Ultrasound – Lymph Node Survey

PURPOSE:
To evaluate the neck for suspicious lymph nodes or other focal soft tissue abnormalities.

SCOPE:
Applies to all ultrasound Neck or Head Soft Tissues and Thyroid studies performed in:
- UT Southwestern William P. Clements Jr. University Hospital and Clinics, Imaging Services (UTSW Radiology)
- Parkland Health (Hospital and Clinics), Department of Radiology (PHHS Radiology)

ORDERABLE:
- US Neck or Head Soft Tissues
- US Thyroid

INDICATIONS:
- History of malignancy, such as thyroid or other head and neck cancer
- Signs or symptoms associated with cervical neck lymph node enlargement
- Physical exam findings of a neck soft tissue abnormality
- Abnormal findings on other imaging studies
- Abnormal thyroid nodules (any solid/predominantly solid nodules ≥ 1cm)
- Follow up of known enlarged lymph nodes or other soft tissue abnormalities of the neck

CONTRAINDICATIONS:
- No absolute contraindications

EQUIPMENT:
- Linear array transducer with a frequency range of 9-20 MHz or greater that allows for the highest resolution imaging with appropriate penetration, depending on patient's body habitus

PATIENT PREPARATION:
- None

EXAMINATION:
GENERAL GUIDELINES:
- A complete examination includes evaluation of the cervical neck lymph nodes (medial and lateral compartments).
  - Posterior neck (level 5) may also be needed, depending on indication.
- Cursory views of the thyroid gland (included in central neck sweep) *
  - *If no prior thyroid ultrasound (US) performed at our institution, include complete thyroid imaging (see US Thyroid Protocol)
  - If prior Thyroid US **has** been performed at our institution **and** there are no nodules, complete repeating imaging is not needed.
- Evaluation of any additional soft tissue abnormalities, as indicated.

EXAM INITIATION:

- Review any prior imaging, making note of prior focal soft tissue abnormalities, abnormal lymph nodes, or other findings requiring comparison.
- Introduce yourself to the patient and explain test
- Verify patient identity using patient name and date of birth (DOB)
- Obtain patient history including symptoms. Enter and store data page.
- Place the patient in a supine position with the neck extended. A pillow/towel under the shoulders may facilitate maximum neck extension.

TECHNICAL CONSIDERATIONS:

- Survey the thyroid gland for focal abnormalities. Any nodules > 1cm should be documented without and with size measurements in 3 orthogonal dimensions and without and with color Doppler, preferable on using dual-screen, 2-on-1 imaging.
- Suspicious thyroid nodule features should be demonstrated. These include solid composition, microcalcifications, hypo echogenicity, shape taller-than-wide, irregular/lobulated borders, and extrathyroidal extension.
- See US Thyroid protocol for details.
- Anterior cervical lymph nodes are divided into central (Levels I and VI) and lateral (Levels II-IV) compartments. Posterior cervical lymph nodes are in Levels VA and VB (see Appendix).
- Survey the anterior compartment. Annotate images based on the nodal level (I and VI), as defined in the Appendix.
- Survey the lateral compartment. Annotate images based on the nodal level (II – IV), as defined in the Appendix.
- If there is a history of lymphoma, head & neck melanoma or other skin cancer, physical exam findings that localize to the posterior neck, or if abnormalities are seen incidentally or on other imaging, include a survey of the posterior compartment. Annotate images based on the nodal level (Va and Vb), as defined in the Appendix.
- Suspicious lymph node features include rounded shape, loss of the central fatty hilum, irregular or lobulated cortex, heterogeneity, calcifications, and cystic spaces.
- NORMAL NODES SHOULD NOT BE MEASURED. Abnormal nodes should be documented with size measurements in 3 orthogonal planes and without and with color Doppler, preferable on dual screen, side-by-side imaging.
- Lymph node size is a less useful sign. Consider > 1 cm short axis as enlarged, however other features trump node size. Level II nodes are frequently larger.
- Color Doppler, Power Doppler, and Microvascular Flow Imaging (MFI; MVI; Slow Flow) are useful in showing normal hilar-pattern vascularity, versus abnormal cortical vascularity.
- Any additional focal abnormalities should be documented without and with size measurements in 3 orthogonal planes and without and with color Doppler.
- Document tracheal deviation if present.

DOCUMENTATION:

- Thyroid Gland
  - If a thyroid ultrasound has not been performed at our institution in the last 12 months, then include a complete thyroid evaluation. See “US Thyroid” protocol for details
    - If a US Thyroid **<u>has</u>** been performed at our institution **and** there are no nodules, full thyroid imaging may not be needed.
- Neck Lymph Node Survey

- Survey the anterior and lateral cervical compartments for abnormal lymph nodes. If there is a history of lymphoma, head and neck melanoma or other skin cancer, or physical exam findings localizing to the posterior neck, include evaluation of the posterior neck*.
- Grayscale images
  - Representative lymph nodes in central neck (Levels I and VI) and each lateral compartment (right and left Levels II, III, and IV), as defined in the Appendix.
    - *Level V should be included, when indicated. Additional grayscale images of abnormal Level V lymph nodes should be obtained.
    - If nodes are abnormally enlarged (consider > 1 cm short axis for Level II, and > 0.8 cm for I, III, IV and VI) or exhibit suspicious features, include the following:
      - 3 orthogonal measurements
      - Longitudinal images without and with color Doppler and Microvascular Flow Imaging (MFI; MVI; Slow Flow)
    - Normal lymph nodes should not be measured.
- Cine sweeps
  - Transverse, anterior compartment (Levels I and VI), superior to inferior.
  - Transverse, right and left lateral compartments (Levels II, III, and IV), superior to inferior.
  - *Level V should be included, when indicated. Additional transverse cine sweeps, superior to inferior, of abnormal Level V should be obtained.
  - Refer to Appendix, “Lymph Node Levels of the Neck,” for cine acquisition landmarks.
- Data page(s)
- Use iMorgon diagram to annotate abnormal lymph nodes (if applicable), their sizes, and suspicious features.
- See Thyroid Nodule Imaging Cheat Sheet below for appropriate annotations, if applicable

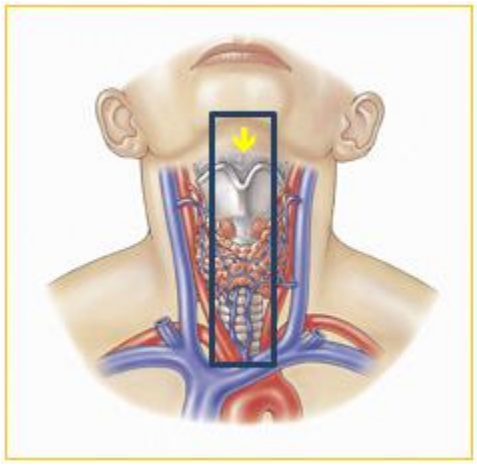
PROCESSING:

- Review examination images and data
- Export all images to PACS
- Confirm data in iMorgon
- Document relevant history and any study limitations

APPENDIX:

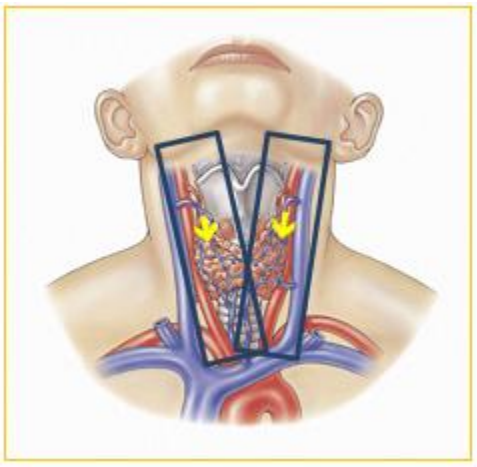
Lymph Node Levels of the Neck

Midline Central Neck (Levels I & VI)



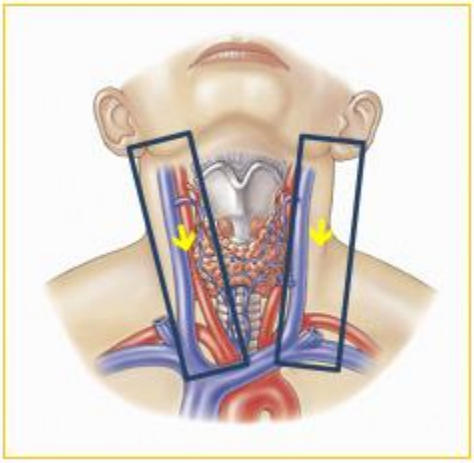
- Superior border: Submental
- Inferior border: Sternum

Thyroid Gland + Central Neck



- Superior border: Submandibular gland
- Inferior border: Clavicle
- Lateral border: Carotid/Jugular Complex

Lateral Neck (Levels II-IV)



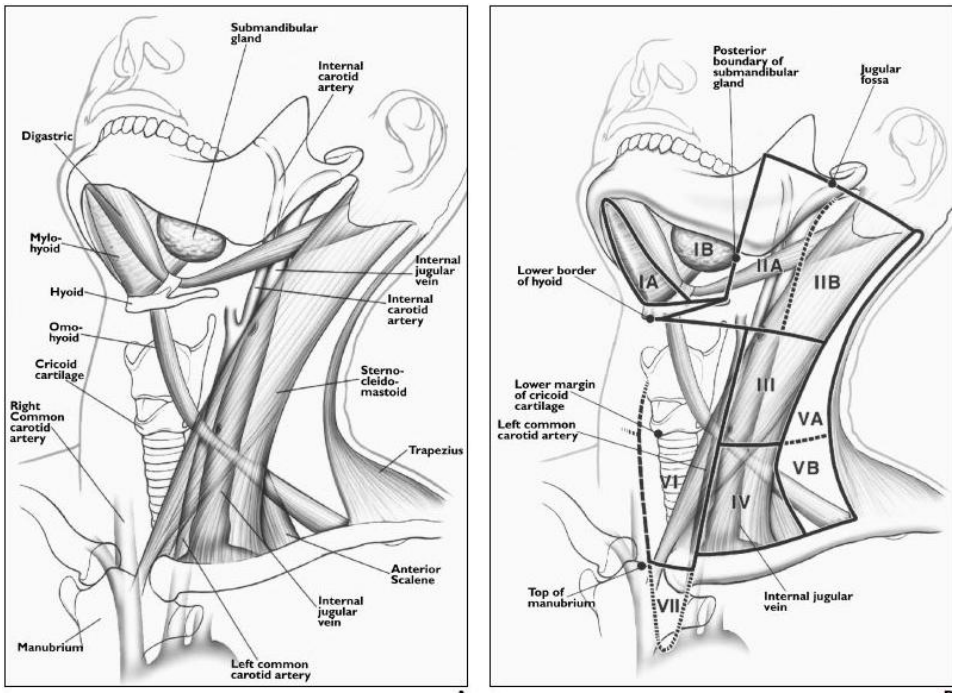
- Superior border: Submandibular gland
- Inferior border: Clavicle
- Medial border: medial aspect of Carotid/Jugular Complex
- Lateral border: lateral border of sternocleidomastoid muscle (SCM)

Posterior Neck (Levels Va and Vb)

- Superior border: Base of skull
- Inferior border: Clavicle
- Anterior border: posterolateral margin of SCM
- Posterior border: Anterior margin of trapezius muscle

Cervical Lymph Node Anatomic Level Classification

MODIFIED FROM AMERICAN JOURNAL OF ROENTGENOLOGY – VOL. 174, ISSUE 3.



APPENDIX: Summary of the Imaging-Based Nodal Classification

Nodes	Definition
Level I:	• Above hyoid bone • Below mylohyoid muscle • Anterior to back of submandibular gland • Previously classified as submental and submandibular nodes
Level IA:	• Between medial margins of anterior bellies of digastric muscles • Previously classified as submental nodes
Level IB:	• Posterolateral to level IA nodes • Previously classified as submandibular nodes
Level II:	• From skull base to level of lower body of hyoid bone • Posterior to back of submandibular gland • Anterior to back of sternocleidomastoid muscle
Level IIA:	• Anterior, lateral, medial, or posterior to internal jugular vein • Inseparable from internal jugular vein (if posterior to vein) • Previously classified as upper internal jugular nodes
Level IIB:	• Posterior to internal jugular vein with fat plane separating nodes and vein • Previously classified as upper spinal accessory nodes
Level III:	• From level of lower body of hyoid bone to level of lower cricoid cartilage arch • Anterior to back of sternocleidomastoid muscle • Previously known as mid jugular nodes
Level IV:	• From level of lower cricoid cartilage arch to level of clavicle • Anterior to line connecting back of sternocleidomastoid muscle and posterolateral margin of anterior scalene muscle • Lateral to carotid arteries • Previously known as low jugular nodes
Level V:	• Posterior to back of sternocleidomastoid muscle from skull base to level of lower cricoid arch • From level of lower cricoid arch to level of clavicle as seen on each axial scan • Posterior to line connecting back of sternocleidomastoid muscle and posterolateral margin of anterior scalene muscle • Anterior to anterior edge of trapezius muscle
Level VA:	• From skull base to level of bottom of cricoid cartilage arch • Posterior to back of sternocleidomastoid muscle • Previously known as upper level V nodes
Level VB:	• From level of lower cricoid arch to level of clavicle as seen on each axial scan • Posterior to line connecting back of sternocleidomastoid muscle and posterolateral margin of anterior scalene muscle • Previously known as lower level V nodes
Level VI:	• Between carotid arteries from level of lower body of hyoid bone to level superior to top of manubrium • Previously known as visceral nodes
Level VII:	• Between carotid arteries below level of top of manubrium • Caudal to level of innominate vein • Previously known as superior mediastinal nodes
Supraclavicular:	• At or caudal to level of clavicle as seen on each axial scan • Lateral to carotid artery on each side of neck • Above and medial to ribs
Retropharyngeal:	• Within 2 cm of skull base and medial to internal carotid arteries

Note.—For levels I–V, the nodes are classified for each side of the neck. The parotid nodes and other superficial nodes are referred to by their anatomic names. (Appendix modified and reprinted with permission from [16])

Cervical Lymph Node Evaluation*

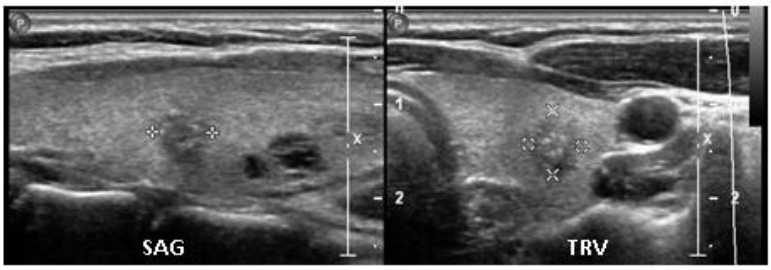
- Suspicious Features:
- Size (controversial)
  - Levels II, > 10 mm short axis
  - Levels III, IV or VI, > 8 mm short axis
- Loss of fatty hilum
- Round shape
- Heterogeneous, hyperechoic cortex
- Microcalcifications
- Cystic spaces
- Peripheral vascularity

Sign	Reported sensitivity %	Reported specificity %
Microcalcifications	5-69	93-100
Cystic aspect	10-34	91-100
Peripheral vascularity	40-86	57-93
Hyperechogenicity	30-87	43-95
Round shape	37	70

REF: EUROPEAN THYROID ASSOCIATION GUIDELINES FOR CERVICAL ULTRASOUND

Thyroid Imaging Cheat Sheet

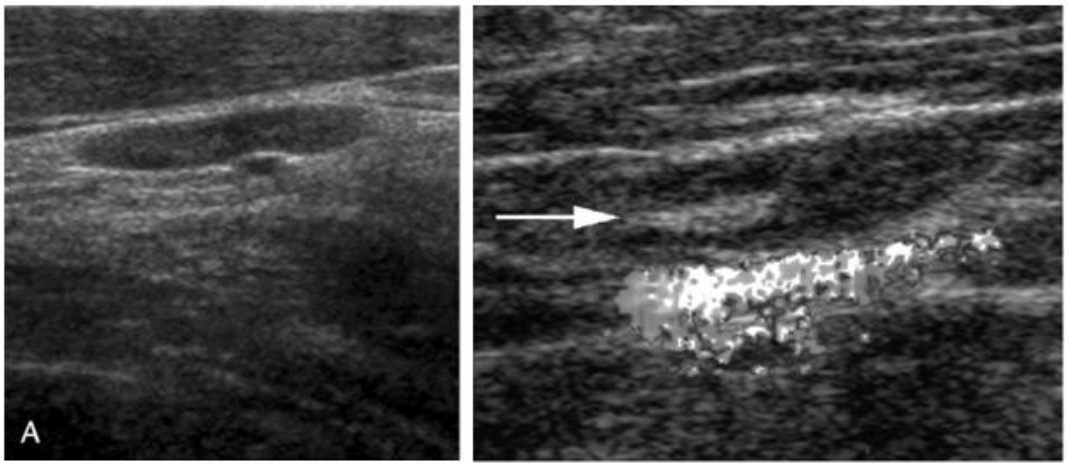
- Measure up to 3 nodules per lobe, up to 2 in isthmus.
  - Number superior-to-inferior
  - R1-R3; L1-L3; I1, I2
- Criteria for measuring (in descending order of importance):
  1. Any nodule w/ echogenic foci or calcs (without comet tail), then
  2. Any nodule > 1cm, predominately solid, then
  3. Any nodule ≥ 1.5 cm solid or cystic
- Measure using **DUAL screen**
- Acquire images w/o and then w/ calipers
- First measurement in Long/Sag (cc dimension only)
- Then, at largest point, measure in Axial (Trv and AP dimensions)



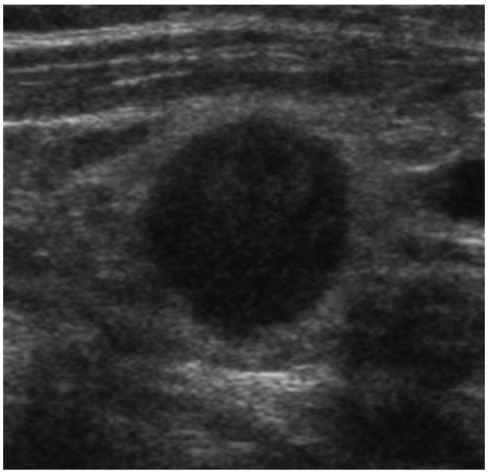
- If nodule is being measured, INCLUDE NECK SWEEPS
  - Measure only ABNORMAL lymph nodes

Lymph Node Atlas:

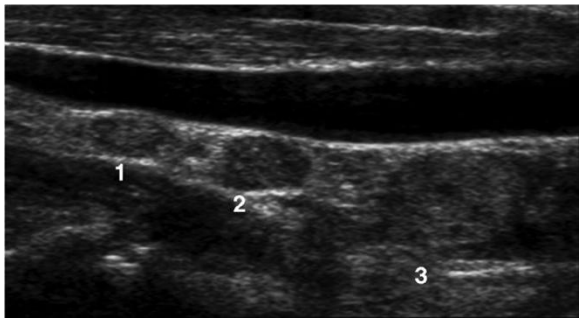
MODIFIED FROM ULTRASONOGRAPHY OF ABNORMAL NECK LYMPH NODES, ULTRASOUND QUARTERLY 2007



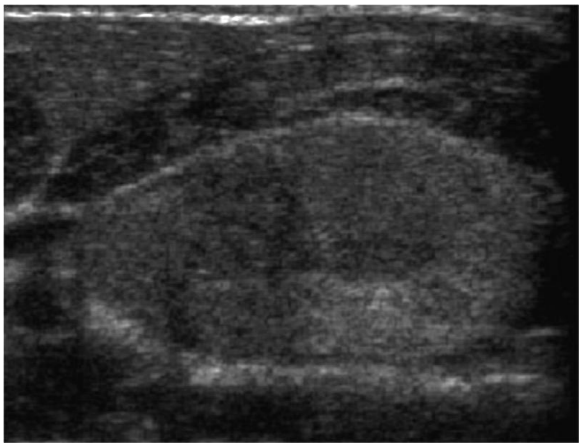
Normal appearance of several cervical lymph nodes; elongated, thin cortex (A), with central fatty hilum (arrow).



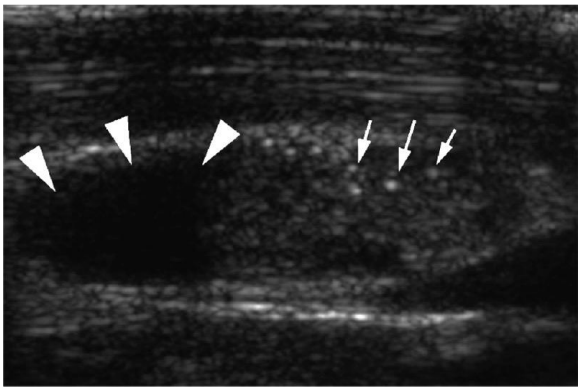
Abnormal round shape
Pathology – Lymphoma



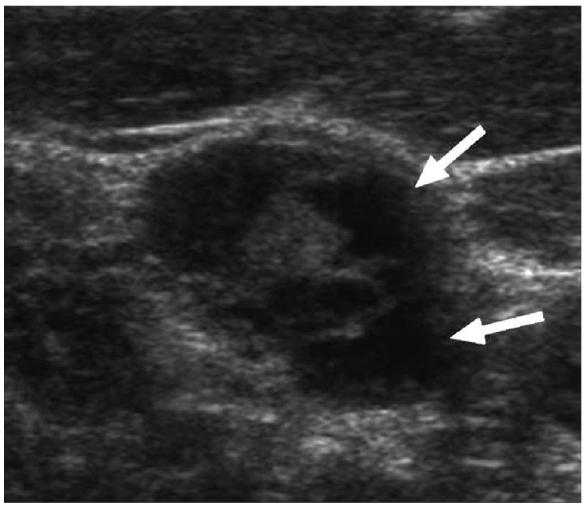
Chain of rounded; mildly heterogeneous lymph nodes (1-3)
Pathology – Metastatic papillary thyroid carcinoma



Enlarged, heterogeneous and markedly hyperechoic
Pathology – Metastatic papillary thyroid carcinoma



Microcalcifications (arrows) with cystic changes (arrow heads)
Pathology – Metastatic papillary thyroid carcinoma



Heterogeneous with cystic spaces (arrows)
Pathology – Metastatic papillary thyroid carcinoma

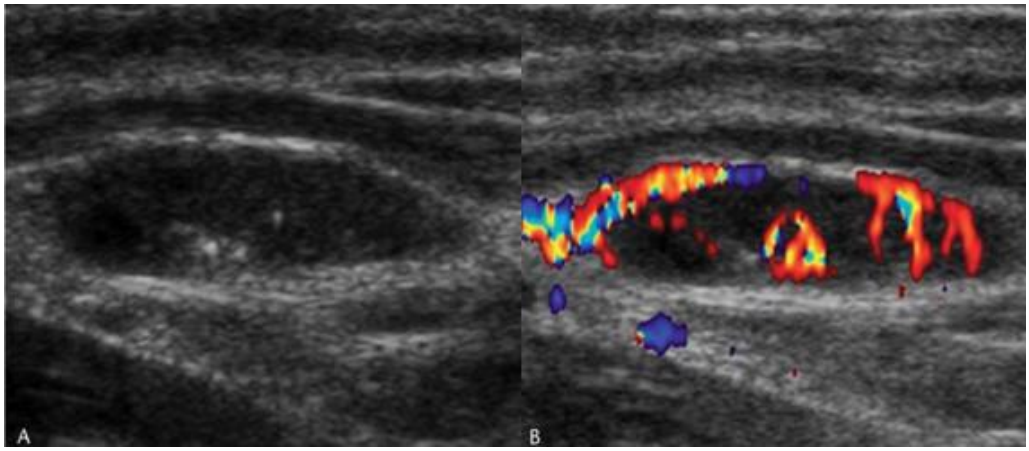
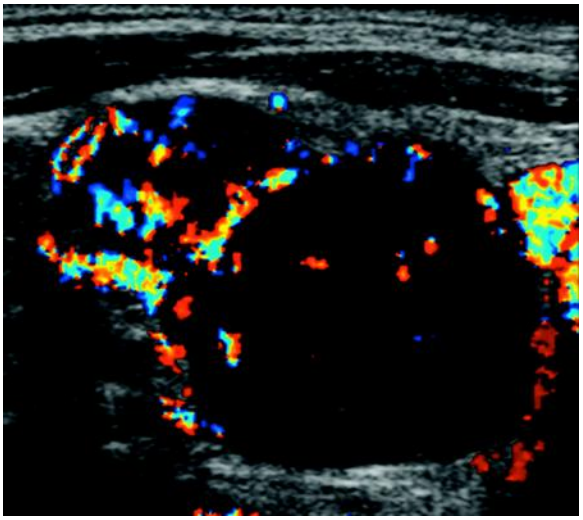
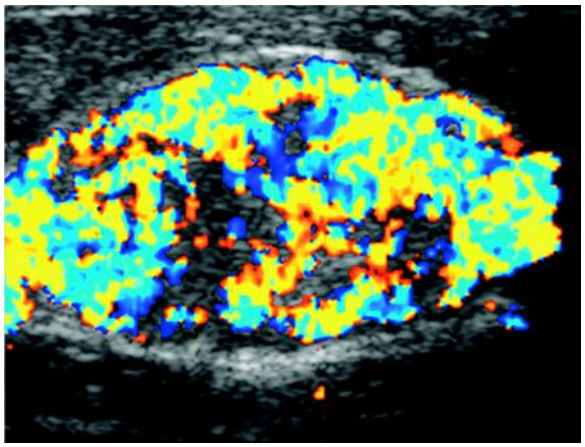


Image A (LEFT) – Normal fatty hilum. Possible microcalcification
Image B (RIGHT) – Abnormal vascularity with enlarged peripheral and capsular vessels



Enlarged, heterogeneous lymph nodes with web of vascularity
Pathology Lymphoma



Markedly abnormal, chaotic hypervascularity
Pathology – Metastatic papillary thyroid carcinoma

REFERENCES:

- ACR-AIUM Practice Guideline (Revised 2007)
- ATA Guidelines (Revised 2015)
- Som PM, et al. Imaging-Based Nodal Classification for Evaluation of Neck Metastatic Adenopathy, AJR 2000, 174
- Ultrasonography of Abnormal Neck Lymph Nodes, Ultrasound Quarterly, 2007

CHANGE HISTORY:

DATE:	SUBMITTED BY: (NAME, TITLE)	APPROVED BY: (NAME, TITLE)	SUMMARY:
1/18/2016	David Fetzer, Director		Submitted
1/18/2016	David Fetzer, Director		Approved
09/12/2018	David Fetzer. Director		Reviewed
11/14/2018	Lori Watumull, MD		Reviewed
11/17/2016	David Fetzer		Added information regarding when to image levels I and V
09/12/2018	David Fetzer		Corrections to be consistent with US Thyroid protocol
09/24/2018	Lori Watumull		Minor edits for clarification
03/02/2026	Maria Johnson	David Fetzer, Director	Minor edits for clarification
09/09/2026	Crystal Bruce, RDMS, RVT	David Fetzer, Director	A11y Updated heading styles for the protocol template.