Head and Neck Anatomy
Chapter 9

Learning Objectives
Lesson 9.1: Bones of the Head
1. Pronounce, define, and spell the key terms.
2. Identify the regions of the head.
3. Locate and identify the bones of the skull, including the following:
   - Name and locate the bones of the cranium, the face, and the hyoid bone.
   - Discuss the postnatal development of the skull.
   - Differentiate between the male and female skull.

Introduction
- The study of head and neck anatomy provides the dental assistant with the anatomical basis for the clinical practice of dental assisting.
- You will learn about the muscles and the lymph nodes in the neck, the bones of the skull and face, and the salivary glands.
- You will also learn about the muscles that create your facial expressions and those that help you open and close your mouth and swallow your food.
Regions of the Head

- The head is divided into regions:
  - Frontal
  - Parietal
  - Occipital
  - Temporal
  - Orbital
  - Nasal
  - Infraorbital
  - Zygomatic
  - Buccal
  - Oral
  - Mental

Bones of the Skull

- The human skull is divided into two sections:
  - The cranium
    - Composed of eight bones that cover and protect the brain
  - The face
    - Consists of 14 bones
Bones of the Cranium

- Single
  - Frontal
  - Occipital
  - Sphenoid
  - Ethmoid
- Paired
  - Parietal
  - Temporal

Lateral View of the Skull


Frontal View of the Skull

Posterior View of the Skull

View of External Base of the Skull

Bones of the Face

- The bones visible on the anterior view of the skull include the following:
  - Lacrimal bone
  - Nasal bone
  - Vomer
  - Nasal concha
  - Zygomatic bone
  - Maxilla
  - Mandible
Hyoid Bone

- The hyoid bone is unique because it does not articulate with any other bone
  - The hyoid is suspended between the mandible and the larynx
  - It functions as a primary support for the tongue and other muscles
- Shaped like a horseshoe and consists of a central body with two lateral projections
  - Its position is noted in the neck between the mandible and the larynx
  - It is suspended from the styloid process of the temporal bone by two stylohyoid ligaments

Postnatal Development

- At birth, the cranial vault is large, and the cranial base and face are small
- The face lacks vertical dimension because the teeth have not yet erupted

Fusion of Bones

- Several bones of the skull have not fused as single bones at the time of birth
- The frontal bone is separated by an interfrontal suture, and various components of the temporal, occipital, sphenoid, and ethmoid bones will fuse during infancy and early childhood
Development of the Facial Bones

- **Mandible**
  - At birth, the mandible is present in two halves separated by the symphysis menti.
  - During the first year of life, the symphysis menti fuses.

- **Maxilla**
  - At birth, the maxilla is entirely filled with developing tooth buds.
  - Vertical growth of the upper face is caused largely by dentoalveolar development and formation of the maxillary sinuses.

Differences Between Male and Female Skulls

- Generally speaking, female skulls tend to be smaller and lighter and to have thinner walls.
  - The female forehead usually retains a rounded anterior contour, and the teeth are smaller, with rounded incisal edges.

- Male skulls are larger and heavier and have more rugged muscle markings and prominences.
  - Male teeth are larger and more squared incisally, and the forehead is flatter as a result of developing frontal sinuses, which are larger in men.
Learning Objectives
Lesson 9.2: Joints, Muscles, and Glands of the Head

4. Discuss the temporomandibular joints, including the following:
   - Identify the components of the temporomandibular joint.
   - Describe the action and movement of the temporomandibular joint.
   - Describe the symptoms of temporomandibular joint disorders.

5. Locate and identify the muscles of the head and neck.

6. Identify the locations of minor and major salivary glands and associated ducts, and name the three large paired salivary glands.

Temporomandibular Joints

- The TMJ is a joint on each side of the head that allows for movement of the mandible for speech and mastication (chewing)
- It takes its name from the two bones that enter into its formation, the temporal bone and the mandible

Temporomandibular Joints (Cont.)

- Bony parts of the TMJ
  - Glenoid fossa
  - Articular eminence
  - Condylar process
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Capsular Ligament

- A fibrous joint capsule completely encloses the TMJ
- The capsule wraps around the margin of the temporal bone’s articular eminence and articular fossa superiorly
- Inferiorly, the capsule wraps around the circumference of the mandibular condyle, including the condyle’s neck

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Articular Space

- The area between the capsular ligament and the surfaces of the glenoid fossa and condyle
- Articular disc (meniscus) is a cushion of dense, specialized connective tissue that divides the articular space into upper and lower compartments
  - These compartments are filled with synovial fluid, which helps lubricate the joint and fills the synovial cavities

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Lateral View of the Temporomandibular Joint
Jaw Movement of the TMJ

- **Hinge action**
  - The first phase of mouth opening
  - Only the lower compartment of the joint is used
- **Gliding movement**
  - Allows the lower jaw to move forward or backward
  - It involves both the lower and upper compartments of the joint
  - The condyle and articular disc "glide" forward and downward along the articular eminence (projection)

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Gliding Movement

- **Protrusion** is the forward movement of the mandible
  - The reversal of this movement is the backward movement of the mandible, called **retrusion**
- **Lateral movement** of the mandible occurs when the internal and external pterygoid muscles on the same side of the face contract together
Temporomandibular Disorders

- A patient may experience a disease process associated with one or both of the TMJs, called a temporomandibular disorder (TMD).
- TMD is complex, involving such factors as:
  - Stress
  - Clenching
  - Holding teeth tightly together for prolonged periods
  - Bruxism
  - Habitual grinding of the teeth, especially at night
- TMD can also be caused by trauma to the jaw, systemic diseases such as osteoarthritis, or wear due to aging.

Palpation of the Patient during Movements of Both TMJs

Symptoms of TMJ Disorder

- Pain
  - Patients with TMD may report a wide range of pain types.
- Joint sounds
  - Clicking, popping, or crepitus may be heard when the mouth is opened.
  - Crepitus is the cracking sound that may be heard in a joint.
- Limitations of movement
  - Trismus, spasm of the muscles of mastication, is the most common cause of restricted mandibular movement.
Causes of TMJ Disorder

- TMDs are often considered to be related to stress
- Oral habits such as clenching the teeth or bruxism are important contributing factors
- Other causes of TMDs include:
  - Accidents involving injuries to the jaw, head, or neck
  - Diseases of the joint, including several varieties of arthritis
  - Malocclusion, in which the teeth come together in a manner that produces abnormal strain on the joint and surrounding tissues

Muscles of the Head and Neck

- To perform a thorough patient examination, it is necessary to know the location and action of many muscles of the head and neck
- Malfunctions of muscles may be involved in malocclusions (improper bite), TMJ disorder, and even the spread of dental infections

Muscles of the Head and Neck (Cont.)

- Seven main groups of muscles include:
  - Muscles of the neck
  - Muscles of facial expression
  - Muscles of mastication
  - Muscles of the tongue
  - Muscles of the soft palate
  - Muscles of the floor of the mouth
  - Muscles of the pharynx
Major Muscles of the Neck

- The two muscles of the neck are both superficial and easily palpated
  - Sternocleidomastoid
  - Trapezius

- These muscles can become painful when dental assistants use improper posture while assisting

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Palpation of the Sternocleidomastoid Muscle

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Major Muscles of Facial Expression

- Orbicularis oris
  - Closes and puckers the lips

- Buccinator
  - Compresses the cheeks against the teeth and retracts the angle of the mouth

- Mentalis
  - Raises and wrinkles the skin of the chin and pushes the lower lip up

- Zygomatic major
  - Draws the angles of the mouth upward and backward, as in laughing
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Major Muscles of Mastication

- Temporal
- Masseter
- Internal (medial) pterygoid
- External (lateral) pterygoid

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Major Muscles of Mastication (Cont.)

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Muscles of the Floor of the Mouth

- Digastric
- Mylohyoid
- Stylohyoid
- Geniohyoid
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View from Above the Floor of the Oral Cavity

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Muscles of the Tongue

- **Intrinsic (within the tongue)**
  - Responsible for shaping the tongue during speech, chewing, and swallowing
- **Extrinsic**
  - Assist in the movement and function of the tongue

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Extrinsic Muscles

- **Genioglossus**
  - Depresses and protrudes the tongue
- **Hyoglossus**
  - Retracts and pulls down the side of the tongue
- **Styloglossus**
  - Retracts the tongue
- **Palatoglossus**
  - Elevates the tongue and pulls it slightly backward
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Extrinsic Muscles of the Tongue

- Palatoglossus
- Palatopharyngeus

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Muscles of the Soft Palate

- Palatoglossus
- Palatopharyngeus

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Salivary Glands

- The salivary glands produce saliva, which lubricates and cleanses the oral cavity and aids in the digestion of food through an enzymatic process.
- Saliva also helps maintain the integrity of tooth surfaces through a process of remineralization.
- Salivary glands are classified by their size as either major or minor.
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Locations of Salivary Glands

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Two Types of Saliva
- Serous
  - Watery
    - Mainly protein
- Mucous
  - Very thick
  - Mainly carbohydrate

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Minor Salivary Glands
- Smaller and more numerous than the major salivary glands
- Scattered in the tissues of the buccal, labial, and lingual mucosa; the soft palate; the lateral portions of the hard palate; and the floor of the mouth
- Ebner's salivary gland is associated with the large circumvallate papillae on the tongue
Major Salivary Glands

- **Parotid salivary gland**
  - Saliva passes from the parotid gland into the mouth through a duct called the parotid duct (also known as Stensen’s duct).

- **Submandibular salivary gland**
  - Releases saliva into the oral cavity through Wharton’s duct, which ends in the sublingual caruncles.

- **Sublingual salivary gland**
  - Releases saliva into the oral cavity through the sublingual duct (also known as Bartholin’s duct).

Disorders of the Salivary Glands

- **Xerostomia (dry mouth)**
  - Can result in an increase in dental decay and problems in speech and chewing.

- **Salivary stones (sialoliths)**
  - May block duct openings, preventing saliva from flowing into the mouth.

Sialoliths

From Ibsen O, Phelan J: Oral pathology for the dental hygienist, ed 6, St Louis, 2014, Saunders; Courtesy Dr. Barry Wolinsky.
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Sialolith in a Minor Salivary Gland

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Learning Objectives
Lesson 9.3: Blood Vessels, Nerves, and Lymph Nodes of the Head

7. Identify and trace the routes of the blood vessels of the head and neck.
8. Identify and locate the nerves of the head and neck, including the following:
   - Name the twelve cranial nerves.
   - Name the maxillary and mandibular divisions of the trigeminal nerve.

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Learning Objectives
Lesson 9.3: Blood Vessels, Nerves, and Lymph Nodes of the Head (Cont.)

9. Discuss the importance of lymph nodes, including the following:
   - Explain the structure and function of lymph nodes.
   - Identify the locations of the lymph nodes of the head and neck.
   - Identify the locations of major lymph node sites of the body.
10. Identify the paranasal sinuses and explain their function.
Blood Supply to the Head and Neck

- It is important to be able to locate the larger blood vessels of the head and neck because these vessels may become compromised by disease or during dental procedures such as local anesthetic injections.

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Major Arteries of the Face and Oral Cavity

- Common carotid artery
  - Arises from the aorta and subdivides into the internal and external carotid arteries
- Internal carotid artery
  - Supplies blood to the brain and eyes
- External carotid artery
  - Provides the major blood supply to the face and mouth

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Major Arteries of the Face and Oral Cavity (Cont.)

- External carotid artery
- Facial artery
- Lingual artery
- Maxillary artery
- Mandibular artery
Major Veins of the Face and the Oral Cavity

- Maxillary vein
- Retromandibular vein
- External jugular vein
- Subclavian vein
- Facial vein
- Common facial vein
- Deep facial vein
- Lingual veins
- Internal jugular vein

Nerves of the Head and Neck

- Understanding the nerves of the head and neck is important for the use of local anesthesia during dental treatment
- The nerves are related to certain conditions of the face, such as facial paralysis
Facial Paralysis

Cranial Nerves
- There are 12 pairs of cranial nerves, all connected to the brain
- These nerves serve both sensory and motor functions
- The cranial nerves are generally named for the area or function they serve and are also identified with the use of Roman numerals

The Twelve Cranial Nerves
Innervation of the Oral Cavity

- The trigeminal nerve is the primary source of innervation for the oral cavity.
- The trigeminal nerve subdivides into three main branches:
  - Maxillary
  - Mandibular
  - Ophthalmic (not discussed in this chapter)
Maxillary Division of the Trigeminal Nerve

- Supplies the maxillary teeth, periosteum, mucous membrane, maxillary sinuses, and soft palate
- Subdivides into the:
  - Nasopalatine nerve
  - Greater palatine nerve
  - Anterior superior alveolar nerve
  - Middle superior alveolar nerve
  - Posterior superior alveolar nerve

Mandibular Division of the Trigeminal Nerve

- The buccal nerve
  - Supplies branches to the buccal mucous membrane and mucoperiosteum of the mandibular molar teeth
- The lingual nerve
  - Supplies the anterior two thirds of the tongue and gives off branches to supply the lingual mucous membrane and mucoperiosteum
- The inferior alveolar nerve
  - Further subdivides into the mylohyoid nerve, mental nerve, incisive nerve, and small dental nerves that supply the molar and premolar teeth, alveolar process, and periosteum

Palatal, Lingual, and Buccal Innervation
Lymph Nodes of the Head and Neck

- A dental professional must examine and palpate the lymph nodes of the head and neck very carefully during extraoral examination.
- Enlarged lymph nodes may indicate infection or cancer.
- The lymph nodes for the oral cavity drain intraoral structures, such as the teeth, as well as the eyes, ears, nasal cavity, and deeper areas of the throat.

Structure and Function of Lymph Nodes

- Lymph nodes are small and round or oval structures located in lymph vessels.
- The major sites of lymph nodes include:
  - Cervical (in the neck)
  - Axillary (under the arms)
  - Inguinal (in the lower abdomen)
- The lymph nodes of the head are classified as superficial (near the surface) or deep.

Superficial Lymph Nodes of the Head

- There are five groups of superficial lymph nodes in the head:
  - Occipital
  - Retromandibular
  - Anterior auricular
  - Superficial parotid
  - Facial nodes
Superficial Lymph Nodes of the Head

Deep Cervical Lymph Nodes

- The deep cervical lymph nodes are located along the length of the internal jugular vein on each side of the neck, deep to the sternocleidomastoid muscle.
Lymphadenopathy

- When a patient has an infection or cancer in a particular region, the lymph nodes in that region will respond by increasing in size and becoming very firm.
- Lymphadenopathy results from an increase in both the size of each lymphocyte and the overall cell count in the lymphoid tissue.
- With an increase in the size and number of lymphocytes, the body is better able to fight the disease.

Paranasal Sinuses

- The paranasal sinuses are air-containing spaces within the skull that communicate with the nasal cavity.
- The functions of the sinuses include:
  - Producing mucus
  - Making the bones of the skull lighter
  - Providing resonance that helps produce sound
- The sinuses are named for the bones in which they are located.

Paranasal Sinuses (Cont.)

- The maxillary sinuses are the largest of the paranasal sinuses.
- The frontal sinuses are located within the forehead, just above both eyes.
- The ethmoid sinuses are irregularly shaped air cells separated from the orbital cavity by a very thin layer of bone.
- The sphenoid sinuses are located close to the optic nerves, where an infection may damage vision.
Paranasal Sinuses (Cont.)

Questions?