

## 6. The Pharynx

The pharynx, which forms the upper part of the digestive tract, consists of three parts: the nasopharynx, the oropharynx and the laryngopharynx. The principle object of this dissection is to observe the pharyngeal constrictors that form the back wall of the vocal tract. Because the cadaver is lying face down, we will consider these muscles from the back. Figure 6.1 shows their location.

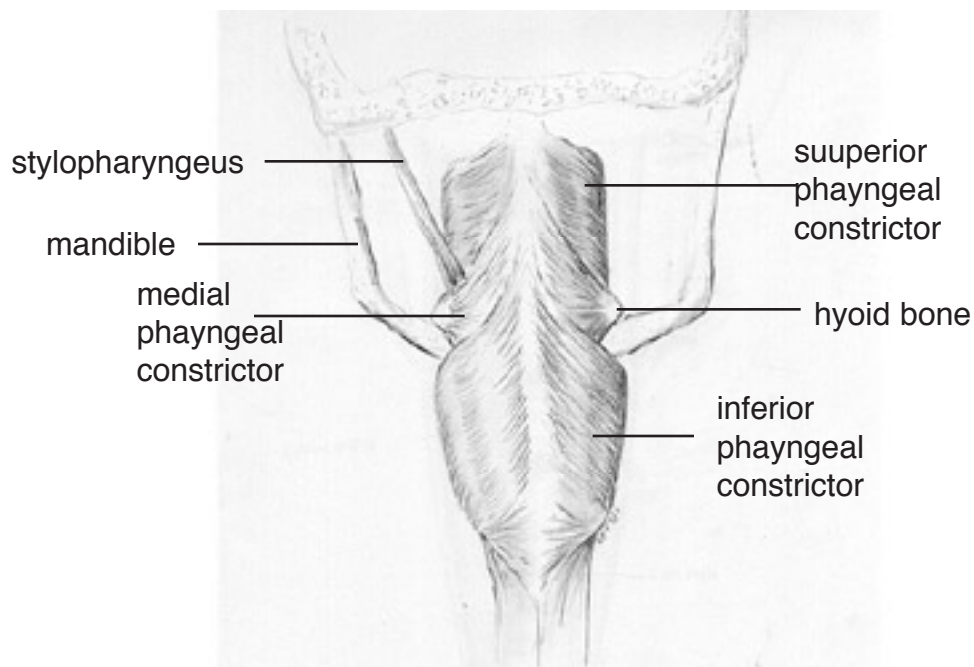


Figure 6.1. Posterior view of the muscles of the pharynx.

Each of the three pharyngeal constrictors has a left and right part that interdigitate (join in fingerlike branches) in the midline, forming a raphe, or union. This raphe forms the back wall of the pharynx. The superior pharyngeal constrictor is largely in the nasopharynx. It has several origins (some texts regard it as more than one muscle) one of which is the medial pterygoid plate. It assists in the constriction of the nasopharynx, but has little role in speech production other than helping form a site against which the velum may be pulled when forming a velic closure. The medial pharyngeal constrictor, which originates on the greater horn of the hyoid bone, also has little function in speech. To some extent it can be considered as an elevator of the hyoid bone, but its most important role for speech is simply as the back wall of the vocal tract. The inferior pharyngeal constrictor also performs this function, but plays a more important role constricting the pharynx in the formation of pharyngeal consonants. It originates on the thyroid cartilage, with some additional fibers arising from the cricoid cartilage. These two parts are sometimes called the thyropharyngeus and the cricopharyngeus muscles.

Before proceeding with the dissection, you should also review the structures found in previous dissections. By palpation on the cadaver (and on yourself), locate the hyoid bone, the anterior aspect (front side) of the thyrohyoid membrane, the superior (top) border of the thyroid cartilage and its superior cornu (horn). Notice the thyroid notch in the midline. You should be able to locate all these features on yourself. Below the thyroid notch, on the cadaver, locate the

cricothyroid muscle which connects the cricoid cartilage (the first cartilage ring of the trachea) to the thyroid cartilage. Posteriorly (in the back), the recurrent laryngeal nerve can be seen adjacent to the joint of the cricoid and the thyroid cartilage.

### Dissection

*Caution:* In this dissection, you will cut through the spinal column. As always when dealing with central nervous system tissue, wear double gloves.

This dissection consists of three parts. First, we will cut through the spinal column and the adjoining musculature. This will sever the head and neck from the torso. Next we will locate the pharyngeal muscles. Finally we will open up the pharynx to reveal the larynx and its structures.

1. Locate the retropharyngeal space and work a probe into it, separating the two layers of fascia (Figure 6.2). Enlarge the space by moving the probe up and down. This will isolate the structures we wish to preserve from those we will simply cut through.

The retropharyngeal space is a region between two layers of fascia separating the spinal column from the esophagus and trachea. The pretracheal fascia encloses the organs in the anterior portion of the neck, and the prevertebral fascia encloses the spine and its musculature. Between these two fascia lies the retropharyngeal space, the space between the esophagus and the spinal cord.

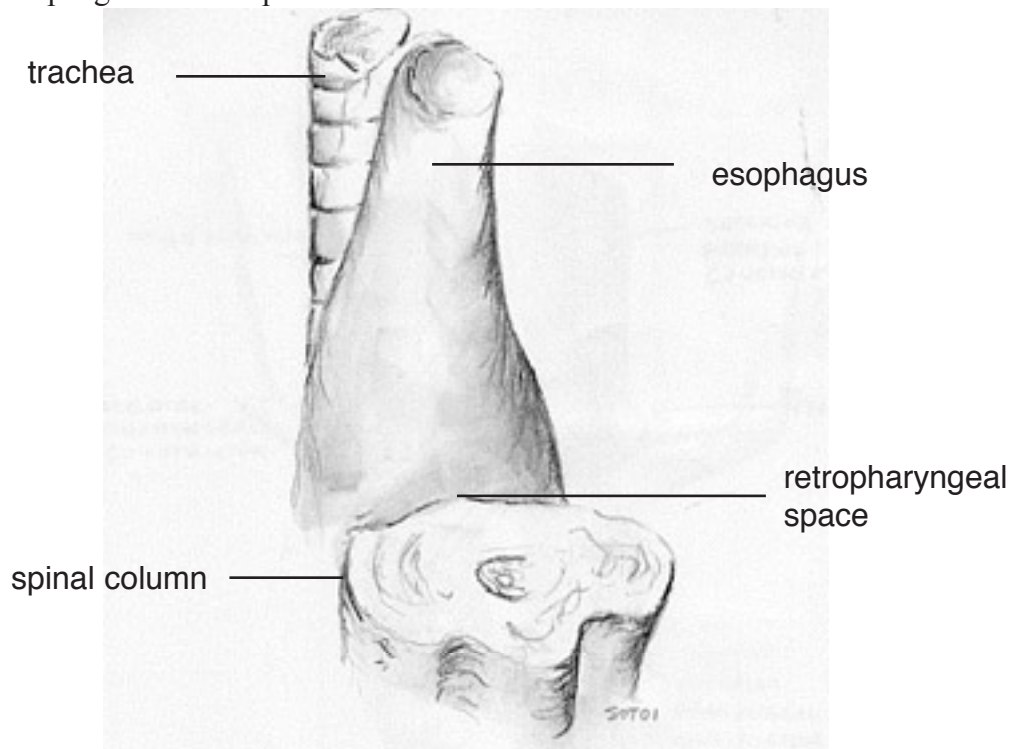


Figure 6.2. The retropharyngeal space, as seen from the rear.

2. Turn the cadaver over to a prone position (i.e. face down) with the probe in place.
3. Sever the muscles attached to the cranium and clear away all the muscles along the back and sides of the neck. From the back you should now see the cervical vertebrae.

4. Cut transversely with a bone saw through the spinal column at a level anywhere between cervical vertebrae C1 and C4, C1 being the first vertebra in the spinal column.
5. Sever all the prevertebral muscles with a sharp scalpel down to the level of the probe in the retropharyngeal space. The prevertebral muscles run between the front of the vertebrae to the occipital bone or the ribs.
6. Turn the cadaver over once more so it is now supine (i.e. face up).
7. Cut the trachea and esophagus as close to the clavicle as possible. The head is now severed from the body, and you can discard the lower portion of the cadaver at this stage. (Please confirm what the disposal rules are before doing this.)
8. Put the severed head face down on the table with the cut skull resting flat, so that you are viewing the pharynx from the posteroinferior view (from behind and below). Because the head is now upside down, it is important to remember that all vertical directions in this section are given in relation to the cadaver in an upright position. Locate the styloid process by inserting your finger in the cavity behind the ear.

### **The Pharynx**

1. The superior constrictor muscle

Remove the medial pterygoid muscle to uncover the superior constrictor muscle of the pharynx. The medial pterygoid muscle is attached to the medial pterygoid plate. The medial pterygoid plate and the lateral pterygoid plates look like wings and extend out from the sphenoid bone. The sphenoid bone is located on the skull just behind the eyes and nose. The pterygoid plates are not yet visible at this stage of the dissection, and they may be broken off of a skull model.

Observe the raphe joining the two halves of the superior constrictor muscle.

Observe how the superior part of the pharynx relates to its surrounding structures. Note how the constrictor muscles of the pharynx and the buccinator muscle of the cheek form a contiguous wall and enclose the oropharyngeal cavity. Underneath the superior constrictor muscle, the back wall of the pharynx consists of the pharyngobasilar fascia which is attached to the skull base. The upper edge of this fascia lies level with the hard palate. The pharyngotympanic (eustachian) tube passes through the space between superior constrictor muscle and base of the skull.

2. The medial constrictor muscle

Locate the medial constrictor muscle. It arises from the horns of the hyoid bone and attaches to the median raphe of the superior constrictor muscle. The medial and inferior constrictor muscles are divided by the thyrohyoid membrane, which is attached to the thyroid cartilage and the hyoid bone.

3. The inferior constrictor muscle

Locate the inferior constrictor muscle. It is composed of two distinct parts, the thyropharyngeus and the cricopharyngeus muscles. The thyropharyngeus muscle is attached anteriorly to the oblique line (a vertical line on the side) of the thyroid cartilage and from

there sweeps posteriorly to the midline raphe. Superiorly, it is attached as high as the level of the soft palate. Inferiorly, its lowermost fibers are horizontal and adjacent to the cricopharyngeus muscle. The cricopharyngeus muscle is attached from one side of the cricoid arch to the other. Thus, there is no midline raphe. The cricopharyngeus muscle is a sphincter muscle at the lower end of the pharynx, and opens only during the act of swallowing.

### Opening the pharyngeal cavity

1. There are two methods for opening the pharyngeal cavity:

Locate the superior horns of the thyroid cartilage and the greater horn of the hyoid bone. With a sharp scalpel, make an incision between these two landmarks from left to right. From the mid-line of this first incision, cut vertically through the posterior wall of the pharynx, inferiorly to the superior edge of the esophagus.

Alternatively, dissect from the inferior, cut edge of the esophagus up to the hyoid bone. Next, make a horizontal incision between the horns of the thyroid cartilage and the greater horns of the hyoid bone.

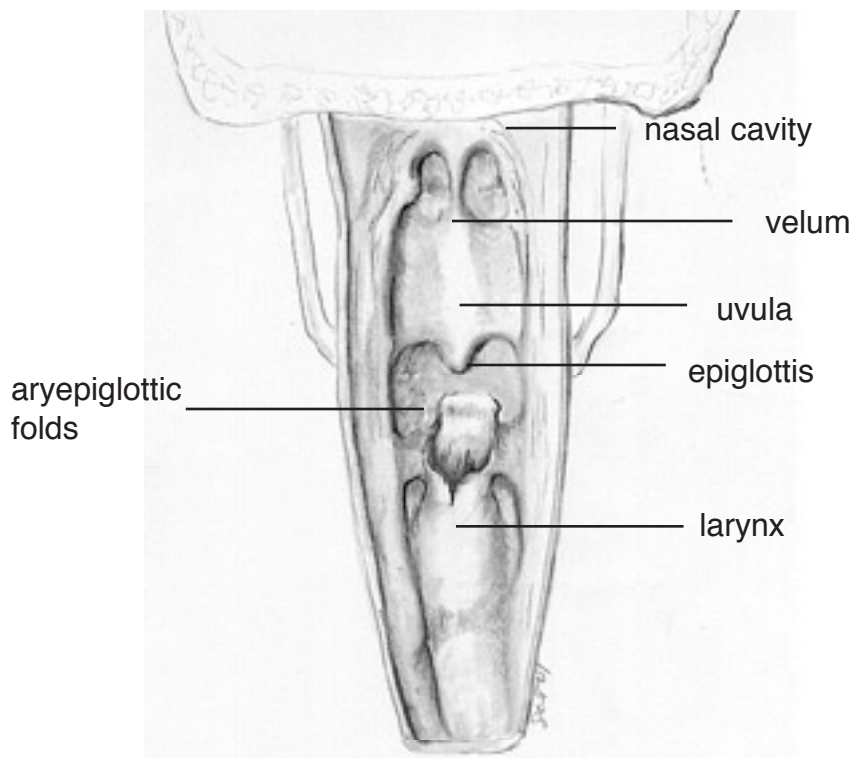


Figure 6.3. The opened pharynx from behind. Note that the posterior musculature of the larynx is still covered with fascia.

2. Reflect laterally the flaps of the pharyngeal wall thus formed.
3. Shine a light down the tube of the larynx to see the vocal cords forming a V-shaped opening with the apex of the V pointing anteriorly. The vocal folds may be smaller than expected, and difficult to see.
4. Locate the epiglottis. It is a leaf-shaped structure, which is attached by a stalk to the midline of the posterior aspect of the thyroid cartilage. Food goes around the epiglottis through the periform sinuses into the esophagus.
5. Locate the aryepiglottic folds. They run inferoposteriorly along the side of the epiglottis toward the arytenoid cartilages. The aryepiglottic muscles, which lie beneath the mucosa covering these folds, attach to the arytenoid cartilage.
6. Locate the arytenoid cartilages. (Although they cannot be seen in the figure, they can be palpated.) These triangulate cartilages sit on the cricoid cartilage. The arytenoid cartilages are covered posteriorly by the arytenoid muscles.
7. Locate the corniculate cartilages (also not shown on the figure) on the apex of each arytenoid cartilage. These are best found by gently palpating the arytenoid cartilages.