Vagus nerve: superior ganglia (syn. jugular ganglia)

The vagus nerve is the tenth cranial nerve. It has the most extensive distribution of any of the cranial nerves and contains sensory, motor and parasympathetic fibers.

The vagus emerges from the brain stem at the medulla oblongata, between the olive and the inferior cerebellar peduncle. It exits the cranium through the jugular foramen with the glossopharyngeal and accessory nerves.

The vagus nerve has two ganglia, the superior and inferior ganglia. The superior ganglion lies within the jugular foramen, whereas the inferior ganglion is situated just below. Just below the inferior ganglion, the vagus is joined by the cranial part of the accessory nerve. The vagus then passes downwards within the carotid sheath and enters the thorax at the root of the neck.

Vagus nerve: inferior ganglia (syn. nodose ganglia)

As the vagus nerve leaves the skull through the jugular foramen, it has two marked enlargements, the inferior and superior ganglia. The inferior ganglion is larger and is also known as the nodose ganglion.

The ganglion, which is exclusively sensory, is connected to the hypoglossal nerve, the superior cervical sympathetic ganglion and the first and second cervical spinal nerves.

Vagus nerve (syn. X cranial nerve)

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Origin

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Region

The vagus nerve has two ganglia, the superior and inferior ganglia. The superior ganglion lies within the jugular foramen, whereas the inferior ganglion is situated just below. Just below the inferior ganglion, the vagus is joined by the cranial part of the accessory nerve. The vagus then passes downwards within the carotid sheath and enters the thorax at the root of the neck.

The vagus nerves in the neck differ in one important respect, namely the origins of the recurrent laryngeal nerves.

Branches:

Meningeal branch, auricular branch, pharyngeal branch and branches to the carotid body, superior laryngeal nerve, recurrent laryngeal nerve and cardiac branches.

Supply

Sensory fibers to: ear, tongue, pharynx and larynx.

Motor fibers to: pharynx, larynx and esophagus.
Parasympathetic and visceral fibers to: thoracic viscera, abdominal viscera.

**Anterior Vagal Trunk**

**Origin**

Mainly from the left vagus nerve but includes fibers from the right vagus and also some sympathetic fibers from the splanchnic nerves.

**Region**

The anterior vagal trunk consists of two or three trunks which are adhered to the anterior aspect of the esophagus.

The branches of the esophageal plexus coalesce and enter the abdominal cavity through the oesophageal hiatus in the diaphragm.

It is usually single but may be divided into two trunks.

**Clinical Pathology**

**Duodenal ulcer disease**

Patients with duodenal ulcer disease have hyperactive vagal input to the parietal cell mass within the stomach.

This causes excessive hydrochloric acid production by these cells with inflammatory and lytic effects on duodenal mucosa and the risk of ulceration, typically in the first part of the duodenum.

To avoid postgastrectomy sequelae with distal resection of the stomach, such as dumping syndrome and weight loss, and to avoid postvagotomy diarrhea when the trunks of the right and left vagus nerves are divided on the distal esophagus to lower acid production, a new operative procedure, known as parietal cell vagotomy, has been utilized with considerable success.

In this procedure, the vagal nerve trunks that descend from the esophagus and run anteriorly and posteriorly parallel to the lesser curve of the stomach are left intact.

This preserves the innervation of the antrum, gastric emptying remains normal, and dumping risk is considerably reduced. The branches off these two nerve trunks to the parietal cell mass are divided from about 5 cm proximal to the esophagogastric junction to the level of the incisura angularis at a distance of about 7-8 cm from the pyloric valve.

This protects the patient from diarrhea and also prevents weight loss.

Acid production is reduced and the ulcer diathesis is either cured or greatly controlled along with the addition of antacid and H2 blocker therapy.

**Posterior Vagal Trunk**

**Origin**

Mainly from the right vagus nerve but includes fibers from the left vagus and also some sympathetic fibers from the splanchnic nerves.

**Region**

The branches of the esophageal plexus coalesce and enter the abdominal cavity through the oesophageal hiatus in the diaphragm.

It is usually single but may be divided into two trunks.

**Clinical Pathology**

**Duodenal ulcer disease**

**Vagus nerve: meningeal branches**

The meningeal branches of the vagus nerve arise from the superior ganglion in the jugular fossa. It supplies dura in the posterior cranial fossa. There is some evidence that this nerve is not truly a branch of the vagus but is derived from upper cervical nerves and/or the superior cervical sympathetic ganglion.
Vagus nerve: auricular branches

The auricular branch of the vagus nerve arises from the superior ganglion. It enters the temporal bone via the mastoid canaliculus on the lateral wall of the jugular fossa. It then passes out through the tympanomastoid fissure and divides into two branches. One branch joins the posterior auricular branch of the facial nerve; the other contributes to the innervation of the skin of the auricle, external acoustic meatus and tympanic membrane.

Vagus nerve: pharyngeal branches

The pharyngeal branch of the vagus nerve is, in fact, derived from the cranial part of the accessory nerve. It runs from the inferior ganglion of the vagus, between the internal and external carotid arteries, and towards the middle constrictor of the pharynx. There it forms the pharyngeal plexus with branches from the sympathetic trunk, and the glossopharyngeal and external laryngeal nerves. The pharyngeal nerve is the main motor nerve to the muscles of the pharynx and palate.

Vagus nerve: branches to carotid bodies

The carotid body lies deep within the carotid bifurcation and monitors gas levels in the blood. Although primarily supplied by the glossopharyngeal nerve, the carotid body also receives nervous supply from the vagus nerve. These branches may arise from the inferior ganglion or travel in the pharyngeal branch. At the body they form a plexus with the glossopharyngeal branches of the cervical sympathetic trunk.

Vagus nerves: superior laryngeal nerves

The superior laryngeal nerve arises inferior to the pharyngeal branch, from the middle of the inferior (nodose) ganglion. It descends deep to both the carotid arteries and then splits into internal and external branches.

Supply

The external and internal branches will go on to supply the mucous membrane of the pharynx and larynx as well as the cricothyroid and inferior constrictor muscles.

Vagus nerves: recurrent laryngeal branches

The recurrent laryngeal nerve is a branch of the vagus nerve, which is the tenth cranial nerve. The vagus nerves in the neck differ in one important respect, namely the origins of the recurrent laryngeal nerves. The right recurrent laryngeal nerve arises in the root of the neck. It leaves the vagus in front of the subclavian artery, loops below and behind the artery and then ascends towards the larynx.

The left recurrent laryngeal nerve arises in the thorax, as the vagus passes across the arch of the aorta. Both recurrent laryngeal nerves reach the larynx by passing upwards in grooves between the trachea and the esophagus, with the inferior thyroid arteries. They pass beneath the inferior borders of the inferior constrictor muscles to supply the mucosa of the larynx and most of the intrinsic muscles.

Recurrent laryngeal nerves: cardiac branches

Usually two or three cardiac branches emanate from the vagus nerve in the neck. They run downwards and medially into the thorax, terminating at the deep part of the cardiac plexus.

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Bell’s Palsy

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