Ultrasound – Lymph Node Survey

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

SCOPE:
Applies to all US Abdomen Complete studies performed in Imaging Services / Radiology

INDICATIONS:
- History of malignancy, such as 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 $\geq$ 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 10-18 MHz or greater that allows for appropriate penetration and resolution depending on patient's body habitus

PATIENT PREPARATION:
- None

EXAMINATION:
  GENERAL GUIDELINES:
    A complete examination includes evaluation of the anterior cervical lymph nodes (medial and lateral compartments), with cursory views of the thyroid gland and evaluation of any additional soft tissue abnormalities, as indicated.

  EXAM INITIATION:
  - Introduce yourself to the patient and explain test
  - Verify patient identity using patient name and DOB
  - Obtain patient history including symptoms. Enter and store data page.
  - Place patient in supine position with the neck extended. A pillow/towel under the shoulders may facilitate maximum neck extension.

  TECHNICAL CONSIDERATIONS:
  - Review any prior imaging, making note of prior focal soft tissue abnormalities, abnormal lymph nodes, or other findings requiring comparison.
  - 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.

- o Suspicious thyroid nodule features should be demonstrated. These include: solid composition, microcalcifications, hypoechogenicity, shape taller-than-wide, irregular/lobulated borders, and extrathyroidal extension.
  - o 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 (I and VI), as defined in the Appendix.
- If there is a history of 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 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 as enlarged, however other features trump node size. Level II nodes are frequently enlarged.
- 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
  - o If a thyroid ultrasound has not been performed in the last 12 months, then include a complete thyroid evaluation. See "US Thyroid" protocol for details

- Neck Lymph Node Survey
  - o Survey the anterior and lateral cervical compartments for abnormal lymph nodes. If there is a history of 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.
    - ▪ 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.
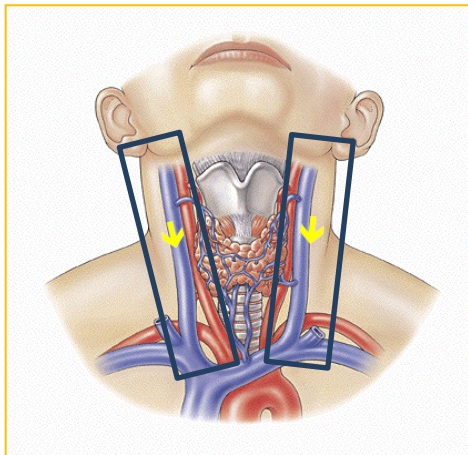
Midline Central Neck (Levels I & VI)
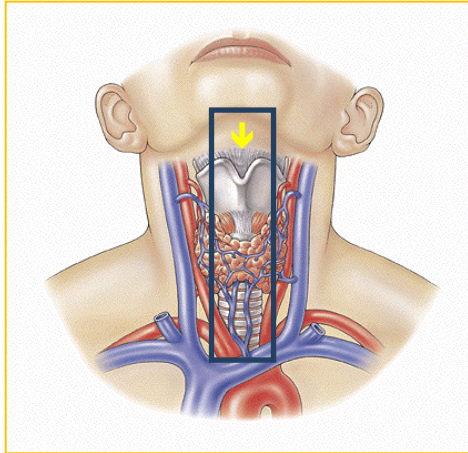
Superior border: Submental
Inferior border: Sternum

Thyroid Gland + Central Neck
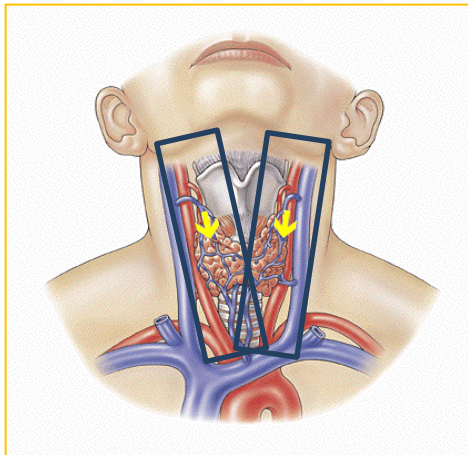
Superior border: Submandibular gland
Inferior border: Clavicle
Lateral border: Carotid/Jugular Complex

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

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

- **Normal lymph nodes should not be measured.** If nodes are abnormally enlarged (consider > 1 cm 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

- 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

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

APPENDIX:

CERVICAL LYMPH NODE ANATOMIC LEVEL CLASSIFICATION
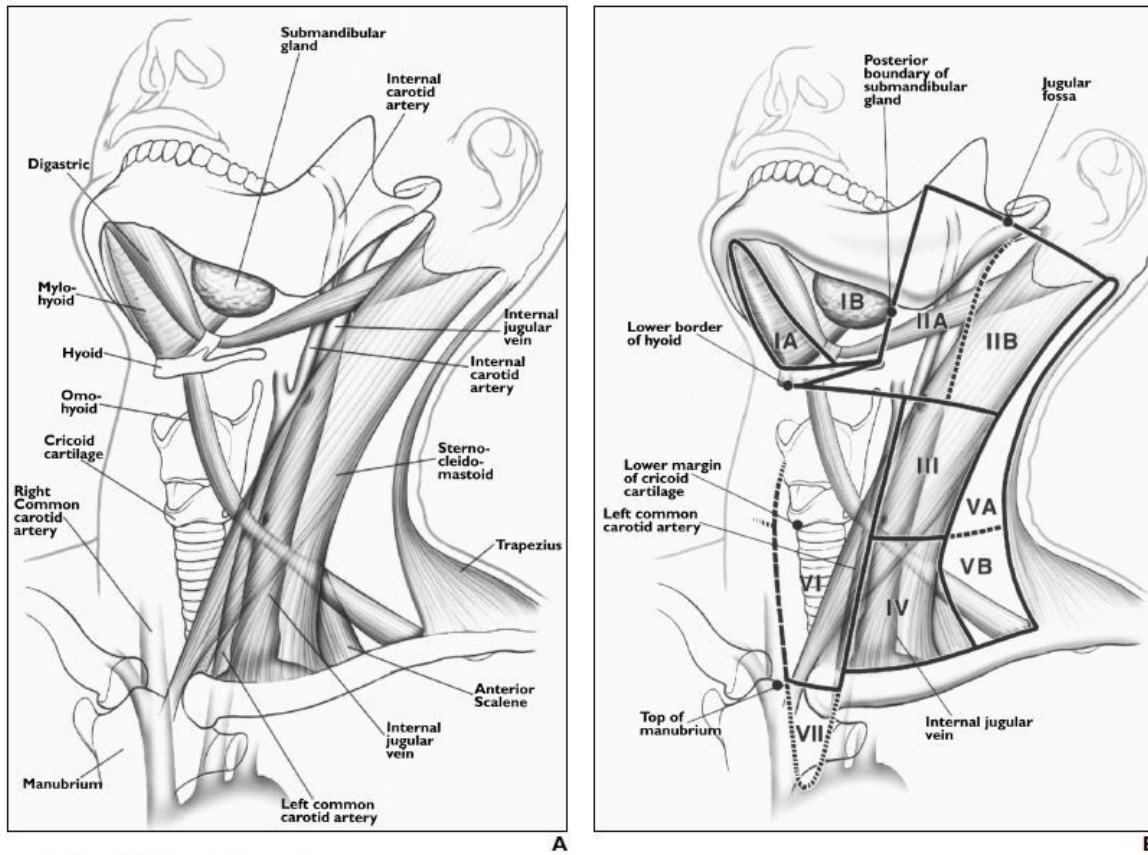
Fig. 1.—Neck as seen from left anterior view.
A, Drawing shows anatomy pertinent to nodal classification.
B, Drawing shows specific margins of anatomy seen in A that relate to definitions of classification levels. Note that line of separation between levels I and II is posterior margin of submandibular gland. Separation between levels II and III and level V is posterior edge of sternocleidomastoid muscle. Line of separation between levels IV and V is oblique line extending from posterior edge of sternocleidomastoid muscle to posterior edge of anterior scalene muscle. Posterior edge of internal jugular vein separates level IIA and IIB nodes. Carotid arteries separate levels III and IV from level VI. Top of manubrium separates levels VI and VII. (Reprinted with permission from [16])

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AJR:174, March 2000

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 Nodule Imaging Cheat Sheet

Thyroid Key*

○ – Cystic

■ – Solid

◑ – Cystic w/ solid area

◉ – Solid w/ cystic area

✦ – Complex

< – Calc

– Heterogeneous Lobe

– Multiple small nodules/cysts

*Imorgon Worksheets

- Measure up to 3 nodules per lobe, up to 2 in isthmus.
  - o Number superior-to-inferior
    - o 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)
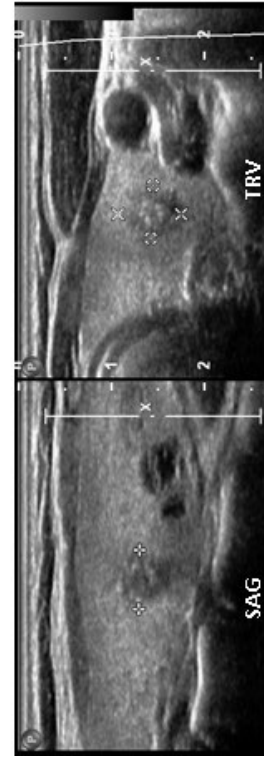
- If nodule is being measured, INCLUDE NECK SWEEPS
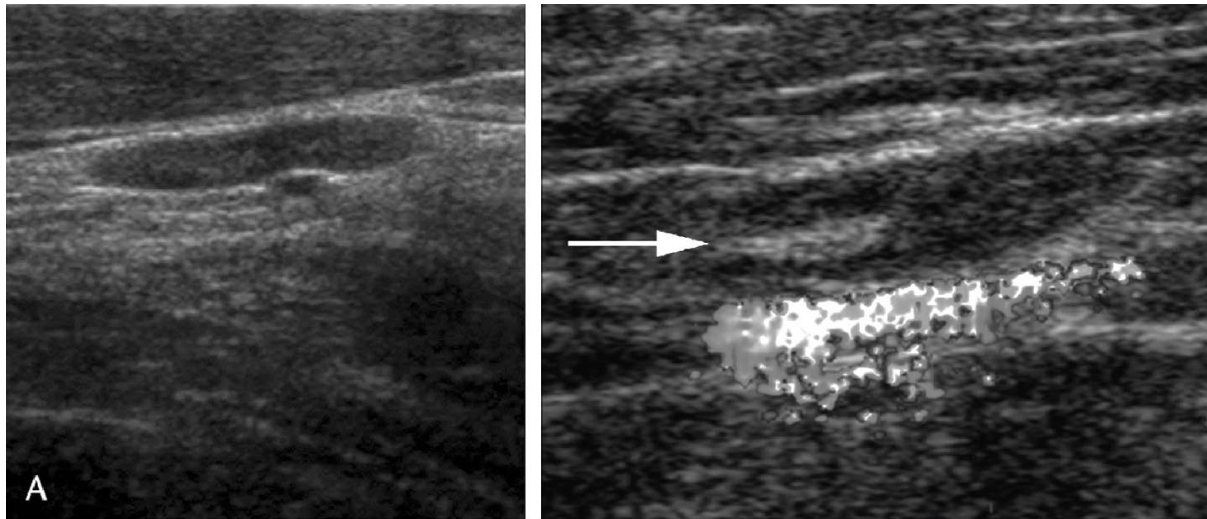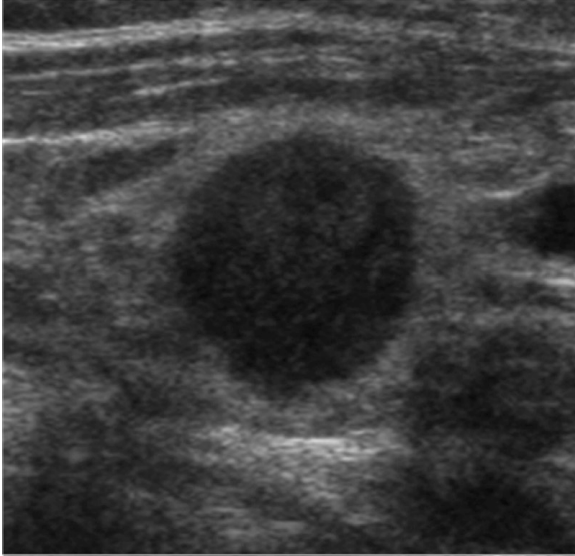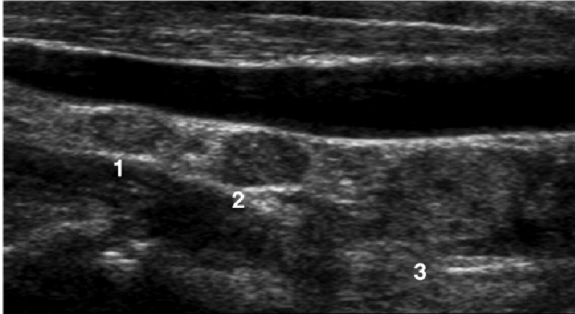 - o Measure only ABNORMAL lymph nodes

Lymph Node Atlas:

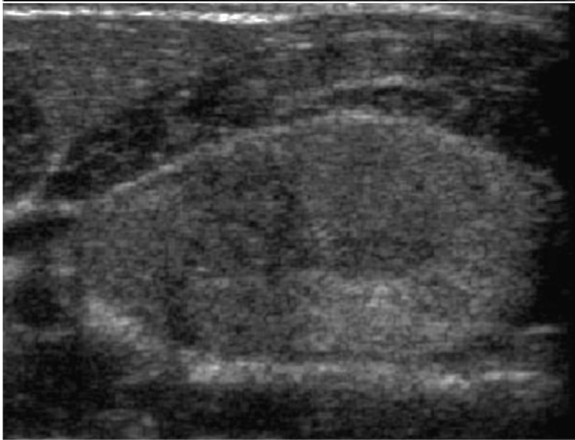Modified from Ultrasonography of Abnormal Neck Lymph Nodes, Ultrasound Quarterly 2007

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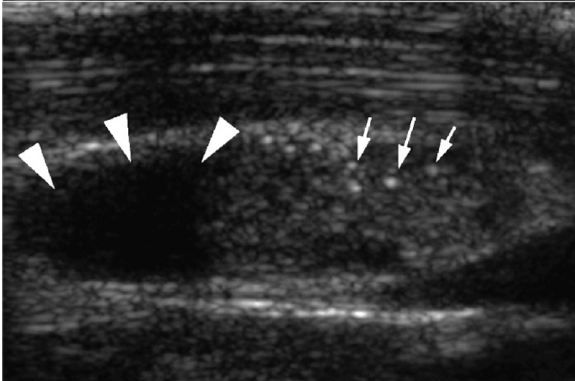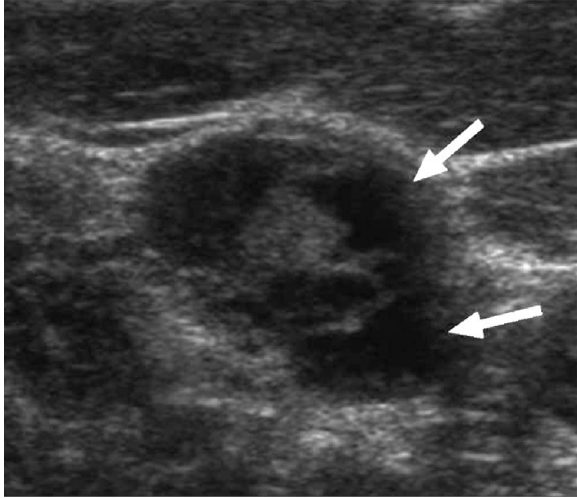
Abnormal round shape
(Lymphoma)

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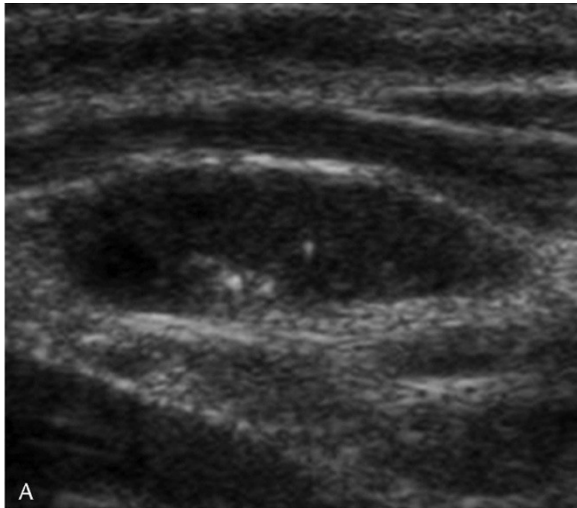lymph nodes (1-3)
(Metastatic papillary thyroid carcinoma)

Enlarged, heterogeneous and markedly
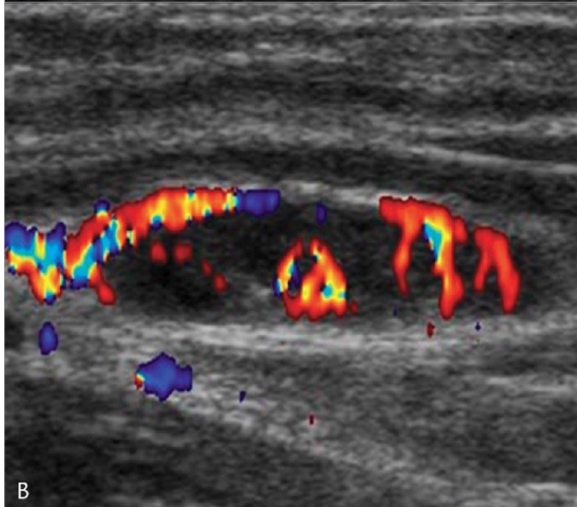hyperechoic
(Metastatic papillary thyroid carcinoma)

Microcalcifications (arrows) with cystic
changes (arrow heads)
(Metastatic papillary thyroid carcinoma)
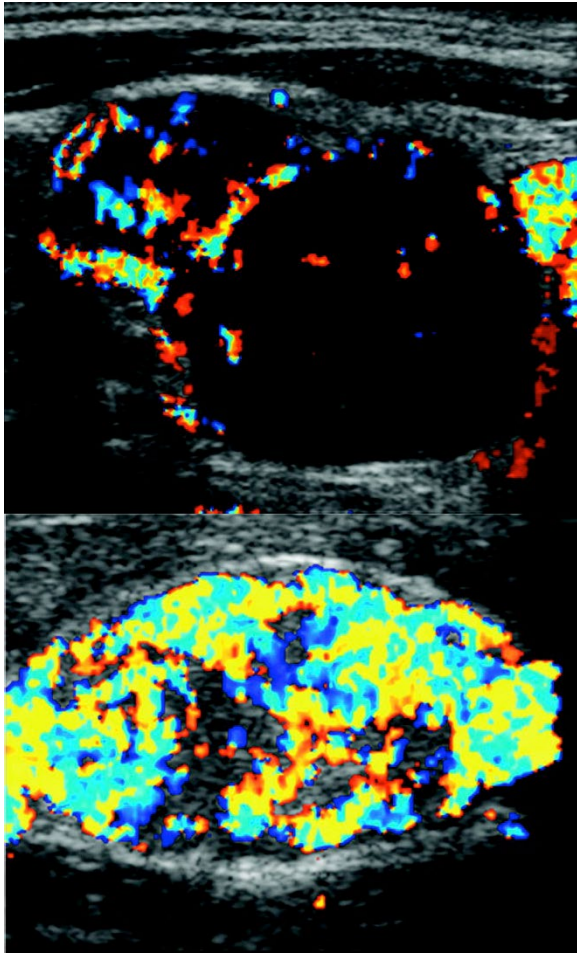
Heterogeneous with cystic spaces (arrows) (Metastatic papillary thyroid carcinoma)

Normal fatty hilum. Possible microcalcification (A). Cont…

However, abnormal vascularity with enlarged peripheral and capsular vessels (B)

Enlarged, heterogeneous lymph nodes with web of vascularity
(Lymphoma)

Markedly abnormal, chaotic hypervascularity
(Metastatic papillary thyroid carcinoma)

CHANGE HISTORY:

STATUS	NAME & TITLE	DATE	BRIEF SUMMARY
Submission	David Fetzer, Director	**1/18/2016**	Submitted
Approval	David Fetzer, Director	**1/18/2016**	Approved
Review	David Fetzer	**09-12-2018**	Reviewed
	Lori Watumull, MD	**11-14-2018**	Reviewed
Revisions	David Fetzer	11/17/2016	Added information regarding when to image levels I and V
	David Fetzer	09-12-2018	Corrections to be consistent with US Thyroid protocol
	Lori Watumull	09-24-2018	Minor edits for clarification

US Neck Lymph Node Survey   Revision date: 09-24-2018