

Triangles of neck, thyroid, parathyroid

Cutaneous Innervation of neck: dermatomes (Moore Fig 1.20 pp 86)

The dermatomes that supply the neck region extend from C2-C4, with some overlap with C5. The nerves that innervate the skin arise from the **dorsal rami** of spinal nerves. Note, until now – we have only been dealing with the **ventral rami** of spinal nerves. It also receives innervation from the **ventral rami** of the **cervical plexus**.

Superficial veins of neck (Notes)

The two most important veins here are the external and anterior jugular veins. These will be dealt with more detail later in the notes.

Platysma muscle (Moore pp 1000, Fig 8.5)

This muscle extends along the anterior and posterior triangle of the neck. It diverges at its base, and converges superiorly – travelling over the clavicle, parts of the deltoid to merge with the muscles of the face. It lies in the subcutaneous tissue so it is most likely that you did not see it during dissection. It is supplied by the cervical branch of the **facial nerve (CN VII)**.

Sternocleidomastoid muscle (Moore pp 1001 Netter 22)

This is an important landmark, as it **divides** the anterior and posterior triangles of the neck. It has **two** inferior heads: a rounded head attaching to the manubrium of the sternum, and a flat edged head attaching to the medial third of the clavicle. It runs superoposteriorly to attach to the **mastoid process of the temporal bone**, and the **superior nuchal line of the occipital bone**. Functionally, (acting bilaterally) – can **flex** the neck so that chin touches the manubrium, or can **protrude** the chin outward, (acting unilaterally) – **abducts** the neck, and **rotates** head so ear approaches shoulder of same side. It is supplied by the **spinal root of accessory nerve (CN XI)** and pain and proprioception is achieved by C2&C3 fibres.

Trapezius muscle (Moore pp 1001 Netter 160)

This is a large muscle covering the posterolateral aspect of the neck and thorax. Functionally, it can **elevate** (superior fibres), **retract** (middle fibres), and **rotate** (inferior fibres) the **scapula**. It is supplied by the **spinal root of accessory nerve (CN XI)** and pain and proprioception is achieved by **C3&C4 fibres**.

Note: The LMN's (last neuron leaving the spinal cord) – are located in the ventral horn of the upper cervical spinal cord.

Deep fascia of neck (Moore pp 998 Netter 30)

The fascial layers of the neck can be split up into two compartments: **superficial** and **deep**. The superficial layer invests between the **dermis** of the skin and the **deep fascia**, and contains all the **cutaneous nerves, blood vessels, lymphatics and nodes**. It also contains the **platysma muscle** anterolaterally.

The deep cervical fascial layers include: **investing, pretracheal, prevertebral**. It also condenses to envelope the common carotid arteries, internal jugular veins, and vagus nerves (CN X) – called the **carotid sheath**. The layers of the fascia support the organs and muscles, lymphatics and vessels and also function as protection from spread of infection, and also a barrier for external objects penetrating the neck.

The investing layer of the deep cervical fascia splits into superficial and deep layers to invest the SCM, and trapezius muscles. The pretracheal layer (visceral layer) is only in the anterior neck region, includes a muscular layer investing the infrahyoid muscles, and a visceral layer investing the thyroid gland. Inferiorly extends to form the fibrous pericardium of the heart in the thorax.

The carotid sheath contains the following structures in detail:

- **Common carotid and internal carotid arteries**
- **IJV**
- **Vagus nerve (CN X)**
- **Deep cervical lymph nodes**

- **Carotid sinus nerve**
- **Sympathetic nerve fibres (carotid periarterial plexuses)**

Note the special relevance of the **retropharyngeal space**. This is of significance because this space is filled with loose connective tissue, thereby allowing some movement of the oesophagus, trachea, and larynx during swallowing.

Anterior and Posterior triangles of neck (Moore 1003)

Borders of posterior triangle of neck

- *Anteriorly* bound by posterior border of SCM
- *Posteriorly* bound by anterior border of trapezius
- *Inferiorly* bound by middle third of clavicle between trapezius and SCM
- *Apex*: where trapezius and SCM meet
- *Roof*: investing layer of deep cervical fascia
- *Floor*: prevertebral layer of deep cervical fascia + associated muscles

Borders of anterior triangle of neck

- *Anteriorly* bound by median line of neck
- *Posteriorly* bound by anterior border of SCM
- *Superiorly* bound by inferior border of mandible
- *Apex*: jugular notch
- *Roof*: subcutaneous tissue containing platysma muscle
- *Floor*: pharynx, larynx and thyroid gland

Scalene muscles in posterior triangle of neck (Moore 1004 Netter 25)

Only the scalenes are depicted well in Netter 25. The posterior triangle of neck has a floor formed by four muscles: **middle and posterior scalenes, splenius capitis, and levator scapulae**.

The important structures here are the **brachial plexus** and **phrenic nerve**. The phrenic nerve runs anteriorly to the anterior scalene muscle. Part of the **brachial plexus** and **subclavian artery** runs between the anterior and middle scalenes.

Sub triangles in anterior triangle of neck (Moore 1012, Netter Plate 23/24)

The anterior triangle of neck is divided into three sub-triangles namely: submandibular, carotid, muscular, submental. These are explained briefly below:

- **Submandibular:**
 - This is bordered by the **digastric muscles (lateral border – anterior belly)**, and the floor is made up of the **mylohyoid** and **hypoglossus muscle**. The **stylohyoid muscles** form the lateral border. The **submandibular salivary gland** fills most of this space. **Submandibular lymph nodes** are also located here.
- **Submental:**
 - This triangle is directly **inferior** to the chin. Laterally bounded by the **digastric muscles (medial border – anterior belly)**, floor is made up by the two **mylohyoid** muscles, inferiorly bounded by the **hyoid bone** (forms base), and the apex is bounded by the **mandibular symphysis**.
- **Carotid:**
 - This is an **important landmark** because this is where the carotid arteries can be palpated with light application of pressure. Bounded by the **omohyoid muscle (superior belly)**, anterior border of SCM, **digastric muscles (posterior belly – lateral border)**.
- **Muscular:**
 - This is bounded by the **anterior border of SCM, superior belly of omohyoid muscle**, and the **median line of the neck**. This triangle is

important because it consists of the infrahyoid muscles, and the viscera such as: thyroid gland, parathyroid glands.

Infrahyoid muscles (Moore 1015 Netter 24)

The muscles of this group are referred to as **strap muscles**. The muscles are namely: **sternohyoid** (sternum to the hyoid bone), **thyrohyoid** (thyroid gland to hyoid bone), **omohyoid** (two bellies), and **sternothyroid** (sternum to thyroid). These muscles are all located **inferior** to the **hyoid bone** and their main function includes: **anchor** the hyoid bone, sternum, clavicle, and scapula – **depress** the hyoid bone and larynx during swallowing and speaking (sorry – copied straight out of Moore).

Viscera of neck (Moore 1031)

The neck contains the following viscera (we have covered this in detailed last year so refer to last year's notes if you are a geek!): larynx, trachea, pharynx, oesophagus, thyroid, parathyroid.

Contents of carotid sheath (Refer to notes mentioned above) – “DICSCV”

Internal Jugular Vein (Moore 1019 Netter 26/68)

Just a little bit of revision: **Confluence of sinus** (where does all the blood come from) → **transverse sinus** → **sigmoid sinus** (receives input from superior and inferior petrosal sinuses) → **cavernous sinus** → **internal jugular vein**. The internal jugular vein basically drains the **cranium**, **cervical viscera**, and **face** and leaves the cranial fossa via the **jugular foramen**. It then runs inferiorly in the **carotid sheath**, passes **deep** to the SCM, then joins the **subclavian vein** at the sternal end of the clavicle, to form the **brachiocephalic vein** which drains into the **SVC** which in turn drains straight into the **right atrium**.

Jugular pulses can be seen just superior to the medial end of the clavicle because the **brachiocephalic** and **superior vena cava do not have valves**. Therefore contractions of the right ventricle can be directly seen at the internal jugular vein, usually at a 45 degree angle (best view).

The internal jugular vein is also useful for putting in a central line/venous catheterisation. This helps in measuring the right atrial pressure directly, and for performing angiograms etc.

Common Carotid Artery (Moore 1017 Netter 29)

The common carotid artery differs depending on which side you talk about. The right common carotid artery arises at the **bifurcation** of the **brachiocephalic trunk**, the other branch being the **right subclavian artery**. From here it ascends into the neck. The left common carotid artery arises directly from the **arch** of the **aorta**, and travels into the neck – noting that it travels a little bit in the thorax before hand. The common carotids **bifurcate** at the **upper end** of the **thyroid cartilage** to become the **external** and **internal carotids**. The **carotid sinuses** and **bodies** are located near the bifurcation point of the common carotid artery. These act as **chemoreceptors** and **pressure sensors**. The **superior thyroid** artery branches of the external carotid, and in turn gives off the **superior laryngeal** branch. Superior to this is the **ascending pharyngeal** artery coming off as a branch, and even more superiorly is the branching of **lingual artery** (supplies the tongue). The other superior branches are the: **facial**, **occipital**, **posterior auricular**, **maxillary**, and **superficial temporal** artery.

Autonomic nerves in neck (Moore 1022 Netter 124)

The **vagus nerve** is present in the neck, descending into the thorax and travelling into the abdomen. The neck also hosts some sympathetic ganglion namely: **cervicothoracic ganglion** (stellate) – and this is located in the most **inferior aspect** of the **neck**. The **middle cervical sympathetic ganglion** parallels the common carotid artery, and the **superior cervical sympathetic ganglion** – is a huge mass which parallels the external carotid artery.

Subclavian artery and its branches (Moore 1027 Netter 28)

Note that the anterior scalenes **divide** the **subclavian arteries** into **three** subsections. Its course in the neck is minor, where it arches superolaterally and inferiorly to pass beneath the clavicle. The first subsection is **medial** to the anterior scalene muscle, the second is

posterior to it, and the **third** is lateral to it. The branches of the subclavian can now be deduced:

- **Vertebral artery, internal thoracic artery, and thyrocervical trunk** from the 1st subsection
- **Costocervical trunk** from the 2nd subsection
- **Dorsal scapular artery** from the 3rd subsection

Blood supply to thyroid and parathyroids (Moore 1031 Netter 68)

The thyroid has a very rich vascular supply. The **superior thyroid artery** derives from the external carotid artery, and the **inferior thyroid artery** derives from the **thyrocervical trunk**, itself a branch of the 1st part of the subclavian. The superior thyroid artery descends to the **superior pole** of each **lobe**, and pierces the fascial layer to divide into **anterior** and **posterior** branches. The inferior thyroid artery travels **superomedially** to reach the **inferior pole** and pierces the fascial layers, and then splits into various **sub branches** to supply mainly the inferior pole of the thyroid gland.

The venous drainage is quite similar except three veins exist. The **superior, middle** and **inferior** thyroid veins all drain their respective lobes. The superior and middle thyroid veins drain into the **IJV** whereas the inferior thyroid vein drains into the **brachiocephalic trunk**.

The **parathyroid** gland is mainly supplied by the **inferior thyroid artery**, and drained via the **plexus** of veins.

Lymphatics of the neck (Notes)

This is spread across Moore so use the lecture notes. Basically the lymphatics travel along the **deep cervical nodes**, or **superficial cervical nodes**. The deep nodes are located within the **carotid sheath**, parallel to the IJV. The superficial nodes are located along the **external** and **anterior jugular veins**. The lymph travels eventually to the **left brachiocephalic vein**, via a system of trunks.

Development of thyroid and parathyroid (Langman's Embryology pp 364 Fig 15.17)

The thyroid gland descends in front of the **pharyngeal gut** (derivation of endoderm) and remains connected to the tongue via the **thyroglossal duct** (eventually disappears). Eventually it migrates in front of the hyoid bone, and laryngeal cartilages. It reaches its final position at about the **7th week**, and begins functioning at the **3rd month**. If the thyroglossal duct doesn't disappear, then you get **thyroglossal cysts**.