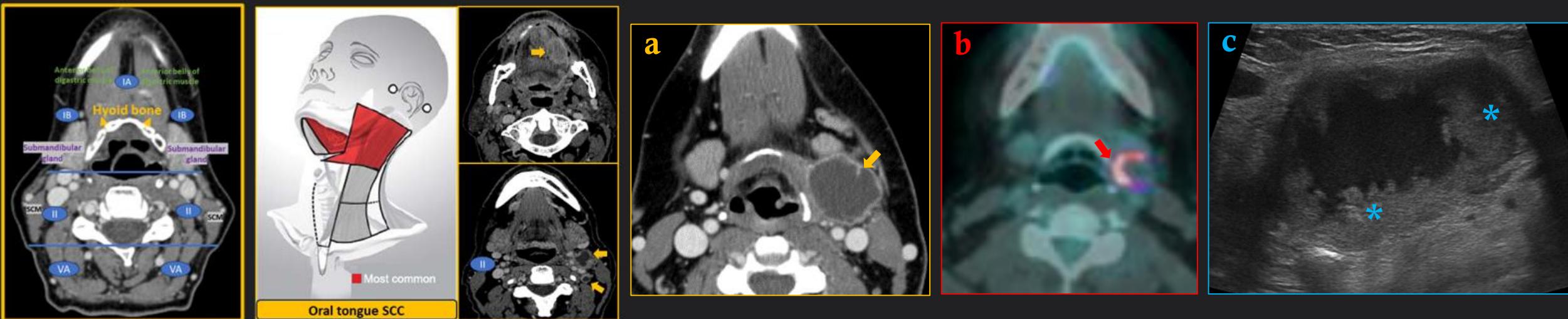


# Malignant Cervical Lymph Nodes: Key Imaging Features on Ultrasound, CT, and PET/CT



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# Learning Objectives

- To identify **imaging-based level-based classification** of cervical lymph nodes.
- To recognize **typical metastatic nodal distribution patterns** associated with common head and neck primary malignancies, as well primaries outside of the head and neck.
- To **differentiate malignant from benign cervical lymph nodes** on ultrasound, CT, and PET/CT based on key imaging features beyond nodal size alone.
- To illustrate the **imaging characteristics of cervical adenopathy** on US, CT and PET CT for **different type of head and neck malignancies**.
- To introduce **imaging-detected extranodal extension (iENE)** of the lymph nodes.
- To briefly review **US-guided biopsy** of lymph nodes.



Nothing to disclose.



There is no conflict of interest.

Introduction

Role of Imaging

Imaging-based Classification of Cervical Lymph Nodes

Patterns of spread of H&amp;N Cancers

## Prevalence of Nodal Metastasis:

- ◊ Found in 37-49% of head and neck malignancies.
- ◊ Found in up to 80% of patients with upper aerodigestive mucosal malignancy at presentation.

## Importance of Assessing Malignant Lymph Nodes:

- ◊ Crucial for initial staging, management , prognosis, and surveillance of head and neck cancers.

## Impact on Survival Rates:

- ◊ Unilateral metastatic node reduces the 5-year survival rate by 50%.
- ◊ Bialteral metastatic nodes reduce the 5-year survival rate to 25%.

Introduction

Role of Imaging

Imaging-based Classification of Cervical Lymph Nodes

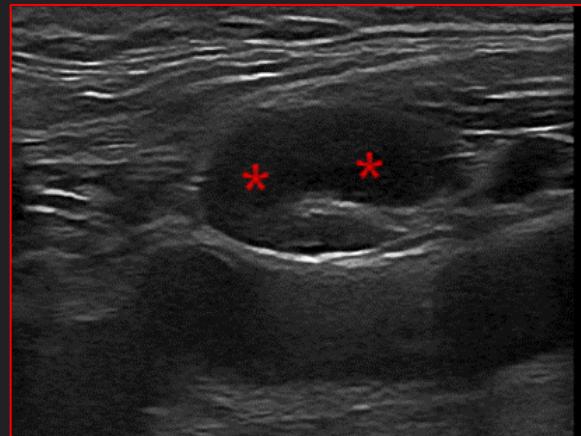
Patterns of spread of H&amp;N Cancers

## Role of Imaging

- To confirm the N0 status of the neck
- To document contralateral lymphadenopathy
- Nodal surveillance after treatment

### Ultrasound

- Has the **highest sensitivity** in the assessment of malignant cervical nodes.
- Specificity of US + FNA: 93%.



### CT

- Sensitivity: 90.2%
- Specificity: 93.9%
- Important for lymph node **location not readily visible on US**, such as retropharyngeal lymph nodes.



### FDG PET/CT

- Has the **highest specificity** in the diagnosis: 92.8%.
- Lower sensitivity: 80.3%.



Introduction

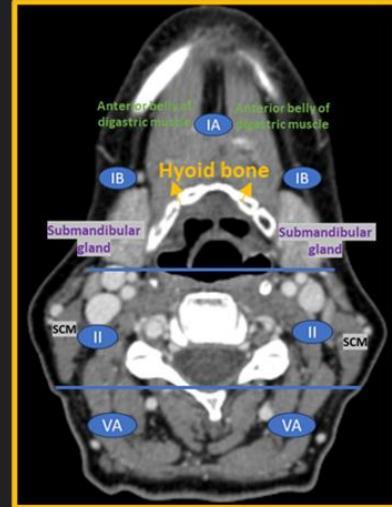
Role of Imaging

**Imaging-based Classification of Cervical Lymph Nodes**

Patterns of spread of H&amp;N Cancers

**Zone I: Submental & Submandibular**

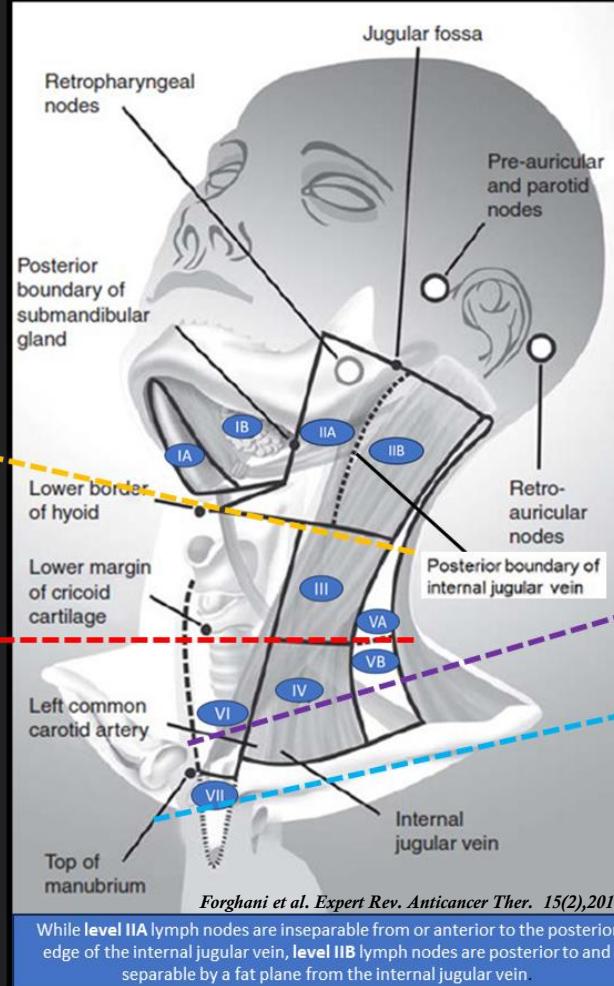
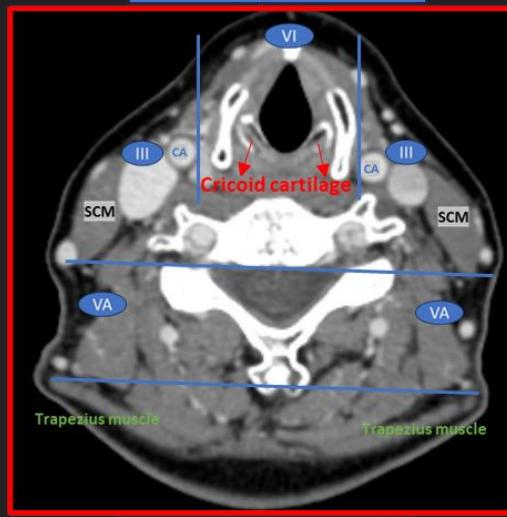
(Branch of anterior facial vein runs between the submandibular gl. and submandibular LNs)



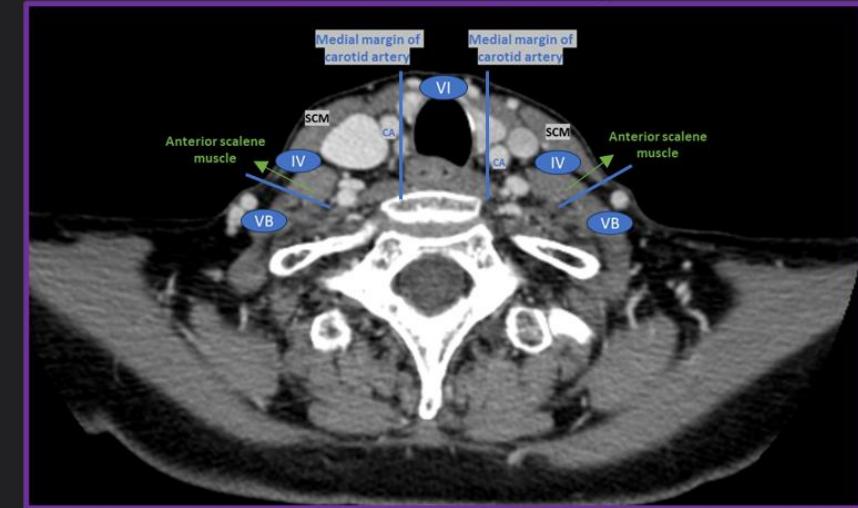
Zone II: Above the hyoid

Zone III: Hyoid to cricoid

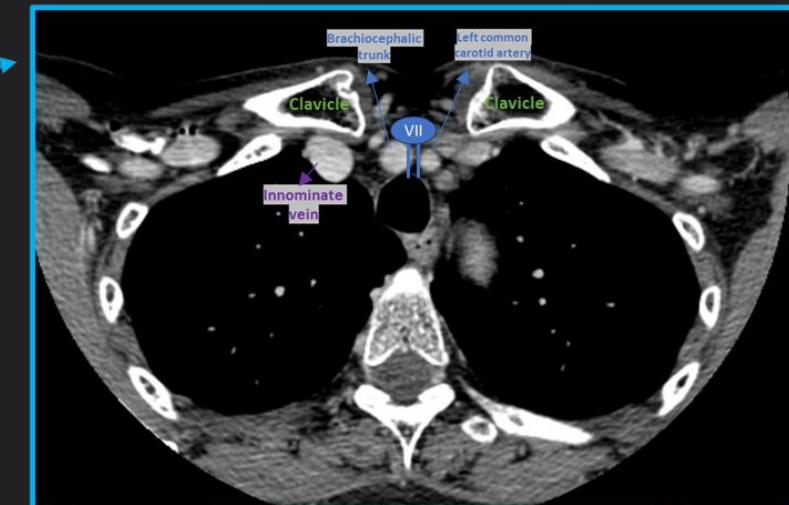
Zone V: Posterior to SCM

**Imaging-based classification of cervical lymph nodes**

Zone IV: Below cricoid



Zone VI: Anterior midline



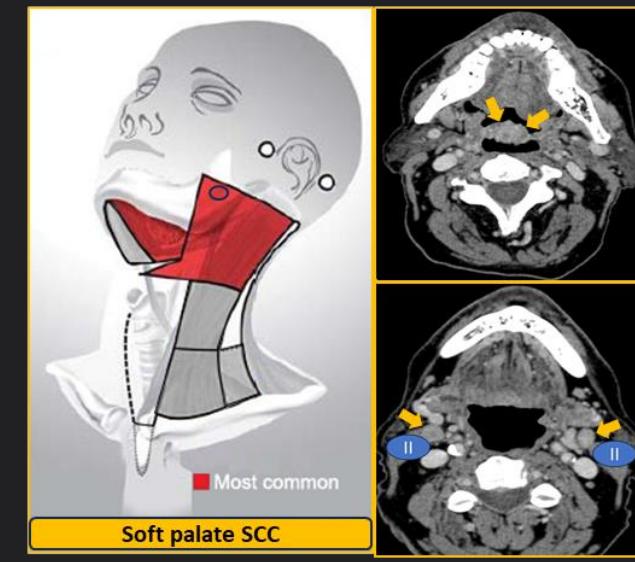
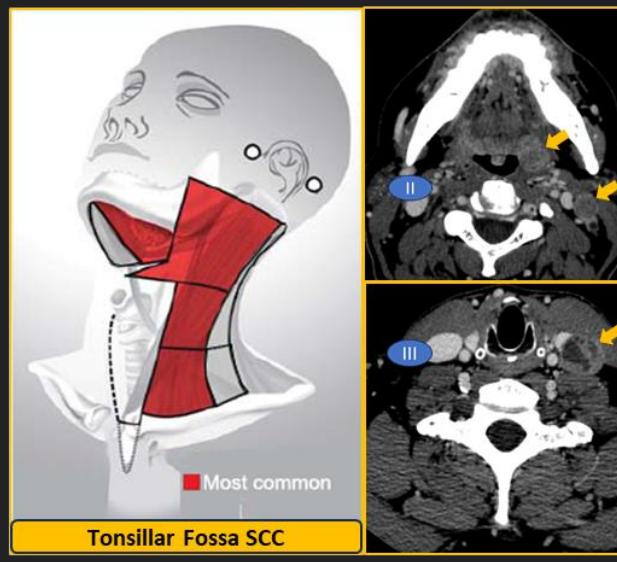
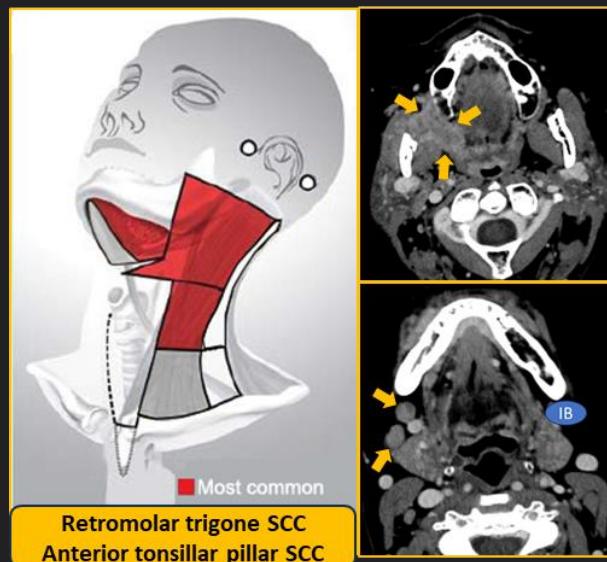
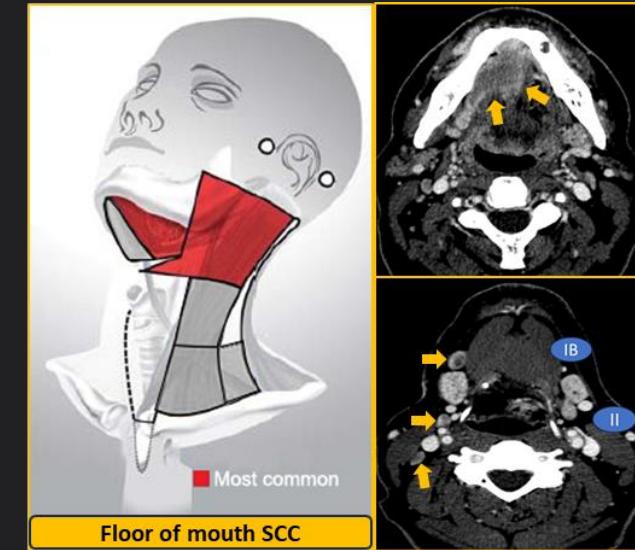
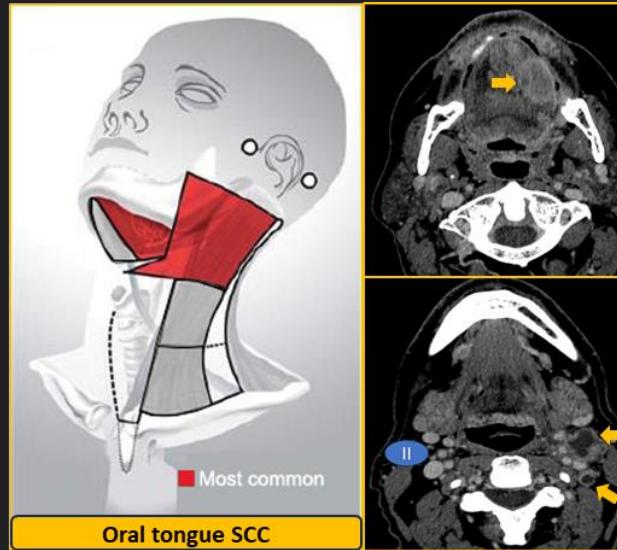
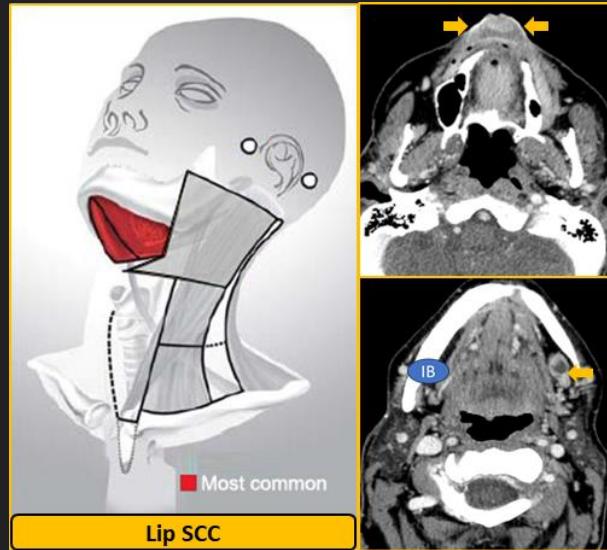
Zone VII: Manubrium to innominate vein

Introduction

Role of Imaging

Imaging-based Classification of Cervical Lymph Nodes

Patterns of spread of H&amp;N Cancers



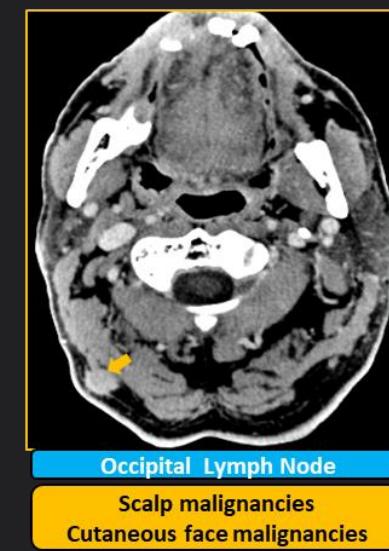
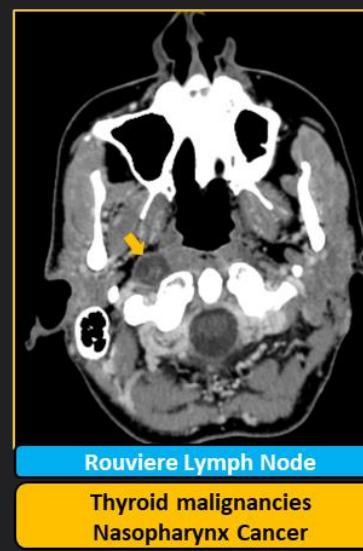
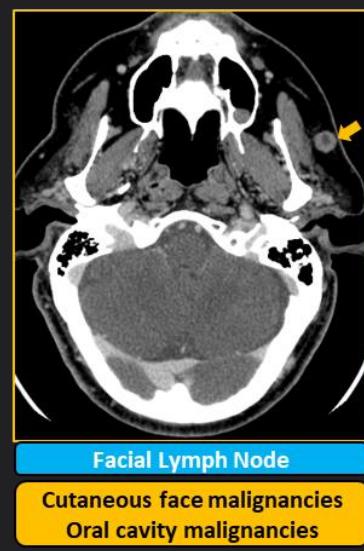
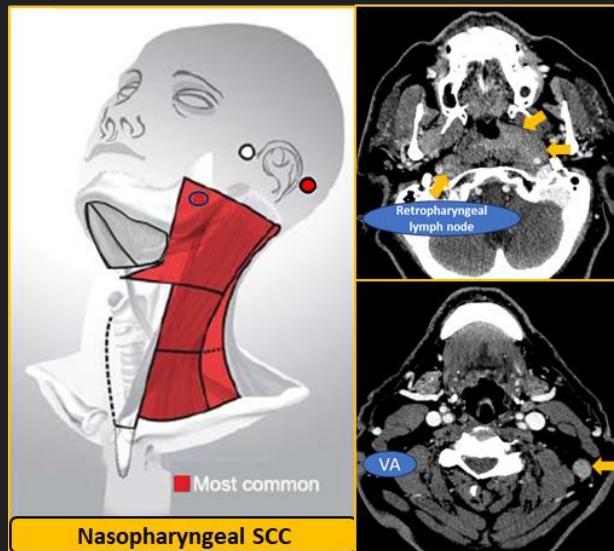
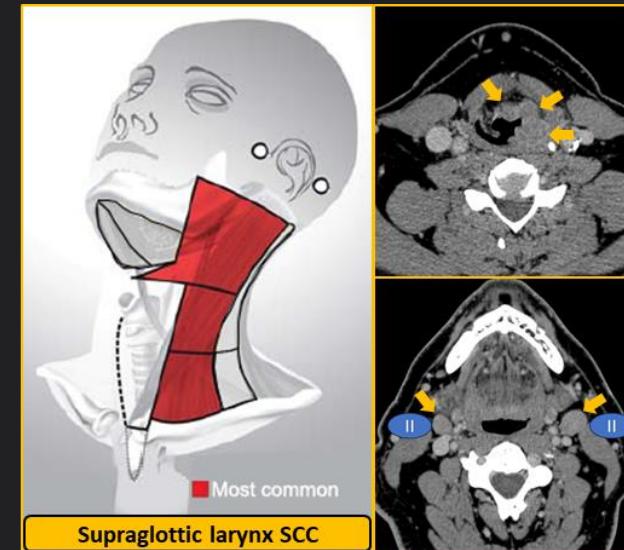
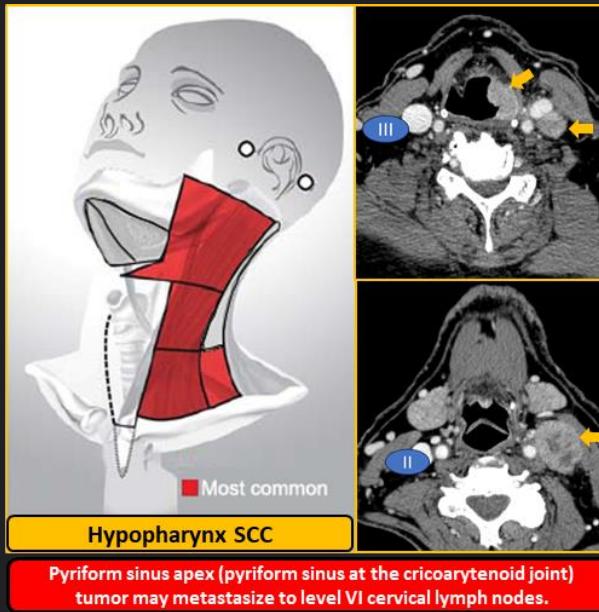
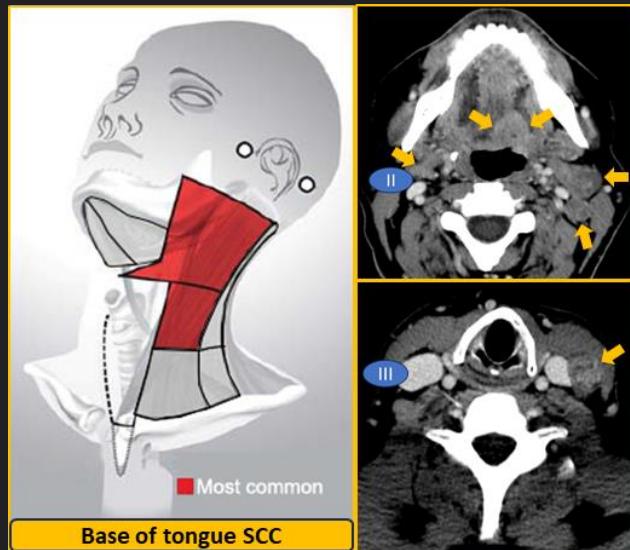
## Patterns of spread of H&N SCC

Introduction

Role of Imaging

Imaging-based Classification of Cervical Lymph Nodes

Patterns of spread of H&amp;N Cancers



- Parotid and Superficial Lateral Lymph Nodes**
- Parotid gland malignancies
  - Cutaneous face malignancies
  - Scalp malignancies
  - Sinonasal cavity malignancies
- Level IA, IB Lymph Nodes**
- Floor of mouth malignancies
  - Submandibular gland cancers
  - Anterior oral cavity cancers
  - Sinonasal cavity malignancies
  - Lips malignancies
  - Periorbital malignancies
  - Cutaneous face malignancies

Size

Shape

Eccentric Cortical Hypertrophy

Echogenicity

Echogenic Hilum

Border

Central Necrosis  
Cystic Changes

Calcification

Vascularity

Extranodal extension

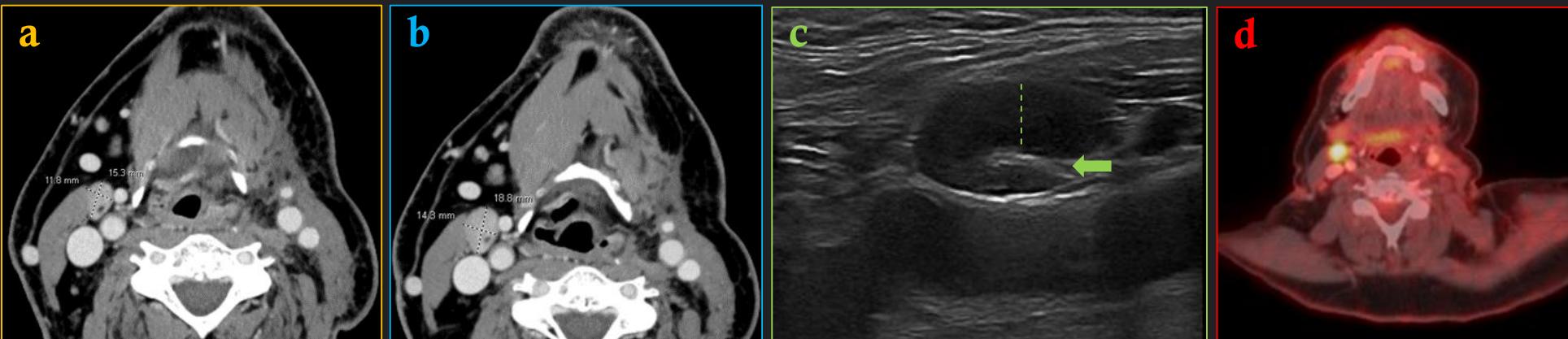
Tumor-Specific Nodal Signatures

### Clinical Importance of Nodal Size

- An **increase in nodal size** on serial examinations in a patient with a known carcinoma is highly suspicious for metastatic involvement.
- Incremental **reduction in nodal size** is a sign of treatment response

### Node Size Limitations

- 50% of malignant lymph nodes** measure **less than 5 mm**.
- 25% of nodes with **extracapsular spread** are less than 10 mm.



**Teaching point 1:**  
Nodal size alone is not an accurate criterion for differentiating a normal lymph node from a malignant node.

A 55-year-old male with a history of **malignant melanoma** of the left temple, treated with wide local excision and left neck dissection. Follow-up CT with contrast revealed an **interval increase in the size** of a contralateral right level 2A lymph node from 1.1 cm (a) to 1.5 cm in short axis (b), and US evaluation was recommended. Longitudinal grey scale US revealed a homogeneous, hypoechoic lymph node with **preserved echogenic hilum** (c, arrow) and **increased cortical thickness** (c, dashed line). Increasing size and hypo echogenicity of the lymph node prompted ultrasound-guided fine needle aspiration (US FNA) that revealed metastatic melanoma. The same lymph node appeared **hypermetabolic** on subsequent PET CT (d).

**Teaching point 2:** Increasing size and hypoechoogenicity of lymph nodes, which can be seen in melanoma nodal metastasis, are critical indicators for further investigation. Imaging modalities and tissue sampling together provide a comprehensive evaluation for accurate diagnosis.

Size

**Shape**

Eccentric Cortical Hypertrophy

Echogenicity

Echogenic Hilum

Border

Central Necrosis  
Cystic Changes

Calcification

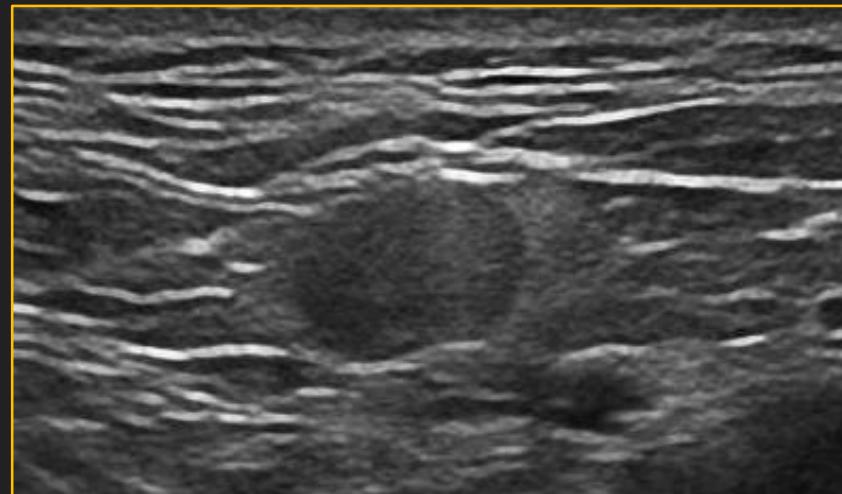
Vascularity

Extranodal extension

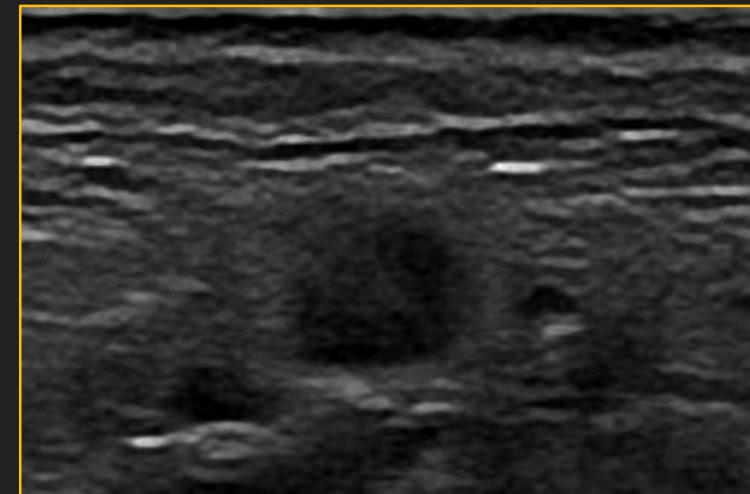
Tumor-Specific Nodal Signatures

**Teaching point 3:** Benign lymph nodes tend to be elliptical.

Longitudinal grey scale sonogram showing normal lymph node architecture with **elongated shape** and **preserved echogenic hilum**.

**Teaching point 4:** Metastatic nodes tend to be round with a short to long axes ratio >0.5.

A 59 yo male with lung adenocarcinoma and biopsy proven right supraclavicular nodal metastasis showing **rounded shape** and **loss of echogenic hilum**.

**Teaching point 5:** Submandibular and parotid benign lymph are usually round.

Longitudinal sonogram showing **normal submandibular lymph node** demonstrating **rounded shape**.

Size

Shape

**Eccentric Cortical Hypertrophy**

Echogenicity

Echogenic Hilum

Border

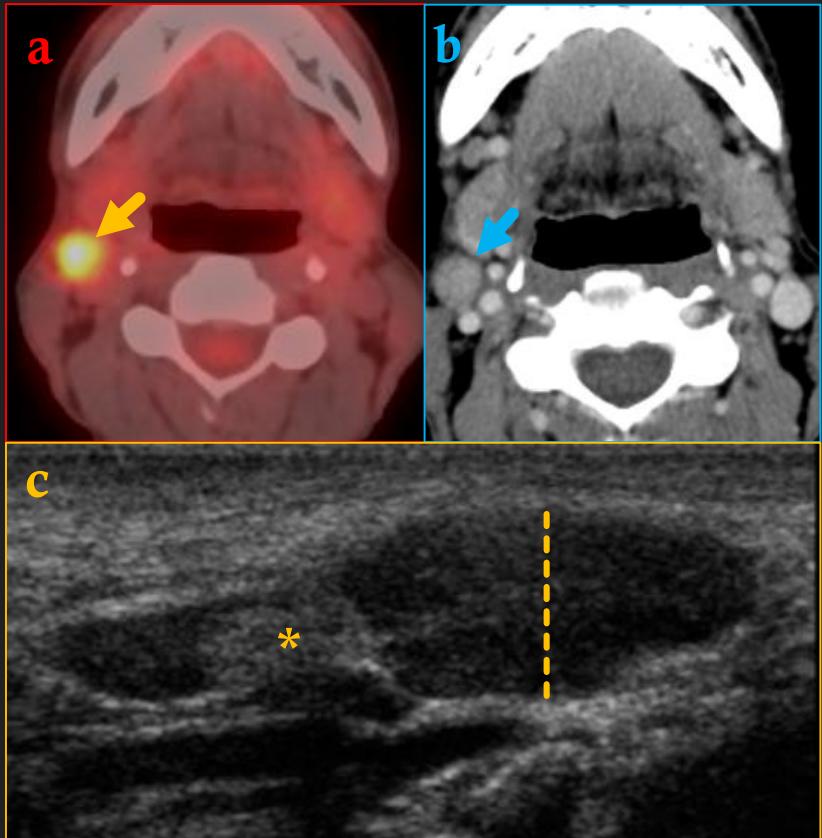
Central Necrosis  
Cystic Changes

Calcification

Vascularity

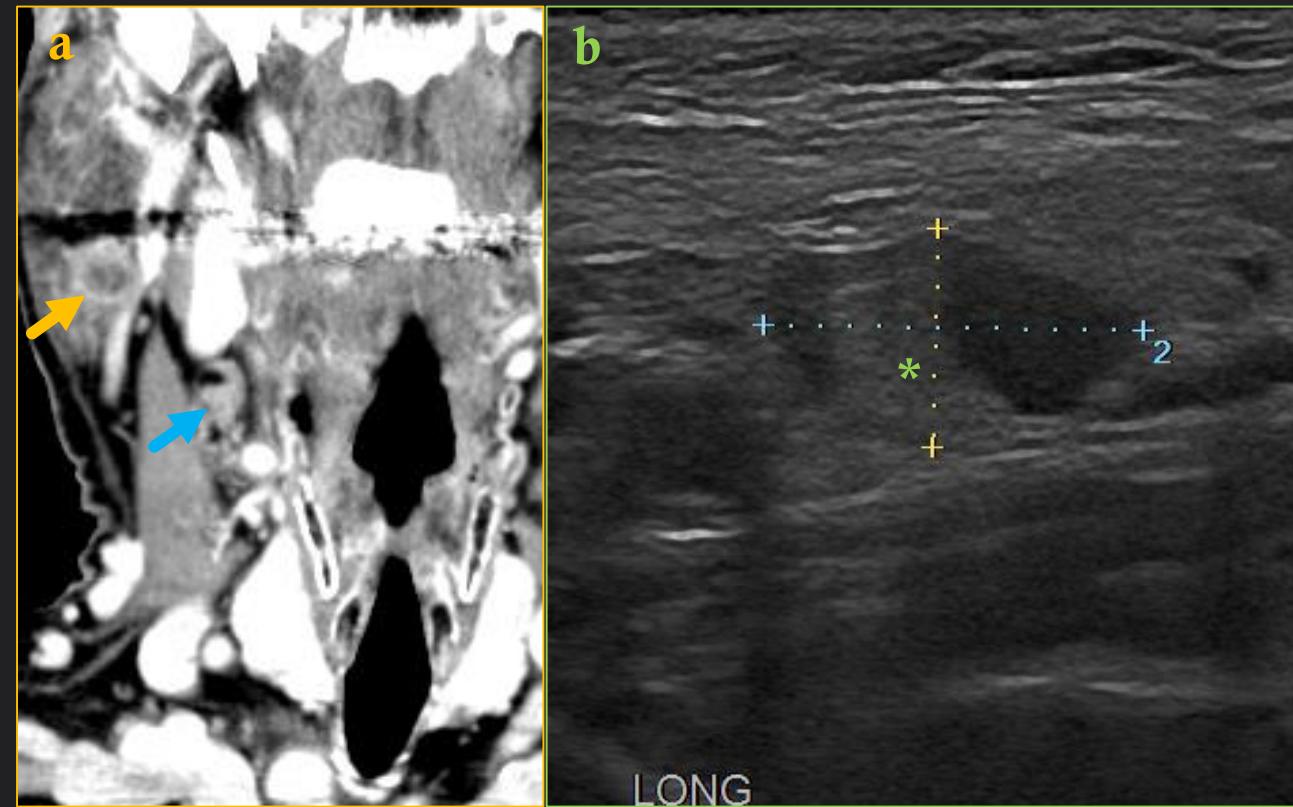
Extranodal extension

Tumor-Specific Nodal Signatures



A 47-year-old with a remote h/o Hodgkin's lymphoma presented with a new palpable lymph node. (a) PET/CT shows **focal area of FDG uptake** with a max SUV 10 in the right level II. (b) The corresponding lymph node (LN) demonstrates a **nonspecific appearance** on CT with IV contrast. (c) Ultrasonography revealed a hypoechoic LN with **preserved echogenic hilum (\*)** and **eccentric cortical hypertrophy**. US FNA revealed squamous cell carcinoma from right tonsil primary.

**Teaching point 6:** Eccentric cortical hypertrophy is related to focal tumor infiltration within the lymph node and it is an important sign of malignant lymph node.



A 84- year-old male with history of cutaneous SCC. (a) CT with IV contrast revealed prominent lymph node with **eccentric cortical hypertrophy**. Note metastatic **lymph node in the right parotid** (c). Ultrasonography revealed lymph node with **preserved echogenic hilum** and **eccentric bulbous cortex**.

Size

Shape

Eccentric Cortical Hypertrophy

Echogenicity

Echogenic Hilum

Border

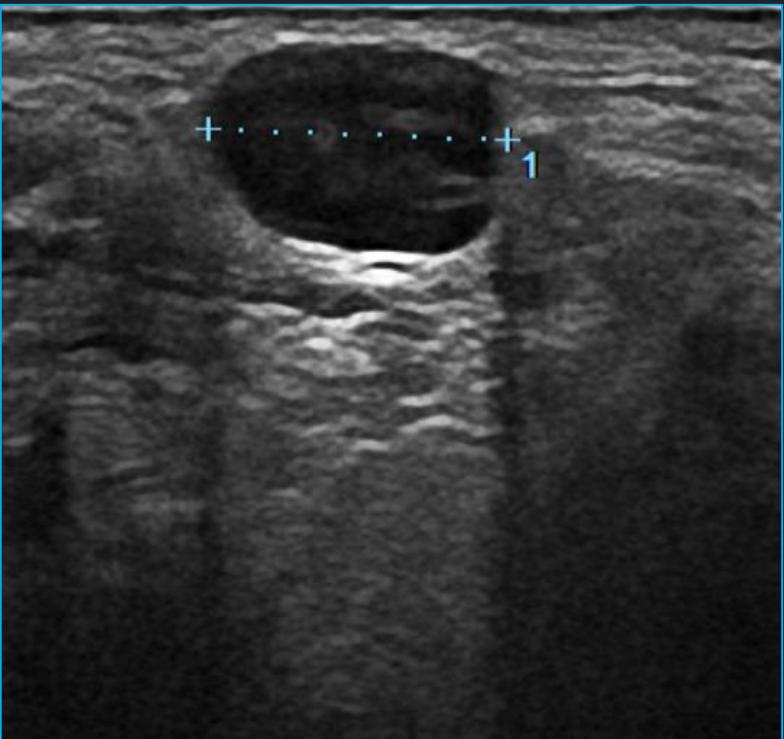
Central Necrosis  
Cystic Changes

Calcification

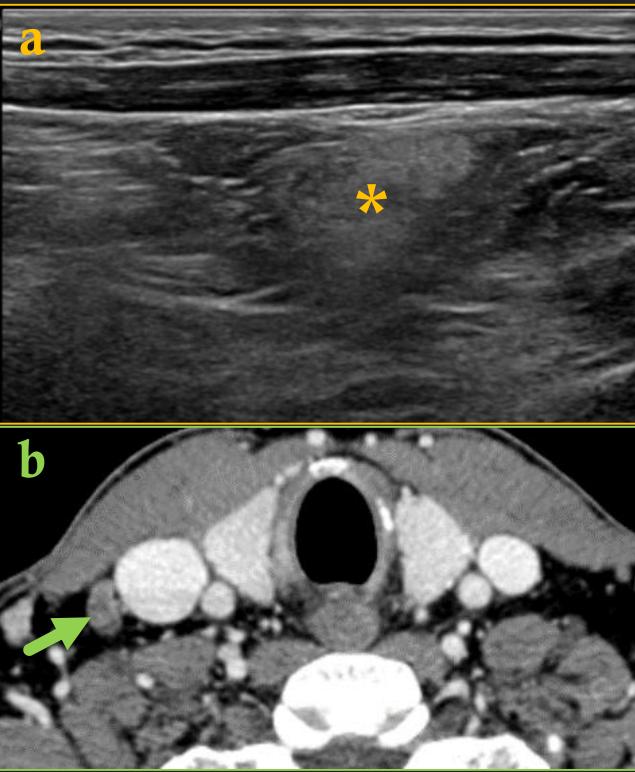
Vascularity

Extranodal extension

Tumor-Specific Nodal Signatures

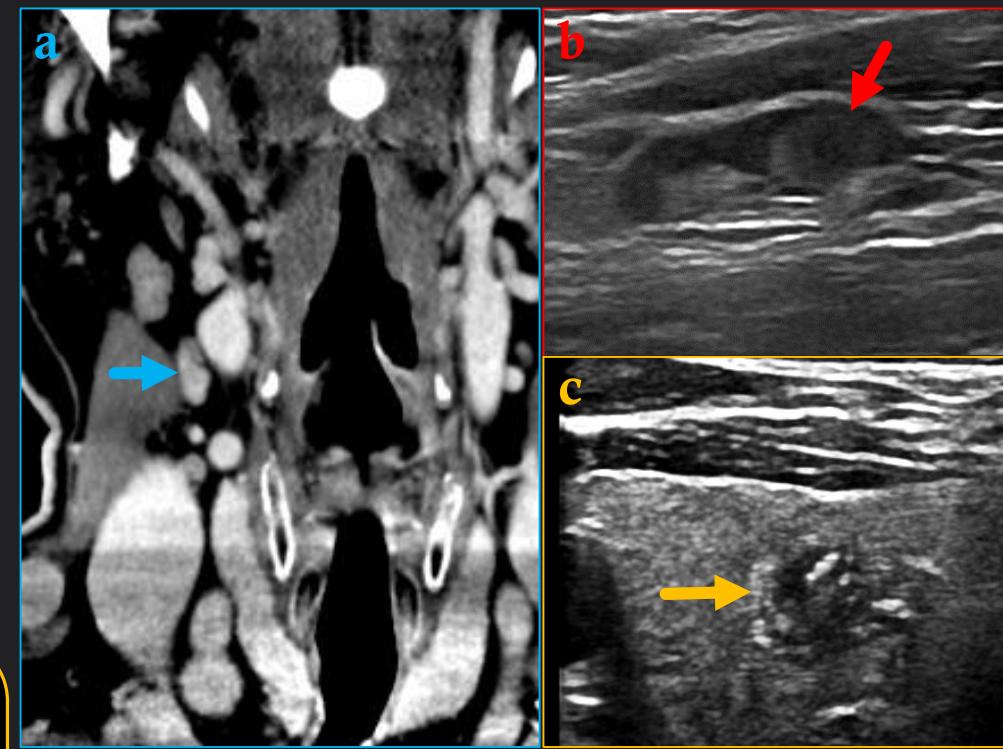


**Teaching point 7:** Lymph nodes can mimic a simple cyst, particularly in lymphomas, melanoma and poorly differentiated cancers.



A 59-year-old female with newly diagnosed PTC and right level 4 nodal metastasis. Gray scale US showing **hyperechoic metastatic LN** (a). Hyperechoic component within the node may be related to intranodal deposition of thyroglobulin. The corresponding LN demonstrates **hypodense heterogenous appearance** on CT with IV contrast (b).

**Teaching point 8:** Metastatic lymph nodes are usually hypoechoic but can be hyperechoic or mixed echogenicity.



A 49-year-old male with newly diagnosed **PTC in the right thyroid lobe** on US scan (c). Staging CT demonstrates **unremarkable lymph nodes on CT** with IV contrast. The US scan shows **focal heterogeneity** in one pole of the lymph node, while the remaining aspects of the LN appear normal. The heterogeneous area of the LN should be targeted with US FNA.

Size

Shape

Eccentric Cortical Hypertrophy

Echogenicity

Echogenic Hilum

Border

Central Necrosis  
Cystic Changes

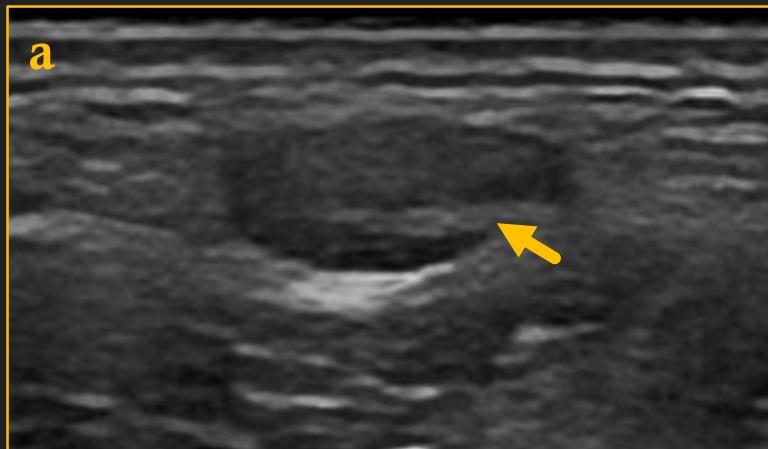
Calcification

Vascularity

Extranodal extension

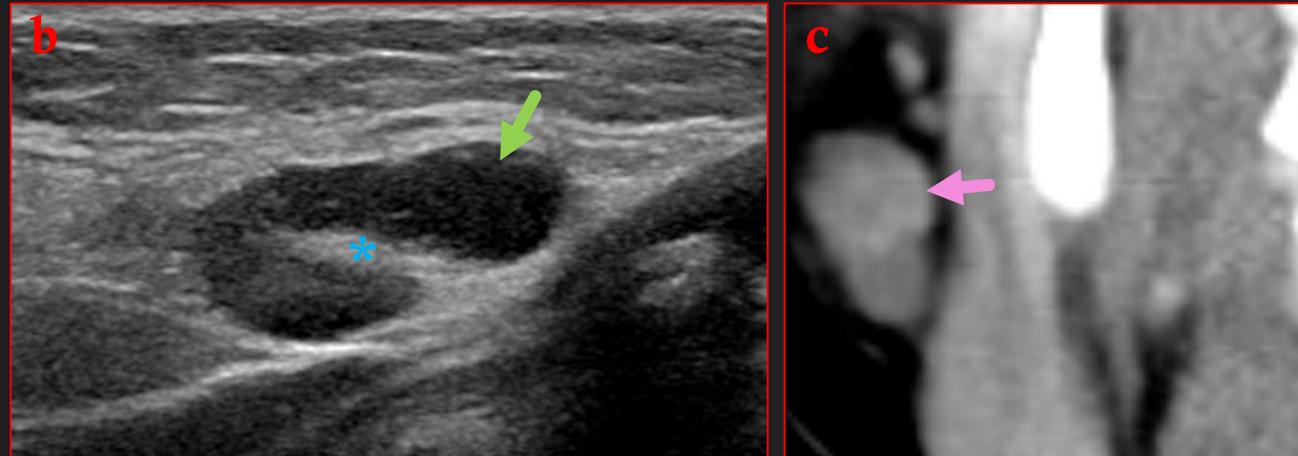
Tumor-Specific Nodal Signatures

**Teaching point 9:** The presence/absence of echogenic hilus cannot be used as the sole criterion in the evaluation of cervical lymph nodes. 4% of metastatic LN may demonstrate echogenic hilum.

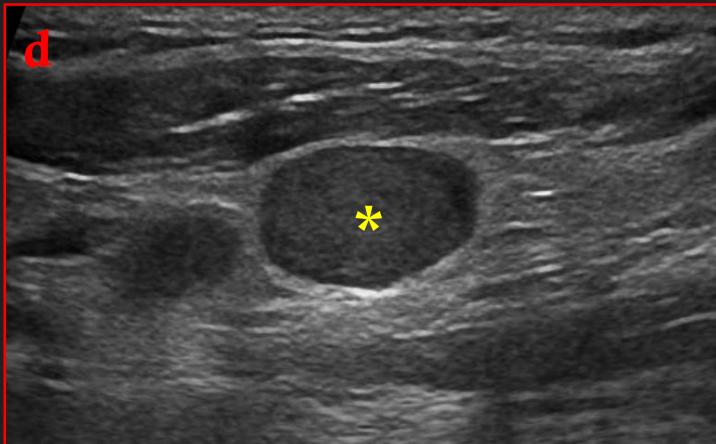


**Normal Lymph node** (a) Longitudinal gray-scale US of a normal reniform shaped neck lymph node with **fatty hilum**.

- Presence of an echogenic hilum is usually sign of benignity.
- Echogenic hilum results from the presence of multiple medullary sinuses, veins, and fatty tissue.
- 90% of nodes with a maximum transverse diameter greater than 5mm exhibit an echogenic hilum on US.



**Metastatic Lymph node** (c) Longitudinal gray scale US image shows reniform, hypoechoic, with **focal cystic area** in the cortex and **preserved fatty hilum** LN. US FNA-PTC. (d) CT with IV contrast shows corresponding heterogeneous lymph node with **focal hyperdense focus**.



**Metastatic Lymph node** (d) Longitudinal gray scale US image shows **round, hypoechoic**, LN with **lack of fatty hilum**.

Size

Shape

Eccentric Cortical Hypertrophy

Echogenicity

Echogenic Hilum

Border

Central Necrosis  
Cystic Changes

Calcification

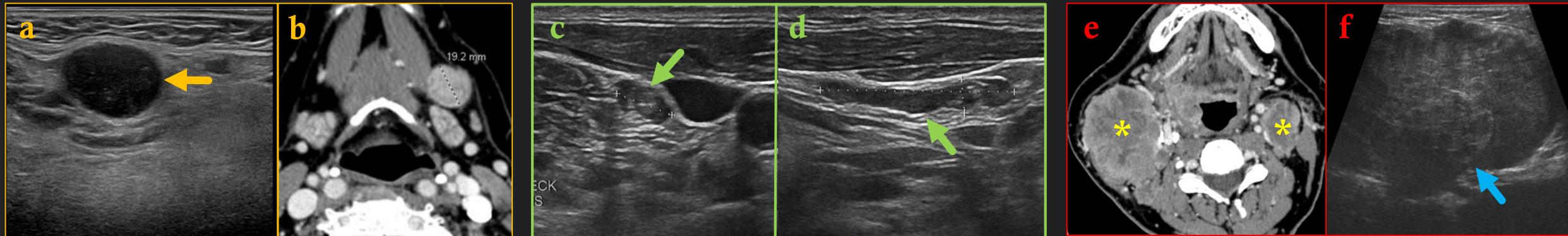
Vascularity

Extranodal extension

Tumor-Specific Nodal Signatures

- Malignant lymph node tend to have **sharp borders** due to intranodal tumor infiltration, which **increases acoustic impedance** between the abnormal node and the surrounding soft tissue on ultrasound.
- Benign, reactive nodes may have **blurred borders** due to surrounding tissue inflammation.

**Teaching point 11:** Matting, or blending of borders of adjacent lymph nodes, is suggestive of malignancy and extracapsular tumor spread.



**Metastatic Lymph node** (a) Longitudinal gray-scale US image of a left level IB in a patient with floor of mouth squamous cell carcinoma show **hypoechoic, rounded** with **sharp borders** with lack of fatty hilum. (b) The corresponding enlarged adenopathy is noted on CT with IV contrast.

**Metastatic Lymph node** (c, d) Transverse and longitudinal gray-scale US image in a patient with papillary thyroid carcinoma show heterogeneous lymph node with **punctate echogenic foci** and **irregular borders**.

**Matted metastatic lymph nodes right and left neck** (e) CT with IV contrast shows **large matted adenopathy** in the levels II in a patient with oropharyngeal squamous cell carcinoma. (e) Longitudinal gray-scale US image revealed **confluent, hypoechoic lymph nodes**.

**Teaching point 10:** Irregular borders is a sign of malignant lymph node.

Size

Shape

Eccentric Cortical Hypertrophy

Echogenicity

Echogenic Hilum

Border

Central Necrosis  
Cystic Changes

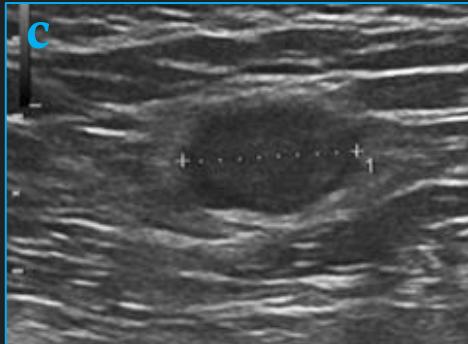
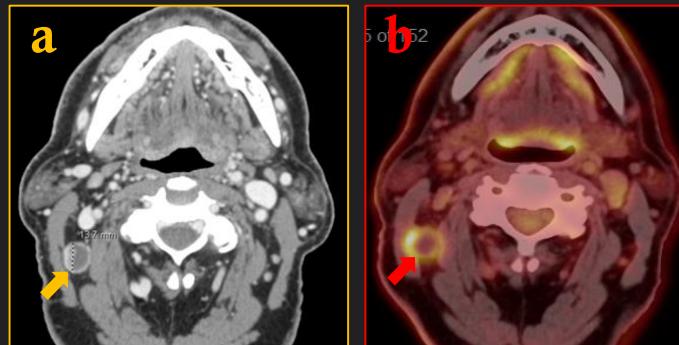
Calcification

Vascularity

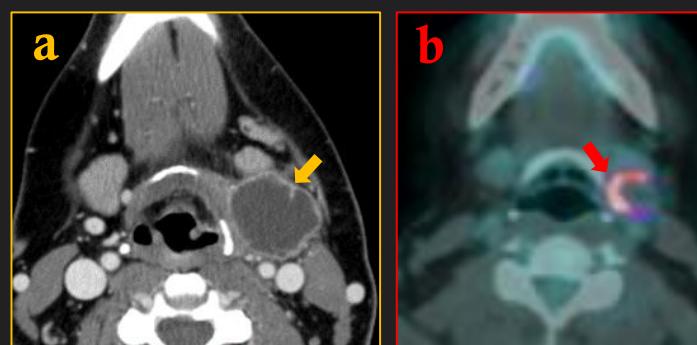
Extranodal extension

Tumor-Specific Nodal Signatures

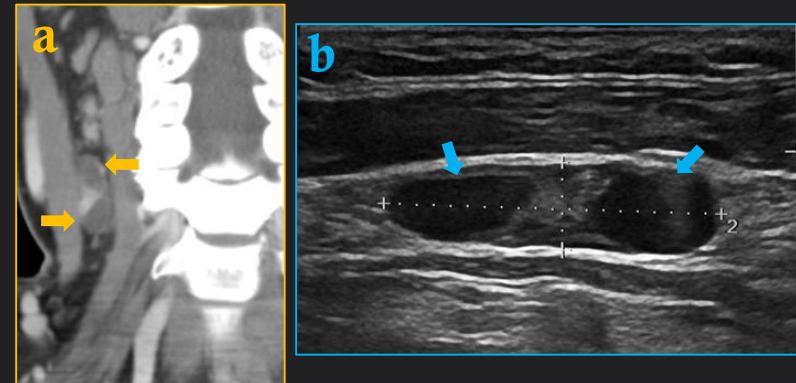
- Cystic nodal metastases show **homogeneous fluid content** and enhancing **thin smooth capsule**.
- Necrotic nodal metastasis show **thick, irregular enhancing walls**.
- Common finding in **p16-positive metastatic squamous cell carcinoma** and **papillary thyroid carcinoma**.



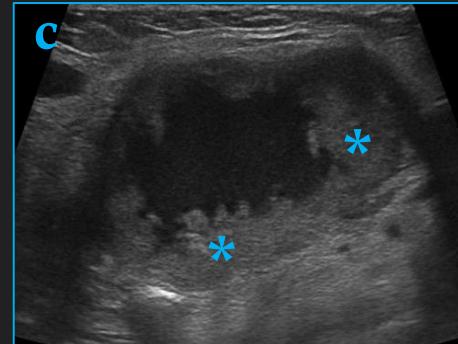
Metastatic lymph node. (a) Axial CT with IV contrast shows **centrally necrotic LN with enhancing capsule** in a patient with cutaneous squamous cell carcinoma SCC. (c) Longitudinal US image show **hypoechoic LN** without fatty hyperechoic hilum. (b) PET CT shows **peripheral FDG uptake with hypometabolism of the central aspect** of the LN.



(a) Axial contrast-enhanced CT image shows a **cystic LN with a thin smooth capsule** and **homogeneous internal content** at left level IIA in the patient with history of oral tongue SCC. (c) Longitudinal axial gray-scale US shows **thick irregular capsule** and **cystic necrotic changes**. (b) PET CT demonstrates **peripheral FDG uptake** corresponding to solid parts seen on US image.



(a) Coronal contrast-enhanced CT image shows enlarged LN in the right level III, which shows **cystic changes** suggesting the possibility of thyroid cancer. (b) Longitudinal axial gray-scale US shows **cystic changes with thin smooth capsule**. The results from a fine-needle aspiration of the LN were positive for papillary thyroid carcinoma.



**Teaching point 12:** Regardless of nodal size, the presence of intranodal necrosis should be considered pathologic.

Size

Shape

Eccentric Cortical Hypertrophy

Echogenicity

Echogenic Hilum

Border

Central Necrosis  
Cystic Changes

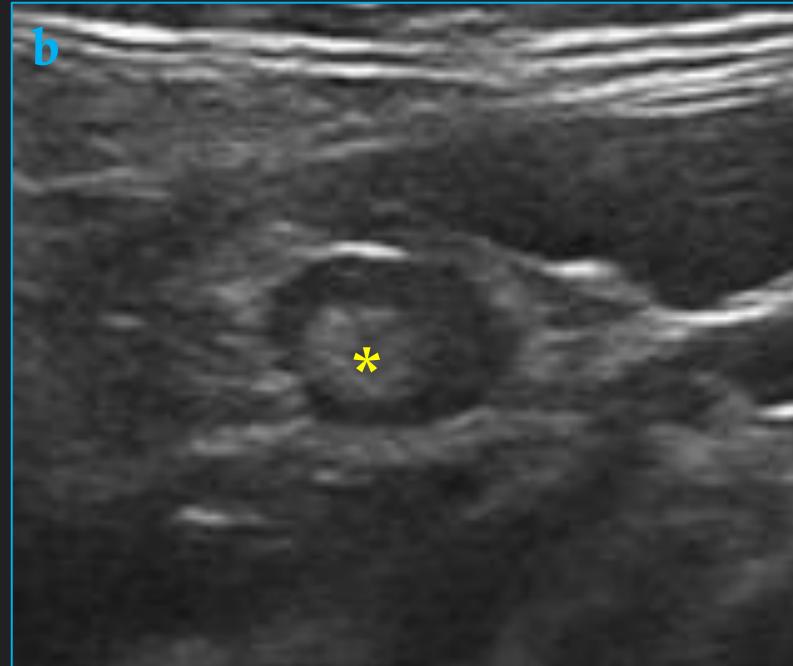
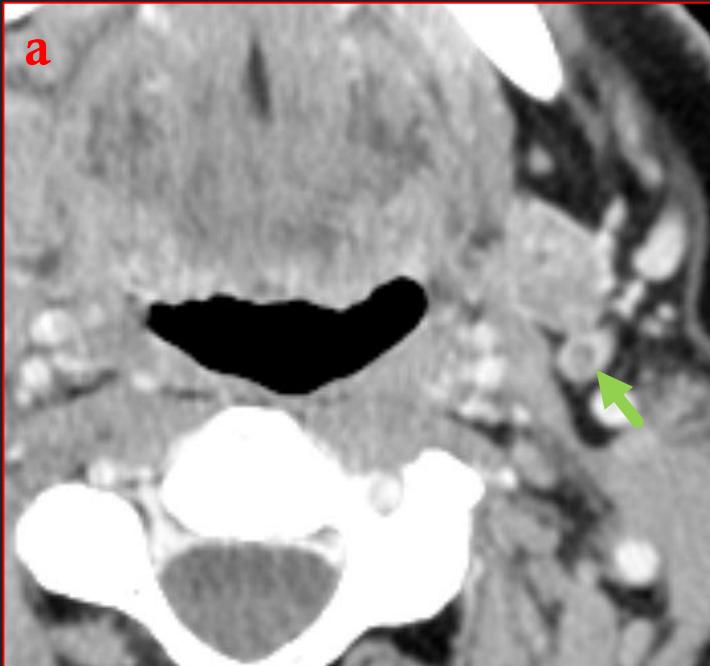
Calcification

Vascularity

Extranodal extension

Tumor-Specific Nodal Signatures

## Echogenic Hilum versus Intranodal Necrosis



Axial contrast-enhanced CT image (a) from a patient with a history of scalp angiosarcoma reveal a lymph node with **central hypodensity** suspicious for central necrosis. The corresponding US image (b) demonstrates a prominent **hyperechoic fatty hilum**. The **fatty hilum** of a node may be **centrally** located, which should **not be confused** with pathologic **inhomogeneity** or **central necrosis**.

**Teaching point 13:** Focal hypodensity on CT with contrast can be mistaken for necrosis. US correlation reveals prominent fatty hilum.

Size

Shape

Eccentric Cortical Hypertrophy

Echogenicity

Echogenic Hilum

Border

Central Necrosis  
Cystic Changes

Calcification

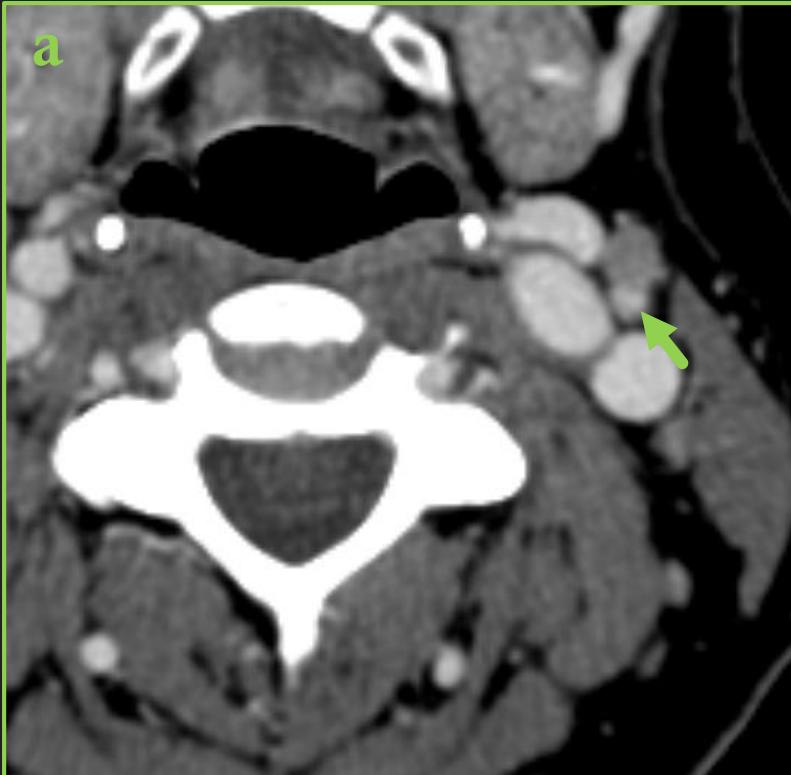
Vascularity

Extranodal extension

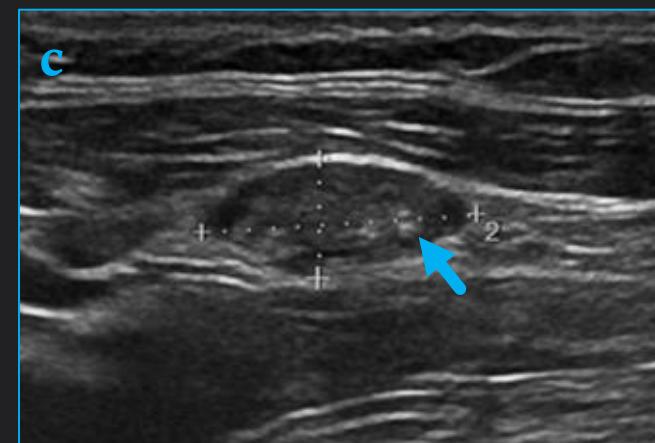
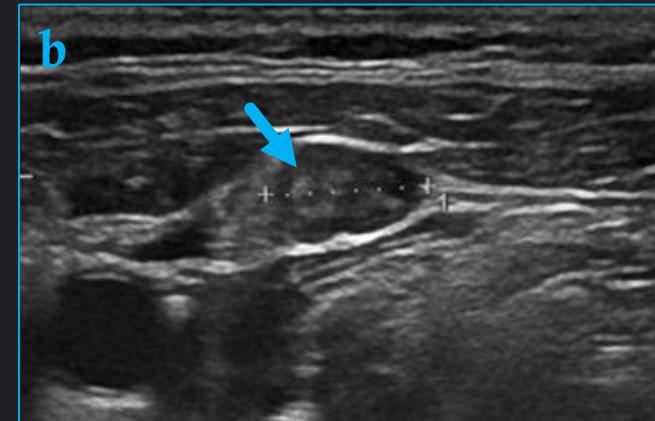
Tumor-Specific Nodal Signatures

- **Calcification** in malignant cervical lymph nodes are typically seen in
  - Papillary thyroid cancer
  - Medullary thyroid cancer
  - Mucinous colonic adenocarcinoma
- Calcifications may also occur because of radiation or chemotherapy.

**Teaching point 14:** Lymph node calcifications may be small and do not demonstrate posterior acoustic shadowing on ultrasonography.



**Calcified metastatic lymph node.**  
 (a) Axial CT with contrast shows heterogenous LN with cystic changes and **small calcifications** in a patient with papillary thyroid carcinoma. The transverse (b) and longitudinal (c) gray-scale US images show a lymph node with **small central echogenic calcific foci**.



Size

Shape

Eccentric Cortical Hypertrophy

Echogenicity

Echogenic Hilum

Border

Central Necrosis  
Cystic Changes

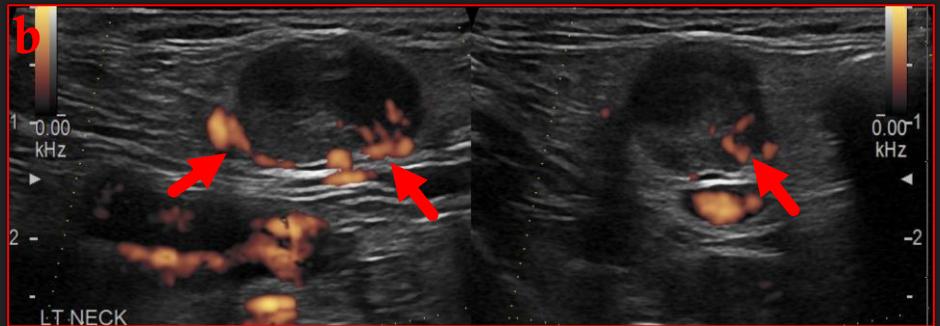
Calcification

Vascularity

Extranodal extension

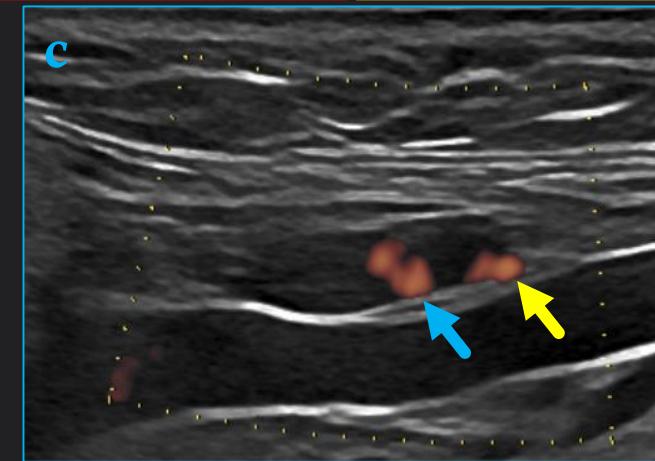
Tumor-Specific Nodal Signatures

- Power Doppler can be helpful in evaluation of vascular distribution.
- Approximately 90% of normal lymph nodes with a maximum transverse diameter greater than 5mm will show **hilar vascularity**.



CT with contrast (a) and corresponding power Doppler sonogram (b), in a patient with papillary thyroid carcinoma, show an **enlarged metastatic lymph node** with **peripheral vascularity** on the power Doppler sonogram (b).

**Teaching point 15:** Peripheral or mixed vascularity are common in metastatic nodes.



A 71-year-old female with medullary thyroid carcinoma.  
 (a) 68 Ga-Dotatate PET/CT shows a **small somatostatin-avid** left high central compartment lymph node. (b) CT with IV contrast shows a **small nonspecific hypodense lymph node**. (c) Power Doppler sonogram shows both **central** and **peripheral vascularity**.

Size

Shape

Eccentric Cortical Hypertrophy

Echogenicity

Echogenic Hilum

Border

Central Necrosis  
Cystic Changes

Calcification

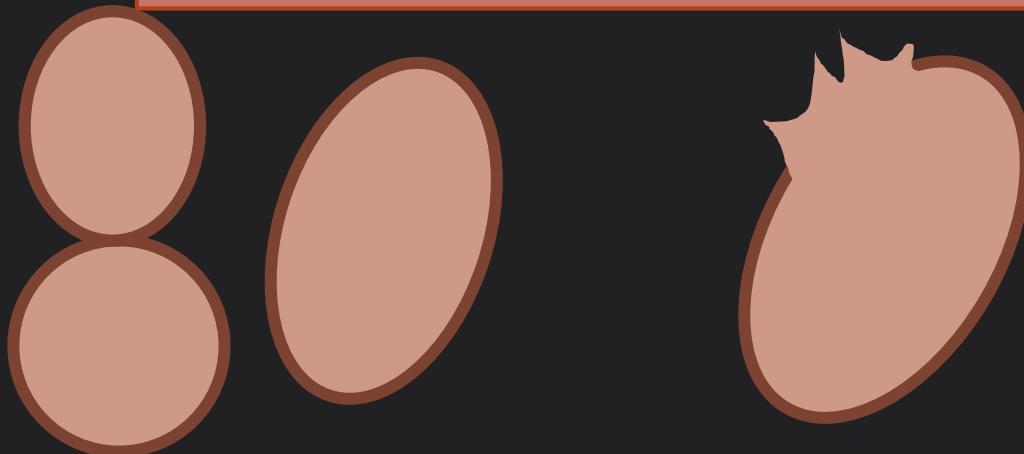
Vascularity

Extranodal extension

Tumor-Specific Nodal Signatures

- Pathologic extracapsular spread is a poor prognostic sign and requires more intensive therapy.
- Now call it **ENE (extranodal extension)**
  - pENE (pathologic)
  - cENE (clinical fixation of lymph node)
  - iENE (imaging-detected)
- iENE is an **INDEPENDENT** predictor (above and beyond pENE)
- Current version of AJCC/ UICC included iENE for **nodal staging**
  - Nasopharyngeal carcinoma
  - HPV+ oropharyngeal SCC
  - Salivary gland tumor

**Teaching point 17:** Ultrasound, CT and MRI are all treated the same for iENE.

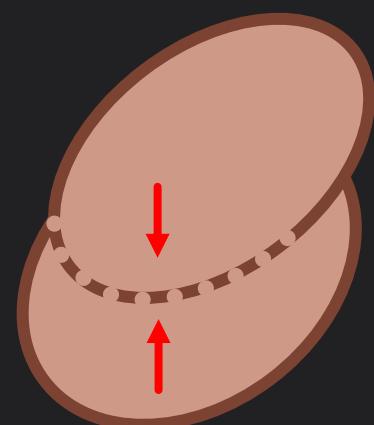


Grade 0 (absence of iENE)

**Teaching point 16:**  
MUST comment on iENE when staging NPC, HPV+ oropharyngeal SCC and salivary gland tumors!

- If there is iENE +**
- NPC**
    - Upgrades to N3 (even one node with iENE)
    - Only grade 3 upstages**
    - Ignore retropharyngeal nodes (too close to primary)
  - HPV + Oropharyngeal SCC**
    - Upstages N1 to N2
    - Upstages N2 to N3
  - Salivary Cancers**
    - Upstages to N2 (highest N)

**Teaching point 18:** Definitive iENE is need for staging!  
When in doubt → you down grade!!!!



Grade 1 (perinodal fat involvement)



Grade 2 (coalescent/ matted nodes)

**Grade 3** (other organ invasion such as muscle, artery, skin)

Size

Shape

Eccentric Cortical Hypertrophy

Echogenicity

Echogenic Hilum

Border

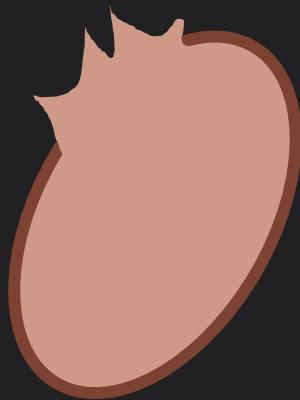
Central Necrosis  
Cystic Changes

Calcification

Vascularity

Extranodal extension

Tumor-Specific Nodal Signatures

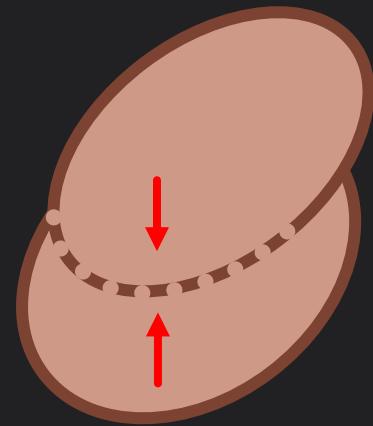
**Grade 1** (perinodal fat involvement)

- **Irregular/ indistinct capsule** is not enough to call it as grade 1!!!
- Need **projections/ spikes of tumor** into fat.

**Mimics**

- Irradiated nodes
- Infected nodes
- Recently- biopsied nodes
- Streak artifact!

**Teaching point 19:** Irradiated or biopsied lymph nodes should not be evaluated in terms of extranodal extension.

**Grade 2** (coalescent/ matted/ conglomerate nodes)

- Only **2 nodes** needed
- All three imaging criteria **MUST be met**:
  - **Loss of fat planes** between nodes
  - **Loss of convexity** at least one node point of contact
  - **Loss of acute angle** between nodes at least one edge of contact

**Mimics**

- **Lobulated margin** of a single node
- **Solid and necrotic regions** of a single node

**Teaching point 20:** Use multiple imaging planes to decide Grade 1 versus Grade 2.

**Grade 3** (other organ invasion such as muscle, artery, skin)

- Require definitive **enhancement WITHIN** the organ
  - Loss of fat planes or displacement not sufficient
  - Equivocal enhancement within organ not sufficient
  - Edema not sufficient

**Arterial involvement requires**

- **270° encasement**
- Tumor **thrombus**
- Only **major** arteries (CCA, ICA, ECA, verteb)

**Juguler vein involvement**

- Compression/ displacement not enough
- Must have **tumor thrombus** or be completely **obliterated** (need contrast)

**Direct nerve invasion** usually cannot be seen → use **muscle denervation**!

**Teaching point 21:** Merger of node and primary is Grade 3, except retropharyngeal nodes in NPC!!!

Size

Shape

Eccentric Cortical Hypertrophy

Echogenicity

Echogenic Hilum

Border

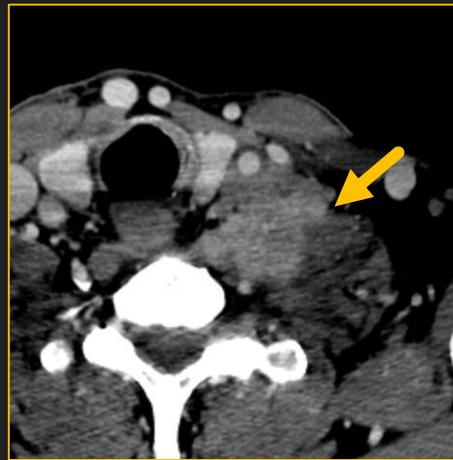
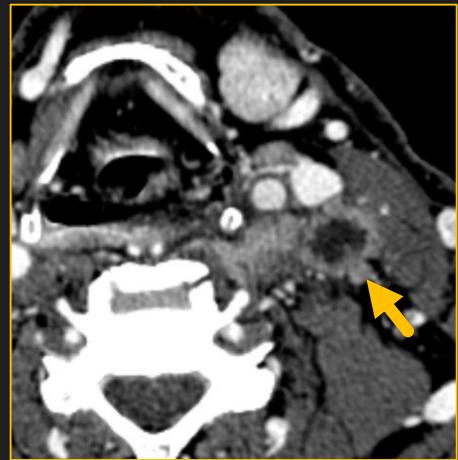
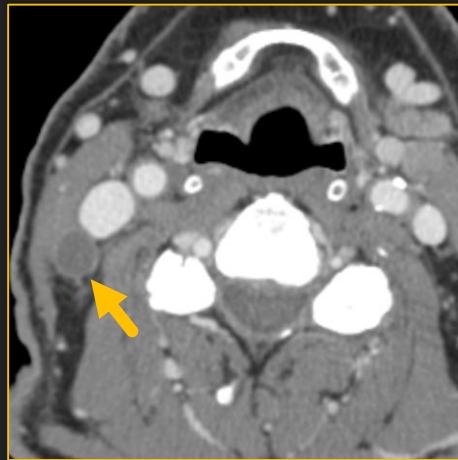
Central Necrosis  
Cystic Changes

Calcification

Vascularity

Extranodal extension

Tumor-Specific Nodal Signatures

**Grade 0**

Cystic/ necrotic **well defined** lymph node with **clean margins** and thickened capsule. Abutting the IJV without invasion. Clear separation between the node and adjacent SCM and paraspinal musculature.

**Grade 1**

Lymph node with **ill-defined margins** with **posterior lobulation** and **spiculation** extending into the perinodal fat. Close to the SCM but **no deformity**, **no enhancement**, **no edema** within the muscle. Also, abutting the IJV without encasement or tumor thrombus.

**Grade 2**

Two lymph nodes with **loss of fat planes** between, **loss of convexity** of both nodes at the point of contact and **loss of acute angle** between on at least one border. Close to SCM and IJV without definitive invasion.

**Grade 3**

**Loss of the fat plane** between node and sclane musculature with **unequivocal enhancement of the muscle**. There is also **less than 270° encasement**.

**Teaching point 22:** Internal necrosis, cystic change do not count towards upgrading beyond Grade 0!

**Teaching point 23:** Internal heterogeneity or peripheral well marginated lobulations not enough to upgrade as long as it seems plausible that it is still one node!

**Teaching point 24:** All three imaging criteria MUST be met to establish Grade 2 iENE.

**Teaching point 25:** Loss of the fat plane between node and muscle OR equivocal enhancement of the muscle not sufficient to establish Grade 3 iENE.

Size

Shape

Eccentric Cortical Hypertrophy

Echogenicity

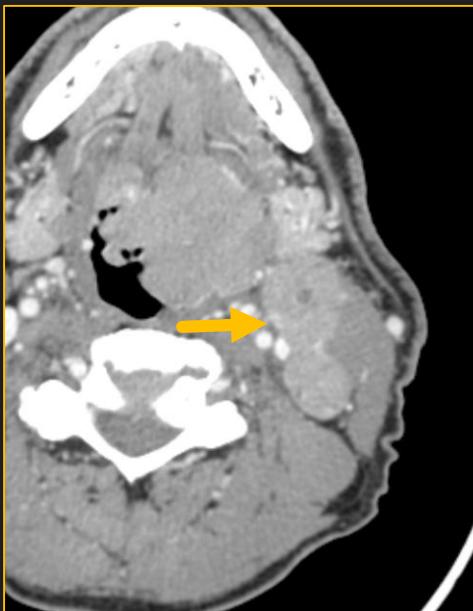
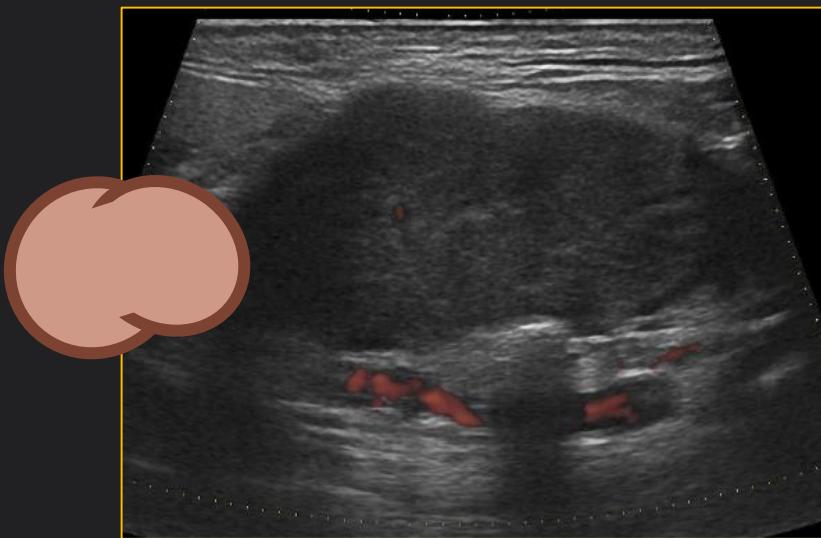
Echogenic Hilum

Border

Central Necrosis  
Cystic Changes

Calcification

Vascularity

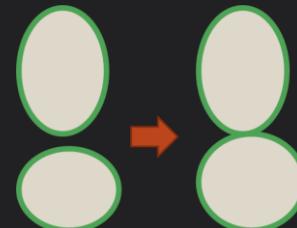
Extranodal  
extensionTumor-Specific Nodal  
Signatures

**Grade 2 :** Two lymph nodes with **loss of fat planes** between, **loss of convexity** of at least one node at the point of contact and **loss of acute angle** between nodes at least one edge of contact which is seen better on ultrasound. Close to SCM, submandibular gland and IJV without definitive invasion. There is no merger of node and primary left glossotonsilar SCC.

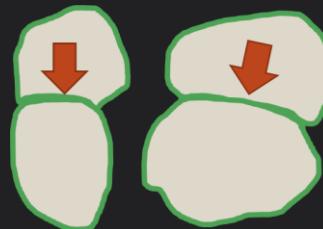
**Teaching point 21:** Merger of node and primary is Grade 3, except retropharyngeal nodes in NPC!!!

**Teaching point 24:** All three imaging criteria MUST be met to establish Grade 2 iENE.

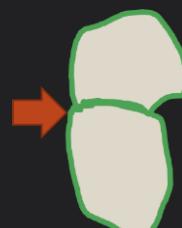
**Loss of fat planes between the nodes**



**Loss of convexity of at least one node at the point of contact**



**Loss of acute angle between nodes on at least one border**



Size

Shape

Eccentric Cortical Hypertrophy

Echogenicity

Echogenic Hilum

Border

Central Necrosis  
Cystic Changes

Calcification

Vascularity

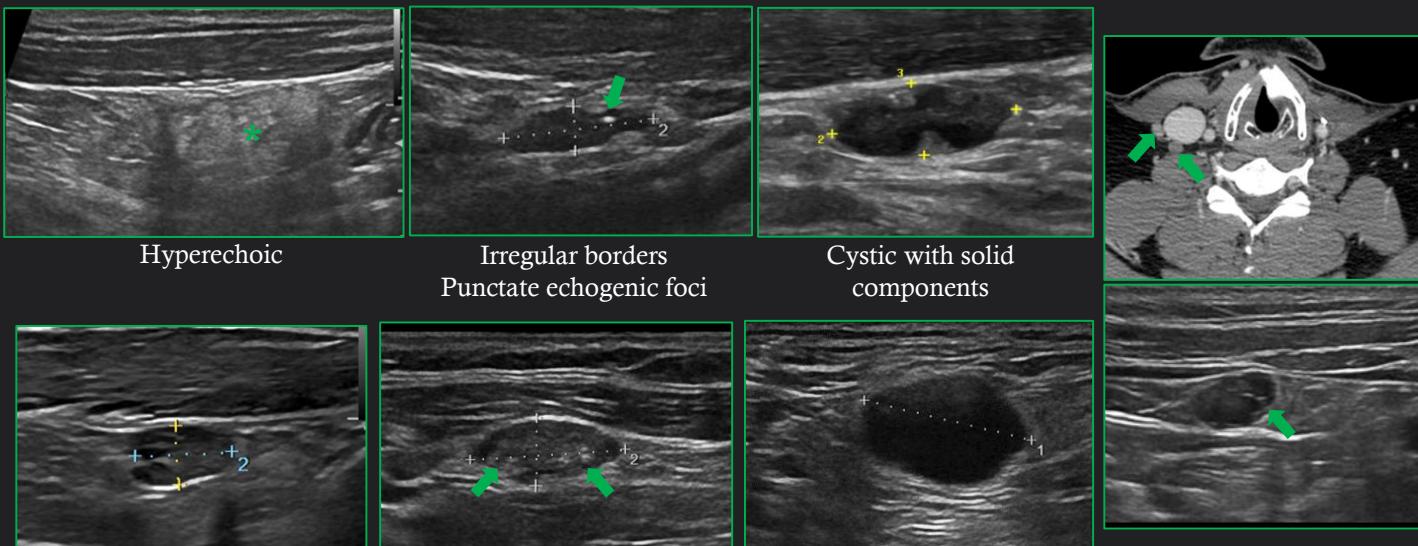
Extranodal extension

Tumor-Specific Nodal Signatures

## Spectrum of imaging appearances of metastatic lymph nodes

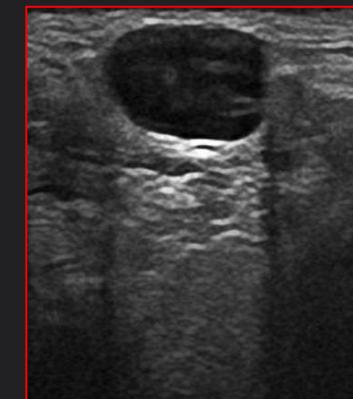
### Papillary thyroid cancer

- PTC – is the most common type of thyroid cancer.
- Cervical lymph node metastasis is seen in 20-50% of patient before treatment.
- Metastatic lymph nodes from PTC can demonstrate variable ultrasonographic characteristics.



### Malign melanoma

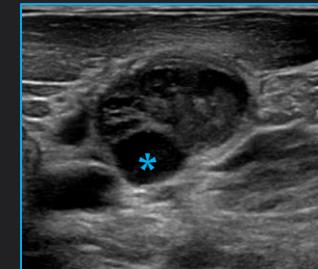
- Hypoechoic round shape with posterior acoustic enhancement.
- Can preserve normal architecture.
- Hyperdense nodes without calcification on non-contrast CT (melanin or hemorrhage)



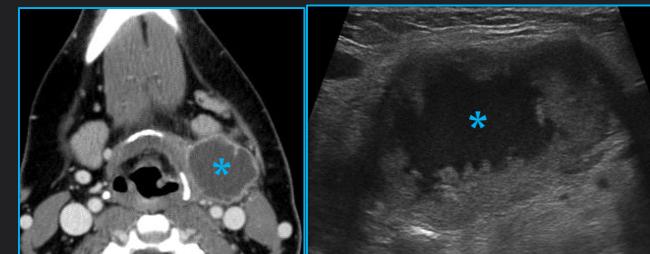
Hypoechoic round shape with posterior acoustic enhancement

### Squamous cell carcinoma

- Can mimic branchial cleft cyst.
- In adults, a new cystic neck node = metastatic SCC until proven otherwise.
- Common in HPV-related oropharyngeal SCC



Cystic in p16-positive metastatic SCC



Necrotic lymph node

Size

Shape

Eccentric Cortical Hypertrophy

Echogenicity

Echogenic Hilum

Border

Central Necrosis  
Cystic Changes

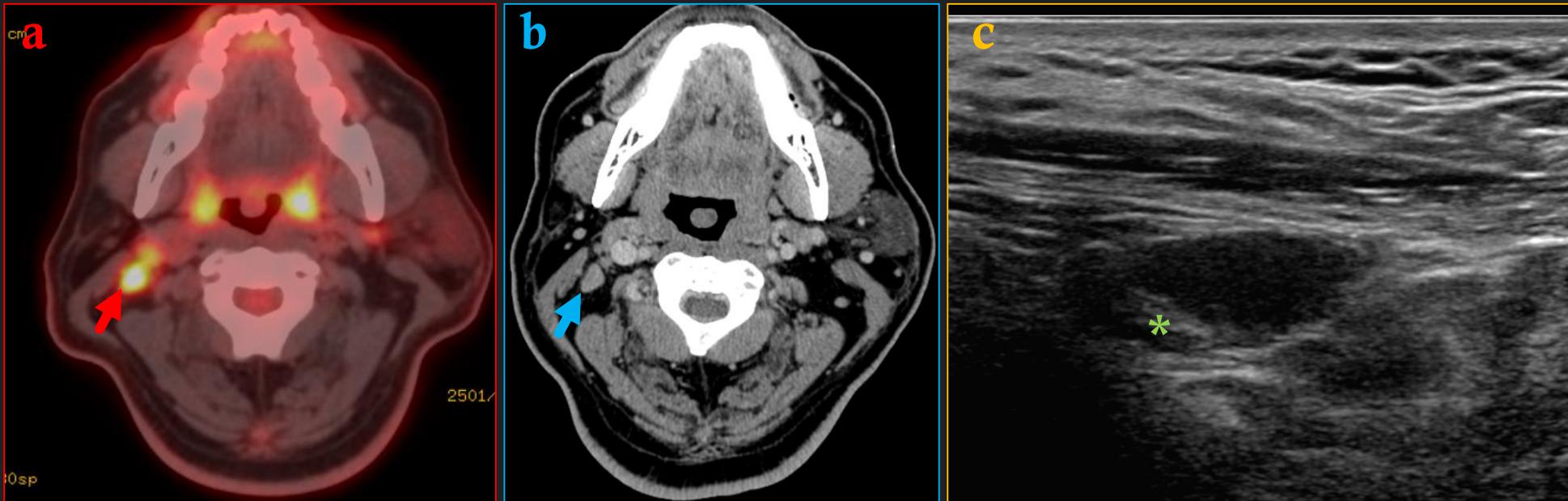
Calcification

Vascularity

## Fine-needle aspiration (FNA) for thyroglobulin

- Fine-needle aspiration (FNA) for thyroglobulin measurement in lymph nodes is a **diagnostic tool used to detect metastatic thyroid cancer**.
- **Thyroglobulin** is a protein produced by thyroid tissue, and its **presence in lymph nodes** can indicate the spread of thyroid cancer, especially in patients with a history of **differentiated thyroid carcinoma**.

- The cutoff value for thyroglobulin in FNA samples from lymph nodes is **around 1 ng/mL**. Values **above** this threshold are often considered **suspicious for metastatic disease**.



**Teaching point 26:**  
**In patients with differentiated thyroid cancer, a normal-appearing lymph node with negative cytology may still be metastatic; elevated thyroglobulin in FNA ( $>1$  ng/mL) strongly suggests nodal metastasis.**

A 60-year-old male with metastatic papillary thyroid cancer, treated with surgery, radiation, and radioactive iodine. (a) PET CT shows an **FDG avid lymph node**. (b) The corresponding axial CT with IV contrast shows a **mildly prominent lymph node without suspicious features**. (c) Longitudinal gray-scale US image demonstrates an **ellipsoid, hypoechoic lymph node** with a **preserved hyperechoic hilum**. US FNA was performed, and cytologic examination showed benign lymphoid cells with no metastatic carcinoma identified. However, thyroglobulin measurement of lymph node aspirate was performed, showing an increased level of 6.3 ng/ml, indicating metastatic papillary thyroid carcinoma.

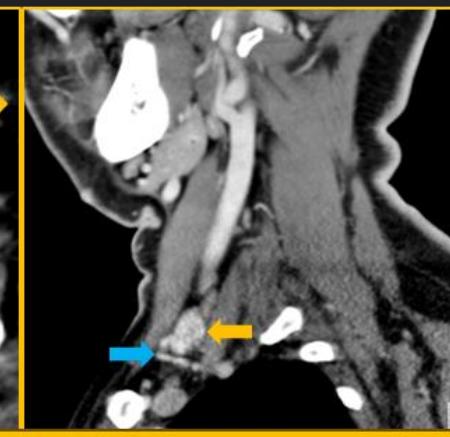
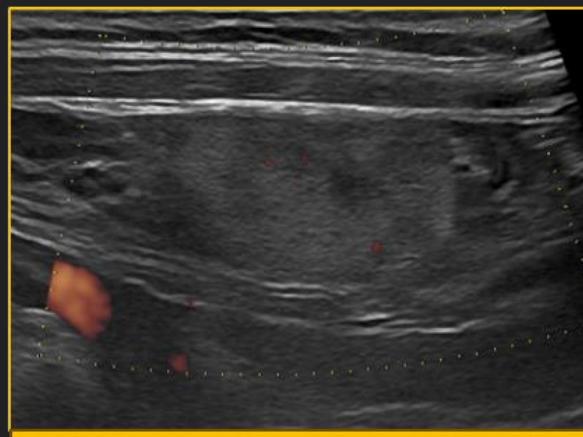
**Teaching point 27:** Benign entities can mimic metastatic cervical lymph nodes; recognizing their typical location/ imaging appearance and considering the clinical history helps avoid misdiagnosis.



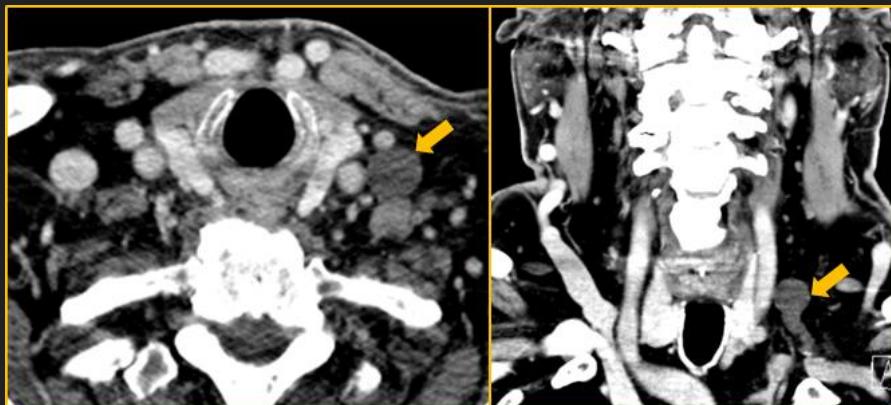
Schwannoma



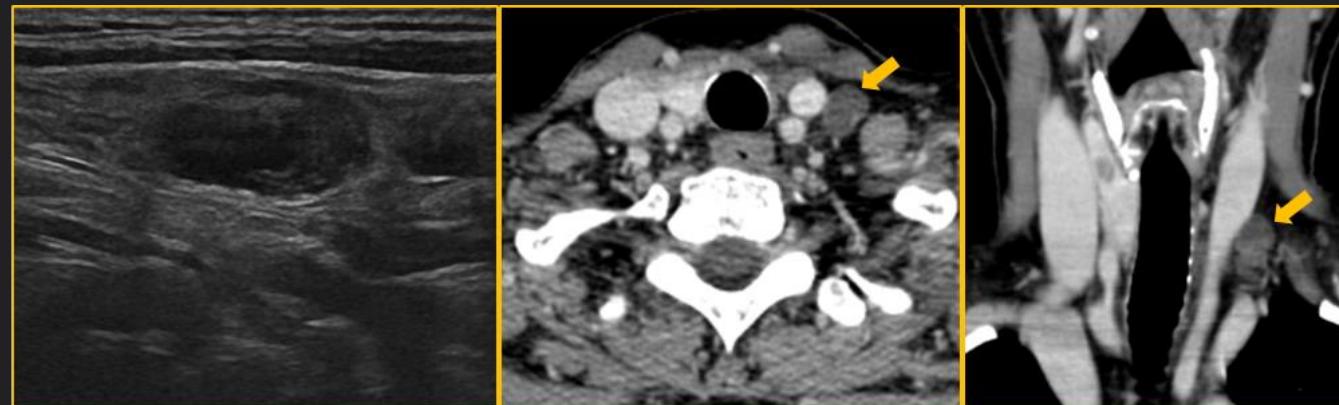
Implanted parathyroid gland



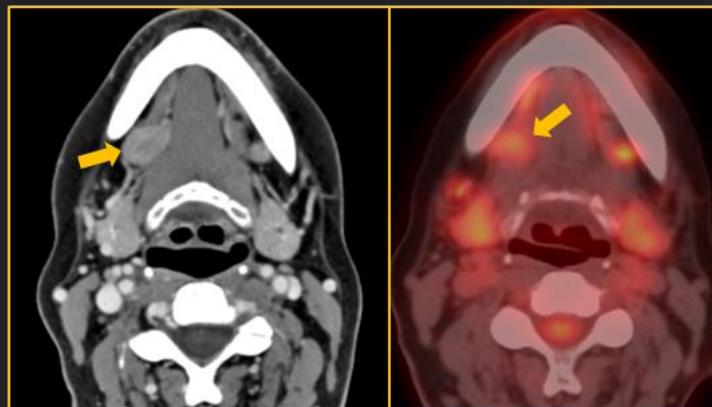
Vascular malformation



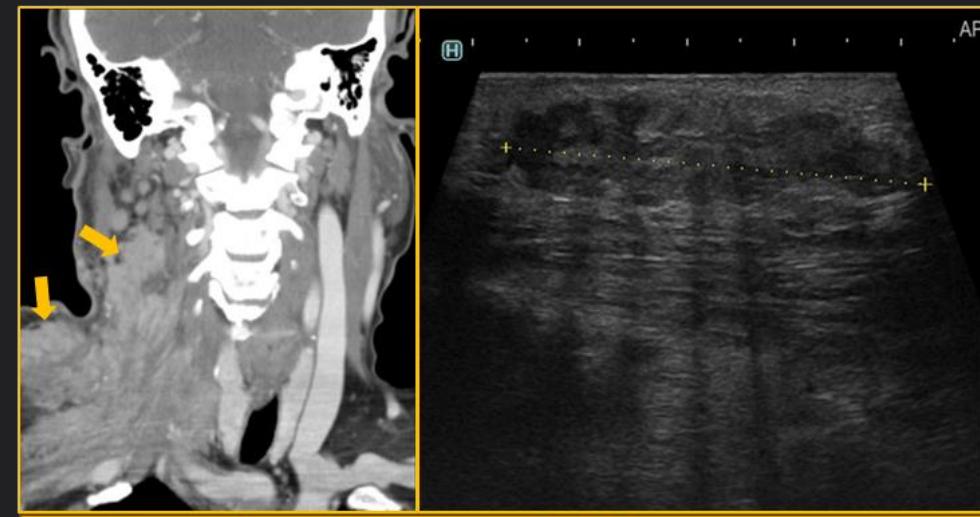
Ampullary flaring of the terminal distal thoracic duct



Papillary thyroid carcinoma lymph node metastasis



Accessory Salivary Tissue in the Mylohyoid Boutonnière



Lymphangitic spread of breast cancer

**Teaching point 27:** Benign entities can mimic metastatic cervical lymph nodes; recognizing their typical location/ imaging appearance and considering the clinical history helps avoid misdiagnosis.

# Take Home Messages

- **Nodal size alone is not an accurate criterion** for differentiating normal lymph node from metastatic or lymphoma nodes.
- **Preservation of the echogenic hilum** is **not exclusion criterion** for metastatic adenopathy.
- Combination of **normal architecture** with **focal heterogeneity**, or **cortical bulge**, or **abnormal contour** can indicate **metastatic lymph nodes**.
- Nodal metastasis from **papillary thyroid carcinoma** is characterized by **cystic changes**, **calcifications**, and **hyperechoic components** related to the deposition of colloid or hemorrhage.
- **Cystic adenopathy** may be observed in **p-16 positive oropharyngeal cancers** and **thyroid papillary carcinoma**.
- Metastatic lymph nodes from **malignant melanoma** are usually **hypoechoic**, **round shaped**, and **can preserve normal architecture**.
- Current version of AJCC/ UICC included **iENE for nodal staging** and MUST comment on definitive iENE when staging **NPC**, **HPV+ oropharyngeal SCC** and **salivary gland tumors!**
- Accurate determination of whether a lymph node is pathologic or benign requires consideration of multiple criteria across multiple modalities.

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