

ANATOMY

ANATOMY

NECK

AREAS	BONES	ORGANS	MUSCLES	NERVES	VESSELS	OTHER
<ul style="list-style-type: none"> • Anterior Triangle • Posterior Triangle 	<ul style="list-style-type: none"> • Cervical Spine • Hyoid Bone 	<ul style="list-style-type: none"> • Pharynx • Larynx • Oesophagus • Thyroid Gland • Parathyroid Glands 	<ul style="list-style-type: none"> • Suboccipital • Suprahyoids • Infrahyoids • Scalenes 	<ul style="list-style-type: none"> • Phrenic Nerve • Cervical Plexus 	<ul style="list-style-type: none"> • Arterial Supply • Venous Drainage • Lymphatics 	<ul style="list-style-type: none"> • Fascial Layers

Neck



NECK

Nerves of the Neck

- Cervical Plexus
- Phrenic nerve



Nerves Of the
Neck

Cervical Plexus

Cervical Plexus

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2 Branches of the Cervical Plexus

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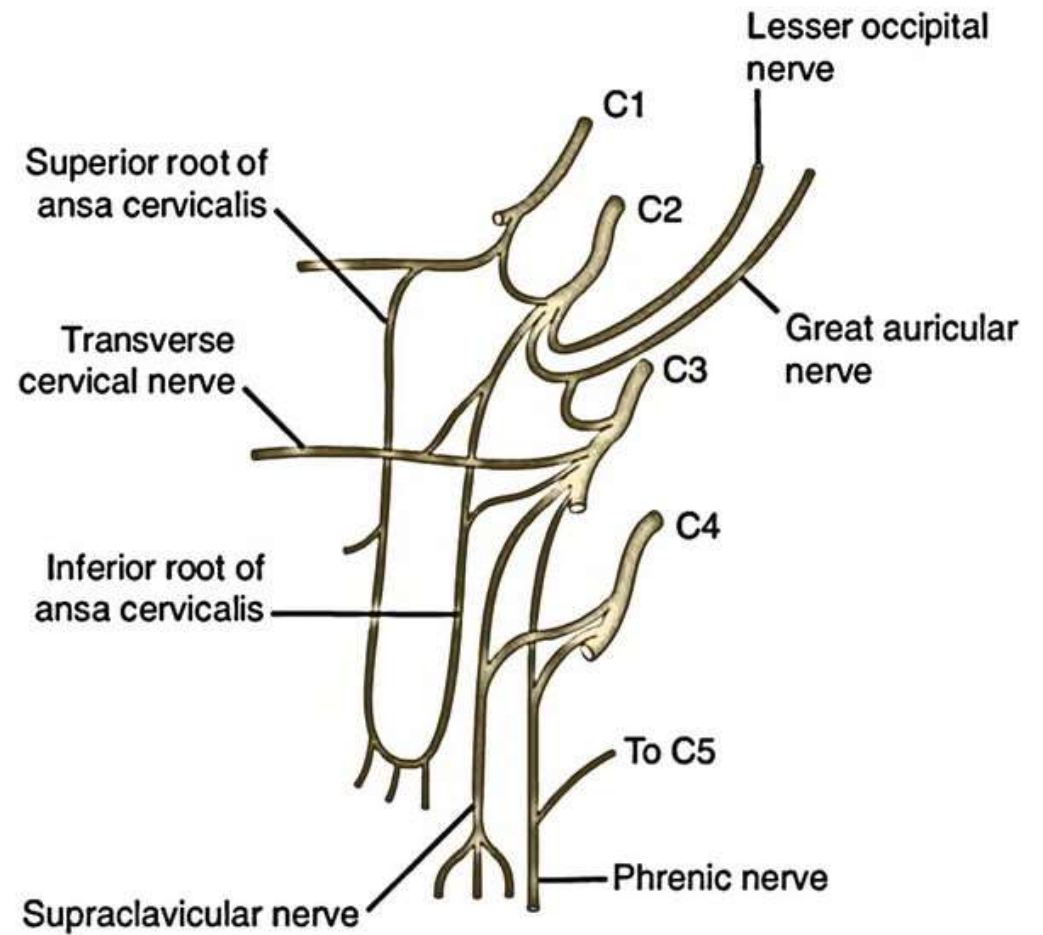
2.2 Sensory Branches

3 Clinical Relevance – Cervical Plexus Block

Cervical Plexus

- The cervical plexus is a **network** of nerve fibres that supplies innervation to some of the structures in the neck and trunk.
- It is located in the posterior triangle of the neck, halfway up the sternocleidomastoid muscle, and within the **prevertebral layer** of cervical fascia. The plexus is formed by the anterior rami (divisions) of cervical spinal nerves C1-C4.
- In this article, we shall look at the anatomy of the cervical plexus – its branches, functions and clinical correlations.

Cervical Plexus



Cervical Plexus

Spinal Nerves

- The spinal nerves C1 – C4 form the basis of the cervical plexus.
- At each vertebral level, paired spinal nerves leave the spinal cord via the **intervertebral foramina** of the vertebral column.
- Each nerve then divides into anterior and posterior nerve fibres. The cervical plexus begins as the **anterior fibres** of the spinal nerves C1, C2, C3 and C4.
- These fibres combine with each other to form the branches of the cervical plexus.

Cervical Plexus

Branches of the Cervical Plexus

- The cervical plexus gives rise to numerous branches which supply structures in the head and neck. They can broadly be divided into two groups – muscular branches and sensory branches.
- We shall now examine these branches in more detail.

Cervical Plexus

Phrenic Nerve

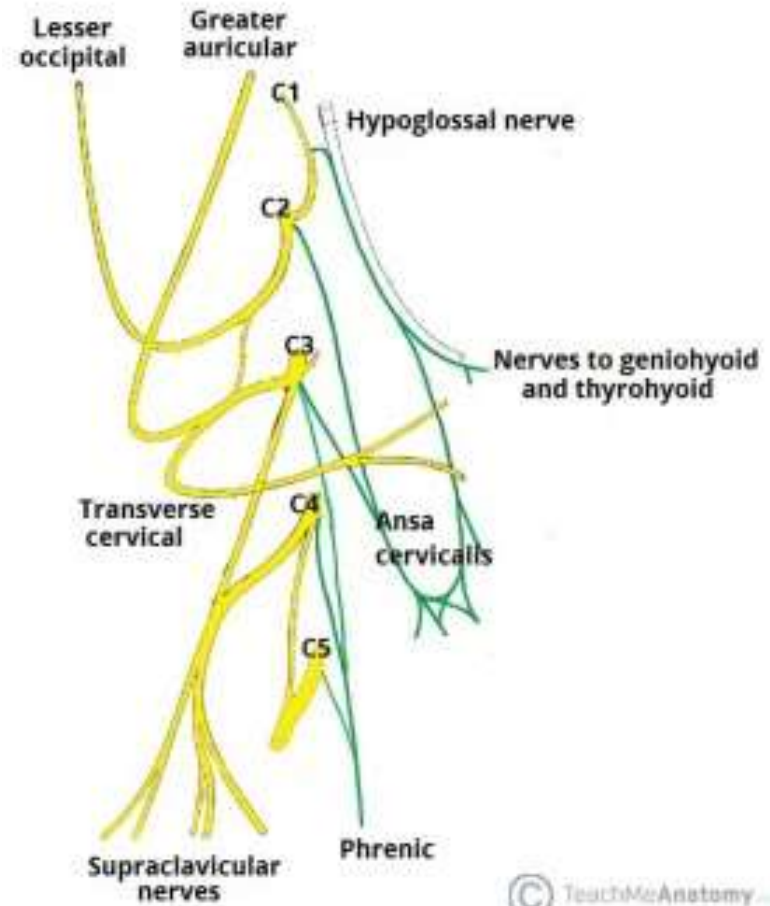
- The phrenic nerve arises from the anterior rami of C3-C5. It provides motor innervation to the **diaphragm**.
- After arising from the cervical plexus, the nerve travels down the surface of the **anterior scalene** muscle and enters the thorax. In the thoracic cavity, the nerve descends anteriorly to the root of the lung to reach the diaphragm.
- *A good memory aid for the roots of the phrenic nerve is C3,4,5 keeps the diaphragm alive.*

Nerves to Geniohyoid and Thyrohyoid

- The C1 spinal nerve gives rise to nerves to the **geniohyoid** (moves the hyoid bone anteriorly and upwards, expanding the airway) and the **thyrohyoid** (which depresses the hyoid bone and elevates the larynx).
- These nerves travel with the [hypoglossal nerve](#) to reach their respective muscles.

Cervical Plexus

Phrenic Nerve



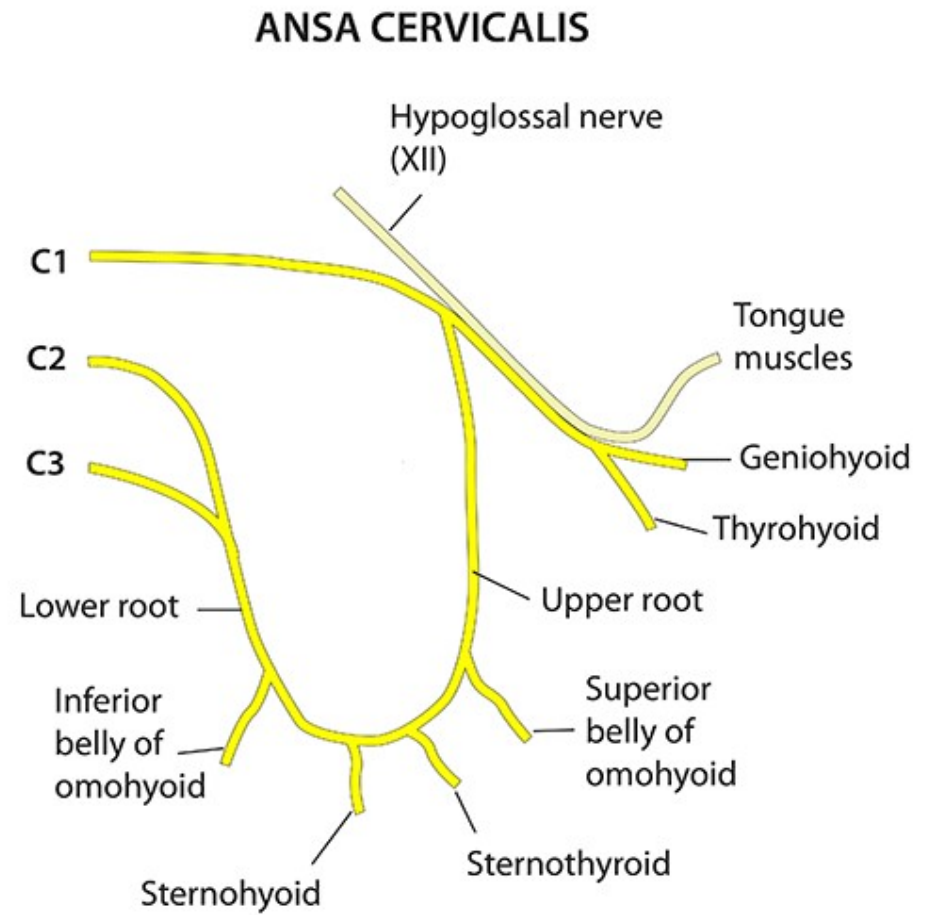
Cervical Plexus

Ansa Cervicalis

- The ansa cervicalis (goose's neck) is a loop of nerves, formed by nerve roots C1-C3. It gives off four muscular branches:
- Superior belly of the omohyoid muscle
- Inferior belly of omohyoid muscle
- Sternohyoid
- Sternothyroid
- These muscles (the [infrahyoids](#)) act to depress the hyoid bone; an important function for swallowing and speech.

Cervical Plexus

Ansa Cervicalis



Cervical Plexus

Other Muscular Branches

Several other minor branches arise from the nerve roots to supply muscles of the neck and back:

- **C1-C2:** Rectus capitis anterior and lateralis
- **C1-C3:** Longus capitis
- **C2-C3:** Prevertebral muscles and sternocleidomastoid
- **C3-C4:** Levator scapulae, trapezius and scalenus medius
- The middle and anterior scalenus muscles also receive innervation directly from the cervical plexus.

Cervical Plexus

Sensory Branches

- The cutaneous branches of the cervical plexus supply the skin of the neck, upper thorax, scalp and ear. These nerves all enter the skin at the middle of the posterior border of the sternocleidomastoid. This area is known as the nerve point of the neck (Erb's point), and is utilised when performing a cervical plexus nerve block.

Cervical Plexus

Greater Auricular Nerve

- The greater auricular nerve is formed by fibres from C2 and C3 roots. It provides sensation to the **external ear** and the skin over the [parotid gland](#). It is the largest ascending branch of the plexus.
- The nerve also communicates with the **auricular branch of the vagus nerve** and the **posterior auricular branch of the facial nerve** (which innervates some small muscles around the ear).

Cervical Plexus

Transverse Cervical Nerve

- The transverse cervical nerve is also formed by fibres from C2 and C3. It curves around the posterior aspect of the sternocleidomastoid, and supplies sensation to the anterior neck. The nerve then pierces the **deep cervical fascia** and then gives branches that pass superiorly and inferiorly to supply the anterolateral skin of the neck and upper sternum.

Lesser Occipital Nerve

- The lesser occipital nerve is derived from the C2 root, with a contribution from C3 in some individuals. It supplies cutaneous sensation to the **posterosuperior scalp**, and commonly communicates with the posterior branch of the greater auricular nerve.
- After its formation, the nerve curves around the [accessory nerve](#), and passes superiorly, close to the posterior border of the sternocleidomastoid.

Cervical Plexus

Supraclavicular Nerves

- The supraclavicular nerves are a group of nerves formed from the C3 and C4 roots.
- They arise from the behind the posterior border of sternocleidomastoid, and provide sensation to the skin overlying the **supraclavicular fossa** and upper thoracic region and sternoclavicular joint.

Cervical Plexus

Clinical Relevance – Cervical Plexus Block

- A cervical plexus block is used to provide **regional anaesthesia**, usually for surgery in the neck region – such as carotid endarterectomy, thyroidectomy and cervical lymph node excision.
- The anaesthetist inserts the needle containing the local anaesthetic, midway up the posterior border of the **sternocleidomastoid** (the nerve point of the neck). They then proceed to inject three times in a fan like fashion, with the needle pointing cranially, caudally and then anteriorly.
- *Note: as this procedure can also affect the phrenic nerve, it is usually not performed on those with co-existing cardiac or respiratory disease.*



NECK

Nerves of the Neck

- Cervical Plexus
- Phrenic nerve



Nerves Of the Neck

Phrenic nerve

Phrenic Nerve

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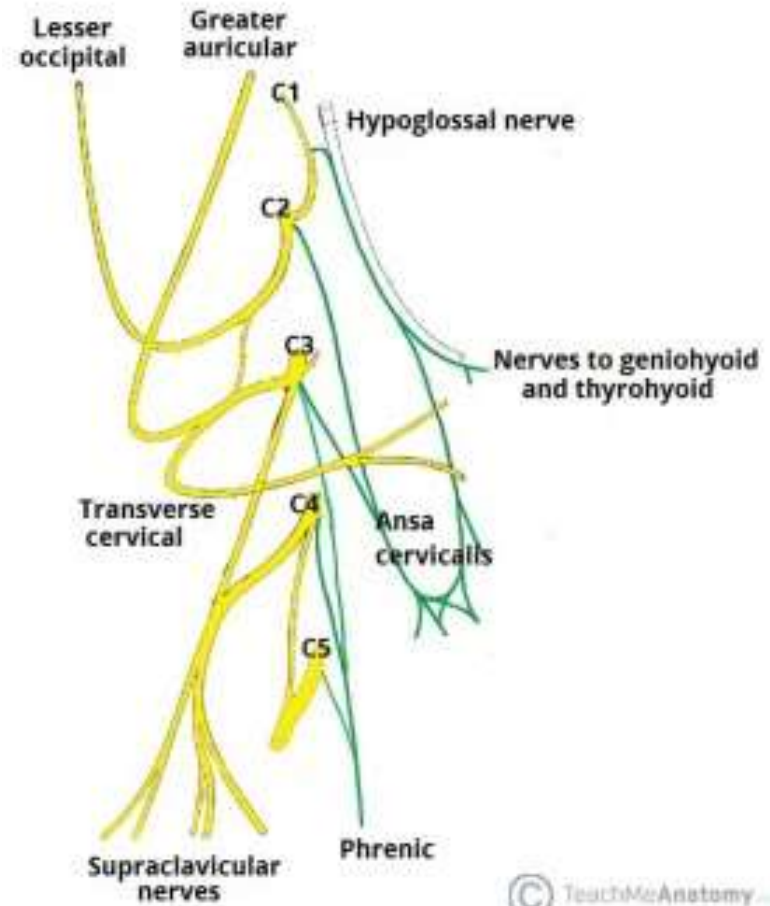
5 Clinical Relevance: Diaphragmatic Paralysis

Phrenic Nerve

- The **phrenic nerve** is a bilateral, mixed nerve that originates from the cervical nerves in the neck and descends through the thorax to innervate the diaphragm.
- It is the only source of motor innervation to the **diaphragm** and therefore plays a crucial role in breathing.
- In this article, we shall look at the anatomy of the **phrenic nerve** – its anatomical course, motor and sensory functions.

Phrenic Nerve

Formation



Phrenic Nerve

Overview

- **Nerve roots** – anterior rami of C3, C4 and C5.
- **Motor functions** – innervates the [diaphragm](#).
- **Sensory functions** – innervates the central part of the diaphragm, the pericardium and the mediastinal part of the parietal pleura.

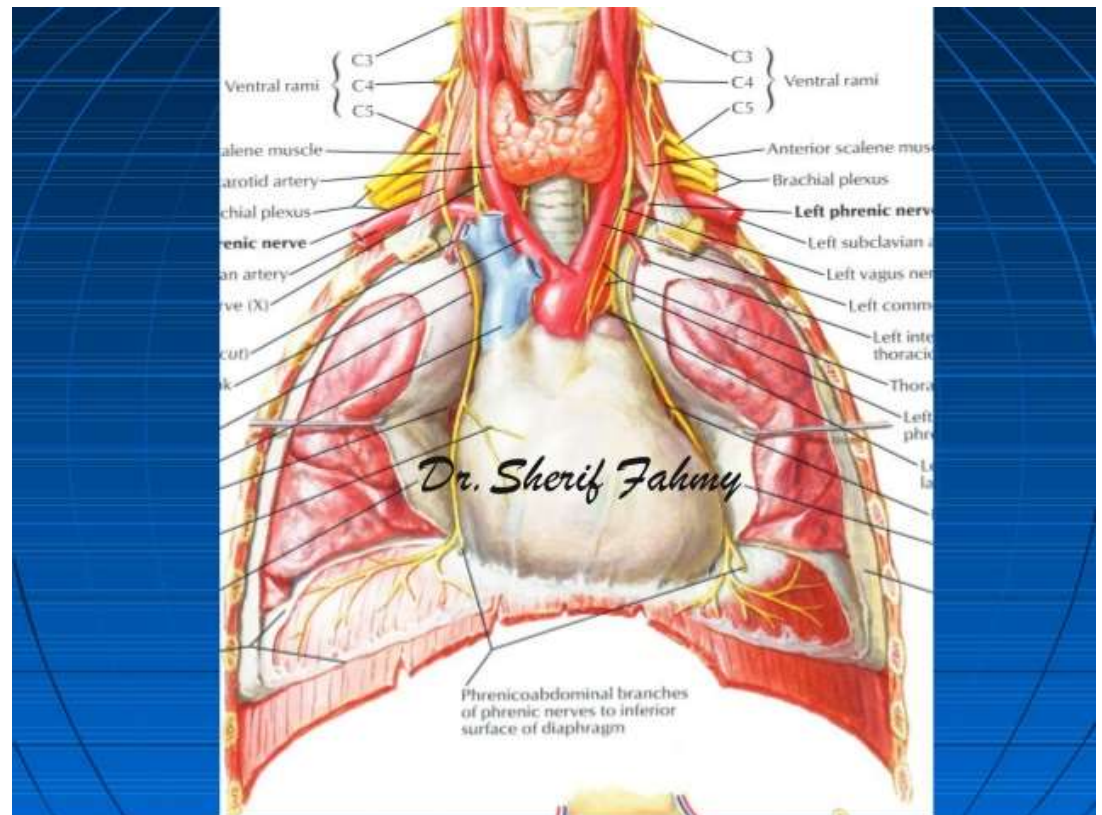
Phrenic Nerve

Anatomical Course

- The **phrenic nerve** originates from cervical spinal roots C3, C4 and C5 . This can be remembered using the limerick “*C3, 4 and 5 keep the diaphragm alive*”. Spinal root C4 provides the main contribution, with lesser contributions from **C3** and **C5** and some communicating fibres from the **cervical plexus**.
- The nerve arises at the lateral border of the **anterior scalene** muscle. It then passes inferiorly over the anterior surface of anterior scalene, deep to the **prevertebral layer** of cervical fascia. On both sides, the nerve runs posterior to the subclavian vein. From here, the course of the phrenic nerve differs between the left and right:

Phrenic Nerve

Anatomical Course



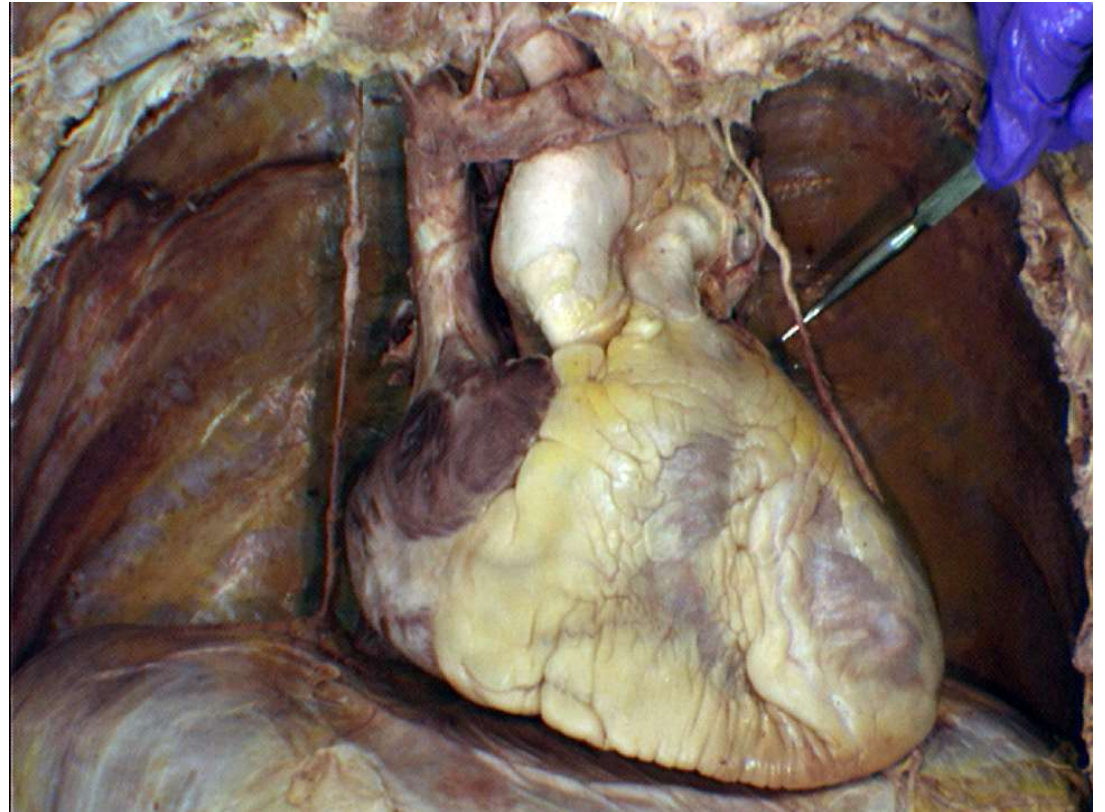
Phrenic Nerve

Right Phrenic Nerve

- Passes anteriorly over the lateral part of the right subclavian artery.
- Enters the thorax via the superior thoracic aperture.
- Descends anteriorly along the right lung root.
- Courses along the pericardium of the right atrium of the heart.
- Pierces the diaphragm at the inferior vena cava opening.
- Innervates the inferior surface of the diaphragm.

Phrenic Nerve

Right Phrenic Nerve



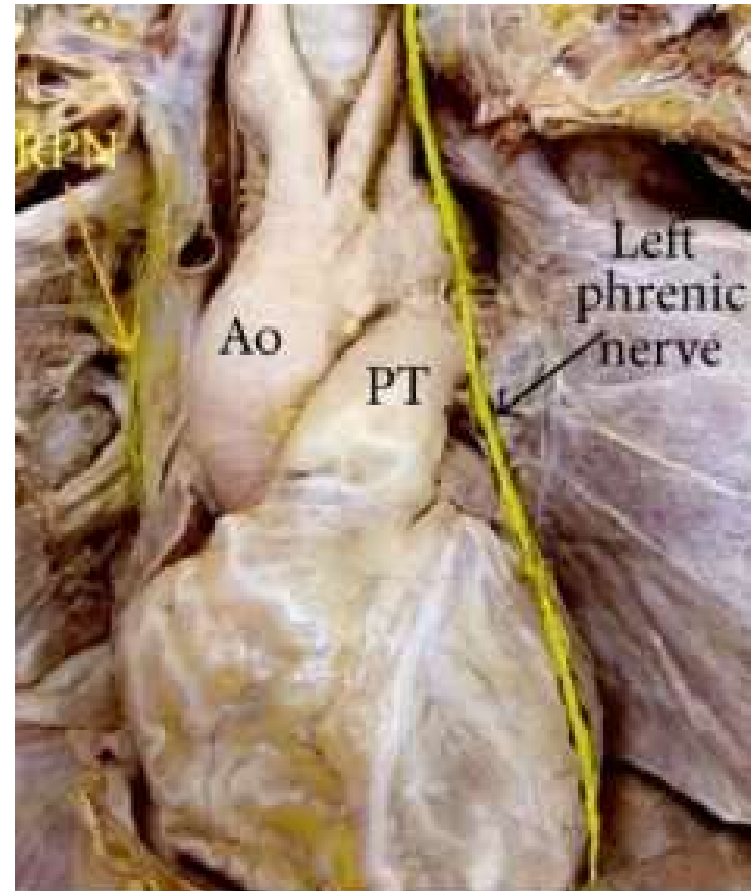
Phrenic Nerve

Left Phrenic Nerve

- Passes anteriorly over the medial part of the left subclavian artery.
- Enters the thorax via the superior thoracic aperture.
- Descends anterior to the left lung root.
- Crosses the aortic arch and bypasses the vagus nerve.
- Courses along the pericardium of the left ventricle.
- Pierces and innervates the inferior surface of the diaphragm.

Phrenic Nerve

Left Phrenic Nerve



Phrenic Nerve Cadaver

Phrenic Nerve

Motor Functions

- The phrenic nerve provides motor innervation to the **diaphragm**; the main muscle of respiration.
- As the phrenic nerve is a bilateral structure, each nerve supplies the ipsilateral side of the diaphragm (the hemi-diaphragm on the same side as itself).

Sensory Functions

- Sensory fibres from the phrenic nerve supply the central part of the diaphragm, including the surrounding **pleura** and **peritoneum**. The nerve also supplies sensation to the mediastinal pleura and the pericardium.

Phrenic Nerve

Clinical Relevance: Diaphragmatic Paralysis

- The phrenic nerve provides motor innervation to the diaphragm. If the nerve becomes damaged, paralysis of the diaphragm can result. Causes of phrenic nerve palsy include:
- **Mechanical trauma** – ligation or damage to the nerve during surgery.
- **Compression** – due to a tumour within the chest cavity.
- **Neuropathies** – such diabetic neuropathy.
- Paralysis of the diaphragm produces a **paradoxical movement**. The affected side of the diaphragm moves upwards during inspiration, and downwards during expiration. A unilateral diaphragmatic paralysis is usually asymptomatic and is most often an incidental finding on x-ray. If both sides are paralysed, the patient may experience poor exercise tolerance, orthopnoea and fatigue. Lung function tests will show a **restrictive deficit**.