Thyroid Nodules and Ultrasound

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No Financial Disclosures

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Acknowledgements

Ed Peremaki (SPH)
Emily Pang (VGH)
• Large volume
  – 1278 US
  – 540 bxt
OUTLINE PRESENTATION

• Background
• Cases
• What are we currently using (and why)
• ACR TI-RADS system
• Discussion
Case 1

• 52 female
• Incidental on Carotid US

• Size 1.2 (AP) x 0.9 (TR) x 1.3 (CC)

• Management?
Case 2

- Size 2.0 (AP) x 1.6 (TR) x 1.7 (CC)

- 43 female

- 5mm growth 1 year

- Biopsy?
Case 3

- Size 1.2 (AP) x 1.6 (TR) x 1.8 (CC)
- Male 55
- Incidental on CT Chest
- Recent biopsy "inadequate"
- Management?
INTRODUCTION

- Thyroid nodules are very common
- Estimated prevalence 4-68%

Guth S. Very high prevalence of thyroid nodules detected by high frequency (13 MHz) ultrasound examination. Eur J Clin Investig
INTRODUCTION

- About 5-10% malignant

- Differentiated
  - Papillary 80%
  - Follicular 10%

- Poorly differentiated carcinoma
  - Medullary 5%
  - Anaplastic 2%
INTRODUCTION

- Incidence Thyroid ca dramatically increased past 30 years
- Increased use Ultrasound and incidentally detected on other modalities
- Mortality Thyroid ca remained relatively stable

THYROID CANCER SCREENING IN SOUTH KOREA

Thyroid screening with ultrasound becomes available

Diagnosed cases increase rapidly

Deaths remain constant


LET’S BEAT CANCER SOONER
cruk.org
Incidence rates for thyroid cancer by province

Topstad D, Dickinson JA. CMAJ Open. 2017 Aug
New Number of New Thyroid Ca Diagnosed in 2015 in BC

<table>
<thead>
<tr>
<th>Age at Diagnosis</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-19</td>
<td>0</td>
<td>10</td>
<td>10</td>
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<tr>
<td>20-39</td>
<td>35</td>
<td>80</td>
<td>110</td>
</tr>
<tr>
<td>40-59</td>
<td>40</td>
<td>135</td>
<td>180</td>
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<tr>
<td>60-79</td>
<td>35</td>
<td>80</td>
<td>110</td>
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<tr>
<td>80+</td>
<td>5</td>
<td>20</td>
<td>25</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>115</strong></td>
<td><strong>320</strong></td>
<td><strong>435</strong></td>
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<tr>
<td>Age at Death</td>
<td>Males</td>
<td>Females</td>
<td>Total</td>
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<tr>
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<td>10</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>80+</td>
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<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>15</td>
<td>30</td>
</tr>
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</table>
# Estimated New Thyroid Cancer Diagnoses in 2018

<table>
<thead>
<tr>
<th>Health Authority</th>
<th>0-19</th>
<th>20-39</th>
<th>40-59</th>
<th>60-79</th>
<th>80+</th>
<th>Total*</th>
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<tbody>
<tr>
<td>Interior</td>
<td>0</td>
<td>15</td>
<td>35</td>
<td>30</td>
<td>5</td>
<td>80</td>
</tr>
<tr>
<td>Fraser</td>
<td>0</td>
<td>55</td>
<td>95</td>
<td>60</td>
<td>15</td>
<td>220</td>
</tr>
<tr>
<td>Coastal</td>
<td>0</td>
<td>40</td>
<td>60</td>
<td>35</td>
<td>5</td>
<td>150</td>
</tr>
<tr>
<td>Island</td>
<td>0</td>
<td>20</td>
<td>35</td>
<td>30</td>
<td>5</td>
<td>90</td>
</tr>
<tr>
<td>Northern</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>10</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td><strong>BC</strong></td>
<td>5</td>
<td>140</td>
<td>235</td>
<td>165</td>
<td>35</td>
<td>580</td>
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</table>

*Total includes all age groups.
## Estimated Thyroid Cancer Deaths 2018

<table>
<thead>
<tr>
<th>Health Authority</th>
<th>0-19</th>
<th>20-39</th>
<th>40-59</th>
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<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Fraser</td>
<td>0</td>
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<td>0</td>
<td>10</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Coastal</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Island</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Northern</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
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<td><strong>BC</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
<td>10</td>
<td>30</td>
</tr>
</tbody>
</table>

[http://www.bccancer.bc.ca](http://www.bccancer.bc.ca)
“We believe the time has come to address the problem of papillary thyroid cancer overdiagnosis and overtreatment.”

The problem is particularly acute for women, who have lower autopsy prevalence of thyroid cancer than men but higher cancer detection rates by a 3:1 ratio.

Thyroid Nodules: Is It Time to Turn Off the US Machines?¹

John J. Cronan, MD

The authors of the article “Benign into the US and endocrinology worlds. "

Radiology: June 2008
We propose the term Indolent Lesion of Epithelial origin, or IDLE, for those lesions currently labelled as cancers.

75% of Canadians diagnosed with thyroid cancer don't need aggressive treatment, new study suggests

Overdiagnosis likely due to improvements in imaging technology and overtesting, say researchers

Tricia Lo - CBC News - Posted: Aug 14, 2017 3:37 PM MT | Last Updated: August 21, 2017
INTRODUCTION

Need a “reliable, non-invasive method to identify which nodules warrant FNA on the basis of a reasonable likelihood of biologically significant malignancy”

many professional societies have developed ultrasound-based risk stratification systems to identify nodules that warrant biopsy or follow-up
US-based risk stratification systems

• ACR TI-RADS Thyroid Imaging Reporting and Data System
• ATA
• K-Tirads
• BTA
• National Comprehensive Cancer Network (NCCN)
• AACE/ACE/AME
• F-Tirads
• SRU Ultrasound "U" classification
• McGill Thyroid Nodule Score (MTNS)
US-based risk stratification systems

• Qualitative: How the nodule looks like (ATA)

• Quantitative scoring system: (TI-RADS)
ATA 2015

High Suspicion >70-90%
- microcalcifications
- hypochoic nodule
- irregular margin

Intermediate Suspicion 10-20%
- hypochoic solid regular margin
- hypochoic solid irregular margin

Low Suspicion 5-10%
- hyperechoic solid regular margin
- isoechoic solid regular margin
- partially cystic with eccentric solid area
- partially cystic with eccentric solid areas

Very low Suspicion <3%
- spongiform
- partially cystic no suspicious features
- partially cystic no suspicious features

Benign <1%
- cyst
2015 American Thyroid Association Management Guidelines
Diagnostic performance?

US-based risk stratification systems
Comparison between the TIRADS and the 2014 ATA Guidelines.

- Both TIRADS and the ATA guidelines provide effective malignancy risk stratification for thyroid nodules

Yoon JH et al. Radiology. 2016 Mar;278(3):917
Reducing the number of unnecessary thyroid biopsies while improving diagnostic accuracy: towards the "right" TIRADS

• Wide variety in their ability to reduce the number of unnecessary thyroid nodule FNAs.

• The ACR TIRADS outperformed the others, classifying over half the biopsies as unnecessary.

Grani G at al. J Clin Endocrinol Metab. 2018
## Diagnostic Performance of Seven Society Guidelines Applied to 2000 Thyroid Nodules

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity %</th>
<th>Specificity %</th>
<th>PPV %</th>
<th>NPV %</th>
<th>Acc %</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACR</td>
<td>74.7</td>
<td>67.3</td>
<td>40.2</td>
<td>90.1</td>
<td>69.0</td>
</tr>
<tr>
<td>ATA</td>
<td>87.6</td>
<td>33.2</td>
<td>28.3</td>
<td>91.6</td>
<td>46.0</td>
</tr>
<tr>
<td>AACE/ACE/AME</td>
<td>80.4</td>
<td>58.0</td>
<td>36.0</td>
<td>91.0</td>
<td>63.1</td>
</tr>
<tr>
<td>NCCN</td>
<td>92.5</td>
<td>30.2</td>
<td>28.0</td>
<td>93.2</td>
<td>44.4</td>
</tr>
<tr>
<td>FSE</td>
<td>72.7</td>
<td>62.4</td>
<td>36.2</td>
<td>88.6</td>
<td>64.7</td>
</tr>
<tr>
<td>SRU</td>
<td>70.9</td>
<td>41.5</td>
<td>26.3</td>
<td>82.9</td>
<td>48.2</td>
</tr>
<tr>
<td>KTA</td>
<td>94.5</td>
<td>26.4</td>
<td>27.4</td>
<td>94.2</td>
<td>41.9</td>
</tr>
</tbody>
</table>

*Ha EJ et al. Radiology. 2018 Jun. 287(3)*
so far, no consensus on a single system has emerged
SPH

- Large volume requests. Risk factors? Urgency?
- Previous imaging often not available or inadequate
- Recommendations for biopsy vs follow-up often inconsistent

- Clinicians are often frustrated by inconsistent biopsy recommendations
- Or don’t get a nodule biopsied to their liking
SPH Examples

• Multinodular goiter. “Please Bxt all nodules >1 cm”

• Repeated request for clearly benign nodules

• Biopsy request in patients with other serious health conditions (Mets, ICU)
Goal SPH

• Too many guidelines. Can we pick 1?

• We should use descriptive terminology that everyone understands

• Clear guideline so our referring clinicians understand our position

• Clinicians on board
OPTIONS TO CONSIDER

SPH

• Adopt TI-RADS? ATA?
• one of the Other?

• Only go for size and growth

• Keep doing whatever we prefer to do as individuals
• Discussions and a vote

• ACR TI-RADS

• Now followed by VGH, UBC, Richmond
TIRADS

2017: ACR Thyroid Imaging, Reporting and Data System TI-RADS

Proposed by the American College of Radiology in 2017
1. Standardization of US Vocabulary and Reporting

2. Management guidelines based on risk stratification
TI-RADS

What’s New?

• Architecture determines management

• 5 categories different morphologic features
  • Points are assigned to each

• Final score (1-5) to stratify risk

• Higher size threshold for FNA and follow-up
  • Able to classify all nodules, unlike ATA criteria
ACR TI-RADS FEATURE CATEGORIES

1. Composition
2. Echogenicity
3. Shape
4. Margin
5. Echogenic Foci
1. COMPOSITION

Cystic or almost entirely cystic (0 points)

Spongiform (0 points)
– no further points are added
1. COMPOSITION

Mixed cystic and solid (1 point)

- More suspicious features of solid components: eccentric, acute angles, punctate echogenic foci, lobulation, hypoechogenic
- Exclude echogenic debris: mobile, avascular
- Assign remaining points based on solid component
1. COMPOSITION

Solid or almost completely solid (2 points)

* Assign 2 points if unable to determine because of calcification (assume solid)
2. ECHOGENICITY

<table>
<thead>
<tr>
<th>Anechoic (0 points)</th>
<th>Hyperechoic or isoechoic (1 points)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Anechoic Image" /></td>
<td><img src="image2.png" alt="Hyperechoic Image" /></td>
</tr>
</tbody>
</table>

- I.e. cystic or almost completely cystic
- Compared to adjacent thyroid parenchyma
- 1 point of unable to determine due to calcification
2. ECHODENSITY

<table>
<thead>
<tr>
<th>Hypoechoic (2 points)</th>
<th>Very hypoechoic (3 points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Image 1]</td>
<td>![Image 2]</td>
</tr>
</tbody>
</table>

- Relative to thyroid parenchyma
- Relative to neck strap muscles
3. SHAPE

<table>
<thead>
<tr>
<th>Wider than tall (0 points)</th>
<th>Taller than wide (3 points)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image 1" /></td>
<td><img src="image2.png" alt="Image 2" /></td>
</tr>
</tbody>
</table>

- As determined in the transverse plane, compare dimensions parallel and perpendicular to ultrasound beam (can usually be visually determined)
- Insensitive but specific indicator of malignancy
4. MARGINS

<table>
<thead>
<tr>
<th>Smooth (0 points)</th>
<th>Ill-defined (0 points)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Smooth Image" /></td>
<td><img src="image2" alt="Ill-defined Image" /></td>
</tr>
<tr>
<td>• Uninterrupted, well-defined curvilinear edge</td>
<td>• Unable to define margins</td>
</tr>
<tr>
<td>• Spherical or elliptical</td>
<td></td>
</tr>
</tbody>
</table>
4. MARGINS

<table>
<thead>
<tr>
<th>Lobulated or irregular (2 points)</th>
<th>Extra-thyroidal extension (3 points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lobulated: protrusions into adjacent tissue</td>
<td>Nodule extends through thyroid border</td>
</tr>
<tr>
<td>Irregular: jagged, spiculated, or sharp margins</td>
<td>Use caution when reporting minimal ETE, especially of the nodule otherwise appears benign</td>
</tr>
</tbody>
</table>
# 5. ECHOGENIC FOCI

<table>
<thead>
<tr>
<th>None or large comet tail artifact (0 pts)</th>
<th>Macroc calcifications (1 point)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Large comet tail – indicating colloid</td>
<td>• Coarse echogenic foci with acoustic shadowing</td>
</tr>
<tr>
<td>• V-shaped, &gt;1 mm, in cystic components</td>
<td></td>
</tr>
</tbody>
</table>
## 5. ECHOGENIC FOCI

Add all points in this category

<table>
<thead>
<tr>
<th>Peripheral (rim) calcifications (2 points)</th>
<th>Punctate echogenic foci (3 points)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image 1" /></td>
<td><img src="image2.png" alt="Image 2" /></td>
</tr>
<tr>
<td>• Complete or incomplete along margin</td>
<td>• Non-shadowing, may have small comet tail artifacts</td>
</tr>
</tbody>
</table>

5. ECHOGENIC FOCI

- Peripheral (rim) calcifications (2 points)
  - Complete or incomplete along margin
  - Non-shadowing, may have small comet tail artifacts

- Punctate echogenic foci (3 points)
Add Points From All Categories to Determine TI-RADS Level

0 Points
TR1
Benign
No FNA

2 Points
TR2
Not Suspicious
No FNA

3 Points
TR3
Mildly Suspicious
FNA if ≥ 2.5 cm
Follow if ≥ 1.5 cm

4 to 6 Points
TR4
Moderately Suspicious
FNA if ≥ 1.5 cm
Follow if ≥ 1 cm

7 Points or More
TR5
Highly Suspicious
FNA if ≥ 1 cm
Follow if ≥ 0.5 cm

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TECH SHEET

SONOGRAPHER WORKSHEET

THYROID

This is NOT a diagnosis by a medical practitioner. Please refer to the radiologist’s report for final results.

<table>
<thead>
<tr>
<th>ECHOTEXTURE</th>
<th>NORMAL</th>
<th>COARSE</th>
<th>DARK</th>
<th>BRIGHT</th>
<th>VASCULAR</th>
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<tbody>
<tr>
<td>RIGHT</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isthmus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEFT</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opaque</th>
<th>Gasdomin</th>
<th>Mass</th>
<th>Tenderness</th>
<th>Nodules</th>
<th>Echogenicity</th>
<th>Necrosis/Cyst</th>
<th>Reaction</th>
<th>Size (cm)</th>
</tr>
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<tbody>
<tr>
<td>RIGHT</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

SONOGRAPHER WORKSHEET

NECK LYMPH NODES

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<table>
<thead>
<tr>
<th>NODE</th>
<th>SIZE</th>
<th>Shunt</th>
<th>Vasc.</th>
<th>Shadow</th>
<th>Reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIGHT</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>LEFT</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
REPORTING CONSIDERATIONS

Additional considerations when reporting using TI-RADS

• Nodules targeted for surveillance numbered sequentially

• Definition of growth
  • at least 20% increase in two dimensions
  • minimum increase of 2 mm
  • or >50% increase in volume

• Discourage usage of the term dominant nodule
ACR FU Recommendations

• ACR believes that scanning intervals of less than 1 year are not warranted

• Except for proven cancers under active surveillance

Follow-up Recommendations

• **TR3**: follow up: 1, 3 and 5 years
• **TR4**: follow up: 1, 2, 3 and 5 years
• **TR5**: annual follow up for up to 5 years

• If Ti-Rads level changes go to yearly

• Imaging can stop at 5 years
Number of Nodules to Biopsy

- Biopsy of three or more nodules is poorly tolerated
- No more than two nodules with the highest score
- Size should not be the primary criterion
Cases
Case 1

- 52 female
- Incidental on Carotid US
- Size 1.2 (AP) x 0.9 (TR) x 1.3 (CC)
- Management?
Case 1

- Size 1.2 (AP) x 0.9 (TR) x 1.3 (CC)
- Composition: Solid 2
- Echogenicity: Hypoechoic 2
- Shape: Wider than tall 0
- Margins: Irregular 2
- Echogenic foci: Macrocalcifications 1 and punctate echogenic foci 3

- Total point: 10

TI-RADS 5
Add Points From All Categories to Determine TI-RADS Level

0 Points
- TR1: Benign
  - No FNA

2 Points
- TR2: Not Suspicious
  - No FNA

3 Points
- TR3: Mildly Suspicious
  - FNA if ≥ 2.5 cm
  - Follow if ≥ 1.5 cm

4 to 6 Points
- TR4: Moderately Suspicious
  - FNA if ≥ 1.5 cm
  - Follow if ≥ 1 cm

7 Points or More
- TR5: Highly Suspicious
  - FNA if ≥ 1 cm
  - Follow if ≥ 0.5 cm
Case 2

- Size 2.0 (AP) x 1.6 (TR) x 1.7 (CC)
- 43 female
- 5mm growth 1 year
- Biopsy?
Case 2

- Size 2.0 (AP) x 1.6 (TR) x 1.7 (CC)
- Composition: Spongiform:  0
- Echogenicity: Doesn’t matter:  0
- Shape: Doesn’t matter:  0
- Margins: Doesn’t matter:  0
- Echogenic foci: Doesn’t matter:  0

- Total points:  0

TI-RADS 1
ACR TI-RADS

<table>
<thead>
<tr>
<th>COMPOSITION</th>
<th>ECHOGENICITY</th>
<th>SHAPE</th>
<th>MARGIN</th>
<th>ECHOCENTRIC FOCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose 1: Cylic or almost completely cystic, 0 points</td>
<td>Choose 1: Anechoic, 0 points</td>
<td>Wider-than-tall, 0 points</td>
<td>Smooth, 0 points</td>
<td>None or large comet-tail artifacts, 0 points</td>
</tr>
<tr>
<td>Spongeform, 0 points</td>
<td>Hyperechoic or isoechoic, 1 point</td>
<td>Taller-than-wide, 3 points</td>
<td>Ill-defined, 0 points</td>
<td>Macrocalcifications, 1 point</td>
</tr>
<tr>
<td>Mixed cystic and solid, 1 point</td>
<td>Hypoechoic, 2 points</td>
<td></td>
<td>Lobulated or irregular, 2 points</td>
<td>Peripheral (cm), 2 points</td>
</tr>
<tr>
<td>Solid or almost completely solid, 2 points</td>
<td>Very hypoechoic, 3 points</td>
<td>Extra-thyroidal extension, 3 points</td>
<td>Extra-thyroidal extension, 3 points</td>
<td>Punctate echogenic foci, 3 points</td>
</tr>
</tbody>
</table>

Add Points From All Categories to Determine TI-RADS Level

- **0 Points**
  - TR1: Benign, No FNA
- **2 Points**
  - TR2: Not Suspicious, No FNA
- **3 Points**
  - TR3: Mildly Suspicious, FNA if ≥ 2.5 cm, Follow if ≥ 1.5 cm
- **4 to 6 Points**
  - TR4: Moderately Suspicious, FNA if ≥ 1.5 cm, Follow if ≥ 1 cm
- **7 Points or More**
  - TR5: Highly Suspicious, FNA if ≥ 1 cm, Follow if ≥ 0.5 cm

---

**COMPOSITION**
- Spongeform: Composed predominantly (>50%) of small cystic spaces. Do not add further points for other categories.
- Mixed cystic and solid: Assign points for predominant solid component.
- Assign 2 points if composition cannot be determined because of calcification.

**ECHOGENICITY**
- Anechoic: Applies to cystic or almost completely cystic nodules.
- Hyperechoic/isoechoic/hypoechoic: Compared to adjacent parenchyma.
- Very hypoechoic: More hypoechoic than strap muscles.
- Assign 1 point if echogenicity cannot be determined.

**SHAPE**
- Taller-than-wide: Should be assessed on a transverse image with measurements parallel to sound beam for height and perpendicular to sound beam for width.
- Care should be taken to avoid misinterpretation of vascular structures.
- This can usually be assessed by visual inspection.

**MARGIN**
- Lobulated: Protrusions into adjacent tissue.
- Irregular: Jagged, spiculated, or sharp angles.
- Extra-thyroidal extension: Obvious invasion = malignancy.
- Assign 0 points if margin cannot be determined.

**ECHOCENTRIC FOCI**
- Large comet-tail artifacts: V-shaped, >1 mm, in cystic components.
- Microcalcifications: Cause acoustic shadowing.
- Peripheral: Complete or incomplete along margin.
- Punctate echogenic foci: May have small comet-tail artifacts.

*Refer to discussion of papillary microcarcinomas for 5-9 mm TR5 nodules.*
Case 3

- Size 1.2 (AP) x 1.6 (TR) x 1.8 (CC)
- Male 55
- Incidental on CT Chest
- Recent biopsy “inadequate”
- Management?
Case 3

<table>
<thead>
<tr>
<th>Feature</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composition: Solid</td>
<td>2</td>
</tr>
<tr>
<td>Echogenicity: Hypo</td>
<td>2</td>
</tr>
<tr>
<td>Shape: Wider than Tall</td>
<td>0</td>
</tr>
<tr>
<td>Margins: Extra thyroid ext</td>
<td>3</td>
</tr>
<tr>
<td>Echogenic foci: No</td>
<td>0</td>
</tr>
</tbody>
</table>

• Total points: 7

TI-RADS 5: Repeat biopsy (or surgery?)
Add Points From All Categories to Determine TI-RADS Level

- **0 Points**
  - TR1: Benign
  - No FNA

- **2 Points**
  - TR2: Not Suspicious
  - No FNA

- **3 Points**
  - TR3: Mildly Suspicious
  - FNA if $\geq 2.5$ cm
  - Follow if $\geq 1.5$ cm

- **4 to 6 Points**
  - TR4: Moderately Suspicious
  - FNA if $\geq 1.5$ cm
  - Follow if $\geq 1$ cm

- **7 Points or More**
  - TR5: Highly Suspicious
  - FNA if $\geq 1$ cm
  - Follow if $\geq 0.5$ cm

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*Journal of the American College of Radiology 2017, 14, 587-595 DOI: (10.1016/j.jacr.2017.01.046) Copyright © 2017 American College of Radiology*
Composition (Choose 1)* - Cystic or almost completely cystic 0 points
  - Spongiform 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
  - Ill-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
  - Macrocalcifications 1 point
  - Peripheral (rim) calcifications 2 points
  - Punctate echogenic foci 3 points

Total Points: 0

TR-RADS Score: TR1

Recommendations: Benign: No FNA

Reset
EXAMPLE 3

**Composition (Choose 1)**
- Cystic or almost completely cystic 0 points
- Spongiform 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
- Ill-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
- Macrocalcifications 1 point
- Peripheral (rim) calcifications 2 points
- Punctate echogenic foci 3 points

**Total Points** 7

**TI-RADS Level** TR5

**Recommendations**
- Highly Suspicious: FNA if ≥ 1 cm; Follow if > 0.5 cm
SUMMARY
SUMMARY

• Consistent reports and recommendations
• Improves communication
• System that most can live with (for now)
SUMMARY

- Multidisciplinary approach required to mitigate overdiagnosis and overtreatment Papillary thyroid cancer

- TI-RADS Not perfect, oversimplifies

- Not the goal to diagnose every cancer
- Identifying clinically important cancers
SUMMARY

• Multidisciplinary approach
  – Previous reports
  – Indication of Urgency
  – Risk factors

• Risk stratification which also incorporates clinically relevant data and risk factors
MISC THYROID CONTROVERSIES for discussion

• What to do with High Risk Patients? Does TI-RADS Apply?

• What to do with request for TI-RADS 1-2 nodules?

• Significant proportion still in TI-RADS 3 and 4

• From Survey: TI RADS is a misguided attempt to lend a sense of accuracy to a test that is inherently inaccurate
Cancer Risk ACR TI-RADS 2018

• These guidelines are not rules!
ACR TI-RADS 2018

• These guidelines are not rules!

Estimated Cancer Risk

- TR1: <2%
  - Sens 74.7%
  - Spec 67.3%
  - PPV 40.2%
  - NPV 90.1%
  - Acc 69.0%
- TR2: <2%
- TR3: <5%
- TR4: 5-20%
- TR5: >20%

Tessler FN et al. ACR Thyroid Imaging, Reporting and Data System (TI-RADS): JACR. 14 (5): 587-595
References


• Hoang JK et al. Managing incidental thyroid nodules detected on imaging: white paper of the ACR Incidental Thyroid Findings Committee. 2015. JACR. 12 (2): 143-50.

• http://tiradscalculator.com
The End