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Head and Neck Anatomy Review in Preparation for the Diagnosis and Treatment of TMD Module One

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**Answer Sheet: Head and Neck Anatomy Review in Preparation for the
Diagnosis and Treatment of TMJ**

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Educational Objectives

Upon completion of the course, the student will:

- Understand the basic anatomy of the head and neck.
- Identify the major muscles of the head and neck.
- Know the role of ligaments in head and neck anatomy.
- Identify major nerves and their pathways.
- Know the implications of the anatomical structures for TMJ disease discussions in additional modules.

Introduction

The purpose of this course is not to dazzle you with knowledge of anatomy or to test you according to origins and insertions of muscles; rather it is to impart to you the basic information necessary for a clinician to diagnose and treat the malady of Temporomandibular Dysfunction (Myofascial Pain Dysfunction; TMJ Pathology; Occlusal disharmony; Fibromyalgia, etc.) This course is the introductory module for a discussion of TMJ pathology, and is also a stand alone course for a basic review of anatomic structures of the head and neck.

ABOUT THE AUTHOR

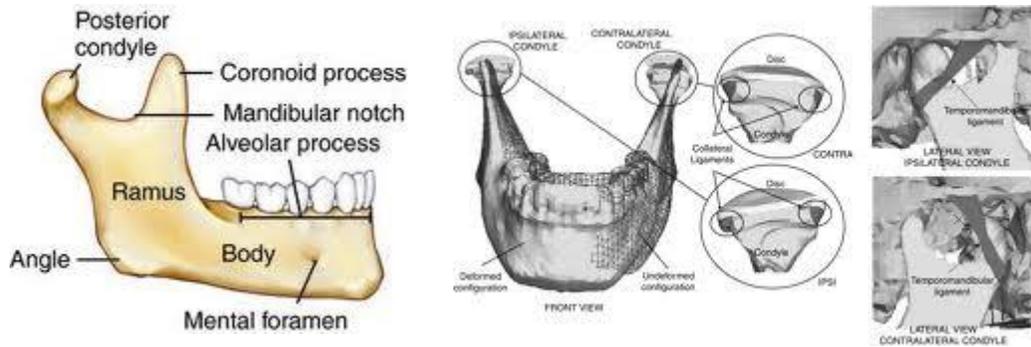
William D. Bellavia, DDS, MAGD, a graduate of SUNY Buffalo Dental School, conducted a successful clinical practice in Western New York State, and specialized in treatment of the TMD (Temporomandibular Dysfunction). Dr. Bellavia served as a faculty member at the SUNY Buffalo School of Dental Medicine in the instruction of treatment modalities for diseases of the TMJ, as well as an instructor in Occlusion.

Dr. Bellavia has published many clinical articles, notably in The Journal of Neurological and Orthopaedic Medicine and Surgery. And he holds patents on various devices used in the treatment of TMJ disorders. Currently, Dr. Bellavia, continues to steadily write books and articles, while enjoying retirement with his wife, Marilyn.

Osteology

Mandible

The *Mandible* is a horseshoe like bone with a bilateral paired joint called the Temporomandibular Joints; its angles (body of the mandible) house the insertion of both the masseter muscles and Internal Pterygoid Muscles (see individual muscles below):



The mandible houses both the mandibular teeth as well as the Third Division of the Trigeminal Nerve as it enters the mandibular canal via the foramen called the lingulae.

This unique bone has a forward process dubbed the coronoid process, which tucks under the zygomatic process (temporal bone/cheek bone). The process is home to the insertion of the temporalis muscle.

Maxillae

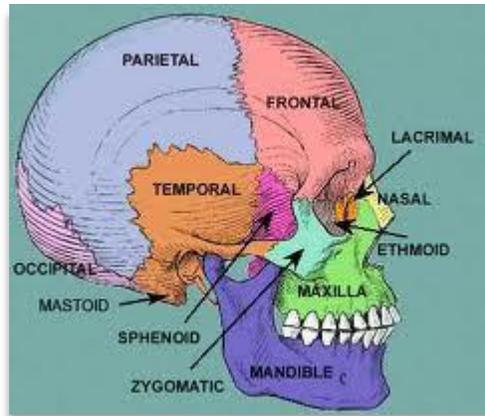
The *Maxillae* houses the maxillary teeth and the major sinus (maxillary sinus) of the head as well as the floor of the orbit.



Temporal Bone

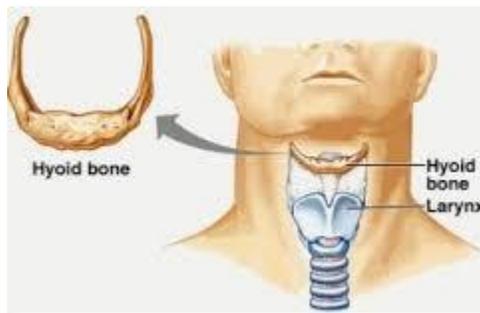
The *Temporal Bone* is a major bone of the skull. It resides on the side of the skull and has as its most inferior process the Styloid process. Just above and in front of this process (anterior to the ear (auditory) canal) is the glenoid fossa which in turn houses the mandibular condyle and makes up one half of the Temporomandibular Joint (TMJ).

Just in front and above this joint is a process known as the zygomatic arch (cheek bone).

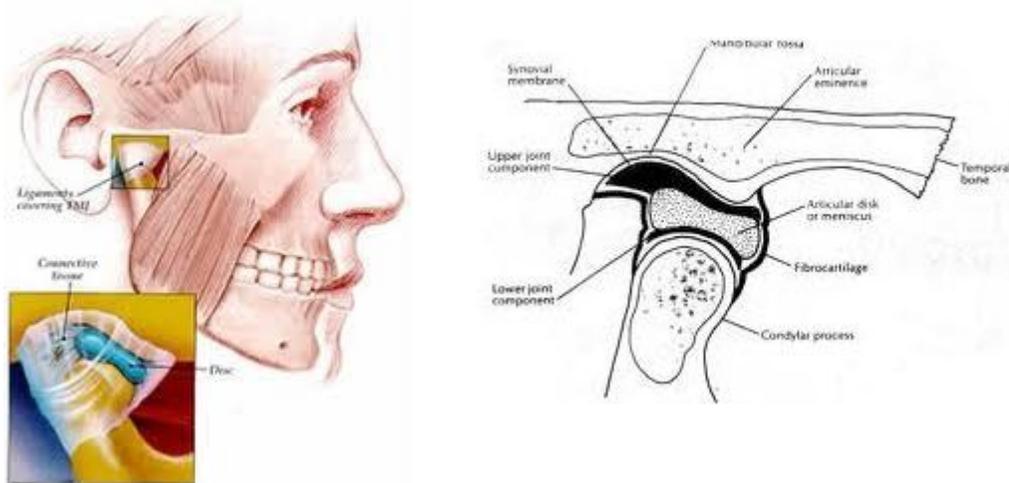


Hyoid Bone

The hyoid bone is located in the mid-throat. It is unique in that it is the only bone in the body which does not articulate with another bone. It literally floats in the throat and acts as bracing anchor enabling the weaker opening muscles of the mandible to perform their duty (as well as aid in the swallowing process).



Temporomandibular Joints

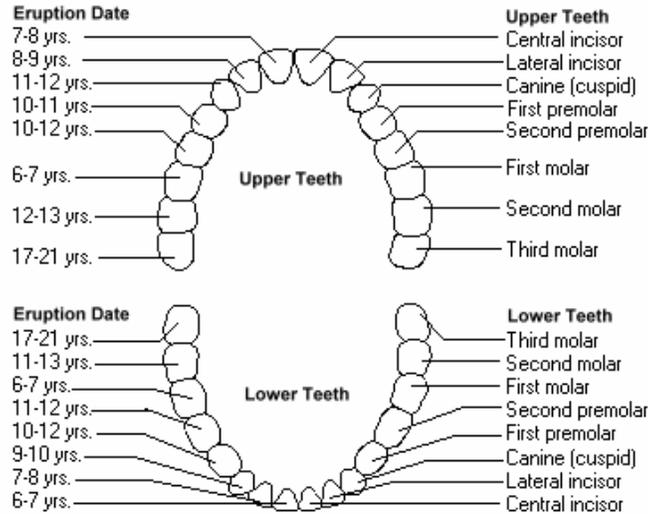


The joints are paired and oblong. They are suspended to the skull via ligaments, tendons, and muscles.

For ease of discussion we will speak of the joint as individual. It articulates with the temporal bone via a capsular ligament and is cushioned (separated) by a fibrocartilaginous disc as it articulates with the glenoid fossae of the temporal bone.

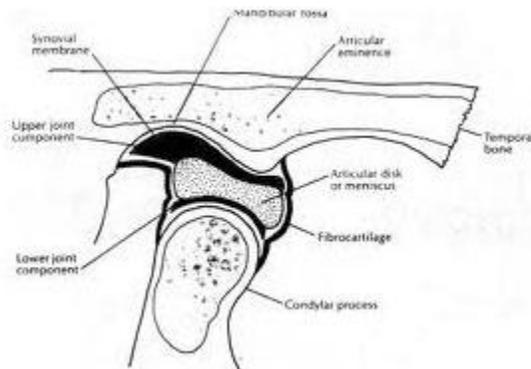
Teeth

Teeth articulate (and thus are categorized as a joint) when the mandible closes. Their major function is to chew food, breaking it into small enough pieces to swallow and aid in digestion. The way in which the teeth articulate may enhance or be causative in Temporomandibular Joint Disease.



Cartilage

The joint itself (glenoid fossae and head of the mandibular condyles as well as the disc) is composed mainly of tough fibrous tissue rather than elastic and smooth cartilaginous tissue found in most joints, hence the name, fibro cartilaginous joint rather than the more elastic cartilaginous (hyaline cartilage) joint.



Opening Muscles of the Mandible

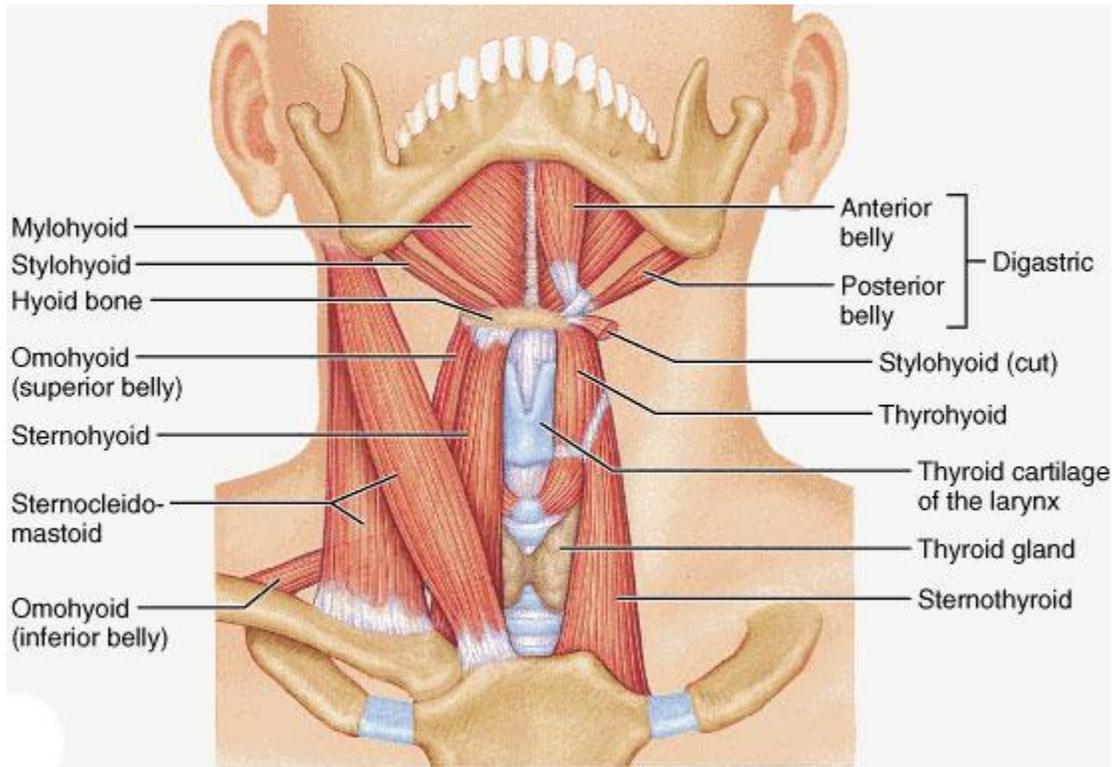
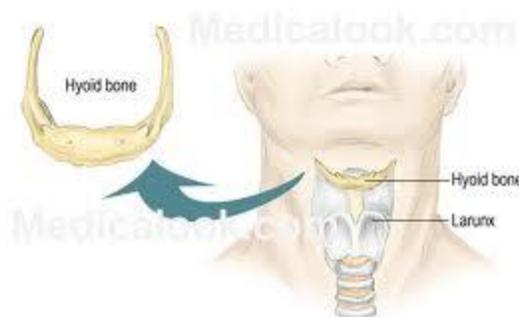


Image courtesy of B. Commings, Addison Wesley Longman, Inc.

Two muscles which originate at the lower interior portion of the mandible and insert on this bone (hyoid) are the mylohyoid & digastric. Together with the stylohyoid muscle they make up the major components of the floor of the mouth. The shoulder gets involved with these muscles via the omohyoid which takes a circuitous route from the hyoid to the shoulder. The thyrohyoid muscle originates at the thyroid cartilage and aids in moving the larynx as well as bracing, while the sternum gets involved with the sternohyoid originating from the sternum and inserting into the hyoid.



These muscles are much weaker than the closing musculature of the mandible.

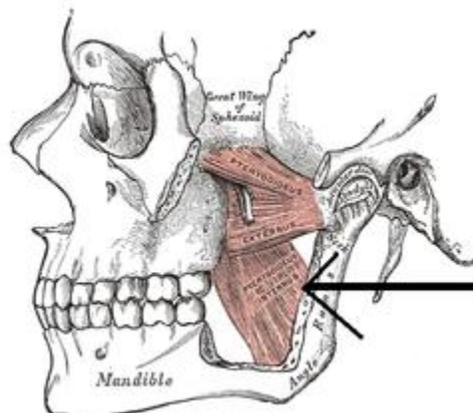
Closing Muscles of the Mandible

Masseter

One of the 'sling' muscle, it is the strongest of the group and functions in a straight closing action. It originates at angle of the mandible and inserts on the zygomatic process.

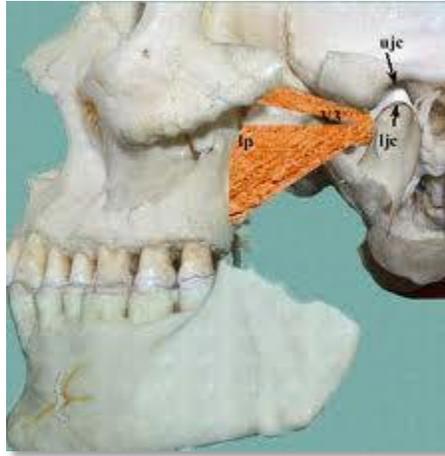


Internal Pterygoid resides opposite the masseter and completes the sling. It too functions in a straight closing action. The Internal Pterygoid originates at the internal aspect of the angle of the mandible and inserts on the Pterygoid process of the sphenoid bone.



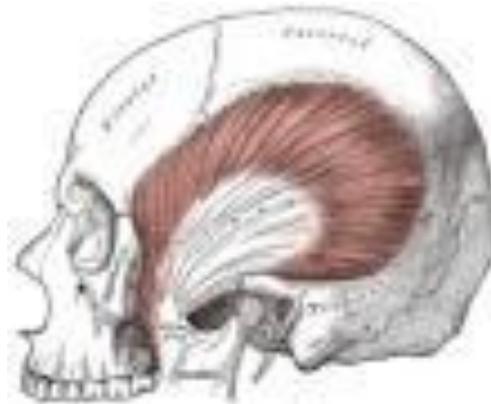
External Pterygoid

Assists the disc and mandible to pull forward when mandible closes and moves laterally during chewing (deglutition). It originates on the pterygoid process of the sphenoid bone and inserts onto the disc (may be via a ligament) and head of the condyle. It has two bellies (superior and inferior (see above)).



Temporalis

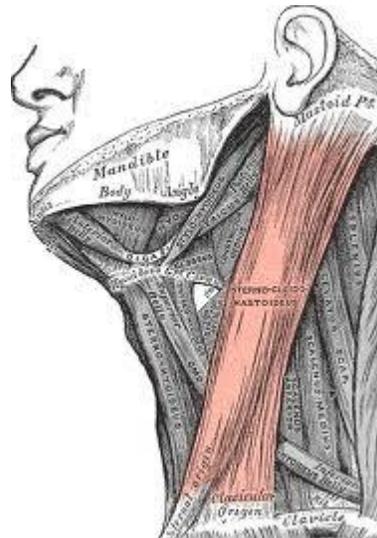
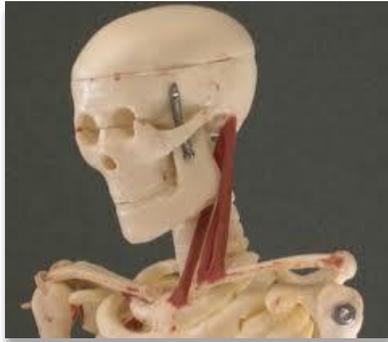
Assists in closing mandible; it is a powerful muscle that virtually covers the temporalis bone of the skull. As it descends it ducks under the zygomatic process and inserts onto the coronoid process of the mandible.



The long tendon insertion onto the coronoid process of the mandible is often associated with pathology.

Sternocleidomastoid

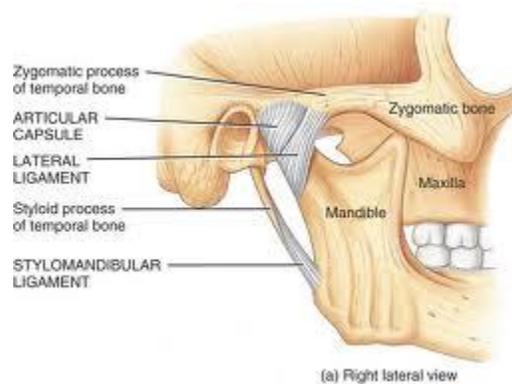
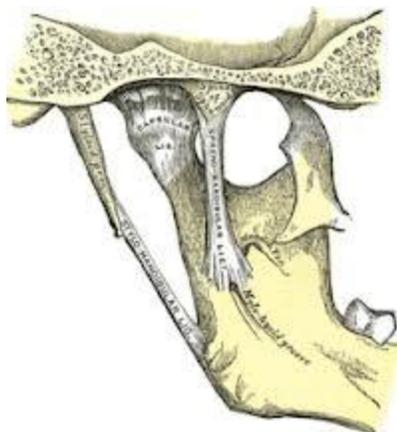
Acts as a bracing muscle for the opening and closing of the mandible. It is a unique muscle in that it is a muscle of mastication (bracing, opening mandible), side bending (head), rotating (neck), and flexing (neck) muscle and as such is associated with more individual aspects of movement than any other muscle. It also covers and is in close proximity to the jugular vein, carotid artery, and stellate ganglion... all vital to life.



Ligaments

Ligaments attach bone to bone and act as breaks for excessive movements. There are three ligaments which attach the mandible to the skull. They are: *stylomandibular ligament*, *spenomandibular ligament*, and the *articular or capsular ligament*.

The other major ligament residing in the area is the *stylohyoid ligament*.

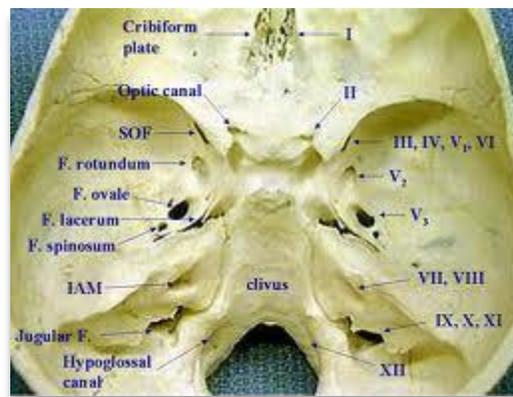


Neurology

The Trigeminal Nerve is the fifth cranial nerve (nerve which originates in the brain instead of first synapsing in the spinal cord). It is a sensory nerve (carries message from stimulus to the brain).

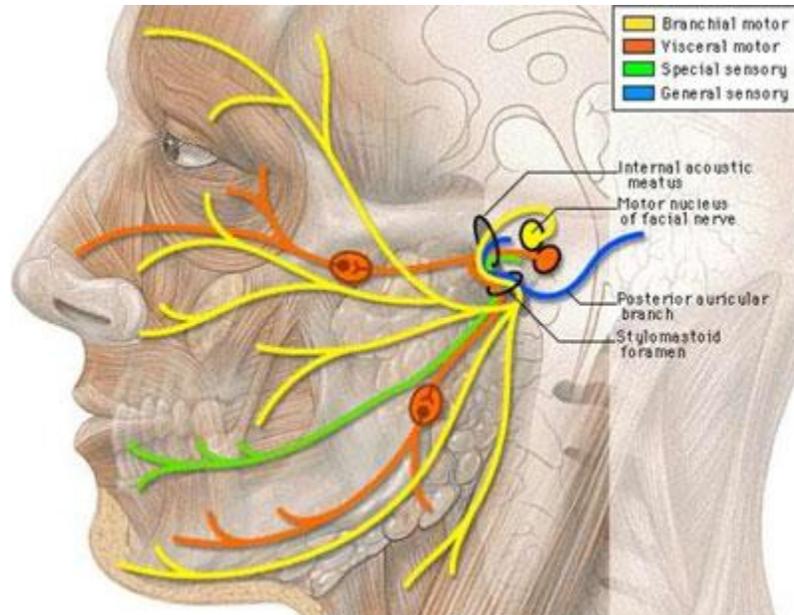
After it exits the base of the brain it separates and leaves the skull via the foramen (see below). The three major branches of the Trigeminal Nerve are: the Ophthalmic V₁ (upper face; superior orbital fissure), the Maxillary V₂ (mid face, foramen rotundum), and the Mandibular V₃ (lower face, foramen ovale).

The first major nerve to branch from the V₃ is the Auriculo-temporal nerve. It innervates the TMJ as well as the other structures in the area (pterygoid region). As the mandibular branch readies itself to enter the mandible via the lingulae (spot where dentists access to give mandibular block) it sends a separate branch to innervate the tongue (lingual nerve).



Facial Nerve (VII)

The Seventh Cranial Nerve is mainly a motor nerve (carries the impulse from the brain to the muscle) and is responsible for all facial movement and expression. It exits the brain behind the ear (internal acoustic meatus) and after two tight turns within the skull (facial canal) it exits via the stylomastoid foramen. After it passes through the parotid salivary gland (but not innervating it) it divides into five branches: Temporal; Zygomatic; Buccal; Masseter; Cervical.



References

Cummings, B and Addison Wesley Inc. *Anatomy* Accessed via Wikipedia August 2017.

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<https://healthfinder.gov/Default.aspx> accessed August 2020.

Wikipedia accessed September 2020.

Conclusion

There you have it... dental anatomy in its most basic form, broken up as to its structures: bone, cartilage, joints, etc. This is no way is this meant to be a comprehensive course, but one meaningful and practical to the clinician as a review of the major anatomical features of the head and neck—to prepare for a discussion of TMJ Disease in other study modules.

Course Test: Head and Neck Anatomy Review in Preparation for the Diagnosis and Treatment of TMD Module One

1. The major bones involved with the TMJ are:
 - a. temporal
 - b. mandible
 - c. hyoid
 - d. Maxillae
 - e. A, B, C
2. The Mandible articulates with:
 - a. the coronoid process
 - b. the maxillae
 - c. the temporal bone
3. The Temporal Muscle inserts on the Coronoid Process of the Mandible via a:
 - a. tendon
 - b. ligament
4. The mandible is articulated with the skull via:
 - a. ligaments
 - b. tendons
 - c. A & B
5. The Hyoid Bone is unique in that it:
 - a. does not articulate with any other bone
 - b. is made mostly of fibrous tissue
 - c. stabilizes the sternocleidomastoid muscle
 - d. is mainly involved with closing the mandible

6. The TMJ is separated from the skull via cartilagino-fibrous disc
 - a. True
 - b. False
7. The only other joint with the make-up of the TMJ Disc is the
 - a. Knee
 - b. Glenoid Fossae
 - c. Shoulder
 - d. Sternoclavicular joint
8. The muscle which boasts the most individual movements is:
 - a. Masseter
 - b. Temporalis
 - c. External Pterygoid
 - d. Sternocleidomastoid
9. The closing muscles of the mandible are:
 - a. Internal Pterygoid and Temporalis
 - b. Masseter and External Pterygoid
 - c. All of the Above
10. Teeth cannot affect the wellbeing of the TMJ.
 - a. True
 - b. False
11. The main purpose of teeth is to aid in the closing of the mandible.
 - a. True
 - b. False

12. The main function of the External Pterygoid Muscle is to:
- a. Close the mandible
 - b. Guide the disc over the Hyoid Bone
 - c. Guide the disc over the glenoid fossae
13. Ligaments attach bone to muscle.
- a. True
 - b. False
14. There are three major ligaments attaching the mandible to the skull.
- a. True
 - b. False
15. The Capsular ligament attaches the mandible to:
- a. Hyoid Bone
 - b. Temporal Bone
 - c. Maxillae
16. A sensory nerve carries stimuli away from the CNS.
- a. True
 - b. False
17. The Facial Nerve is a Sensory Nerve.
- a. True
 - b. False
18. The Trigeminal Nerve has five major branches.
- a. True
 - b. False

19. The mandibular branch of the Trigeminal Nerve breaks into three branches before it enters the mandible.
- a. True
 - b. False
20. The _____ nerve innervates the TMJ.
- a. Temporal Nerve
 - b. Lingual Nerve
 - c. Maxillary Nerve
 - d. Auriculo-temporal Nerve