The neck

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**Surface anatomy**
The sternomastoid muscle divides the neck into two anatomical triangles. These are often referred to in clinical practice and in exams when describing lumps in the neck, and therefore an understanding of them is essential. It should be recognized that these triangles are artificial and have not been chosen for clinical or embryological reasons and as a result pathology does not often respect or follow their boundaries (Figure 8.1).

Using Figure 8.2, try to identify the position of all the following important structures on yourself:
- (a) Mastoid process
- (b) Heads of the clavicles
- (c) Sternomastoid muscle membrane
- (d) Trachea
- (e) Cricoid cartilage
- (f) Cricothyroid
- (g) Thyroid prominence
- (h) Hyoid bone
- (i) Carotid artery bifurcation
- (j) Thyroid gland
- (k) Parotid gland
- (l) Submandibular gland
- (m) Jugulodigastric lymph node.

Don’t be alarmed if you feel one or two small, soft lymph glands. This is quite a common finding in normal people, especially in children. There are 200–300 lymph nodes in a normal person’s head and neck. The largest and most frequently enlarged is the jugulodigastric node.

**Deep neck anatomy**
The neck is divided into anatomical compartments by strong fascia, which is arranged in layers and tends to align neck structures in bundles. These are real and important anatomical divisions and have great relevance clinically.

![Triangles of the neck.](image-url)
Broadly speaking, where the fascial planes of the neck cross a bony structure, such as the hyoid, they are fused to it. The outermost layer that surrounds the neck is the investing fascia. This is often described as being similar to a polo-neck jumper. It is attached above to the mandible and skull base and below to the clavicles and cervical spine. More fascial planes divide the neck into compartments.

There are two main compartments of the neck, which are separated by the prevertebral fascia (Figure 8.3):

- **Posterior, skeletal compartment**: contains the cervical spine and its musculature. This need concern us no further.
- **Anterior, visceral compartment**: contains all the other structures and organs. This contains bundles of structures, each of which is enclosed by a fascial envelope (Figure 8.4). The most important of these are:
  - **Pretracheal fascia**: this is clinically relevant since it encloses the thyroid gland and binds it to the trachea. Thus, when the larynx and trachea move with swallowing, the thyroid gland also ascends and descends.
  - **Carotid sheath**: a fascial bundle that encloses the carotid, internal jugular vein and vagus nerve.

Between all of the fascial bundles are potential spaces, known collectively as the deep neck spaces. Herein lies further clinical relevance, since disease, particularly infections of the neck, can spread along these spaces to form deep-seated abscesses. The most important of the named deep neck spaces are the parapharyngeal, retropharyngeal and submandibular spaces (Figures 8.4 and 8.5).

**OVERVIEW**

**Neck Diseases**

**Congenital**
- Branchial cyst
- Thyroglossal cysts
- Cystic hygroma
- Dermoid cyst.

**Acquired**

Skin and subcutaneous tissue
- Sebaceous cysts
- Lipomas
- Furuncle.

Lymph nodes
- **Benign**:
  - General: reactive lymphadenitis
  - Specific infections: e.g. glandular fever, human immunodeficiency virus (HIV), tuberculosis (TB), toxoplasmosis.
INVESTIGATION OF NECK LUMPS

Making the clinical diagnosis

A good history and careful examination will often point to a clinical diagnosis, which will in turn help to guide towards ordering the appropriate investigations necessary to confirm the diagnosis. The duration of the history and the presence of any intercurrent illness are important factors to ascertain. A history of pain or swelling in a neck lump usually indicates an inflammatory process; if these symptoms are clearly related to eating, then sialadenitis/sialolithiasis must be suspected.

When examining the patient, try to answer the following questions to determine the lump's characteristics:

- What is its site?
- What is its size?

INVESTIGATION OF NECK LUMPS

Malignant:
- Primary
- Metastatic.
Blood vessels
- Carotid body tumours
- Carotid aneurysm.
Nerves
- Vagal neuromas.
Salivary glands
- Sialadenitis/sialolithiasis
- Tumours: benign and malignant.
Larynx
- External laryngocoele.
Pharynx
- Pharyngeal pouch.
Thyroid
- Simple/physiological goitre
- Solitary nodule
- Multinodular goitre
- Thyroid tumours: benign and malignant
- Thyroiditis.

Figure 8.4 Fascial layers and spaces of the neck.

Figure 8.5 Submandibular space.
The neck

- What is its shape?
- Is it smooth or lobulated?
- Is it in the midline?
- Is it solid or cystic?
- Is there more than one lump?
- Is it tender?
- Is it attached to any viscus or skin?
- Is it connected to the thyroid and therefore moves on swallowing?
- Is it pulsatile?
- Is there any associated acute or chronic inflammation or ulceration anywhere within the head and neck? (Remember this includes the scalp and oral and nasal cavities.)

Confirmatory investigations

Having arrived at a clinical diagnosis, or at least a list of differential diagnoses, one usually needs to perform confirmatory investigations. These will vary depending on the most likely cause of the lump.

Blood tests

A full blood count (FBC) is frequently performed. Occasionally it is diagnostic; however, more often it contributes to, or detracts from, a diagnosis – for example, a raised white cell count suggests an infective process. Similarly, the erythrocyte sedimentation rate (ESR) is rarely diagnostic in itself but is often helpful nevertheless.

Monospot or Paul Bunnell test

This will confirm that generalized lymphadenopathy is due to glandular fever (infectious mononucleosis). Remember, also, to examine the axillae and groins and check for liver and spleen enlargement.

Human immunodeficiency virus

HIV testing and other serum tests for specific infections such as toxoplasmosis are sometimes necessary in cases of chronic generalized lymphadenopathy.

Radiology

A computed tomography (CT) scan or chest X-ray is often indicated when malignancy or chronic benign lymphadenopathy is suspected. An ultrasound scan is helpful in some circumstances. Ultrasound is particularly good at distinguishing between cystic and solid lumps and can show abnormal nodal architecture and blood flow in malignant lymphadenopathy. Ultrasound is the investigation of choice in the thyroid gland and is also very useful in diagnosing vascular lesions. Computed tomography and magnetic resonance imaging (MRI) are frequently employed, and in many cases either modality will give sufficient information; however, in some patients, both CT and MRI will be required to demonstrate the lesion fully. It should be realized that in isolation scans are rarely diagnostic but are vital in demonstrating the anatomy and extent of the lesion. Positron-emission tomography (PET) with CT is frequently used in the assessment of malignant disease and is particularly useful in identifying small primary tumours and distant metastases (Figure 8.6).
Cytology

Fine-needle aspiration cytology (FNAC) is extremely useful in diagnosing the cause of many lumps in the neck. It is important to recognize that interpreting samples from this technique is difficult and demands an experienced cytologist. Also, some tissues are difficult to decipher accurately, such as thyroid lumps and lymphomas. However, FNAC is simple and cheap to perform – it can be carried out by a doctor in the clinic with ease. For these reasons, we describe the technique in detail.

Fine-needle aspiration cytology

The procedure is explained to the patient, who is asked to lie down on a couch. The skin is cleaned and the lump fixed firmly with the fingers. A green (22G) needle is attached to a 10 mL syringe. The needle is passed through the skin to the approximate centre of the lump. At this point, suction is applied to the syringe by withdrawing the plunger (a syringe-holder greatly facilitates this otherwise awkward one-handed procedure).

With suction applied, the needle is agitated repeatedly backwards and forwards within the lump. As a result, cells are drawn up into the barrel of the needle. If at any time blood should flash back into the syringe, the sample should be regarded as contaminated and the procedure repeated, this time without applying suction. Four to six passes through the lump should give an adequate sample in most cases. The suction must be released before withdrawing the syringe to avoid contamination of the sample with skin cells.

The needle is removed and the syringe filled with air. Then the needle is replaced and its contents expelled on to a clean glass slide. This manoeuvre should be repeated several times until no more material can be expelled. The sample material is then spread as thinly as possible over the slide, which is then labelled, fixed and left to dry.

Endoscopy

Carcinomas that arise in the head and neck often metastasize to the regional lymph nodes in the neck. Therefore, when a patient presents with such a node, an examination of the possible primary sites is essential, since this tumour must be identified and treated if the patient is to survive. With the advent of fibre-optic endoscopes, many of the potential sites of tumour genesis can be visualized in the ENT outpatient clinic. However, it is not possible to take biopsies easily, and some areas remain hidden. For these reasons, pan-endoscopy is performed under general anaesthesia. If no obvious tumour is seen, ‘blind’ biopsies are taken from the likely sites:

- Nasopharynx
- Tongue base
- Tonsil
- Vallecule
- Pyriform fossae
- Postcricoid region.

Biopsy

In some cases, the origin or the exact nature of a neck lump cannot be identified using the above investigations. In this case, open biopsy of the neck lump is required. As a general rule, such a biopsy should be excisional rather than incisional, since there is a danger of a tumour spreading to a previously uninvolved area. This can result in compromising further treatment. To diagnose the various types of lymphoma, the ENT surgeon will often need to perform such an excisional biopsy since it is the detailed microarchitecture of the node that proves diagnostic in subtyping lymphomas.

CONGENITAL NECK REMNANTS

Thyroglossal cyst and fistula

These lesions, although congenital, do not often present at birth but more commonly present in childhood or early adulthood. They result from defects in the development of the thyroid gland. The thyroid develops at the tongue base and in embryo descends downwards, around or through the hyoid bone, and through the tissues of the neck, to eventually overlie the trachea and thyroid cartilage (see Figure 7.1 in Chapter 7, p. 75). As a result of this descent, a tract is left that runs from the foramen caecum of the tongue to the thyroid gland. The tract usually resorbs; if it remains,
cyst or fistula formation of the tract can result (Figure 8.7).

The lesions are almost always present in the mid-line and move upwards when the patient sticks out their tongue, due to the attachment of the tract to the hyoid and tongue base. The patient may notice a swelling or, in the case of a fistula, may complain of a discharging area at the front of the neck. In fact, spontaneous fistula formation is rare and usually results from misguided attempts to drain an abscess or other surgical intervention.

Treatment consists of surgical excision of the whole tract, including the body of the hyoid bone. Attempts at local excision of these defects are misguided since the problem will often recur unless the whole tract is removed, from neck skin to tongue base if necessary.

**Branchial cyst and fistulae**

**Branchial cyst**

These tend to present before the age of 30 years and occur in a characteristic position. They present with a lump in the neck situated in the region of the middle third of the sternomastoid muscle (Figure 8.8). If the cyst becomes infected, it may be painful.

Previously it was largely accepted that these lesions arose as a result of an abnormality of fusion of the embryological branchial clefts. However, more
Dermoids
These result from defects of fusion in embryo, but elements of the skin become trapped subcutaneously and develop into cysts lined with squamous epithelium and skin appendages such as hair follicles and sweat glands. They present as painless midline swellings anywhere between the suprasternal notch and the chin. Unlike thyroid remnants, they do not move on swallowing or protrusion of the tongue and cannot be separated from the overlying skin. Complete surgical excision is the only treatment.

Cystic hygroma
A cystic hygroma is a rare type of lymphangioma (benign tumour of lymph vessels). Lymphangiomas are generally classified according to the size of the vessels within the tumour. Capillary and cavernous lymphangiomas consist of small and medium-sized vessels, respectively.

Cystic hygroma is the name given to these tumours when the vessels are very large and dilated. They occur in the neck and expand between the tissue planes. They are usually noticed at or soon after birth and may be very large, in which case vital structures within the neck, such as the trachea, may be compressed. Staged, multiple excisions are sometimes needed over many years.

NECK INFECTIONS
Parapharyngeal abscess
This is a rare infection of the parapharyngeal space (see p. 84) and usually results from lower jaw dental infection or tonsillitis. The patient is pyrexial and toxic and has trismus, and may have airway obstruction due to intravenous antibiotics after 48 hours, surgical drainage of the space is essential.

Ludwig’s angina
Here, the submandibular space is affected. It usually results from dental infection, with Strep-tococcus viridans being the pathogen most frequently isolated. The patient is pyrexial and drooling, has trismus, and may have airway obstruction due to...
backward displacement of the tongue. There is a firm swelling of the tissues of the floor of mouth. First-line treatment is with intravenous antibiotics since incision seldom finds pus. If the airway is threatened, a tracheostomy may be required.

**LYMPH NODE ENLARGEMENT**

The function of the lymph nodes within the head and neck, as anywhere in the body, is to provide a local defence mechanism against infection or tumour. When active, the nodes enlarge and become palpable.

** Infective lymphadenopathy**

When the nodes enlarge as a result of infection, they are usually tender. Often the site of the infection is obvious, e.g. tonsillitis. However, occasionally one or more nodes may enlarge without any obvious primary infected site. In this case, one must consider specific infections such as infectious mononucleosis, tuberculosis, HIV, toxoplasmosis, actinomycosis, brucellosis and cat-scratch fever. Atypical tuberculosis is becoming more common and frequently presents in children as a neck mass with involvement of the skin and sometimes frank discharge (Figure 8.10).

**Neoplastic lymphadenopathy**

Malignancy must be excluded when an enlarging or persistently palpable lymph node is present in an adult. In early adulthood, the most likely neoplasm is a lymphoma, which may require excisional biopsy. In older patients, there is a higher chance that a malignant node contains squamous cell carcinoma (Figure 8.11). This will have originated from a primary tumour somewhere within the head and neck, and in some cases may be microscopic and asymptomatic. These metastatic squamous deposits are usually easy to diagnose on FNAC.

All patients in whom a neck lump could represent a malignancy deserve a rigorous search for the primary site, and this must begin with referral to an ENT clinic where facilities for a full examination of the head and neck are available. From this initial examination, the primary site may well be evident. However, not infrequently, a small primary may remain elusive. In this case a full examination of all these areas must be performed under anaesthetic with ‘blind’ biopsies of those areas under suspicion.

The TNM (tumour, nodes, metastasis) classification is used to stage metastatic nodes in the neck.

**CASE STUDY**

Adam, a 27-year-old surveyor, presents complaining of a lump on the right side of his neck. The lump came up rapidly 3 weeks ago, and since then it has increased and decreased in size slightly but has not gone away. He feels well in himself. Examination reveals a 4 cm × 3 cm swelling, just deep to the upper third of the sternomastoid muscle on the right side. It is a little tender and has a smooth surface. It is rubbery in consistency and appears fluctuant. It does not transilluminate.

1 What is the diagnosis?
2 What investigation would you perform?
3 How is this condition treated?

**Answers**

1 In a young patient, a rapidly enlarging neck swelling, especially with the features of a cyst, is very likely to represent a branchial cyst.
2 Fine-needle aspiration will reveal fluid, which may be purulent if the cyst has become infected. Cytological examination of the aspirate is usually diagnostic.
3 Surgical excision.
Based on this staging and the site and size of the primary tumour, a treatment plan can be decided upon:

N1: Single node, ipsilateral, < 3 cm
N2: Single node, ipsilateral, > 3 cm but < 6 cm; or multiple ipsilateral nodes < 6 cm; or contralateral nodes < 6 cm
N3: Any node > 6 cm.

The anatomical position of each group of nodes is classified depending upon their lymph node level (Figures 8.12 and 8.13). Different clusters of nodes or levels drain different anatomical sites of the upper aerodigestive tract. As such, the most likely nodes to be involved in any primary cancer of the ENT systems can be predicted.

The treatment options in squamous cell carcinomas of the head and neck usually consist of either radiotherapy or surgery, and not infrequently a combination of the two. The basic surgical approach is that of radical excision of the primary tumour with en bloc resection of the affected nodes via a neck dissection. The basic aim of a radical neck dissection is to remove all the lymph-bearing structures that lie between the skull base and clavicle. This necessitates sacrificing the sternomastoid, internal jugular vein and accessory nerve. Modifications of this operation with preservation of some or all of the above structures, and selective dissections of the nodal levels most at risk, are also employed in some cases.

**NECK HERNIAS**

**Laryngocoele**

The characteristic bulging neck of the bullfrog is well known. It is due to inflation of an air sac connected to its airway. Many lower animals have similar air sacs. It is thought that a small blind-ending space, called the saccule, found in...
the human larynx may represent this vestigial structure. Sometimes the sacculle can enlarge to produce a laryngocoele, a blind-ending outpouching of the laryngeal mucosa. As they expand, laryngoceles may remain enclosed within the framework of the larynx, in which case they are known as internal laryngoceles. Alternatively, they can escape from the larynx, via a potential weak spot in the thyrohyoid membrane where the superior laryngeal neurovascular bundle pierces this layer, in which case they are called external laryngoceles. An external laryngocoele may present as a lump in the neck, usually in association with hoarseness.

It has been postulated that this condition is more common in glassblowers and trumpet players; however, there is little evidence to support this. It is more important to recognize that a small carcinoma at the site of the neck of the sacculle can lead to a valve-like effect with subsequent laryngocoele development. Once this has been excluded, treatment is by surgical excision of the sac and repair of the defect, as in any hernia repair.

**Pharyngeal pouch**

This is another type of herniation or pulsion diverticula. The mucosa of the upper oesophagus herinates through a potential weak spot in the constrictor muscles of the pharynx, known as Killian's dehiscence. This more frequently causes swallowing problems, but it can also present as a lump in the neck. We discuss this condition more fully in Chapter 6.

Conditions of the salivary glands and thyroid may present with a lump in the neck. These conditions are dealt with in more detail in other chapters.

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**KEY POINTS**

**The Neck**

- Neck structures are arranged in bundles, which are surrounded by fascia. These have potential spaces between them, which may become involved in disease.
- In the neck, one or two small, soft, mobile, palpable lymph nodes are quite normal, especially in children.
- FNAC is the single most useful primary investigation in diagnosing neck lumps.
- Midline swellings are likely to be of thyroid origin if they move on swallowing, or dermoid cysts if they do not.
- Neck lumps that could represent a malignancy must be referred to an ENT surgeon to search for a primary site. In patients with a neck lump malignancy is particularly associated with: unilateral sore throat, voice change, referred otalgia, swallowing pain/difficulty, unilateral nasal discharge, and unilateral hearing loss due to glue ear.
- Subtyping of lymphomas usually requires an excisional biopsy to study the microanatomy of the affected node.