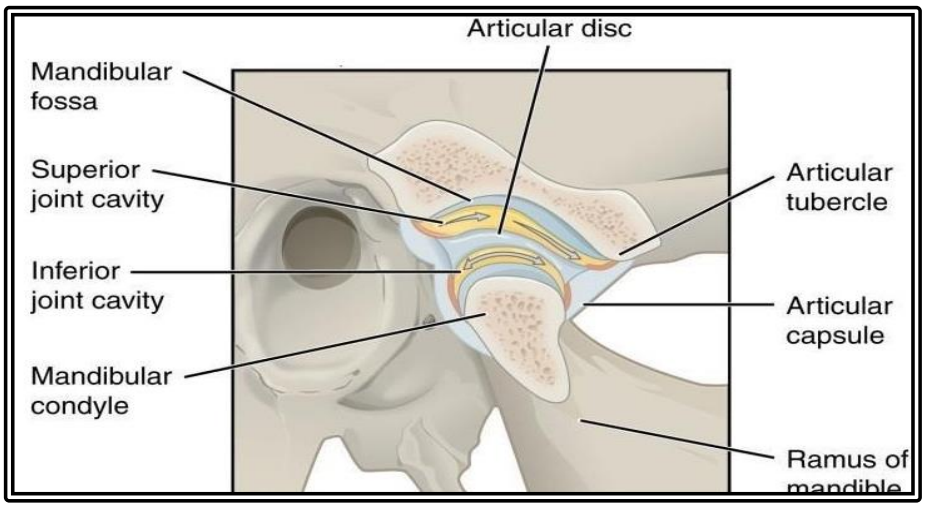
Temporomandibular joint (TMJ)

TMJ: a joint that involves the articulation of the condylar process of the mandible with the mandibular (glenoid) fossa of the temporal bone.

Parts of TMJ

1. Mandibular or glenoid fossa of the temporal bone.
2. Condylar process of the mandible (the head of the mandible).
3. Articular disk (meniscus) which is a dense fibrous connective tissue structure placed between the condyle and the glenoid fossa. It divides the joint space into superior (upper) and inferior (lower) compartments.
4. Synovial cavity, a synovial membrane lines the articular capsule and it secretes synovial fluid which serves as a natural lubricant and source of nutrition for some of the joint tissues.



The differences between the TMJ and the other Joints in the body

1. TMJ is a complex joint because the articulating surfaces of the condylar processes and fossae are covered with dense fibrous connective tissue instead of hyaline cartilage.

2. TMJ is a synovial joint which secretes synovial fluid.
3. The TMJ has an articular disc that completely divides the joint spaces into upper and lower joint compartments.
4. TMJ is a ginglymoarthrodial joint which means it is capable of both a hinging (rotation) and a gliding or sliding (translation) articulation.
5. The mandible is the only bone in the body hinged on both ends and not capable of independent movement at one end.
6. The relationship of teeth affects the relationship of the articulating components. The TMJ is connected to the maxilla through the occlusal surfaces of the teeth. For this reason, the occlusion of the teeth must be in harmony with the jaw's relations when the teeth are in contact.

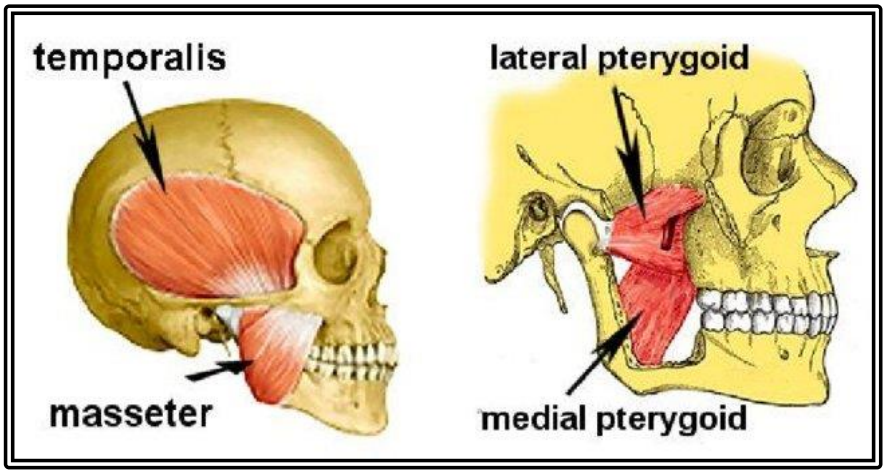
The muscles that control the movement of the mandible

They control the movement of the mandible and may be grouped into 3 groups: closing, opening, and gliding muscles. They include:

1. The masseter, temporalis, and medial pterygoid muscles supply the power for pulling the mandible against the maxillae (elevating and closing the mandible).
2. The lateral pterygoid muscles connect the mandible to the lateral pterygoid plate and act to protrude the jaw or to move it laterally (gliding).
3. The muscles that depress the mandible (open) consist of four groups, suprahyoid muscles, infrahyoid muscles, platysma muscles, and inferior head of lateral pterygoid muscles.

The masseter, temporalis, medial pterygoid, and lateral pterygoid muscles are known as the muscles of mastication. They are very powerful muscles, having masticatory and non-masticatory functions (deglutition, speech, respiration, bruxing, and clenching). They originate from the bones of the skull and attach to

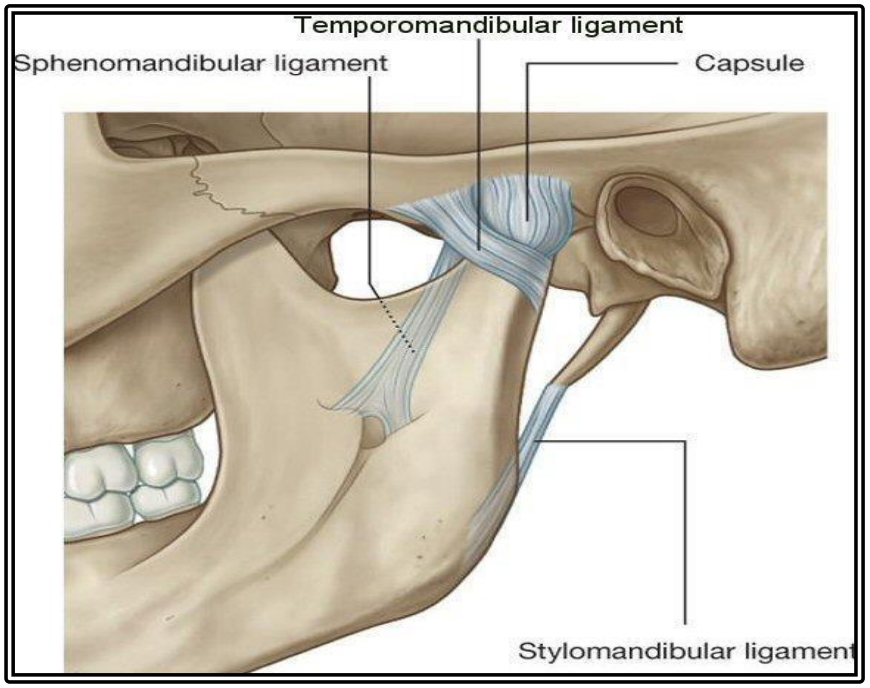
the mandible.



Ligaments

The mandible has a specific relationship to the bones of the cranium; it is connected to the cranium at the right and left sides by the ligaments. The function of the ligaments is to stabilize the joints by limiting the movements, ligaments do not stretch but they could be elongated and the elongation of the ligament could compromise normal joint function. The ligaments that are associated with the T.M.J are:

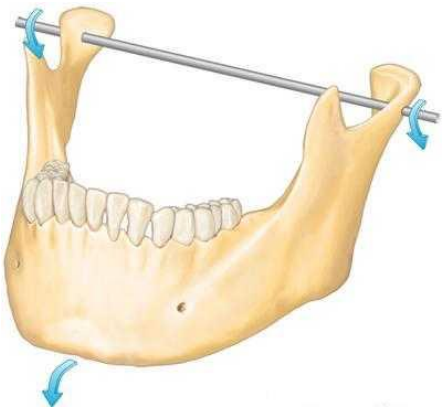
1. Temporomandibular ligament
2. Sphenomandibular ligament
3. Stylomandibular ligament

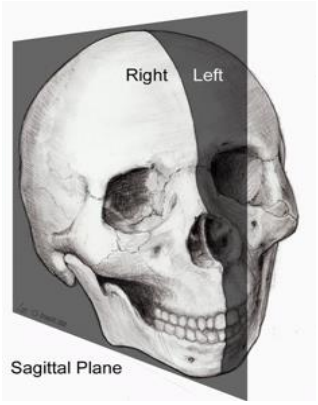


Mandibular axes

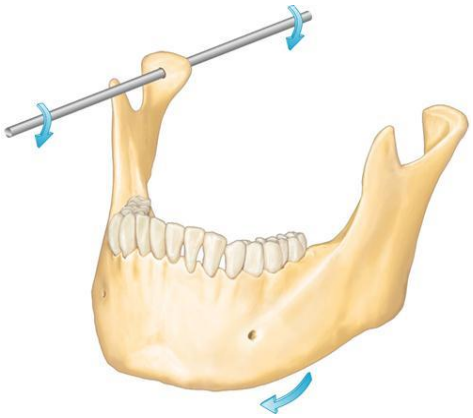
There are 3 axes around which the mandibular movements take place these axes are:

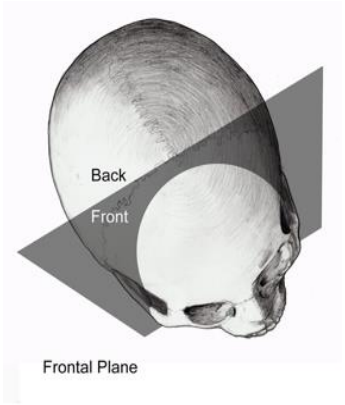
1. Hinge axis or transverse horizontal axis: an imaginary line around which the mandible may rotate within the sagittal plane.



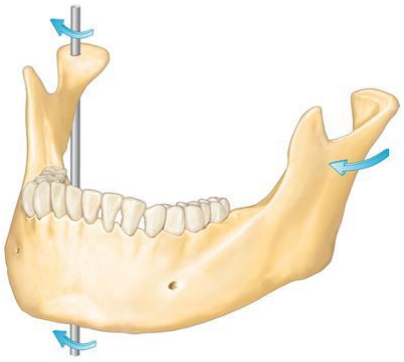


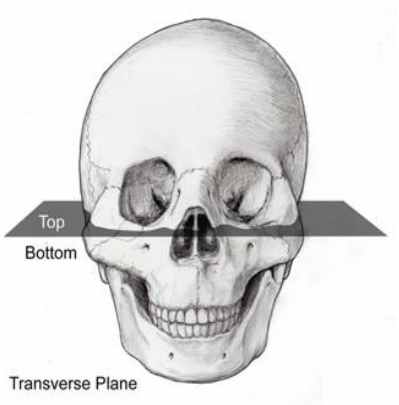
2. Sagittal axis: an imaginary anterior-posterior line around which the mandible may rotate when viewed in the frontal plane.





3. Vertical axis: an imaginary line around which the mandible may rotate when viewed through a horizontal plane.





Mandibular movements

Generally, there are two basic mandibular movements:

- Functional movements.

Natural and characteristic movements that occur during mastication, speech, and yawning.

- Parafunctional movements.

Unnatural and non-characteristic movements like clenching and bruxism

Mandibular movement can be classified according to:

1. The dimension involved in the movement.

   Mandibular movements are related to three planes of the skull the **horizontal, frontal, and sagittal**. The mandible rotates in each of the three planes of space. The point of intersection of the three axes is called the center of rotation.

2. The type of movement.

A. Basic movements: the presence of the articular disk on the TMJ allows two types of movements:

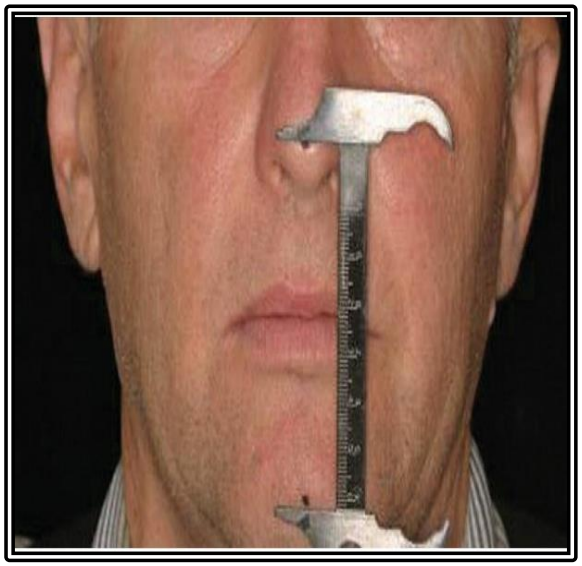
- Rotational movement (hinge): occurs in the lower compartment between the inferior surface of the articular disk and the condyle.
- Translatory (gliding or sliding): occurs in the upper compartment between the superior surface of the articular disk and the glenoid fossa of the temporal bone, in which the condyle and the disk move as one unit.

B. Functional movements: it is a combination of rotational and translatory movements and includes all the mandibular movements except the terminal hinge movement. They include:

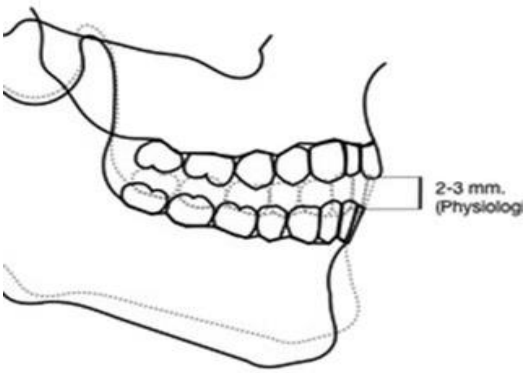
- Opening and closing movements.
- Symmetrical forward and backward movements.
- Asymmetrical side-wise or lateral movement.

Maxillo-mandibular Relation

- **Vertical relation:** It is the amount of separation between the maxilla and the mandible in a frontal plane.
- **Vertical dimension:** It is the distance between two selected points, one on a fixed and one on a movable member. In general, the vertical measurement of the face could be recorded between any two arbitrarily selected points which are usually located one above the mouth (at the tip of the nose) and the other below the mouth (at the tip of the chin in the midline region).

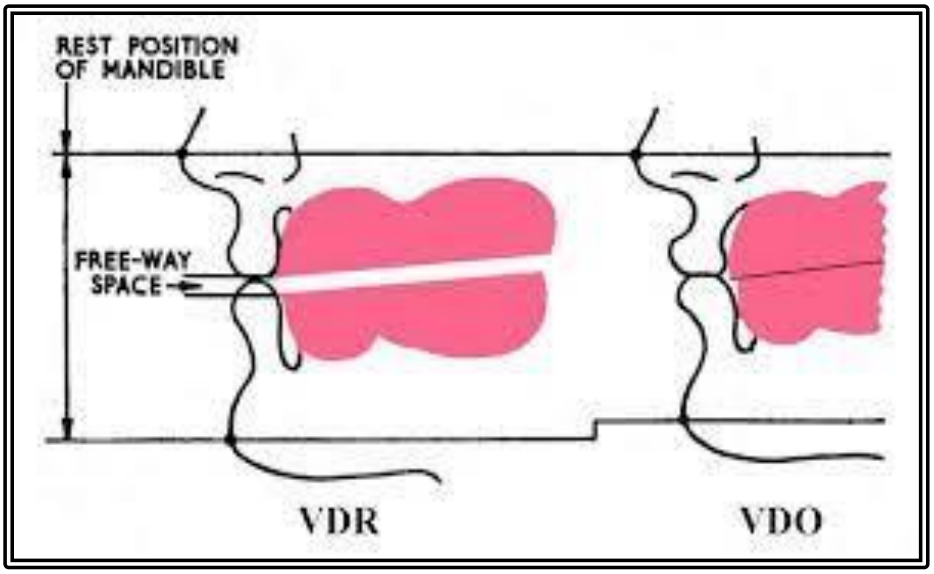


- **Physiological rest position:** It is the postural position of the mandible when an individual is resting comfortably in an upright position and the associated muscles are in a state of minimal contractual activity.



- **Rest vertical dimension:** It is the distance between two selected points (one at the tip of the nose and the other at the tip of the chin (in the midline region) measured when the mandible is in the physiologic rest position.
- **Occlusal vertical dimension:** It is the distance measured between two points when the occluding members (teeth or occlusal rims) are in contact.
- **Inter-occlusal distance (inter-occlusal space):** It is the distance between the occluding surfaces of the maxillary and mandibular teeth when the mandible is in a specified position.

- **Inter-occlusal rest space (free-way space):** It is the distance between the occluding surface of maxillary and mandibular teeth when the mandible is in its physiological rest position. It is the difference between the vertical dimension of rest and the vertical dimension of occlusion.



Types of Jaw Relations

A- Vertical relation

1. Vertical relation at rest position
2. Vertical relation at occlusion

B- Horizontal relation

1. Centric jaw relation.
2. Eccentric jaw relation.
   - A- Lateral jaw relation.
   - B- Protrusive relation

Importance of vertical dimension

A. Functional roles: include mastication, deglutition, phonetics, and respiration.

B. Physiological role (Comfortable role): by maintenance of the health of tissue (mucosa, bone, muscles, and temporomandibular joint).

C. Esthetic role.

D. Psychological role.

Consequences of Increased Vertical Dimension

1. Increased trauma to the denture bearing area (acceleration of residual ridge resorption).
2. Inharmonious facial proportion (increased lower facial height).
3. Difficulty in swallowing and speech.
4. Pain and clicking in the temporomandibular joint and muscular fatigue.
5. Stretching of the facial muscles and skin.
6. Increase the space of the oral cavity.
7. Loss of biting power.
8. Increase the nasolabial angle.
9. Sensation of the bulky denture.
10. Premature contacts of upper and lower teeth.
11. Instability of dentures due to their excessive height.
12. Clicking of teeth in speech and mastication.
13. Separated upper and lower lip with poor esthetic and difficulty in bilabial sound ***(/p/b/m/)***.
14. Seem unable to open the mouth widely.
15. Excessive displays of artificial teeth and gum.

Consequences of Decreased Vertical Dimension

1. Comparatively lesser trauma to the denture-bearing area.
2. Inharmonious facial proportion (decreased lower facial height).
3. Difficulty in swallowing and speech.
4. Pain and clicking in the temporomandibular joint and muscular fatigue.
5. Loss of muscle tone and presence of wrinkles and folds that are not due to age.
6. Decreased space of the oral cavity, and pushing the tongue backward.
7. Loss of biting power.
8. Naso-labial angle is less than 90°.
9. Angular cheilitis due to folding of the corner of the mouth.
10. Cheek biting.
11. Thinning of the vermilion borders of the lip.
12. Prominence of lower jaw and chin
13. Obstruction of the opening of the Eustachian tube due to elevation of the soft palate due to elevation of the tongue and mandible