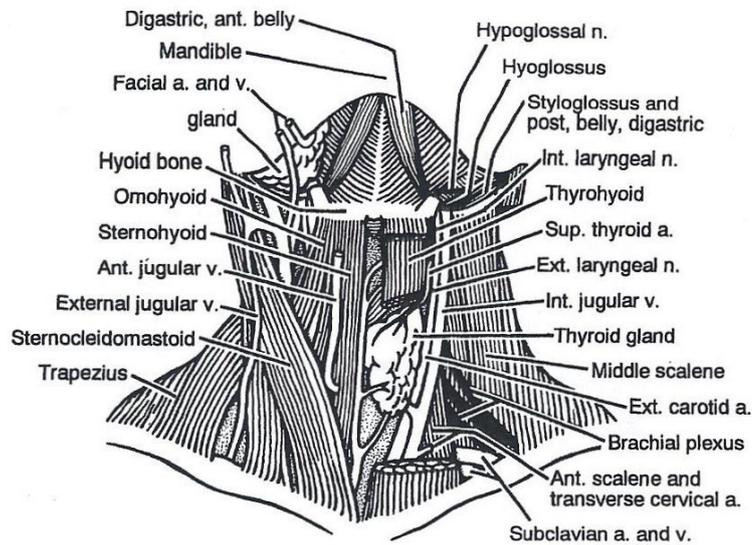


# An approach to a neck mass

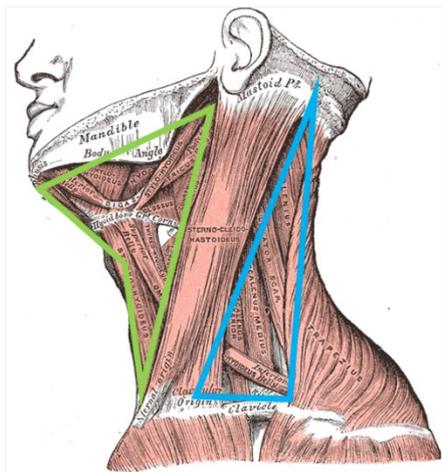
Please also see the section “Head and Neck examination”.

The neck is the “highway” between the head and rest of the body. The anatomy is complex and condensed into a limited space. Basic anatomy is reviewed in the pictures below.

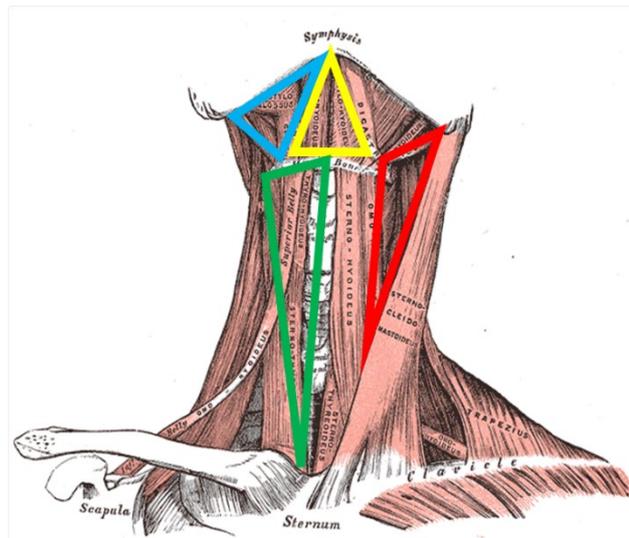


Gland = Submandibular salivary gland

The neck can be divided into levels, zones, or triangles. Levels are used in head and neck cancer surgery, zones in trauma surgery, and triangles as a reference to a certain area. The picture below shows the triangles.

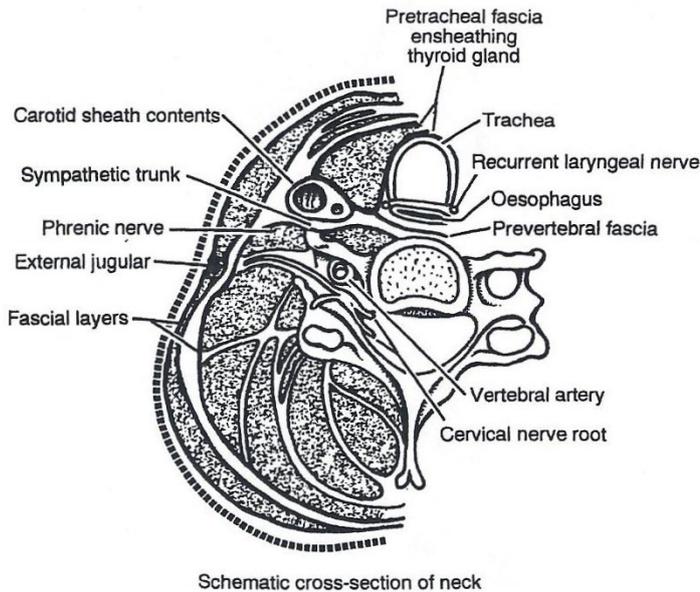


Green = Anterior triangle; Blue = Posterior triangle



Blue = Submandibular triangle; Yellow = Submental triangle; Green = Muscular triangle; Red = Carotid triangle

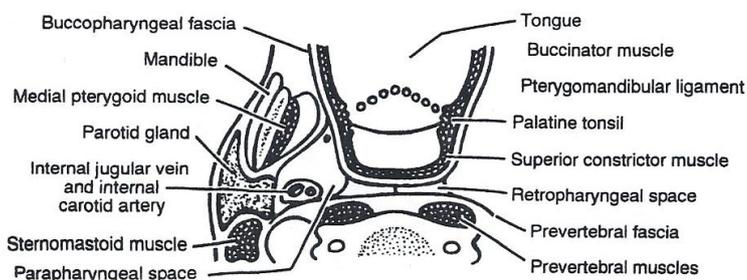
Furthermore, the neck is divided into superficial and deep layers according to the fascial layers as shown in the picture below.



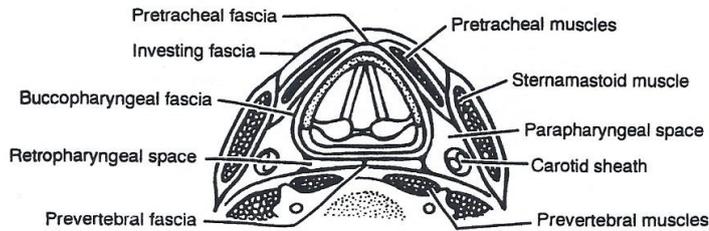
Schematic cross-section of neck

Lastly, the neck contains potential spaces (typically affected in infective processes in the neck) and spaces with structures in it. We will not expect of you to know this in detail, but the most important spaces are:

- Perimandibular space
- Mental space
- Buccal space
- Canine (infra-orbital) space
- Masticator space
- Submandibular space
- Sublingual space
- Submental space
- Submasseteric space
- Parapharyngeal (lateral pharyngeal) space
- Retropharyngeal space
- Prevertebral space
- Danger space
- Peritonsillar space
- Pretracheal space



Fascial compartments of neck at level of C.2



Fascial compartments of neck at level of C.5

Because of your exposure to head and neck cancer surgery with us, neck levels are discussed in reasonable detail under head and neck examination. However, we do not expect of you to have any in depth knowledge of this.

## Neck masses / Nodes

As with any diagnostic dilemma, a thorough history and examination of the head and neck will allow the correct diagnosis to be made most of the time. It should be borne in mind, that simply resorting to the attitude that the easiest way to find out what the lump is, is to take it out, can adversely affect the patient's prognosis if the mass happens to be a metastatic lymph node or a vascular tumour! Incidentally, the correct management may often include needle aspiration and cytological examination. **Rarely**, a lymph node excision is required in the case of lymphoma (note that fine needle aspiration flow cytometry often produces a result). Partial removal of a primary neoplasm will also adversely affect the prognosis.

The first step would be to differentiate normal palpable structures in the neck from pathological processes.

## Normal palpable structures

### Thyroid gland

The thyroid gland has a classic position around the trachea, below the thyroid cartilage. The thyroid is normally attached to the pretracheal fascia and when the trachea and larynx are lifted up by muscle action on the hyoid bone during swallowing, the thyroid gland also move up. This characteristic can make thyroid disease easier to differentiate from other disease. Pre- and para-tracheal lymph nodes, may also be attached to the pretracheal fascia and will therefore also move on swallowing. Thyroid diseases resort under General Surgery at Tygerberg Hospital.

### Salivary glands

Both parotid and submandibular glands are palpable in almost all patients. Both have classic positions namely at the angle of the mandible and pre-auricular for the parotid and in the submandibular triangle for the submandibular gland respectively. Lymph nodes may also be found in these anatomical areas and therefore may cause confusion.

The parotid gland is much more extensive than commonly realized. The part of the gland that is often forgotten about is below the angle of the jaw, and this can be confused with swellings in the upper cervical region. These include the jugulo-digastric lymph nodes. Parotid enlargement and disease are discussed separately, but remember that pathology of the deep lobe will present with a bulge in the oropharynx that will push the tonsil and uvula to the opposite side.

The submandibular gland again has a classic position, below the middle of the jaw. Swellings in this region should always be **bimanually palpated**, with one hand in the submandibular region and a finger of the other hand in the floor of the mouth. This allows the mass to be balloted between the two fingers and allows stones within the duct to be identified. Submandibular salivary gland swellings have to be differentiated from submandibular lymph node swellings. These are relatively rare, except when there is an oral cavity tumour with secondary spread or dental caries.

## Bone and cartilage

The inexperienced clinician often mistakes the normal bony or cartilaginous structures in the neck for pathological lumps. The most common structure to be confused, especially in thin necks, is the transverse process of the axis which is deep below the angle of the jaw. The transverse processes are bilateral but one may be more prominent than the other.

Other normal structures such as the hyoid bone, the thyroid and cricoid cartilages should not be difficult to identify. An accessory cervical rib can sometimes be palpable.

## Blood vessels

Normally the carotid artery wall is not palpable, although pulsations within it are. Arteriosclerotic thickening of the wall often makes the artery palpable and the pulsations within it less so. A bruit can often be heard by auscultation over an arteriosclerotically narrowed carotid artery. Carotid body tumours are extremely rare and do usually enter into the differential diagnosis of a lump in the neck. They classically present in the region of the carotid bifurcation.

## Pathological diseases

Knowing the site / area of the mass already tells the clinician the most likely organ / structure / site involved and thereafter the pathology. The mass can be situated in any tissue from the skin superficially to include all the deeper structures. The table below structures the differential diagnoses according to age groups and position in the neck in relation to the most likely aetiology. It does not cover skin associated masses such as dermoid, epidermoid, and sebaceous cysts.

### Differential diagnosis of neck masses

Age groups	0-15	16-40	>40
<b>Order of likelihood</b>	Inflammatory Congenital Malignant Benign	Inflammatory Congenital Benign Malignant	Malignant Benign Inflammatory Congenital
<b>Differential diagnosis according to triangles</b>			
<b>Aetiology</b>	<b>Midline</b>	<b>Anterior triangle</b>	<b>Posterior triangle</b>
<b>Congenital</b>	Thyroglossal cyst Laryngocele Dermoid Lymphangioma	Branchial cyst Salivary glands Lymphangioma	Lymphangioma
<b>Inflammatory</b>	Lymphadenitis (Bacterial / Viral / Granulomatous)	Lymphadenitis Sialadenitis	Lymphadenitis
<b>Tumour</b>	Thyroid Lymphoma	Thyroid Salivary glands Lymphoma Metastatic nodes Paragangliomas Carotid body	Metastatic Lymphoma

## Lymph and lymph nodes

Roughly 90% of interstitial fluid is returned to blood and 10% enters the lymphatic pathway. Lymph nodes are part of the lymphatic pathway. They are organized in superficial and deep groups of nodes and eventually drain via the right lymphatic duct and left thoracic duct into the subclavian or internal jugular veins.

Most lymph nodes have an oval or bean shape, with a depression at the hilar region. The hilar region is where the afferent, efferent, vein and artery enter the lymph node. Normal lymph nodes are usually less than 1 cm in size, except for jugulodigastric nodes, which can be up to 1.5 cm in size.

Although lymph nodes perform a filtration effect, their main function is lymphopoiesis and the creation of an immune reaction. The lymph brings antigens to the node and exposes them to antibodies. Furthermore, it activates the B lymphocytes of the humoral immune system, and T-cell and macrophage of cellular immune system respectively. In addition, the phagocytic apparatus of the sinuses filters the lymph, retaining foreign antigens and substances. The passage of the lymph and cells from one chain of lymph nodes to the next is a means by which the immune response is conveyed from the peripheral to the more central lymph nodes. Normally, the lymph node is estimated to recirculate its entire population of lymphocytes within about 12 days. This flow can double or triple when the node is antigenically challenged.

There are several hundred lymph nodes on each side of the neck. About 1/3 of all lymph nodes in the body is in the head and neck area. In adults, lymph nodes are not normally palpable and should be investigated. In children and adolescents, it is normal to palpate some lymph nodes, mainly because they are chronically inflamed due to the repeated upper respiratory and alimentary tract infections in this age group. Another reason why lymph nodes are easier to palpate in children is the lack of fat deposition in the neck. The lymph nodes, although generously distributed have definite pattern of distribution. The only groups which are inaccessible to palpation being the retropharyngeal node. Their pattern of drainage from the different areas of the head and neck is also relatively constant. In an infective or neoplastic disease not all nodes in the chain draining the affected part are necessarily affected, and one can find “skipped” lymph nodes.

If a lymph node is enlarged it implies pathology in the head and neck region, the only **exception** being the **supraclavicular nodes**. These nodes also drain from the **thorax** and, in addition, on the left there is drainage from the **upper abdomen** because of the relationship to the thoracic duct (Virchow-Trossier node). Lymph node enlargement can only be due to infections, non-infective inflammatory diseases or neoplasms.

### Lymphadenopathy

- Infective (known as lymphadenitis)
  - Viral
    - Adenovirus, Rhinovirus, Enteroviruses (coxsackie), Epstein-Barr, HIV
  - Bacterial
    - Suppurative lymphadenopathy
      - Staphylococcus aureus and group A  $\beta$ -haemolytic Streptococcus
    - Mycobacterium
      - Mycobacterium tuberculosis and atypical mycobacterium species
    - Toxoplasmosis / Cat-Scratch disease
  - Fungal
- Non-infectious inflammatory diseases
  - Autoimmune diseases (RA, SLE)
  - Sarcoidosis
  - Amyloidosis
  - Storage diseases
  - Kawasaki disease
  - Sinus histiocytosis
  - Drug induced
- Primary and Metastatic tumours
  - Squamous cell carcinomas
  - Any head and neck cancer
  - Lymphomas

## Lymph nodes and infections

Lymph node enlargements which are secondary to inflammation are mostly painful. Often several glands are affected and they usually are, or at some stage have been, tender to palpation. The most common sites to be infected are the pharynx including the tonsils, teeth, and nose. Correspondingly, the upper deep cervical (jugulo-digastric) lymph nodes are the ones most commonly affected. As stated earlier, palpable lymph nodes are common in children, who normally have recurrent upper respiratory and oropharyngeal infections. In adolescents, infectious mononucleosis must be considered. Here the lymphadenopathy is usually multiple and bilateral and can involve lymph node groups apart from those of the head and neck. In adults, infective enlargement of a lymph node is uncommon, and **neoplasm** is the more likely possibility.

Primary tuberculosis of the neck nodes is, however, still a possibility following ingestion of the organisms and is not necessarily associated with pulmonary tuberculosis. The nodes are not usually tender. Occasionally, cervical tuberculosis may present as an abscess or as a fistula (especially if it was incised and drained).

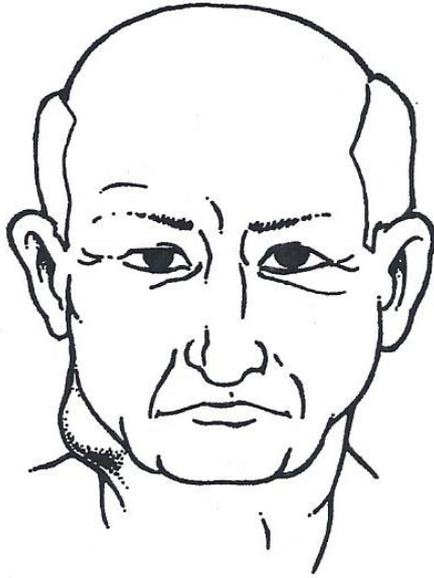
## Lymph nodes and cancer

Head and neck cancer typically spread via lymphatic pathways. The reason being that capillaries have tight inter-endothelial cell junctions, there is a basement membrane, and there are surrounding pericytes. If metastatic cells are to enter these vessels, they must actively penetrate these various layers, and this process is known as intravasation. By comparison, the lymphatic capillaries have loose inter-endothelial cell junctions, valve openings, no basement membrane, and no surrounding pericytes. As a result, tumor cell entry into lymphatic vessels is considered a passive process, whereas entry into the blood vessels is considered an active process.

In adults, an enlarged lymph node in the neck must be considered a neoplasm until proven otherwise. In adults under the age of 40, the most likely neoplasm is a lymphoma. In those over 40, it is likely to be a secondary from a primary squamous carcinoma from somewhere in the head and neck. In all patients the first thing to do is to thoroughly examine the head and neck, paying particular attention to other lymphatic tissue in the tonsils, the postnasal space and the base of the tongue. The area which primarily drains to the enlarged node should be examined but not to the exclusion of the other areas. The primacy site for a squamous carcinoma is very often silent, that is without symptoms or signs. This is not surprising as the head and neck have many spaces where a neoplasm has to be fairly big before it causes symptoms. Examples of such spaces are the nasopharynx, the pyriform fossae, the supraglottis, the base of tongue, the retromolar trigone, floor of the mouth (gutter), the tonsil and the oral cavity.

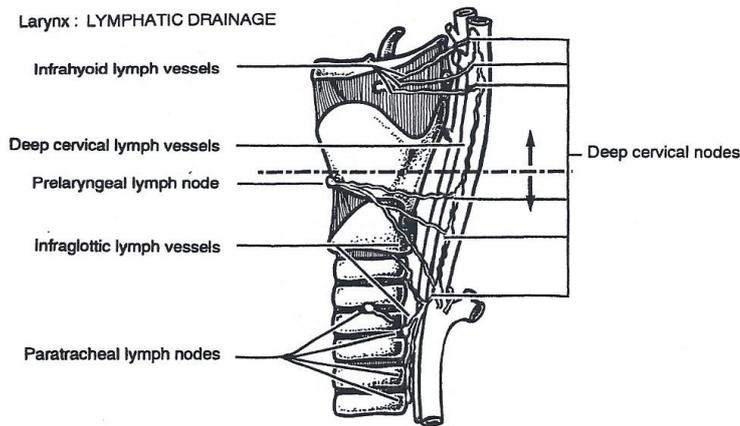
The majority of these sites are not easy to examine, and it should, therefore, be the rule that an otolaryngologist should examine every adult with a neck swelling. Having completed the examination, the otolaryngologist will be faced with one of two situations which are handled in different ways. One is an obvious primary with secondary lymph node involvement and the other no obvious primary with secondary lymph node involvement. We don't expect of you to know what to do, but general principles are important:

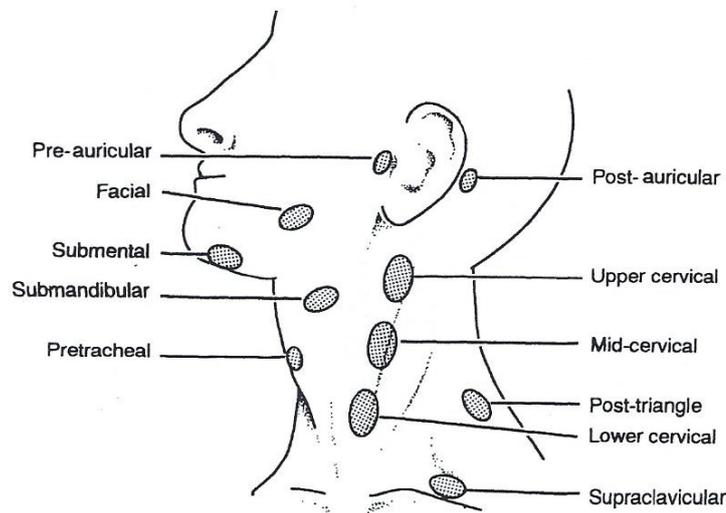
- “Search” for the primary and rather biopsy the primary
  - Remember that lymph nodes, in general, follow an orderly pattern of involvement (see head and neck examination)
- Do not incise or remove a lymph node!
- Rather do a FNAC, with or without a cell block (cell block entails performing a fine-needle aspirate, and sending the aspirate in a specimen container with normal saline for cell block cytology)
- Rarely, you may do a core needle biopsy
- Do general bloods (FBC, U&E, Albumin, HIV)
- REFER



Metastatic mass in the neck. The mass was fixed, and very hard which made the diagnosis of metastatic lymph node most likely. A careful search of the mouth, throat, etc., was negative. A very small primary tumour was found in the scalp.

The normal drainage pathways are shown below





Classic pattern of distribution of neck lymph nodes

Nodes	Areas draining to these nodes
Submental	Lower lip, Floor of Mouth, Lower gum
Facial / Submandibular	Face, Nose, Paranasal sinuses, Oral cavity, Submandibular gland
Pretracheal	Larynx, Thyroid
Pre-auricular	Anterior scalp, Forehead, Parotid
Upper-cervical	Oral cavity, Oropharynx, Nasopharynx, Hypopharynx, Supraglottic larynx
Mid-cervical	Thyroid, Larynx, Hypopharynx, Cervical oesophagus
Lower cervical	Intra-abdominal organs, Breast, Lung, Oesophagus, Thyroid
Post-auricular	Posterior scalp, Posterior ear
Supraclavicular	Nasopharynx, Thyroid, Oesophagus, Lung, Breast

## The Hot Neck Node

It is very important to distinguish between what is referred to as a “hot neck node” and a “cold neck node” on clinical grounds. The reason being twofold. Firstly, we don’t want you to incise into “cold” neck nodes, because most of them will be neoplasms and this will increase their regional spread (and result in poorer outcomes). Secondly, you can under the ideal circumstances manage a patient with an obvious (but limited) infective process in the neck. If it is fluctuating, warm to touch and red you can incise it to facilitate the drainage of the puss, break down the loculation, rinse and pack the cavity. The only exception to this rule is secondarily infected congenital neck masses. Rather aspirate them, because once incised and drained they have a higher occurrence rate after definitive surgery. The more severe cases, or if you don’t have the experience or supervision, needs to be referred to a hospital. The table below lists the differences.

	Hot	Cold
<b>Aetiology</b>	Infective process / Lymphadenitis	Either neoplastic or congenital
<b>Signs of infection such as fever, tachycardia, raised inflammatory markers</b>	Yes	No
<b>Signs of an abscess such as warm to touch, fluctuant, erythema of skin</b>	Yes	No
<b>Features of the node</b>	Fluctuant / Soft	Hard / Fixated / Infiltrated
<b>Management</b>	Depending on your skill level and infrastructure <ul style="list-style-type: none"> <li>• Aspiration</li> <li>• Incision and drainage</li> </ul>	Do not incise and drain! By far the majority would be metastatic lymph nodes or congenital conditions

	<ul style="list-style-type: none"> <li>• Formal exploration in theatre</li> </ul>	Fine needle aspiration cytology is allowed Rarely core needle biopsy Remember that most congenital masses in the neck are cystic in nature
<b>Further management</b>	MCS Antibiotics	Refer

## Fine needle aspiration cytology (FNAC)

Sometimes it is also referred to as a fine needle aspiration biopsy. This is a technique that you certainly can acquire the skill to do it yourself. FNAC can be done blindly or under ultrasound guidance. In our Head and Neck clinic we employ the blind technique with good results. The reader is referred to an excellent chapter on “BIOPSY OF HEAD & NECK TUMOURS & CERVICAL LYMPH NODES” in the OPEN ACCESS ATLAS OF OTOLARYNGOLOGY, HEAD & NECK OPERATIVE SURGERY at the following webpage [Head and neck lymph node and tumour biopsy techniques](#). It also discusses various other biopsy techniques.

## Fine needle aspiration cytology (FNAC) with Cell Block

This is a technique that you certainly can acquire the skill to do it yourself. Following a FNAC, the specimen is placed into a container with sterile normal saline (rather than onto cytology slides) and is sent for “cell block” cytology examination.