Mimics of neoplastic lesions in neck imaging

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Purpose

This presentation is meant to highlight the possible mimics seen in a busy oncology centre during a follow up imaging, especially ultrasound (US) of the neck. Various innocuous findings may be mistaken for recurrent or residual disease causing confusion due to inexperience or an apparent lack of knowledge.

Methods and Materials

The prospective study includes a routine follow up mainly by Ultrasound or in few cases with CT for nodal or nonnodal metastatic or recurrent disease. More than 1000 cases are followed up at our centre annually. Only findings which mimicked neoplasm are included in this series irrespective of initial or current tumor staging. These cases were done mainly on Toshiba Xario US unit, Tokyo Japan and some on ATL-HDI 3500, Philips, Seattle, USA; using Linear array high frequency probes (7 -12 MHz). CT sections when required were obtained on GE brightspeed 16 slice MDCT scanner.

Results

All the findings which may lead to an erroneous diagnosis have been divided into the following categories -

- thyroid and salivary gland abnormalities
- lymph nodal
- vascular
- neurogenic
- cartilaginous
- bony
- soft tissue abnormalities.

These include several conditions which mimic metastatic nodes, extracapsular nodal spread, residual lesions of thyroid bed, parathyroid adenomas and a few specific lesions such as Kuttner's tumour of submandibular gland. Post-operative changes or foreign body granulomas may mimic soft tissue recurrences or laryngeal neoplasm, while incidental or postoperative neurogenic lesions may appear as recurrent masses. In two cases parasitic pathology was identified causing concern for neoplasm Fig. 8 on page 11. Calcified, necrotic or non-necrotic tuberculous lymph node also form an important subset due to its high incidence in India. Normal thymic and tonsillar tissue also mimicked neoplasm in some cases.
Discussion

Thyroid related mimics

Thyroid bed evaluation following partial or total thyroidectomy is routine practice. The aim is to identify the residual thyroid tissue Fig. 4 on page 7 separately from recurrent tumour and looking for small central compartment level 6 lymph nodes.

Post-surgical foreign body material can cause confusion\(^1\) and so does focal thyroiditis.

Young lady came to our hospital for revision thyroidectomy following bilateral excision of thyroid nodule. The clinical details were not available due to language barrier. US of thyroid was done. Fig. 2 on page 6

Ectopic thyroid tissue mimicking abnormal soft tissue mass overlying the thyroid cartilage (abutting hyoid bone). The thyroid fossa however was empty. There was no history of thyroidectomy. Simple screening of the thyroid fossa could prevent the erroneous diagnosis. Fig. 3 on page 6

Focal thyroiditis is known to mimic neoplastic lesions Fig. 5 on page 8 or neoplasms like non-Hodgkin’s lymphoma which is known to co-exist with Hashimoto’s thyroiditis.\(^2\)

Salivary glands

Salivary glands are routinely screened during follow up neck US. Some of the issues involved are changes related to prior surgical interference in the floor of mouth; causing injury to the ipsilateral duct leading to unequal appearance compared to normal side, post-radiation inflammatory process Fig. 9 on page 11 and at times a lymph node located behind the submandibular gland. A specific entity called Kuttner's tumor Fig. 7 on page 10 needs mention as during clinical palpation the submandibular gland would be hard enough to mimic either neoplasm or metastatic lymph node.\(^3\)

Lymph Nodal

It is established practice to use ultrasound imaging in head and neck malignancies to evaluate lymph nodes for early detection of metastasis.\(^4\) While doing so; many structures could mimic a lymph node. This can be avoided by correct US technique, comparison with contralateral normal side and at times using US guided FNA.
Structures which can look like Lymph Node

- Muscle belly Fig. 10 on page 12
- Vessel Fig. 11 on page 13
- Thrombosed vein or sluggish flow Fig. 12 on page 14
- Cartilage
- Foreign body granuloma
- Epidermal inclusion cyst
- Branchial cleft cyst (BCC) Fig. 13 on page 14
- Warthin's tumour Fig. 6 on page 9
- Other neoplasms like Schwannoma Fig. 20 on page 19
- Intramuscular cysticercous granuloma Fig. 29 on page 24

Vascular

Some normal vascular structures could mimic neoplastic lesions such as ectatic vessels, post operative ligated venous branches Fig. 17 on page 16, slow flow in jugular vein or its abnormal distension. Thrombosed vessel can also mimic a solid nodule. Fig. 16 on page 15

Such vascular structures are known to mimic lymphnode, recurrent disease or at times in abnormal thyroid nodule if located in the thyroid area.⁵

Anomalous course of common carotid artery can mimic abnormal enhancing nodule in a post contrast axial CT scan. This can be mistaken for a lesion during laryngoscopic examination.⁶ This should be kept in mind especially if it is a pulsatile nodule. Coronal Reformation confirms the anomalous course on right side. Fig. 18 on page 18

Neurogenic

Postoperative neuromas can present as palpable skin nodules and may mimic soft tissue recurrence or skin metastasis Fig. 19 on page 18. On the other hand pre-existing neurogenic tumors can mimic an enlarged lymph node or even a thyroid nodule. Fig. 21 on page 20

If FNA is performed these nodules are extremely painful which gives a clue to the diagnosis. These would occur in relation to cut end of nerve and are not true neurogenic tumours.
Bony and Cartilaginous

Normal unossified cricoid cartilage, partially ossified thyroid cartilage Fig. 23 on page 21 or prominent rounded cartilage in central compartment can have confusing US appearances. These can be mistaken for recurrent thyroid malignancy or abnormal mass in pyramidal lobe and at times superior parathyroid adenomas. Fig. 22 on page 20

Similar confusing appearances have been reported in literature.⁷

This finding could be easily reproduced in other young normal subjects during oblique scanning of paramidline laryngeal area.

Soft tissues

Soft tissue recurrence is an anticipated problem following major neck dissection and flap surgeries. This needs early diagnosis to reduce the morbidity and improve quality of life in the head and neck cancer patients. On the other hand a malignant lesion may present as an abscess due to necrotic component around a true mass.

Granulation tissue in a post-operative neck can mimic recurrence. One of the parathyroid gland sometimes is reimplanted in neck following total thyroidectomy. This can mimic abnormal subcutaneous nodule. Surgical notes can be of help to correctly identify it.

Lipomas may become cause of concern in head and neck malignancy cases as patients get apprehensive even about any previously existing palpable lumps. Fig. 31 on page 25

Tuberculosis being common in Indian subcontinent could surprise us with unusual lesion at atypical sites and mainly co-exist with malignancies especially in patient who are immune-compromised due to chemo-radiation forming cold abscesses which could mimic soft tissue recurrence.⁸

Foreign body granulomas

Long and transverse section of left upper neck following left radical neck dissection (RND) and palpable soft tissue lump actually corresponds to foreign body granulomas around the surgical clips. Fig. 32 on page 26

Enlarged tonsil and hypertrophied thymic tissue
Normal or abnormal tonsil and thymic tissue in lower neck can lead to confusing appearances.

PET scan shows abnormal SUV uptake in left upper thyroid bed. This was considered as recurrent mass. Initial CT guided FNA was inconclusive. Repeat US was showed soft tissue lesion in left paratracheal groove extending in superior mediastinal region with typical appearance of thymic tissue. No further investigation was considered necessary.

Images for this section:

**Fig. 2:** Thyroid bed on both sides, revealed thyroid like 'Avascular' tissue in both the lower poles with superiorly located thyroid like moderately vascular tissue. This was mistaken as recurrence in thyroid bed however during revision surgery and central compartment clearance the avascular tissue was actually surgical gelfoam (purified porcine absorbable skin gelatin) packs mimicking neoplastic tissue. In one of the published study, there was complete absorption of Gelfoam approximately 14 months after the surgery.
Fig. 3: A&B - Ectopic thyroid tissue mimicking abnormal soft tissue mass overlying the thyroid cartilage (abutting hyoid bone). C- The thyroid fossa however was empty. There was no h/o thyroidectomy. Simple screening of the thyroid fossa could prevent the erroneous diagnosis.
Fig. 4: 20/F, Total thyroidectomy in a known papillary thyroid carcinoma, A-Transverse,B & C-longitudinal US sections of thyroid bed- Bilateral symmetrical hypervascular nodular areas in thyroid bed are suggestive of residual thyroid tissue in view of the homogenous and symmetrical appearance on both sides, would be unusual finding for the recurrent disease. If thyroid tissue shows heterogeneity or punctate calcific foci or cystic change with abnormal vascularity, US guided FNA would be required to rule out recurrence.
Fig. 5: 46/F, with known head and neck malignancy presented with focal palpable, nodular lesion in right hemithyroid extending in isthmus. A&C-Long and trans. US images of right lobe: depicting focal expansion with decreased echogenicity and minimal internal vascularity. B- Left lobe was spared. D- US guided FNA and biopsy proved it to be focal thyroiditis. (HP- Granulomatous thyroiditis)
Fig. 6: A-Transverse(axial)US section of left parotid gland with multiple small intraparotid lymph nodes; considered as a normal finding in asymptomatic cases. B-Similar section in other individual shows enlarged lymph node like area proven to be Warthins tumor. This resemblance can be explained due to a similar histology of a lymph node and Warthins tumor.

Fig. 7: Elderly lady with hard left submandibular swelling since few months. Earlier diagnosed as papillary carcinoma of thyroid. A- Transverse oblique US scan of normal right submandibular gland (Rt SMG) B-Similar section of Left SMG on comparison shows palpable nodule to be corresponding to enlarged left submandibular gland (Lt SMG) with few hypoechoic nodules (arrows) against normal parenchymal background. On US initial diagnosis of subacute left submandibular sialoadenitis was given. US guided FNA of left SMG suggested chronic sclerosing sialoadenitis. However due to patient's apprehension this gland was excised. Final histopathological diagnosis was Kuttner's tumor. This condition can also involve parotid gland.
Fig. 8: Elderly male; operated case of left malignant gingivobuccal mass - came with left parotid swelling of few months duration. This was thought to be suspicious large metastatic node. A- Transverse and B- longitudinal section ultrasound of left parotid shows focal well defined complex nodule with a large calcific focus. US guided FNA yielded pus like material suggestive of chronic inflammatory pathology. C- Final histopathology however showed necrotic burnt out inflammation with dead parasitic inclusion.
Fig. 9: 62/F, diagnosed case of squamous cell carcinoma (SCC) of left lateral border of tongue, post wide glossectomy & radical neck dissection, post radiotherapy (RT) status came with left parotid hard swelling. On coronal (A) and axial (B) CT scan, left parotid was grossly enlarged with fat stranding. C & D are corresponding US sections. On US and CT, the diagnosis of post-radiation parotitis was made. However, US of left parotid could better depict thickened Stenson's duct (blue arrow) due to recent radiotherapy induced inflammation.
Fig. 10: Fig 10 A Transverse oblique section in submental region shows prominent muscle belly as lymph node when obliquely imaged. This can be confirmed by longitudinal viewing. In this image MS denotes muscle belly in cross section while N is the true level 1A lymph node. B-corresponds to oblique transverse and longitudinal US scan showing prominent omohyoid muscle belly crossing internal jugular vein, this variant can be confirmed by changing scanning angle and tracing the normal omohyoid. C- Similar section shows a flat level three lymph node with normal central hilar flow.

Fig. 11: A & B oblique US sections of left submnadibular area, both at same level with power doppler (A) and only B-mode scan (B) of level I region with submandibular gland in
back ground shows a lymph node like structure (vs.) due to facial artery coursing through the submandibular gland. However switching on power angio confirms it to be a vessel and not a true lymph node. VS - Vessel LN - Lymph node MSL - Muscle CC - Carotid

**Fig. 12:** A-In this example, the oval pseudo cystic lesion was a proven cystic metastatic right level III lymph node with internal haemorrhage from a known papillary thyroid carcinoma. B & C- Similar looking nodule on opposite side actually represents internal jugular vein (IJV) with sluggish parabolic flow. When obliquely viewed this structure may mimic a metastatic node.
Fig. 13: Transverse US scan Left level II region shows proven cystic necrotic metastatic lymph node with peripheral solid component in a known case of SCC as seen in image -B. In a similar location as seen in image -A; in another young male a rounded cystic lesion with smooth outline showing intermediate level echoes- proven to be second branchial cleft cyst. (BCC) Differentiating point is the peripheral nubbin of solid tissue in a metastatic node while BCC has smoother outlines.

Fig. 14: A-One of the left level IV lymph node shows focal patchy hypoechoic areas (arrows). This patient was subjected to modified left neck dissection (MND) for a metastatic lymph node at other level. B-On final histopathology the illustrated node showed granulomatous (tuberculous) involvement which at times mimics metastases or both can co-exist.
**Fig. 16:** Similar to previous case (Fig. 15), partially thrombosed right internal jugular vein mimics small necrotic node in transverse section; on longitudinal section a thrombosed vein is readily identified.

**Fig. 15:** A & B correspond to longitudinal and transverse US scan of right hemithyroid shows a prominent right superior thyroid vein (RT STV) in cross section mimicks small cystic thyroid nodule on transverse section.
**Fig. 17:** Operated case of left partial glossectomy with left modified neck dissection (MND). Routine follow-up US shows tubular hypoechoic oval structure in left supraclavicular area on grey scale images (A) and with colour flow (B) even at low velocity settings. This looked like enlarged lymphnode with loss of hilum however its peculiar shape and inferior connection to jugular vein could suggest the diagnosis of partially thrombosed vein, ligated during earlier neck dissection.

![Fig. 17](image_url)

**Fig. 18**
Fig. 19: Elderly lady, upper limb amputation done for Osteogeic Sarcoma, presented with painful lump in Lt lower neck. On US, focal nodular, solid, lobulated mass arising from lower Brach. plexus trunk. T1W, T2W MR is confirmatory. N=neuroma, R = Rib
Fig. 20: A-oblique and B- transverse US section in right supraclavicular area showing pre-existing neurogenic tumor mimicking enlarged metastatic lymph node. If calcified it may look like healed granulomatous lymph node.

Fig. 21: A,B,C & D- US images show a large cystic neurogenic tumour clinically confused as a thyroid neoplasm arising from right lobe. Careful US examination did show its extension towards lower cervical spinal canal. E&F- CT sections showing the characteristic widened intervertebral foramen.
Fig. 22: Young girl with suspicious of parathyroid adenoma, her US showed typical, oval, vascular adenoma adjacent to left upper pole of thyroid extending in left carotid sheath as shown in image B & C. On opposite side as seen in image A; similar rounded nodule - however without abnormal vascularity - was located near but separate from upper pole of right hemithyroid. Initial impression was that of additional parathyroid adenoma. However on detailed scanning this could be attributed as unossified cricoid cartilage as shown in transverse and longitudinal images above.
**Fig. 23:** 31 / male with SCC of left border of tongue; on US left thyroid lamina shows hypoechoic nodule initially considered as intracartilaginous deposit, however limited CT sections show it to be focal unossified cartilaginous nodule mimicking metastasis.

![Fig. 23 Image](image)

**Fig. 24:** 51 / male known case of head and neck malignancy came with left supraclavicular non tender hard swelling. A-US showed focal oval elongated hypoechoic solid looking lesion extending along the left sternocleidomastoid separate from left hemithyroid. B- shows further inferior extent towards root of the the neck.

![Fig. 24 Image](image)

**Fig. 25:** contd.from Fig.24- Inferiorly the lesion could be traced back to abnormally widened left sternoclavicular joint. CT sections(A) show erosive changes in left sternoclavicular joint suggestive of infective osteoarthritis. US guided FNA(B) yielded caseating material suggestive of tuberculous etiology.

![Fig. 25 Image](image)
Fig. 26: A patient with total laryngectomy and thyroidectomy with jejunal pull through. Transverse image through thyroid bed shows unusual soft tissue mass due to repositioned jejunal loop. This image(with high frequency probe) shows mucosal folds within - which is diagnostic.

Fig. 27: 59 / male had revision radical neck dissection(RND)on the left side with subsequent US showing repositioned elongated muscle belly lateral to left carotid artery as soft tissue mass, however the overall appearance and its elongated orientation showed it to be a muscle belly. Multiple neck dissections and flap surgeries may lead to anatomical distortion with apparent soft tissue masses.
Fig. 28: 60 / male presented with palpable lump over his earlier left modified neck dissection (MND) scar. An echogenic mass of 1.6 x 0.7 cm size was noted. Initial impression at first was that of soft tissue recurrence. FNA was however suggestive of epidermal inclusion lesion.

Fig. 29: 30/ female with soft tissue swelling in right submental region was subjected to US. A well defined rounded cystic lesion of 10 mm size is noted with internal calcific inclusion. Surrounding thick muscle like echogenicity was identified this appearance is highly suggestive of intramuscular cysticercous granuloma with internal peripheral calcification. These patients are treated with oral tablet albendazole. This should not be mistaken as metastatic necrotic lymph nodes.
Fig. 30: Young man presented with soft tissue swelling in right upper neck suspected to be necrotic lymph node. A- On US this lesion was seen to be located in right thyrohyoid membrane region with figure of '8' shape, extending in supraglottic region beneath the right thyroid lamina. A diagnosis of external fluid filled laryngocoele was made, B-this was confirmed on CT Scan. C-Corresponding relevant anatomy. On laryngoscopy and intra-operatively care must be taken to exclude underlying supraglottic masses in region of ipsilateral pyriform sinus.
**Fig. 31:** 40 / male with a large swelling in right anterior triangle of neck was subjected to US. On US the entire iso-to-hypoechoic oval mass was located between the sternocleidomastoid and strap muscles with echogenicity similar to thyroid but with feathery appearance. This is highly suggestive of lipoma. The corresponding CT sections confirm the diagnosis.
Fig. 32: Long and transverse section of left upper neck following left radical neck dissection (RND) and palpable soft tissue lump actually corresponds to foreign body granulomas around the surgical clips.
Fig. 33: A-39/F with high calcitonin levels (5000 iu) came with abnormal uptake in both tonsillar region and left level II node on PET scan. B-Corresponding oblique US sections done through submandibular glands on both sides reveal these to be prominent faucial
tonsils. Left level II lymphnode FNA was suggestive of reactive lymph node. No further investigation was done. For comparison another young child with image of normal tonsils is shown in next figure.

**Fig. 34:** A- Normal US appearance of bilateral faucial tonsils in young male child. B- Abnormal enlarged left tonsil as seen on oblique US image of submandibular area in a known case of primary tonsilar non Hodgkin lymphoma(NHL).
**Fig. 35:** PET scan shows abnormal SUV uptake in left upper thyroid bed. This was considered as recurrent mass. Initial CT guided FNA was inconclusive. Repeat US was showed soft tissue mass in left paratracheal groove extending in superior mediastinal region with typical ultrasound appearance of thymic tissue. No further investigation was considered necessary.
Conclusion

In conclusion, it is important to be aware of various normal and abnormal findings on ultrasound and CT imaging in Head and Neck cancer follow ups which may mimic recurrence or residual disease. These are likely to create confusion in a busy oncology set up where many radiologists exhibiting various levels of expertise work independently.

Learning all that looks abnormal may in fact be normal tissue or non neoplastic finding is vital to be innumerated and displayed in busy oncology imaging sections.

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