

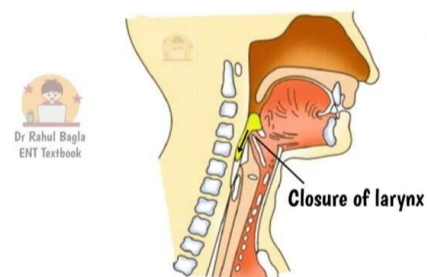
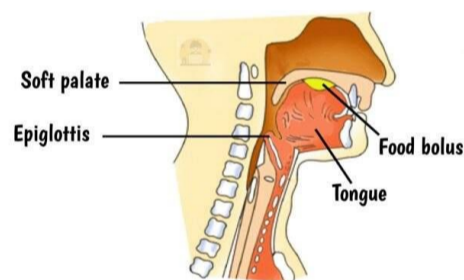


## Physiology of Swallowing

Swallowing involves the coordinated action of various muscles that guide food or liquids from the oral cavity to the stomach through the pharynx and oesophagus while preventing entry into the airways. Swallowing involves three main phases: oral, pharyngeal, and oesophageal. The first phase is under voluntary control, and the latter two are governed by autonomic reflexes.

### 1. Oral Phase:

- **Oral preparatory phase.** The food is chewed, mixed with saliva, and formed into a bolus, while the soft palate remains lowered to prevent premature entry into the oropharynx.
- **Oral transit phase.** It begins when the bolus is moved from the oral cavity into the oropharynx by the tongue. The lips and cheeks work to maintain the bolus centrally, while the tongue elevates against the hard palate to push the bolus into the pharynx.



### 2. Pharyngeal Phase:

- The **pharyngeal phase** starts when the bolus enters the pharynx. It is initiated when the bolus contacts the pharyngeal mucosa.
- Reflex actions guide the food into the oesophagus while protecting the airway and nasal passages:
- **Closure of nasopharynx:** The soft palate presses against the posterior pharyngeal wall, sealing off the nasopharynx.
- **Closure of oropharyngeal isthmus:** Prevents food from re-entering the oral cavity through tongue and palatoglossal muscle action.
- **Closure of larynx:** Prevents aspiration by halting respiration, contracting aryepiglottic folds, and closing the vocal cords.
- **Pharyngeal muscle contraction and cricopharyngeal relaxation:** Synchronous contractions of the pharyngeal muscles and relaxation of the cricopharyngeus allow food to pass into the oesophagus.

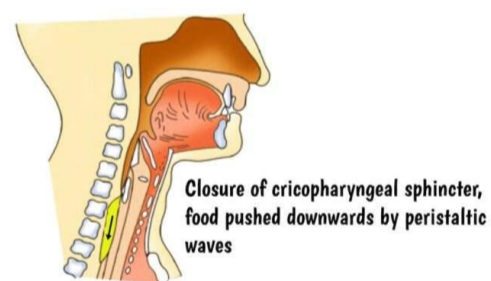
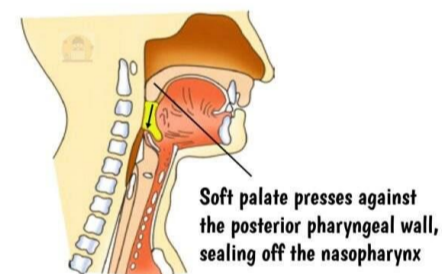


Figure: Physiology of swallowing showing progression of bolus into the stomach

### 3. Oesophageal Phase:

- The cricopharyngeal sphincter closes after food enters the oesophagus.
- Peristaltic waves push the bolus downwards towards the stomach, with the gastroesophageal sphincter momentarily relaxes to admit the bolus into the stomach.
- Regurgitation is prevented by several mechanisms including:
- Tone of the gastroesophageal sphincter.

- Negative intrathoracic pressure.
- Diaphragm's pinch-cock effect.
- Mucosal folds.
- The angle between the oesophagus and stomach (oesophago-gastric angle).
- Slight positive intra-abdominal pressure.

Throughout swallowing, protection of the airway is paramount. The larynx is elevated and closed off by the adduction of the vocal folds. A cough reflex can clear any foreign objects that may enter the

airway. During the pharyngeal phase, breathing is temporarily suspended (apnea) to prevent choking.

### Applied Physiology of the Oesophagus

#### 1. Manometry:

- Manometry is a technique used to measure intraluminal pressure at various points in the oesophagus.
- Two high-pressure zones are identified in the oesophagus, functioning as physiological sphincters:

**Upper Oesophageal Sphincter (UES):** Composed of cricopharyngeus muscle.

- Located at the upper border of the oesophagus, it is 3–5 cm long.
- Functions during the act of swallowing.

**Lower Oesophageal Sphincter (LES):**

1. Located at the lower portion of the oesophagus, also 3–5 cm long.
2. Functions to prevent gastroesophageal reflux.

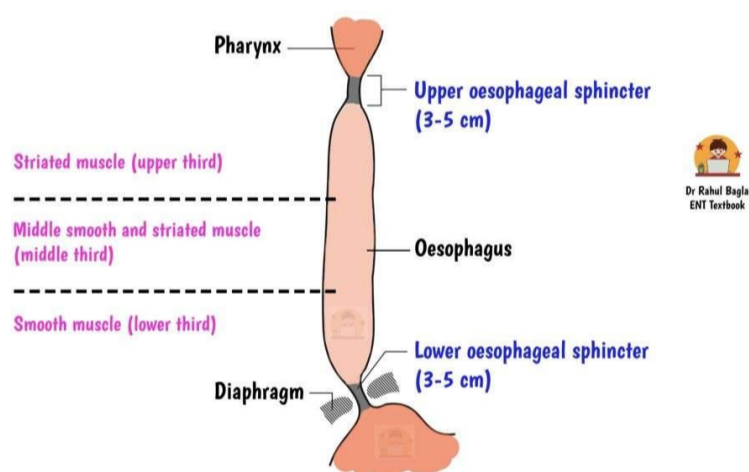


Figure: Two high-pressure zones are identified in the oesophagus

#### 2. Oesophageal Peristalsis:

- Active peristalsis occurs in the middle portion of the oesophagus.
- Peristaltic waves are weaker in the upper part and gradually strengthen toward the lower portion.

#### 3. pH-metry:

- It measures oesophageal pH levels.
- pH-metry helps evaluate conditions such as reflux, motility disorders, and clinical syndromes like Globus sensation and upper chest pain.

— End of the chapter —