Chapter 11

Forensic Odontology
Introduction—Objectives

1. Describe the structure of a typical tooth.
2. Compare and contrast permanent and deciduous human dentition.
3. Recognize the value of odontology in forensic investigations.
4. Explain how teeth and craniofacial features are helpful in estimating age, ancestry, and sex.
5. Differentiate between the dentition of humans and other animals.
Ted Bundy

- 1974 - Northwestern U.S.
- College women begin missing at the rate of about one per month.
- No clues until TB failed to stop for police
- Items in his car and apartment lead to his arrest for murdering two women.
- TB escapes to Florida and murders two more women, leaving bite marks on one victim.
- TB arrested again and brought to trial.
Introduction

- **Odontontology**—the study of the anatomy and growth of teeth and diseases associated with the teeth and gums.
- Forensic Odontologist uses knowledge of the teeth to:
  - Identify victims of mass disasters
  - Help police in criminal investigations
  - Verify signs of abuse
Digestion begins in the mouth
- Enzymes in the saliva chemically break down complex carbohydrates into simpler molecules
- Teeth mechanically grind and crush food
- Tooth is divided into three regions
  - **Crown**—above the gum line
  - **Neck**—where crown and root meet
  - **Root**—embedded in in bony socket
Structure & Function of Teeth (Obj 11.1, 11.2)

- **Dentin**—a connective tissue that has *calcified* and gives teeth their basic shape.
- **Pulp**—a softer connective tissue inside the tooth; contains nerves and blood vessels.
- **Enamel**—calcium carbonate and calcium phosphate covering the dentin.

*Figure 11-4. Anatomy of a typical tooth.*
Structure & Function of Teeth (Obj 11.1, 11.2)

- **Cementum**—a bonelike substance that covers the dentin in the root
- **Periodontal ligament**—anchors the tooth to the bone, keeps teeth in alignment, and acts as shock absorber
Structure & Function of Teeth (Obj 11.1, 11.2)

Figure 11-3. Typical dental X-rays.
Structure & Function of Teeth (Obj 11.1, 11.2)

- 20 deciduous (baby) teeth
- 32 permanent (adult) teeth
- Incisors
- Canines
- Molars

*Figure 11-5. Full sets of deciduous and permanent teeth.*
Estimating Physical Characteristics (Obj 11.3, 11.4)

- A forensic odontologist compares dentals records with the victim’s remains
- Dental alterations—fillings, caps, bridgework, and dentures
- Teeth—size, shape, gaps, cracks, alignment, missing or extra one, wears, stains
- Dentition—the pattern made by a particular set of teeth
Age Estimation

*Figure 11-7.* Ubelaker’s Chart of Dental Development shows the emergence pattern of human teeth.
Ancestry Estimation

- Examining physical characteristics CANNOT absolutely determine an unidentified person’s ancestry.
- Certain characteristics are more common within certain population groups.

*Figure 11-8.* The nasal spine is usually much more prominent in people of European descent than in people of African descent.
Ancestry Estimation

- The shape of the decedent’s incisors can be a useful feature
- Fewer than 10% of European and African decent have this feature
Sex Estimation

- Difficult to determine with teeth
- Male teeth—generally larger
- Female teeth—canines tend to be more pointed
- Craniofacial differences make sex determination more accurate
Determining Positive Identification (Obj 11.3, 11.5)

- **Presumptive identification**
  - Personal effects
  - Family ID
  - Location of the body

- **Positive identification**
  - Fingerprints
  - DNA
  - Medical and dental records
Dental Records

- Forensic Odontologist compares
  - The antemortem records (take during life)
  - The postmortem records (recorded after death)
- Especially helpful
  - Fillings
  - Bridgework
  - Dental implants

*Figure 11-12. The serial numbers of the dental implants are circled in red.*
Human Bite Marks

- Bite marks look different in soft and stretchy substances like skin versus hard substances like cheese or a pencil.
- When the bite occurs antemortem:
  - The area bruises and swells.
- When the bite occurs postmortem:
  - The area does not bruise or swell.
- Typical bite has a double horseshoe pattern.
Human Bite Marks

**Figure 11-13.** Odontologists review color and black-and-white photos of each bite mark. They also make careful dimensional measurements.
Human Bite Marks

- Swelling and inflammation can deform the bite mark
- Trace bite marks
- Cast deep bites
- Compare casts or traces with impressions from a suspect

**Figure 11-14.** A casting of human teeth that can be compared to a bite mark.

**Figure 11-15.** Overlay of a bite mark.
Animal Bite Marks

- Very different dentition patterns
- Compare DNA and bite patterns just like with humans

*Figure 11-16.* A dog’s jaws have a long, narrow arch.
Chapter Summary

- A forensic odontologist—a dentist using knowledge of teeth to identify unknown decedents, help police in criminal investigations, and verify signs of abuse.
- Teeth are used in the mechanical digestion of food.
- A human has two sets of teeth in a lifetime. The shape of teeth varies depending on function.
- A typical tooth consists of the crown, the neck, and the root. The crown is the portion of the tooth that is above the gum line.
Chapter Summary

- Family identification, personal effects, and location of the body may provide information for a presumptive identification of a body.
- Fingerprints, DNA analysis, or comparison of medical or dental X-rays are necessary for a positive identification.
- Teeth and craniofacial features provide clues to a person’s age, ancestry, and sex.
Chapter Summary

- Teeth and dental alterations are more resistant to the forces of decomposition than other tissues of the body, making teeth an important tool in identification of burned or badly decomposed remains.
- Bite marks alone are not conclusive evidence, but useful in narrowing a list of suspects.
- Traces of DNA from saliva in a bite mark may lead to a positive identification of the perpetrator.
Chapter Summary

- A typical human bite mark has a double horseshoe pattern. The marks left by the six most central teeth of the upper and lower jaws are the most evident.
- Nonhuman bite marks have very different dentition patterns than those of humans.