

2017 ATA Victoria  
Advanced Thyroid US

DIFFUSE THYROID CONDITIONS

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Disclosures

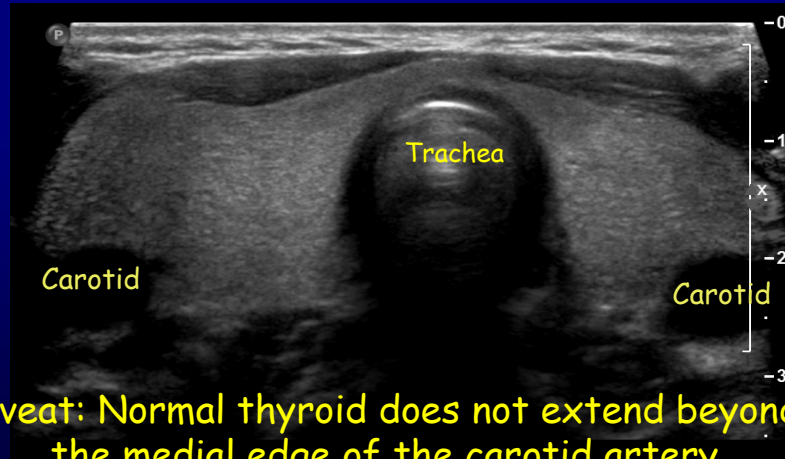
- Lee: None

## The Challenge of Determining if Gland is Abnormal

- Normal variation: Height, BMI, gender, race, age
- Subclinical autoimmune thyroid disease
- Adenomatous goiter
  - Nodules do not have intact capsules and isoechoic nodules may not be seen
- Pregnancy
- Mild - moderate iodine deficiency
  - Initially diffuse hyperplasia without nodules

## Diffuse Goiter

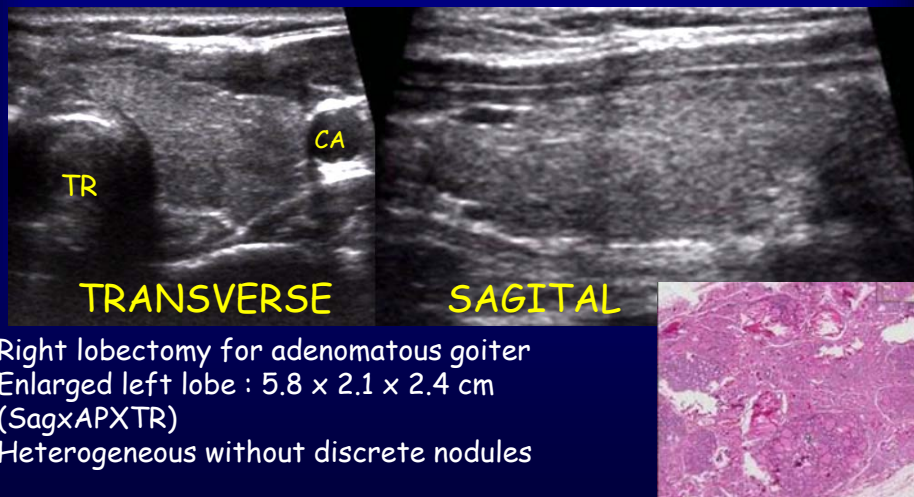
## Diffuse goiter: Transverse



**Caveat: Normal thyroid does not extend beyond the medial edge of the carotid artery**

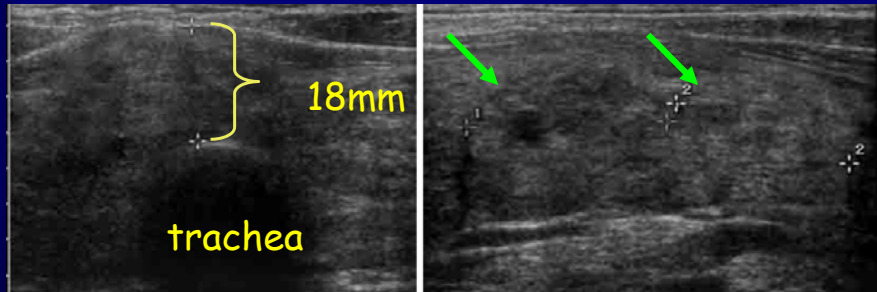
## Adenomatous Goiter

- Adenomatous goiter is diffusely nodular with confluent or indistinct nodules



## Adenomatous Goiter

- Most nodules in a MNG are discrete, obvious, and measurable.
- Adenomatous goiter is diffusely nodular with confluent or indistinct nodules



These nodules have an "indistinct" margin rather than an "infiltrative" margin

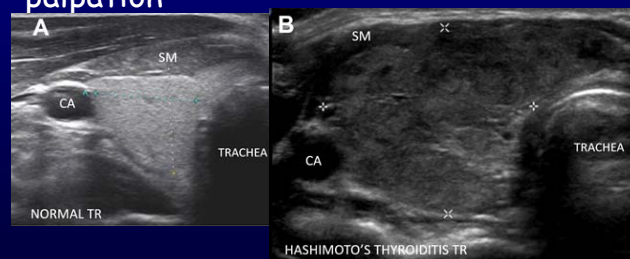
## Thyroiditis

## Diffuse Inflammatory Thyroid Disease

- Thyroiditis
  - Chronic lymphocytic thyroiditis (Hashimoto's)
  - Graves Disease
    - (Toxic diffuse goiter)
  - Subacute thyroiditis (granulomatous or de Quervain's, silent lymphocytic and postpartum)
  - Riedel's thyroiditis
- Suppurative Thyroiditis
- Drug-induced Thyroiditis (amiodarone, lithium, interferon alfa, interleukin-2, tyrosine kinase)

## Chronic Lymphocytic (Hashimoto's) thyroiditis

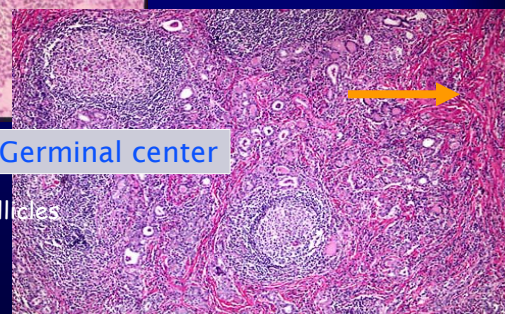
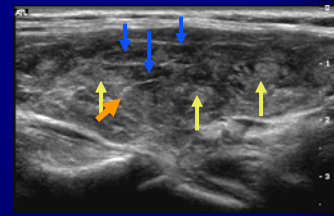
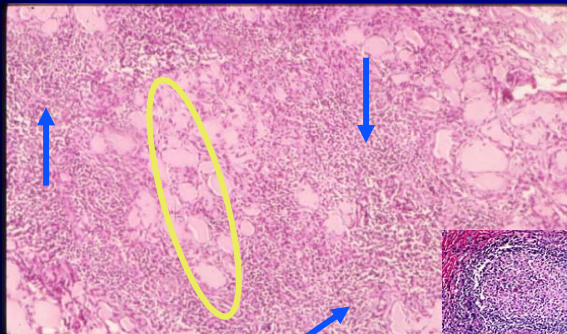
- Autoimmune disease occurring most frequently in middle aged women, with strong familial predisposition
- Patients may be eu-, hypo- or hyperthyroid
- Patient may be goitrous or agoitrous to palpation



## Many Faces of Thyroiditis



## Lymphocytic Thyroiditis



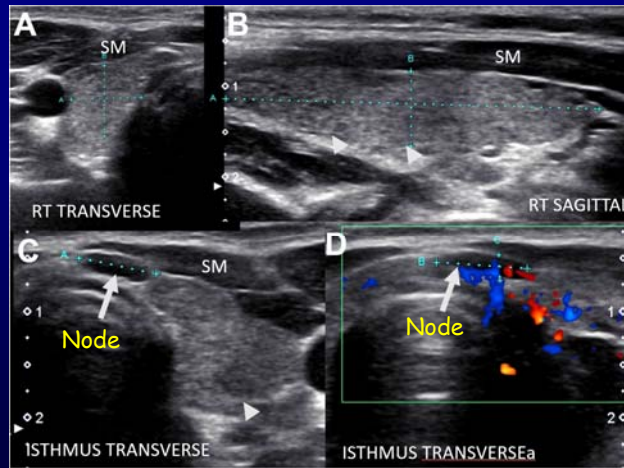
•Chronic lymphocytic infiltration,  
lymphocytic germinal centers,  
destruction/apoptosis of thyroid follicles  
and fibrosis

•Results typical US appearance and  
hypothyroidism

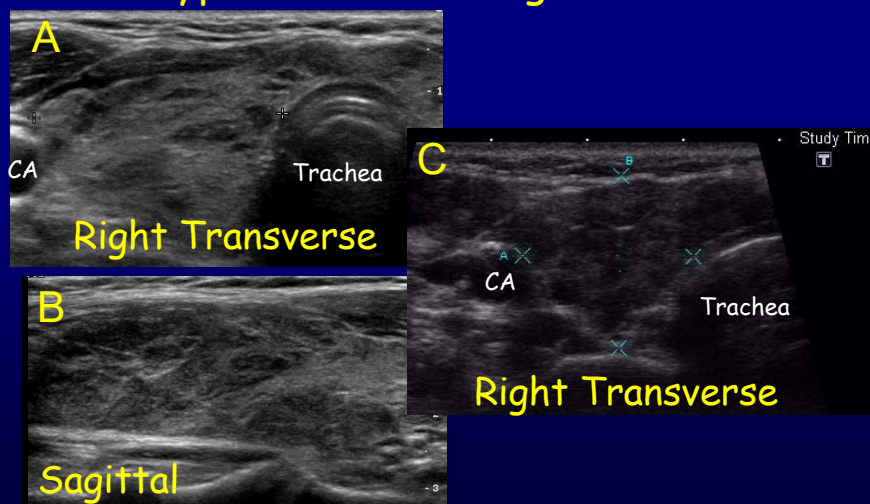
Germinal center



**Microcystic Change: Subtle Early  
Evidence of Thyroiditis - often  
before TPO or TSH are abnormal**



**Hashimoto's Thyroiditis-Evolution to Diffuse  
Hypoechoic Heterogeneous**



### Hashimoto's Variants: "Patchy" Thyroiditis vs. Nodules

Sagittal

CA

Vascularity NOT displaced

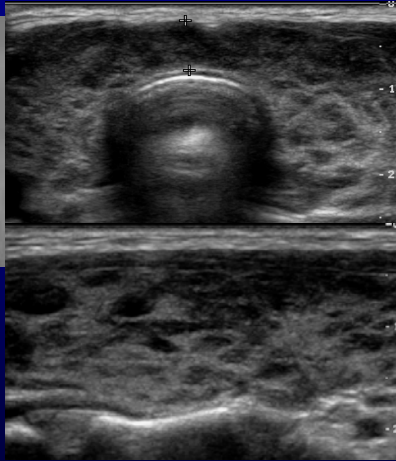
### Hashimoto's Thyroiditis:US Variants

- Lymphocytes deposits (hypoechoic foci - through transmission of sound)
- Fibrosis (hyperechoic bands)
- Diffuse vascularity - often along fibrous bands
- Fibrous bands may "outline" pseudonodules or tiny pockets of lymphocytes
- Pseudonodules are NOT "innumerable small nodules"

PSEUDONODULE #1



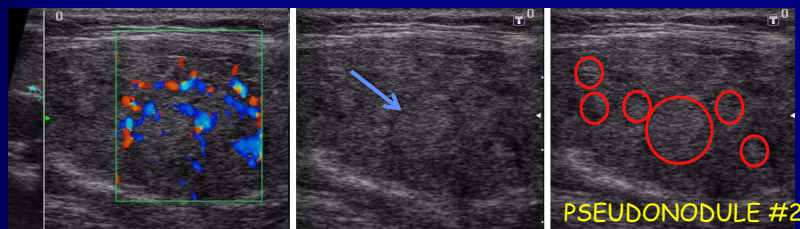
### Benign Nodular Pattern: Giraffe Change of Chronic Thyroiditis



These are pseudonodules  
type 1 in Chronic Thyroiditis

Photo provided by Dr. Robert Levine

### Hashimoto's Thyroiditis: US Variants

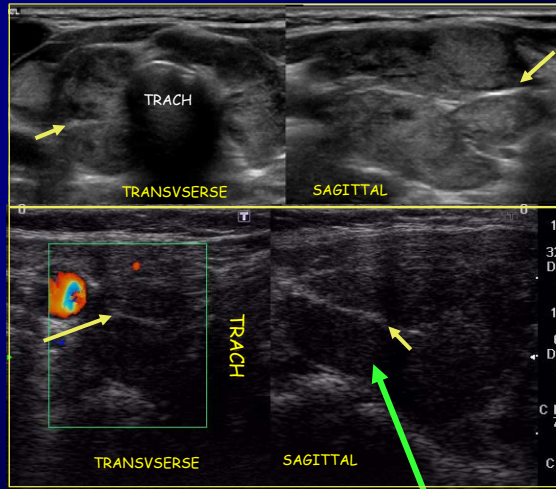


- Multiple microcytic foci surrounding more normal isoechoic tissue create the appearance of an isoechoic/hyperechoic nodule
- The pseudonodule will often appear discrete only in 1 view
  - If you cannot see a nodule in both planes, it is not real - pseudonodule #2

Bonavita JA AJR. 2012;98:W102-3

### Hashimoto's Thyroiditis

- Over time the gland tends to become more hypoechoic and enlarged
- The capsule causes another type of "pseudonodular" appearance, the **cleft sign**
  - Double layer of thyroid capsule (hyperechoic) that can be seen next to hypoechoic parenchyma

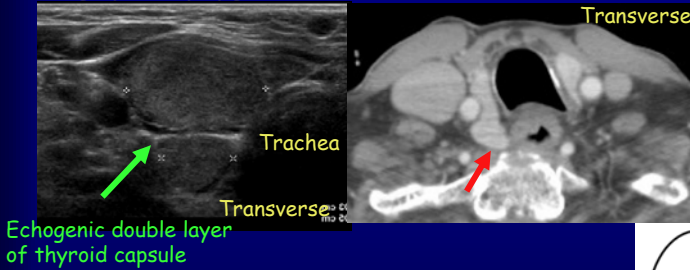


Just as hypoechoic as strap muscle

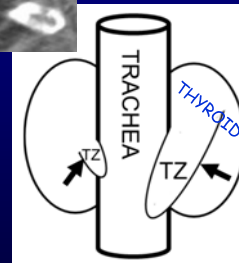
PSEUDONODULE #3

### Hashimoto's and the Cleft Sign: Tubercle of Zuckerkandl

PSEUDONODULE #3

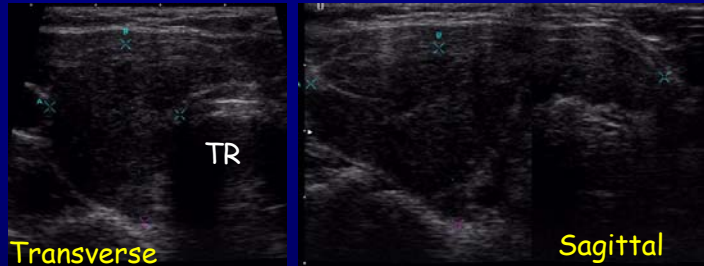


Tubercle of Zuckerkandl:  
 Posterior lateral thyroid tissue  
 from 4<sup>th</sup> branchial cleft +  
 Ultimobranchial body



Posterior view

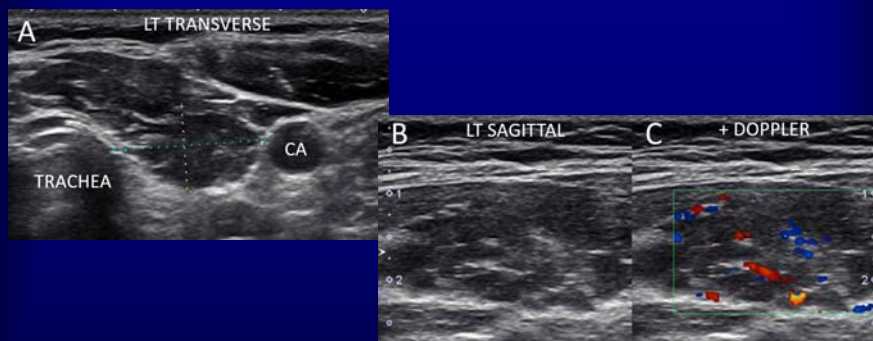
## Hashimoto's Thyroiditis: US Variants



- Progression of the inflammation
  - May be associated with Igg4 Hashimoto's
  - Diffusely hypoechoic gland
  - Difficult to detect margins of the gland
  - Difficult to detect hypoechoic malignancies

Li et al. Mod Pathol 2012 ;25:1086-97

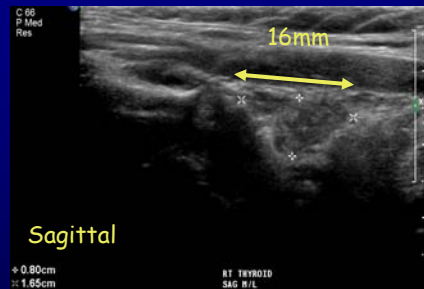
## End-Stage Fibrosis and Thyroiditis



Vascular flow along the fibrotic bands and not  
the parenchyma

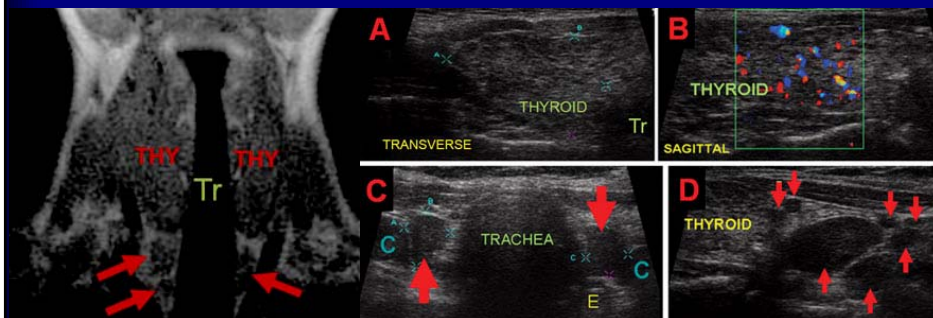
## Atrophic Hashimoto's

- Autoimmune thyroid disease
- Small and atrophic gland
- Hypoechoic and heterogeneous



## Perithyroidal Nodes and Chronic Thyroiditis

188/194 with nodes and autoimmune thyroiditis

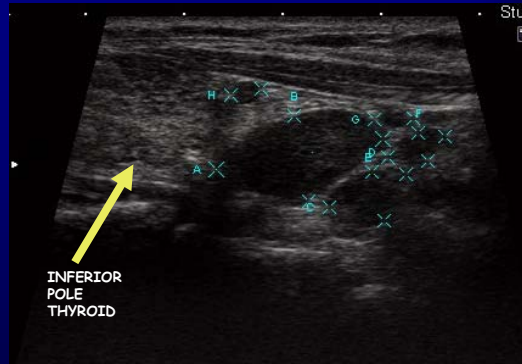


- Multiple benign nodes inferior to both lobes of the thyroid (red arrows) in patient with Hashimoto's

<http://www.healio.com/endocrinology/thyroid/news/print/endocrine-today/%7Bf08cde0-589d-45e5-80fe-6444824ca10f%7D/perithyroidal-masses-in-a-young-woman>; Serres-CrA@ixams X. *J Clin Ultrasound*. 2008;36:418-421

## Hashimoto's Thyroiditis & Nodes

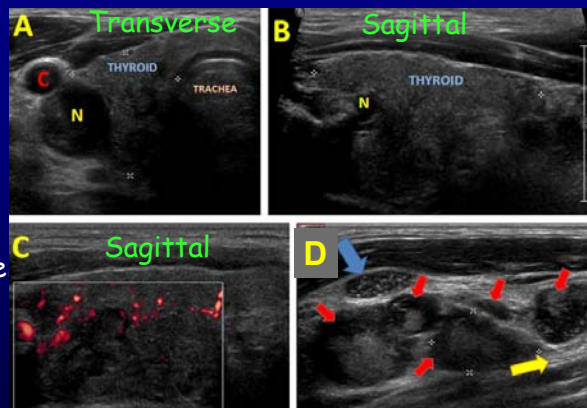
- Followed for 1 year with expanding number of hypoechoic masses bilaterally level VI caudal to thyroid gland
- Changes in US appearance of thyroid c/w thyroiditis
- FNA bx of largest mass (1.4 cm): benign lymphocytes
- Developing thyroiditis with benign reactive adenopathy



SAGITTAL US

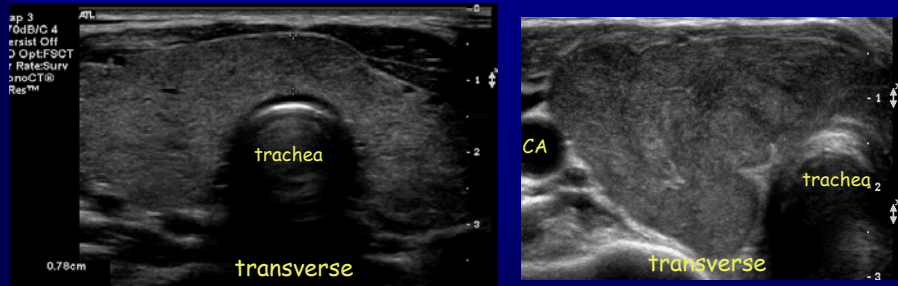
## Metastatic Thyroid CA Without Nodule in Chronic Thyroiditis

- Diffuse sclerosing PTC
- No distinct nodule but heterogeneous hypoechogenicity with scatter micro Ca<sup>++</sup>
- Abnormal right level 3,4 nodes
  - Always do a node survey



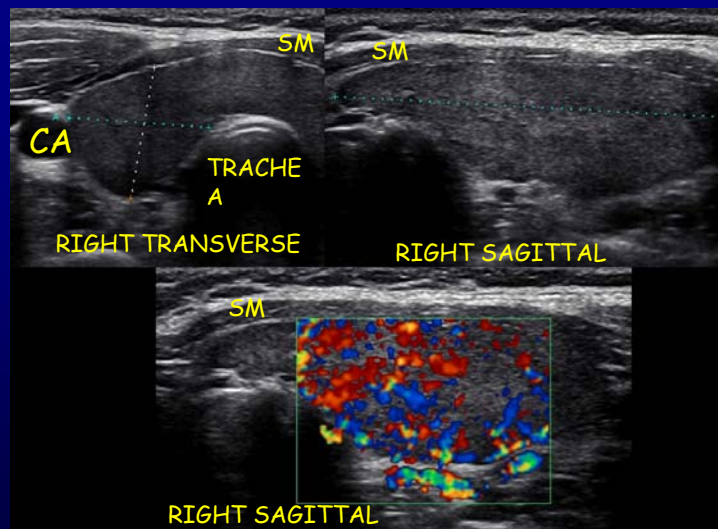


## Graves' Disease



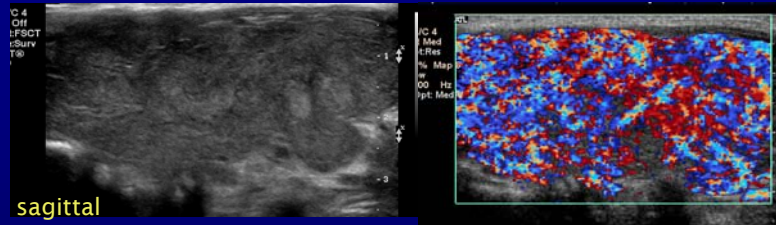
- Marked increase in gland size; less commonly normal or minimally enlarged
- Echotexture is less heterogeneous than Hashimoto's
- Smooth or lobular surface contour

## Graves' Disease





## Graves' Disease



- Hypoechoic, lobular
- Diffuse increased vascularity : **"thyroid inferno"**
- Prominent extra-thyroidal vessels
- Peak systolic velocity of 40 cm/sec or higher has 96% sensitivity and 95% specificity for GD

Kumar K et al, Endocrine Practice 2009; 15:6-9.

## Role of Sonography in Graves' Disease

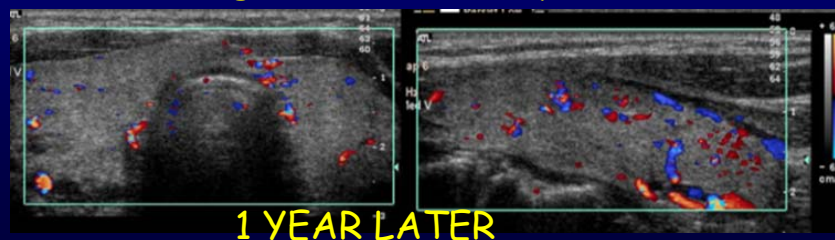
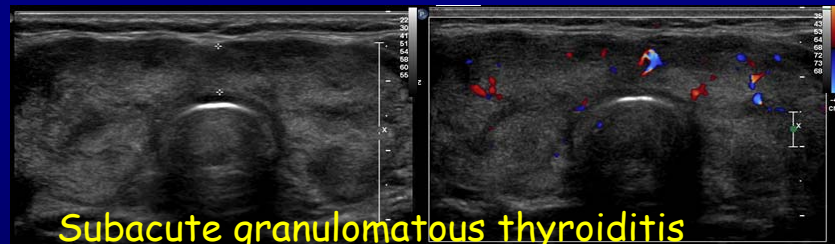
- NOT for diagnosis of GRAVES' but for evaluation for concomitant nodules prior to choosing therapy
- Maybe helpful to exclude subacute thyroiditis (hypoechoic and low vascularity)
- Sonography identified 68/426 (16%) focal nodules vs. 9/426 (2.1%) of I-123 scan
- Thyroid cancer found in 30/68 (48%) of these patients
- *All patients with Graves' Disease should be screened by US*

Cappelli C et al, Eur J Rad 2008; 65:99-103

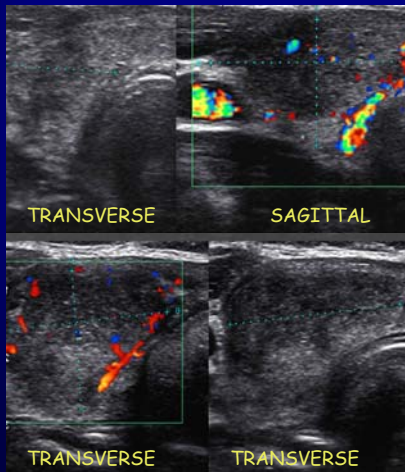
## Subacute Thyroiditis-"De Quervains"

- 0.16- 0.36% of thyroid disease
- Usually after an upper respiratory viral infection
- Presents NOT with signs of thyroid dysfunction but with thyroid tenderness, systemic symptoms
- May have thyrotoxicosis or be euthyroid
- Hypoechoic patchy or nodular areas that resolve
- Variable vascularity—generally NOT vascular

43 yo Woman With a Painful Thyroid  
and "Sore Throat", TSH <0.01 - FT4 2.4



## Painless Firm Thyroid: TSH < 0.01 and Free T4 2.1



Subacute lymphocytic or  
silent thyroiditis -  
Hypoechoic, indistinct  
almost infiltrative margins,  
surrounding vascularity

Week 2

Week 6

## Other (rare) Causes of Diffuse Thyroid Abnormalities

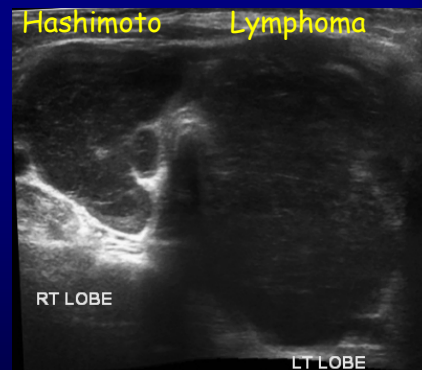
## Malignant Lymphoma

- Usually occurs in a Hashimoto's gland
- 1-2% of all thyroid malignancies
- Nodular pattern
  - Homogeneously hypoechoic with lobulated but well defined border; enhanced through transmission
- Diffuse OR asymmetric enlargement

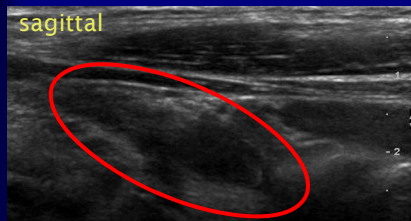
Ito Y et al, World J Surg 2010; 34:1171-80

## Thyroid Lymphoma

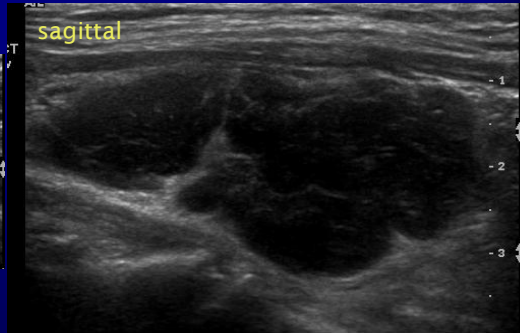
- Pre-existing Hashimoto's thyroiditis
  - Rapid growth over weeks-months
  - Usually in the elderly >65 years old
- Asymmetric or symmetric growth
- Extremely hypoechoic without increase vascularity by Doppler



## Thyroid Lymphoma



Small and atrophic  
right lobe



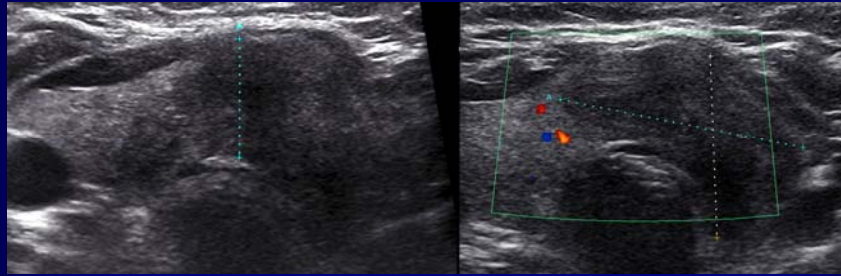
Enlarged markedly  
hypoechoic lobulated left  
lobe

## Thyroid Amyloidosis

- Painless progressive thyroid enlargement in male with familial Mediterranean fever and secondary amyloidosis
- Usually normal thyroid function
- Infiltration by amyloid protein with typical green birefringence with Congo red stain under polarized light
- Other infiltrative Disorders: Iron, Langerhans histiocytosis



**Progressive Hypoechoic Mass  
Indistinct margins & avascular:  
FNB "Insufficient" x2**



Surgical pathology: Riedel's thyroiditis

**Conclusions**

- Sonographic markers of autoimmune thyroid disease include enlarged size, heterogeneous echotexture, increased vascularity
- Clinical information is key
- Differentiation of "pseudo-nodules" from true nodules and tumors may be challenging
  - Asymmetric calcifications
  - Vascular pattern
  - Unilateral large LNS



87<sup>th</sup> Annual Meeting of the American Thyroid Association Endocrine Neck Advanced  
Ultrasound Course, October 18, 2017, Victoria, BC, Canada  
PRESENTATION FOR COURSE PARTICIPANTS, NOT FOR REPRODUCTION OR  
DISTRIBUTION

Thank you for your attention!

