



Roma, 9-12 novembre 2017

AACE Italian Chapter Course 1 : session 1



ITALIAN CHAPTER



Ultrasound Features of Thyroid Nodules

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Disclosure



Ai sensi dell'art. 3.3 sul conflitto di interessi, pag 17 del Regolamento Applicativo Stato-Regioni del 5/11/2009, dichiaro che negli ultimi 2 anni ho avuto rapporti diretti di finanziamento con i seguenti soggetti portatori di interessi commerciali in campo sanitario: ESAOTE, ELESTA.



What is a Thyroid Nodule?

- A thyroid nodule is a focal change in a normal or abnormal thyroid parenchyma
- The terms “nodule”, “lesion” and “focal lesion” are equivalent



Benign lesions		Malignant lesions	
Benign follicular nodule	Adenomatoid nodule Colloid nodule	Papillary carcinoma	
Follicular adenoma	Hürthle cell adenoma	Follicular carcinoma	Hürthle cell carcinoma Poorly differentiated carcinoma
Thyroiditis	Chronic lymphocytic (Hashimoto) thyroiditis	Anaplastic/undifferentiated carcinoma	
		Medullary carcinoma	
		Lymphoma	
		Metastasis	



Thyroid Nodules Incidence

- Focal thyroid changes are frequent in normal population (50% of adults)
- 5%–7% of all thyroid nodules are malignant



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Thyroid Nodules Incidence

- How can we identify possible harmful nodules?



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Thyroid Nodules Characterization

- We should like to have a precise correlation between images and histology



Thyroid Nodules Characterization

- Imaging modalities only seldom offer a precise ultimate diagnosis
- More frequently, by the analysis of multiple parameters, we can minimize the diagnostic uncertainty



US Nodules Characterization

- US offers multiple parameters to be evaluated in thyroid focal abnormality:
 - B-mode (gray scale) appearance
 - ColorDoppler
 - Elastasonography
 - *Contrast Enhanced Ultrasound*



US Nodules Characterization

- In spite of technological evolution B-mode evaluation remains the milestone for nodules characterization
 - Structure
 - Morphology
 - Transition (Margins)



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US NODULES STRUCTURE

Echogenicity

Anechoic
Hyperechoic
Isoechoic
Hypoechoic
- mildly
- markedly



Content

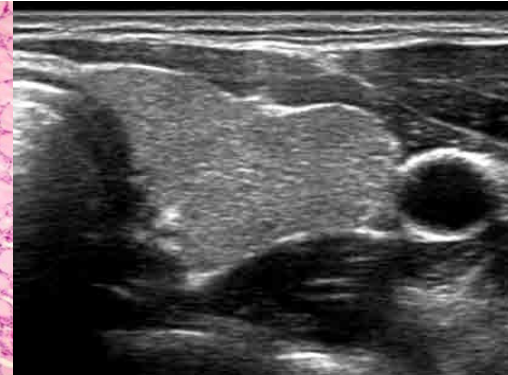
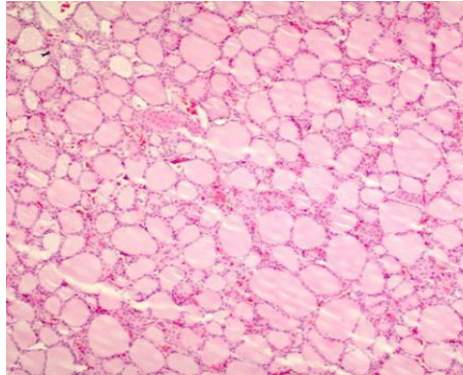
Cystic - Purely
Cystic - With sediments
Spongiform
Mixt - Mainly solid
Mixt - Mainly cystic
Solid - Homogeneous
Solid - Heterogeneous



- Echogenicity is a relative parameter

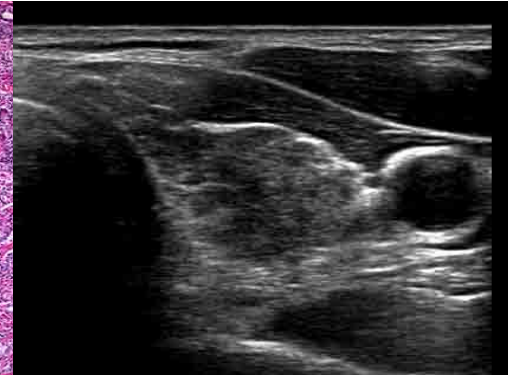
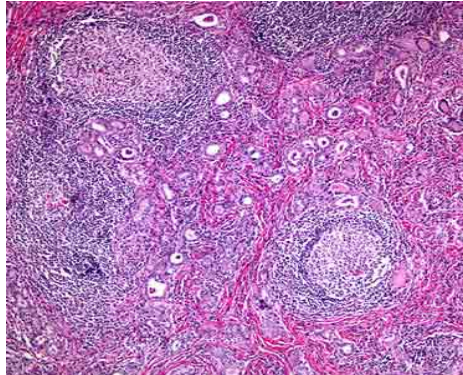
Normal Thyroid

*Hyperechoic relative to muscles
due to follicular structure*



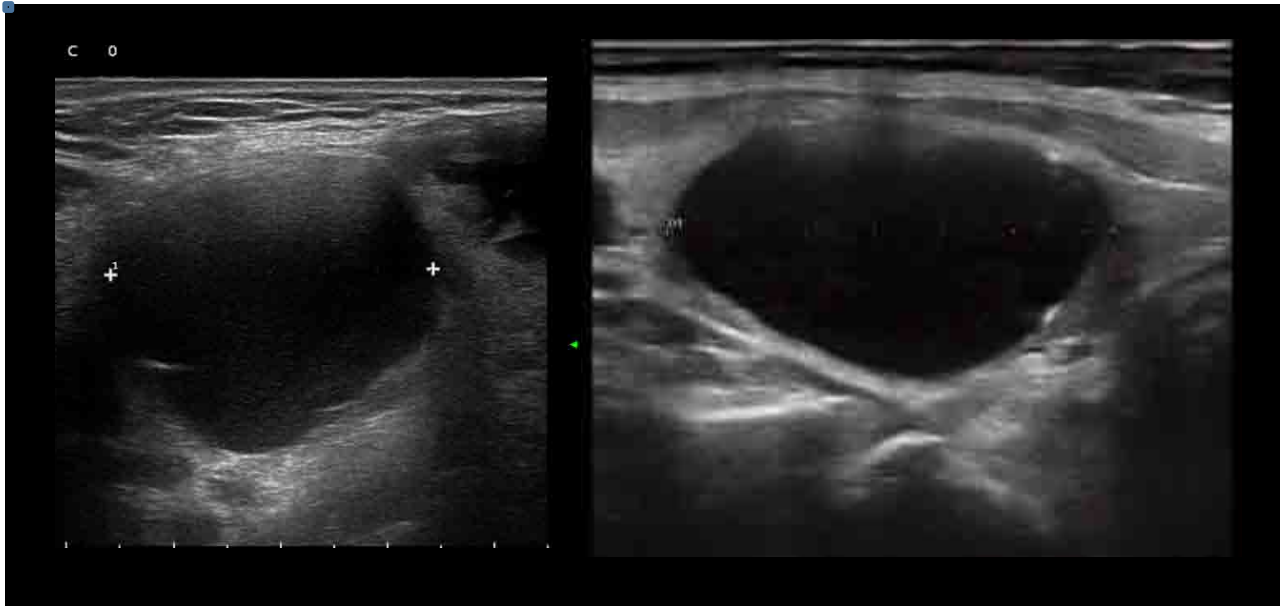
Thyroiditis

*Inhomogeneous and hypoechoic
Loss of follicular structure cellular
infiltration*





- Nodules Echogenicity and Content



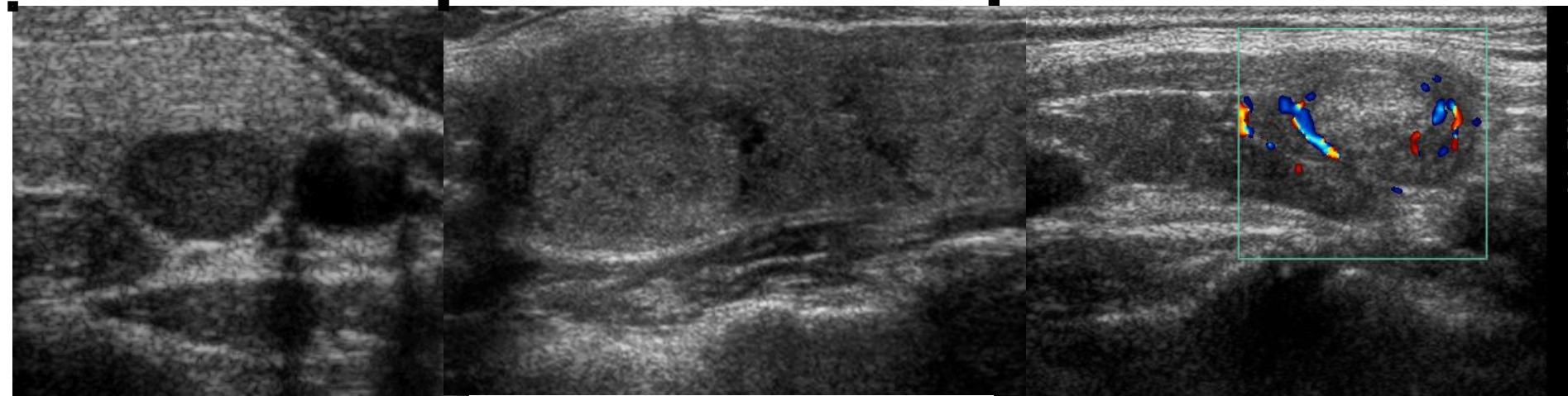


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- Nodules Echogenicity and Content



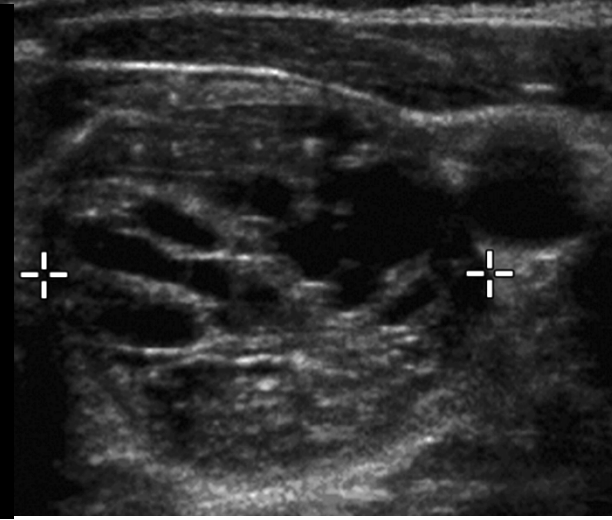
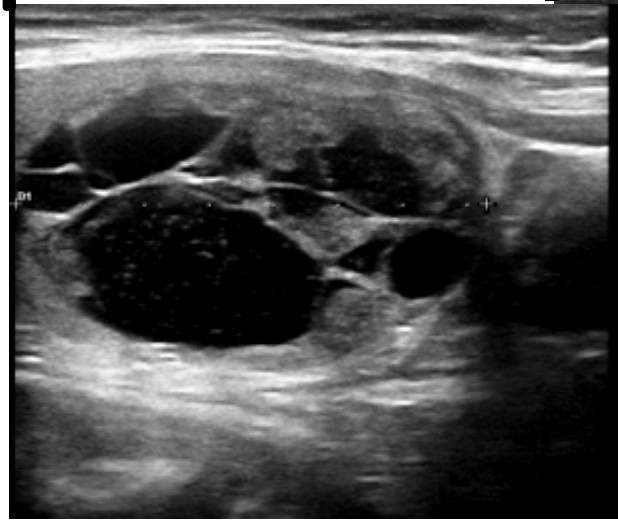


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- Nodules Echogenicity and Content



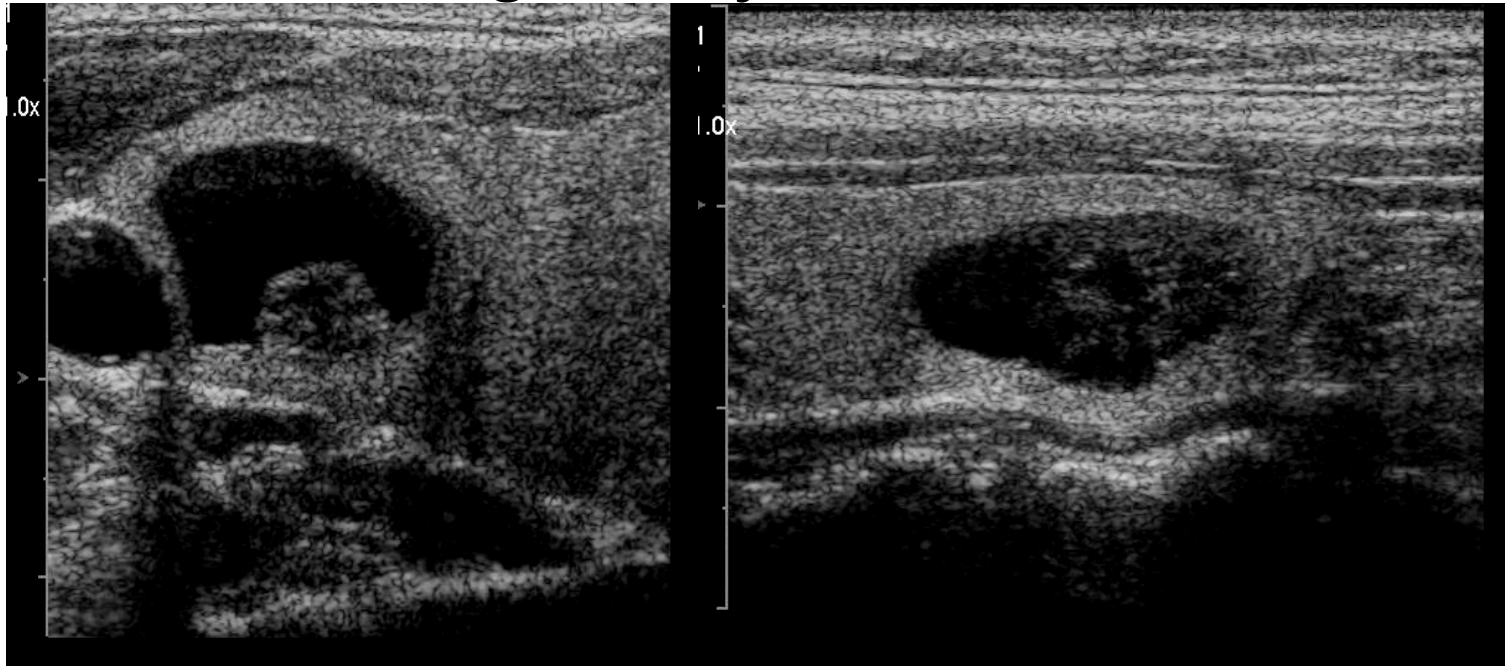


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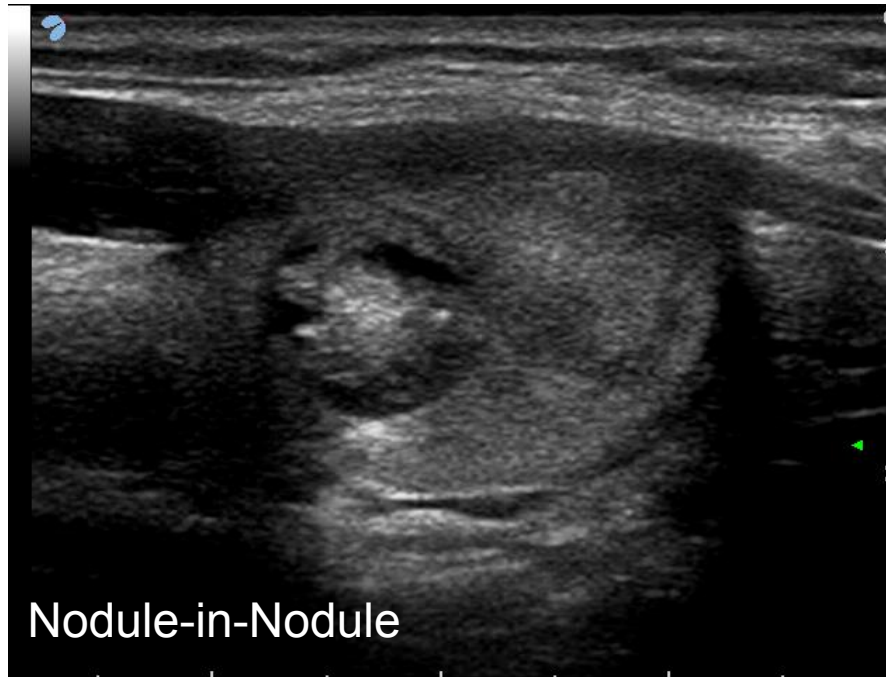
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- Nodules Echogenicity and Content





- Nodules Echogenicity and Content





Nodules Echogenicity and Content

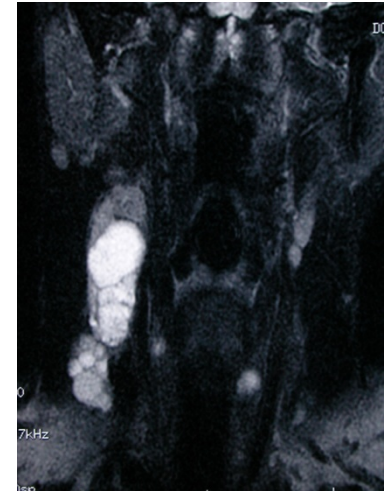
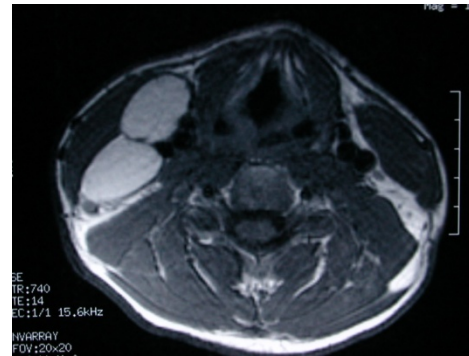
- Nodules echogenicity depends on the presence and amount of acoustic impedance discontinuities
- Fluid or solid homogeneous and cells packed nodules appear markedly hypoechoic



Nodules Echogenicity and Content

- Unfortunately US cannot characterize the fluid (hemorrhagic or colloid)

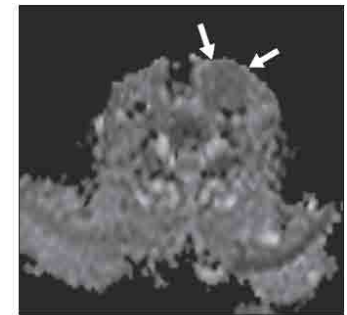
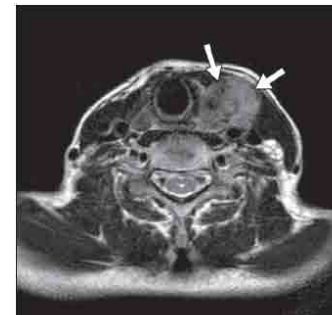
Hemorrhagic metastatic Lymph nodes





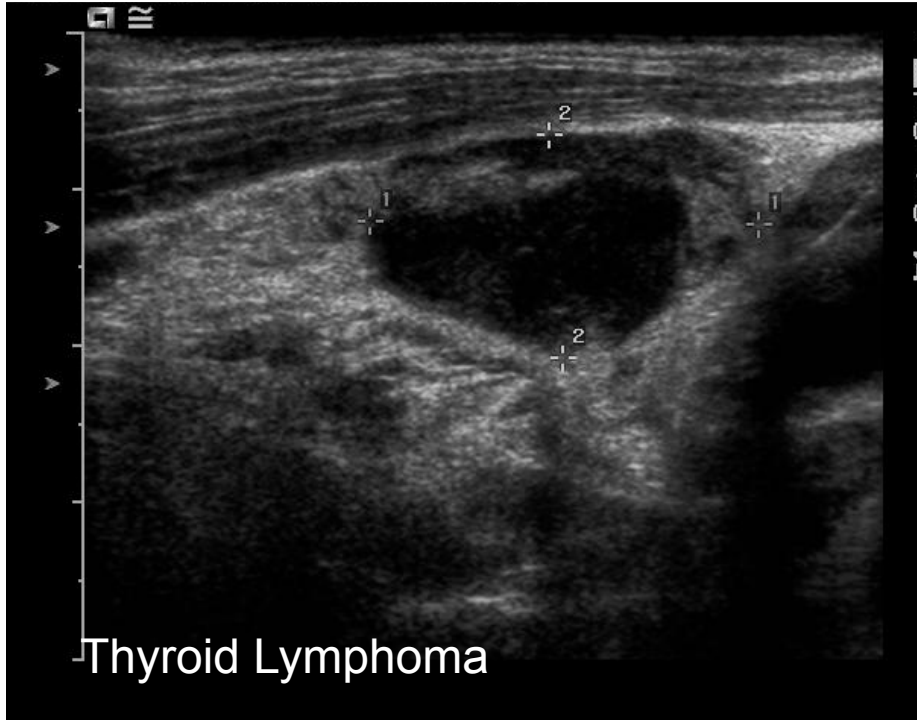
Nodules Echogenicity and Content

- Hypoecogenicity of solid nodules due to packed cell or dense fibrous tissue can correlate with restricted diffusion on MRI





Nodules Echogenicity and Content





NODULES SHAPE VOCABULARY

Shape

Round

Oval

Irregular: taller than wide
taller than long

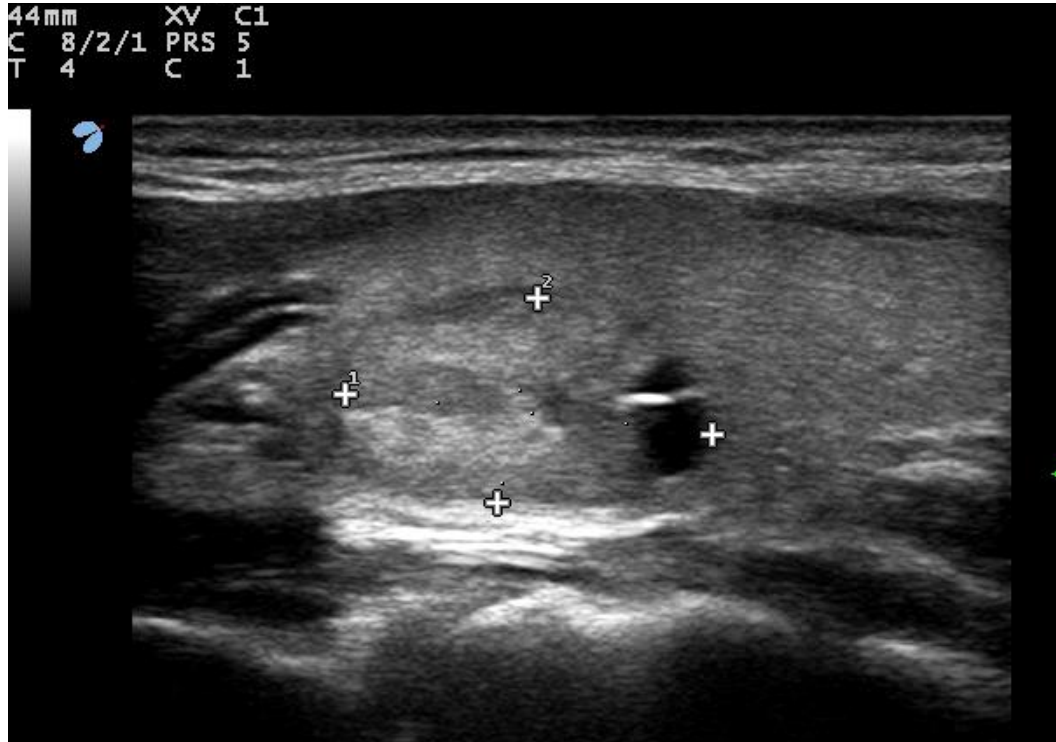


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• NODULES SHAPE





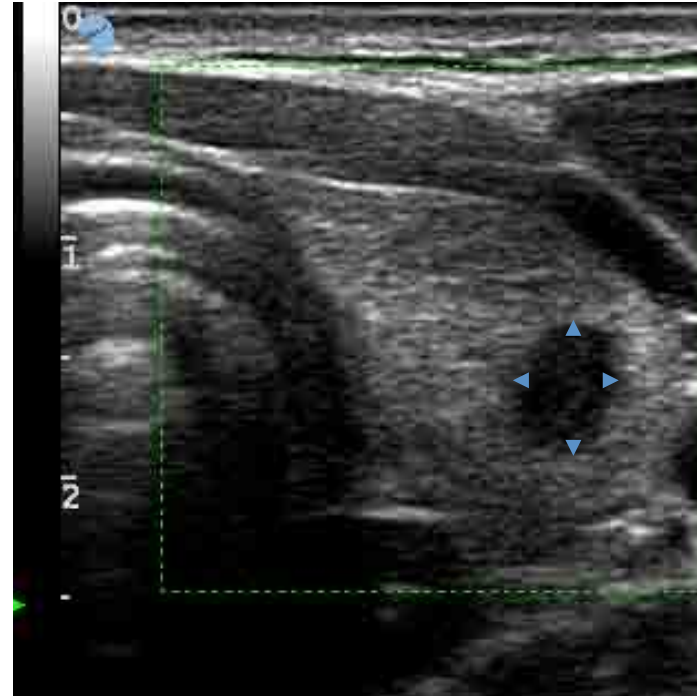
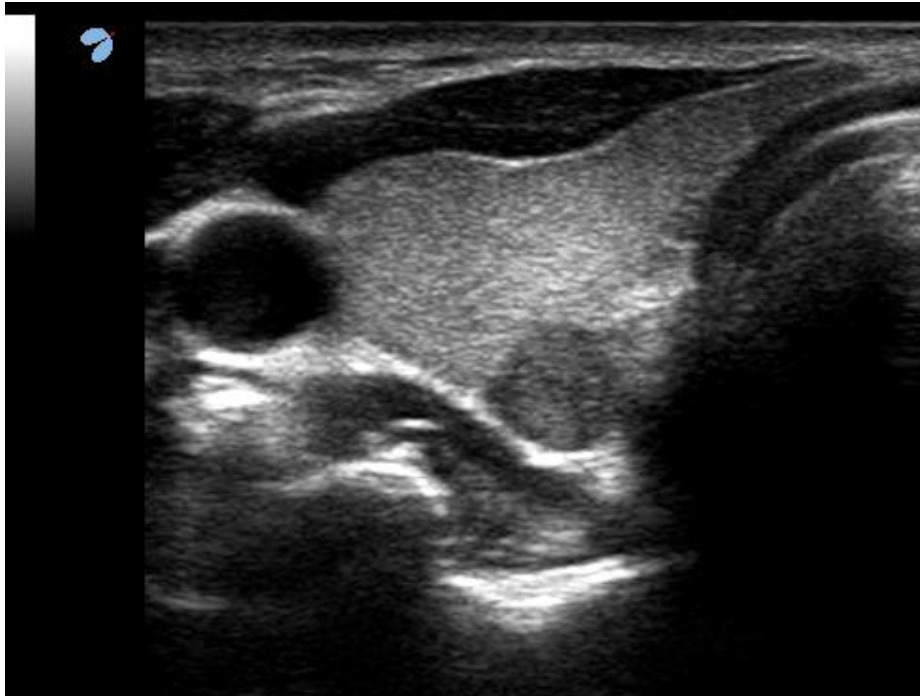
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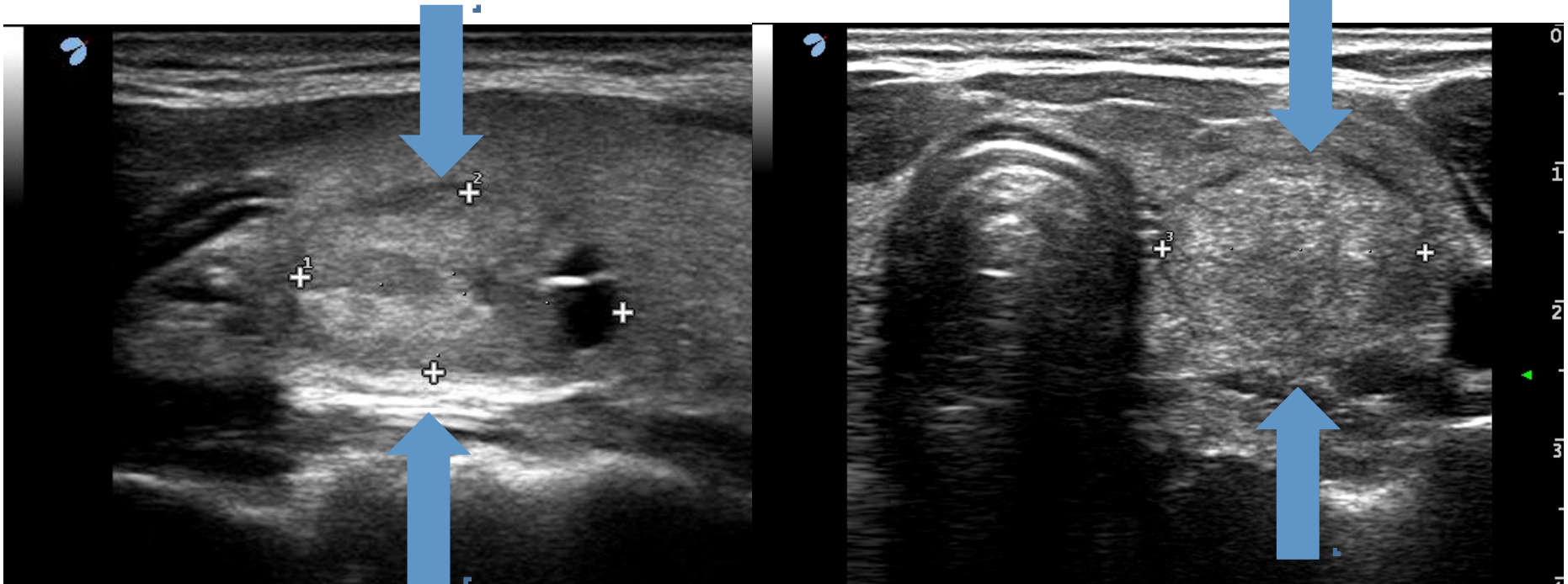


• NODULES SHAPE



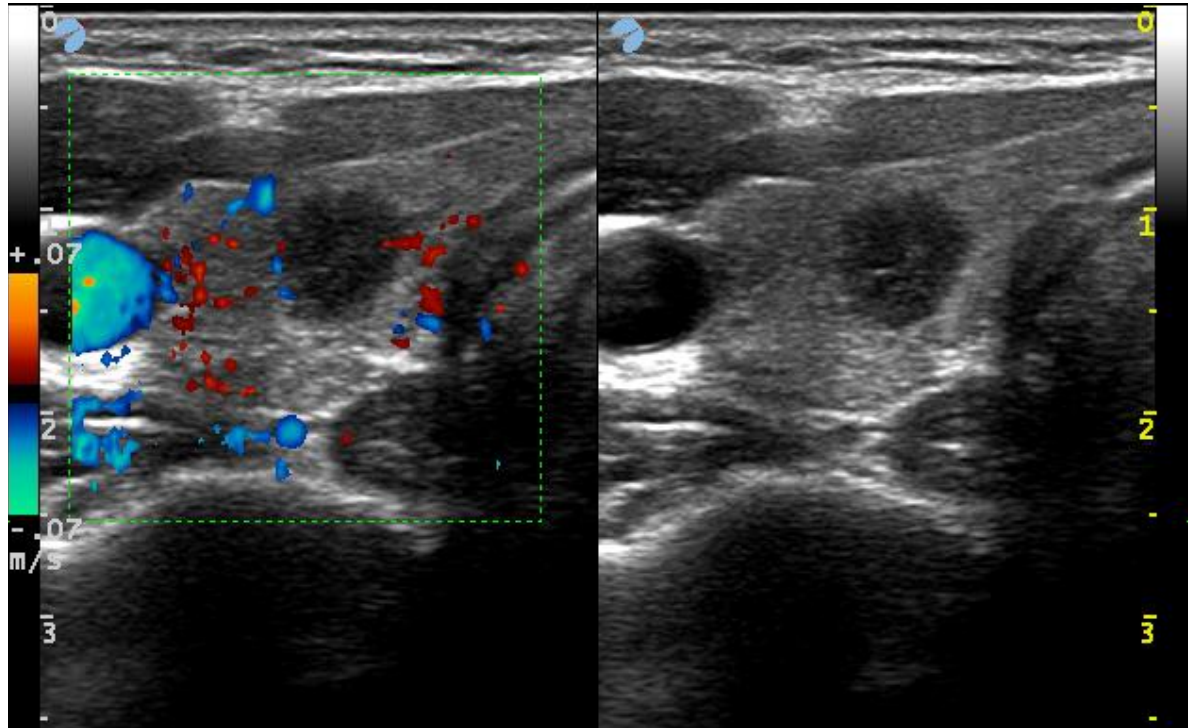


• NODULES SHAPE





• NODULES SHAPE





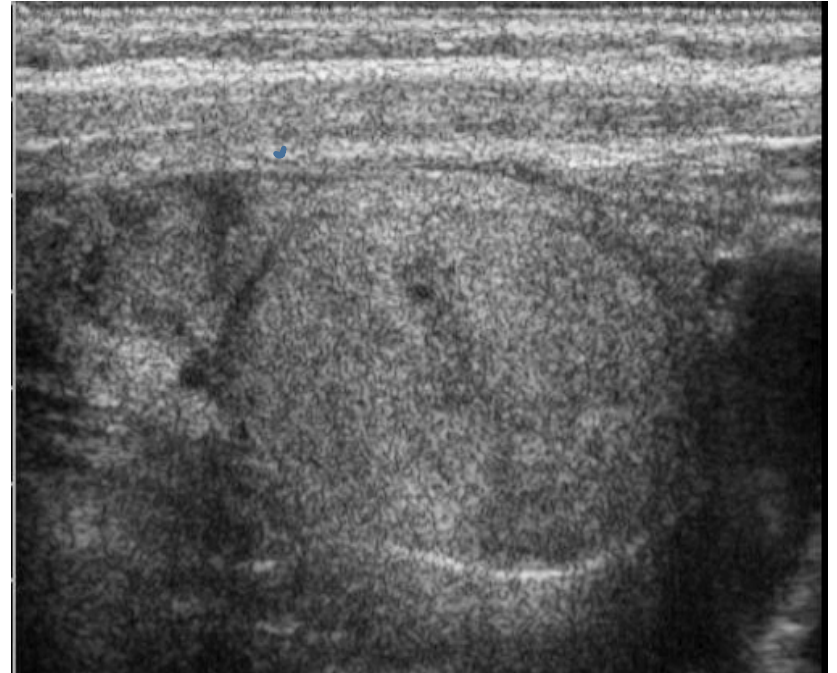
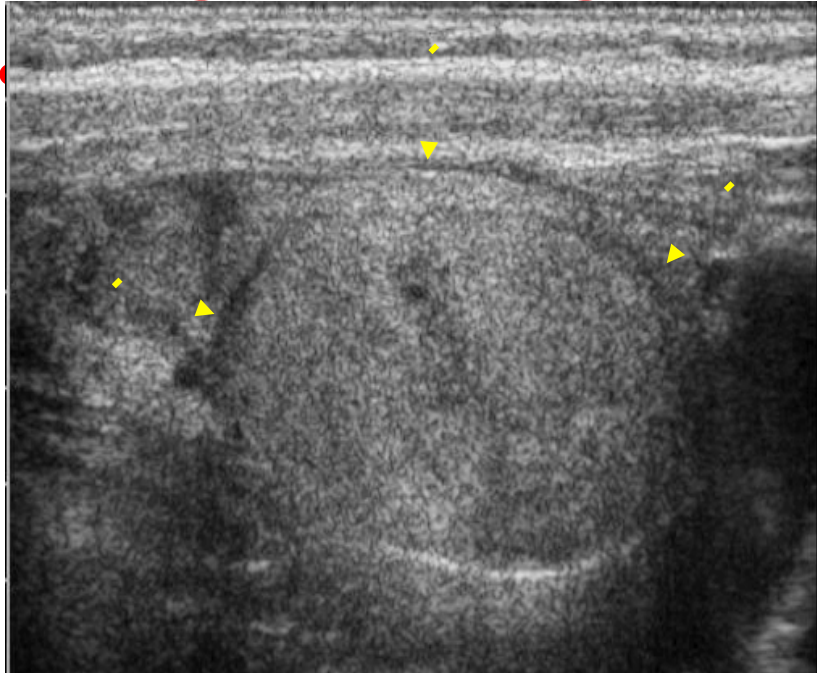
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NODULE MARGIN

<p>Margin</p>	<p>Regular Blurred, ill-defined Irregular: - Microlobulated - Spiculated, angular</p> <p>Halo</p>	<p>Absent Present - Thin Present – Thick</p>
<p>Capsular contact</p>	<p>Absent Present (- <50% - >=50%)</p>	

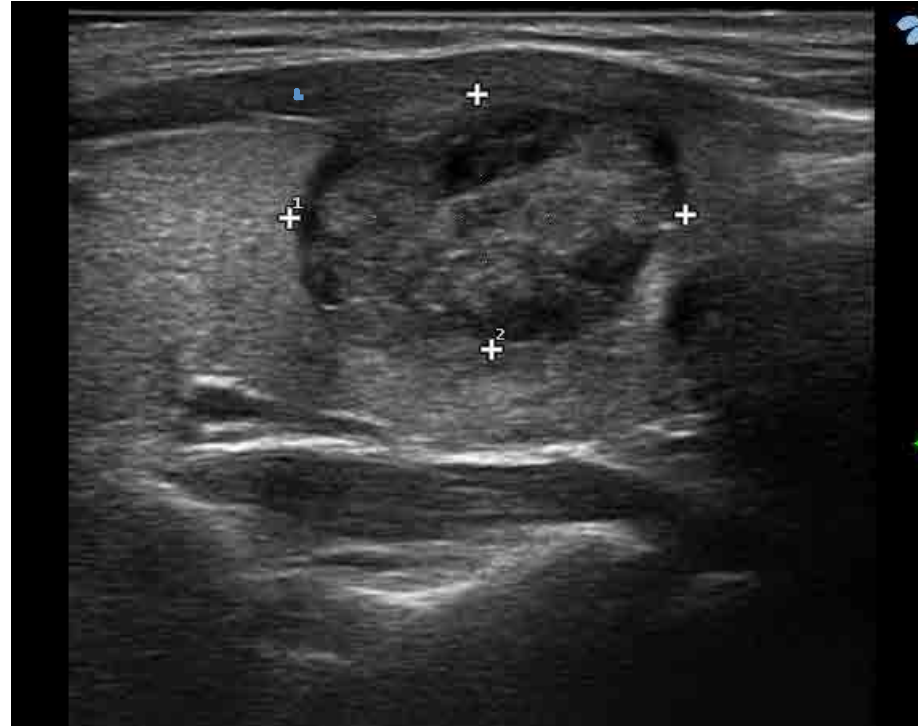
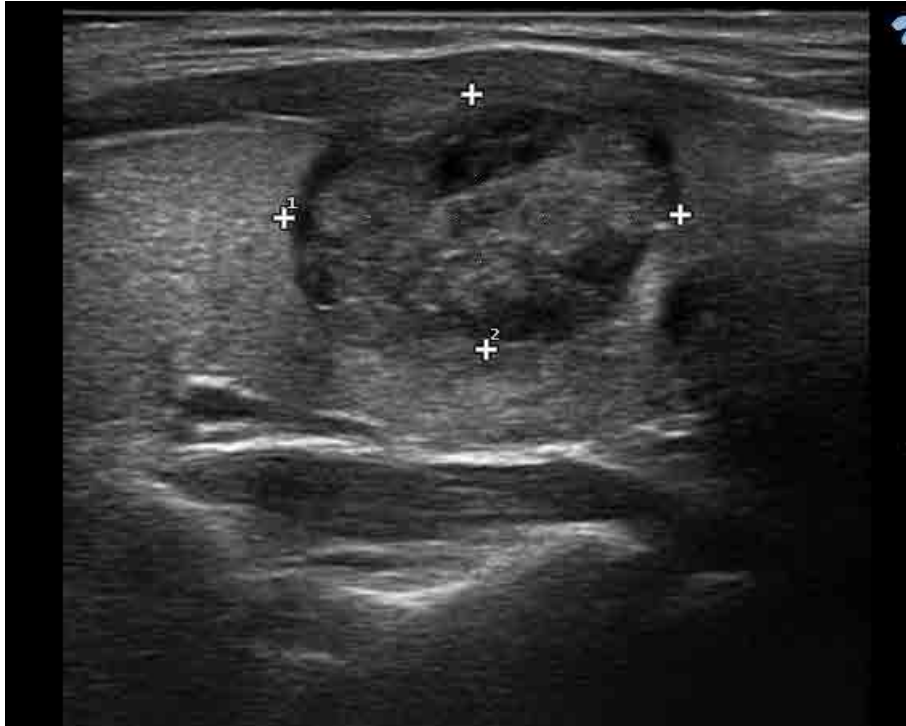


- **Regular Margins**





- Lobulated and Blurred Margins**





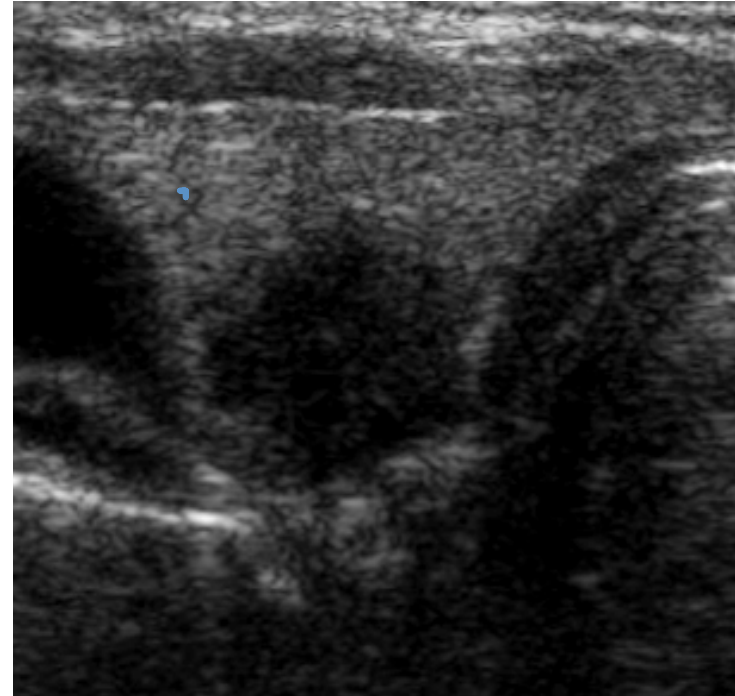
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- **Spiculated Margins and Capsular Contact**

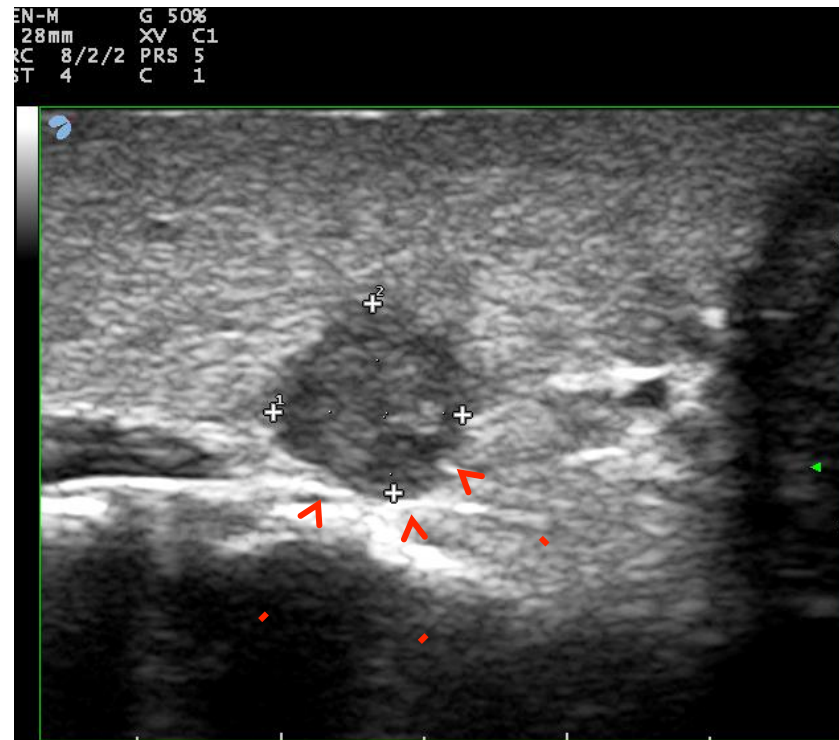
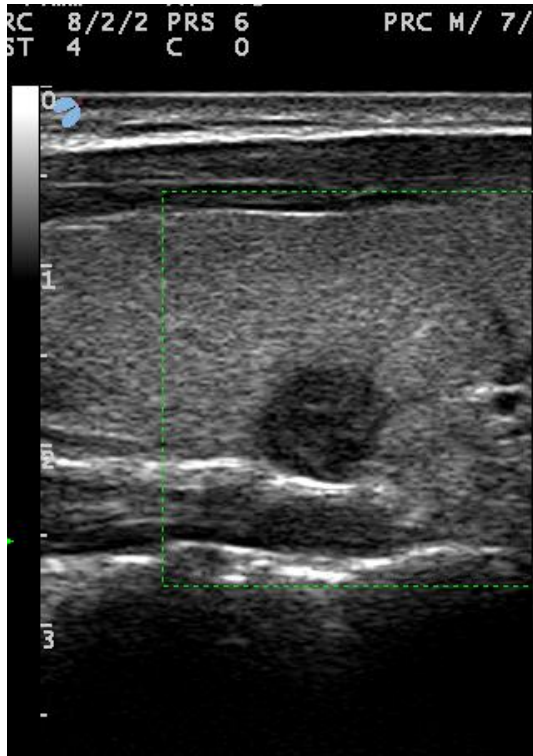




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- NODULE MARGIN: Capsular Infiltration**





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CALCIFICATION AND HYPERECHOIC PUNCTUATIONS

Calcifications

Macrocalcifications

- Central
- Peripheral (egg shell)+/- disrupted

Microcalcifications

Other hyperechoic punctuations

Colloidal granulations

Acoustic enhancement in cystic microcavities



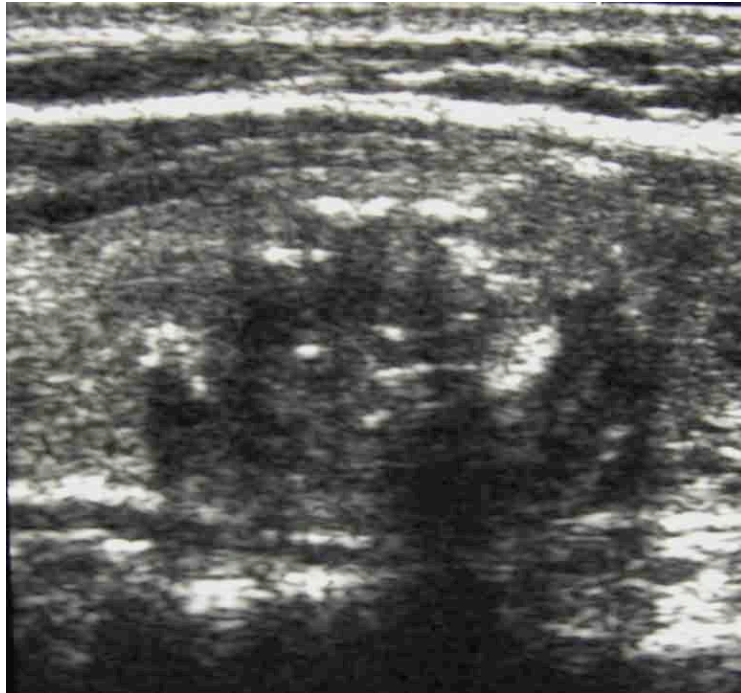
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- **MACROCALCIFICATION**





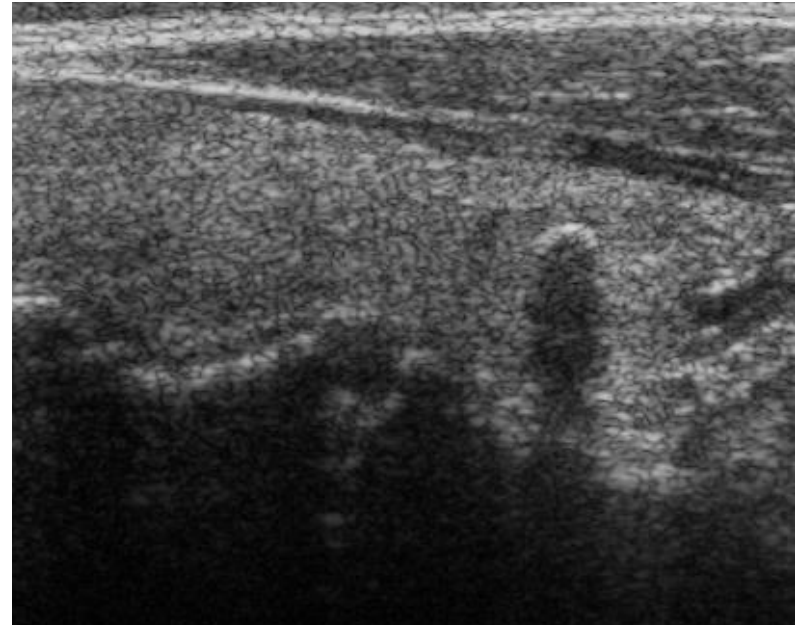
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- **EGG-SHELL CALCIFICATION**



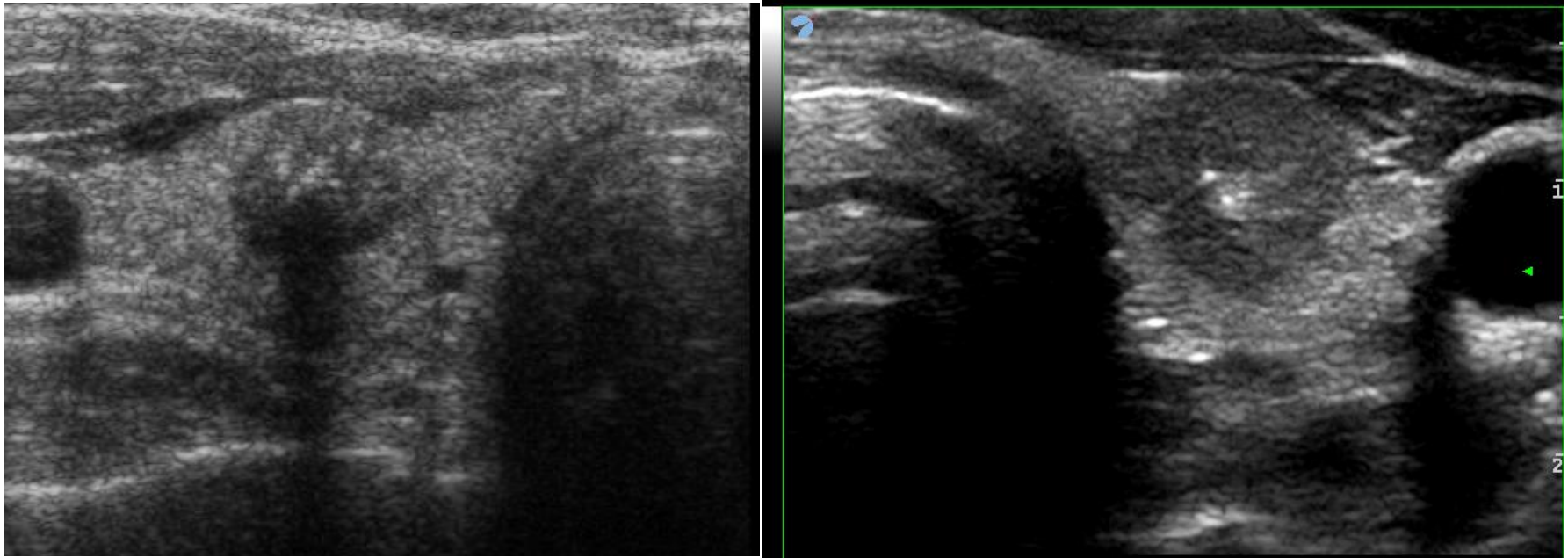


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- **MICROCALCIFICATION**



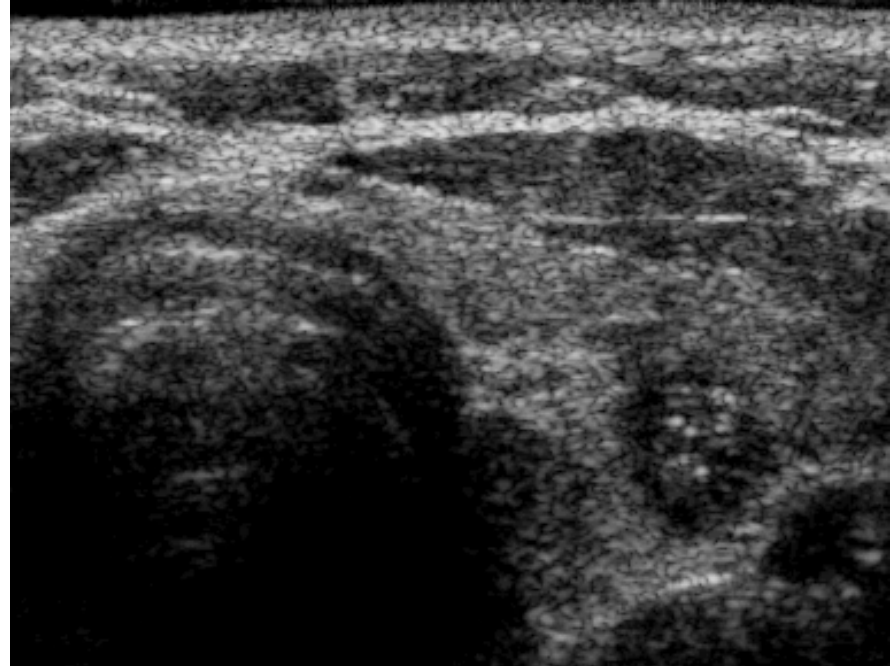
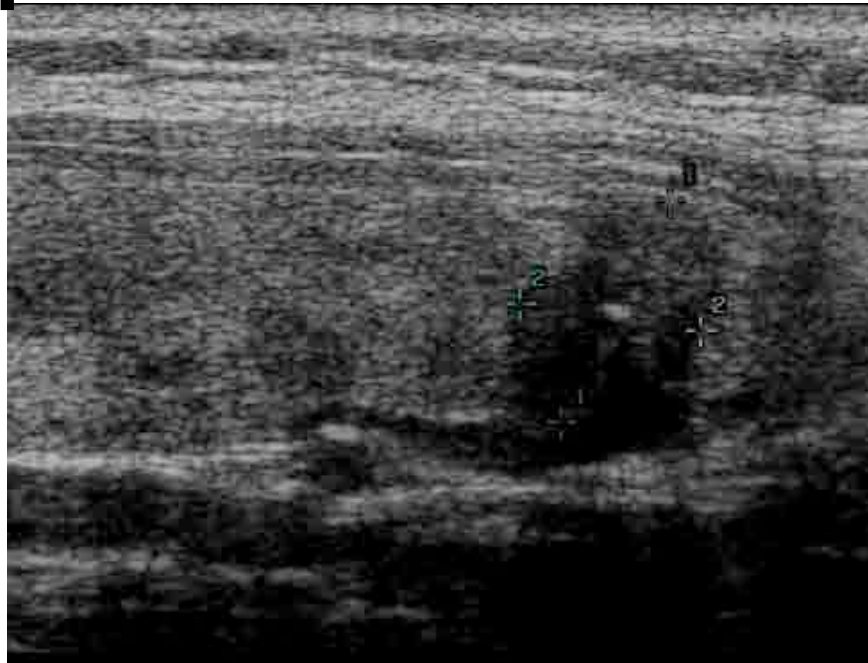


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- **MICROCALCIFICATION**





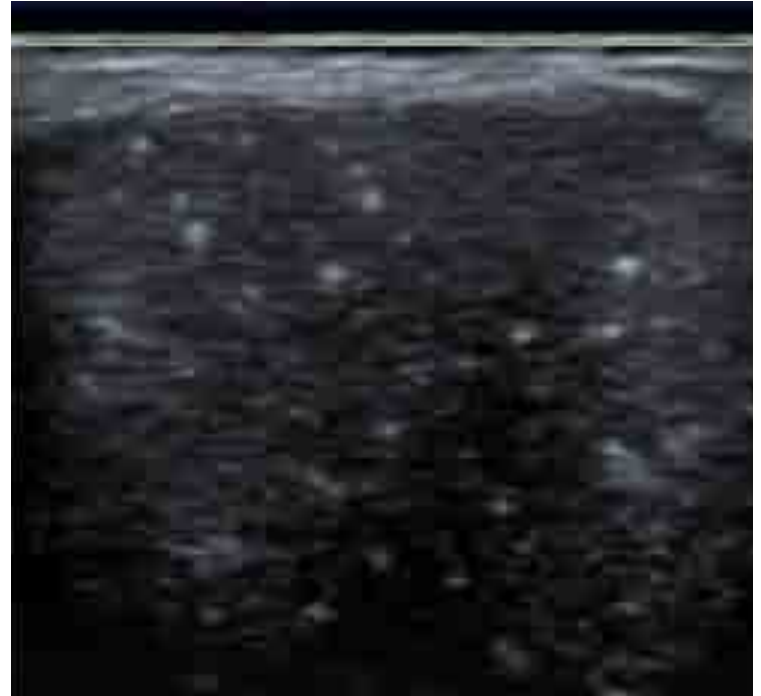
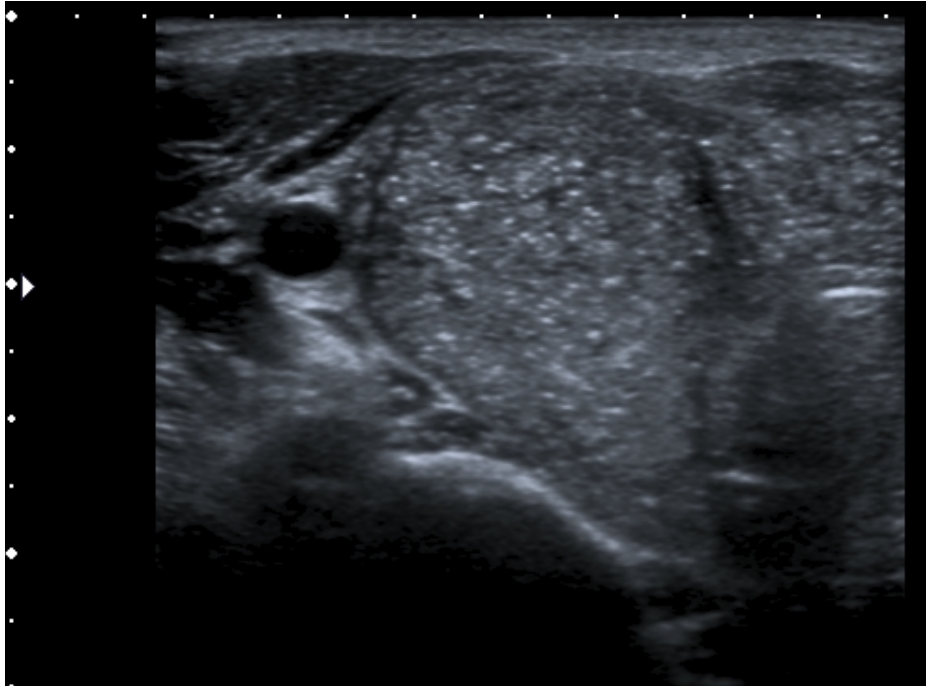
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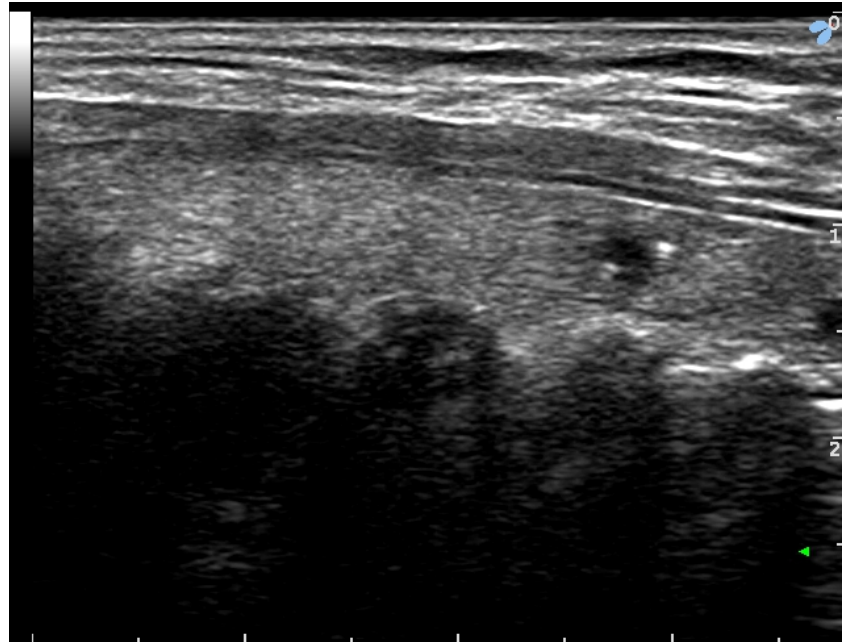


- **MICROCALCIFICATION AND HYPERECHOIC PUNCTUATIONS**





- **HYPERECHOIC PUNCTUATIONS**





MICROCALCIFICATION AND HYPERECHOIC PUNCTUATIONS

- Microcalcifications are psammoma bodies that appear as punctate echogenic foci less than 1 mm. in size and without acoustic shadowing.
- clusters of microcalcifications can produce acoustic shadowing



CALCIFICATION AND HYPERECHOIC PUNCTUATIONS

- Microcalcifications are highly suggestive of papillary carcinoma because they are rare in benign thyroid nodules.
- Psammoma bodies are present in only about 40% of papillary carcinomas.



CALCIFICATION AND HYPERECHOIC PUNCTUATIONS

- Macrocalcifications (including rim calcifications) are less ominous.
- Nevertheless they may be seen in both medullary and papillary carcinoma



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NODULES VASCULARIZATION

Vascularization

Absent (avascular)
Mainly peripheral
Mixt
Mainly central
Diffuse
Resistive index - Normal
- High

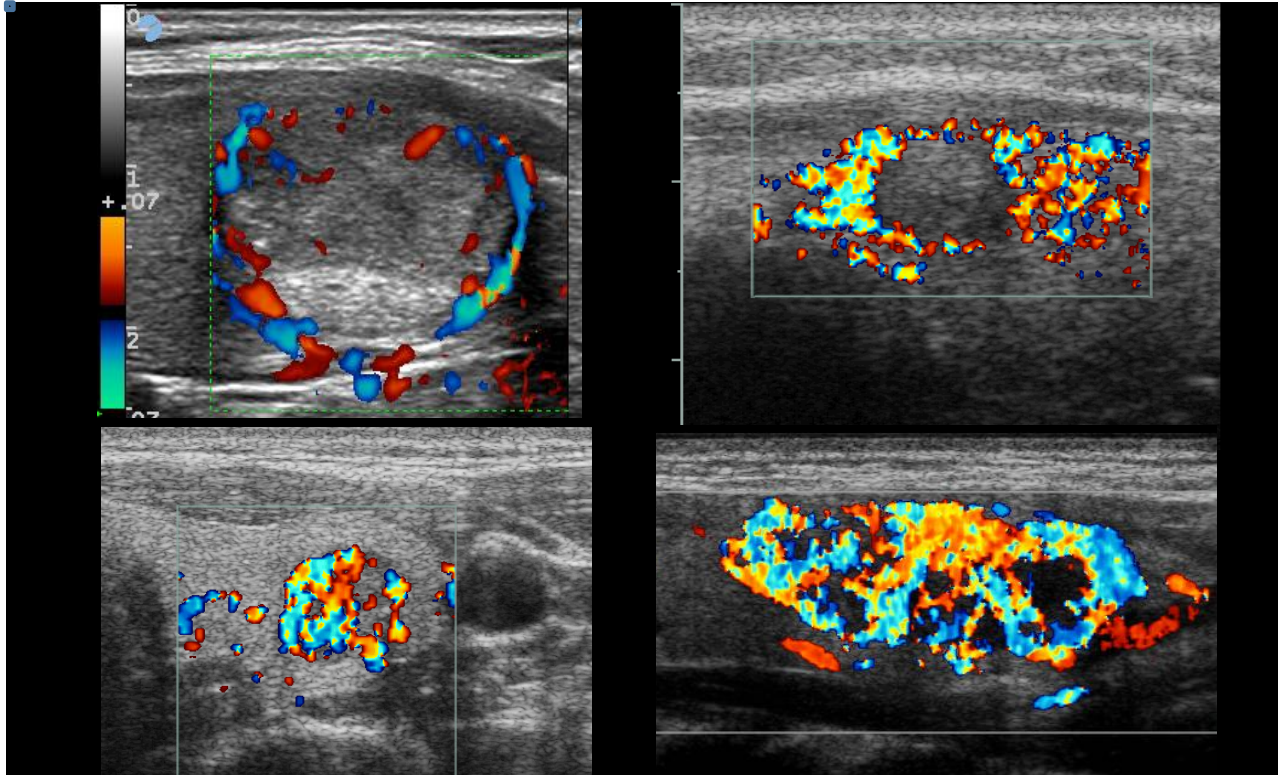


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NODULES VASCULARIZATION: VASCULAR DISTRIBUTION



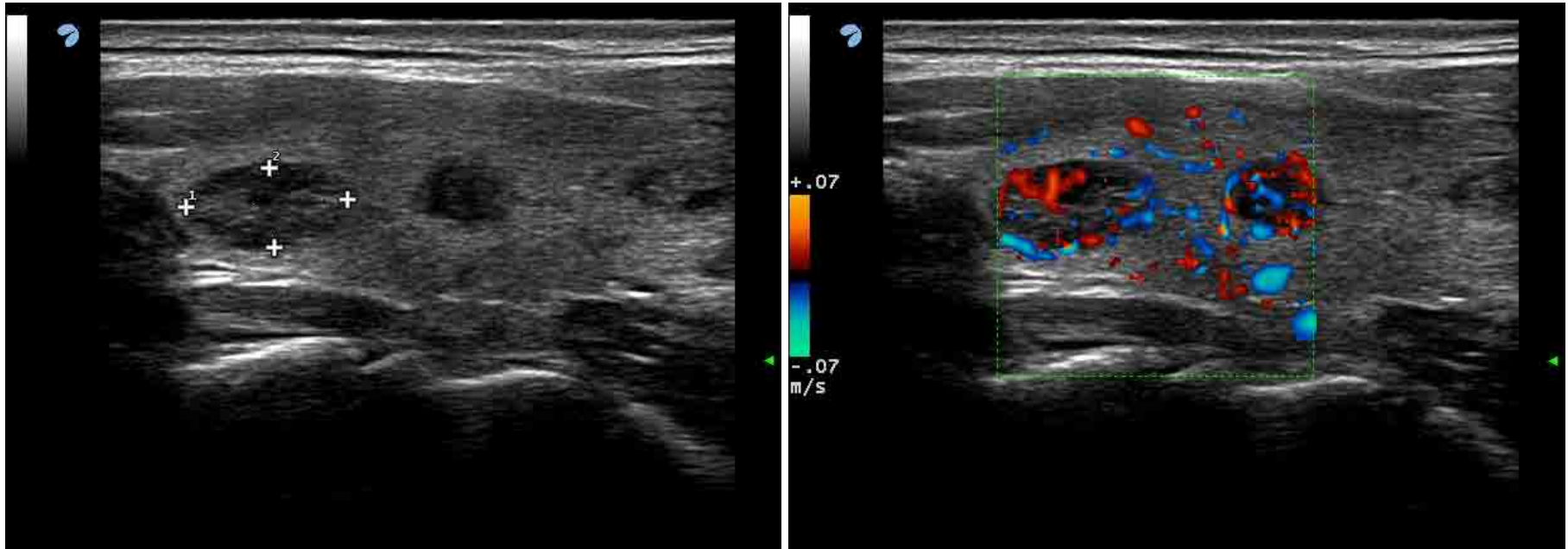


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NODULES VASCULARIZATION: VASCULAR DISTRIBUTION





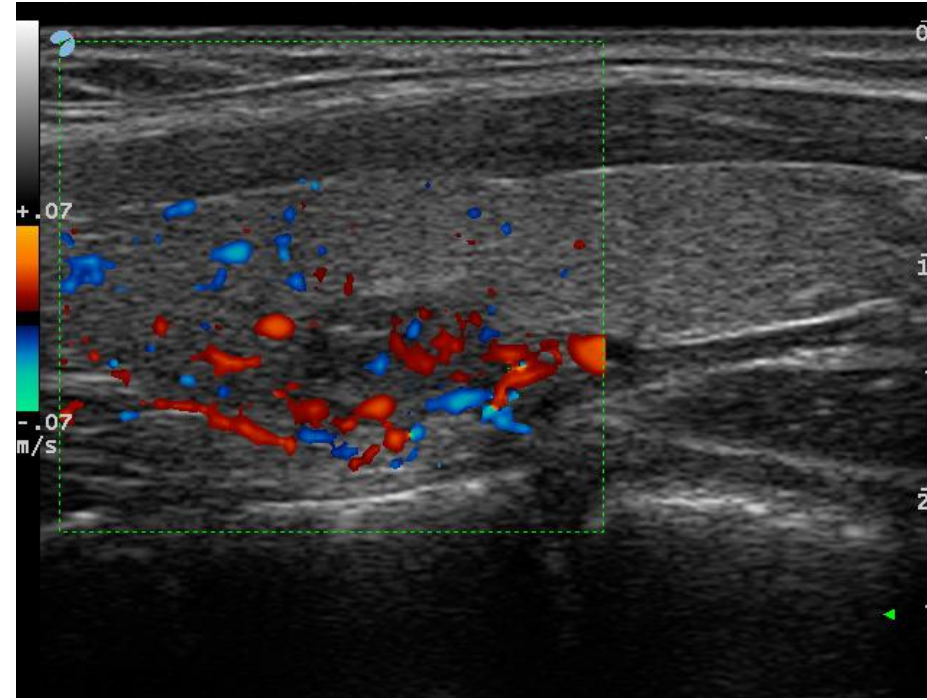
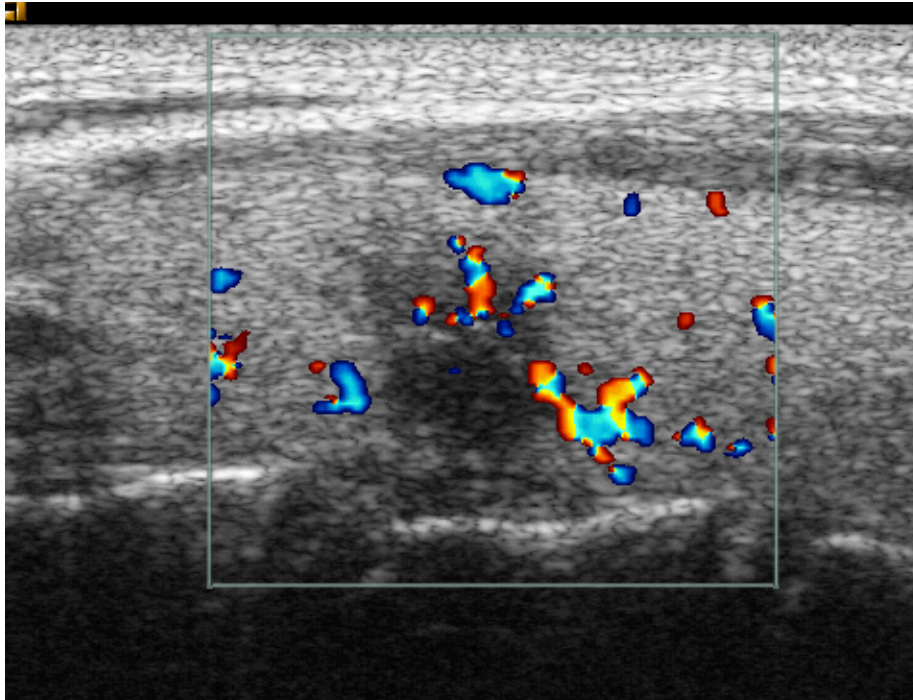
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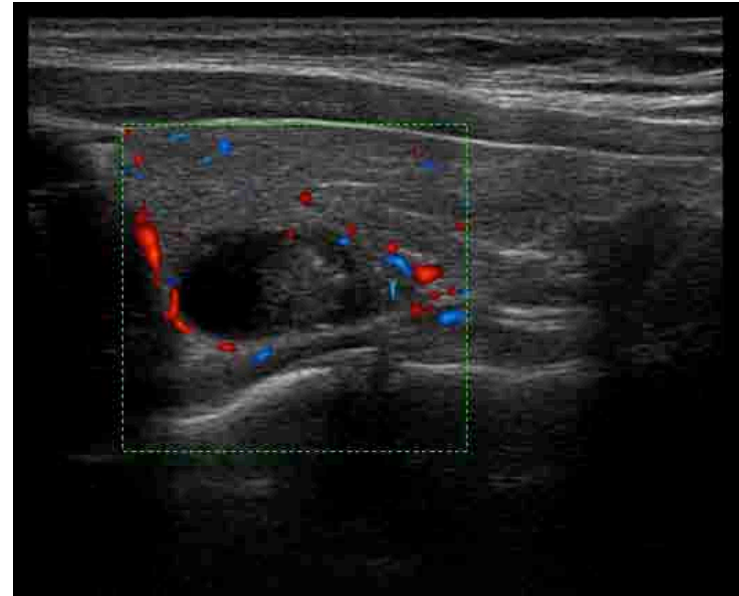
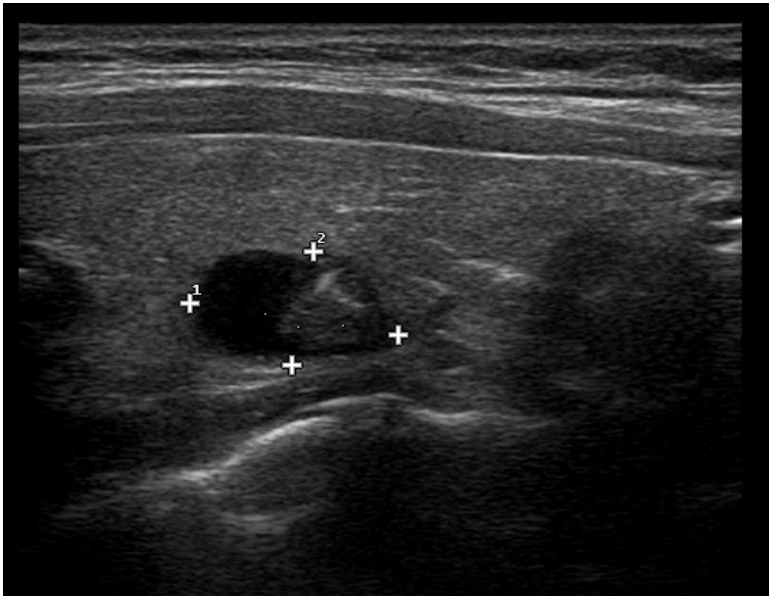


NODULES VASCULARIZATION: VASCULAR STRUCTURE





NODULES VASCULARIZATION





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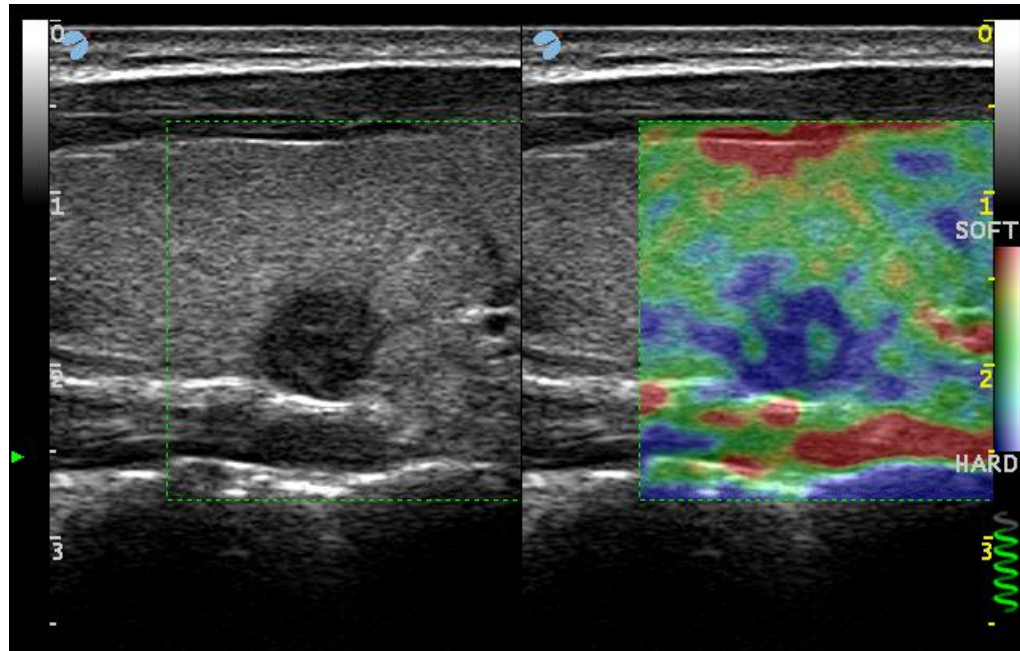
NODULES ELASTOSONOGRAPHY

Elastosonography

Soft
Mixed
Hard

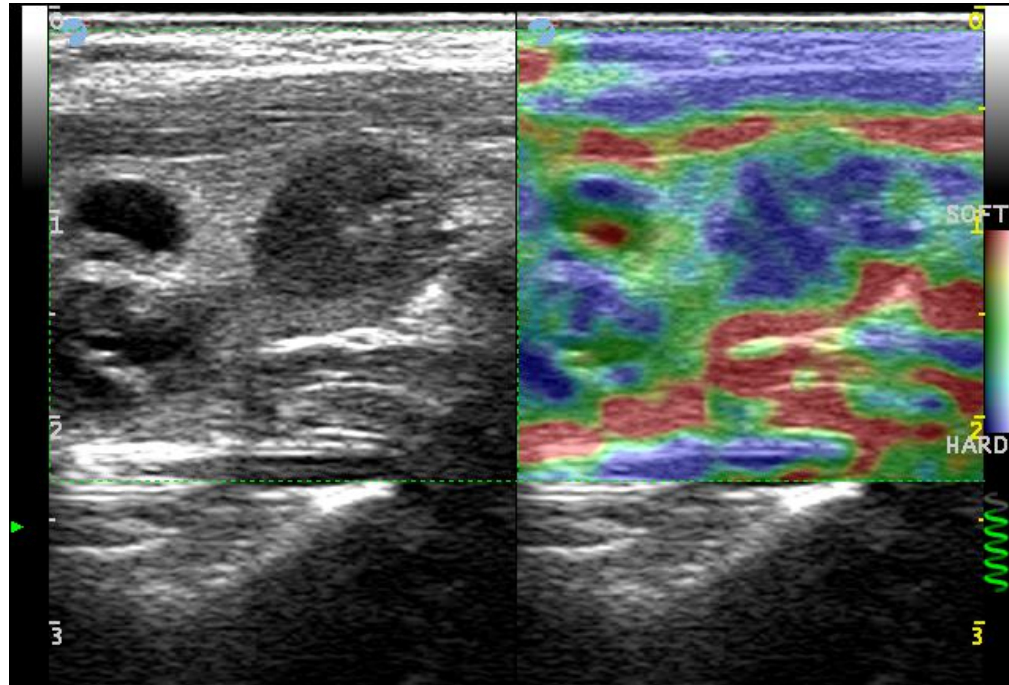


NODULES ELASTOSONOGRAPHY



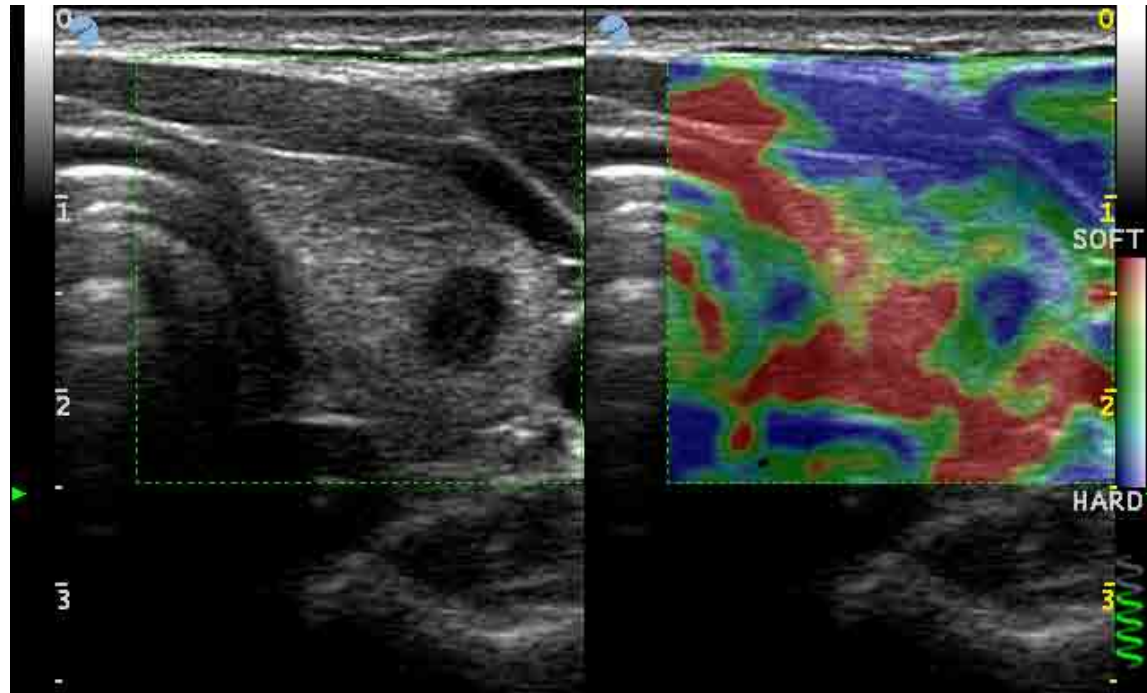


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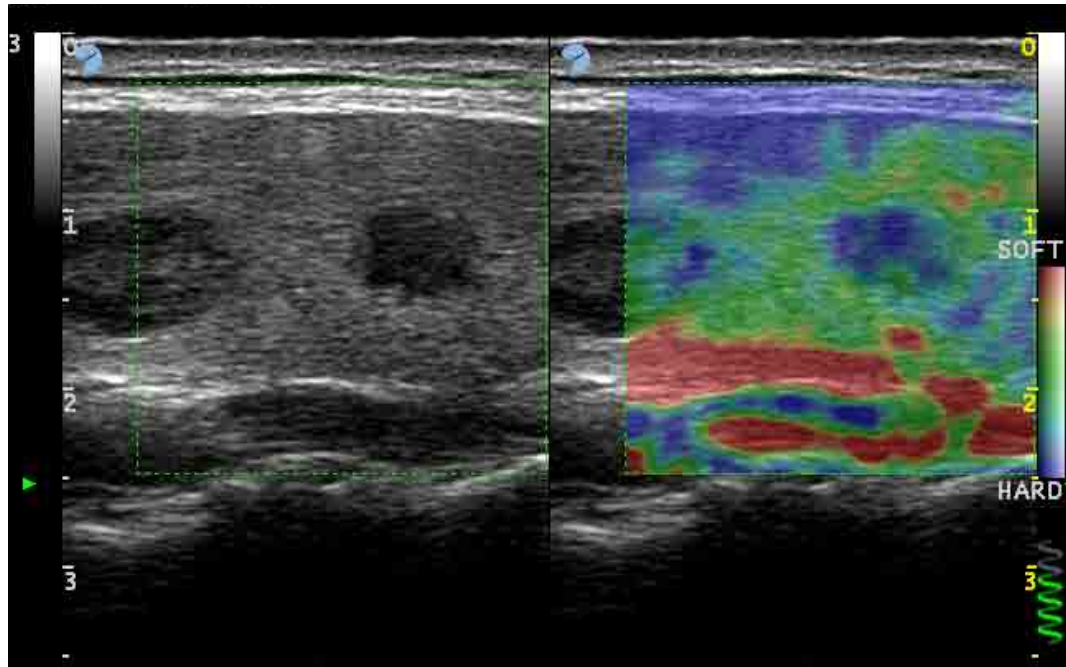


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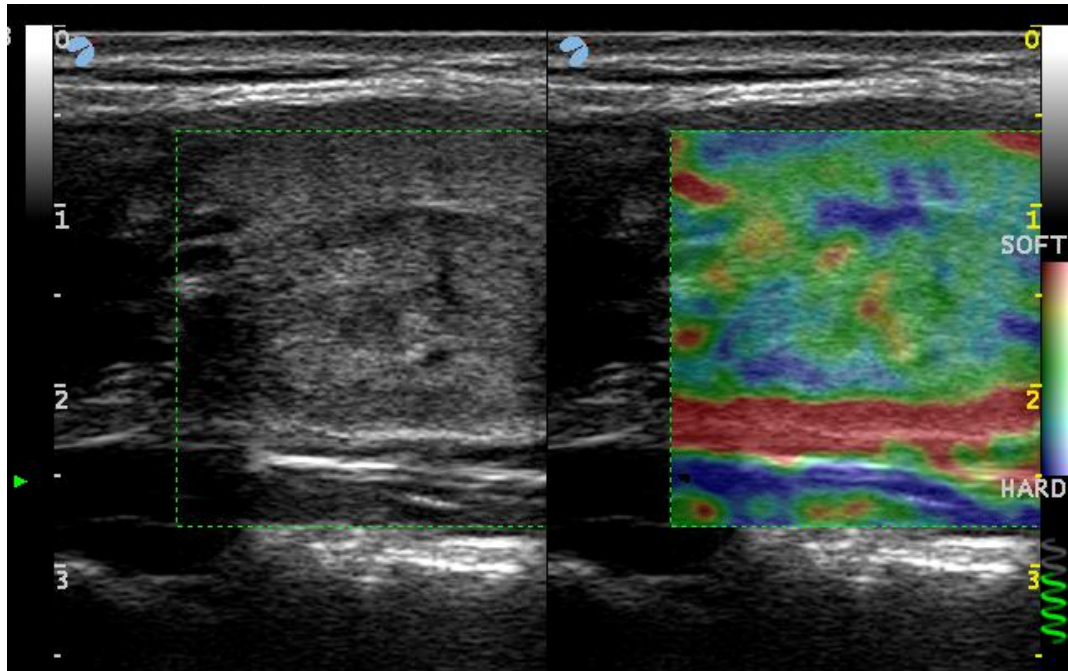


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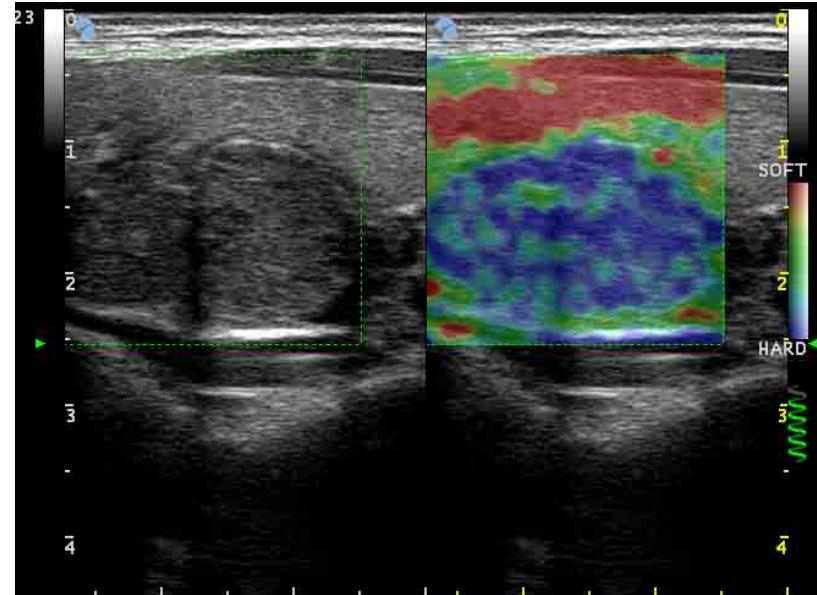
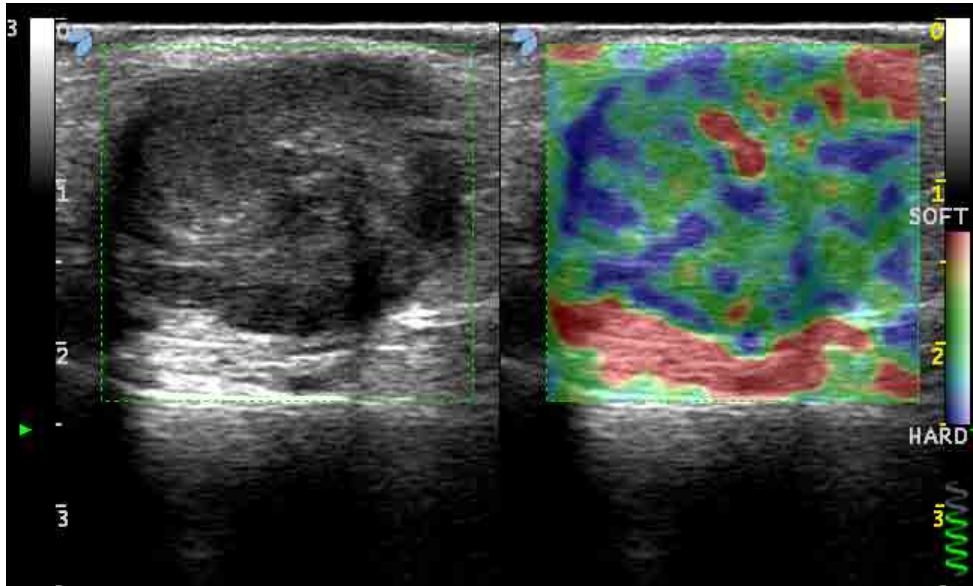


NODULES ELASTOSONOGRAPHY





NODULES ELASTOSONOGRAPHY





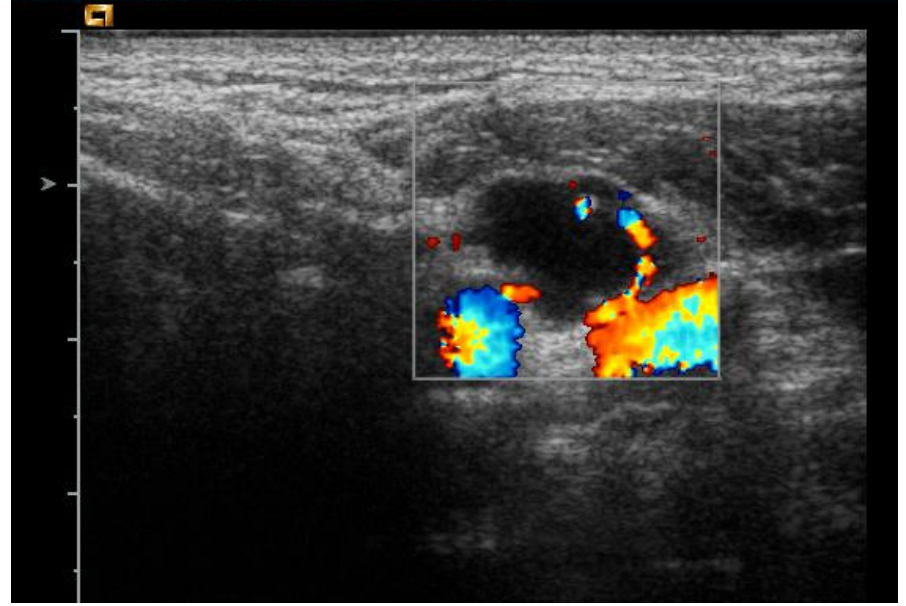
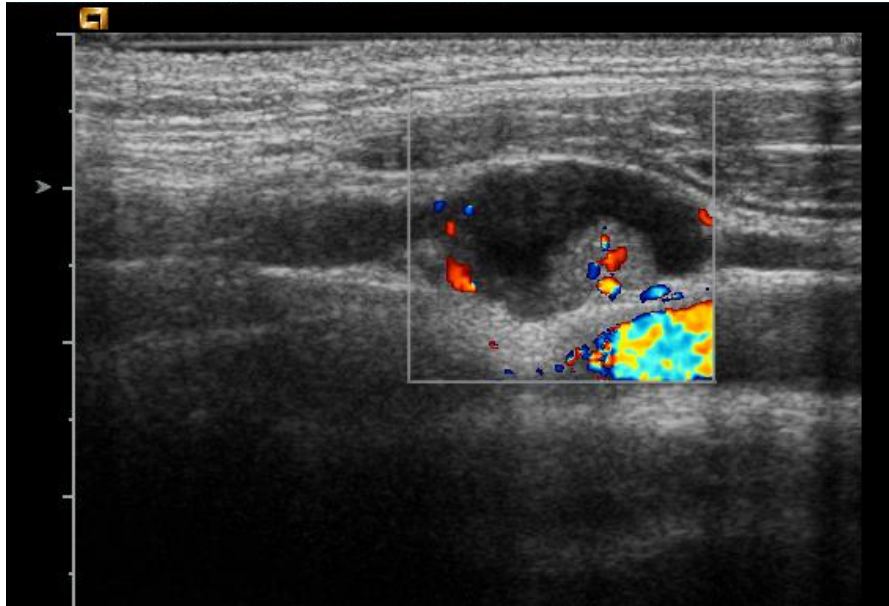
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LYMPH NODES METASTASES





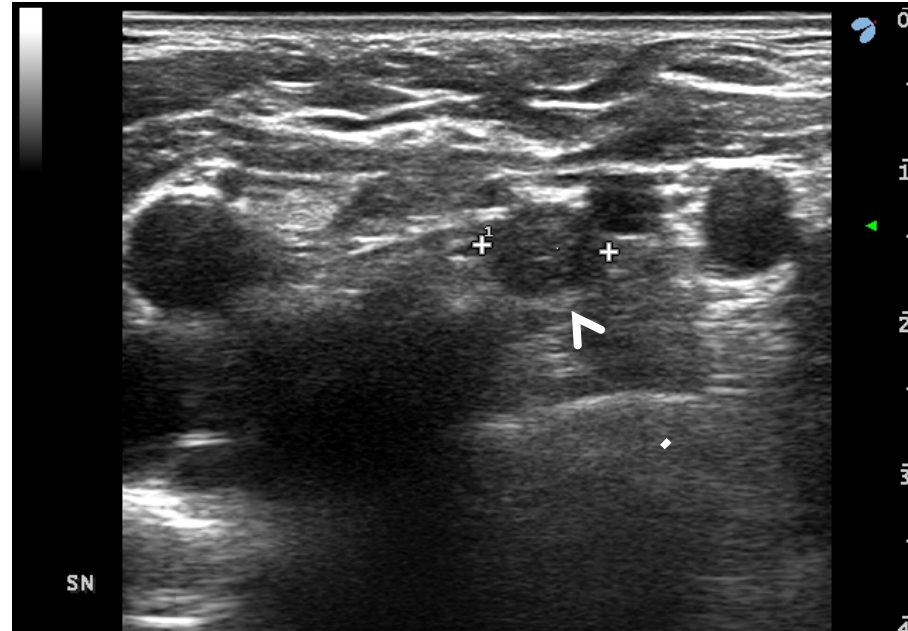
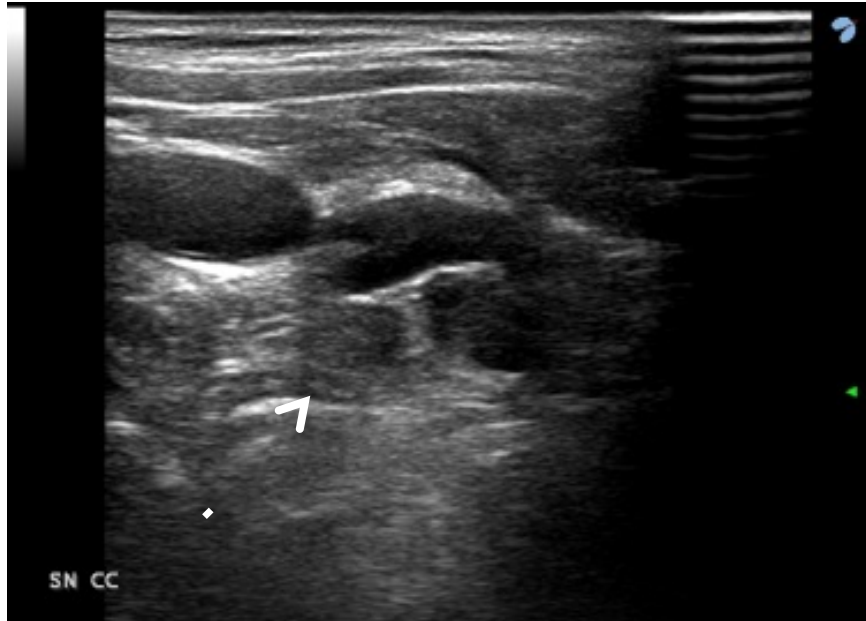
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LYMPH NODES METASTASES





US Features of Thyroid Nodules

Features suggesting benignity

Features suspicious for malignancy

Less specific features suspicious for malignancy

Predominantly cystic

Microcalcifications

No halo around nodule

Uniform halo around nodule

Taller than wide in transverse plane

Ill-defined or irregular margin

Avascular

Markedly hypoechoic

Solid

Enlarged thyroid with multiple nodules

Extension beyond thyroid margin

Increased central vascularity

Cervical lymph node metastasis

Stiffness at elastography



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Thank You