

High Value Care: Thyroid Tests

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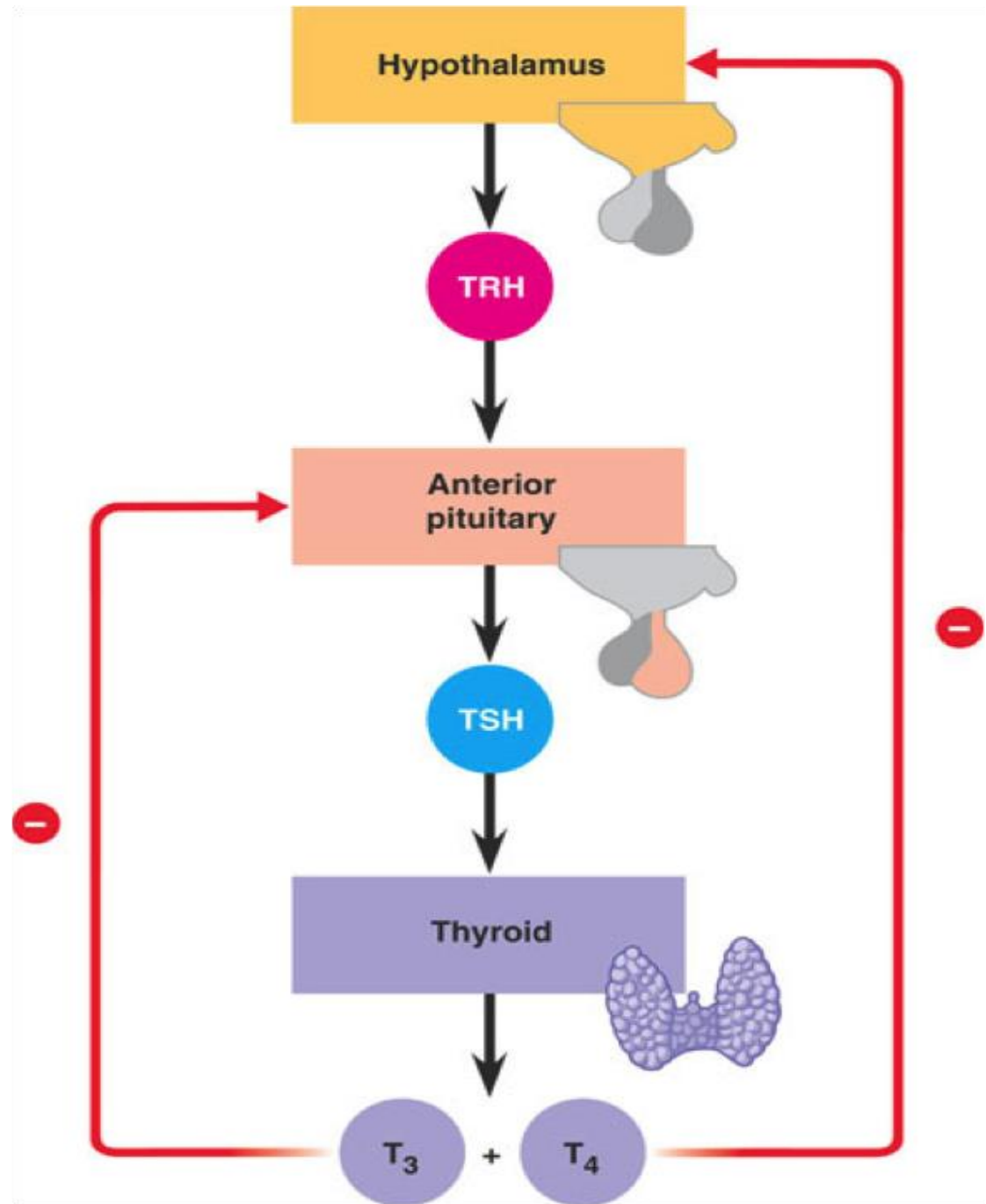
Purpose of Thyroid Testing

- Diagnose hypothyroidism or hyperthyroidism
- Establish severity/prognosis
- Monitor treatment
- Diagnose thyroid nodules accurately
(rule out thyroid cancer with high degree of confidence)

Case Study

- 55 year old woman is in good general health, but reports symptoms of slightly depressed mood, fatigue, and also insomnia and intermittent palpitations.
- Physical exam is normal; there is no thyroid nodule, goiter, or thyroidal tenderness
- There is no family history of thyroid disease, and the patient has never been diagnosed with a thyroid condition
- If you can only order one test of thyroid function, what should it be?

TSH is *THE*
Single-Best
Test of
Thyroid
Function



Laboratory Testing: Hyperthyroidism

- TSH
- Free T4
- Total or free T3
- Reverse T3 (rT3)
- Thyroid stimulating immunoglobulins (TSI)
- Thyrotropin receptor antibodies (TRA)
- Thyroid peroxidase (TPO) antibodies
- Thyroglobulin antibodies

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Laboratory Testing: Hyperthyroidism

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- ~~Reverse T3 (rT3)~~
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Case Study

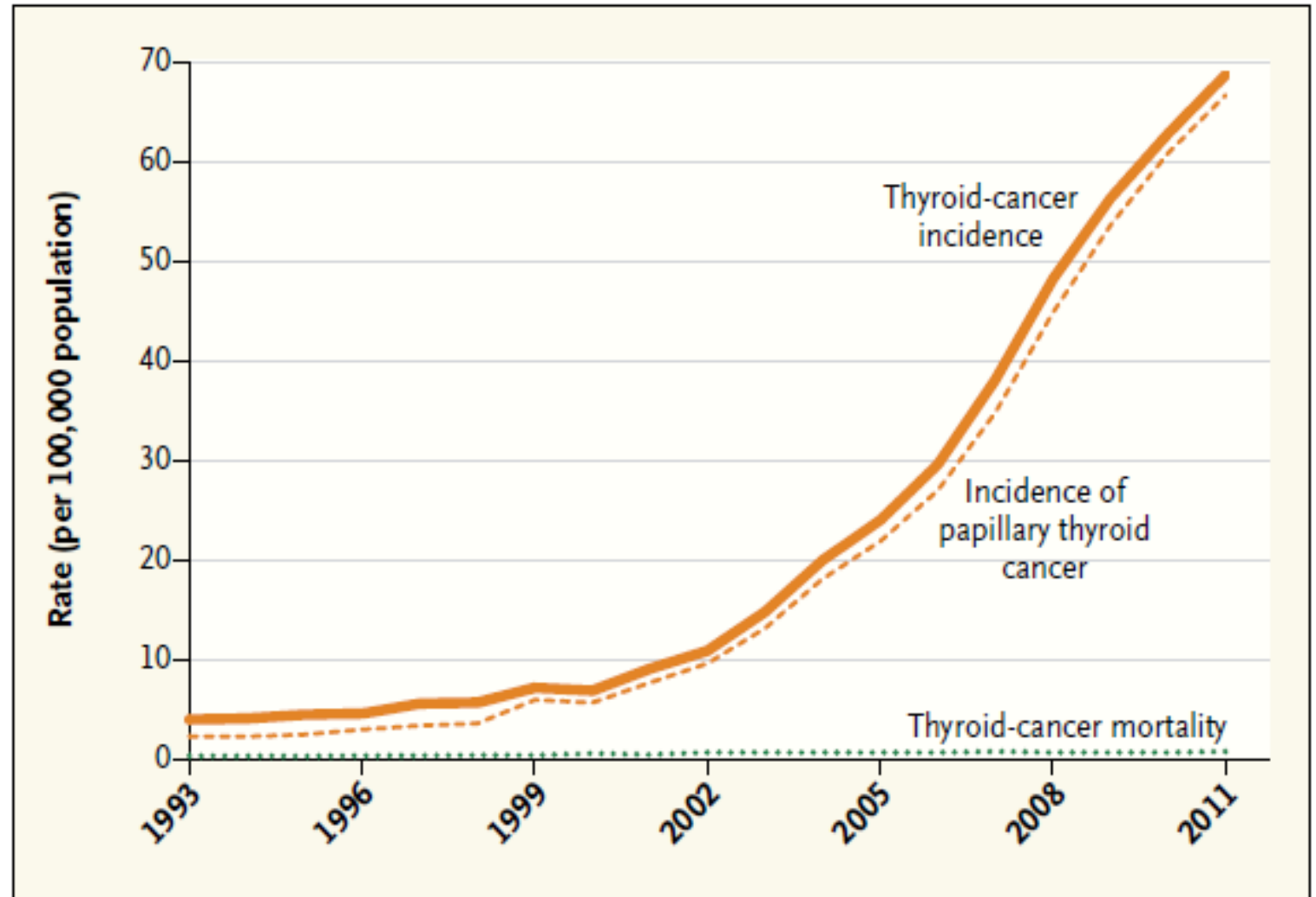
- 52 year old woman has the incidental finding of a thyroid nodule in the right lobe, on a CT scan performed to investigate neck pain following a motor vehicle accident (the study is otherwise normal)
- Physical exam, even with a high degree of post-test bias, is negative for a palpable thyroid nodule, or cervical lymphadenopathy
- There are no symptoms to suggest hyperthyroidism or hypothyroidism
- There is no personal history of head/neck irradiation, or non-thyroid malignancy, and family history is negative for thyroid cancer
- What should be the next steps in evaluating the thyroid nodule? (or is further evaluation warranted?)

The Conundrum of Thyroid Nodules

- Very high prevalence
 - Palpable nodules in 6% of women, and 1.5% of men
 - Autopsy prevalence 30-60%
 - Ultrasound-detectable in 20-75% of randomly selected women
- Cancer incidence in nodules > 1 cm size 5%
(which is also the autopsy prevalence; microcarcinoma < 1 cm size in up to 13%)
- 90% of thyroid cancers are papillary carcinomas
 - Actuarial 25 year survival rate of 98% vs. unaffected individuals

Thyroid Cancer Incidence and Mortality as a Function of Screening

Ahn HS et al. *NEJM*
2014; 371: 1765-1767



Evaluation of Thyroid Nodule(s)

- TSH
- For TSH < 0.4 mU/L: Thyroid scintiscan (I-123 ideally)
Rule out/confirm “hot nodule” (cancer risk nearly zero)
- For TSH > 0.4 mU/L: Thyroid ultrasound
(zero percent chance of “hot” nodule)
- Based on ultrasound characterization, either
 - Follow-up ultrasound in 3-12 months, or
 - FNA biopsy

Ultrasound Features of Malignant Thyroid Nodules

- Hypoechoic
- Irregular margins
- Incomplete “halo”
(border between normal thyroid and nodule)
- Microcalcifications
- Taller than wide on transverse view
- Refer for FNA biopsy if
 - > 1 cm size
 - > 1 risk characteristic

TI-RADS classification scheme for thyroid nodules

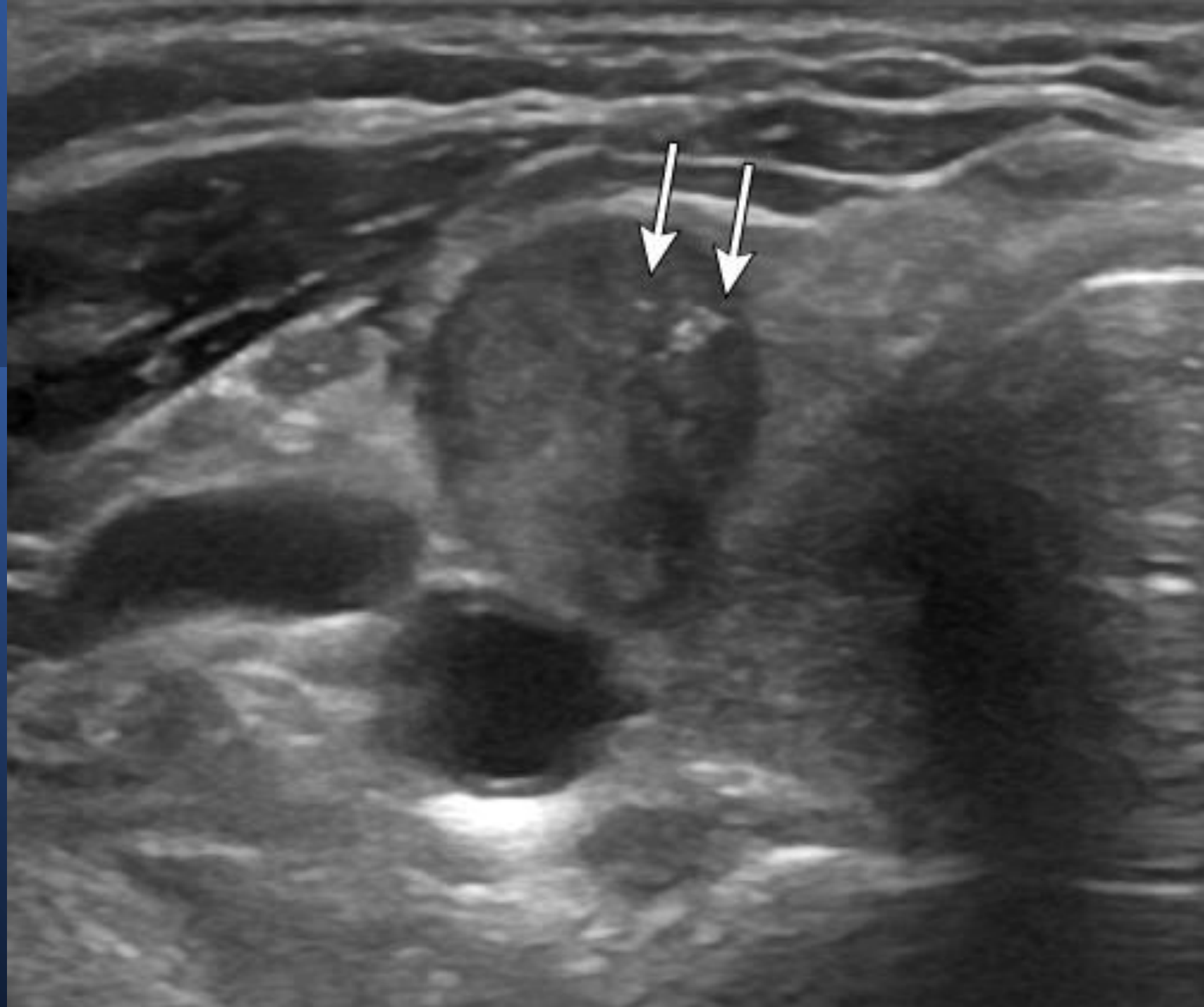
Composition		Echogenicity		Shape		Margin		Echogenic foci	
Cystic or almost completely cystic	0	Anechoic	0	Wider-than-tall	0	Smooth	0	None or large comet-tail artifacts	0
Spongiform	0	Hyperechoic or isoechoic	1	Taller-than-wide	3	Ill-defined	0	Macrocalcifications	1
Mixed cystic and solid	1	Hypoechoic	2			Lobulated or irregular	2	Peripheral (rim) calcifications	2
Solid or almost completely solid	2	Very hypoechoic	3			Extrathyroidal extension	3	Punctate echogenic foci	3
Points									
Malignancy risk (%)									
Biopsy threshold (mm)									
TR1	0		0.3		No biopsy				
TR2	2		1.5		No biopsy				
TR3	3		4.8		25				
TR4	4 to 6		9.1		15				
TR5	7+		35.0		10				

References:

- Middleton WD, Teefey SA, Reading CC, et al. Multiinstitutional analysis of thyroid nodule risk stratification using the American College of Radiology Thyroid Imaging Reporting and Data System. *AJR Am J Roentgenol* 2017; 208:1331.

Original figure modified for this publication. From: Tessler FN, Middleton WD, Grant EG, et al. *ACR Thyroid Imaging, Reporting and Data System (TI-RADS): White paper of the ACR TI-RADS committee. J Am Coll Radiol* 2017; 14:587. Table used with the permission of Elsevier Inc. All rights reserved.

Papillary
Thyroid
Carcinoma:
Characteristic
Ultrasound
Appearance



Conclusions: High-value Thyroid Tests

- TSH always
- Ultrasound = preferred imaging BUT mostly for follow-up of incidentalomas