EXAMINATION OF THE THYROID GLAND PATHOLOGY VOLUME 1

In the examination of a neck mass the examiner could progress in one of 3 ways; to examine as goiter, to examine as a thyroglossal cyst or to examine as any other neck mass. The one that is strikingly different from the others in the sequence of steps, manipulations and postures is the examination of a mass that is suspected to be goiter.

If the neck mass is thyroglossal cyst there are three signs that one will have to elicit that differ from other neck masses. These three signs are swallowing test, tongue protrusion test and tugging test (see below).

If the mass is not a thyroid mass i.e. it is neither goiter (thyroid enlargement) nor a thyroglossal cyst then the examination will process just like a mass in any other part of the body after excluding that the mass does not move with swallowing.

The objective of this short case article is to present vividly the examination of goiter. This article presents the why, the how to do and the how not to do during the examination of goiter. Also included is he examination of a thyroglossal cyst as an aside.

In the examination of goiter the following MUST be considered

Confirm there is indeed an anterior (an anterior neck mass is defined as any mass at the exact midline of the neck or within 2cm of the midline).

Determine whether it is a thyroid mass or otherwise (by the swallow test)

Determine whether it is goiter or thyroglossal cyst (by tongue protrusion test)

Determine the physical characteristic of the thyroid mass (diffuse or unilateral by palpation)

Determine in what plane of the neck the mass is located (by Stenomastoid /strap muscles contraction test-neck flexion test)

Determine presence of local complication and affectation of surrounding structures – inflamed, compression, diffuse with a smooth surfaced or nodular

Determine whether it is pathologically benign or malignant

Determine whether it has normal function, whether it is over-functioning or it is underfuctioning

Rule out other differentials of neck mass

Formulate a plan of investigation and treatment

Can the patient be operated upon instantly or does the patient need initial medical therapy.

Should patient be considered for elective, urgent or interval thyroidectomy?

All these must be done within 3-5 minutes if this station will be passed

This is instructive article describes the examination of goiter in details. It describes the aim of each step, the method of execution and the interpretation and clinical implications.
The examination of goiter is in two phases; locoregional and systemic examination.

The locoregional examination involves examination of the thyroid gland and the regional lymphatic drainage. The systemic examination is directed at determining the function of the gland whether is the patient has hypothyroidism, hyperthyroidism or is euthyroid.

Before we commence here is a brief review of the surface anatomy and relations of the thyroid gland that will be helpful in the interpretation of the examination findings (figure 1a and b)

Figure 1a: LEGEND

(a) Right and left Stenomastoid muscles. (b) Anterior triangle of the neck, between the Stenomastoid muscles (c) right and left posterior triangles lateral to the stenomastoid muscles (d) right and left stenoclavicular joints

Figure 1b LEGEND

(a) thyroid lobes (b) superior thyroid artery (c) external branch of carotid (d) inferior thyroid artery (e) thyrocervical trunk (f) subclavian artery (g) thyroid cartilage (h) border of Stenomastoid (i) clavicle (j) posterior triangles

The discussion the examination will proceed as will be done in any short case examination session

Approach and setting the stage
- Inspection
- Palpation
- Percussion
- Auscultation

First we provide a summary of the locoregional steps that will be described in this volume 1 article

**SUMMARY**

Speak to patient (greet and introduce self and seek permission)
Set the stage and expose
Ask to swallow
Ask to open mouth and then to protrude tongue
Palpate for tenderness, differential warmth and trachea centrality
Move to the back
Palpate to get below the lower border
Palpate the surface for contour, consistency and consistency
Palpate for attachment to skin and surrounding structures
Check for plane of the mass below the strap muscles
Palpate for special signs: thrill, berry’s test and Kocher’s method
Auscultate of bruit
Palpate for cervical lymph node

Now we commence the discussion

Approach and setting the stage

When examining goiter the first step is to seek permission and indulgence. This is important because during the examination of goiter the clinician gives instructions and performs various manipulations that the patient may find uncomfortable. In addition the cooperation of the patient is imperative for ease of demonstrating or eliciting some of the physical signs

Speak to the patient,

Aim: To check the voice for hoarseness.

Execution: Greet the patient and ensure he or she responds

***If the patient nods in response instead of speaking back to you, ask the patient to speak in response to your greeting in order to know if there is hoarseness

Interpretation: if the patient is hoarse suspect malignant infiltration of the recurrent laryngeal nerve, compression loss of pressure by a giant benign multinodular gland, laryngeal edema from recurrent upper respiratory tract infections or laryngeal edema from hypothyroidism

Positioning of patient: The examination should be done with the patient on a situation where you can room to move all around the patient

Execution: If patient is seated on a couch or bed, ask to get onto a chair, place the chair centrally

AIM: This ensures that there is space for you to move all around the patient.

**Also in setting the stage to start the examination, ensure the fan is off, this may be done when about to check for fine tremors with a sheet of paper as will be described later but it is possible to forget to turn of this step in the heat of the moment so it may be better to do this during the time of setting the stage for the examination.

Error of execution: examining the patient in a confined space where it is difficult to get behind or all around the patient or examining the patient on a couch which makes it difficult to examine from the back

EXPOSURE:

Execution: Ask the patient to remove the headgears and the top clothing to expose as far as the nipple line
Reason: The inspection should include the whole of the neck, the skull, the back of the head and neck and the supraclavicular and infraclavicular fossa. Percussion over the upper half of the sternum may also be necessary in case of suspicion of retrosternal extension.

Clinical implication: There could be other masses in the head and neck. There could be metastasis from thyroid follicular carcinoma to the skull bone; there could be cervical lymphadenopathy from papillary carcinoma.

Ask the patient to remove the clothing by themselves; do not rush to remove the clothing for the patient.

Error of execution: not removing the headgear, not asking the patient to remove the top and rushing to undress the patient without first asking the patient to do so themselves.

**INSPECTION**

Note the disposition of the patient,

Execution: note if the patient is calm or restless “sitting calmly on the seat or shifting from time to time, unable to sit still”. Look all around the patient’s head and neck and then to have a good view of the neck mass, the neck should be extended.

Clinical implication: Thyrotoxic patients may be restless, hypothyroidic patient may be sluggish and dull.

Aim: Extension allows a better view of the anterior neck, extension stretches the skin of the neck and any hidden thin scar may become obvious.

Figure 2a the correct way to inspect. Note the examiner’s hand is on the patient’s head don’t just give this instruction extend the patient’s neck and keep your hand on it to keep it extended while you inspect.

**Inspection step 1; slightly extend the neck**
Execution: First look all around the head and neck for other masses, note the location of the mass, and then place your hand over the head of the patient and tilt the neck slightly backwards to get a better view of the anterior neck mass, look to check for scarifications and any scars of previous operations (figure 2)

**Inspection step 2** perform the swallowing test

**Aim:** Check if the lump moves up with swallowing:

**Execution:** Ask the patient to swallow while still extending the neck

**Interpretation:** If the mass moves up with swallowing this suggests that the mass is thyroid mass or it is at least plastered to the voice box.

**Clinical implication:** It will be assumed to be a thyroid mass or a thyroglossal cyst at this stage once it moves with swallowing even though there are other masses that may move with swallowing such as laryngocoele, laryngeal bursa, pretracheal lymph nodes

*If when performing this step there is a bottle or a bag of fluid available, it is preferred to ask the patient to sip a small aliquot and hold in the mouth and then to swallow it when you indicate to observe as the patient swallows

**Error of execution:** inspecting while the neck is flexed and from a lower level (see figure 2b)

**Inspection step 3** Tongue protrusion test

**Aim** Check if the mass moves with protrusion of the tongue. This is necessary to distinguish between goiter and thyroglossal cyst these are the only two masses that are initially considered once a mass moves with swallowing.

**Execution:** Movement with protrusion of the tongue must be elicited in two steps. First ask the patient to open the mouth, wait and look in to the mouth for masses, pigmentations (figure 3a) and then the second step, ask the patient to protrude the tongue. (figure 3b)

**Reason for two steps:** Reason why two separate steps: Because the neck muscles also move when the patient opens the mouth because of their attachment to the chin and lower jaw, when the patient opens the mouth, any mass in the neck will also move, this movement should be eliminated before checking for movement with protrusion of the tongue. Performing this as a single step rather than two separate steps may lead to erroneous assumption that the mass moves with tongue protrusion. In fact for some OSCE station these steps may be scored separately. If the patient does the two steps simultaneously politely ask the patient to close the mouth back and then demonstrate how you want it done so that the patient understands you and then repeat your instructions; two steps first open your mouth and then stick out your tongue

**Interpretation:** if the mass moves upwards when the tongue is protruded then it is assumed to be a thyroglossal cyst

**Clinical implication.** What to look for inside the mouth? there could be neuromas, pigmentory changes which will give a consideration of MENS syndrome. There could also be a lingual goiter. The problem could be an oropharyngeal tumor giving cervical pretracheal node metastasis which will also move with swallowing as earlier noted. The thyroid mass could be infiltrating the pharynx. The protrusion of the tongue may be used to accomplish two things. One, to see if the mass moves upwards when the tongue is protruded suggesting that it is a thyroglossal cyst which is attached to the root of the tongue by a stalk and two, to check for fine tremors. To check for the later the tongue
must be protruded straight out and sticking forward as in the figure and not resting downwards against the teeth and lower lip as shown in the figure 3b

Error of execution: The common mistake is to instruct the patient to protrude the tongue without initially asking them to open the mouth as a separate step. Be conscious of this common mistake !!! Another error is to ask for the patient to open the mouth slightly and to be inspecting the mouth from a lower level

If it is a thyroglossal cyst, only one other maneuver differentiates it from examination of other masses in the head and neck and that is to demonstrate tugging. Tugging is the sign that demonstrates that the mass is pulled by the tongue when the tongue is protruded.

**Execution**: This is done by in 3 steps.

1. with the neck slightly extended, asks the patient to open the mouth
2. hold the mass in a pinch or pincer grip between the thumb and the index finger (see figure 3d-f)
3. ask the patient to protrude the tongue. If it is a thyroglossal cyst the mass will move away from the examiner’s grip

**PALPATION**

**Palpation of the thyroid gland**: This is from two places. It should be started in the front of the patient and completed while standing at the back of the patient
What should be done from the front?: Check for tenderness, differential warmth and trachea centrality then continue palpation at the back for retrosternal extension, fixity to skin, the plane of the mass behind the strap muscles and stenomastoid, thrill, surface and palpation for the special signs; berry’s test, kochers method.

**Palpation from the front step 1:** tenderness and differential warmth

**Aim:** to determine if the mass is inflamed

**Execution:** To check for tenderness, palpate the mass with the flat of your fingers while looking at the patient’s face this is one reason why this is done from the front because we need to check for tenderness by observing the changes in facial expression as the mass is palpated. (figure 4a)

![figure 4](image)

**Palpation from the front step 2:** differential warmth

**Execution:** To check for differential warmth, this should be done with the back of the palpating fingers in three movements (normal to abnormal and back to normal). The normal skin away from the lump is first palpated and then the mass is palpated and then the again the normal skin is palpated. The time spent over each point should not be more than 1-2 seconds; the time spent to execute these 3 movements all together should not be more than 3-5 seconds. If the time spent at any one point during the palpation is extended the differences in the temperature may not be appreciated because of the acclimatization to the temperature difference, the heat will be dissipated.

![Fig 5a Normal skin](image) ![fig 5b The mass](image) ![fig 5c Normal skin again](image)

**Palpation from the front step 3:** Tracheal centrality

Checking for tracheal centrality or location:

**Execution:** Three fingers are required for this process; the index, middle and ring fingers. While stooping or bending in front of the patient. The index finger is placed on one stenoclavicular joint (figure 6b), the ring finger is placed on
the other stenoclavicular joint (figure 6a), then the middle finger is placed on the midline of the neck equidistance between the index and the ring fingers to locate whether the trachea is still central or deviated (figure 6c). The middle finger should not poke around the neck, wavering from side to side, it should only run up and down the midline, it should not wonder away from the midline in search of the trachea if it is deviated.

**Clinical implication:** It is important to know the location of the trachea during examination in preparation for direction of the endotracheal tube during induction of anesthesia. If the isthmus of the gland is enlarged attempt to get above or below it in the midline to palpate for the location of the trachea, if this is not possible or the examiner is unsure of the location by this palpation method, an alternative is to check for location of the trachea by auscultation, this will be described later in this article.

![fig6a](image1)
![fig6b](image2)
![fig 6c](image3)

After these initial 3 steps of palpation for tenderness, differential warmth and trachea centrality, the examination should be completed while standing behind the patient.

**Palpation from the back**

The examiner should stand behind the patient, for continuation of the palpation

**Orientation of the hands for palpation of goiter and positioning of the patient’s head/neck for palpation.**

**Execution:** The hands to be in the position of function as it is done when holding on to a rounded object for example a balloon or a football (figure 7a and b). The digits are spread out if the gland is big while the fingers apposed if the gland is small, the thumbs of the examiner should touch if the hands can conveniently be wrapped around the neck of the patient otherwise they may be apart (fig 7c)
The tendency is for the patient to extend their necks, thinking that will allow the examiner better access to the gland, the examiner should politely ask the patient to flex the neck while he/she pushes with your thumbs at the occiput (figure 7d)

Clinical implication: If the neck is kept in neutral position or in extended position then the neck muscles will stand taut and prevent proper palpation for consistency, surface and other physical characteristics of the mass.

Execution: To commence the palpation from behind, the fingers are wrapped around the neck mass as shown in the figure (fig 7c) while the thumbs are used to push the occiput forward and downs to flex the neck so that the neck muscles will relax for easy examination of the mass. After positioning the flexed state neck for the palpation, the first step is to ask the patient to swallow again to determine whether the ring fingers can be insinuated below the lower border of the mass that is between the mass and the suprasternal space (of burns). fig 8

Interpretation: If is possible to get to the lower border of the mass then it will be assumed that there is no retrosternal extension.

Please note that this does not rule out a totally retrosternal ectopic goiter or a retrosternal part of the mass that is connected to the main body of the thyroid gland by a narrow stalk... If it is not possible to get below the lower border of the mass, then the examiner will need to percuss for retrosternal extension before the locoregional examination is complete.

Error of execution: Palpation from the back with the neck extended or palpating the neck with all the digits (i.e. the four fingers and the thumbs on the gland)

PALPATION FOR SURFACE, CONSISTENCY and COMPRESSIBILITY or EMPTYING.

Execution: One hand stabilizes the gland while the other palpates from down upwards and outwards. The two hands should not work on the gland simultaneously. After this, the skin of the neck is picked away from the mass. The mass may be moved for attachment to surrounding structures.

Interpretation: The mass could have smooth surface and may be a uniform enlargement of the two glands and the isthmus in a patient with diffuse goiter, the surface could be nodular and the gland may be firm in multinodular goiter.

Note that laryngocoele and laryngeal bursa will be soft and will empty
Error of execution: palpation with the two hands simultaneously

Checking for the plane of the mass

**AIM:** Check to confirm that the mass is indeed below the plane of the strap muscles and stenomastoid by tensing those muscles.

**Execution:** There are several methods of doing this

Method 1: Checking the plane by asking the patient to tense each Stenomastoid one after the other. To check on the right, while looking from the same side, ask the patient to turn the head to the left side while applying resistance to the chin with your left hand and vice versa.

Method 2: The two stenomastoid can be tensed at the same time by asking the patient to push forward with the forehead against your left hand while you look from over the right shoulder.

Method 3: Neck flexion method: This method is elicited by asking the patient to extend the neck then place the palm of either hand against the chin and then ask the patient to flex the neck against resistance while looking over the other shoulder

**Interpretation:** If the mass reduces in size upon tensing the neck muscles, this confirms that the mass is in a plane behind the strap muscles and the stenomastoid which is the plane where the thyroid gland is normally situated

**PALPATE FOR SPECIAL SIGNS:** Palpation for thrill, berry’s test and Kocher’s method

**Palpation for thrill:**

**Aim:** to check for increased vascularity of the gland

**Execution:** This should be done at the upper poles of the mass; place the flat of your fingers on the upper poles one after the other to feel for the thrill (because of the more superficial and higher flow superior thyroid artery)

**Interpretation:** If there is palpable thrill, then the gland is hypervascular

**Clinical implication:** the diagnosis will be toxic goiter

**Berry’s test:** This tests the effect of the mass on the carotid pulsation.
**Aim:** To determine whether the mass is encasing the carotid pulsation or it is displacing it backward.

**Figure 10a**

The carotid pulsation is expected to be felt in the groove between the anterior border of the stenomastoid and the angle of the jaw.

**Execution:** It is done one after the other. To check the left side, the examiner should place the palm of his other hand over the vertex of the patient. The left index finger is then run along the lower blade of the jaw the anterior border of the stenomastoid at the angle of the jaw, this is where the carotid pulsation is expected to be felt.

**Interpretation:** The pulsation may be pushed away by a giant goiter or it may be encased by a malignant goiter. If the carotid pulsation is not felt at all then the mass is probably encasing the carotid sheath and the conclusion will be to think the mass is malignant. If the mass is displacing the carotid pulsation posteriorly this may simply suggest a huge benign goiter with pressure displacement of the carotid sheath.

**Error of execution:** Palpating for the two carotid pulsations simultaneously. This **MUST NEVER** be done because applying pressure on the two at the same time will be perceived as elevated blood pressure by the carotid baroreceptors. This perception transmitted to the cardiovascular centre will lead to crashing of the blood pressure in
an attempt to bring down the erroneously perceived elevated pressure this causes hypotension and the patient may faint. This is a vasovagal reflex- This situation is sometime referred to as barbers syndrome (one hand of the barber on one carotid the other trimming the angle of the jaw with the clippers)

**Kocher’s method,**

**Aim:** This is used to check for compromise of the airway:

**Execution:** Kocher’s test is elicited on both sides on after the other. To check on the left side, the examiner looks and listens from the same side, the head is flexed to the turned to the same side, the neck is flexed to the same side and pressure is applied with the left hand on the mass.

**Interpretation:** If the airway is already compromised, when this test is demonstrated the patient’s respiration becomes noisy, the patient will become restless and cyanosed and the face may be suffused

**Clinical implication:** The Kocher’s test may suggest infiltration of the trachea by a malignant or just compression by a giant goiter. This was classically described for malignant goiter

**AUSCULTATION**

**Aim:** For bruit and tracheal centrality:

Checking for bruit.

**Execution:** This is done by placing the bell of the stetoscope over the superior-posterior part of the mass on both sides one after the other

**Clinical correlate:** The auscultation should be at the superior-posterior pole of the gland. This is where the superior thyroid artery supplies the gland. The superior thyroid artery is more superficial than the inferior thyroid artery and it carries more blood flow to the gland because it is a main off shoot from a major vessel (see figure) (It is the first branch of the external carotids) in contrast to the inferior thyroid artery which is deeper and a is not a direct off shoot of a major vessel hence carried lesser blood flow to the gland (the inferior thyroid artery is a branch of the thyrocervical artery which is in turn a branch of the subclavian) (see figure 1)

Interpretation: presence of bruit suggests that there is hypervascularity of the gland

**Clinical implication:** This suggests toxic goiter
Auscultation for the trachea centrality can be done at the time of auscultation if one is unsure by palpation method. This is done from behind still. The stethoscope is placed on either sides and then on the midline over the gland to determine where the trachea breath sound is loudest.

(a) first location of the stethoscope, (b) second location of the stethoscope (c) third location of the stethoscope

Clinical implication: The point where the sound is loudest suggests the location of the trachea

**Palpation for lymph nodes.** This should be done from behind after auscultation. The sequence should be in a pattern of number “7” see figure

**AIM:** to check for presence of regional lymph node metastasis

**Execution:** Starting from the submental(a) to submandibular(b), preauricular(c), postauricular(d), occipital(e), cervical chains anterior(1) and posterior(2) to the Stenomastoid(upper(f1 &2), middle(g1&2) and lower third(h1&2)) and then supraclavicular(i) and infra-clavicular(j) groups (see the short case for examination of the cervical lymph nodes). The description of examination of lymph node is detailed in another article

**Clinical implication:** presence of cervical lymph node suggests metastasis from a papillary carcinoma of the thyroid

**PERCUSSION:**
**AIM:** This is done to check for retrosternal extension of goiter especially when the examiner cannot get below the gland during palpation.

**Execution:** This step can be done from the back, from the side or from the front of the patient. Starting from the mid sternal region, percussion is done in the midline of the chest (over the sternum) from below upwards.

**Interpretation:** A change in the percussion note from resonant to dullness as the percussion approaches the suprasternal space of burns suggest retrosternal gland is present.

This is the complete locoregional examination for goiter. The systemic examination is detailed in the second volume.