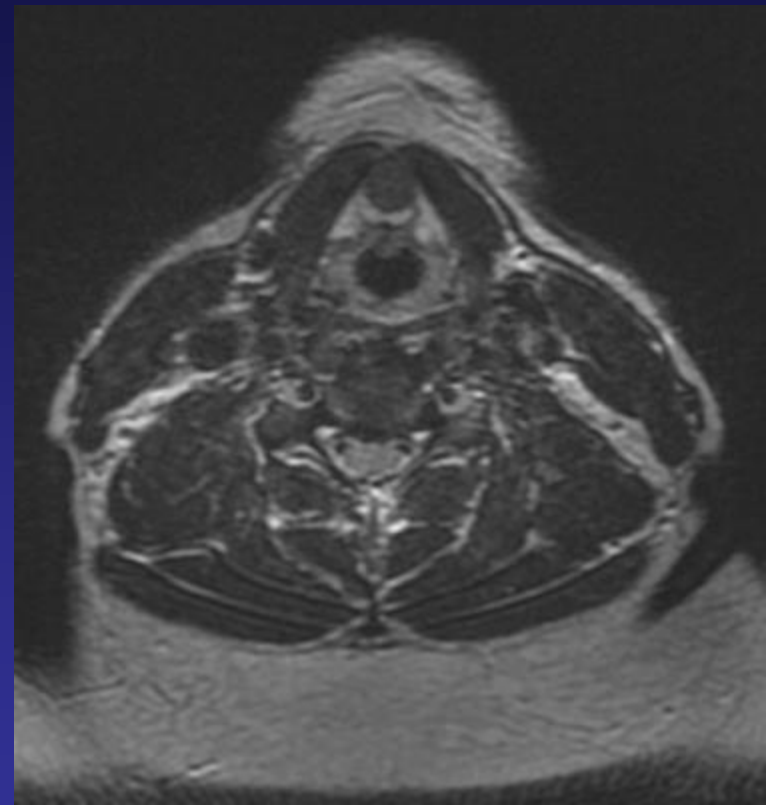
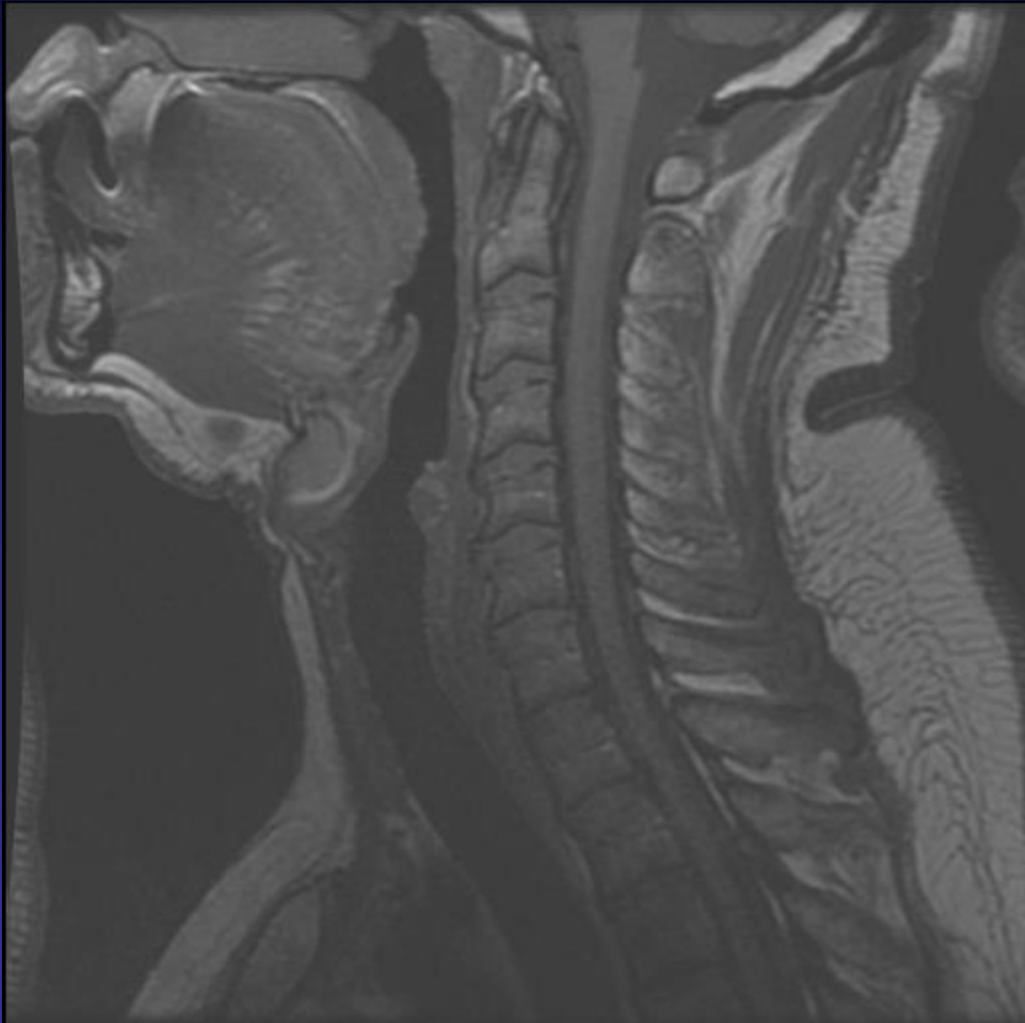


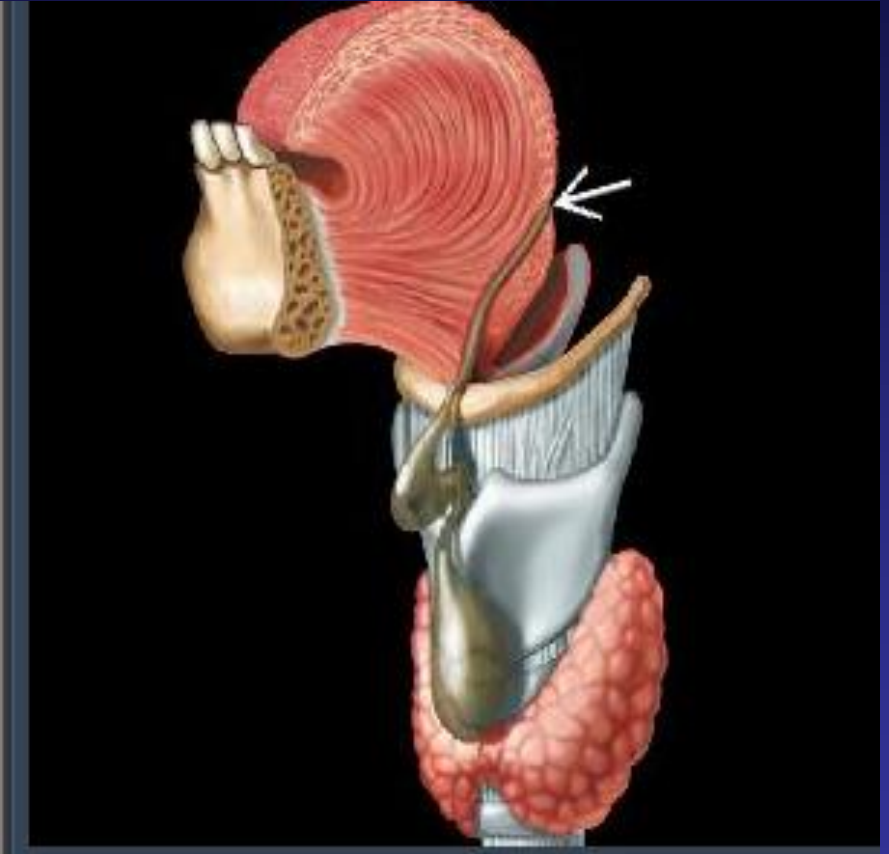
# Thyroid

# Thyroglossal duct Remnant



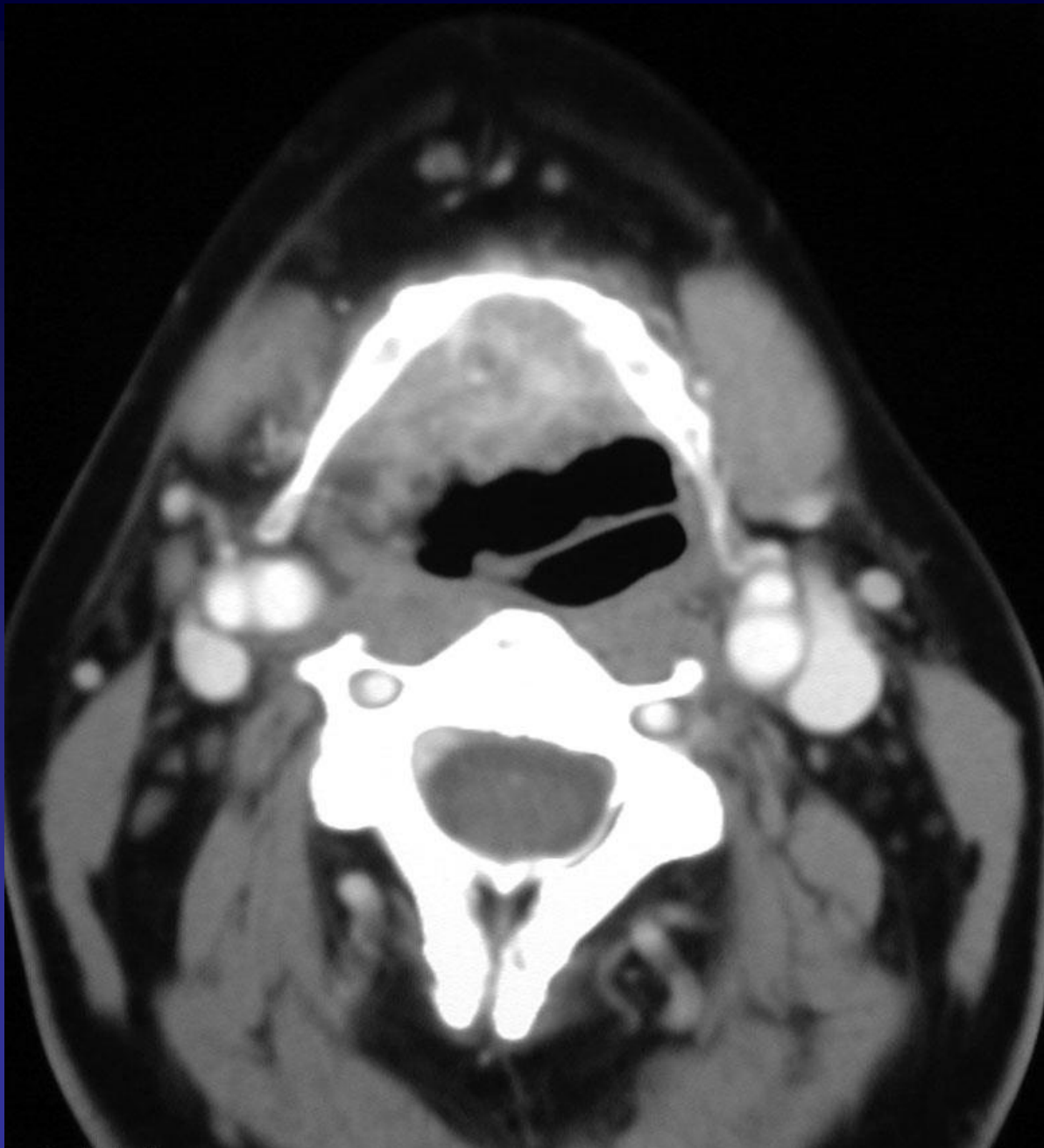
# Thyroglossal duct cyst

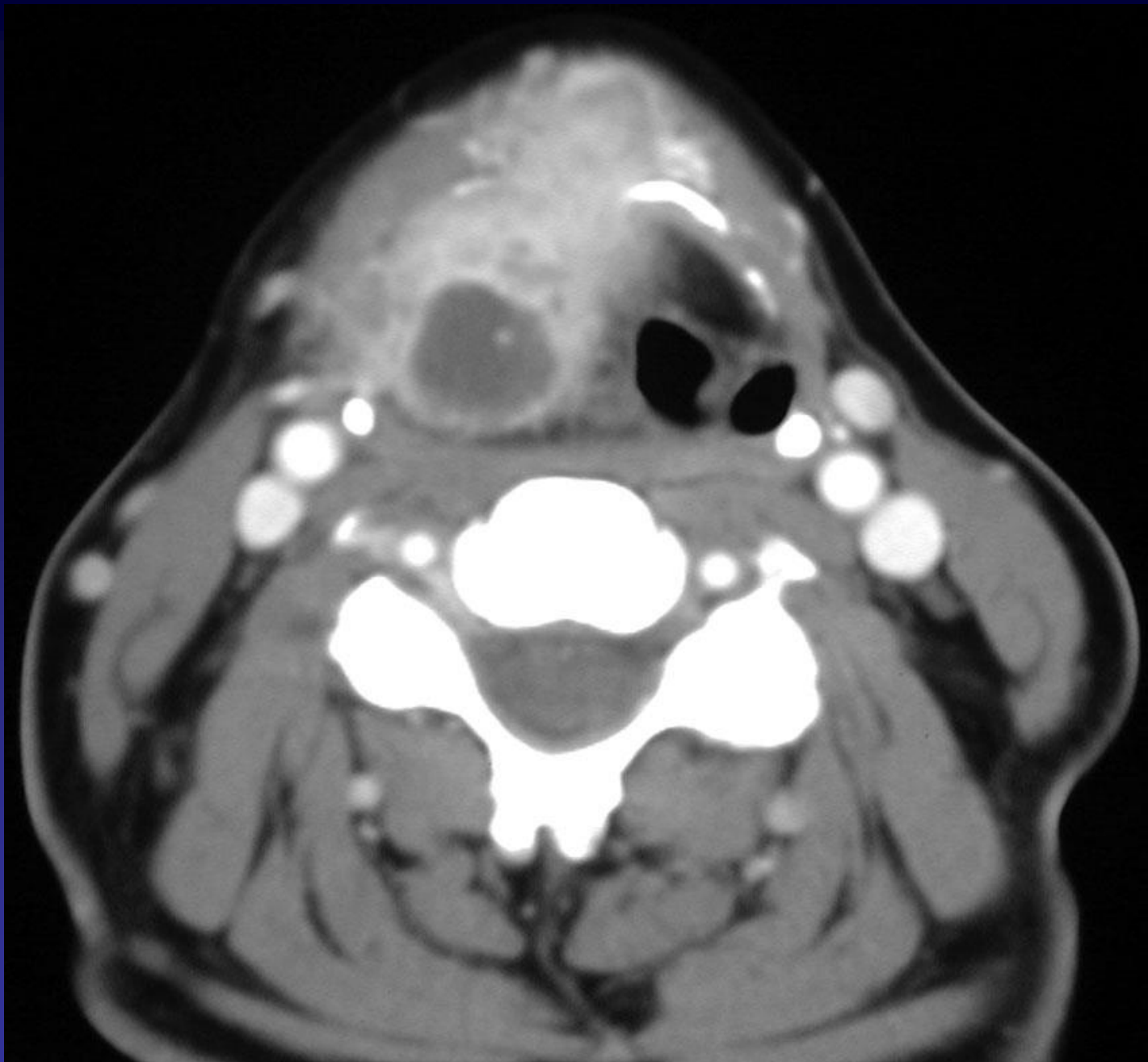
- Best diagnostic clue: Midline cystic neck mass embedded in infrahyoid strap muscles ("claw sign")
- 20-25% in suprahyoid neck
- Almost 50% at hyoid bone
- About 25% in infrahyoid neck
- Wall may enhance if infected.

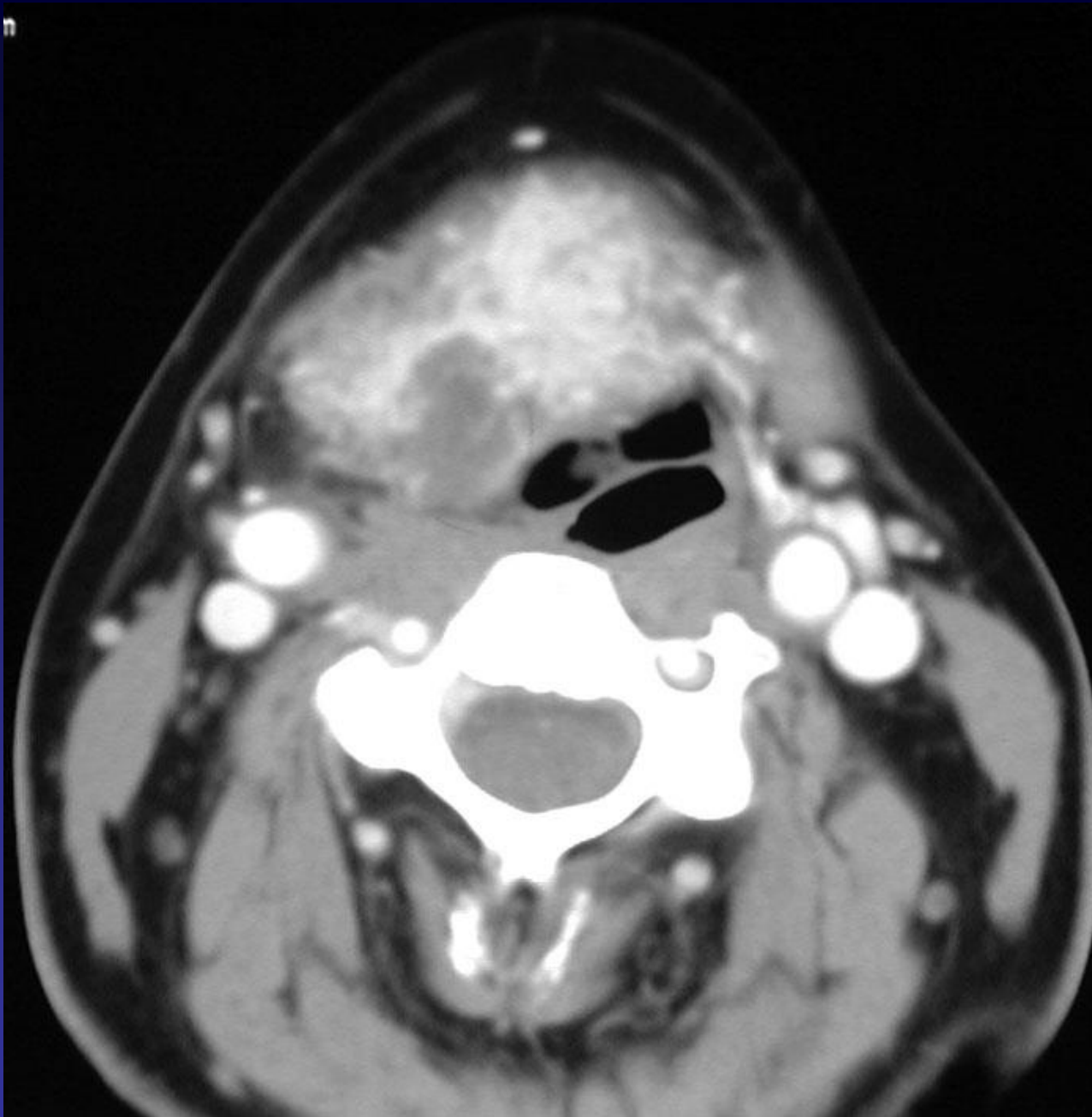


# Papillary Carcinoma, in a thyroglossal remnant









End



# Prevalence of Thyroid Nodules

- By age 60 yrs 50% US/Autopsy of people have thyroid nodule(s)
- 90% benign
- 10% cancers
- 95% of all nodules COLD
- Most sonographic nodules = thyroid hyperplasia (70%)

# Etiology of Thyroid Nodules

- Benign hyperplastic nodules (> 70%)
- Benign adenoma (10%)
- Thyroid carcinoma (5 - 12%) – Papillary (70 - 80%)
  - Follicular (10 - 15%)
  - Medullary (5 - 10%)
- – Anaplastic (<1%)
- Focal thyroiditis (1-5%)
- Uncommon lesions: intra thyroidal parathyroid, true cyst, metastatic disease

# Reporting of incidental thyroid nodules on CT and MRI

- Only 1.6% of patients with one or more thyroid nodules will actually have thyroid cancer.
- More than 96% of thyroid cancers are papillary and follicular cancers (well-differentiated) and have an excellent prognosis.

# Duke 3- Tiered System

CT/MR Pet CT features	Recommendation
<b>Category 1:</b> Nodule Pet avid or locally invasive or suspicious lymph node	Strongly Consider US for any Size
<b>Category 2:</b> Solitary nodule < 35	Consider US if > 1 cm in adults Any size in Pediatrics
<b>Category 3:</b> Solitary nodule > 35	Consider if > 1.5 cm
Multiple nodules	Consider based on solitary criteria

# Nuclear Medicine

## Unconventional Nuclear Medicine

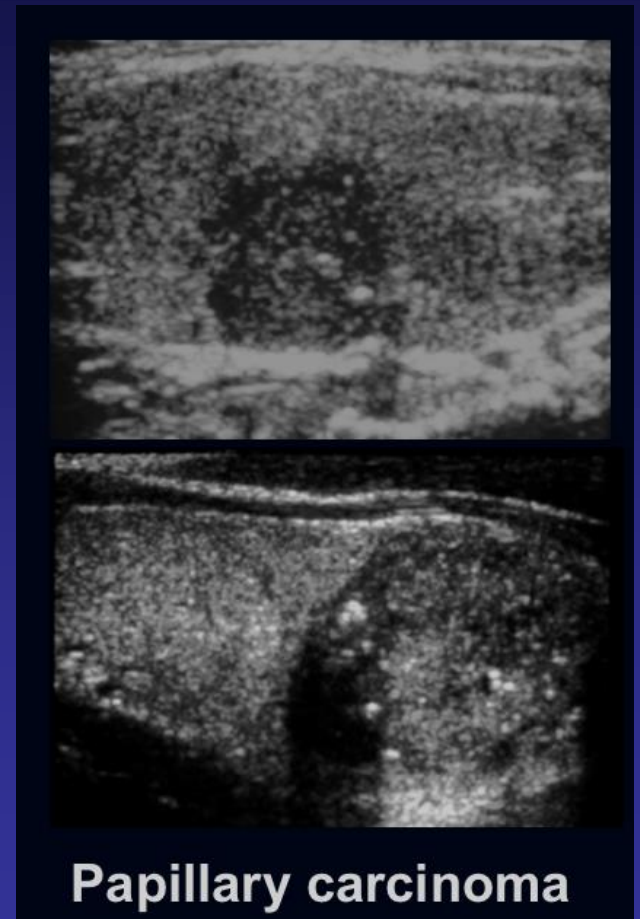
- A thyroid scan is useless unless there is a low TSH<sup>1</sup>
- Radionuclide studies are essentially useless in the vast majority of patients because such studies are rarely definitive and they do not alter the therapy or the follow-up plan; furthermore, these studies add considerable cost<sup>2</sup>
- Unhelpful in differentiating benign from malignant and utility for routine evaluation is limited<sup>3</sup>

# Sonographic features associated with malignancy

- Cervical adenopathy
- Micro-calcifications
- Coarse, interrupted calcifications
- Markedly hypoechoic (like muscle), solid consistency
- Taller than wide
- Irregular, infiltrating margins
- Intra nodular flow *in association with* hypoechogenicity and/or irregular margins

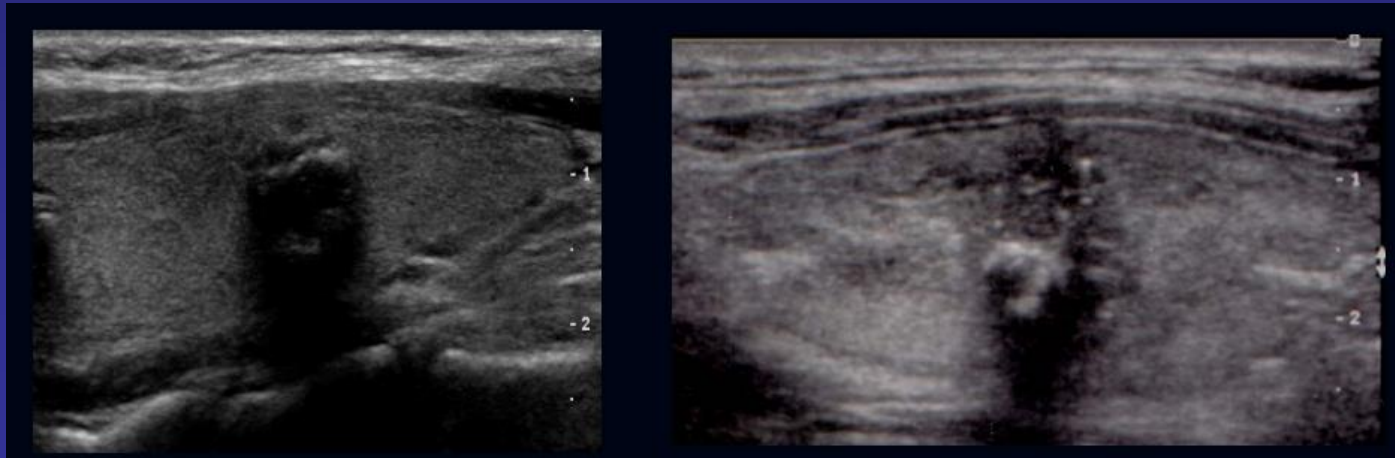
# Micro calcifications

- Multiple punctate ( $< 1$  mm) echoes without shadowing
- **Most specific sign of malignancy**
- 85-95% of thyroid cancers
- Will not see on CT.
- May not be reliable predictor of malignancy in nodule size  $< 10$  mm



# Coarse calcifications

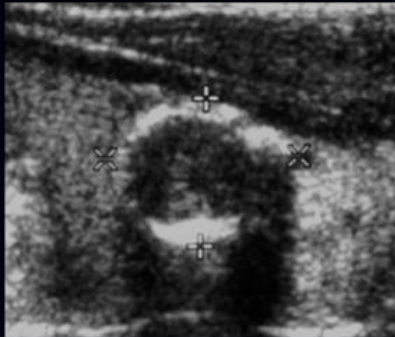
- Common in multinodular goiters = dystrophic calcifications in chronic benign nodules
- When present in solitary nodule malignancy rate approaches 75%





# Peripheral calcification

**Complete, regular  
or “eggshell”**



**Usually benign**

**Interrupted**



**Papillary ca**



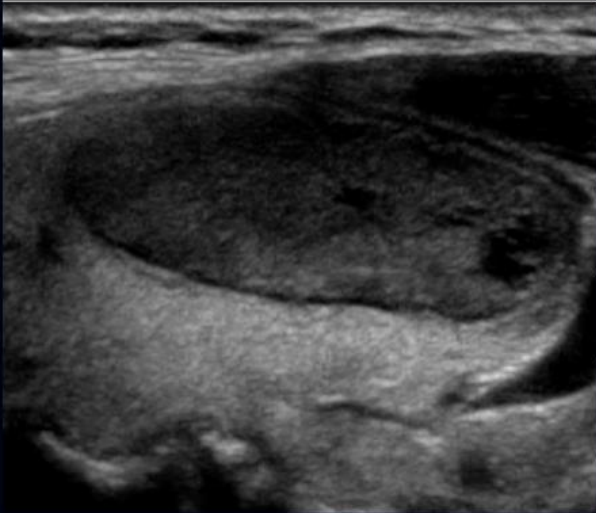
**Follicular ca**

"Eggshell" calcification most often found in benign nodules; if calcified rim is interrupted, it is suspicious of malignancy

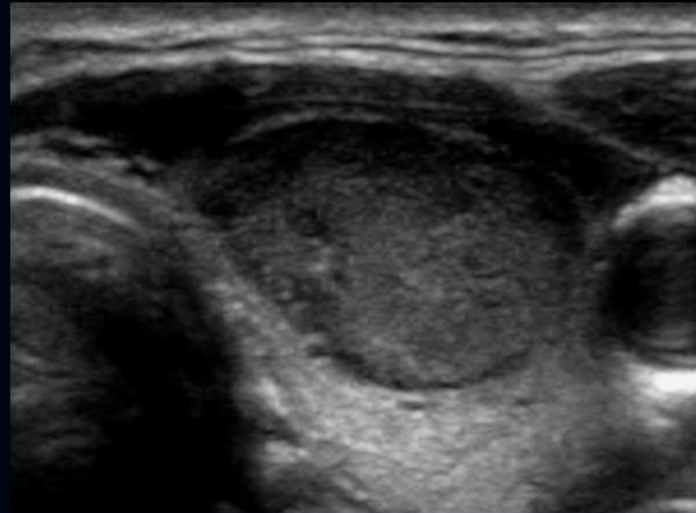
# Hypoechoic Nodules

- Most papillary cancers are hypoechoic
- Since benign nodules more common, most
- hypoechoic nodules are benign
- Incidence of cancer increases if hypoechogenicity is marked (as dark as strap muscles) and is combined with calcifications or intra-nodular flow

# Hypoechoic Nodules



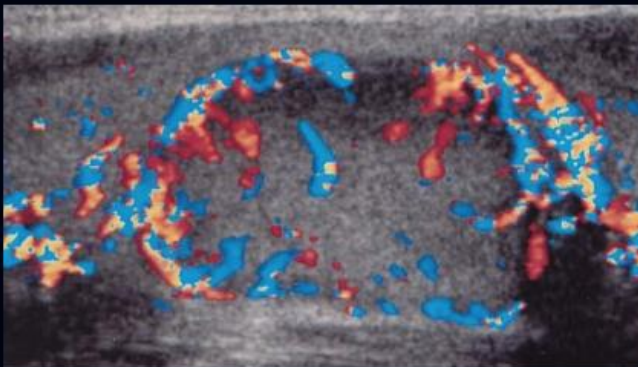
**Benign hyperplastic nodule**



**Papillary carcinoma**

# Intranodular flow

- Solid, hypervascular nodules have 30 - 40% risk malignancy
- > 50% of hypervascular nodules benign



**Adenoma**



**Hyperplastic nodule**

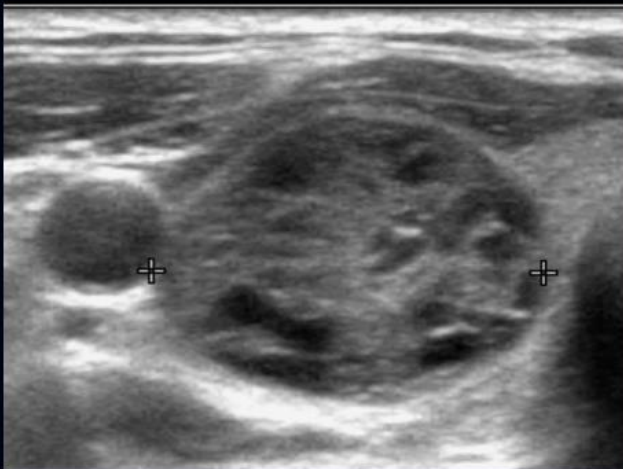
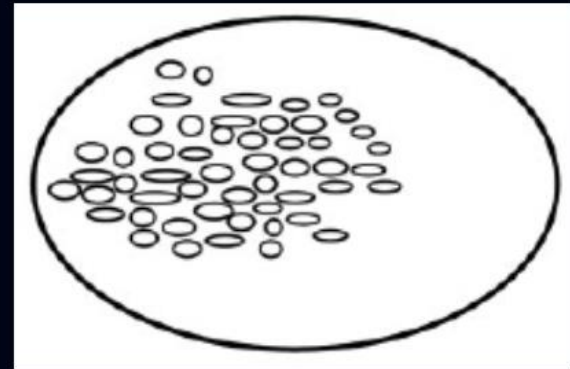
# Nodules that are likely benign

- Entirely cystic
- Predominantly cystic with no flow or calcification in a solid part ( $< 2$  cm)
- Honeycomb or spongiform nodule without calcifications ( $< 2$  cm)
- “Pseudonodules” in autoimmune disease (chronic lymphocytic thyroiditis)
- Mixed cystic and solid nodules with a *functioning* solid component (any size)

# “Spongiform” nodules

## “Spongiform” nodules

- Aggregation of microcysts in  $> 50\%$  of a nodule
- “Honeycomb of internal cystic spaces”
- $< 1\%$  risk of cancer



Moon Radiology 2008; 247:762- 70  
Bonavita AJR 2009; 193:207- 13

# SRU Consensus for Sonographically Detected Nodules

- Bx if microcalcifications & >10 mm
- Bx if solid and/or coarse calcifications & >15 mm
- *Consider* bx if mixed cystic/solid or cystic with a mural nodule & > 20 mm
- *Consider* bx if substantial growth
- Apply clinical judgment!



# SRU Consensus Statement

- Multiple nodule BX recommendations:
- Bx one or more nodules using solitary nodule guidelines
- May not need to bx if gland diffusely enlarged with multiple sonographically similar nodules without suspicious features (multinodular goiter)



# Multiple Nodules

- Cancer present in “non-dominant nodule” in at least one-third cases

## Multinodular goiter $\neq$ Multiple nodular gland



**Multinodular goiter**

Enlarged thyroid with multiple sonographically similar nodules with little or no normal parenchyma



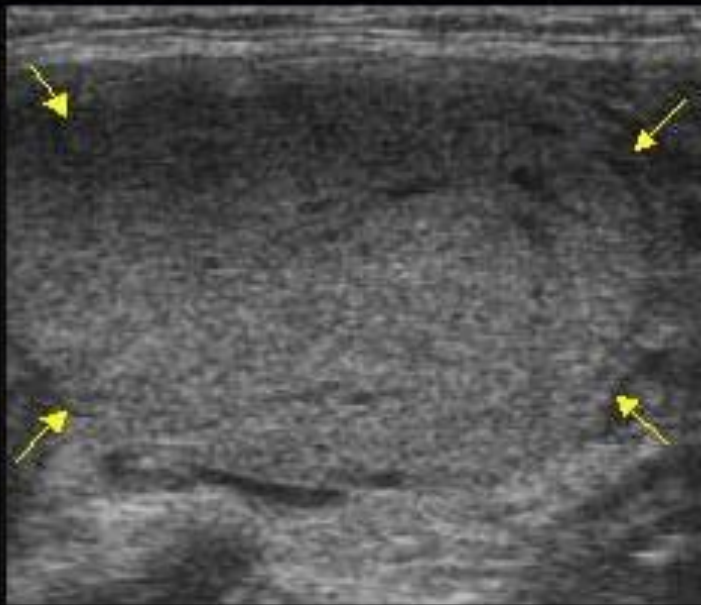
**Multinodular gland**

Normal parenchyma with more than one nodule

# Nodules

- If greater than 1.5 cm > biopsy
- If N 15 cm, then ok unless
  - It has microcalcifications then biopsy
- On CT if less than 2 cm and ECS, nodes or vocal cord paralysis, say no signs to suggest malignancy.

# Hyperplastic adenomatous nodule



Hyperplastic adenomatous nodule longitudinal

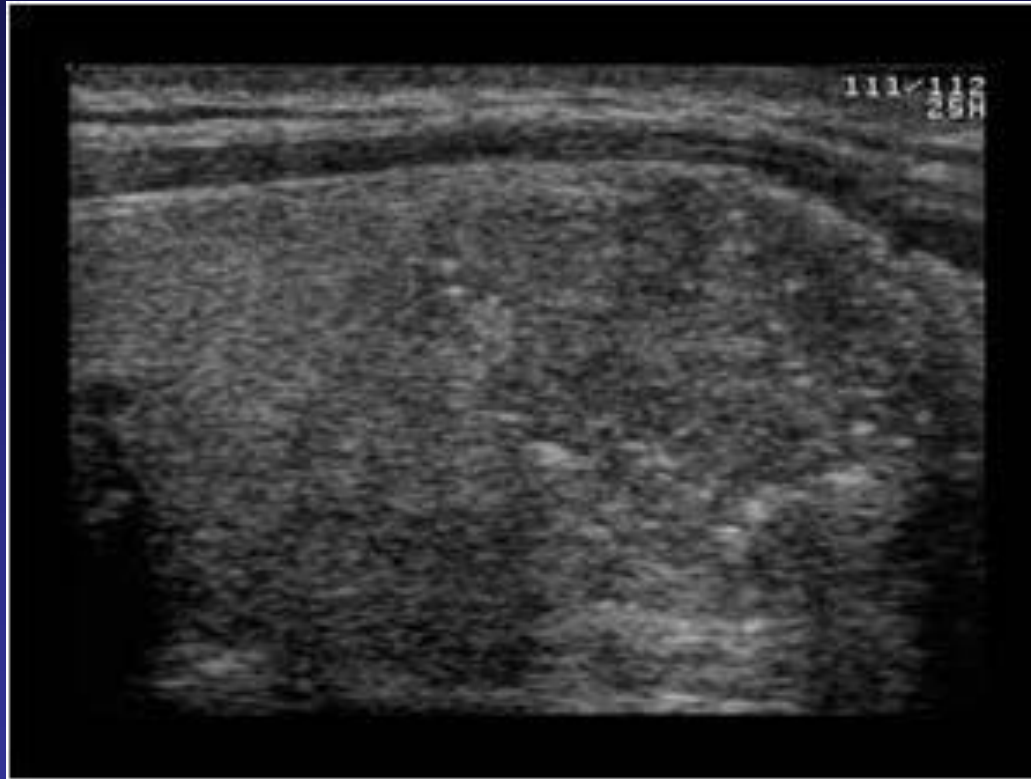
4.1.2/003.jpg



Hyperplastic adenomatous nodule vascularization longitudinal

ID: 4.1.2/004.jpg

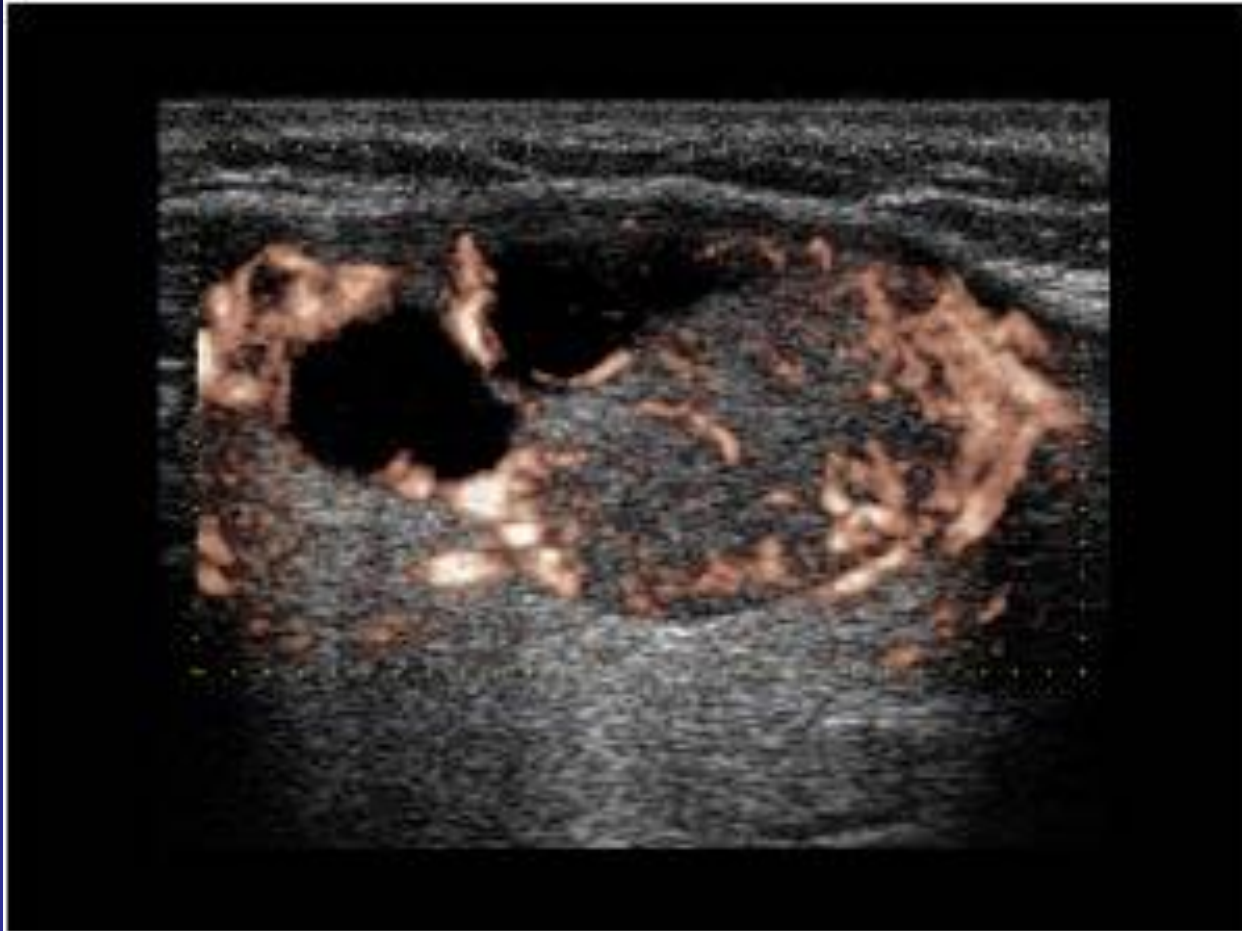
# Dysplastic nodule with punctate calcifications



# Thyroid adenoma with cystic degeneration and ring vascularization

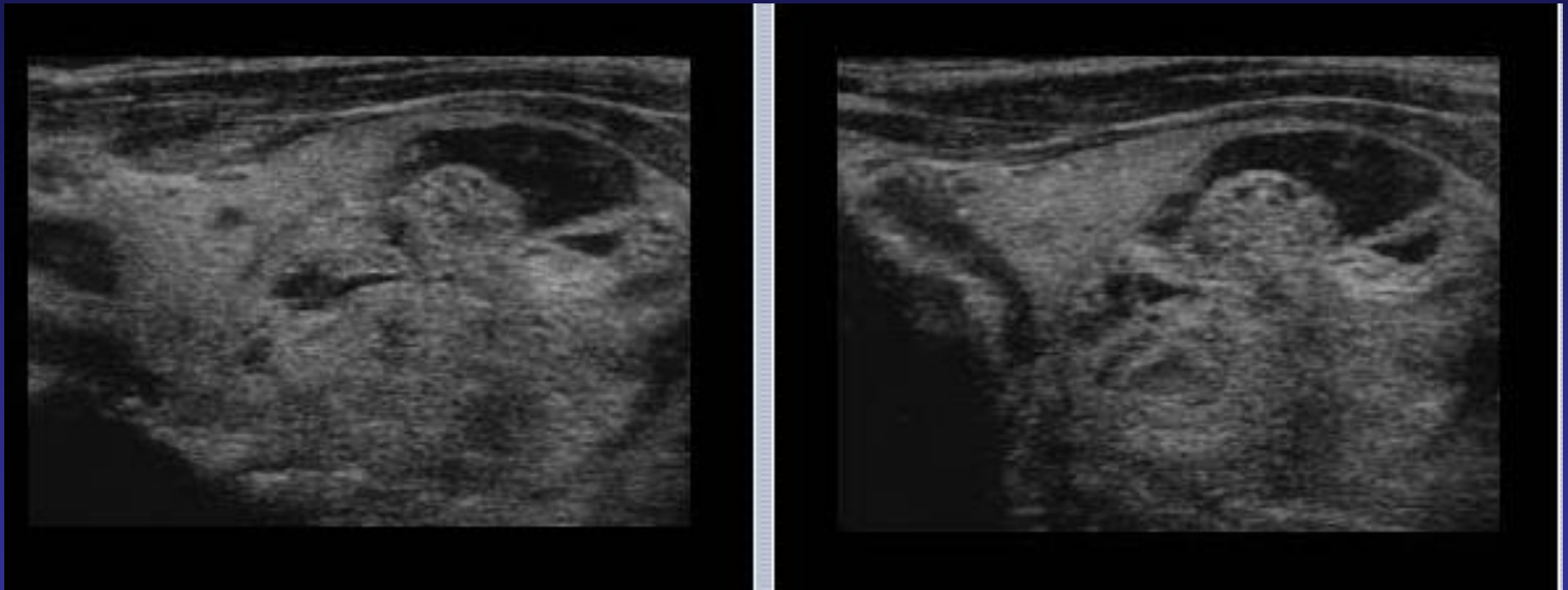


# Hypervascularized partly cystic thyroid adenoma

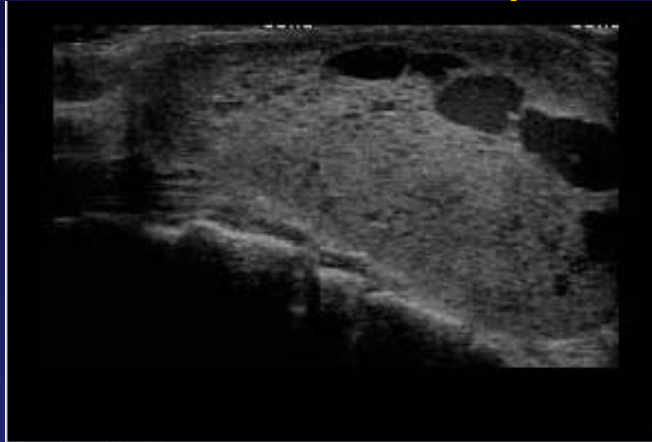




# Cystic changes in an adenomatous nodule (colloid nodule)

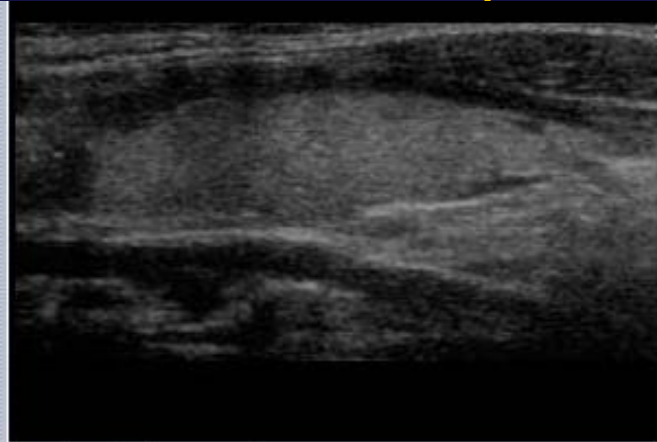


# Cystic changes in an adenomatous nodule (colloid nodule)



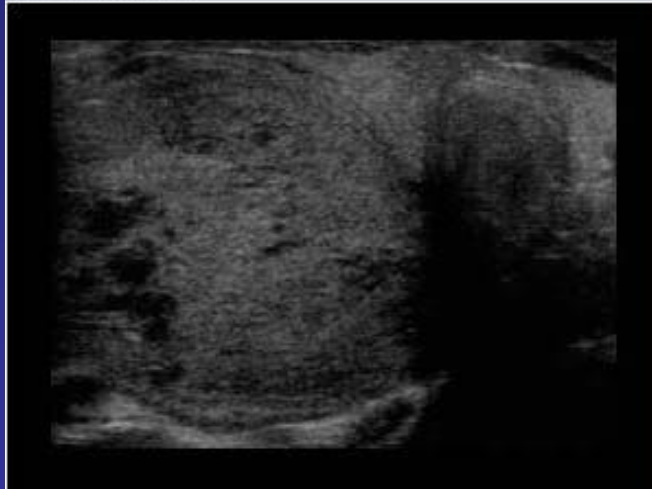
Longitudinal

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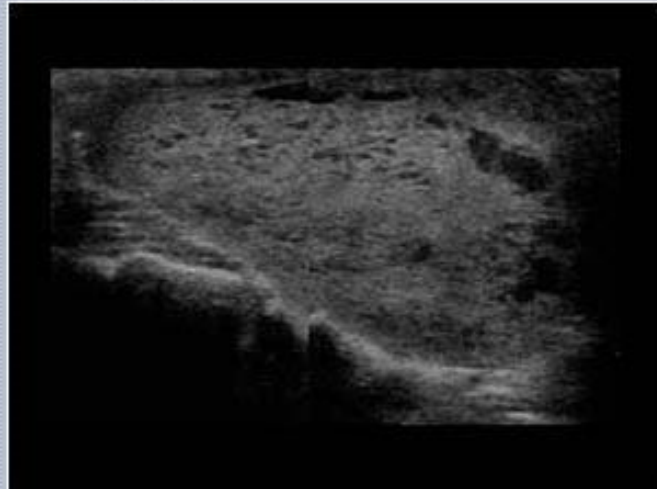


Longitudinal normal

ID: 4.1.2/027.jpg



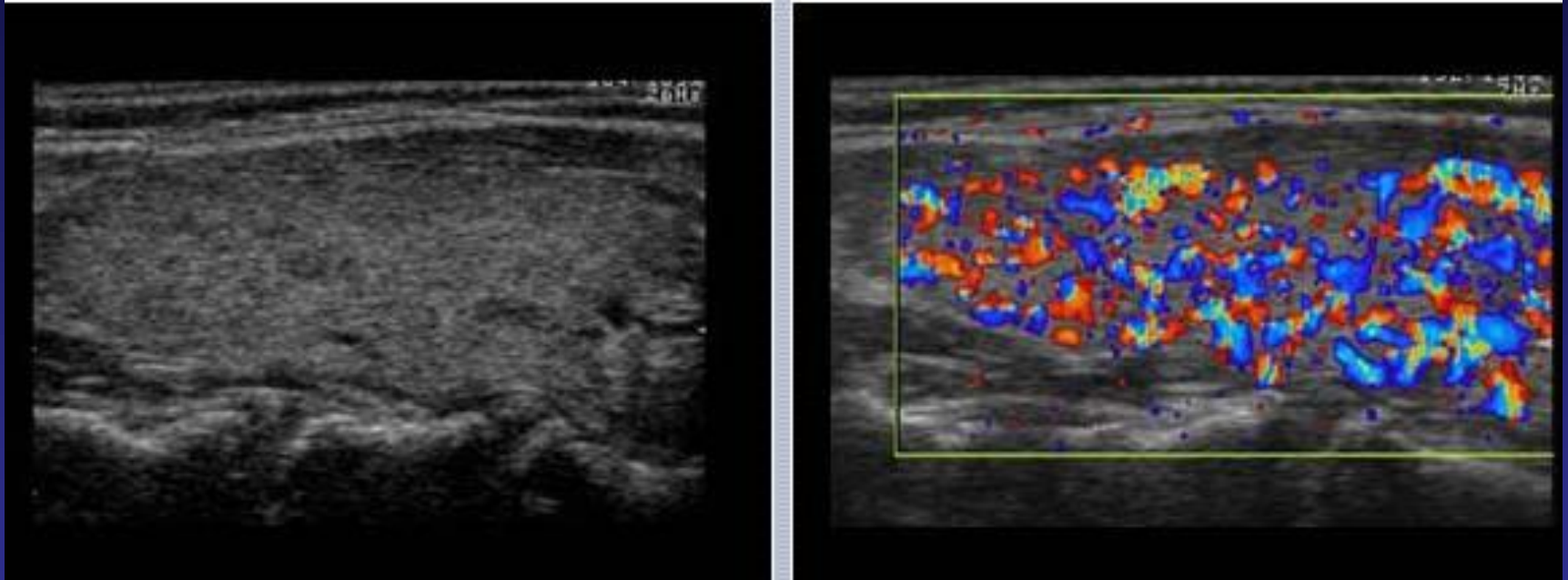
Transverse



Longitudinal

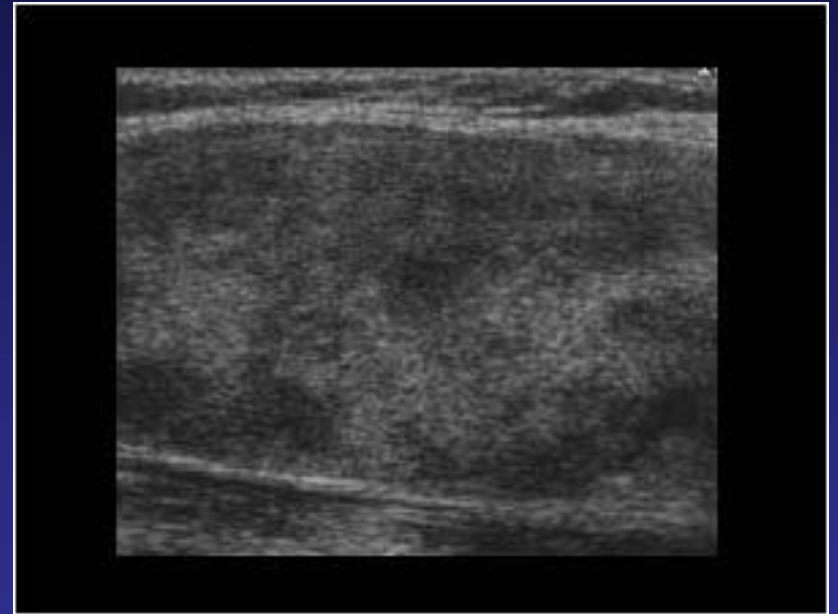
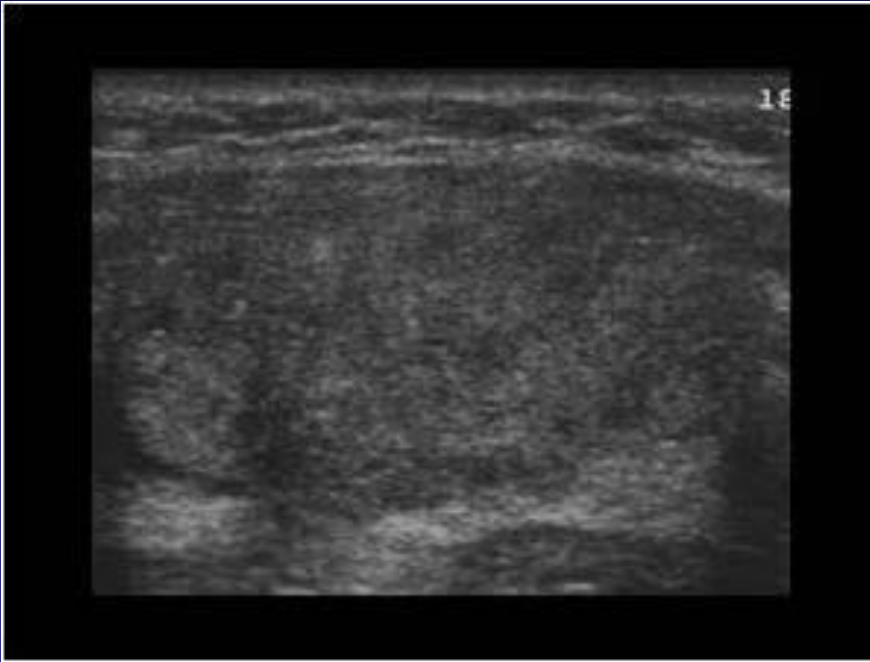


# Graves disease



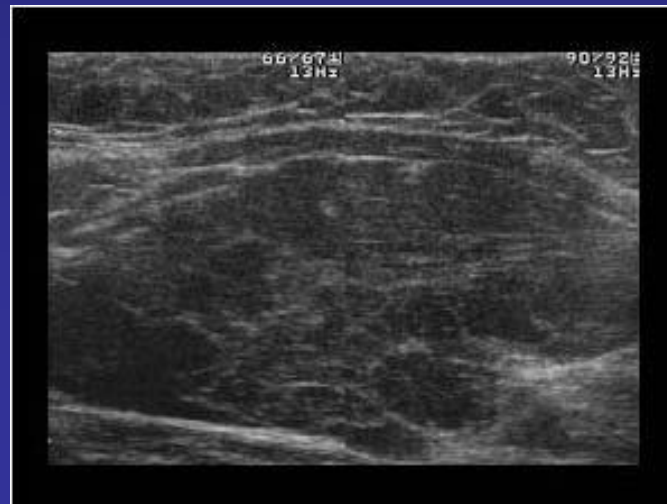
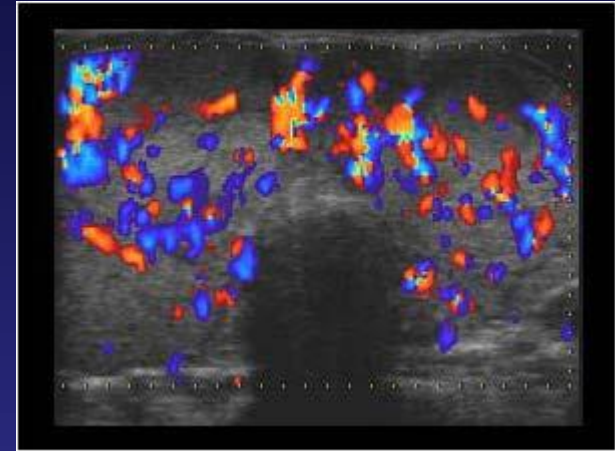
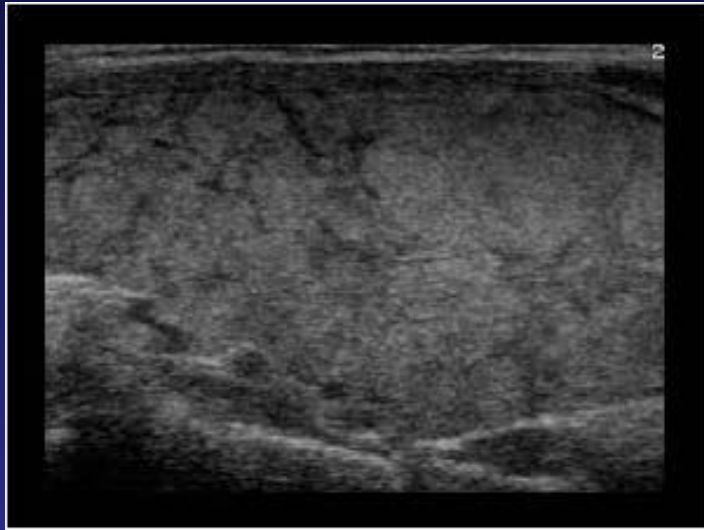
with a hypervascularized diffuse inhomogeneous thyroid gland

# De Quervain's thyroiditis



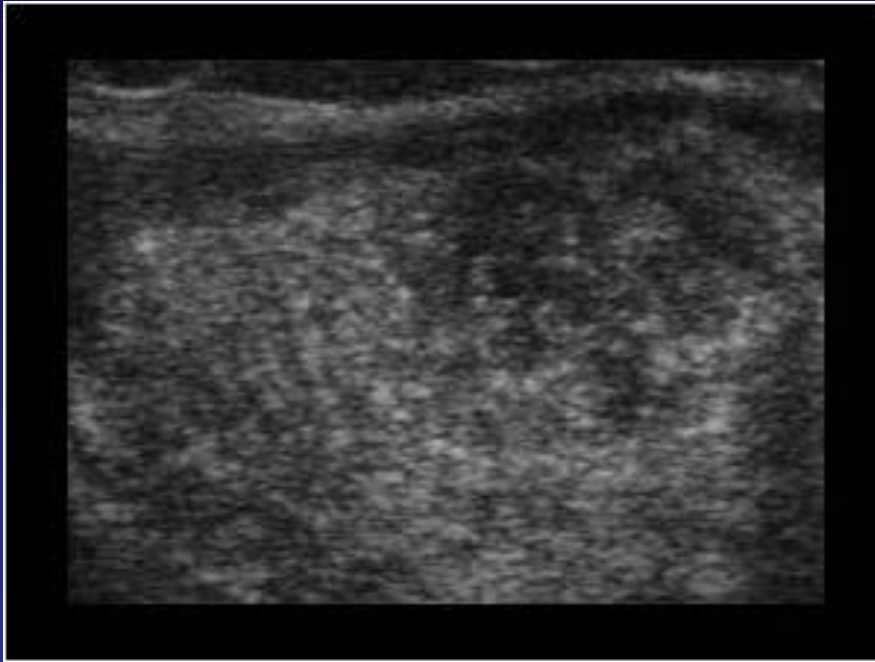
with an enlarged diffuse inhomogeneous thyroid gland

# Chronic autoimmune (Hashimoto) thyroiditis

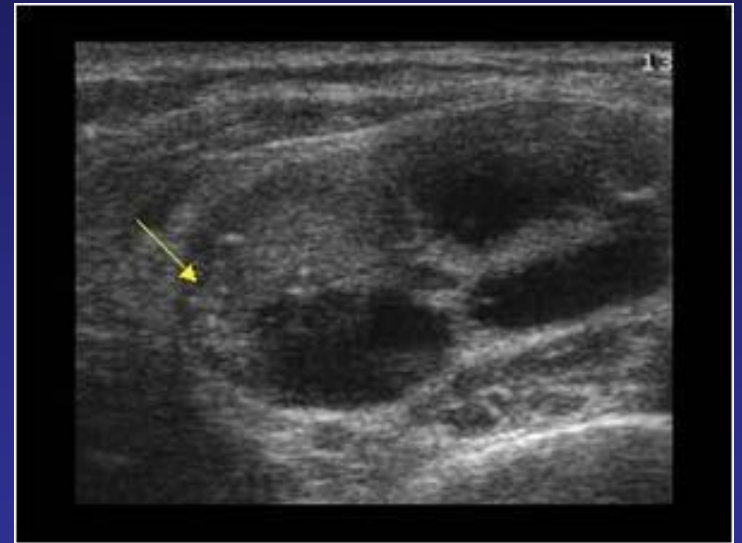


Different patient

# Thyroid carcinoma

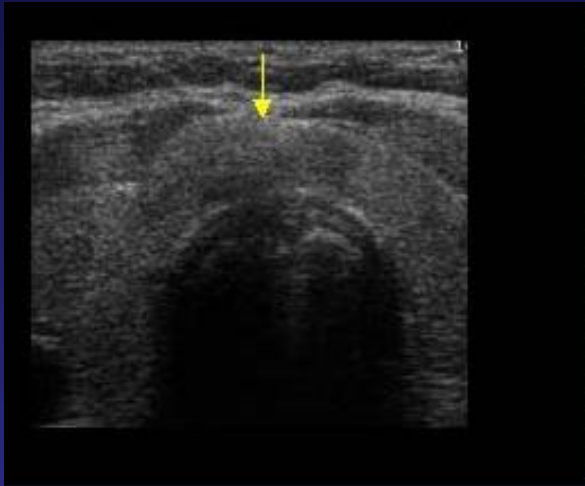


hypoechoic mass with  
punctate calcifications

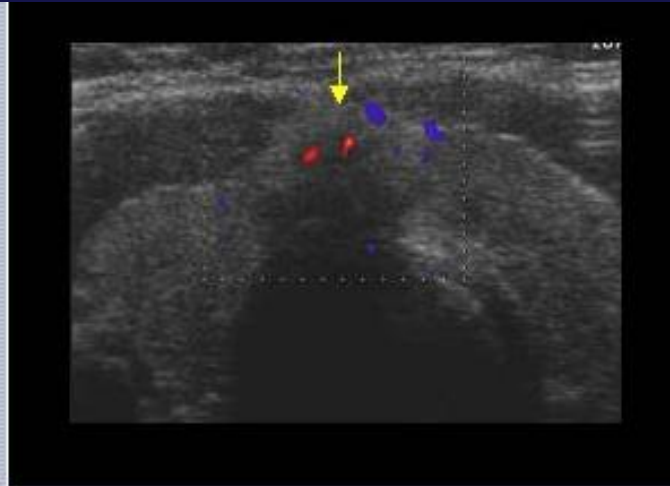


Lymph node metastasis  
with punctate  
calcifications

# Small papillary carcinoma in the isthmus



/065.jpg



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with a hypoechoic ill defined mass with calcifications