Ultrasound – Post-Thyroidectomy Neck Evaluation

PURPOSE:
To evaluate the neck for residual tissue in the surgical bed as well as abnormal cervical lymph nodes.

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

INDICATIONS:
- History of thyroid cancer, thyroidectomy
- Signs or symptoms associated with thyroid cancer recurrence
- Abnormal lab values (example: increased thyroglobulin)
- Abnormal findings on other imaging studies
- Follow up known thyroid bed abnormalities or abnormal cervical lymph nodes

CONTRAINDICATIONS:
- No absolute contraindications

EQUIPMENT:
Linear array transducer with a frequency range of 9-18 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 thyroid resection bed as well as medial and lateral cervical lymph node compartments.

EXAM INITIATION:
- Introduce yourself to the patient
- Verify patient identity using patient name and DOB
- Explain test
- 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.

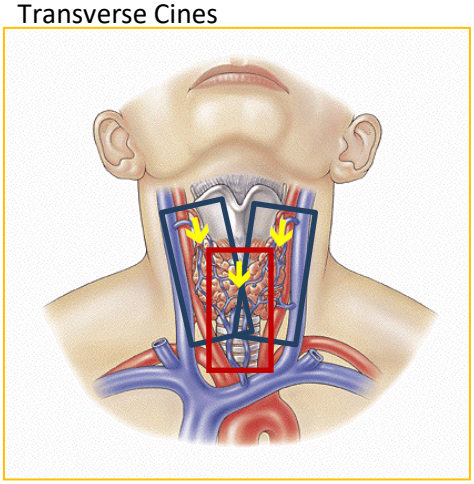
TECHNICAL CONSIDERATIONS:
- Review any prior imaging, making note of prior focal soft tissue abnormalities, abnormal lymph nodes, or other findings requiring comparison.
- Survey the thyroid resection bed for focal abnormalities. Suspicious features include foci with hypoechogenicity, round shape, increased vascularity, cystic changes and microcalcifications.

- Focal abnormalities should be documented with size measurements in 3 orthogonal planes and color Doppler
- Anterior cervical lymph nodes are divided into central (Levels I and VI) and lateral (Levels II-IV) compartments. Posterior cervical lymph nodes are found in levels VA and VB (see Appendix).
- Survey the anterior neck. Annotate images based on the nodal level (I, II, III, IV, VI), as defined in the Appendix.
- Suspicious lymph node features include rounded shape, loss of the central fatty hilum, irregular or lobulated cortex, heterogeneity, calcifications, flow other than in the hilum and cystic spaces.
- Lymph nodes size is a less reliable feature. Consider > 10mm in short axis as abnormal. Of note, normal Level II nodes are commonly larger. Other lymph nodes features trump node size.
- **NORMAL NODES SHOULD NOT BE MEASURED.** Abnormal nodes should be documented with size measurements in 3 orthogonal planes and color Doppler

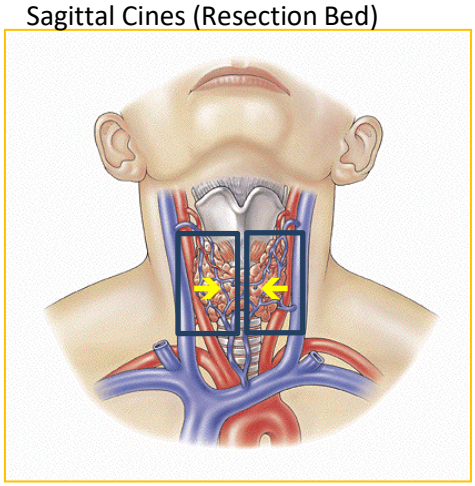
DOCUMENTATION:

- Thyroid Resection Bed
  - Grayscale images:
    - Longitudinal:
      - Right/left
        - Paratracheal; Mid; Lateral
    - Transverse:
      - Right/left
        - Superior; Upper mid; Mid; Lower mid; Inferior
      - Midline thyroid resection bed
  - Color Doppler
    - For focal abnormalities, document images without and with color Doppler
  - Cine sweeps
    - Thyroidectomy bed, transverse (superior to inferior) and longitudinal (lateral to medial)
    - Pretracheal, transverse (superior to inferior)

Transverse Cines



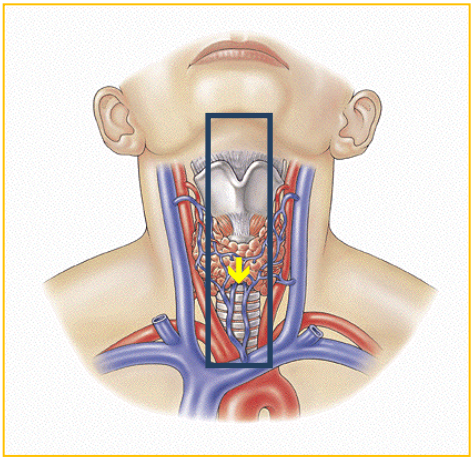
Sagittal Cines (Resection Bed)



Superior border: Inferior thyroid cartilage
Lateral border: Carotid/Jugular Complex
Medial border: Tracheal rings

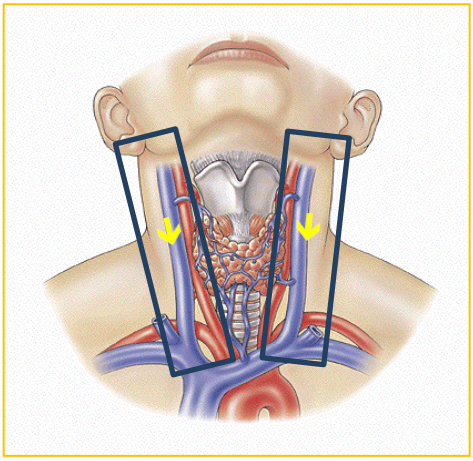
- Neck Lymph Node Survey
  - Survey of anterior and lateral cervical compartments for abnormal lymph nodes:
    - Grayscale images
      - Representative lymph nodes in central neck (Levels I and VI) and each lateral compartment (right and left Levels II, III, and IV), as defined in the Appendix.
      - If Level V lymph nodes are identified (physical exam; prior imaging; incidentally seen), additional grayscale images of 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-IV), superior to inferior.
      - If Level V lymph nodes are identified (physical exam; prior imaging; incidentally seen), additional transverse cine sweeps of Level V should be obtained.

Midline central neck (Levels I & VI)



Superior border: Submental
Inferior border: Sternum

Lateral neck (Levels II-IV)



Superior border: Submandibular gland
Inferior border: Clavicle
Medial border: Medial aspect of Carotid/Jugular Complex
Lateral Border: lateral edge of sternocleidomastoid muscle

  - **Normal lymph nodes should not be measured.** If nodes are abnormally or exhibit suspicious features, include the following:
    - 3 orthogonal measurements
    - Longitudinal images without and with color Doppler
- Data page(s)

- Complete Imorgon worksheets to annotate soft tissue nodules and abnormal lymph nodes (if applicable), their sizes, and suspicious features.

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

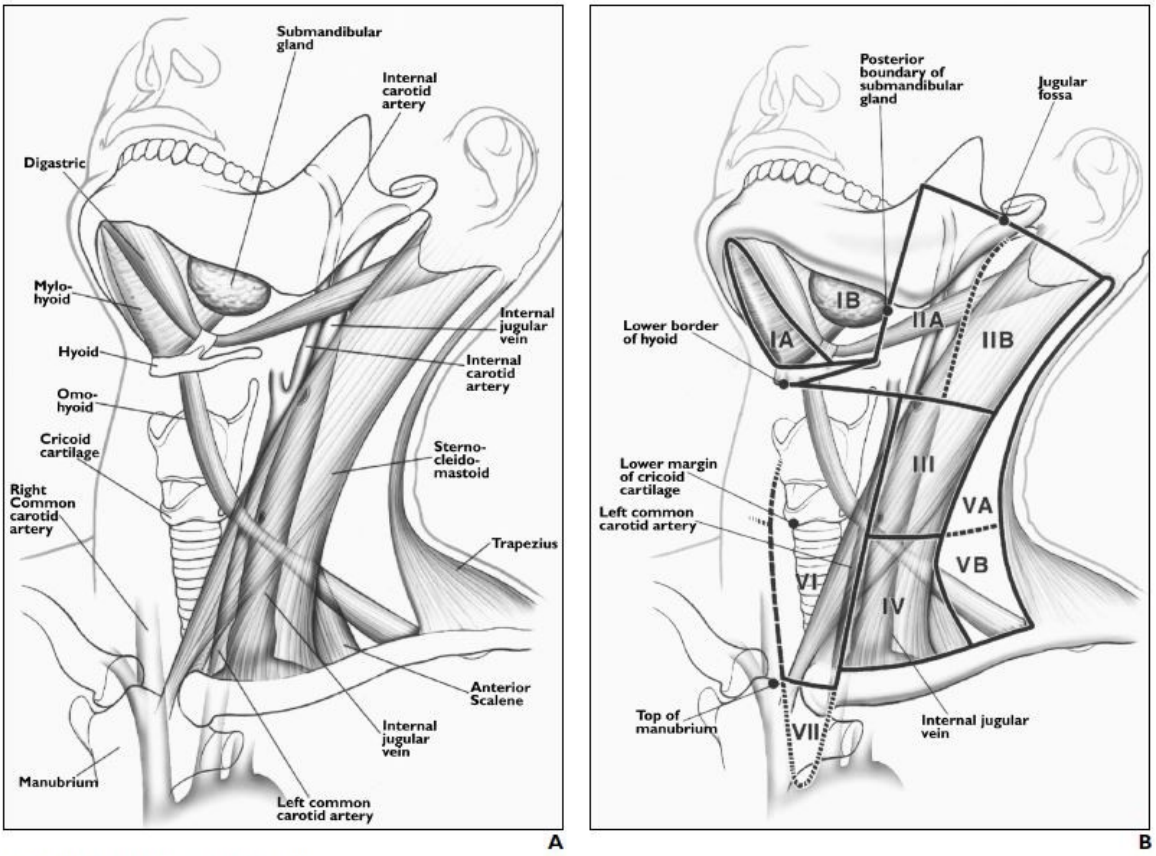


Fig. 1.—Neck as seen from left anterior view.
A, Drawing shows anatomy pertinent to nodal classification.
B, Drawing shows specific margins of anatomy seen in **A** that relate to definitions of classification levels. Note that line of separation between levels I and II is posterior margin of submandibular 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])

838 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*

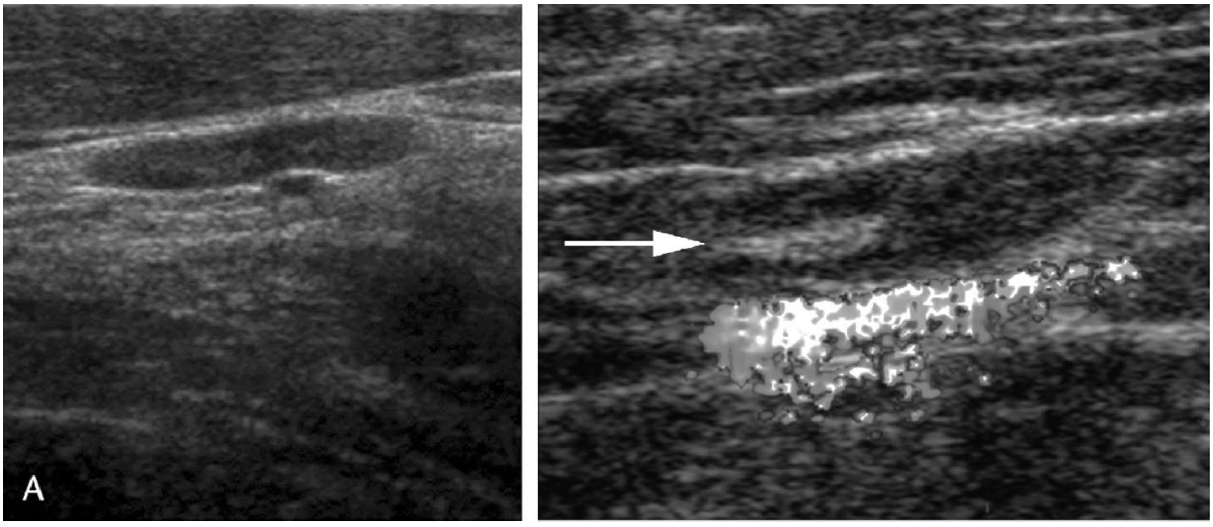
- Suspicious Features:
  - **Size** (controversial)
    - Levels II, > 10 mm short axis
    - Levels III, IV or VI, > 8 mm short axis
  - **Loss of fatty hilum**
  - **Round shape**
  - **Heterogeneous, hyperechoic cortex**
  - **Microcalcifications**
  - **Cystic spaces**
  - **Peripheral vascularity**

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

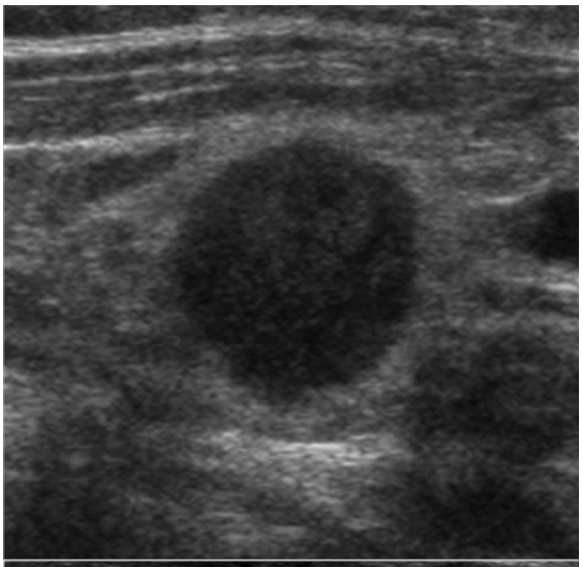
ref: European Thyroid Association guidelines for cervical ultrasound

Lymph Node Atlas:

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



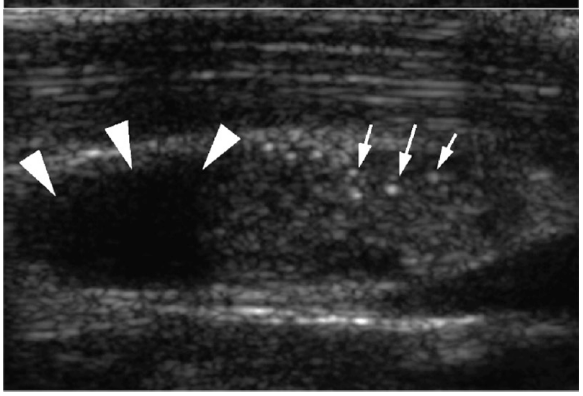
Normal appearance of several I cervical lymph nodes; elongated, thin cortex (A), with central fatty hilum (arrow).



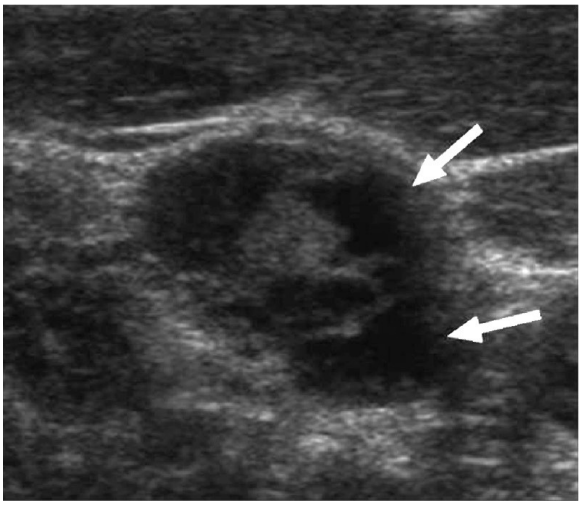
Abnormal round shape
(Lymphoma)

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

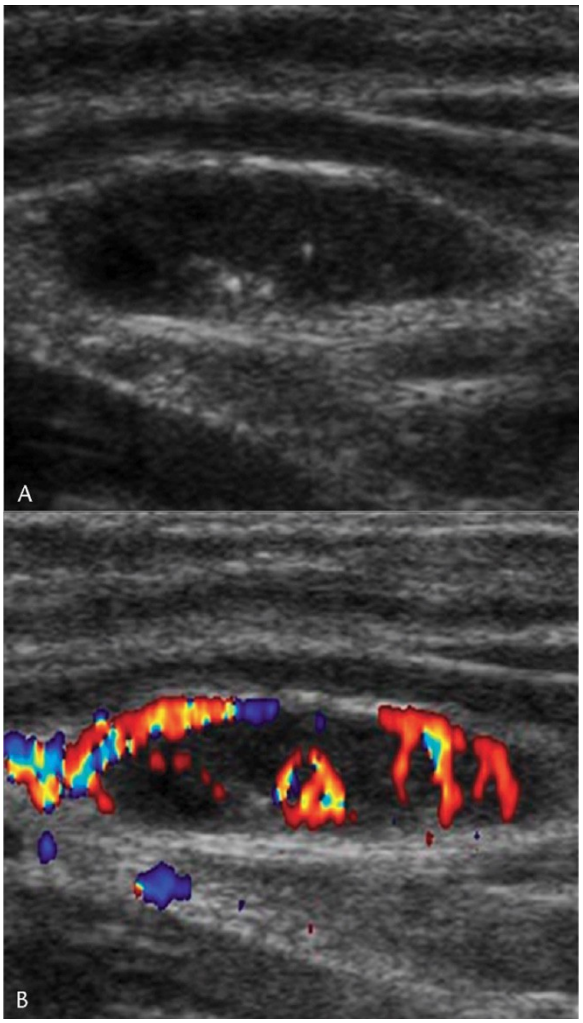
Enlarged, heterogeneous and markedly hyperechoic
(Metastatic papillary thyroid carcinoma)



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

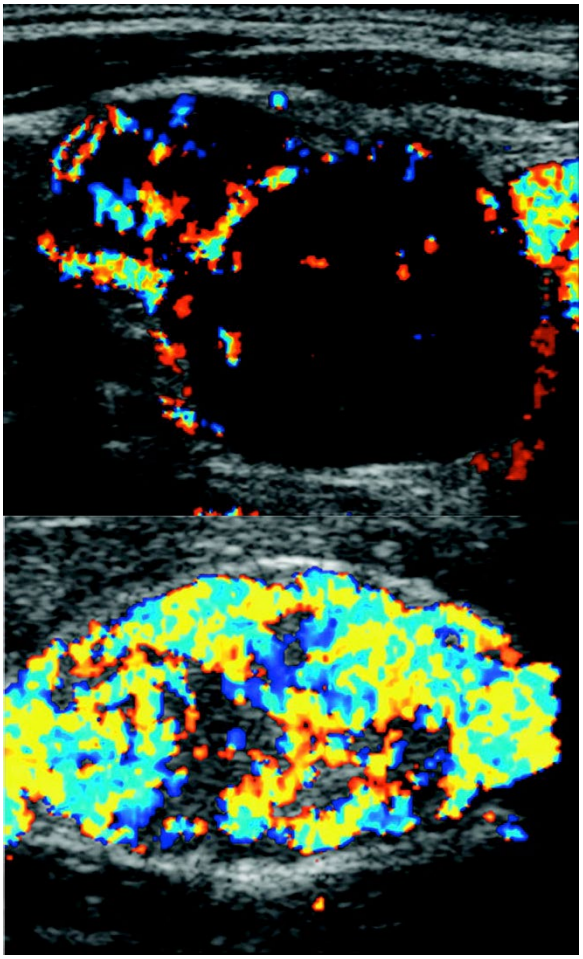


Heterogeneous with cystic spaces (arrows) (Metastatic papillary thyroid carcinoma)



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