Management of Thyroid Nodules, Parathyroid and Lymph Nodes

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Thyroid US is a poor screening tool because:

- 66% of benign nodules have at least one positive US predictor of papillary thyroid cancer
- 66% of papillary cancers have at least one non-suspicious US feature

So US guided FNA is a vital adjunct.

2015 ATA Guidelines RECOMMENDATION 7: FNA is the procedure of choice in the evaluation of thyroid nodules, when clinically indicated.
Indications for Thyroid FNA
(2015 ATA Management Guidelines Taskforce)
(Recommendation 8)

- Nodules > 1cm with high suspicion US features (strong recommendation, moderate-quality evidence)
- Nodules > 1cm with intermediate suspicion US features (strong recommendation, low-quality evidence)
- Nodules > 1.5cm with low suspicion US features (weak recommendation, low-quality evidence)
- Nodules > 2cm with very low suspicion US features (weak recommendation, moderate-quality evidence)

FNA not required for:

- Nodules that do not meet above criteria (strong recommendation, moderate-quality evidence)
- Purely cystic nodules (strong recommendation, moderate-quality evidence)
### TABLE 6.

**SONOGRAPHIC PATTERNS, ESTIMATED RISK OF MALIGNANCY, AND FINE-NEEDLE ASPIRATION GUIDANCE FOR THYROID NODULES**

<table>
<thead>
<tr>
<th>Sonographic pattern</th>
<th>US features</th>
<th>Estimated risk of malignancy, %</th>
<th>FNA size cutoff (largest dimension)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High suspicion</td>
<td>Solid hypoechoic nodule or solid hypoechoic component of a partially cystic nodule with one or more of the following features: irregular margins (infiltrative, microlobulated), microcalcifications, taller than wide shape, rim calcifications with small extrusive soft tissue component, evidence of ETE</td>
<td>&gt;70–90</td>
<td>Recommend FNA at ≥1 cm</td>
</tr>
<tr>
<td>Intermediate suspicion</td>
<td>Hypoechoic solid nodule with smooth margins without microcalcifications, ETE, or taller than wide shape</td>
<td>10–20</td>
<td>Recommend FNA at ≥1 cm</td>
</tr>
<tr>
<td>Low suspicion</td>
<td>Isoechoic or hyperechoic solid nodule, or partially cystic nodule with eccentric solid areas, without microcalcification, irregular margin or ETE, or taller than wide shape.</td>
<td>5–10</td>
<td>Consider FNA at ≥1.5 cm</td>
</tr>
<tr>
<td>Very low suspicion</td>
<td>Spongiform or partially cystic nodules without any of the sonographic features described in low, intermediate, or high suspicion patterns</td>
<td>3–5</td>
<td>Consider FNA at ≥2 cm, Observation without FNA is also a reasonable option</td>
</tr>
<tr>
<td>Benign</td>
<td>Purely cystic nodules (no solid component)</td>
<td>&lt;1</td>
<td>No biopsy</td>
</tr>
</tbody>
</table>

*a* Recommend FNA at ≥1 cm  
*b* Consider FNA at ≥2 cm, Observation without FNA is also a reasonable option
TI-RADS Calculator

Online calculator for Thyroid Imaging Reporting and Data System (TI-RADS) based on 2017 ACR white paper with guidance on fine needle aspiration (FNA) and follow-up.

Click here for images and description for each of the ultrasound features

- **Composition (Choose 1)**
  - Cystic or almost completely cystic 0 points
    - Spongeform 0 points
    - Mixed cystic and solid 1 point
    - Solid or almost completely solid 2 points

- **Echogenicity (Choose 1)**
  - Anechoic 0 points
    - Hyperechoic or isoechoic 1 point
    - Hypoechoic 2 points
    - Very hypoechoic 3 points

- **Shape (Choose 1)**
  - Wider-than-tall 0 points
    - Taller-than-wide 3 points

- **Margin (Choose 1)**
  - Smooth 0 points
    - Ir-defined 0 points
    - Lobulated or irregular 2 points
    - Extra-thyroidal extension 3 points

- **Echogenic Foci (Choose All That Apply)**
  - None or large comet-tail artifacts 0 points
    - Macroccalcifications 1 point
    - Peripheral (rim) calcifications 2 points
    - Punctate echogenic foci 3 points

**Total Points:** 0

**TI-RADS Score:** TR1

**Recommendations:** Benign: No FNA
Ultrasound Features

1. Calcification
   a. Egg shell calcification (B/M)
   b. Coarse calcification (B/M)
   c. Microcalcification/punctate
      i. with comet-tail (B)
      ii. without comet-tail (M)

2. Echogenicity
   a. hyperechoic (B)
   b. hypoechoic (M)

3. Vascularity
   a. peripheral (B)
   b. intranodular flow (M)

4. Margins/halo
   a. presence of halo (B)
   b. irregular margins/microlobulated (M)

B = benign
M = malignant
Ultrasound Features

Benign

✦ spongiform
✦ giraffe pattern
✦ cyst with colloid clot
✦ diffuse hyperechogenic
✦ comet-tail artifact (colloid)

Malignant

✦ taller-than-wide shape
✦ intranodule hypervascular
✦ irregular margins/microlobulated
✦ absence of halo
✦ hypoechogenic
✦ solid
✦ microcalcifications
Hyperechoic Nodule
Hypoechoic Nodules

Well defined borders

Ill-defined borders
Isoechoic Nodule

With Halo

Without halo

(and microcalcifications)
Microcalcifications
Comet-tail Artifact
Macrocalcifications
Cyst with Colloid Clot
Spongiform Nodule
Giraffe Pattern
Hypervascular on color flow doppler

Stop sign

Ring of fire
Hypoechoic, microlobulated margin, taller-than-wide shape
106 patient undergoing parathyroidectomy had pre-op surgeon US and sestamibi localization:

- Sensitivities for correct *quadrant* localization for US vs sestamibi were 87% vs. 58%.

- Sensitivities for correct *side* localization for US vs sestamibi were 91% vs 74%.

1. Superior parathyroid - Seen on US above level of cricoid or posterior to carotid artery.

2. Inferior parathyroid - Seen on US ventral to carotid artery.
Parathyroid Adenoma

Transverse/axial plane  Longitudinal/sagittal plane
Lymph Node Evaluation for Surgical Planning of Thyroid Cancer
(2015 ATA Management Guidelines Taskforce)

- (Recommendation 32) Preoperative neck US for cervical (central and especially lateral neck compartments) lymph nodes is recommended for all patient undergoing thyroidectomy for malignant or suspicious for malignancy cytologic or molecular findings. US-guided FNA of sonographically suspicious lymph nodes > 8-10mm in the smallest diameter should be performed to confirm malignancy if this would change management. (strong recommendation, moderate-quality evidence)
US Lymph Node Normal

1. Shape: Oval shape

2. Echogenicity: Hypoechoic lymph node with hyperechoic hilus

3. Vascularity: Hilar vascularity or avascular
US Lymph Node Abnormal

1. Shape: Round shape
2. Hyperechoic lymph node
3. Vascularity: vascularity
4. Absence of hills
5. Cystic change
6. Vascularity
US Lymph Node Abnormal

**Table 7. Ultrasound Features of Lymph Nodes Predictive of Malignant Involvement**

<table>
<thead>
<tr>
<th>Sign</th>
<th>Reported sensitivity, %</th>
<th>Reported specificity, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microcalcifications</td>
<td>5–69</td>
<td>93–100</td>
</tr>
<tr>
<td>Cystic aspect</td>
<td>10–34</td>
<td>91–100</td>
</tr>
<tr>
<td>Peripheral vascularity</td>
<td>40–86</td>
<td>57–93</td>
</tr>
<tr>
<td>Hyperechogenicity</td>
<td>30–87</td>
<td>43–95</td>
</tr>
<tr>
<td>Round shape</td>
<td>37</td>
<td>70</td>
</tr>
</tbody>
</table>
That's all folks!