

## The Mandible

The mandible or lower jaw is the largest and strongest bone of the face, and it articulates with the skull at the temporomandibular joint.

The mandible consists of a horseshoe-shaped **body** and a pair of **rami**. The body of the mandible meets the ramus on each side at the **angle of the mandible** (Fig. 11.32).

The **body of the mandible**, on its external surface in the midline, has a faint ridge indicating the line of fusion of the two halves during development at the **symphysis menti**. The **mental foramen** can be seen below the second premolar tooth; it transmits the terminal branches of the inferior alveolar nerve and vessels.

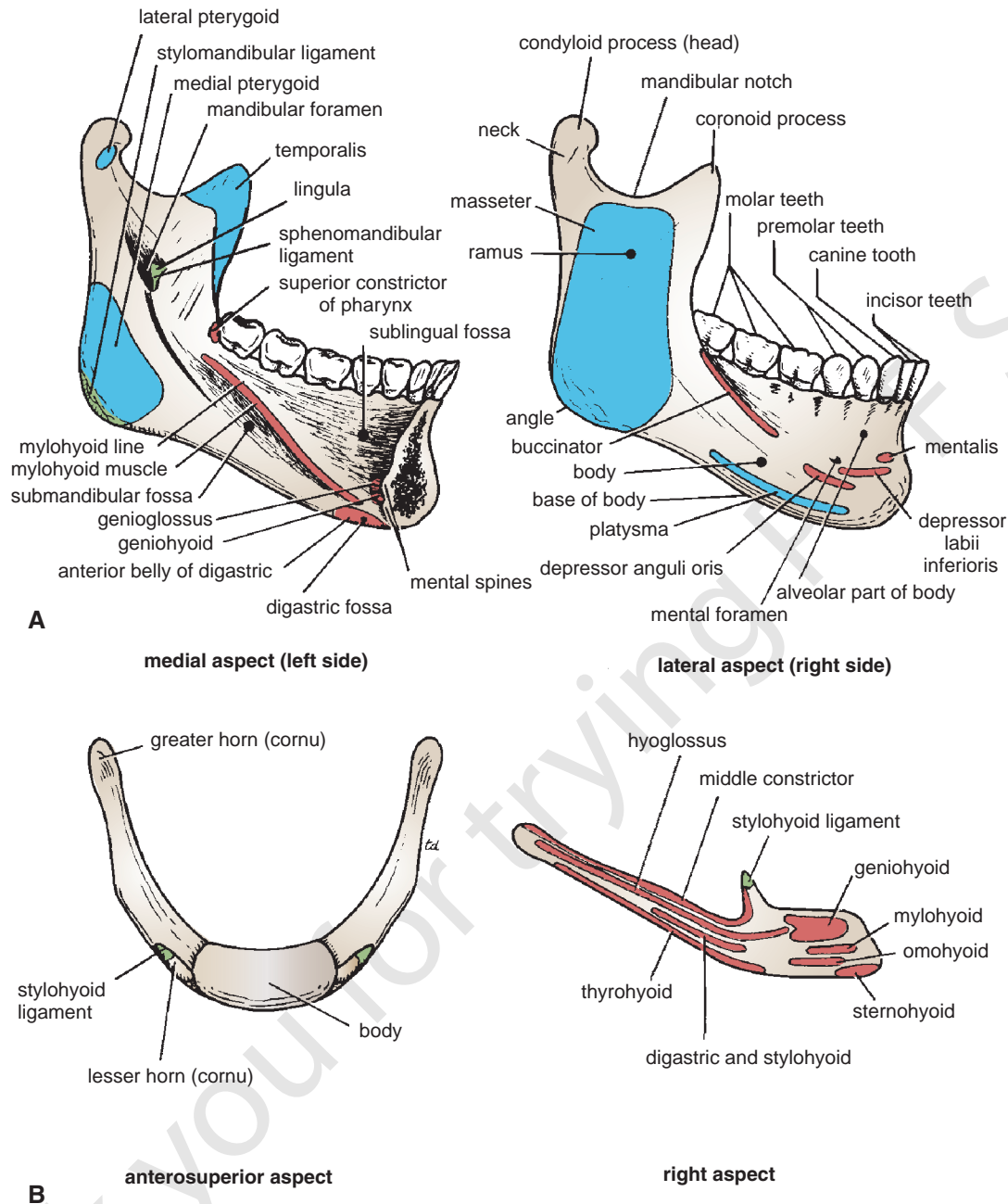
On the medial surface of the body of the mandible in the median plane are seen the **mental spines**; these give origin to the genioglossus muscles above and the geniohyoid muscles below (Fig. 11.31). The **mylohyoid line** can be seen as an oblique ridge that runs backward and laterally from the area of the mental spines to an area below and behind the third molar tooth. The **submandibular fossa**, for the superficial part of the submandibular salivary gland, lies below the posterior part of the mylohyoid line. The **sublingual fossa**, for the sublingual gland, lies above the anterior part of the mylohyoid line (Fig. 11.32).

The upper border of the body of the mandible is called the **alveolar part**; in the adult, it contains 16 sockets for the roots of the teeth.

The lower border of the body of the mandible is called the **base**. The **digastric fossa** is a small, roughened depression on the base, on either side of the symphysis menti (Fig. 11.32). It is in these fossae that the anterior bellies of the digastric muscles are attached.

The **ramus of the mandible** is vertically placed and has an anterior **coronoid process** and a posterior **condyloid process**, or **head**; the two processes are separated by the **mandibular notch** (Fig. 11.32).

On the lateral surface of the ramus are markings for the attachment of the masseter muscle. On the medial surface is the **mandibular foramen** for the inferior alveolar nerve and



**FIGURE 11.32** A. Mandible. B. Hyoid bone.

vessels. In front of the foramen is a projection of bone, called the **lingula**, for the attachment of the **sphenomandibular ligament** (Figs. 11.32 and 11.33). The foramen leads into the **mandibular canal**, which opens on the lateral surface of the body of the mandible at the **mental foramen** (see above). The **incisive canal** is a continuation forward of the mandibular canal beyond the mental foramen and below the incisor teeth.

The **coronoid process** receives on its medial surface the attachment of the temporalis muscle. Below the **condyloid process**, or **head**, is a short **neck** (Fig. 11.32).

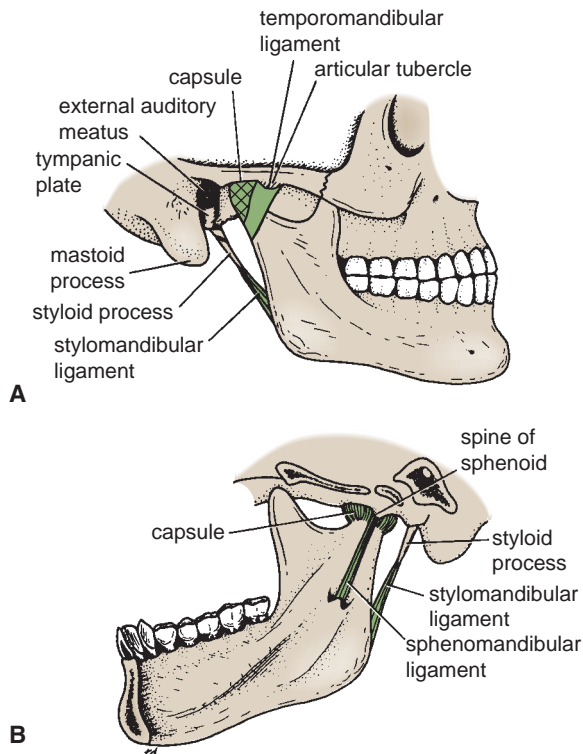
The important muscles and ligaments attached to the mandible are shown in Figure 11.32.



## CLINICAL NOTES

### Fractures of the Mandible

The mandible is horseshoe shaped and forms part of a bony ring with the two temporomandibular joints and the base of the skull. Traumatic impact is transmitted around the ring, causing a single fracture or multiple fractures of the mandible, often far removed from the point of impact.



**FIGURE 11.33** Temporomandibular joint as seen from the lateral (A) and medial (B) aspects.

## Temporomandibular Joint

### Articulation

Articulation occurs between the articular tubercle and the anterior portion of the mandibular fossa of the temporal bone above and the head (condyloid process) of the mandible below (Figs. 11.33 and 11.34). The articular surfaces are covered with fibrocartilage.

### Type of Joint

The temporomandibular joint is synovial. The articular disc divides the joint into upper and lower cavities (Fig. 11.35).

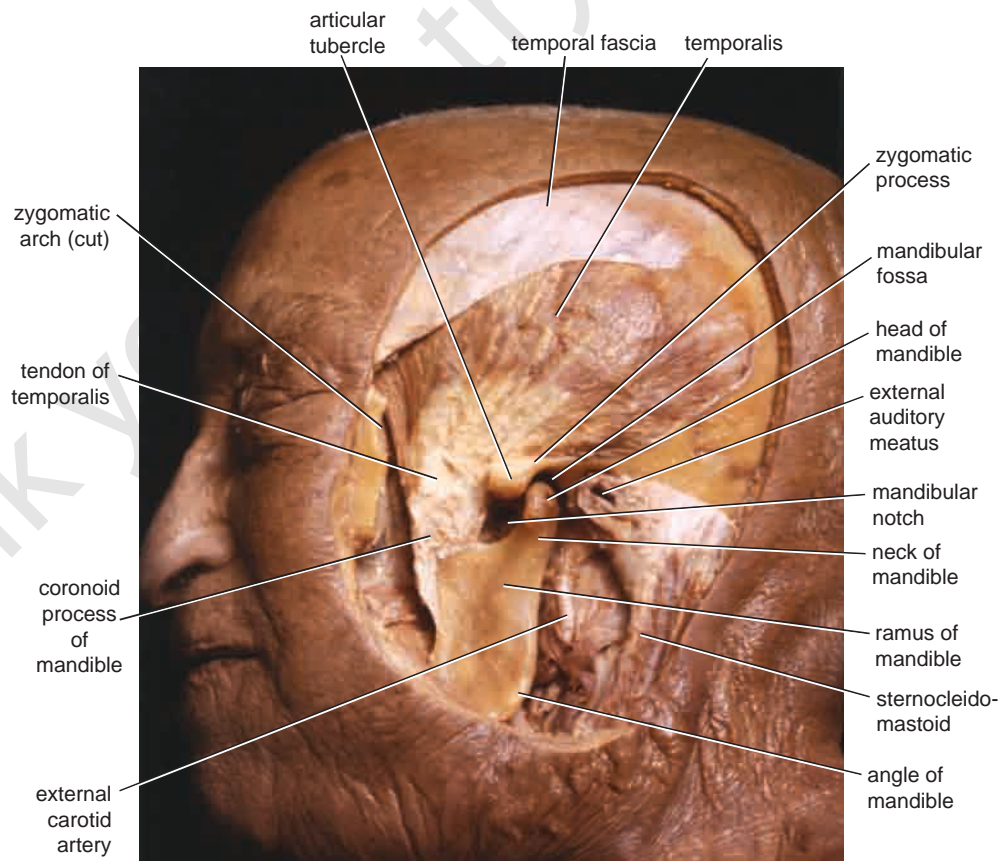
### Capsule

The capsule surrounds the joint and is attached above to the articular tubercle and the margins of the mandibular fossa and below to the neck of the mandible.

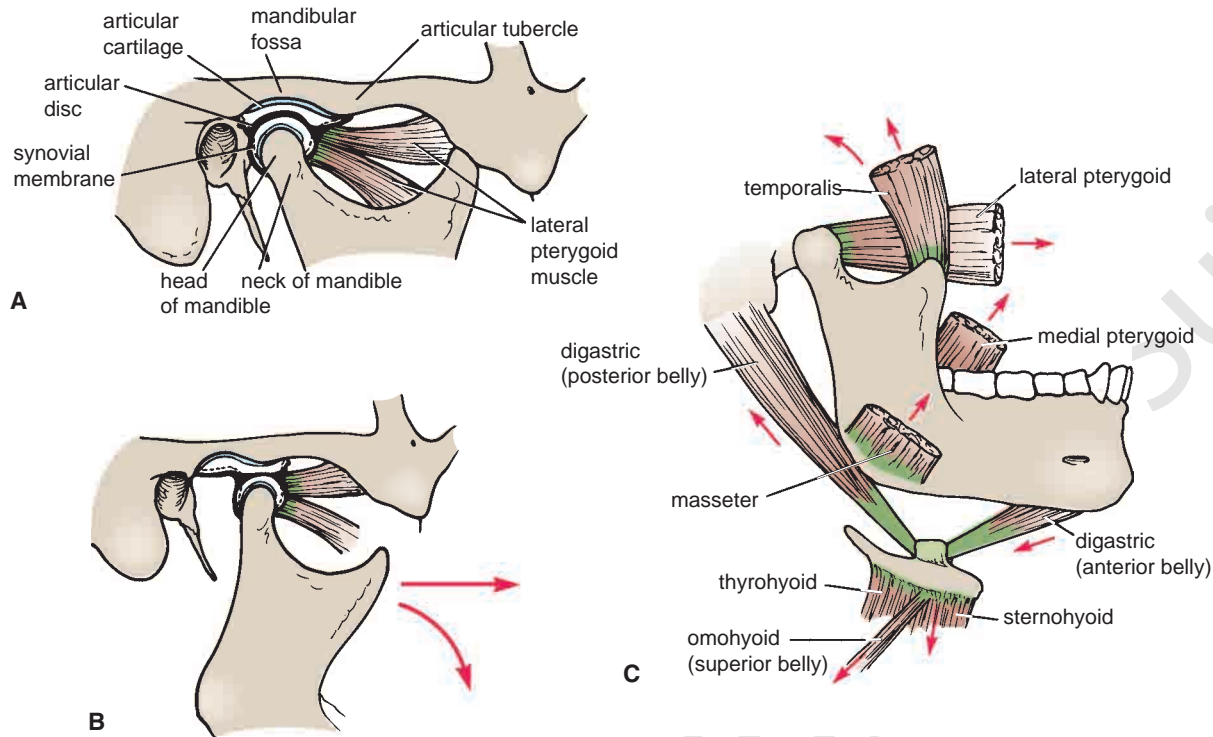
### Ligaments

The **lateral temporomandibular ligament** strengthens the lateral aspect of the capsule, and its fibers run downward and backward from the tubercle on the root of the zygoma to the lateral surface of the neck of the mandible (Fig. 11.33). This ligament limits the movement of the mandible in a posterior direction and thus protects the external auditory meatus.

The **sphenomandibular ligament** lies on the medial side of the joint (Fig. 11.33). It is a thin band that is



**FIGURE 11.34** A dissection of the left temporomandibular joint. The capsule and lateral temporomandibular ligament have been removed to reveal the interior of the joint. Note the articular tubercle and mandibular fossa of the temporal bone and the head of the mandible. The articular disc is present within the joint cavity on the upper surface of the head of the mandible.



**FIGURE 11.35** Temporomandibular joint with mouth closed (**A**) and with the mouth open (**B**). Note the position of the head of the mandible and articular disc in relation to the articular tubercle in each case. **C**. The attachment of the muscles of mastication to the mandible. The *arrows* indicate the direction of their actions.

attached above to the spine of the sphenoid bone and below to the lingula of the mandibular foramen. It represents the remains of the first pharyngeal arch in this region.

The **stylomandibular ligament** lies behind and medial to the joint and some distance from it. It is merely a band of thickened deep cervical fascia that extends from the apex of the styloid process to the angle of the mandible (Fig. 11.33).

The **articular disc** divides the joint into upper and lower cavities (Fig. 11.35). It is an oval plate of fibrocartilage that is attached circumferentially to the capsule. It is also attached in front to the tendon of the lateral pterygoid muscle and by fibrous bands to the head of the mandible. These bands ensure that the disc moves forward and backward with the head of the mandible during protraction and retraction of the mandible. The upper surface of the disc is concavoconvex from before backward to fit the shape of the articular tubercle and the mandibular fossa; the lower surface is concave to fit the head of the mandible.

### Synovial Membrane

This lines the capsule in the upper and lower cavities of the joint (Fig. 11.35).

### Nerve Supply

Auriculotemporal and masseteric branches of the mandibular nerve

### Movements

The mandible can be depressed or elevated, protruded or retracted. Rotation can also occur, as in chewing. In the

position of rest, the teeth of the upper and lower jaws are slightly apart. On closure of the jaws, the teeth come into contact.

### Depression of the Mandible

As the mouth is opened, the head of the mandible rotates on the undersurface of the articular disc around a horizontal axis. To prevent the angle of the jaw impinging unnecessarily on the parotid gland and the sternocleidomastoid muscle, the mandible is pulled forward. This is accomplished by the contraction of the lateral pterygoid muscle, which pulls forward the neck of the mandible and the articular disc so that the latter moves onto the articular tubercle (Fig. 11.35). The forward movement of the disc is limited by the tension of the fibroelastic tissue, which tethers the disc to the temporal bone posteriorly.

Depression of the mandible is brought about by contraction of the digastrics, the geniohyoids, and the mylohyoids; the lateral pterygoids play an important role by pulling the mandible forward.

### Elevation of the Mandible

The movements in depression of the mandible are reversed. First, the head of the mandible and the disc move backward, and then the head rotates on the lower surface of the disc.

Elevation of the mandible is brought about by contraction of the temporalis, the masseter, and the medial pterygoids. The head of the mandible is pulled backward by the posterior fibers of the temporalis. The articular disc is pulled backward by the fibroelastic tissue, which tethers the disc to the temporal bone posteriorly.

### Protrusion of the Mandible

The articular disc is pulled forward onto the anterior tubercle, carrying the head of the mandible with it. All movement thus takes place in the upper cavity of the joint. In protrusion, the lower teeth are drawn forward over the upper teeth, which is brought about by contraction of the lateral pterygoid muscles of both sides, assisted by both medial pterygoids.

### Retraction of the Mandible

The articular disc and the head of the mandible are pulled backward into the mandibular fossa. Retraction is brought about by contraction of the posterior fibers of the temporalis.

### Lateral Chewing Movements

These are accomplished by alternately protruding and retracting the mandible on each side. For this to take place, a certain amount of rotation occurs, and the muscles responsible on both sides work alternately and not in unison.

The muscles of mastication are summarized in Table 11.4. See also Figure 11.35.

### Important Relations of the Temporomandibular Joint

- **Anteriorly:** The mandibular notch and the masseteric nerve and artery (Fig. 11.36)

**TABLE 11.4** Muscles of the Head

Muscle	Origin	Insertion	Nerve Supply	Action
<b>Muscle of Scalp</b>				
Occipitofrontalis				
Occipital belly	Highest nuchal line of occipital bone	Epicranial aponeurosis	Facial nerve	Moves scalp on skull and raises eyebrows
Frontal belly	Skin and superficial fascia of eyebrows			
<b>Muscles of Facial Expression</b>				
Orbicularis oculi				
Palpebral part	Medial palpebral ligament	Lateral palpebral raphe	Facial nerve	Closes eyelids and dilates lacrimal sac
Orbital part	Medial palpebral ligament and adjoining bone	Loops return to origin	Facial nerve	Throws skin around orbit into folds to protect eyeball
Corrugator supercilii	Superciliary arch	Skin of eyebrow	Facial nerve	Vertical wrinkles of forehead, as in frowning
Compressor nasi	Frontal process of maxilla	Aponeurosis of bridge of nose	Facial nerve	Compresses mobile nasal cartilages
Dilator naris	Maxilla	Ala of nose	Facial nerve	Widens nasal aperture
Procerus	Nasal bone	Skin between eyebrows	Facial nerve	Wrinkles skin of nose
Orbicularis oris	Maxilla, mandible, and skin	Encircles oral orifice	Facial nerve	Compresses lips together
<b>Dilator Muscles of Lips</b>				
Levator labii superioris alaeque nasi	Arise from bones and fascia around oral aperture and insert into substance of lips		Facial nerve	Separate lips
Levator labii superioris				
Zygomaticus minor				
Zygomaticus major				
Levator anguli oris				
Risorius				
Depressor anguli oris				
Depressor labii inferioris	Outer surface of alveolar margins of maxilla and mandible and pterygomandibular ligament		Facial nerve	Compresses cheeks and lips against teeth
Mentalis				
Buccinator				
Platysma	See Table 11.5			

(continued)

TABLE 11.4 Muscles of the Head (continued)

Muscle	Origin	Insertion	Nerve Supply	Action
<b>Muscles of Mastication</b>				
Masseter	Zygomatic arch	Lateral surface ramus of mandible	Mandibular division of trigeminal nerve	Elevates mandible to occlude teeth
Temporalis	Floor of temporal fossa	Coronoid process of mandible	Mandibular division of trigeminal nerve	Anterior and superior fibers elevate mandible; posterior fibers retract mandible
Lateral pterygoid (two heads)	Greater wing of sphenoid and lateral pterygoid plate	Neck of mandible and articular disc	Mandibular division of trigeminal nerve	Pulls neck of mandible forward
Medial pterygoid (two heads)	Tuberosity of maxilla and lateral pterygoid plate	Medial surface of angle of mandible	Mandibular division of trigeminal nerve	Elevates mandible

- **Posteriorly:** The tympanic plate of the external auditory meatus (Fig. 11.33) and the glenoid process of the parotid gland
- **Laterally:** The parotid gland, fascia, and skin (see Fig. 11.85)
- **Medially:** The maxillary artery and vein and the auriculotemporal nerve

to pull the disc forward beyond the summit. In bilateral cases, the mouth is fixed in an open position, and both heads of the mandible lie in front of the articular tubercles. Reduction of the dislocation is easily achieved by pressing the gloved thumbs downward on the lower molar teeth and pushing the jaw backward. The downward pressure overcomes the tension of the temporalis and masseter muscles, and the backward pressure overcomes the spasm of the lateral pterygoid muscles.



### CLINICAL NOTES

#### Clinical Significance of the Temporomandibular Joint

The temporomandibular joint lies immediately in front of the external auditory meatus. The great strength of the lateral temporomandibular ligament prevents the head of the mandible from passing backward and fracturing the tympanic plate when a severe blow falls on the chin.

The **articular disc** of the temporomandibular joint may become partially detached from the capsule, and this results in its movement becoming noisy and producing an audible click during movements at the joint.

#### Dislocation of the Temporomandibular Joint

Dislocation sometimes occurs when the mandible is depressed. In this movement, the head of the mandible and the articular disc both move forward until they reach the summit of the articular tubercle. In this position, the joint is unstable, and a minor blow on the chin or a sudden contraction of the lateral pterygoid muscles, as in yawning, may be sufficient

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