THYROID NODULES:
THE ROLE OF ULTRASOUND

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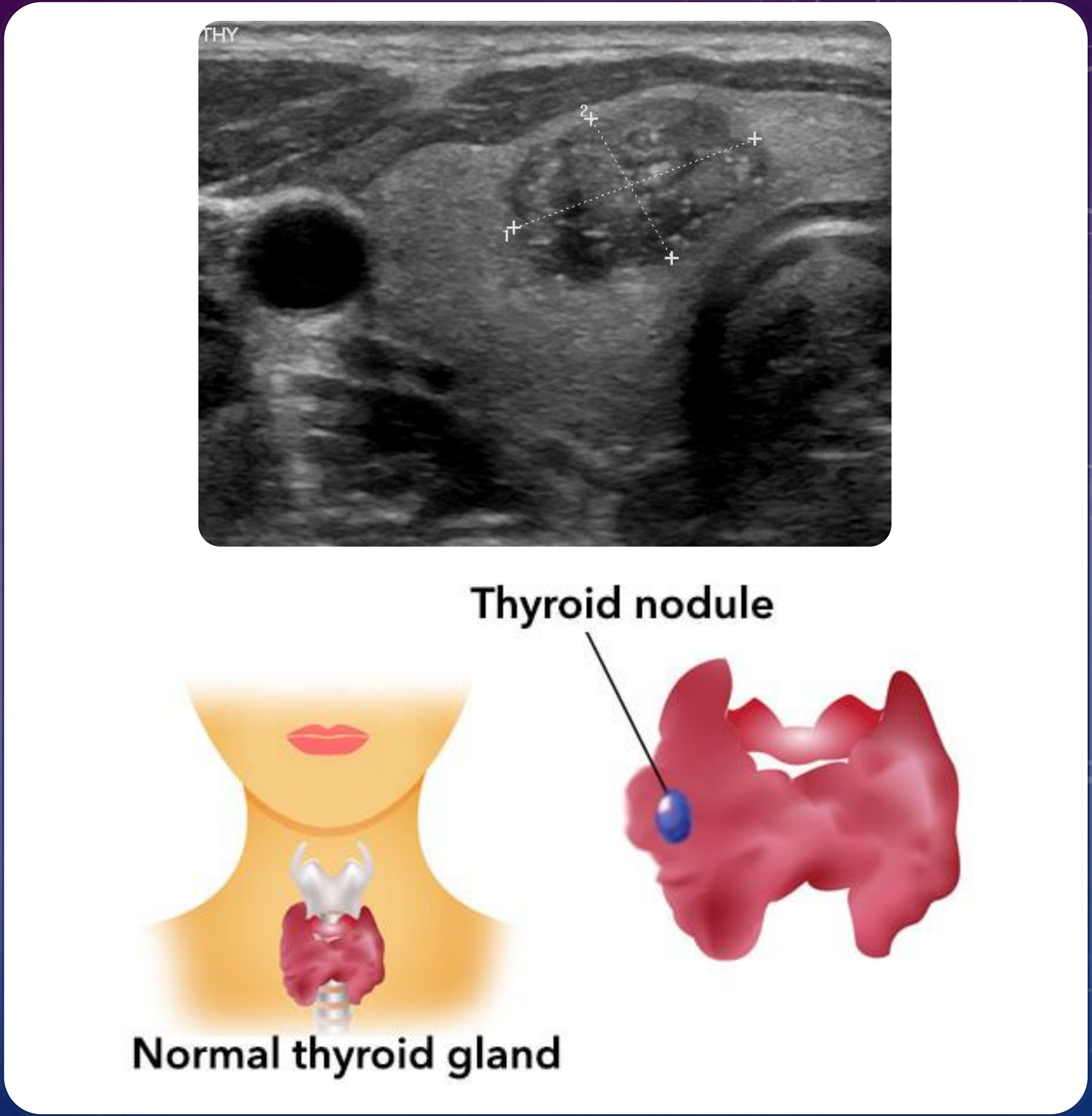
DEFINITION

- **<u>Thyroid nodule:</u>** Focal area within the thyroid gland with echogenicity different from surrounding parenchyma.



THYROID NODULES

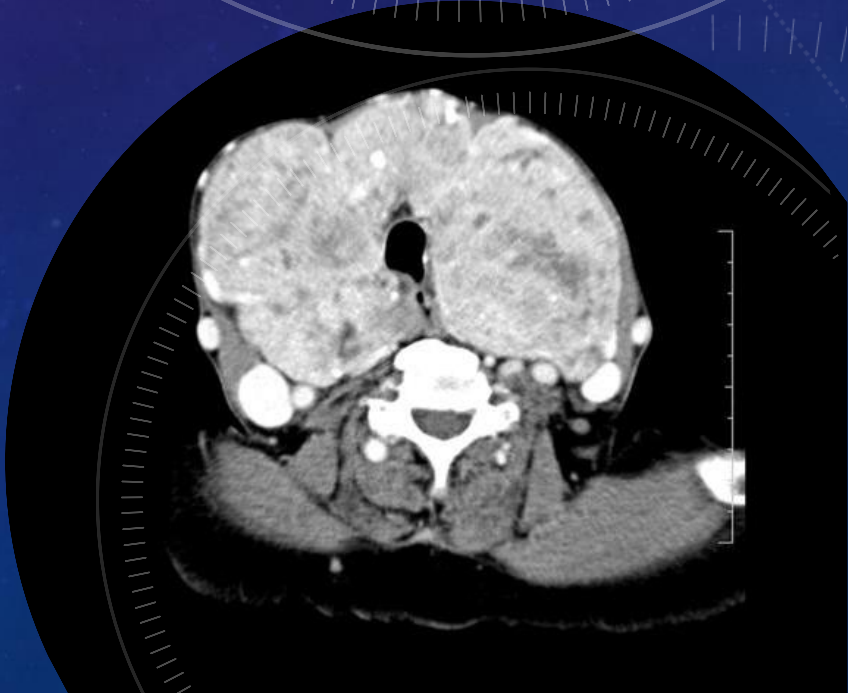
- Very common
  - Palpable nodules in 4-8% of adults
  - Nodules on US in 10-41%
  - Found in up to 50% of adults in autopsy series
- Many nodules are discovered incidentally on imaging performed for non-thyroid reasons e.g. chest/neck CT, Carotid Doppler US

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

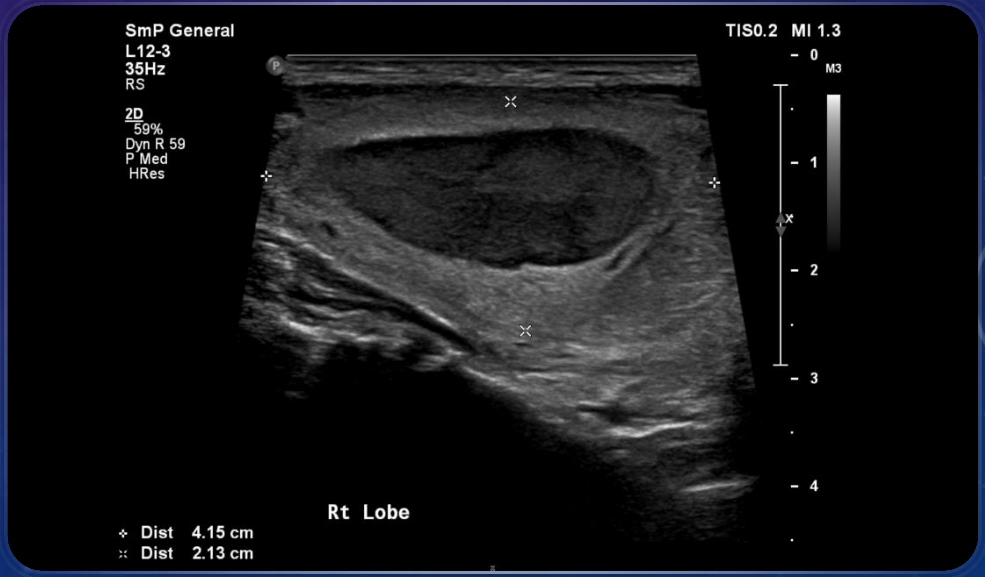
- Which nodule(s) to biopsy?
- Significant overlap in features of benign and malignant nodules
- This can pose a problem in deciding appropriateness of FNA

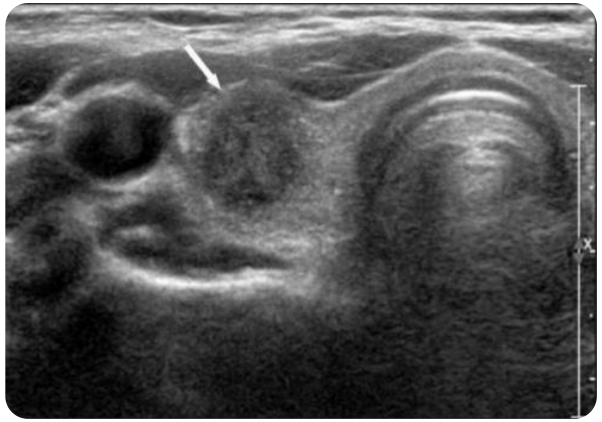
ULTRASOUND

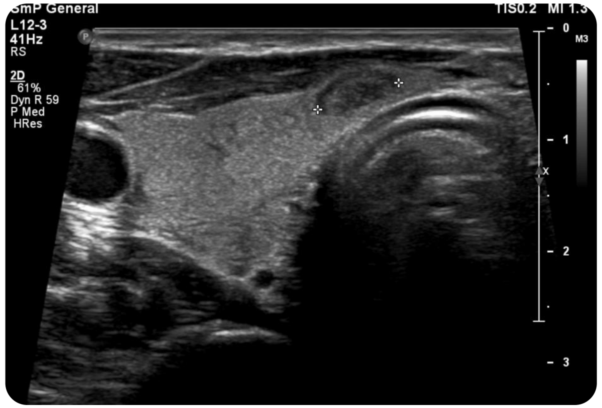
- Sonographic characteristics:
  - Size
  - Shape
  - Echogenicity
  - Margin
  - Calcifications
  - Internal content
  - Presence of abnormal lymph nodes

SONOGRAPHIC CHARACTERISTICS

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





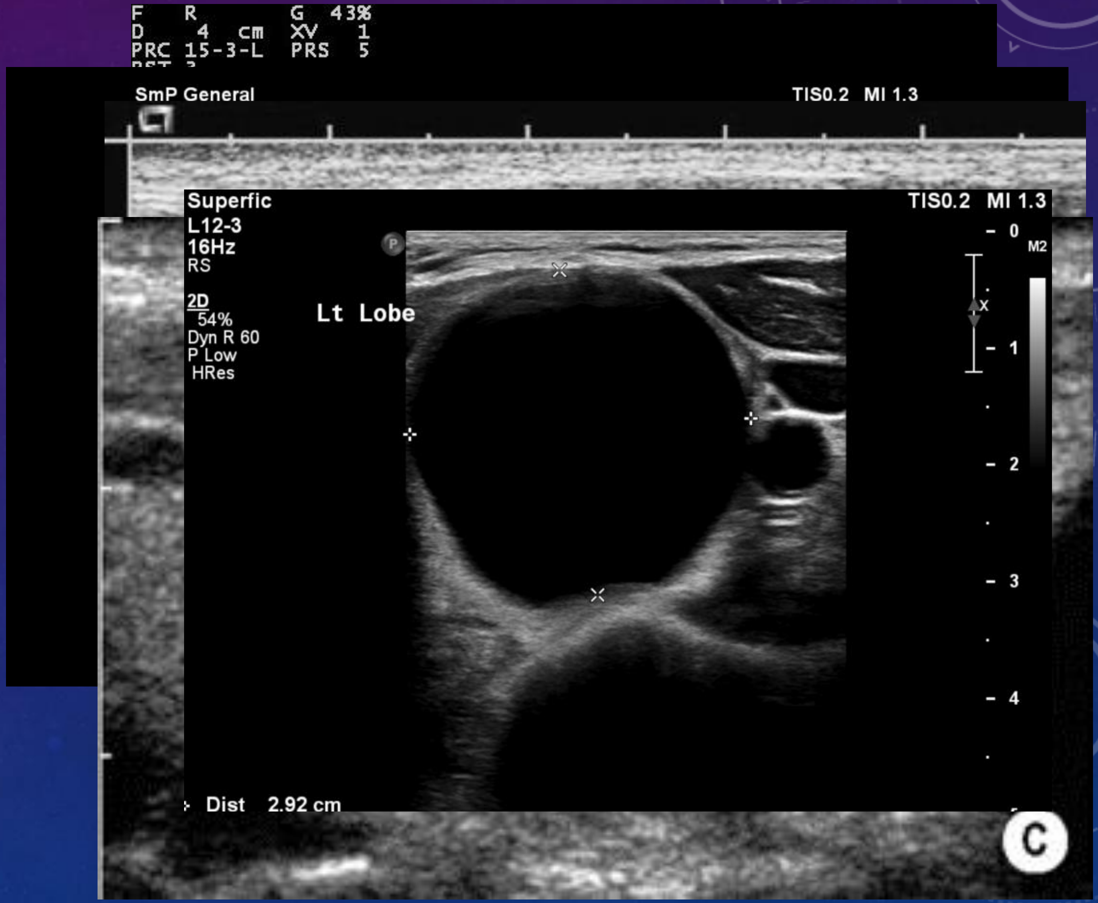


SONOGRAPHIC CHARACTERISTICS

- NODULE SHAPE
  - ‘Taller than wide’ vs ‘Wider than tall’.

SONOGRAPHIC CHARACTERISTICS

- ECHOGENICITY



SONOGRAPHIC CHARACTERISTICS

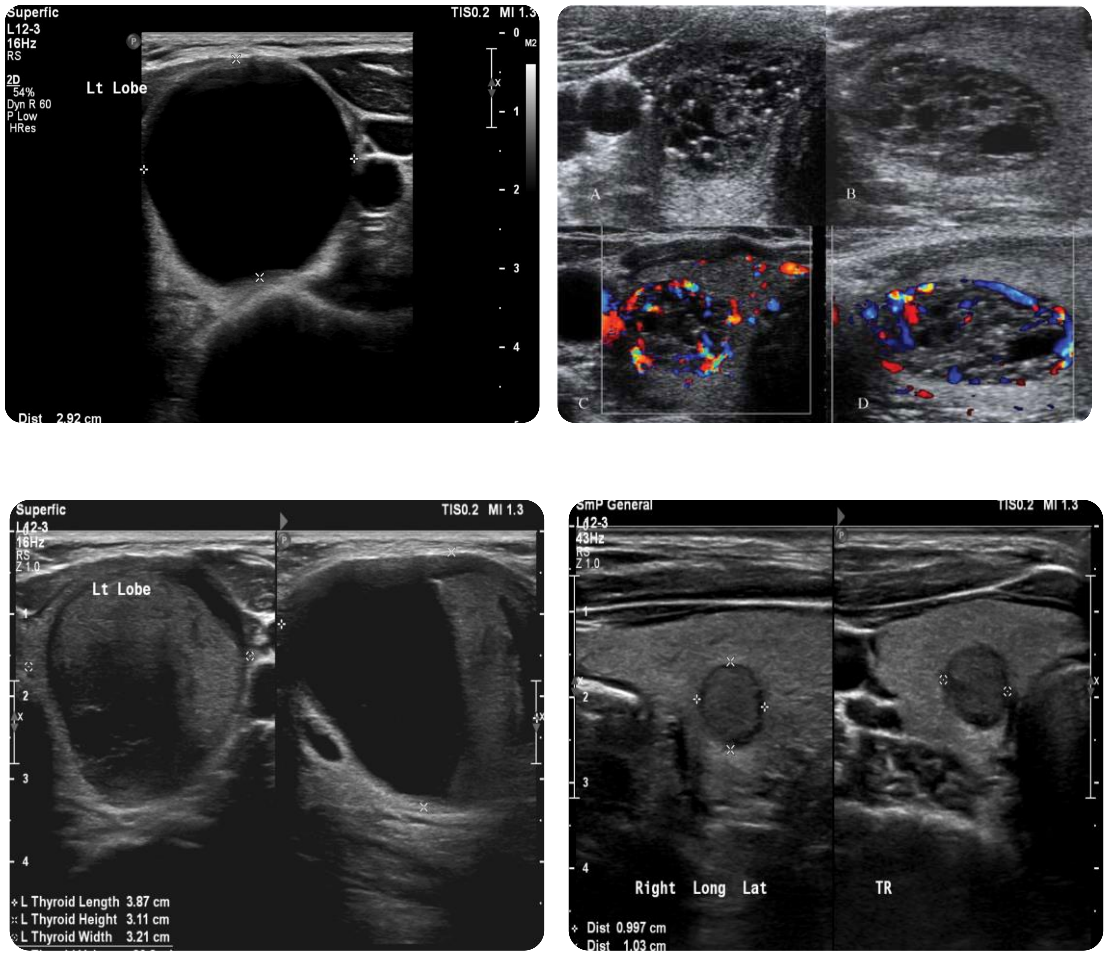
- ECHOGENICITY

Anechoic Cyst

Very Hypoechoic Nodule

SONOGRAPHIC CHARACTERISTICS

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

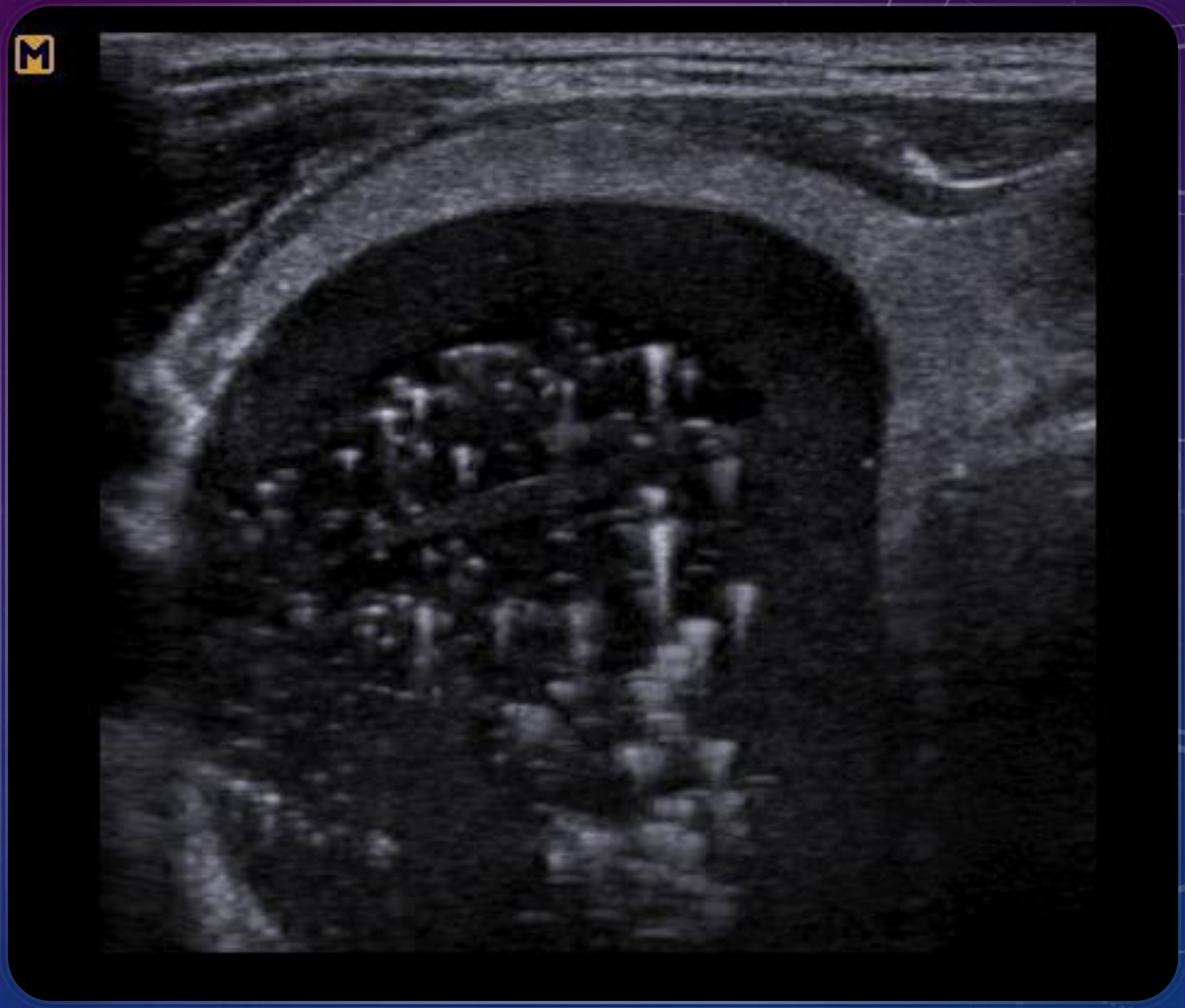


SONOGRAPHIC CHARACTERISTICS

- 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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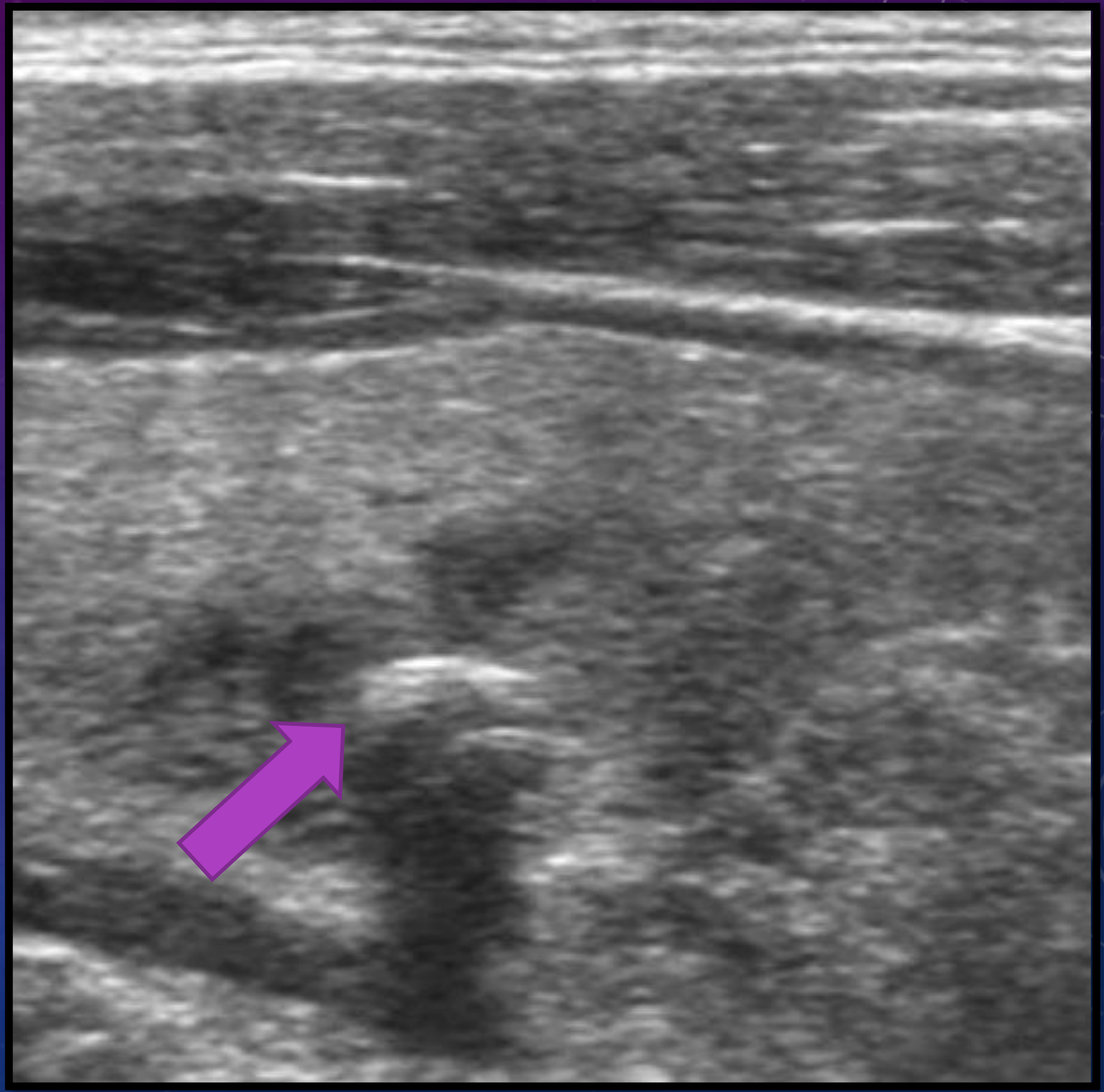

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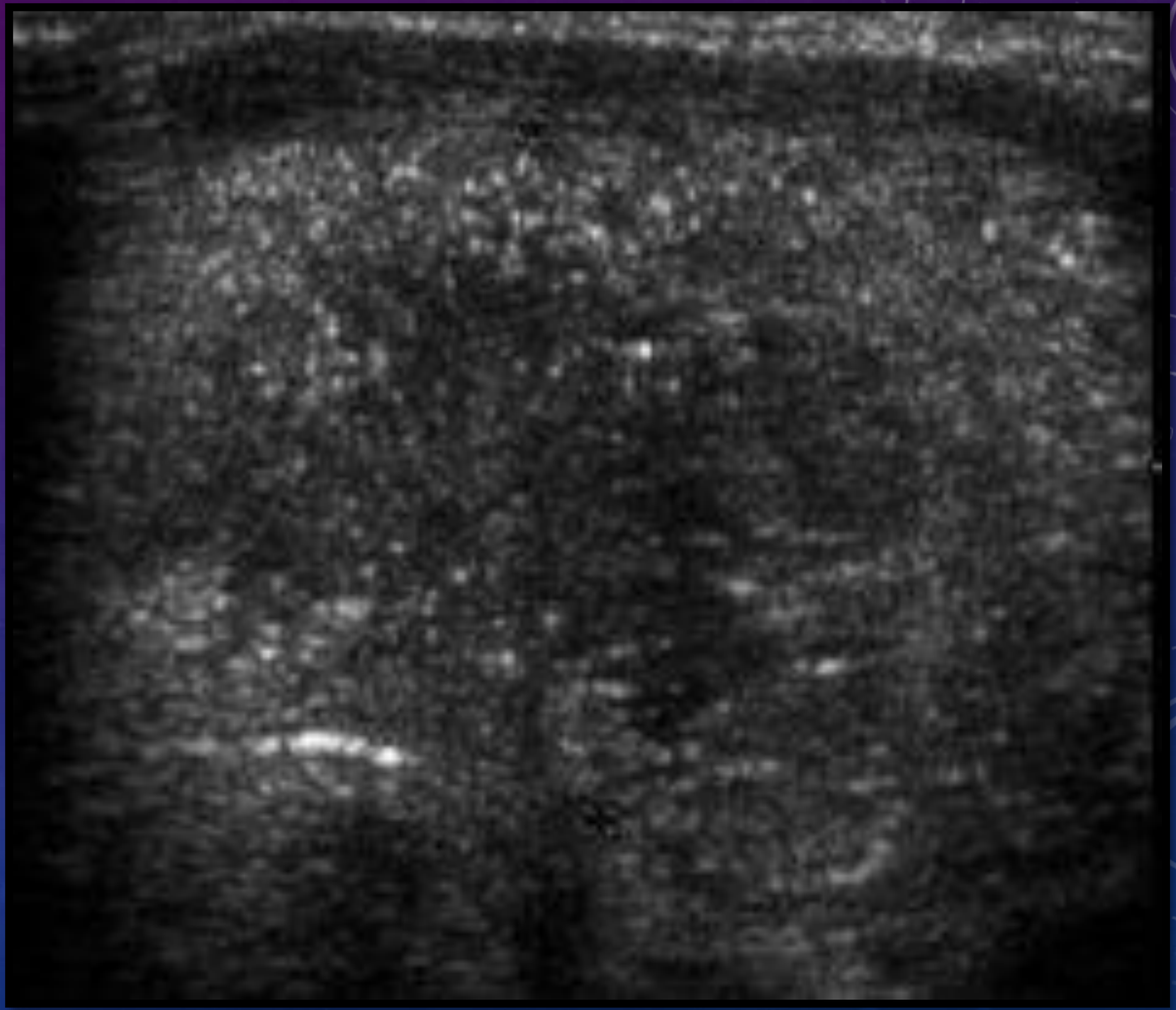


REPORTING

- 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

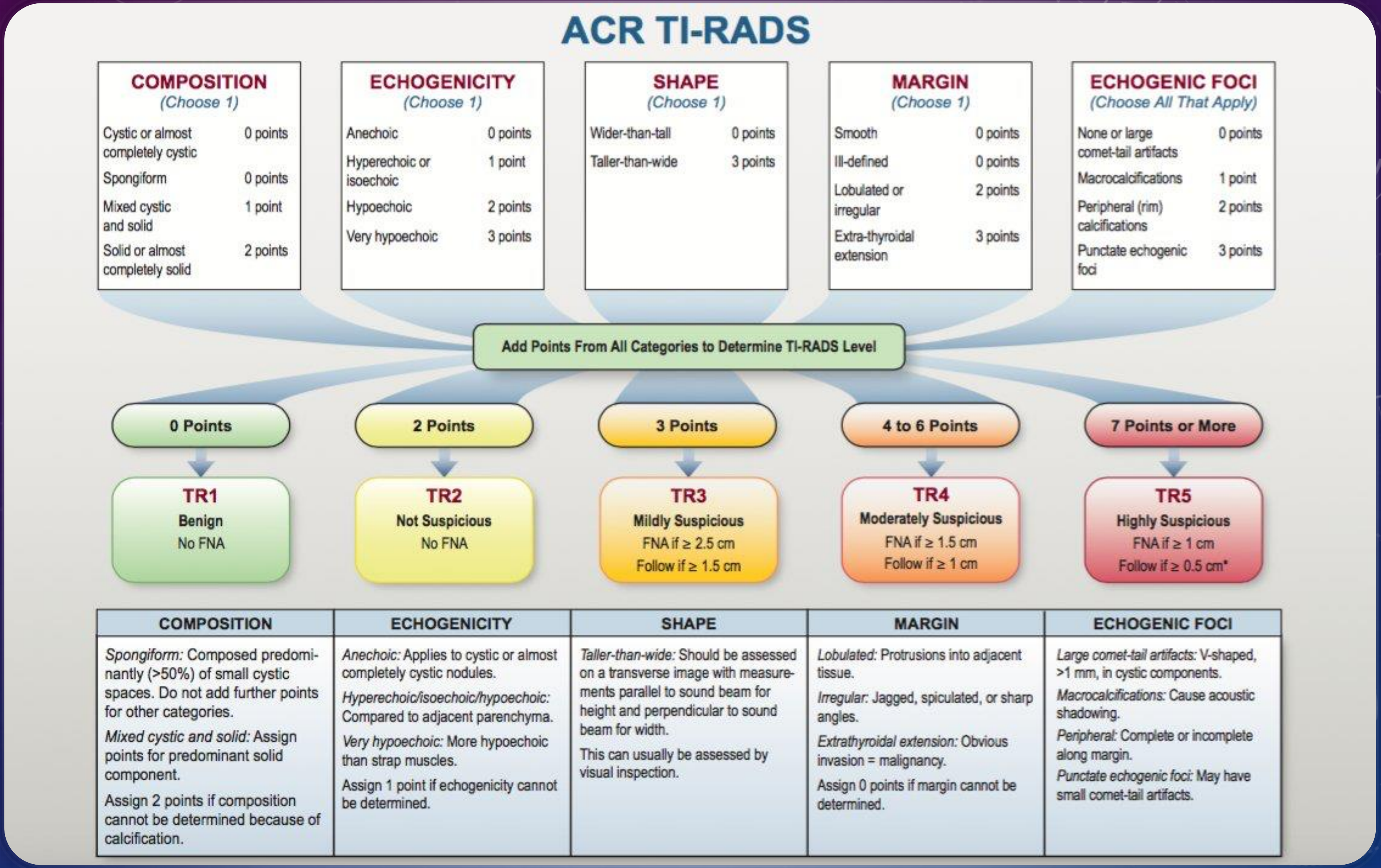
REPORTING

- AMERICAN THYROID ASSOCIATION (ATA)
- SOCIETY OF RADIOLOGISTS IN ULTRASOUND (SRU)
- AMERICAN COLLEGE OF RADIOLOGISTS (ACR)

REPORTING

- 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



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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.

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THANK YOU!