Posterior and Anterior Triangles of the Neck

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READING ASSIGNMENT:
Moore and Agur’s Essential Clinical Anatomy, 3rd edition; pp. 586-603
Agur and Dalley’s Grant’s Atlas of Anatomy, 12th edition; pp. 752-766
Tank’s Grant’s Dissector 14th edition; pp. 186-194

OBJECTIVE:
To obtain a fundamental knowledge of the cervical triangles of the neck with respect to structure and function.

OUTLINE:
I. Introduction: Basic Landmarks
II. Anterior Cervical Triangle
   A. Muscular triangle
   B. Carotid Triangle
   C. Submandibular Triangle
   D. Submental Triangle
III. Posterior Cervical Triangle
   A. Occipital Triangle
   B. Supraclavicular Triangle

Syllabus artwork provided by Dr. Alex Meredith

I. Introduction: Basic landmarks
The boundaries of the neck are the mandible and mastoid process (superior), the trapezius muscle (posterior), the clavicle (inferior) and the midline of the neck (anterior). The sternocleidomastoid muscle transects the neck region and dividing the neck into 2 triangles: the anterior cervical and posterior cervical triangles.

Fig 1
A. Anterior Cervical Triangle
The palpable boundaries of the anterior cervical triangle are the mandible (superior), the sternocleidomastoid muscle (lateral) and the midline of the neck (medial).

The specific boundaries are:
  1. superiorly: the body of the mandible, the styloid process and the mastoid process of the temporal bone
  2. laterally: the anterior edge of the sternocleidomastoid muscle
  3. anteriorly: the midline of the neck

B. Posterior Cervical Triangle
The palpable boundaries of the posterior cervical triangle are the sternocleidomastoid muscle (anterior), the trapezius muscle (posterior) and the clavicle (inferior).

The specific boundaries are:
  1. anterior: the posterior border of the sternocleidomastoid muscle
  2. posterior: the anterior border of the trapezius muscle
  3. inferior: the clavicle

II. Anterior cervical triangle
For ease of reference and discussion, the anterior cervical triangle is subdivided into 4 triangles. The names of these triangles are descriptive with relevance to contents and location:

The 4 triangles of the anterior cervical triangle are:
  1. Muscular triangle
  2. Carotid triangle
  3. Submandibular triangle
  4. Submental triangle

A. Muscular triangle
The boundaries of the muscular triangle are:
  1. lateral-superior: superior belly of the omohyoid muscle
  2. lateral-inferior: sternocleidomastoid muscle
  3. medial: midline of the neck

The muscular triangle is appropriately named since the prominent contents of this triangle are the infrahyoid or “strap” muscles. These muscles are referred to as infrahyoid since they all take their origin below the hyoid bone. These muscles are:

  1. omohyoid, superior belly
  2. sternohyoid
  3. sternothyroid
  4. thyrohyoid
The superior belly of omohyoid muscle inserts on the hyoid bone. At the insertion of the omohyoid, the muscle runs parallel to the medially positioned sternohyoid muscle. As the omohyoid muscle continues its course, it heads laterally and posteriorly. As it passes behind the sternocleidomastoid muscle, the omohyoid muscle is constricted, which indicates the beginning of the inferior belly of the omohyoid muscle. The omohyoid muscle takes it origins from the scapula. The sternohyoid muscle also inserts on the hyoid bone but it originates from the sternum. The omohyoid muscle and the sternohyoid muscle are superficial to the thyrohyoid muscle and sternothyroid muscle. The thyrohyoid muscle originates from the hyoid bone and inserts on the thyroid cartilage. The sternothyroid muscle originates from the sternum and inserts on the thyroid cartilage. Together, the infrahyoid muscles depress, raise and stabilize the larynx and hyoid bone during swallowing and phonation.

Fig 2

The infrahyoid muscles are innervated by motor branches from C1-C3 that form the ansa cervicalis. “Ansa” means loop. The loop can frequently be found embedded in the carotid sheath (see Carotid Triangle section) but the branches of the ansa cervicalis extend to the infrahyoid muscles and thus enter the muscular triangle. The ansa cervicalis is described as having a superior (C1-C2) and an inferior (C2-C3) root. The superior root appears to take origin from the hypoglossal nerve (CN XII). The ansa cervicalis supplies motor innervation to all of the infrahyoid muscles EXCEPT the thyrohyoid. The thyrohyoid muscle is innervated by C1 fibers that run with (piggy back on) the hypoglossal nerve, independent of the ansa cervicalis. Other structures that can be approached through the muscular triangle, are the recurrent laryngeal nerve which supplies motor innervation to all muscles of the larynx except the cricothyroid muscle. The cricothyroid muscle, which can also be approached through the muscular triangle, is innervated by the superior laryngeal nerve (external branch). The muscular triangle also provides access to the trachea, the thyroid and parathyroid glands, the larynx and the esophagus.

B. Carotid triangle
The boundaries of the carotid triangle are:
1. anterior-inferior: superior belly of the omohyoid muscle
2. anterior-superior: posterior belly of the digastric muscle
3. posterior: anterior border of the sternocleidomastoid muscle
The most prominent component of the carotid triangle is the **carotid sheath** which contains the **common carotid artery** (medial), the **internal jugular vein** (lateral) and the **vagus nerve** (CN X) (posterior). The carotid sheath is a continuation of the connective tissue surrounding the great vessels. The carotid sheath runs deep to both the sternocleidomastoid muscle and the omohyoid muscle. In addition to the ansa cervicalis, numerous lymph nodes are also embedded in the sheath. These nodes, difficult to visualize during dissection, have important clinical implications with regard to cancer metastasis of the mouth, larynx and other structures of the head and neck.

The common carotid artery divides into the **internal** and **external** carotid artery at the level of the upper border of the thyroid cartilage (C4). Two specialized receptors are positioned at the carotid bifurcation: the carotid sinus and the carotid body. The **carotid sinus**, a dilatation of the internal carotid, is a baroreceptor that reacts to changes in blood pressure. The **carotid body** is a chemoreceptor that monitors blood oxygen levels. The internal carotid artery gives off no branches until it enters the skull. The external carotid has numerous branches; some of these branches will be discussed in this lecture and others will be addressed in subsequent lectures.

**Branches of external carotid are:**
1. superior thyroid artery
2. lingual artery
3. facial artery
4. ascending pharyngeal artery
5. occipital artery

The **superior thyroid artery** runs along the posterior border of the thyrohyoid muscle and gives off a branch named the **superior laryngeal artery**. The superior laryngeal artery pierces the thyrohyoid membrane along with the internal branch of the superior laryngeal nerve. The **lingual artery** passes deep to the hyoglossus muscle and supplies portions of the pharyngeal wall, oral cavity and tongue. The **facial artery** arises near the angle of the mandible and runs superficial to the mandible as it continues toward the nose as the angular artery. The **ascending pharyngeal artery** arises near the carotid bifurcation. The **occipital artery** arises from the posterior aspect of the external carotid, supplies the sternocleidomastoid muscle and courses medial to the mastoid process. The sixth branch of the external carotid artery is the **posterior auricular artery** but this artery is NOT in the carotid triangle.

In addition to the ansa cervicalis (C1-C3) and the vagus nerve, the hypoglossal nerve also traverses through the carotid triangle. The hypoglossal nerve exits the skull via the hypoglossal canal which is near the origin of the posterior belly of the digastric. The hypoglossal nerve exits the carotid triangle deep to the posterior belly of the digastric. The hypoglossal nerve, which is purely motor, innervates the intrinsic muscles of the tongue and all of the extrinsic muscles of the tongue (**hyoglossus muscle, styloglossus muscle and genioglossus muscle**) EXCEPT the **palatoglossus muscle**.

C. **Submandibular triangle**
The boundaries of the submandibular triangle are:
1. superior: body of mandible and the styloid process of the temporal bone
2. posterior-inferior: posterior belly of digastric muscle
3. anterior-inferior: anterior belly of digastric muscle

The submandibular triangle is largely filled by the submandibular gland, one of the major salivary glands. The submandibular duct (of Wharton) exits the anterior region of the gland, runs superficial to the hyoglossus muscle and empties into the oral cavity near the frenulum of the tongue. The duct first runs deep to the lingual nerve and then passes over the nerve in a superficial position.

The stylohyoid muscle and the mylohyoid muscle are also found in the submandibular triangle. The stylohyoid muscle originates from the styloid process of the temporal bone and inserts on the hyoid bone. The stylohyoid is innervated by the facial nerve (CN VII) and acts to elevate and retract the hyoid bone. The mylohyoid muscle originates from the body of the mandible and inserts in the midline raphe and posteriorly into the hyoid bone. The mylohyoid muscle is innervated by the mylohyoid branch of the inferior alveolar nerve which is a branch of the mandibular division of the trigeminal nerve (CN V). Together with the posterior and anterior bellies of the digastric, these muscles constitute the suprathyoid muscle group.

D. Submental triangle
Mental refers to the chin thus submental is under the chin. The submental triangle is the only triangle of the 4 triangles that comprise the anterior cervical triangle that is not paired (i.e. the submental triangle crosses the midline of the neck).

The boundaries of the submental triangle are:
   1. superior: anterior belly of right and left digastric m.
   2. inferior: hyoid bone

The submental triangle contains the submental lymph nodes. The entire neck region drains lymhatics into the deep cervical nodes. Specifically, the submental nodes drain into a prominent node known as the jugulo-omohyoid node, which lies above the inferior belly of the omohyoid where it crosses the internal jugular vein. Also in the submental triangle are small veins that form the anterior jugular veins. The floor of the submental triangle is formed by the mylohyoid muscle.

III. Posterior cervical triangle

The boundaries of the posterior cervical triangle are:
   1. anterior: the posterior border of the sternocleidomastoid muscle
   2. posterior: the anterior border of the trapezius muscle
   3. inferior: the clavicle
Similar to the anterior cervical triangle, the posterior triangle is also subdivided but the posterior triangle is only divided into 2 triangles. The structure that established these 2 subtriangles is the inferior belly of omohyoid m. The 2 triangles are:

1. **occipital triangle**
2. **supraclavicular triangle** (also known as **subclavian**)

**A. Occipital triangle**

The occipital triangle is superiorly positioned with respect to the supraclavicular triangle. The boundaries of the occipital triangle are:

1. anterior: posterior border of the sternocleidomastoid muscle
2. inferior: the inferior belly of the omohyoid muscle
3. posterior: the anterior border of the trapezius muscle

Prominent components of the occipital triangle are 5 nerves:

1. **lesser occipital nerve** (C2-C3)
2. **great auricular nerve** (C2-C3)
3. **transverse cervical nerve** (C2-C3) (also known as transverse colli)
4. **supraclavicular nerves**: lateral, intermediate and medial (C3-C4)
5. **spinal accessory nerve** (CN XI)
The lesser occipital nerve, the great auricular nerve and the transverse cervical nerve are cutaneous nerves that emerge from the posterior border of the sternocleidomastoid from a common root. The lesser occipital nerve runs upward toward the mastoid process and supplies the scalp behind the ear. The great auricular nerve also runs upward but it travels anterior to the ear. The great auricular nerve frequently travels with the external jugular vein. The transverse cervical nerve is positioned most inferiorly of the three. Upon emerging from the posterior edge of the sternocleidomastoid muscle the transverse cervical nerve will divide and provide cutaneous innervation to the majority of the anterior neck. Inferior to the common root that forms the lesser occipital nerve, the great auricular nerve, and the transverse cervical nerve, the supraclavicular nerve also emerges from the posterior border of the sternocleidomastoid. The supraclavicular nerve trifurcates into the lateral, intermediate and medial branches. These three nerve branches are named according to the direction they travel and they provide cutaneous innervation to those respective regions.

It is important to remember that the 4 above named nerves emerge deep to the sternocleidomastoid muscle but do not innervate that muscle. The spinal accessory nerve emerges from, rarely deep to, the sternocleidomastoid muscle since this nerve innervates this muscle. Upon emerging from the sternocleidomastoid muscle the spinal accessory nerve, running on the levator scapulae muscle pierces the trapezius muscle to supply efferent innervation. In addition to the nerves in the occipital triangle, 2 muscles can be observed in the occipital triangle. These muscles form the floor of this region:

1. splenius cervicis muscle
2. levator scapulae muscle

B. Supraclavicular triangle
The supraclavicular triangle is positioned inferior to the inferior belly of the omohyoid muscle and the boundaries are:

1. anterior: posterior border of the sternocleidomastoid muscle
2. inferior: the clavicle bone
3. superior-posterior: inferior belly of the omohyoid muscle the anterior edge of the trapezius muscle
Similar to the occipital triangle, the most abundant structures of the supraclavicular triangle are nerves:

1. Portions of the **brachial plexus**: ventral rami from C5-T1
2. Nerves derived from the brachial plexus:
   a. **dorsal scapular nerve** (rhomboids and levator scapulae muscles)
   b. **suprascapular nerve** (supraspinatus and infraspinatus muscles)
   c. **long thoracic nerve** (serratus anterior muscle)
3. **phrenic nerve** (C3-C5) (diaphragm muscle)

In addition to the nervous component of the supraclavicular triangle, there are also several arteries and a vein:

1. **transverse cervical artery**: supplies trapezius and muscle of the scapula
2. **suprascapular artery**: supplies muscles of the scapula
3. **subclavian vein**

The floor of the supraclavicular triangle is formed by the middle and posterior scalene muscles.

**Fig 5**