The Pharynx

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Introduction

• The pharynx is the Musculo-fascial half-cylinder that links the oral and nasal cavities in the head to the larynx and esophagus in the neck
• Common pathway for air and food
• Attached above to the base of the skull and is continuous below with the esophagus
• Ends at the level of vertebra C6
Conical fibromuscular tube – upper part of the air & food passages

Location:
- Behind the nasal cavity, oral cavity and larynx
- Extend from the base of the skull to the inferior border of cricoid cartilage (anteriorly) & the inferior border of C6 vertebra (posteriorly)

Dimensions:
- 12-14 cm long
- Width:
  - 3.5 cm (at its base)
  - 1.5 cm (pharyngo-oesophageal junction – narrowest part)
**Superior**
Base of the skull
- Part of body of sphenoid
- Basilar part of occipital bone

**Pharynx**

**Epiglottis**

**Thyroid cartilage**

**Cricoid cartilage**

**First tracheal ring**

**Anterior (Incomplete)**
Nasal cavity
Oral cavity
Larynx

**Esophagus start from here**

**Posterior**
Retropharyngeal space (between the buccopharyngeal & prevertebral fascia)

**Inferior**
Continuous with oesophagus (at level of C6 & lower border of cricoid cartilage)
Region of Pharynx

• The walls of the pharynx are attached anteriorly to the margins of the nasal cavities, oral cavity, and larynx

• Subdivided into three regions having opening of
  – **Nasopharynx**: posterior apertures (choanae) of the nasal cavities
  – **Oropharynx**: posterior opening of the oral cavity (oropharyngeal isthmus)
  – **Laryngopharynx**: superior aperture of the larynx (laryngeal inlet) opens
• Opening of PT tube ½” behind and at the level of INC
• guarded by tubal elevation
• Salpingopharyngeal fold - posterior margin of tubal elevation to side-wall of pharynx downwards.
• Salpingopharyngeus
• Behind salpingopharyngeal fold - pharyngeal recess.
• Under mucous membrane - nasopharyngeal tonsil.
Pharynx

• In addition to these openings
  – pharyngeal cavity is related anteriorly to the posterior one-third of the tongue
  – posterior aspect of the larynx
  – pharyngotympanic tubes open into the lateral walls of the nasopharynx

• Lingual, pharyngeal, and palatine tonsils - the deep surface of the pharyngeal walls

• Separated from the posteriorly positioned vertebral column by a thin retropharyngeal space containing loose connective tissue
Skeletal framework

• 2 sides of the pharyngeal wall are welded together posteriorly in the midline by a vertically oriented cord-like ligament - **pharyngeal raphe that extend**
  – From **pharyngeal tubercle** on the base of the skull
  – To the level of cervical vertebra (C6) : blends with connective tissue in the posterior wall of the **esophagus**

• **Irregular C-shaped** line of pharyngeal wall attachment on the base of the skull
  – Begins at the posterior margin of the **medial plate of the pterygoid process** of the sphenoid bone,
  – Then it is attached just inferior to the cartilaginous part of the **pharyngotympanic tube**
  – Then it passes onto the petrous part of the temporal bone to reach **pharyngeal tubercle**
Bony Attachment for the lateral pharyngeal walls

• **Vertical line of attachment** for the lateral pharyngeal walls is discontinuous and in three parts.

  • **First part**
    – Begins superiorly on the posterior edge of the **medial pterygoid plate** - inferior to **pharyngotympanic tube**
    – onto the **pterygoid hamulus**
    – line descends along the **pterygomandibular raphe**

  • **Second part**
    – begins on the lower aspect of the **stylohyoid ligament**
    – line continues onto the **lesser horn** of hyoid bone
    – then turns and runs posteriorly along the entire **upper surface** of the **greater horn** of the **hyoid** where it terminates

• **Third part**
  – begins superiorly on the **superior tubercle** of the thyroid cartilage
  – descends along the **oblique line** to the **inferior tubercle**
  – Then over the **cricothyroid muscle** along a tendinous thickening of fascia to the **cricoid cartilage** where it terminates
Lesser and greater horn of the hyoid bone
Pharyngeal wall

- Formed by skeletal muscles and by fascia
- Gaps between the muscles are reinforced by the fascia
- Organized into two groups based on the orientation of muscle fibers
  - **Constrictor muscles** – circular: Superior, middle & inferior
  - **Longitudinal muscles** – vertical: Stylopharyngeus, Salpingopharyngeus, and Palatopharyngeus
Superior pharyngeal constrictor

Middle pharyngeal constrictor

Inferior pharyngeal constrictor

Levator veli palatini

Salpingopharyngeus m.

Soft palate

Palatopharyngeus m.

Stylopharyngeus m.

Esophagus

Inner vertical layer is made of Salpingo-, Palato-, and Stylopharyngeus m.
Constrictor muscles

Position of palatopharyngeal sphincter on deep surface of superior constrictor

Superior constrictor

Middle constrictor

Inferior constrictor

Pharyngeal fascia

Pharyngeal tubercle

Styloid process

Stylohyoid ligament

Stylopharyngeus muscle

Pharyngeal raphe

Esophagus
The 3 constrictor muscle on each side - major contributors to the structure of the pharyngeal wall
- Superior, Middle and inferior
- Posteriorly, the muscles from each side are joined together by the pharyngeal raphe
- Anteriorly, these muscles attach to bones and ligaments related to the lateral margins of the nasal and oral cavities and the larynx.
- Constrict or narrow the pharyngeal cavity.
- Innervated by the pharyngeal branch of the vagus nerve [X]
Superior constrictors

- Upper part of the pharyngeal cavity
- Attached anteriorly to the pterygoid hamulus, pterygomandibular raphe, and adjacent bone of the mandible.
- Muscle fans out posteriorly and joins with its partner muscle from the other side at the pharyngeal raphe
- Palatopharyngeal sphincter
  - Special band of muscle originating from anterolateral surface of the soft palate
  - Circles the inner aspect of the pharyngeal wall
- Functions: constricts during swallowing - prominent ridge on the deep aspect of the pharyngeal wall
Superior constrictor muscle

Origin (from above to downwards)
- Pterygoid hamulus
- Pterygomandibular raphe
- Medial surface of mandible at posterior end of mylohyoid line (near the attachment of pterygomandibular raphe)
- Side of the posterior part of the tongue
Middle constrictors

- Attached to the lower aspect of the **stylohyoid ligament**
- **lesser horn** of the hyoid bone, and the entire upper surface of the **greater horn of the hyoid**
- Muscles fan out posteriorly and attach to the **pharyngeal raphe**
- Posterior part of the **middle constrictors** overlaps the **superior constrictors**
Middle constrictor muscle

Origin
- Lower part of stylohyoid ligament
- Lesser cornu of hyoid bone
- Upper border of greater cornu of hyoid bone
Inferior constrictors

- Attach anteriorly to the **oblique line** of the **thyroid cartilage** and the **cricoid cartilage**.
- There are **ligament** that spans between these two attachments to cartilage - crosses the **cricothyroid muscle**
- Spread out posteriorly and attach to the **pharyngeal raphe**
- Posterior part of the inferior constrictors overlaps the middle constrictors
- **Inferiorly**, the muscle fibers blend with and attach into the **wall of the esophagus**
- **Narrowest part** of the pharyngeal cavity
**Inferior constrictor muscle**

1. Thyropharyngeus
   - Arise from **thyroid cartilage**
     - oblique line and inferior tubercle of thyroid cartilage
   - A tendinous band that crossed the cricothyroid muscle & is attached *above to the inferior tubercle of thyroid cartilage*

1. Cricopharyngeus
   - Cricoid cartilage behind the origin of cricothyroid muscle
Longitudinal muscles

- Named according to their origins
  - **Stylopharyngeus**: styloid process of the temporal bone
  - **Salpingopharyngeus**: cartilaginous part of the pharyngotympanic tube
  - **Palatopharyngeus**: soft palate

- **Function**
  - elevate the pharyngeal wall, or
  - during swallowing, pull the pharyngeal wall up and food bolus into the esophagus

- **Nerve Supply**: Except stylopharyngeus (Glossopharyngeal nerve) both the muscle is supplied by **Vagus Nerve**
Longitudinal muscles

• **Stylopharyngeus**
  – cylindrical stylopharyngeus muscle
  – **medial surface** of the *styloid* process
  – descends between the *superior* and *middle constrictor* muscles
  – fan out on, and blend with, the **deep surface** of the *pharyngeal wall*.

• **Salpingopharyngeus**
  – small muscle **originating** from the inferior aspect of the *pharyngotympanic tube*
  – descending on, and blending into the deep surface of the pharyngeal wall

• **Palatopharyngeus**
  – in addition to being a **muscle of the pharynx**, is also a muscle of the *soft palate*
  – attached to the upper surface of the *palatine aponeurosis*
  – passes posteriorly and inferiorly to blend with the **deep surface** of the pharyngeal wall
1. **Stylopharyngeus**

From styloid process,
- passes through the gap between superior & middle constrictor
- Run downward to the inner surface of middle and inferior constrictor

**Stylopharyngeus muscle**
2. Palatopharyngeus

- Descends from **the sides of palate**
- Runs longitudinally on the internal aspect of 3 constrictors

![Palatopharyngeus muscle](image)
3. **Salpingopharyngeus**

- Descends **from the auditory tube**
- Merges with the palatopharyngeus muscle
Fascia

- Pharyngeal fascia is separated into two layers, which sandwich the pharyngeal muscles between them
  - Buccopharyngeal fascia
    - thin layer coats the outside of the muscular part of the wall
    - component of the pretracheal layer of cervical fascia
  - Pharyngobasilar fascia
    - thicker layer lines the inner surface
- Fascia reinforces the pharyngeal wall where muscle is deficient
  - above the level of the superior constrictor - reinforced externally by muscles of the soft palate
Pharyngeal Spaces

- Situated behind the pharynx & extending from the base of skull to the bifurcation of trachea
- Divided into 2 lateral compartments [spaces of Gillette] by a fibrous raphe
- Has retropharyngeal nodes – disappear at 3-4 years
- Infection can pass down behind the oesophagus into the mediastinum
Artery Supply
Artery Supply

- **Upper parts** of the pharynx
  - the ascending pharyngeal artery;
  - the ascending palatine and tonsillar branches of the facial artery;
  - numerous branches of the maxillary and the lingual arteries.

- **Lower parts** of the pharynx
  - pharyngeal branches from the inferior thyroid artery
Veins and Lymphatic Drainage
Veins and Lymphatic Drainage

• Veins of the pharynx form a **plexus**
  – **Superiorly** - pterygoid plexus in the infratemporal fossa
  – **Inferiorly** - facial and internal jugular veins

• Lymphatics
  – drain into the **deep cervical nodes** and include retropharyngeal, paratracheal, and **infrahyoid nodes**
Nerves

- Motor and most sensory innervation - branches of the vagus [X] & glossopharyngeal [IX] nerves
- This 2 nerved forms a plexus in the outer fascia of the pharyngeal wall, consisting of
  - the pharyngeal branch of the vagus nerve [X];
  - branches from the **external laryngeal nerve** from the **superior laryngeal branch** of the vagus nerve [X];
  - pharyngeal branches of the glossopharyngeal nerve [IX]
**Motor innervation**
- All muscles of pharynx are supplied by the cranial accessory nerve through branches of vagus except stylopharyngeus muscle[ pharyngeal branches of glossopharyngeal nerve]
- Inferior constrictor muscle has additional supply from the external and recurrent laryngeal nerves

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**Sensory innervation** Afferent fibers travel through:
1. Glossopharyngeal nerve (mostly)
2. Vagus nerve (partly)
3. Maxillary nerve through pterygopalatine ganglion (nasopharynx Only)
4. Lesser palatine and glossopharyngeal nerve (soft palate & tonsil)

**Autonomic innervation**
Parasympathetic (secretomotor)
1. Greater petrosal nerve (branch of facial nerve)
2. Lesser palatine branches of pterygopalatine ganglion

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Generally, all the nerves supplying the pharynx form a plexus (pharyngeal plexus) which chiefly lies on the middle constrictor muscle:
1. Pharyngeal branch of vagus carrying cranial accessory nerve fibers
2. Pharyngeal branch of glossopharyngeal nerve
3. Pharyngeal branch of the superior sympathetic ganglion

Fibers from pharyngeal plexus also supplies the muscles of soft palate except tensor veli palatini (by Mandibular nerve)