THYROID NODULES: THE ROLE OF ULTRASOUND

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DEFINITION

- **Thyroid nodule**: Focal area within the thyroid gland with echogenicity different from surrounding parenchyma.
THYROID NODULES

- Very common
  - Palpable nodules in 4-8% of adults
  - Nodules on US in 10-41%
  - Found in up to 50% of adults in autopsy series
- Many nodules are discovered incidentally on imaging performed for non-thyroid reasons e.g. chest/neck CT, Carotid Doppler US
THYROID NODULES

- Thyroid cancer relatively uncommon
- American Cancer Society (2016) 64,300 new cases and 1980 deaths (USA)
- 1.6-12% of thyroid nodules selected for biopsy based on ultrasound features proved malignant (ACR)
THYROID NODULES

- Differential Diagnosis (benign or malignant?):
  - Benign:
    - Adenoma
    - Colloid cyst/nodule
    - Multinodular goiter
  - Malignant:
    - Papillary (75-80%)
    - Follicular (10-20%)
    - Medullary (3-5%)
    - Anaplastic (1-2%)
THYROID NODULES

- Papillary cancer: Low risk, 99% survival at 20 years after surgery.
THYROID NODULES

• Reasons for ultrasound referral:
  • Mass/nodule palpated by patient or physician
  • Incidental nodule(s) on other imaging modalities
  • Clinical issues with no palpable nodule
  • Screening in asymptomatic patients
ULTRASOUND

- Easily accessible
- No radiation
- Relatively quick and cost-effective
- Far superior to CT and MRI in characterizing thyroid nodules
- Can be used to guide FNA
ULTRASOUND

Operator dependent

May not visualize retrosternal portions of thyroid
ULTRASOUND

1. Characterize nodules e.g. palpable, or incidentally found on other imaging studies

2. Follow up of nodules with indeterminate features, or negative FNA results

3. Assist in deciding which nodule(s) should undergo first time or repeat FNA

4. Guide FNA procedure, particularly for non-palpable nodules
ULTRASOUND

- Which nodule(s) to biopsy?
- Significant overlap in features of benign and malignant nodules
- This can pose a problem in deciding appropriateness of FNA
ULTRASOUND

- Sonographic characteristics:
  - Size
  - Shape
  - Echogenicity
  - Margin
  - Calcifications
  - Internal content
  - Presence of abnormal lymph nodes
SONOGRAPHIC CHARACTERISTICS

• NODULE SIZE
  • Recommended size limits in deciding whether to biopsy or not differ among authors.
SONOGRAPHIC CHARACTERISTICS

• NODULE SHAPE
  • ‘Taller than wide’ vs ‘Wider than tall’.
SONOGRAPHIC CHARACTERISTICS

- ECHOGENICITY
SONOGRAPHIC CHARACTERISTICS

• ECHOGENICITY

Anechoic Cyst

Very Hypoechoic Nodule
SONOGRAPHIC CHARACTERISTICS

- **COMPOSITION:**
  - Cystic/Nearly completely cystic
  - Spongiform
  - Mixed cystic/solid
  - Solid/Nearly completely solid
SONOGRAPHIC CHARACTERISTICS

• MARGIN
  • Smooth
  • Lobulated
  • Irregular
  • Ill-defined
  • Extrathyroidal Extension
SONOGRAPHIC CHARACTERISTICS

- ECHOGENIC FOCI
  - NONE, OR LARGE COMET-TAIL ARTIFACTS
  - MACROCALCIFICATIONS
  - PERIPHERAL (RIM) CALCIFICATIONS
  - PUNCTATE ECHOGENIC FOCI
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REPORTING

• THYROID REPORTING: ‘Small gland, big problems’
  • Inconsistency in reporting among radiologists and ultrasound technologists
  • Uncertainty over which nodules should be biopsied
  • Consistent and decisive reporting is optimal for referrers and patients.
  • Preparation of accurate and reliable classification system has been difficult
REPORTING

• AMERICAN THYROID ASSOCIATION (ATA)
• SOCIETY OF RADIOLOGISTS IN ULTRASOUND (SRU)
• AMERICAN COLLEGE OF RADIOLOGISTS (ACR)
• ACR: TI-RADS classification. Analogous to BI-RADS
  • Task force undertook extensive literature review to come up with a system of risk stratification based on sonographic characteristics.
  • Terms used by authors were listed and refined.
  • Six categories of terms finally: size, shape, composition, echogenicity, margin, echogenic foci.
REPORTING

- Measurement: max. axial, perpendicular to maximum axial, maximum longitudinal to axial plane.
- Timing of follow up: Intervals of less than 1 year not recommended.
- Definition of (significant) growth:
  - 20% increase in at least two dimensions
  - Minimal increase of 2mm
  - 50% increase in volume
- Number of nodules to biopsy
- Assessment of cervical lymph nodes
SUMMARY

- Thyroid nodules are very common but have low malignant potential.
- Ultrasound is the favoured imaging modality for characterizing nodules and guiding intervention.
- There is high crossover between benign and malignant nodules, making risk stratification difficult.
- Using a standardized reporting system within facilities is ideal for reproducibility.
- TIRADS system put forward by the ACR may be helpful and offers end-to-end tools for description as well as recommendations for intervention or follow up for all nodules.
REFERENCES


• Tanpitukpongse P.T. et al.; Incidental Thyroid Nodules on CT or MRI: Discordance Between What We Report and What Receives Workup. AJR 2015; 205:1281–1287.


THANK YOU!