Presenter Disclosure

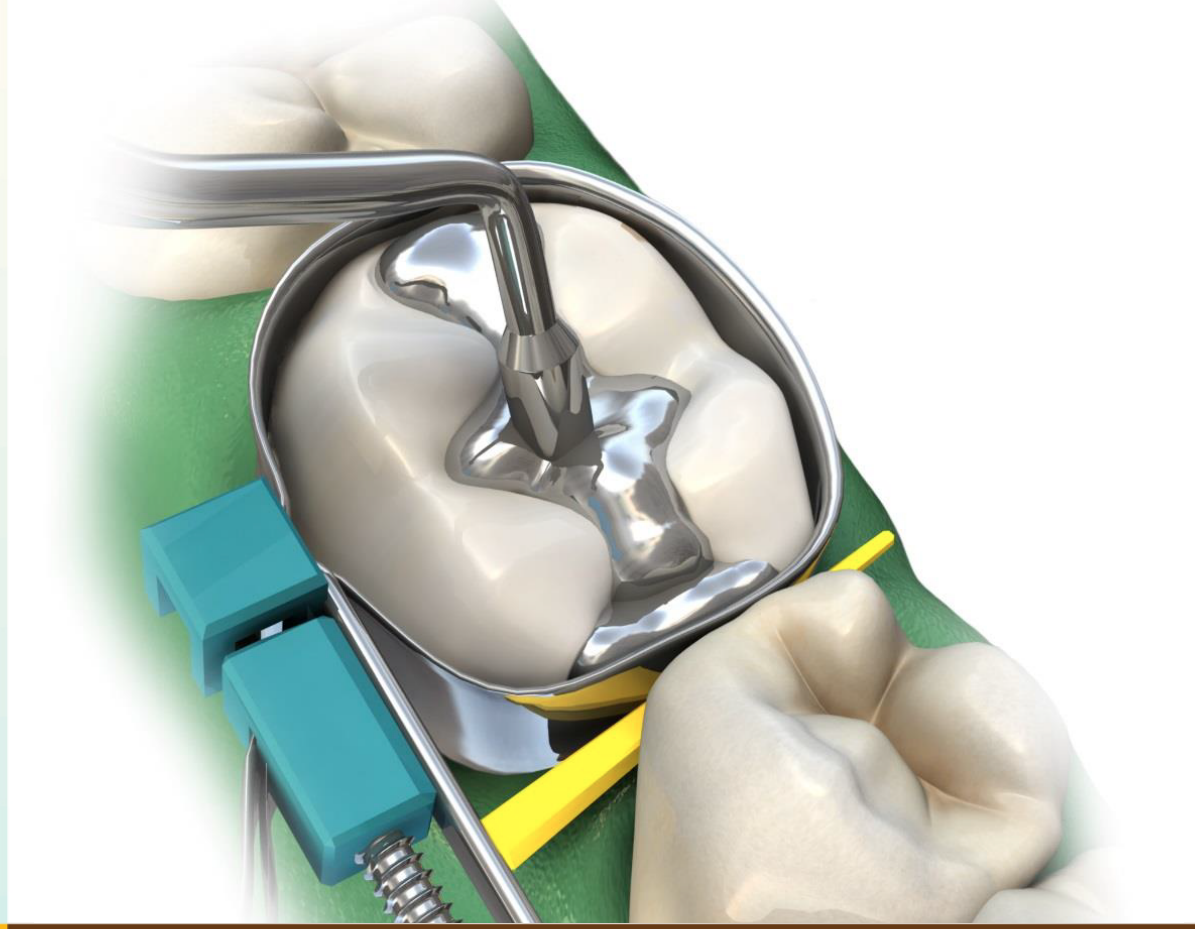
- **Faculty Member:** Dr. Trenna M. Reeve

- **Relationships with commercial interests:**
  - None to report

Disclosure of Commercial Support

- This program has not received any financial support from industry.
- This program has not received any gifts-in-kind from industry.

Forensic Dentistry 101



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Forensic Odontology

- Special thanks for the contributions from
  - Dr. Carla Penner
  - Dr. Noriko Boorberg
  - Dr. Ellen Sim

Outline

Forensic Dentistry

Disaster Victim Identification (DVI)

Ante Mortem

Post Mortem

Reconciliation

Responsibility of dentists in forensics

Forensic Dentistry Definition

- “the branch of forensic dentistry that in the interest of justice deals with the proper handling and examination of dental evidence and the proper evaluation and presentation of dental findings”

C. Adams, Forensic Odontology: An Essential Guide. 1st ed J. Wiley 2014

Forensic Dentistry

- Identification of human remains
- Assessment of bite mark injuries
- Assessment of cases of abuse (child, spousal, elder)
- Age estimation
- Identification in mass fatalities
- Can involve testifying as an expert witness

Bite Mark Analysis

- A physical alteration or representative pattern recorded in a medium caused by the contact of the teeth of a human or animal

Figure 9-8 Manual of Forensic Odontology 5th Ed

Figure 9-7 Manual of Forensic Odontology 5th Ed

Age Assessment

- The processes used to produce an estimation of an individuals chronologic/biologic age using dental data
- Established scientific evaluation processes exist to estimate the chronologic age of an individual
- Used to estimate age at death, narrow search parameters for missing or unidentified
- Humanitarian and immigration application

Identification of Human Remains

- 3 Primary Identifiers
  - Fingerprint
  - DNA
  - Dental Identification
- Additional Methods
  - Anthropologic/radiographic
  - Personal effects
  - Implanted medical devices
  - Visual

History of Forensic Odontology

- 66 AD Agrippina had her soldiers kill Lollia Paulina with instructions to bring back her head
- Unable to positively identify the head upon examination she then used her fingers to look at Lollia Paulina's teeth which were known to have certain distinctive characteristics

- The first use of dental identification of which there is a record

Manual of Forensic Dentistry 5th Ed; D. Senn, R. Weems: CRC Press

The 1850 Webster/Parkman Trial: Dr. Keep's forensic evidence.

Christen AG1, Christen JA.

Abstract

Shortly before two o'clock on a chilly November afternoon in **1849**, the celebrated Harvard physician and surgeon, Dr. George Parkman, left his home on Boston's fashionable Beacon Hill, expecting to return in a few hours. He was never seen alive again. This account describes Parkman's brutal murder and explores the dynamics which preceded this crime. It explains how and why Dr. John White Webster, MD, Professor of Chemistry and Mineralogy at Harvard University, killed Dr. Parkman and unsuccessfully attempted to destroy the physical evidence. Webster's subsequent trial, conviction and ultimate punishment are also detailed. The Parkman-Webster case remains one of the classic murders in the annals of American crime. Compelling dental evidence presented by the famous American dentist, Dr. Nathan Cooley Keep, directly led to the conviction of Dr. Webster. This graphic, ground-breaking case clearly established the viable role of forensic dentistry in legal criminal investigation.

History of Forensic Dentistry

1897 – Bazar de la Charite

- 126 dead
- Mainly aristocratic women
- Identification through clothing and personal effects
- 30 remaining corpses could not be identified, the Paraguayan consul suggested that the dentists of the missing persons be called to chart dentition of the identify the bodies by their dentition
- Identification of charred remains through dental records – The Duchesse d' Alencon

A brief history of Forensic odontology since 1775;R.M. Bruce-Chwatt,J of Forensic and Legal Medicine 17 (2010)

History of Forensic Dentistry

- Dr. Oscar Amoedo considered the Father of Forensic Odontology – thesis entitled “L’Art Dentaire en Medicine Legale”
- Published in Paris in 1898

Forensic Odontology

- ID of human remains resides within the jurisdiction of the Attorney General of Canada
- Delegated to provincial attorney generals, provincial coroner/medical examiner (ME), and then local county coroner/ME
- Local coroners/ME usually ask for assistance from police agencies, pathologists, forensic labs and in some cases forensic odontologists

Coroner System

- Centuries old system found throughout the world in countries that were former British colonies
- Not necessarily a physician
- Prince Edward island and Ontario all coroners by law are physicians
- Generally a legal, medical or investigative background

Medical Examiner System

- Just over a century old and originated in the united states
- Are physicians

Cause vs. Manner of Death

- Cause of death
  - Defined as the disease or injury that initiates the chain of events ending in death

- Manner of death
  - The means by which death occurs
  - Five manners of death
    - Natural
    - Accidental
    - Suicide
    - Homicide
    - Undetermined

Effects of Heat on Permanent Teeth and Dental Materials

- Teeth can withstand temperatures up to 1300C
- Composite resin, compomer, glass ionomer are fire resistant and remain radiopaque although they may shrink and fall out
- Amalgam resistant up to 870C
- Up to 600C composite resin retains its shape
- Endodontic restorations and alloy materials hold their shape
- Gold crowns melt at 870 – 1093C

Effects of Heat on Permanent Teeth

- Crematorium 950–1000C
- Burning car 800-1100C
- House fire 700-900C
- Campfire 400-700C

The Analysis of Burnt Human Remains; C. Schmidt , S.A. Symes, Elsevier 2015

Burned Remains

- Identification using comparison of dental on remaining teeth and frontal sinus pattern with deviated septum

Campobasso C. et al, 2007

Importance of Identification

- Allow families to grieve

- Allow legal processes to occur
  - Wills
  - Insurance
  - Certificate of death
  - Estate transfers

Dental Features Used in Identification of Human Remains

- Teeth present-erupted/unerupted
- Missing teeth
- Tooth type – primary/ permanted/ supernumerary
- Tooth postion
- Crown morphology
- Crown pathology
- Pathological processes/jaw bones
- Root morphology
- Root pathology
- Pulp chamber and root canal morphology/pathology
- Dental restorations
- Periodontium
- PDL morphology
- Maxilla and mandible

Dental Identification

- Restorations have a unique appearance radiographically
- Root canal obturation material
- Other skeletal and dental components also have unique features for comparison
  - Sinus floor pattern
  - Bone trabeculation
  - Shape of pulp/pulp horns
  - Dilacerated root structure

Dental Identification

- Talk about how teeth are resilient

Terminology of Identification

- Positive Identification
- Possible Identification
  - The antemortem and postmortem data have consistent features, but due to the quality of either the PM remains or the AM evidence , it is not possible to positively establish dental identification
- Insufficient Evidence
  - The available information is insufficient to form the basis for a conclusion
- Exclusion

Antemortem
Acquire The Proper Documentation

- Dental chart(s) - original document, radiographs and bills
  - Multiple providers
  - Specialist referrals (orthodontist, endodontist, periodontist, prosthodontist, oral and maxillofacial surgeon)
  - CT of head
  - Medical radiographs of head
- Study models
- Spare prosthetic appliances or items that were not inserted (Night guard etc.)
- Photographs
- Laboratory prescription(s)

Dental Identfication

WARNING*****

- Graphic images
- Sensitive topics

Forensic Odontology

- Often the difference between being able to identify a deceased lays in the hands of the quality and quantity of the ante mortem data collection
- Extremely important and necessary for all dental personnel to support this vital process

Thank you