Pharyngeal Arch Derivatives: 4-6 Arches

The pharyngeal arches (also known as branchial arches) are a fundamental aspect of vertebrate head and neck development. They are all derived from mesoderm and appear early in the third to fourth gestational week, and differentiate into terminal structures by the seventh to eighth gestational week. They are comprised of cartilage support (serving as a precursor to skeletal elements), arterial supply (from the aortic arch system) and cranial nerve supply. The fourth and sixth arches give rise to various cartilages including the thyroid, cricoid, arytenoids, corniculate and cuneiform. The muscles derived from the fourth arch include the pharyngeal constrictors and the cricothyroid. The muscles derived from the sixth arch include the intrinsic muscles of the larynx (except the cricothyroid). The cranial nerve supply to the fourth arch structures is the superior laryngeal branch of CN X (vagus nerve). The cranial nerve supply to the sixth arch structures is the recurrent laryngeal branch of CN X (vagus nerve). The fifth arch only exists transiently, and no human structures are derived from the fifth arch.

PLAY PICMONIC

Cartilage

Thyroid

Thigh-droid

Thyroid cartilage is the largest of the cartilaginous members of the larynx and serves to protect the vocal cords. It is shaped by two flaps that come together, joining at the midline and forming what is called the midline prominence, or Adam's apple. The indent created above this midline prominence is called the superior thyroid notch.

Cricoid

Crocodile

The cricoid is a signet ring-shaped cartilage that lies inferior to the thyroid cartilage. It is the only laryngeal cartilage that forms a complete ring. It serves as an attachment site for the structures that open and close the airway.

Arytenoids

Arrow-heads

The arytenoid cartilage is shaped like a three-pronged hat and acts as a lever to allow vocal cord movement.

Corniculate

Corny-lights

The corniculate cartilage are a pair of cartilage that articulate with the arytenoid cartilages to extend them posteriorly and medially.

Cuneiform

Cow-uniform

The cuneiform cartilages are paired cartilages that sit on top of and move with the arytenoids. They function to support the vocal folds and lateral aspects of the epiglottis.

Muscles

4th: Cricothyroid

(4) Fork with Crocodile-thigh-droid

The cricothyroid tenses and adducts the vocal cords, resulting in higher-pitch phonation. It is derived from the fourth pharyngeal arch and is the only intrinsic laryngeal muscle supplied by the superior laryngeal nerve, a branch of CN X (vagus).

4th: Pharyngeal Constrictors

(4) Fork with Pharoah Constrictor

The muscular wall of the pharynx is composed of the superior, middle and inferior constrictor muscles. These serve to constrict the pharynx. They are derived from the fourth pharyngeal arch and are therefore innervated by the superior laryngeal nerve, a branch of CN X.

6th: Intrinsic Muscles of Larynx

(6) Sax with In-muscles of Larynx

The intrinsic muscles of larynx control sound production. With the exception of the cricothyroid, all intrinsic muscles of the larynx are innervated by the recurrent laryngeal branch of CN X (vagus).

Nerves

4th: CN X (Vagus Nerve)

(4) Fork with (10) Tin Vegas-sign

CN X, also known as the vagus nerve, is a motor, sensory and visceral nerve with several functions such as heart rate regulation, respiratory drive regulation, palate elevation, swallowing, and talking.

Superior Laryngeal Branch

Super Larynx

The superior laryngeal nerve descends next to the pharynx and divides into external and internal branches. The external branch supplies the cricothyroid muscle. The internal branch supplies sensory innervation to the larynx above the vocal cords.

6th: CN X (Vagus Nerve)

(6) Sax with (10) Tin Vegas-sign

CN X, also known as the vagus nerve, is a motor, sensory and visceral nerve with several functions such as heart rate regulation, respiratory drive regulation, palate elevation, swallowing, and talking.

Recurrent Laryngeal Branch

Recurrent Larynx

The recurrent laryngeal branch of CN X (vagus) supplies sensory innervation below the vocal cords, and motor innervation to all laryngeal muscles except the cricothyroid. Injury to this nerve due to surgery, trauma, or mass lesion may result in difficulty speaking and a hoarse voice.