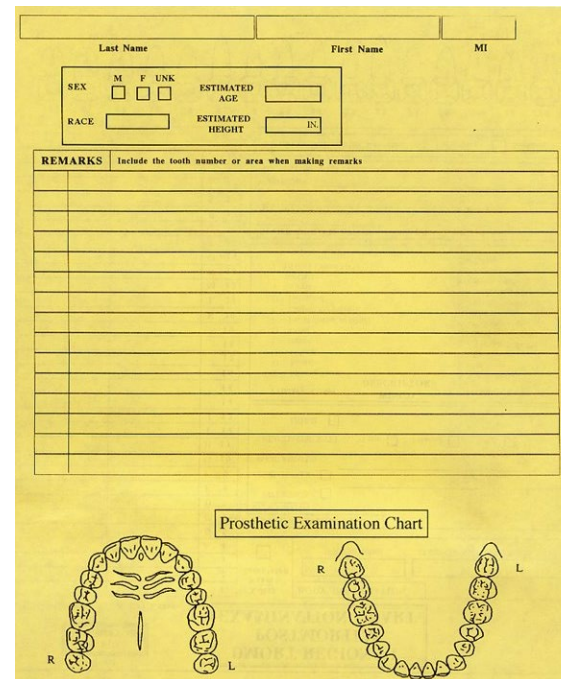
Photos by RM Scanlon, DMD

How Do We Accomplish a Forensic Dental Identification

- Accurate charting of the postmortem dental remains of the victim



The form is titled "POSTMORTEM DENTAL IDENTIFICATION CHART". It features a dental arch diagram at the top with teeth numbered 1-16 from right (R) to left (L). Below the diagram are sections for "WIND DESCRIPTORS", "Clinical Exam", "X Ray Exam", "BODY INFORMATION", "IMAGING INFORMATION", "WINDS DESCRIPTORS", and "CHART VERIFICATION". The "WINDS DESCRIPTORS" section includes a legend for Primary Codes (X-Missing Tooth, M-Metal, O-Occlusal, J-Incisor, D-Distal, K-Facial, L-Lingual, U-Usurped, V-Virgin, N-No Data, J-Missing Crown MPD) and Secondary Codes (A-Amputation, B-Deciduous, C-Crown, E-Composite Resin, G-Gold or cast metal, H-Porcelain, N-Non-Precious, P-Plastic, R-Rest cast (fill), S-Silver Amalgam, T-Denture teeth, Z-Temporary).

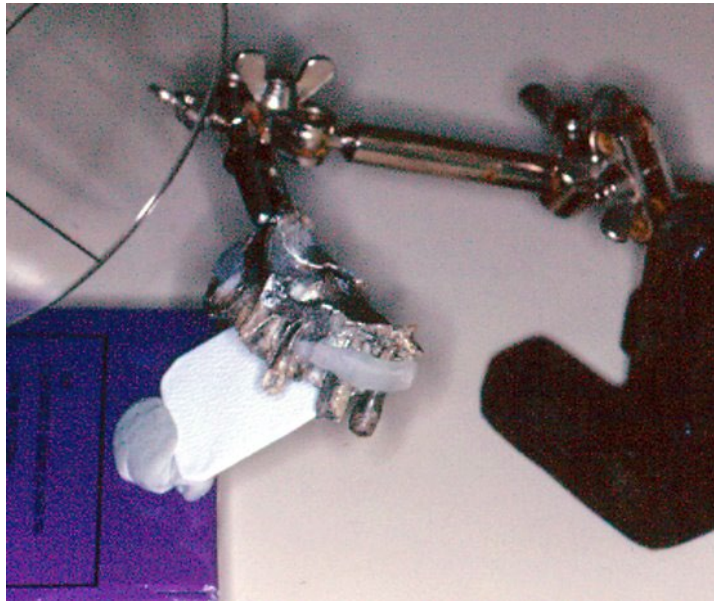


The form is titled "Prosthetic Examination Chart". It includes fields for "Last Name", "First Name", and "MI". Below these are checkboxes for "SEX" (M, F, UNK) and "ESTIMATED AGE", and checkboxes for "RACE" and "ESTIMATED HEIGHT". A "REMARKS" section is provided for notes, with a note to "Include the tooth number or area when making remarks". At the bottom, there is a dental arch diagram with teeth numbered 1-16 from right (R) to left (L).



How Do We Accomplish a Forensic Dental Identification

- Accurate postmortem charting of the dental remains
- Radiographic documentation of the postmortem dental remains



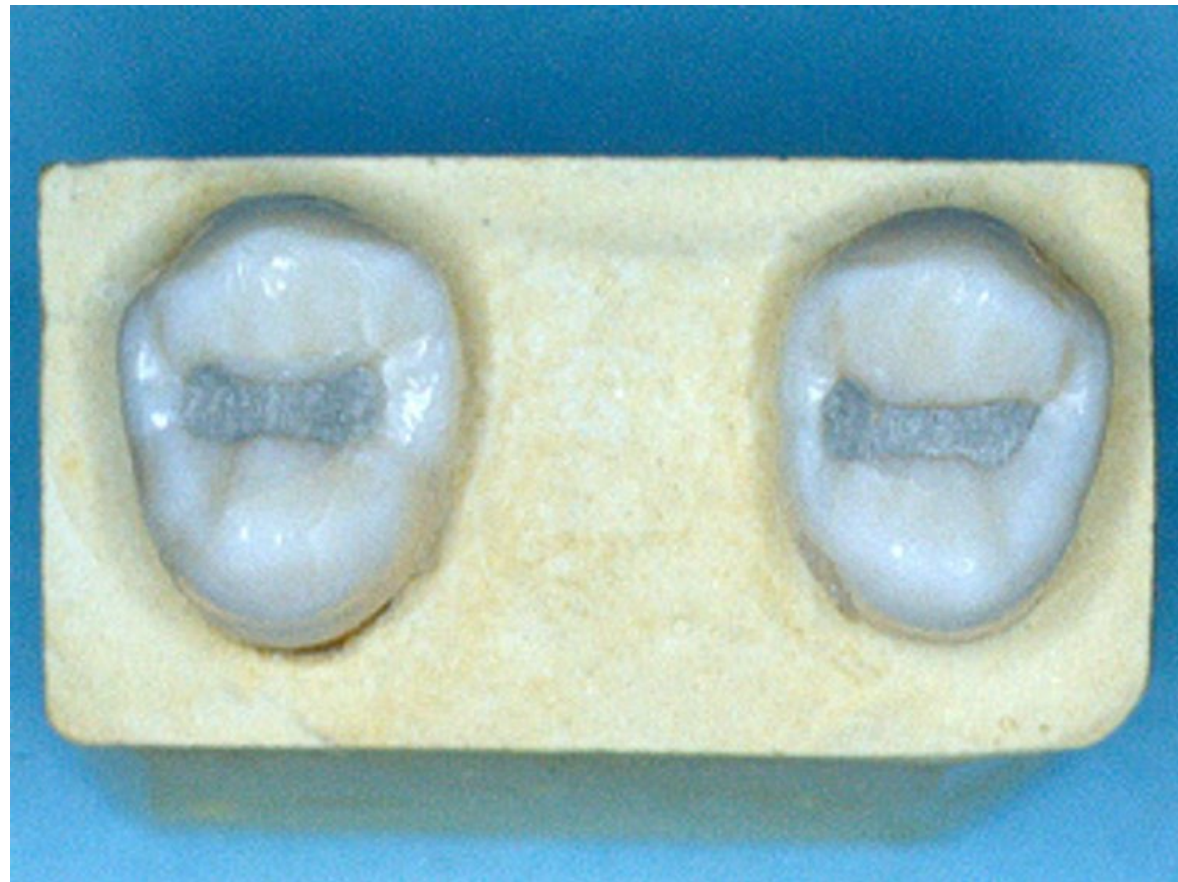
Dental Identification Nomenclature

- **EXCLUSION** – when error has been ruled out and a dentally impossible situation exists between the antemortem and postmortem records.
- **POSSIBLE IDENTIFICATION** – no unexplained discrepancies exist, the antemortem and postmortem data have consistent features, but either the antemortem or postmortem information is of poor quality, missing or incomplete to positively establish a positive dental identification.

Dental Identification Nomenclature

- **POSITIVE IDENTIFICATION** – antemortem and postmortem dental data match in sufficient detail to establish that they are from the same individual, and there are no unexplained discrepancies.
- **INSUFFICIENT EVIDENCE** – available information is insufficient to form a conclusion.

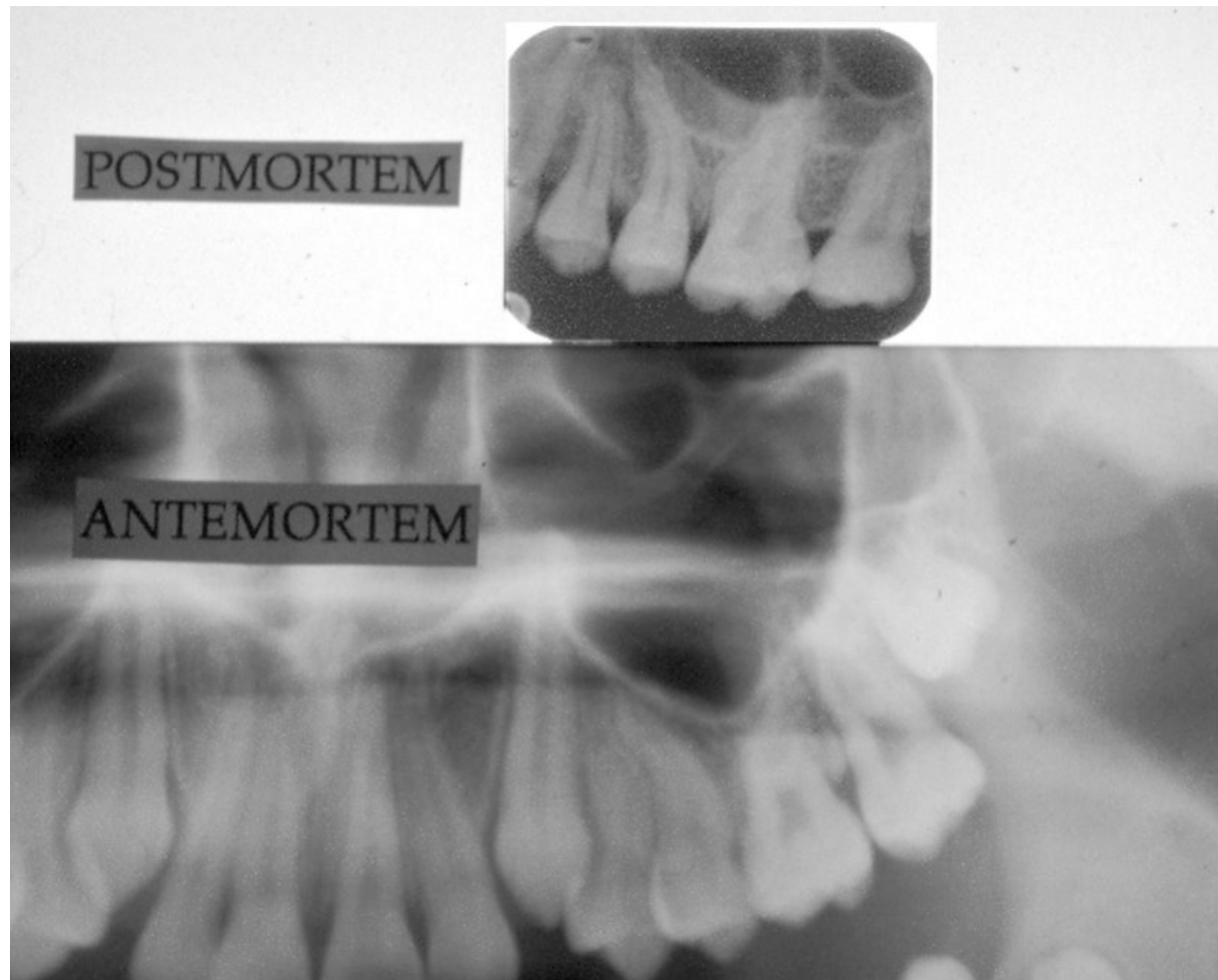
Dental “Fingerprints”



Comparison With No Restorations



Radiographic Comparison



Photos by RM Scanlon, DMD

Radiographic Superimposition





Dental Identification Case Example

Somerset County

“Second Opinion” Case

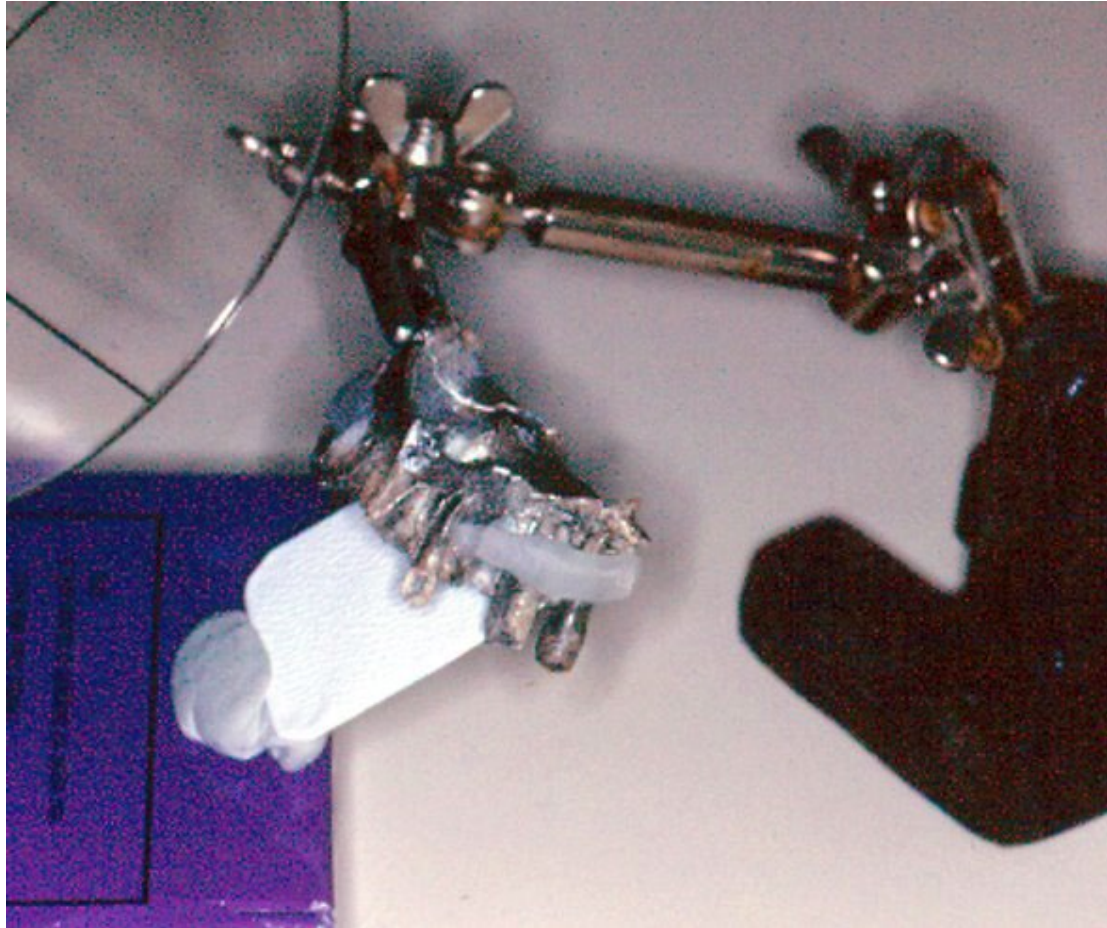
In October 1996, I was contacted by Pennsylvania State Police and requested to examine human dental remains excavated from a fire pit in Somerset County. The remains were believed to be those of a female homicide victim.

The remains were recovered by a team of forensic anthropologists.

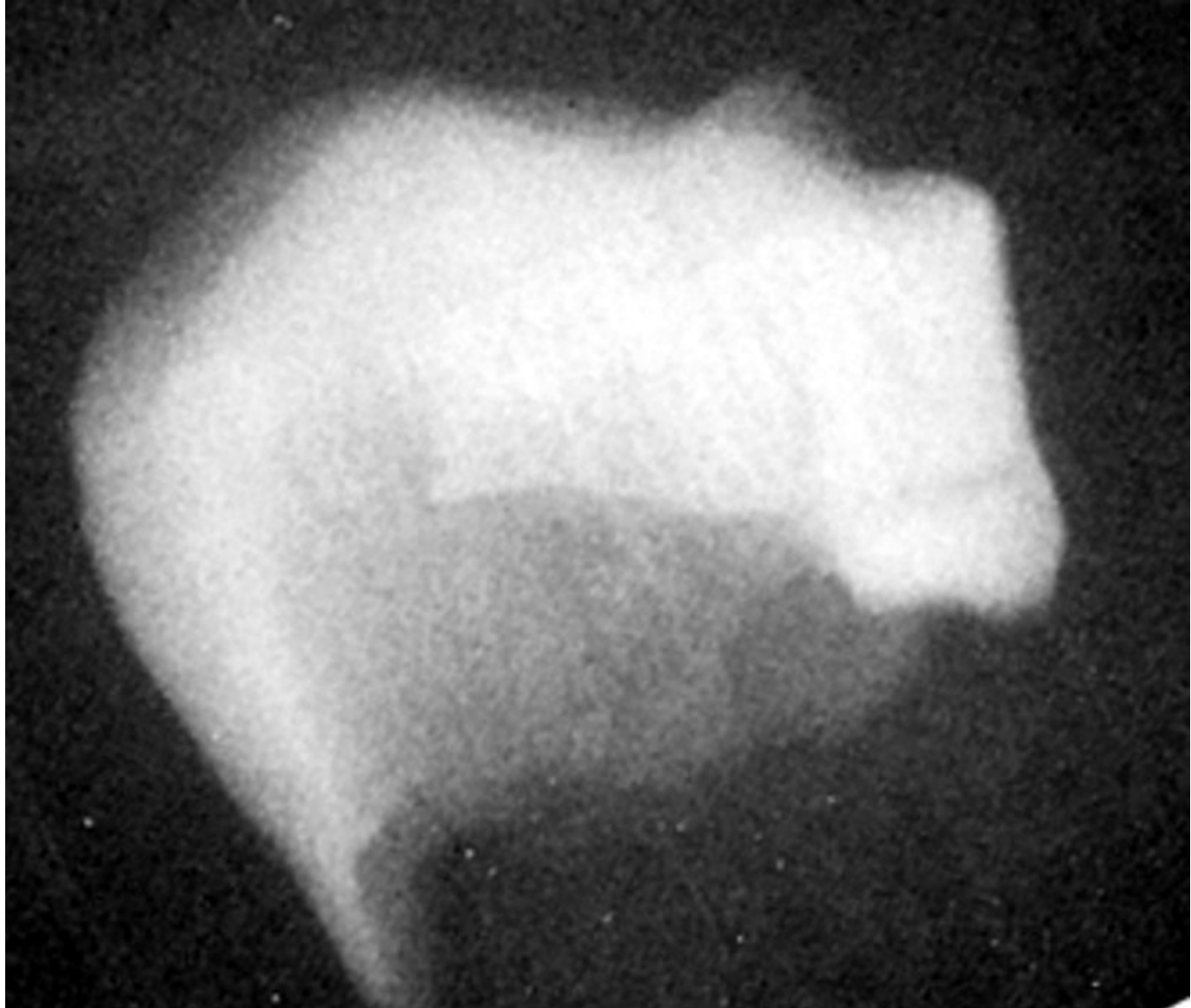
An initial forensic examination of the remains was made, but the odontologist had concluded that the remains were not of the probable homicide victim.



Remains were radiographed and photographed in various positions, at least 10 times per fragment.



Photos by RM Scanlon, DMD





From these radiographs, comparisons were made to the antemortem radiographs of the probable victim.

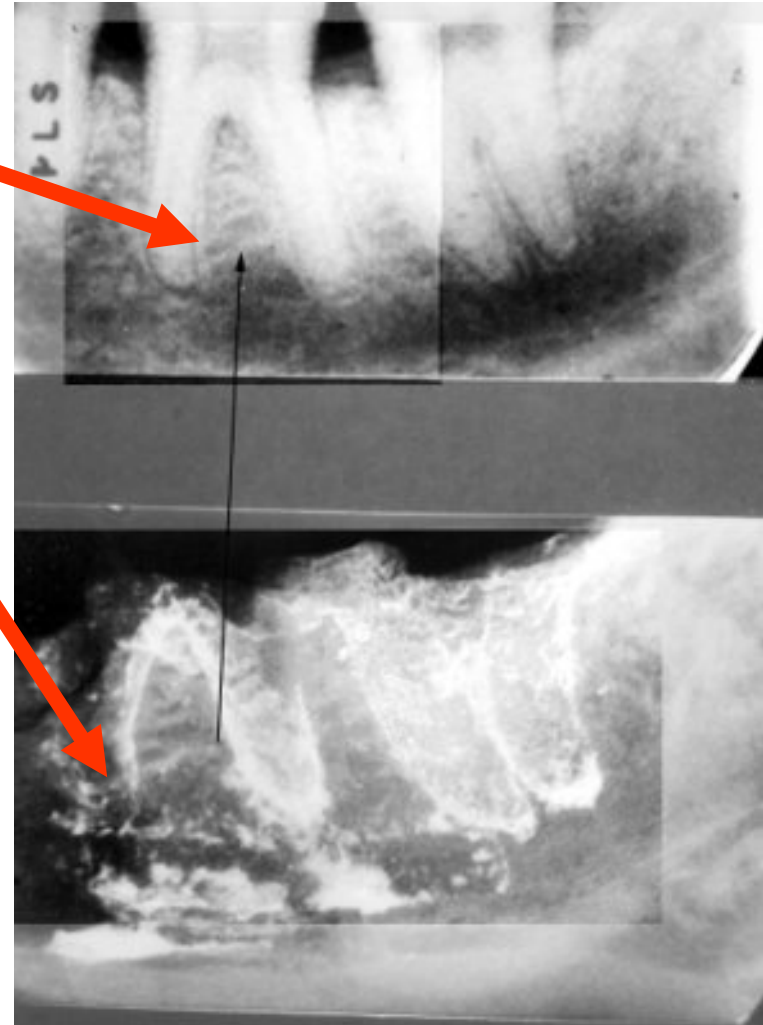
Maxillary Bicuspid



Photos by RM Scanlon, DMD

Mandibular Left Molar Area

Even in the absence of teeth, the bone patterns or trabeculae patterns will have distinct patterns. In addition, an analytical comparison of the positions of the roots was accomplished.



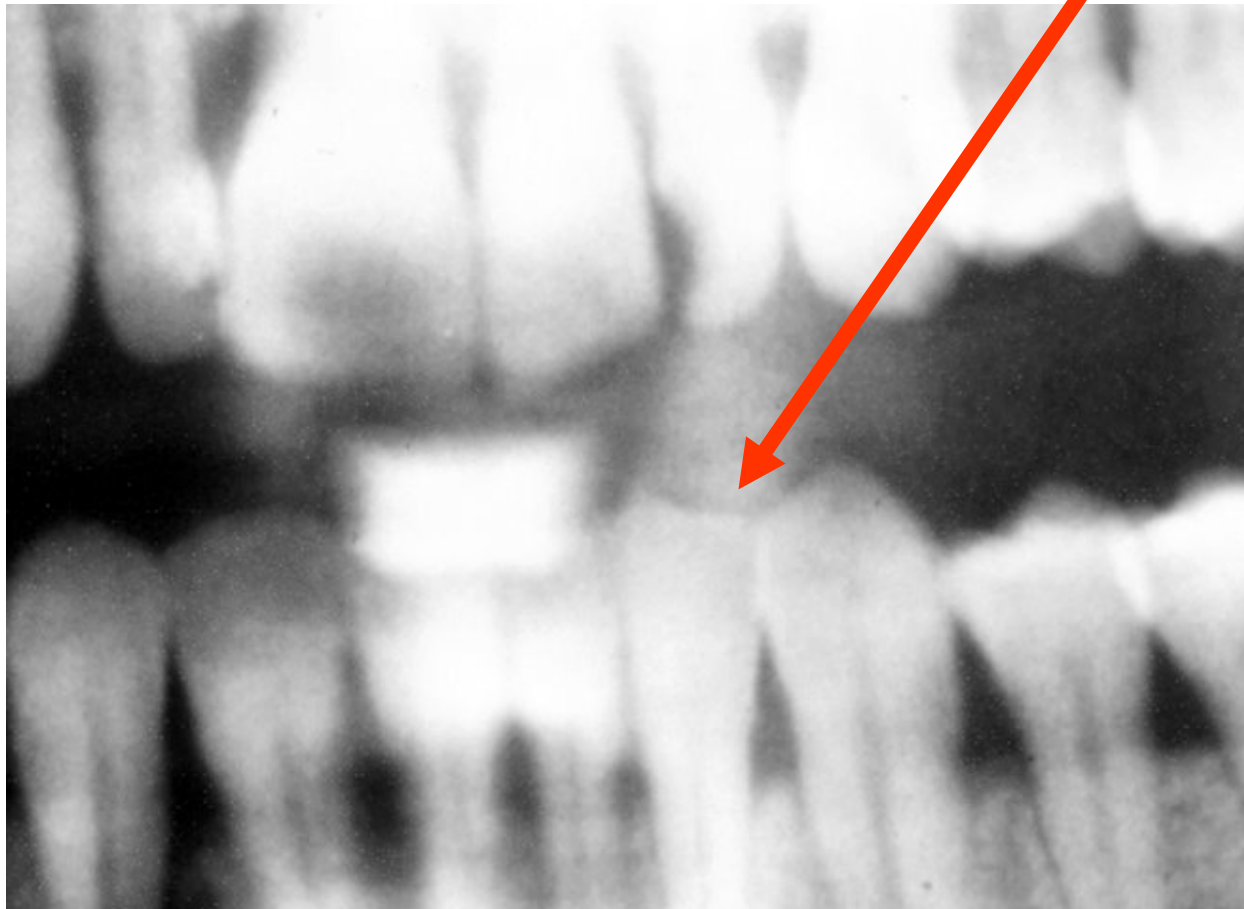
Photos by RM Scanlon, DMD

Mandibular Anterior Incisor



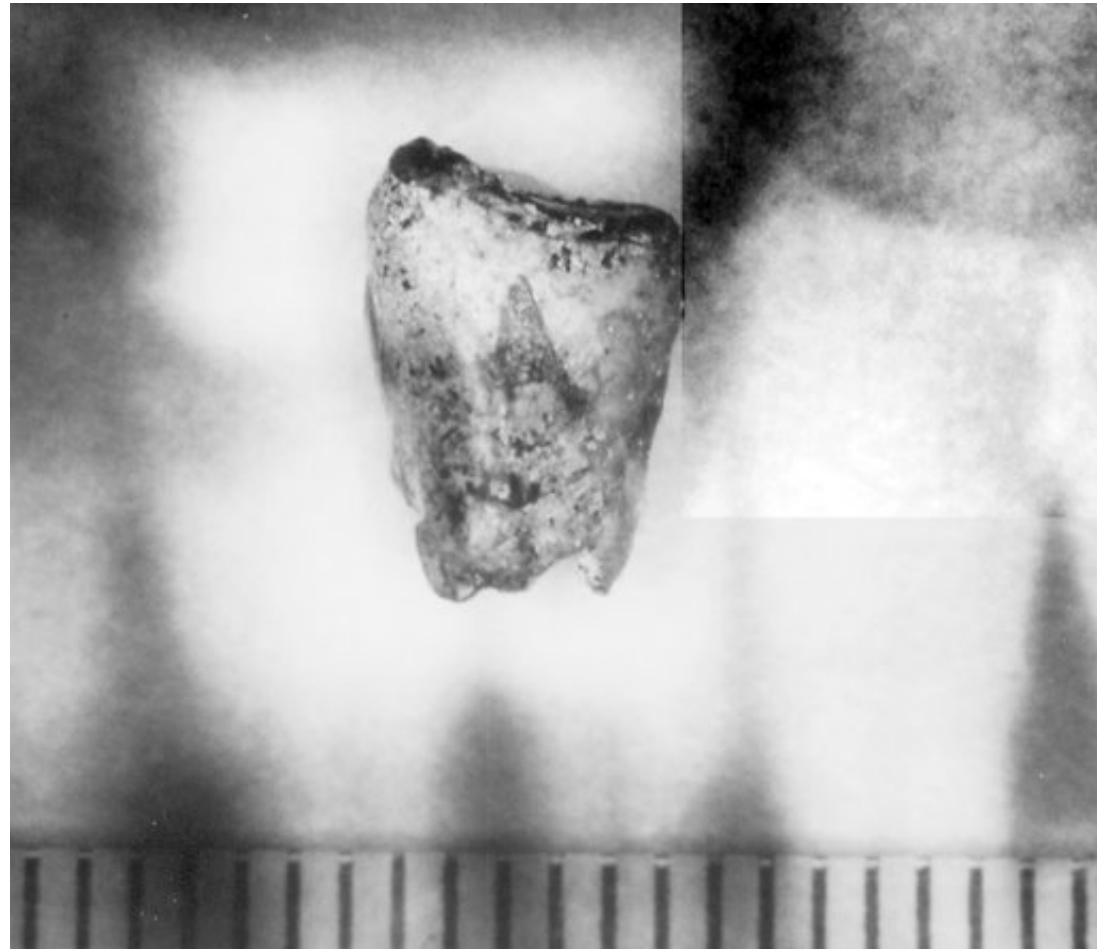
Photos by RM Scanlon, DMD

Mandibular Anterior Incisor



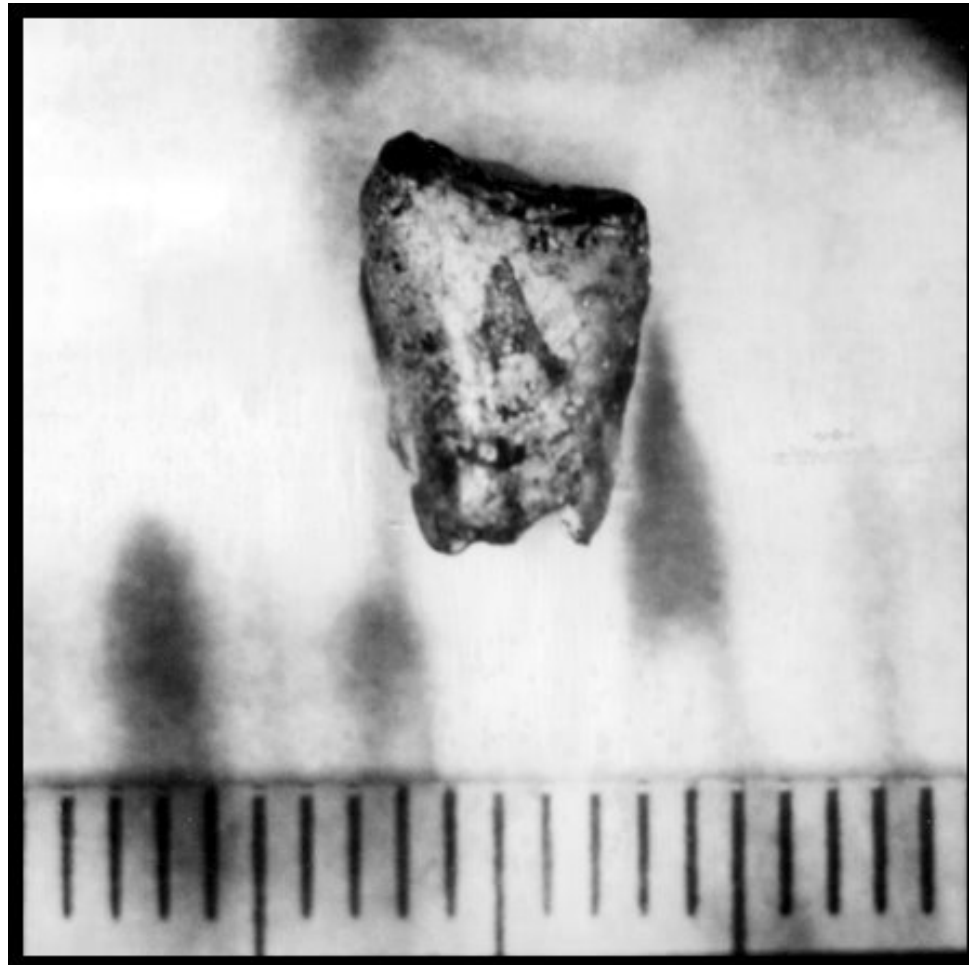
Photos by RM Scanlon, DMD

Mandibular Anterior Incisor



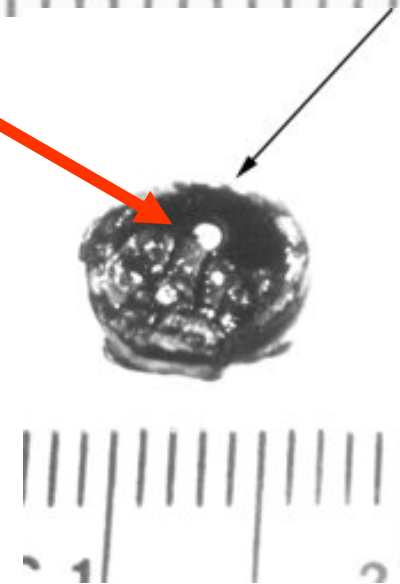
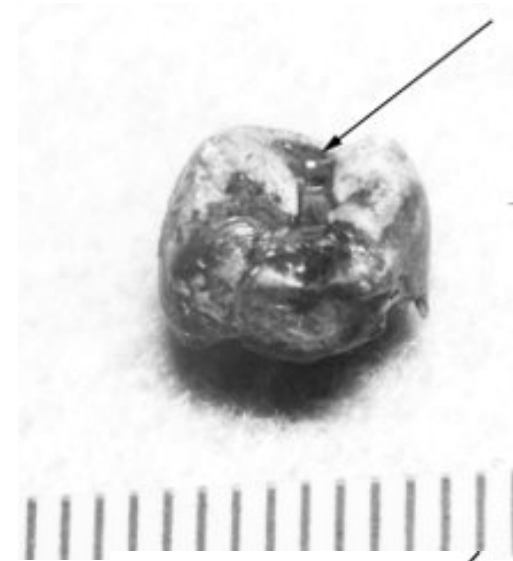
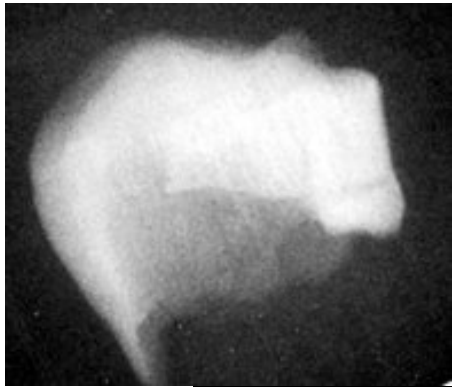
Photos by RM Scanlon, DMD

Mandibular Anterior Incisor



Photos by RM Scanlon, DMD

Mandibular Left Bicuspids



Photos by
RM Scanlon,
DMD

Forensic Conclusions

- Each of the individual areas of consistency may in of themselves not be sufficient to merit a positive identification.
- However, taken together they represent a unique and accurate determination of a positive identification.
- I presented my final report and other evidence, the defense stipulated to the identification and plead the case two days before trial.

Forensic Dental Identification Summary

- Accurate, reliable, inexpensive, timely and legal process of identification if completed correctly.
- Be certain as to the credentials of your odontologist (dentist). Get a second opinion if concerned. It's your case and reputation.
- Be certain the odontologist is current with new techniques, completes a radiographic survey on every case and submits a detailed report, preferably with graphic comparison of the points of dental and anatomical concordance.

Bitemark Evidence

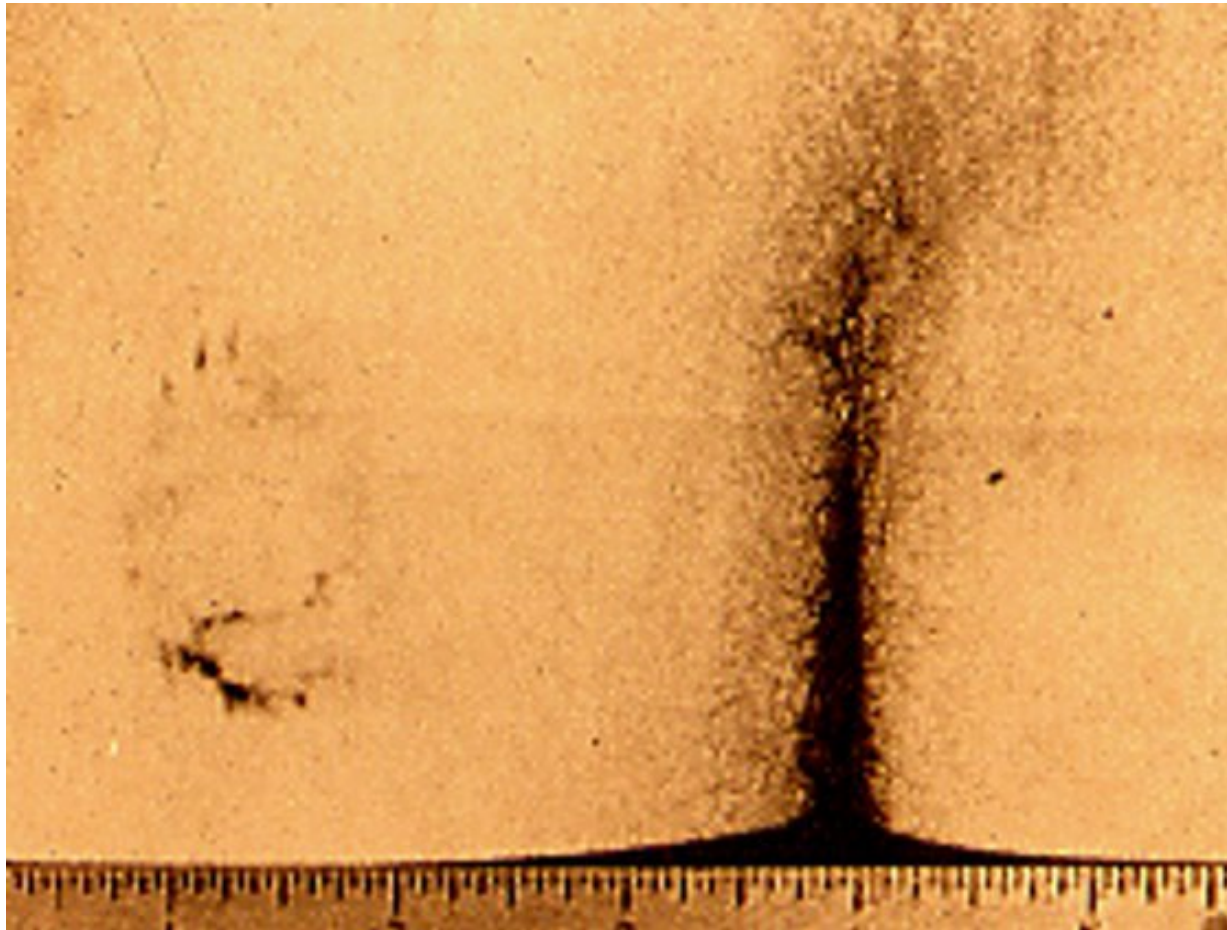
Forensic Odontology's VIP of Bitemarks



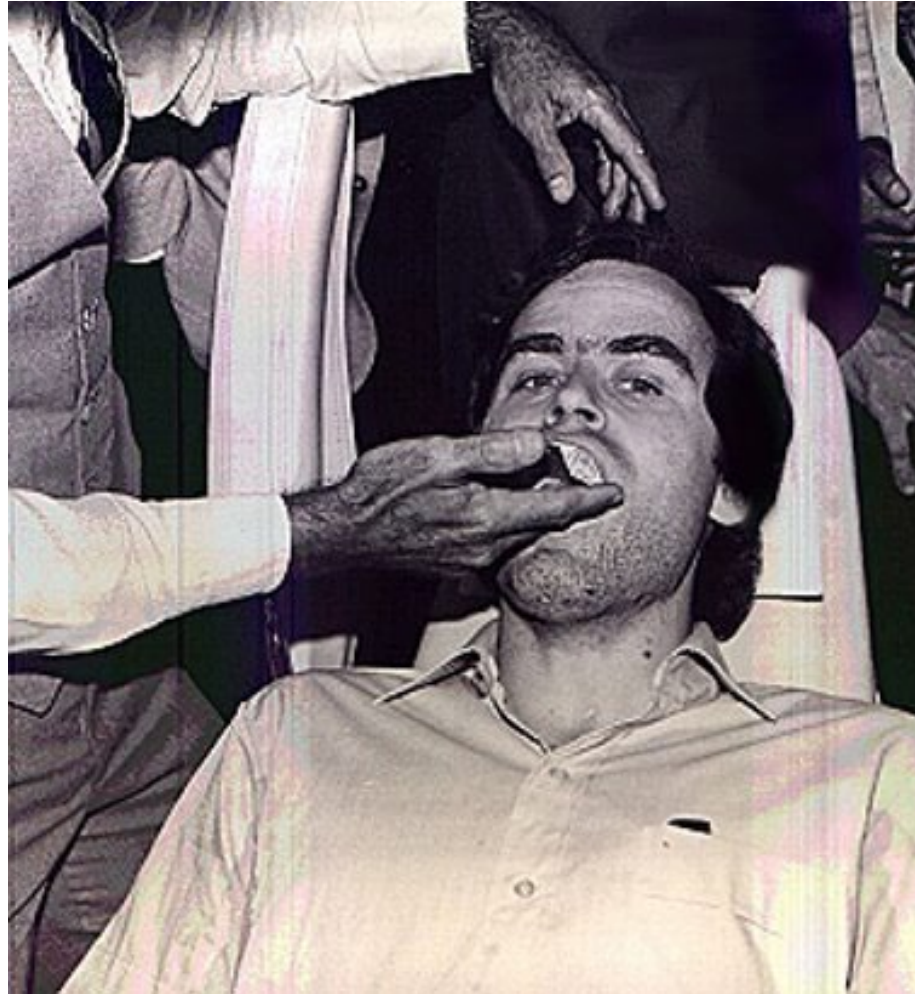
Ted Bundy and Bitemark Evidence



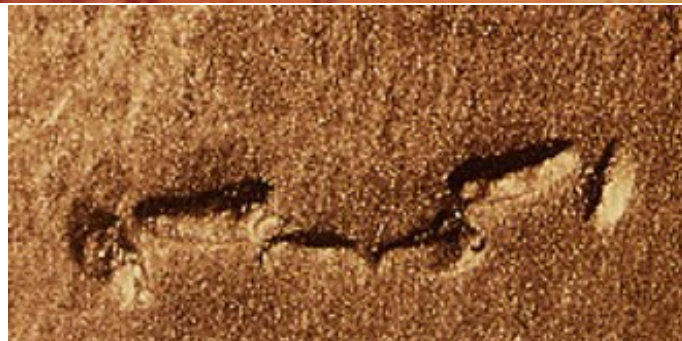
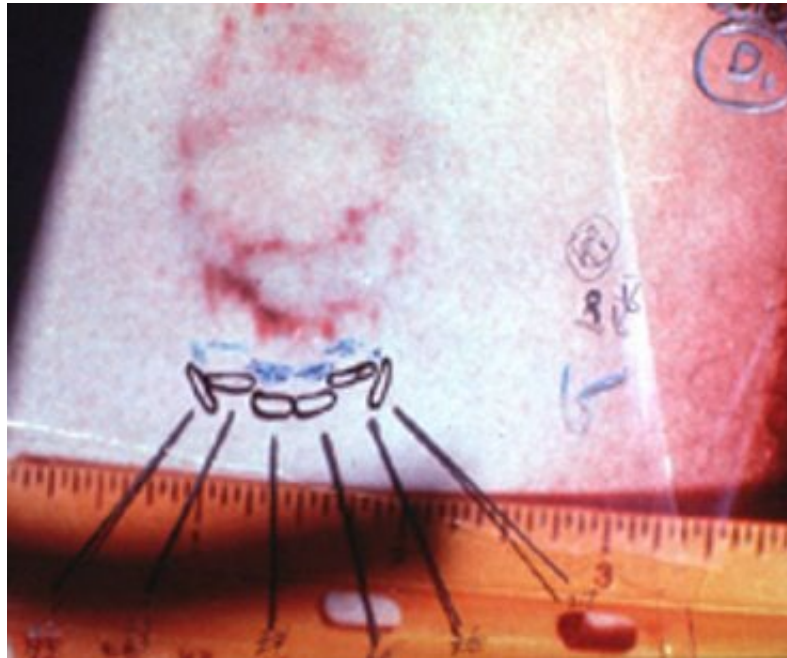
Ted Bundy and Bitemark Evidence



Ted Bundy and Bitemark Evidence



Ted Bundy and Bitemark Evidence



Ted Bundy and Bitemark Evidence



Ted Bundy and Bitemark Evidence

Serial killer put to death

By DAVE VON DREHLE
Knight-Ridder Newspapers

STARKE, Fla. — The terrible life of Theodore Robert Bundy came to an end as the sun rose Tuesday. The serial killer now linked by the FBI to as many as 50 murders nationwide was electrocuted at Florida State Prison.

Prison doctor Frank Kilgo pronounced Bundy dead at 7:16 a.m.



BUNDY

It was the final page of a violent saga that gripped America for over a decade. The name that became a shorthand for the slow, choking inefficiency of capital punishment was entered on a death certificate by a Gainesville coroner — nine years and 177 days after Bundy was sentenced to death for the 1978 murders of Margaret Bowman and Lisa Levy at a sorority house in Tallahassee.

But that sentence was not the one carried out on Tuesday. Bundy died because he kidnapped, raped and mutilated Kimberly Diane Leach, a 12-year-old Lake City girl.

What is a Good Bitemark?



Bite Mark Evidence Collection Pitfalls

- Low resolution digital photo
- No scale present
- No impression taken
- Angulation is not ideal for analysis
- No saliva swabbing



Photos by RM Scanlon, DMD

Good Bitemark - Fair Evidence Collection



Good Bitemark - Good Evidence Collection



What Makes a Good Bitemark Evidence?

- RECOGNITION, RECOGNITION, RECOGNITION!
- Teeth with minimal unique features, and the size of the population of possible perpetrator.
- Good Photography – color, high resolution, black and white, proper scale, angulation.

Common Anatomical Locations of Bitemarks

- Sexual assaults – Breast, inner thigh, penis, vaginal area, shoulder, back, hands, arms and face.

Common Anatomical Locations of Bitemarks



Common Anatomical Locations of Bitemarks

- Child Abuse – Hands, arms, legs, back, face, and genital area.

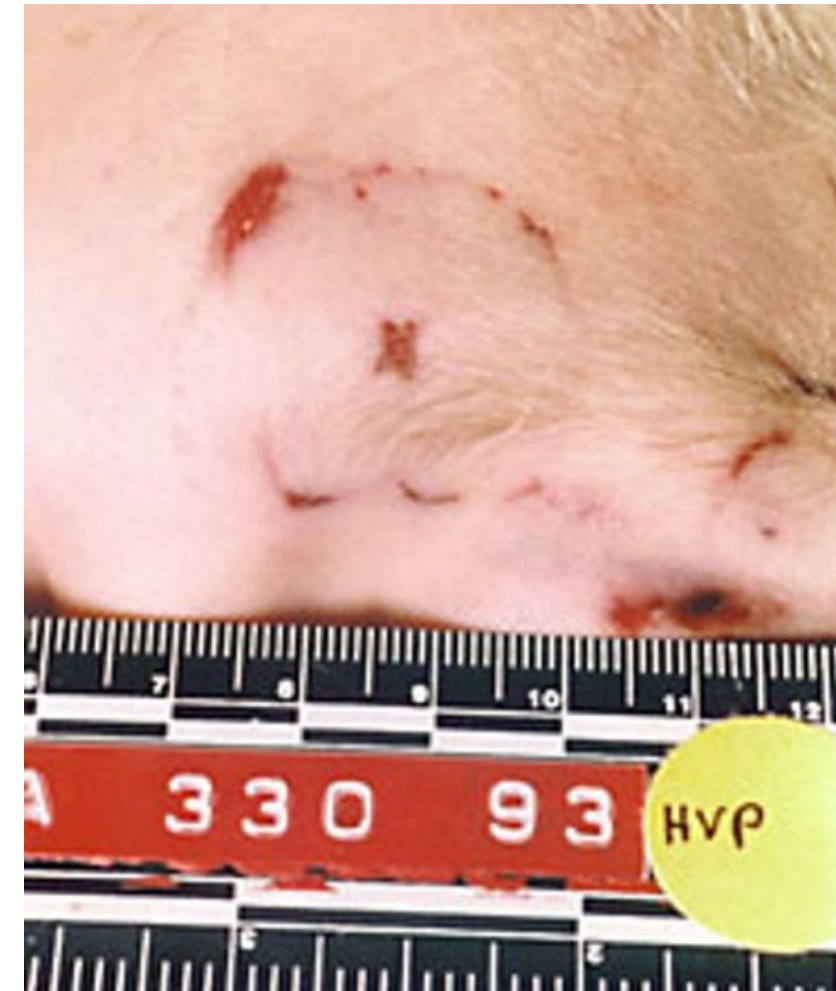
Common Anatomical Locations of Bitemarks



Common Anatomical Locations of Bitemarks

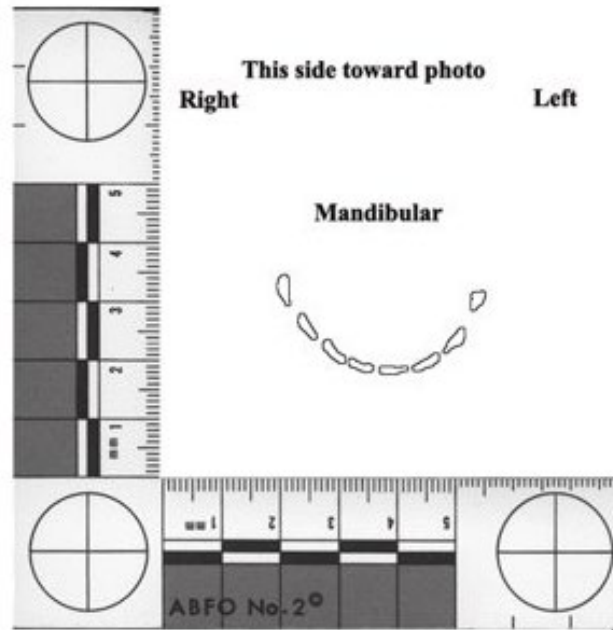
- Defensive wounds – Hands, arms, shoulder, breast, face.

Common Anatomical Locations of Bitemarks





Maxillary



Bite Mark Evidence Summary

- Know locations and types of deaths associated with bite marks.
- Call an odontologist first!!!
- Take multiple high resolution color photographs with a scale.
- If no blood present, collect potential saliva from bite mark area.

Bitemark Evidence

- Computer analysis of the bitemark and potential perpetrators teeth.
- Second opinion on all bitemarks should be a forensic standard.
- Bitemarks are very subjective evidence and should be treated as such.
- Take impressions of the bitemark if relevant.



Bite Mark Cases

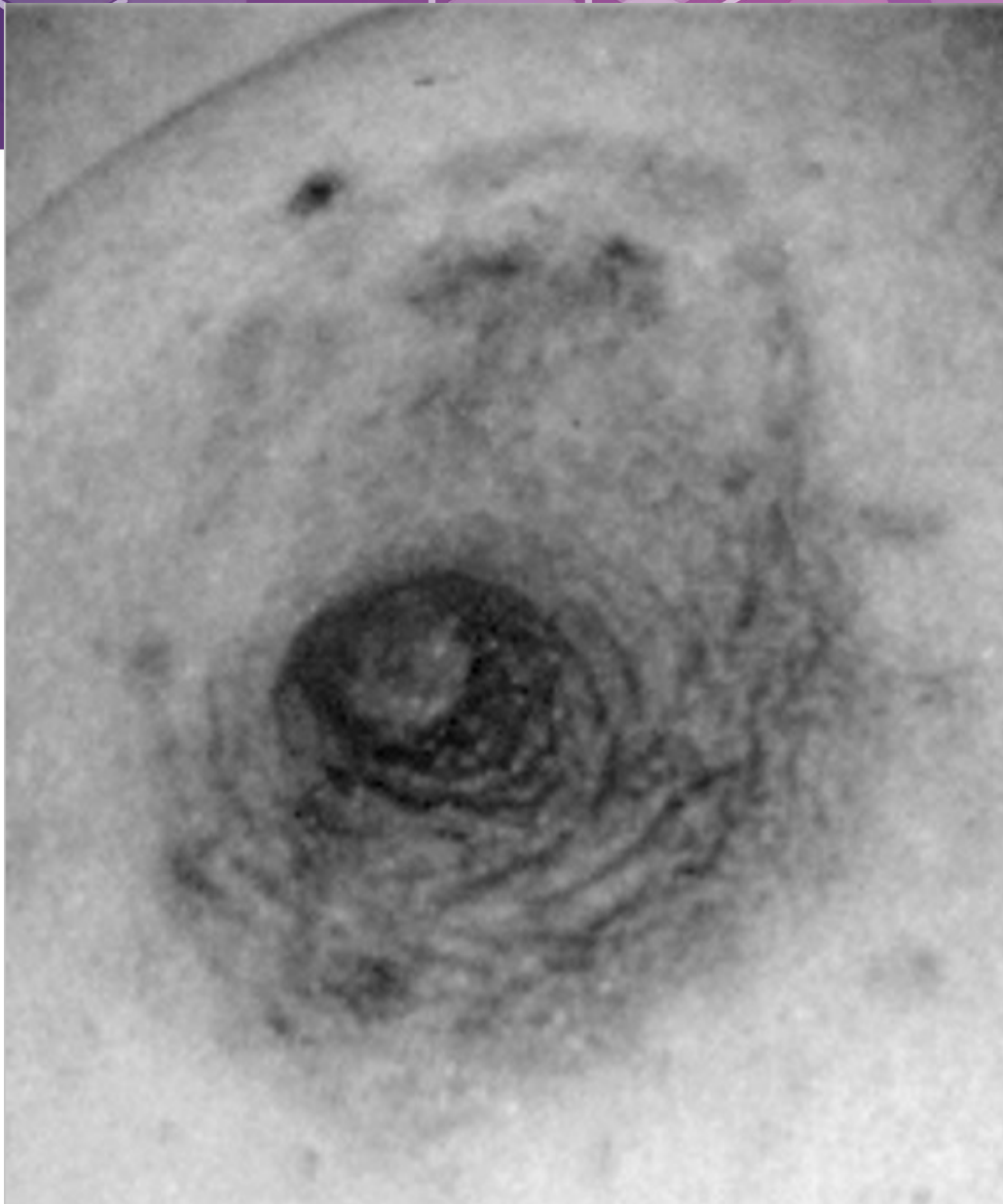
26-year-old woman attacked and strangled from behind.

When awoke, had been sexually assaulted and did not see her attacker. Bite not noticed during the rape examination.

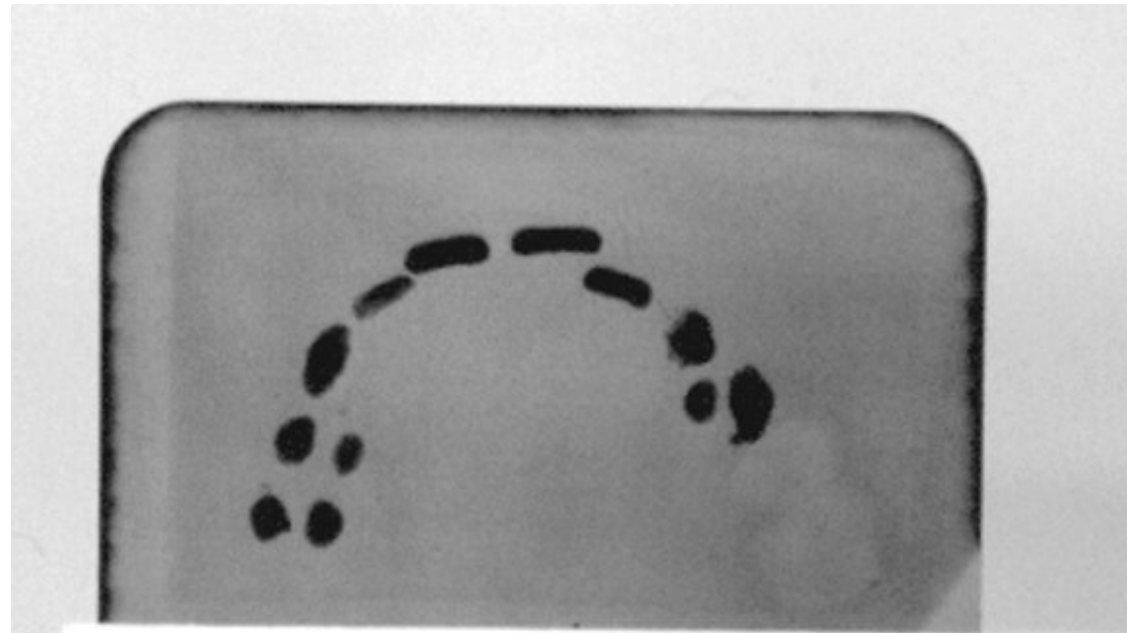
Seen subsequently on review of the photographs.





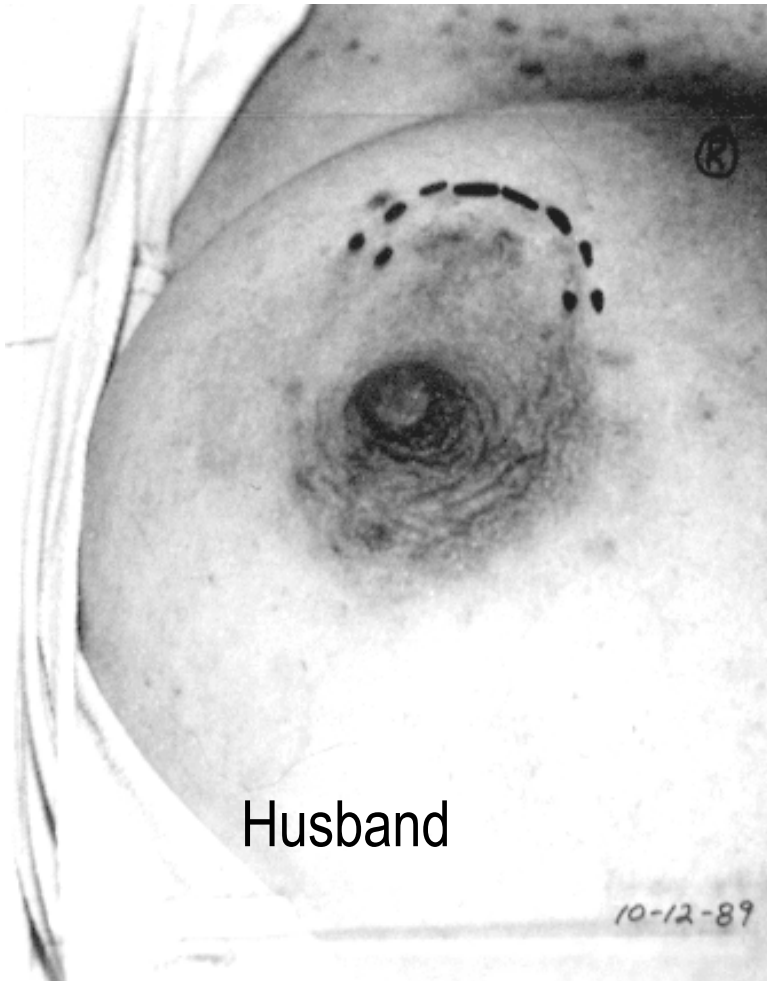


Radiographic Overlay



8/28/89
17:58 Dr. Scanlon
Radiographic Overlay bites

Overlay Comparison



Overlay Comparison

Gibb convicted in assault of woman

By TOM KNARR
Senior reporter

LEWISTOWN — Dale Gene Gibb lowered his head to the table in Mifflin County Court Wednesday evening as a guilty verdict was read aloud by the jury foreman.

His head was not raised until Judge Francis A. Searer informed him of his right to an appeal.

Gibb, 24, of 64½ Logan Street, Lewistown, was found guilty of attempted rape, indecent and aggravated assault, burglary and criminal

trespass.

The verdict of the nine-woman, three-man jury concluded that Gibb forcibly entered the Tri-County Mental Health and and Mental Retardation Center the morning of June 27 and assaulted a 26-year-old McVeytown woman who was working at the center.

Gibb, handcuffed and mumbling obscenities, was led out of the courtroom by guards after being found guilty. A small scuffle between the guards and Gibb occurred

in the hallway outside the rear entrance of the courtroom.

Gibb still faces charges of attempted homicide, aggravated and indecent assault and robbery in connection with the assault and stabbing of a female store clerk at the West Fourth Street, Lewistown, Uni-Mart.

The 23-year-old Lewistown woman was stabbed, assaulted and robbed about 3:30 a.m. on June 20.

District Attorney Timothy Searer said in a recent interview that Gibb

is expected to go to trial on Jan. 1 for the Uni-Mart charges.

The woman assaulted at the Green Avenue, Lewistown, center was hospitalized for 36 hours for treatment of injuries she suffered as a result of the beating.

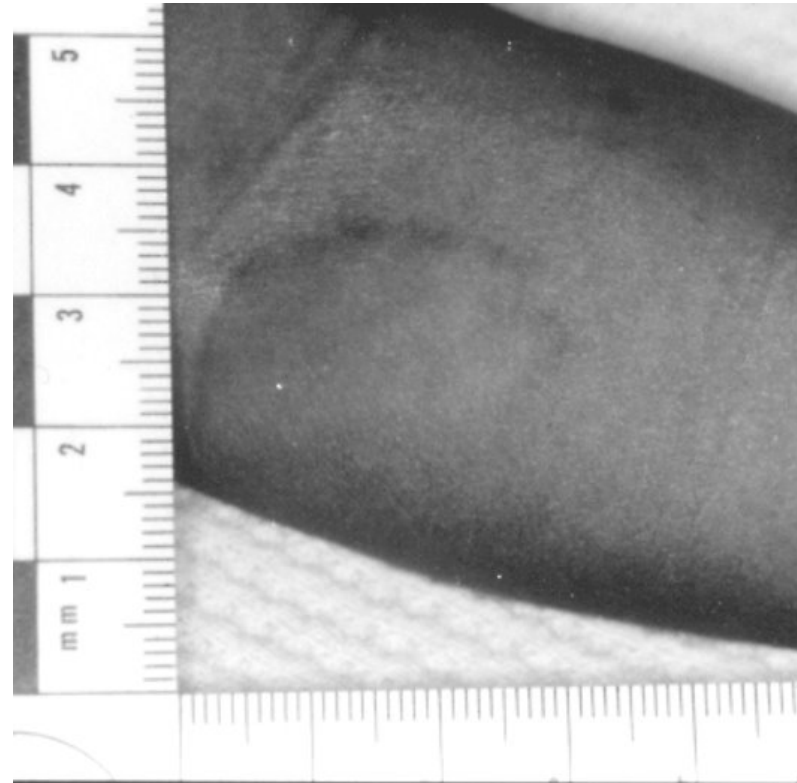
Among several bruises to her head and face, testimony indicates that the woman's left breast was bitten by Gibb.

Lewistown dentist Dr. Richard Scanlon, who was considered by the court as an expert witness in foren

19-month-old child admitted to the hospital following an accidental injury



19-month-old child admitted to the hospital following an accidental injury



13-month-old infant found with multiple bite marks by pediatrician

Pennsylvania State Police



**Photograph resized to 1:1
Richard M. Scanlon 5/31/01**

Bitemark Summary

- Recognition is the most important aspect of bitemark evidence.
- Proper photography is the best method for collection of evidence...USE A SCALE!!!!
- Bitemarks are not always conclusive. Less than 10% may yield a perpetrator.
- Beware of inexperienced odontologists.
- Salivary evidence is an excellent and inexpensive forensic tool.

The Bitemark Controversy

Admissible Evidence or “Junk Science”?



*“Strengthening Forensic Science in the United States: A Path Forward”
National Academy of Science, August 2009*

“Collection of bite mark evidence are relatively noncontroversial, but there is considerable dispute about the value and reliability of the collected data for interpretation.”

“The committee received no evidence of an existing scientific basis for identifying an individual to the exclusion of all others.”

Modern Scientific Evidence: The Law and Science of Expert Testimony

“No government entity has ever reviewed the validity of bite mark evidence.”

“Bite mark analysis has never passed through the rigorous scientific examination that is common to most normal sciences.”

The Innocence Project

Three studies have examined the reliability of bite mark analysis.

“One showed an error rate of 90%, another conducted by the ABFO had a 63% error rate and another study reported an 11.9% – 22% error rate, concluding that the “poor performance” is cause for concern because it has “very serious implications for the accused, the discipline, and society.”

Recent Study of Wrongful Convictions

“44 bitemark comparisons (associated with 34 case errors) are clear examples (of forensic errors), although most bitemark examiners in wrongful conviction cases were certified by the American Board of Forensic Odontology.”

Morgan, John, Wrongful convictions and claims of false or misleading forensic evidence. *Journal of Forensic Sciences* (2022) May, 68(3) 908-961

Recommendations for Bite Mark Investigations

- Determine if a human bite mark.
- Is the bitemark data valid scientifically?
- Is an odontologist available for analysis?
- Does the bite mark evidence have evidentiary/investigative value?
- Will the prosecution wish to use bite mark evidence?

The National Personnel Records Center (NPRC)



2.3 million square feet of records are archived at the NPRC and available, if need to assist a veteran or his family.



Searching for Cold Case Military Records

- The National Archives at St. Louis holds the individual civilian and military medical and dental records of millions of Americans who served the United States Government as members of its civil and military services over the past 150 years.
- It also contains medical and dental records for military dependents that received treatment at military facilities.
- These archived records include medical, dental records and radiographs and may include fingerprints.



Request to the National Personnel Records Center – NPRC

These personnel records are available upon request to law enforcement agencies and medical examiners and coroners to facilitate forensic identifications.

Check NCIC for Military Information

NCIC entry may have information as to military service.
MNU is Miscellaneous number.

- MK//MISSING PERSON INVOLUNTARY
- ORI/VANIS2002 NAM/ , SEX/M RAC/W POB/MN
- DOB/19730824 HGT/603 WGT/200 EYE/BLU HAI/BLN CTZ/US
- **MNU/NS-470882431** SOC/ 2431
- OLN/S162085745660 OLS/MN OLY/1998
- MNP/MP DLC/19961020 OCA/SWND-M-SBR-017
- VLD/20140204 VLN/ LAWRENCE A NOA/N
- MIS/290CT96-SDND-0778-7MNA/C - IF LOCATED/FOUND, CALL 1-877-579-3648 OR THE
- MIS/NEAREST NCIS FIELD OFFICE; FORMER HT3,USNAVY-LAST SEEN ABOARD USS HARPERS
- MIS/FERRY (LSD-49) WHEN PASSED BTWN HAWAIIAN ISLANDS OF KAUAI AND NIIHAU
- FPA/N
- DNA/Y DLO/CODIS VIA US ARMY CRIMINAL INVESTIGATIONS LAB USACIL
- ORI IS US NAVAL CRIMINAL INVESTIGATIVE SERVICE HQ 571 305-9438
- IMN/I397555396 IMT/I
- NIC/M975776243 DTE/19961105 0000 EST DLU/20140204 1120 EST
- IMMED CONFIRM MISSING PERSON STATUS WITH ORI

AF – Airforce

AS – Army and National Guard

CG – Coast Guard

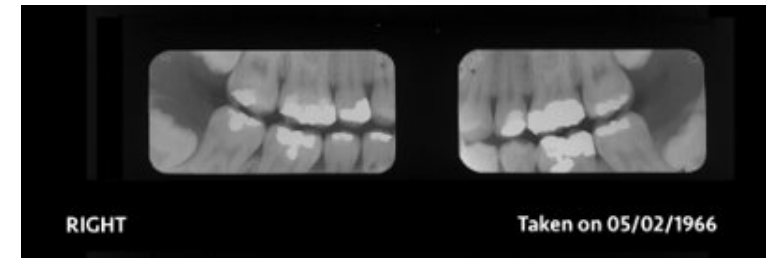
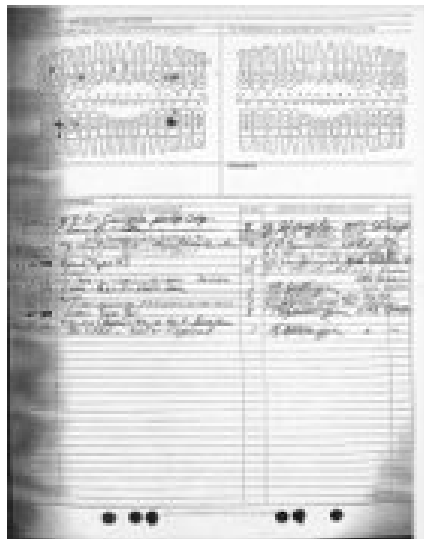
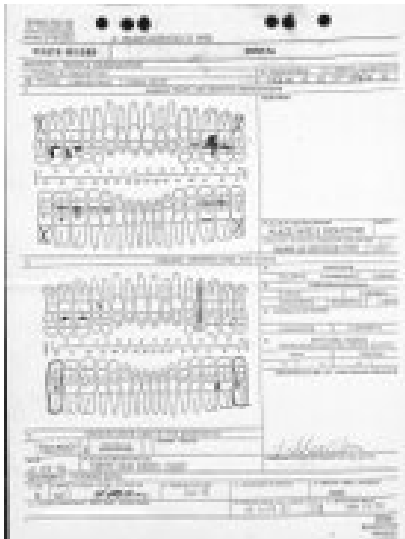
MC – Marine Corps

NS – Naval Service

Cold case squad resolves 47-year-old missing person from Jefferson County, Washington

- Cold case investigator Detective Sgt Gebo contacted NamUs for assistance, as the missing person had no dental records and yet the remains found in 1975 did have dental records. DNA of the unidentified bones was recommended.
- He explained that unfortunately, due to the exposure of the remains, and minimal familial DNA pedigree of the missing person, the DNA comparison was inconclusive.
- He asked what if anything we could do to help. I requested he retrieve the NCIC missing entry for the person, and determined he had served in the US Army.

- Dental records, were available and obtained by me from the NPRC, and a tentative identification was made. As per NamUs protocol all records were forwarded to the Washington State Patrol Odontologist Dr. Gary Bell who verified the positive identification of the unidentified remains after 47 years.





Summary

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