

كلية المستقبل الجامعة قسم هندسة الطب الحياتي

المرحلة الثانية



**HEAD & NECK**

# **ANATOMY**

(L5)

**Head and Neck Fascia & Muscles**

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## Fascial Layers of the Neck

Fascia is an **internal connective tissue** which forms bands or sheets that surround and support muscles, vessels and nerves in the body.

In the neck, these layers of fascia not only act to support internal structures, but also help to **compartmentalise** structures of the neck. There are two fascias in the neck – the superficial cervical fascia and the deep cervical fascia.

### Superficial Cervical Fascia

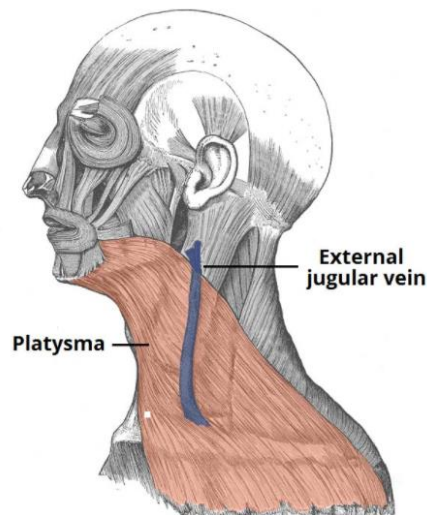
The **superficial cervical fascia** lies between the dermis and the deep cervical fascia. It contains numerous structures:

- Neurovascular supply to the skin
- Superficial veins (e.g. the external jugular vein)
- Superficial lymph nodes
- Fat
- Platysma muscle

#### Platysma

The superficial cervical fascia blends with the 'paper thin' platysma muscle. The **platysma** is a broad superficial muscle which lies anteriorly in the neck.

Innervation to the platysma is via the cervical branch of the [facial nerve](#).



## Deep Cervical Fascia

The **deep cervical fascia** lies, as its name suggests, 'deep' to the superficial fascia and platysma muscle. This fascia is organised into several layers. These layers act like a shirt collar, supporting the structures and vessels of the neck.

We shall now look at the layers of the deep cervical fascia in more detail (superficial to deep):

### Investing Layer

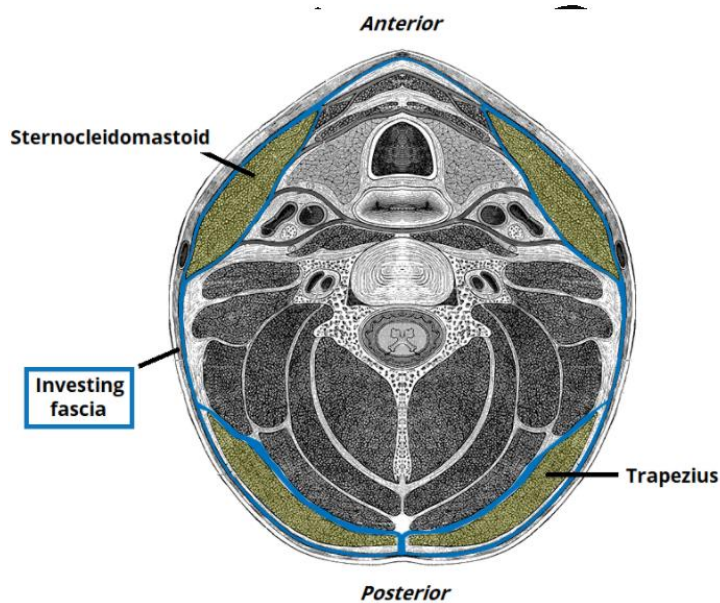
The **investing layer** is the most superficial of the deep cervical fascia.

It surrounds all the structures in the neck. Where it meets the trapezius and **sternocleidomastoid** muscles, it splits into two, completely surrounding them.

The investing fascia can be thought of as a tube; with superior, inferior, anterior and posterior attachments:

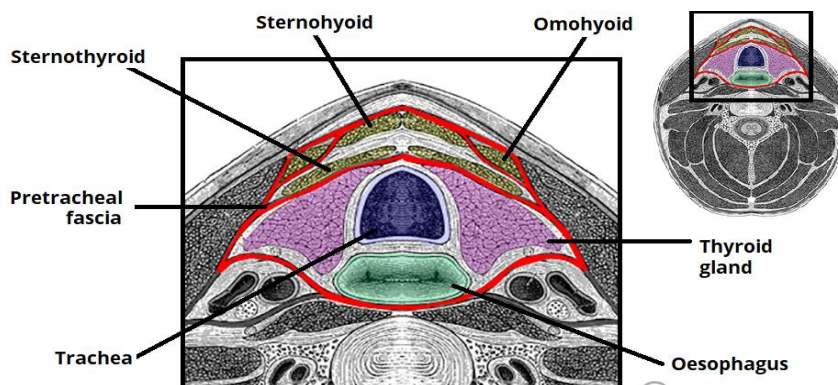
- **Superior** – attaches to the external occipital protuberance and the superior nuchal line of the skull.

- **Anteriorly** – attaches to the hyoid bone.
- **Inferiorly** – attaches to the spine and acromion of the scapula, the clavicle, and the manubrium of the sternum.
- **Posterior** – attaches along the nuchal ligament of the vertebral column



### Pretracheal Layer

The **pretracheal layer** of fascia is situated in the anterior neck. It spans between the hyoid bone superiorly and the thorax inferiorly (where it fuses with the pericardium). The trachea, [oesophagus](#), [thyroid gland](#) and [infrahyoid](#) muscles are enclosed by the pretracheal fascia.



## **Prevertebral Layer**

The **prevertebral fascia** surrounds the [vertebral column](#) and its associated muscles; scalene muscles, prevertebral muscles, and the deep muscles of the back.

It has attachments along the antero-posterior and supero-inferior axes:

- **Superior attachment** – base of the skull.
- **Anterior attachment** – transverse processes and vertebral bodies of the vertebral column.
- **Posterior attachment** – along the nuchal ligament of the vertebral column
- **Inferior attachment** – fusion with the endothoracic fascia of the ribcage.

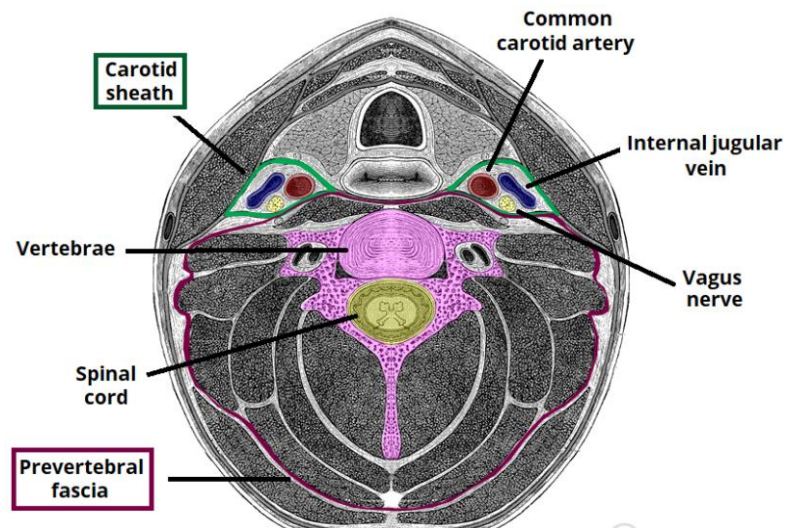
## **Carotid Sheath**

The **carotid sheaths** are paired structures on either side of the neck, which enclose an important neurovascular bundle of the neck.

The contents of the carotid sheath are:

- Common carotid artery
- Internal jugular vein.
- Vagus nerve.
- Accompanying cervical lymph nodes.

The fascia of the carotid sheath is formed by **contributions** from the pretracheal, prevertebral, and investing fascia layers. The carotid artery bifurcates within the sheath into the external and internal carotid arteries.



### Clinical Relevance: Fascial Spaces of the Neck

The neck fascia **compartmentalises** structures within the neck. These layers of tough fascia can limit the spread of infection (for example, a superficial skin abscess may be prevented from spreading deeper into the neck by the investing fascia).

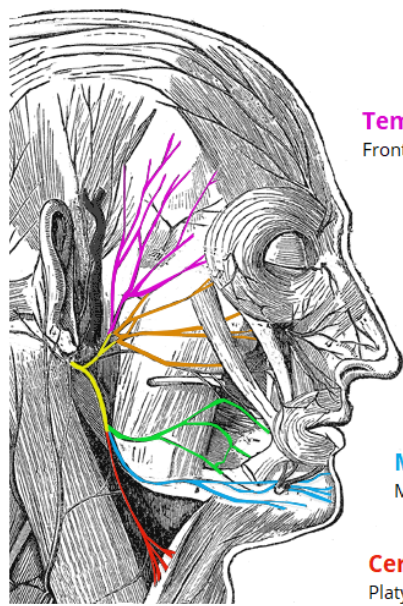
However, infections that reach the **potential spaces** between the neck fascia have a well-defined spread:

### The Muscles of Facial Expression

The muscles of facial expression are located in the subcutaneous tissue, originating from bone or fascia, and inserting onto the skin. By contracting, the muscles pull on the skin and exert their effects. They are the only group of muscles that insert into skin.

All the muscles of facial expression are innervated by the facial nerve.

The facial muscles can broadly be split into three groups: orbital, nasal and oral.



**Temporal branches**

Frontalis, orbicularis oculi, corrugator supercilii

**Zygomatic branches**

Orbicularis oculi

**Buccal branches**

Orbicularis oris, buccinator, zygomaticus

**Marginal mandibular branches**

Mentalis, depressor labii inferioris, depressor anguli oris

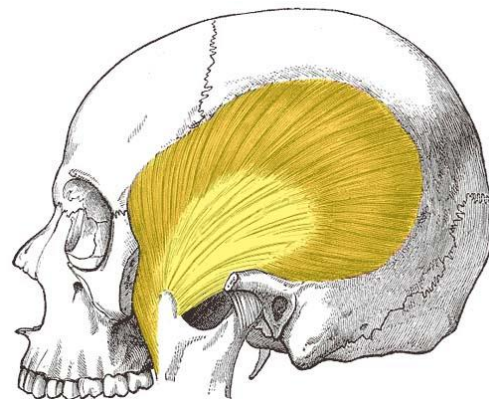
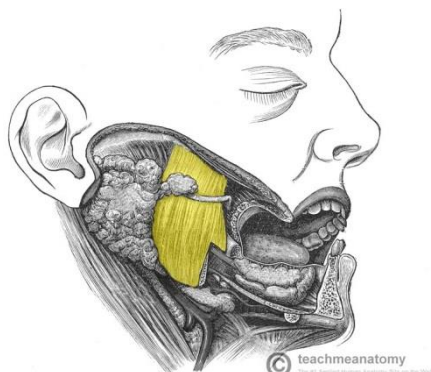
**Cervical branches**

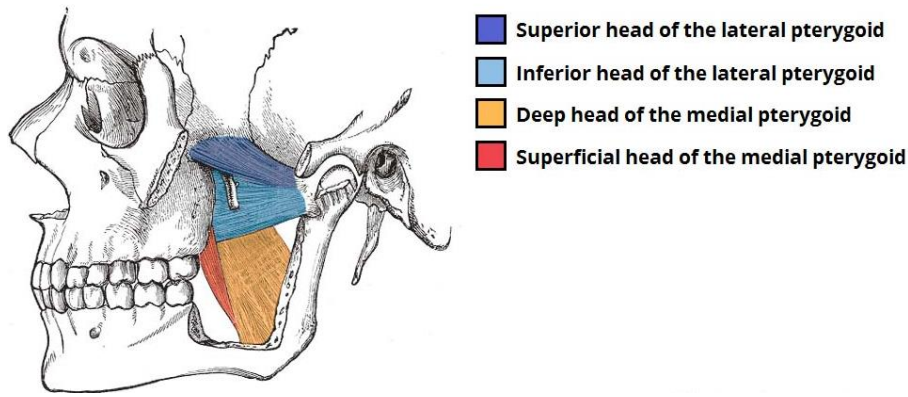
Platysma

The **muscles of mastication** are associated with movements of the jaw ([temporomandibular joint](#)). They are one of the major muscle groups in the head – the other being the muscles of facial expression. There are four muscles:

- Masseter
- Medial pterygoid
- Temporalis
- Lateral pterygoid

they are innervated by a branch of the trigeminal nerve (CN V), the mandibular nerve.





## The Extraocular Muscles

The extraocular muscles are located within the orbit, but are extrinsic and separate from the eyeball itself. They act to control the movements of the eyeball and the superior eyelid.

There are seven extraocular muscles – the levator palpebrae superioris, superior rectus, inferior rectus, medial rectus, lateral rectus, inferior oblique and superior oblique. Functionally, they can be divided into two groups:

- Responsible for eye movement – Recti and oblique muscles.
- Responsible for superior eyelid movement – Levator palpebrae superioris, is innervated by the [oculomotor nerve](#) (CN III).

## Muscles of Eye Movement

There are six muscles involved in the control of the eyeball itself. They can be divided into two groups; the four recti muscles, and the two oblique muscles.

### Recti Muscles

There are four recti muscles; superior rectus, inferior rectus, medial rectus and lateral rectus.

These muscles characteristically originate from the common tendinous ring. This is a ring of fibrous tissue, which surrounds the optic canal at the back of the [orbit](#). From their origin, the muscles pass anteriorly to attach to the sclera of the eyeball.



The name recti is derived from the latin for 'straight' – this represents the fact that the recti muscles have a direct path from origin to attachment. This is in contrast with the oblique eye muscles, which have an angular approach to the eyeball.

### **Superior Rectus**

- Attachments: Originates from the superior part of the common tendinous ring, and attaches to the superior and anterior aspect of the sclera.
- Actions: Main movement is elevation.
- Innervation: [Oculomotor nerve](#) (CN III).

### **Inferior Rectus**

- Attachments: Originates from the inferior part of the common tendinous ring, and attaches to the inferior and anterior aspect of the sclera.
- Actions: Main movement is depression.
- Innervation: [Oculomotor nerve](#) (CN III).

### **Medial Rectus**

- Attachments: Originates from the medial part of the common tendinous ring, and attaches to the anteromedial aspect of the sclera.
- Actions: Adducts the eyeball.
- Innervation: [Oculomotor nerve](#) (CN III).

### **Lateral Rectus**

- Attachments: Originates from the lateral part of the common tendinous ring, and attaches to the anterolateral aspect of the sclera.
- Actions: Abducts the eyeball.

- Innervation: [Abducens nerve](#) (CN VI).

## **Oblique Muscles**

There are two oblique muscles – the superior and inferior obliques. Unlike the recti group of muscles, they do not originate from the common tendinous ring.

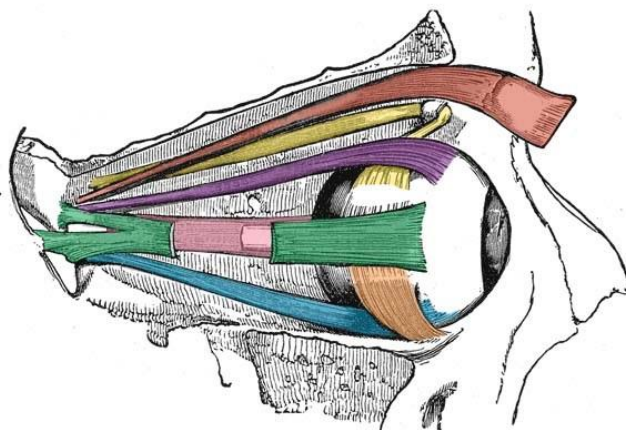
From their origin, the oblique muscles take an **angular** approach to the eyeball (in contrast to the straight approach of the recti muscles). They attach to the posterior surface of the sclera.

### **Superior Oblique**

- Attachments: Originates from the body of the [sphenoid](#) bone. Its tendon passes through a trochlea and then attaches to the sclera of the eye, posterior to the superior rectus.
- Actions: Depresses, abducts and medially rotates the eyeball.
- Innervation: [Trochlear nerve](#) (CN IV).

### **Inferior Oblique**

- Attachments: Originates from the anterior aspect of the orbital floor. Attaches to the sclera of the eye, posterior to the lateral rectus
- Actions: Elevates, abducts and laterally rotates the eyeball.
- Innervation: [Oculomotor nerve](#) (CN III).



<span style="color: red;">■</span>	Levator palpebrae superioris
<span style="color: yellow;">■</span>	Superior oblique
<span style="color: orange;">■</span>	Inferior oblique
<span style="color: purple;">■</span>	Superior rectus
<span style="color: pink;">■</span>	Medial rectus
<span style="color: green;">■</span>	Lateral rectus
<span style="color: blue;">■</span>	Inferior rectus

## Clinical Relevance: Cranial Nerve Palsies

The extraocular muscles are innervated by three cranial nerves. Damage to one of the cranial nerves will cause paralysis of its respective muscles. This will alter the resting gaze of the affected eye. Thus, a lesion of each cranial nerve has its own characteristic appearance:

**Oculomotor nerve (CN III)** – A lesion of the oculomotor nerve affects most of the extraocular muscles. The affected eye is displaced laterally by the lateral rectus and inferiorly by the superior oblique. The eye adopts a position known as ‘down and out’.

**Trochlear nerve (CN IV)** – A lesion of CN IV will paralyse the superior oblique muscle. There is no obvious affect of the resting orientation of the eyeball.

**Abducens nerve (CN VI)** – A lesion of CN VI will paralyse the lateral rectus muscle. The affected eye will adducted by the resting tone of the medial rectus.

*(A good tool to remember the innervation of the extraocular muscles is  $LR_6 - SO_4 - R_3$ )*



Oculomotor nerve palsy

Fig – Right oculomotor nerve palsy, characterised by the ‘down and out’ dilated pupil with ipsilateral ptosis