Chapter 28: The neck

Fascia of the neck

The superficial fascia is a fatty areolar layer between the skin and the more obvious deep fascia. It contains the platysma muscles and the external jugular veins and their tributaries. In an older person the fat is lost and the anterior edges of platysma show clearly through the skin. The deep fascia consists of: (1) the cervical fascia, (2) the prevertebral fascia, (3) the pretracheal fascia, (4) the carotid sheath.

The cervical fascia forms an investing sleeve around all the deep structures of the neck. It splits to enclose sternocleidomastoid and trapezius, and posteriorly it is attached to the ligamentum nuchae. Superiorly it gains attachment to the superior nuchal lines, the mastoid processes and the inferior border of the body of the mandible. Between the mastoid and mandible it splits into two layers which form a sheath for the parotid gland; the superficial layer is attached above to the zygomatic arch; a thickening in the deep part, the stylomandibular ligament, passes to the styloid process. Inferiorly the fascia is attached to the manubrium sterni, the clavicles, the acromial processes and spines of the scapulae and between the scapulae it descends over the postvertebral muscles. Above the manubrium, a split in the fascia, the suprasternal space, contains the jugular venous arch. The infrahyoid group of muscles is embedded in the deep surface of this fascia.

The prevertebral fascia lies in front of the vertebral column, the prevertebral muscles and the cervical and brachial plexuses. Laterally it turns backwards covering the postvertebral muscles on the floor of the posterior triangle and blends with the cervical fascia. Superiorly it is attached to the base of the skull and inferiorly it blends with the anterior longitudinal ligament in front of the body of the 4th thoracic vertebra. Medial to scalenus anterior, the fascia is deficient and the subclavian artery here passes deep to it. Laterally, the subclavian artery carries the fascia into the arm and forms the axillary sheath. The cervical sympathetic trunk is embedded in the prevertebral fascia.

The pretracheal fascia is attached superiorly to the hyoid bone and the oblique lines on the thyroid cartilage. It splits around the thyroid gland to provide a sheath, and below the gland the fascia passes downwards to blend with the carotid sheaths.

The carotid sheath is a condensation of fascias of the neck, and encloses the internal jugular vein laterally, the common and internal carotid arteries medially and the vagus nerve posteriorly. Above, it is attached to the base of the skull and below it fuses with the fibrous pericardium.

Muscles of the neck and back

The triangles of the neck

Classically each side of the neck is divided for descriptive purposes into anterior and posterior triangles by sternocleidomastoid. It must be remembered that many important structures lie deep to this muscle.
The posterior triangle is bounded by sternocleidomastoid anteriorly, trapezius posteriorly and the clavicle inferiorly. The roof is formed by the cervical fascia, the floor by the prevertebral fascial over splenius capitis, levator scapulae, and scalenus medius from above downwards. The triangle is crossed by the posterior belly of omohyoid and contains the accessory nerve, branches of the cervical plexus, the upper and middle trunks of the brachial plexus, and the transverse cervical, suprascapular and subclavian arteries.

The anterior triangle is bounded laterally by sternocleidomastoid, superiorly by the body of the mandible and anteriorly by the midline. It contains structures related to the floor of the mouth, the larynx, the trachea and the pharynx.

**Sternocleidomastoid**

This muscle lies on the anterolateral aspect of the neck enclosed in the cervical fascia.

**Attachments**

Inferiorly - by two heads:

(i) the upper anterior surface of the manubrium sterni.
(ii) the upper surface of the medial one-third of the clavicle.

Superiorly - the lateral surface of the mastoid process and the lateral half of the superior nuchal line.

**Action**

(i) each muscle turns the chin to the opposite side and laterally flexes the neck to its own side, as in looking under the table.

(ii) together, the two muscles flex the head against resistance but extend the neck as in jutting out the chin.

(iii) When the head is fixed by the muscles of the back, the sternocleidomastoid may be used as an accessory muscle of respiration.

**Nerve supply**

This is from the spinal accessory nerve and a branch from the 2nd and 3rd cervical nerves.

**Trapezius**

See in Chapter 15.
The muscles of the back

These comprise muscles attaching the shoulder girdle to the trunk (see Chapter 15) and a group which extends the head and vertebral column.

The latter group forms a large composite mass, lying deep to trapezius and the other girdle muscles and extending from the back of the sacrum to the base of the skull. They may be subdivided from without inwards into: (a) the superiorly placed splenius capitis and cervicis, (b) the erector spinae muscles including longissimus, iliocostalis, spinalis and semispinalis and (c) the deep short muscles - levator costae, multifidus, rotatores, interspinous and intertransversus. These short muscles are replaced between the axis and the base of the skull by the suboccipital muscles.

**Splenius capitis** - passes upwards and laterally from the ligamentum nuchae and the spines of the upper thoracic vertebrae to the mastoid process and the lateral part of the superior nuchal line deep to the sternocleidomastoid.

**Semispinalis** - passes upwards and medially from the transverse processes to the spines above. The upper part of the muscle, semispinalis capitis, is attached to the occipital bone between the superior and inferior nuchal lines.

**Action**

The muscles of the back for the most part maintain the upright position of the body. When standing at rest, the centre of gravity lies just in front of the 2nd piece of the sacrum. Movement of the body frequently carries the centre of gravity much further forwards and this large mass of muscles is required to restore the upright position. The muscles attached to the skull produce extension, lateral flexion and rotation of the head.

**Nerve supply**

All these muscles are supplied by the dorsal rami of the spinal nerves.

**Suboccipital muscles**

**Rectus capitis posterior major** - passes from the spine of the axis to the occipital bone below the inferior nuchal line.

**Rectus capitis posterior minor** - lies anteromedial to the major and passes from the posterior tubercle of the atlas to the occipital bone behind the foramen magnum.

**Obliquus capitis superior** - passes from the tip of the transverse process of the atlas to the occipital bone between the superior and inferior nuchal lines, lateral to semispinalis capitis.

**Obliquus capitis inferior** - passes from the tip of the transverse process of the atlas to the spine of the axis.
The suboccipital muscles extend the skull at the atlanto-occipital joints and rotate it at the atlanto-axial joints. They are all supplied by the dorsal ramus of the 1st cervical nerve. Accurate positioning of the head is necessary for stereoscopic vision.

The **suboccipital triangle** is bounded laterally by the superior oblique, medially by the rectus capitis posterior major and inferiorly by the inferior oblique. Its floor is formed by the posterior atlanto-occipital membrane and the posterior arch of the atlas. The vertebral artery, with the dorsal ramus of the 1st cervical nerve below it, passes deep to the membrane. The roof is crossed by the greater occipital nerve and covered by semispinalis capitis and longissimus capitis. The triangle is filled with fat and the suboccipital plexus of veins which drains to the vertebral veins.

**Ligamentum nuchae**

In animals possessing a protruding head and neck this is a powerful midline elastic ligament passing from the occipital bone to all the cervical spines. In man it is smaller, mainly fibrous tissue and has little supporting action.

**Prevertebral and scalene muscles**

These muscles lie in front of all the cervical and the upper thoracic vertebrae. They are covered anteriorly by the prevertebral fascia.

**Prevertebral muscles** (rectus capitis anterior and lateralis, longus capitis and longus colli) - pass between the skull and vertebrae, and between vertebrae.

**Scalenus anterior** - is attached superiorly to the anterior tubercles of the 3rd-6th cervical vertebrae and inferiorly to the scalene tubercle on the 1st rib.

**Relations:** the anterior surface is crossed obliquely by the phrenic nerve and separated by the prevertebral fascia with the sympathetic trunk from the carotid sheath and its contents, the transverse cervical and suprascapular arteries and the subclavian vein. The posterior surface lies on the scalenus medius (separated from it by the ventral rami of the lower cervical nerves), the dome of the pleura and the subclavian artery.

**Scalenus medius** - is attached superiorly to the posterior tubercles of the 2nd-7th cervical vertebrae and inferiorly to the upper surface of the 1st rib behind the groove for the subclavian artery.

**Scalenus posterior** - is the part of the previous muscle which is attached to the 2nd rib.

**Action**

These muscles are weak flexors of the head and neck; the scalene muscles also raise and fix the upper two ribs.
Nerve supply

All are supplied by the ventral rami of the cervical nerves.

Infrahyoid muscles

There are four pairs of ‘strap’ muscles lying anteriorly in the neck and enclosed in a fascial sheath which is adherent to the deep surface of the cervical fascia:

Thyrohyoid - is attached superiorly to the back of the body and greater horn of the bone and inferiorly to the oblique line on the thyroid cartilage.

Sternohyoid - is attached superiorly to the body of the hyoid bone and inferiorly to the back of the manubrium sterni and the medial end of the clavicle.

Omohyoid - has superior and inferior bellies united by an intermediate tendon which is held to the medial end of the clavicle by a fascial sling. Superiorly the muscle is attached on the body of the hyoid bone and inferiorly to the lateral end of the superior border of the scapula.

Sternothyroid - is attached superiorly to the oblique line on the thyroid cartilage and inferiorly to the back of the manubrium sterni and 1st costal cartilage. The muscle lies deep to sternohyoid.

These muscles fix or depress the hyoid bone in swallowing and speech. They are supplied by the ventral rami of the upper three cervical nerves (via the superior or inferior roots of the ansa cervicalis, the ansa, or the hypoglossal nerve).

The thyroid gland

This is a bilobed endocrine gland situated on each side of the trachea and oesophagus, with a communicating isthmus anterior to the trachea. It is enclosed in pretracheal fascia. Each lobe is about 5 cm long and extends from the oblique line of the thyroid cartilage to the 6th tracheal ring. Occasionally a pyramidal lobe is found arising from the upper border of the isthmus which lies on the 2nd and 3rd tracheal rings.

Relations

Superficial - three strap muscles (not thyrohyoid), the cervical fascia and sternocleidomastoid.

Medial - larynx and trachea and, more posteriorly, the pharynx and oesophagus. The recurrent laryngeal nerve lies between the trachea and the oesophagus. The external laryngeal nerve descends to reach cricothyroid.

Posterior - contents of carotid sheath, the parathyroid glands, and the prevertebral fascia.
**Blood supply**

This is from superior and inferior arteries lying close to the external and the recurrent laryngeal nerves respectively as the vessels approach the gland. Venous blood passes via the superior and middle thyroid veins to the internal jugular vein and via the inferior thyroid veins by a common trunk to the left brachiocephalic vein.

**Nerve supply**

This is from sympathetic nerves from plexuses around superior and inferior thyroid arteries.

**Lymph drainage**

This is to pretracheal, paratracheal and inferior deep cervical nodes.

**Histology**

Cubical epithelium lines follicles which are filled with amorphous colloid (containing thyroglobulin). Between the follicles vascular connective tissue contains groups of parafollicular (C) cells which secrete thyrocalcitonin.

**Embryology**

The gland develops from a midline ventral diverticulum between 1st and 2nd pharyngeal arches which grows caudally to meet an outgrowth of the 4th pharyngeal pouch. The lower end of the diverticulum proliferates and forms the glandular tissue. The rest of the diverticulum (the thyroglossal duct) atrophies, but remnants may persist. The contribution from the 4th pouch may be responsible for the C-cells and the production of thyrocalcitonin. The stored thyroglobulin is changed into thyroxine. This secretion passes back through the follicle cells, is absorbed into the capillaries, and is a vital regulator of cellular metabolism, under the humoral control of the pituitary gland (hypophysis cerebri).

Over activity of the thyroid gland gives rise to thyrotoxicosis, whereas under activity produces cretinism in a child or myxoedema in later life.

During operations on the thyroid gland the recurrent and external laryngeal nerves are at risk and may be damaged. This may result in transient or more permanent hoarseness because of paralysis of the laryngeal muscles. Reduction of the blood supply to the closely applied parathyroid glands or inadvertent removal of the glands may produce postoperative hypoparathyroidism and tetany.

**The parathyroid glands**

These are four small endocrine glands situated behind the lateral lobes of the thyroid gland within its capsule. There is a superior and an inferior pair. Each gland is oval in shape, about 3-6 across and may be mistaken for a fat globule. They have a rich blood supply from the superior and inferior thyroid arteries. They consist of columns of chief cells separated by
blood spaces. The cells have dark-staining nuclei and a chromatin network. Around puberty,
esinophil-staining cells appear.

The superior and inferior glands develop from the 4th and 3rd pharyngeal pouches respectively. The glands secrete parathormone and play an important role in calcium metabolism.

**The trachea**

The trachea is part of the respiratory passage. It descends from the larynx (at the level of the 6th cervical vertebra), through the neck and thorax to its bifurcation into the two bronchi at the sternal angle (the level of the lower border of the 4th thoracic vertebra). It is about 10 cm long and 2 cm in diameter. It is covered by the pretracheal fascia. (See also above.)

The walls of the trachea are formed of fibrous tissue reinforced by 15-20 incomplete cartilaginous rings united behind by fibroelastic tissue and smooth muscle where the trachea rests on the oesophagus. It is lined internally with respiratory epithelium. The rings are of hyaline cartilage.

**Relations** (in the neck): the trachea lies anterior to the oesophagus with the recurrent laryngeal nerve laterally in the groove between. It lies behind the cervical fascia and the infrahyoid muscles, and is crossed anteriorly by the isthmus of the thyroid gland and the jugular venous arch. Laterally are the lateral lobe of the thyroid gland, the inferior thyroid artery and the carotid sheath.

**Relations** (in the thorax): see Chapter 5.

**Blood supply**: the inferior thyroid vessels.

**Lymph drainage**: to the pre- and paratracheal and tracheobronchial nodes.

**Nerve supply**: branches of the sympathetic trunk; parasympathetic branches from the vagus nerve via the recurrent laryngeal nerve and the pulmonary plexuses. Sensory fibres enter the recurrent laryngeal nerves.

In upper respiratory tract obstruction a tracheostomy (opening into the trachea) may be required (see also Chapter 26). Usually the preferred site is at the 3rd and 4th tracheal rings and the isthmus of the thyroid gland often has then to be divided.

**The oesophagus**

This part of the digestive tube begins just behind the cricoid cartilage (at the level of the 6th cervical vertebra) as a continuation of the pharynx. It descends through the neck, thorax and diaphragm, inclining slightly to the left, to enter the stomach at the level of the 10th thoracic vertebra. Its upper end is about 15 cm from the incisor teeth and it is about 25 cm long. (See also Chapters 4 and 9).
**Relations** (in the neck): the oesophagus lies anterior to the prevertebral fascia and muscles and posterior to the trachea, with the recurrent laryngeal nerves in the grooves between. Laterally are the lateral lobe of the thyroid gland and the common carotid artery. The thoracic duct ascends for a short distance along the left side.

**Relations** (in the thorax and abdomen): see Chapters 4 and 9).

**Blood supply:** branches from the inferior thyroid artery, the aorta and the left gastric artery. Venous blood passes to the inferior thyroid, azygos and left gastric veins. The communication of the azygos and left gastric veins in the walls of the oesophagus forms an important portal-systemic anastomosis (see Chapter 9).

**Lymph vessels:** pass to the deep cervical lymph chain, the posterior mediastinal lymph nodes and along the left gastric artery to the coeliac nodes.

**Nerve supply:** sympathetic - thoracic sympathetic chains and greater splanchnic nerves; parasympathetic - from the vagus nerve via the oesophageal plexus; recurrent laryngeal nerves to the upper part.

**Histology:** The oesophagus has four coats. An inner mucosa of stratified squamous epithelium with numerous mucous glands which extend into the vascular submucous coat except at the upper and lower ends. The muscular coat contains inner circular and outer longitudinal layers; it is composed of striated muscle in its upper one-third and smooth muscle below. The outer fibrous coat is a layer of areolar tissue with many elastic fibres. Peritoneum covers part of the abdominal oesophagus.