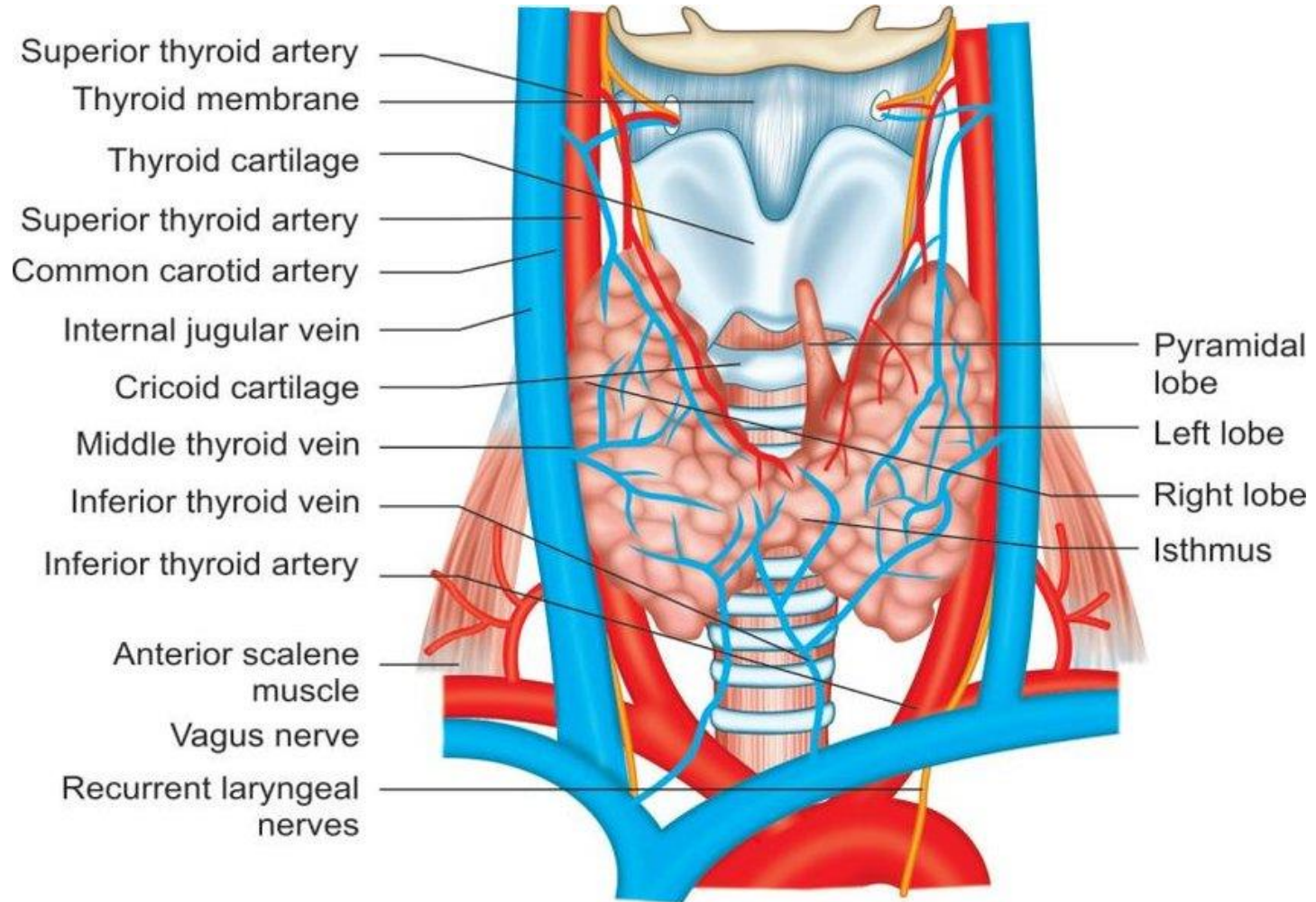
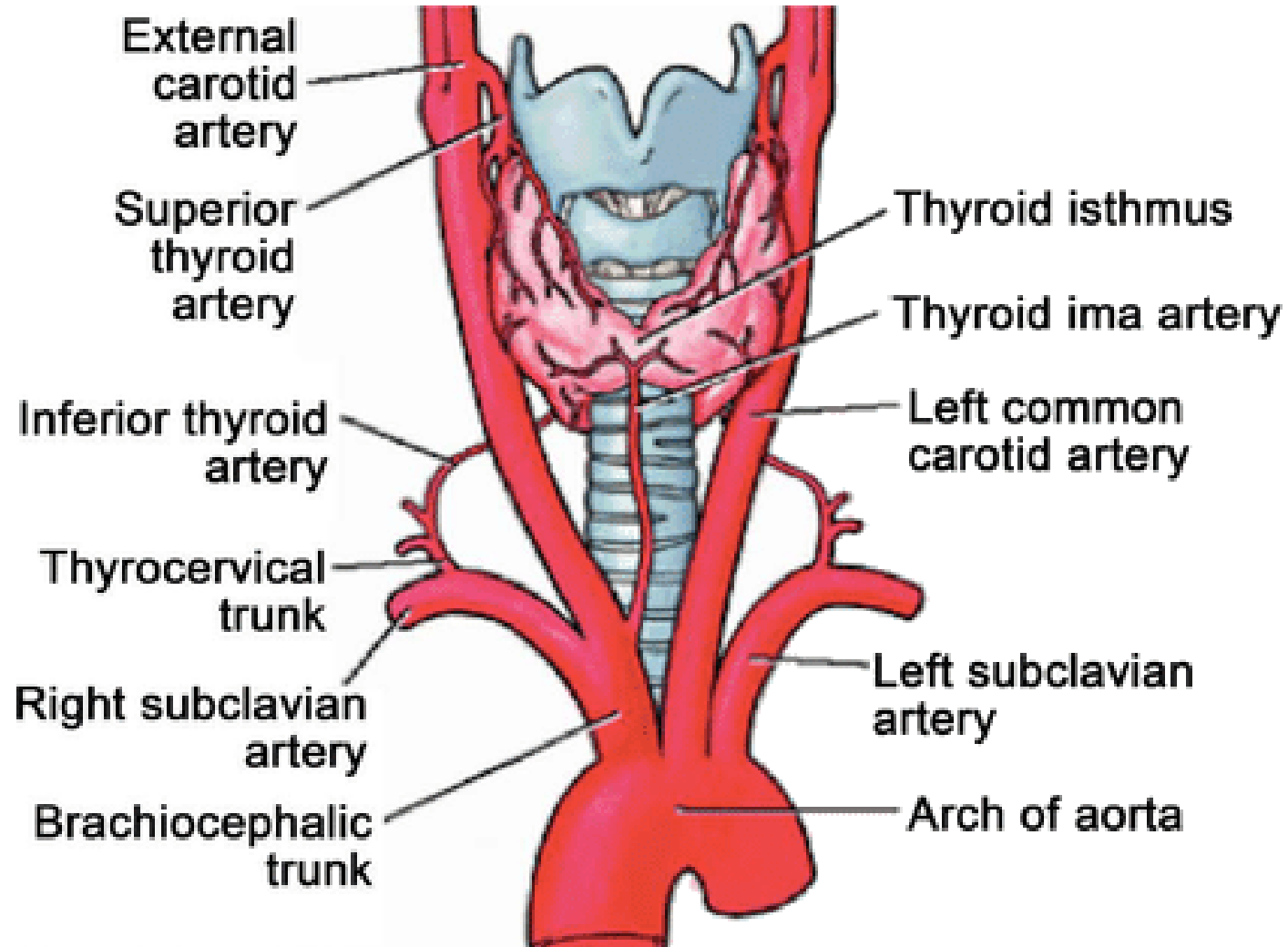


The Thyroid: Common Clinical Scenarios

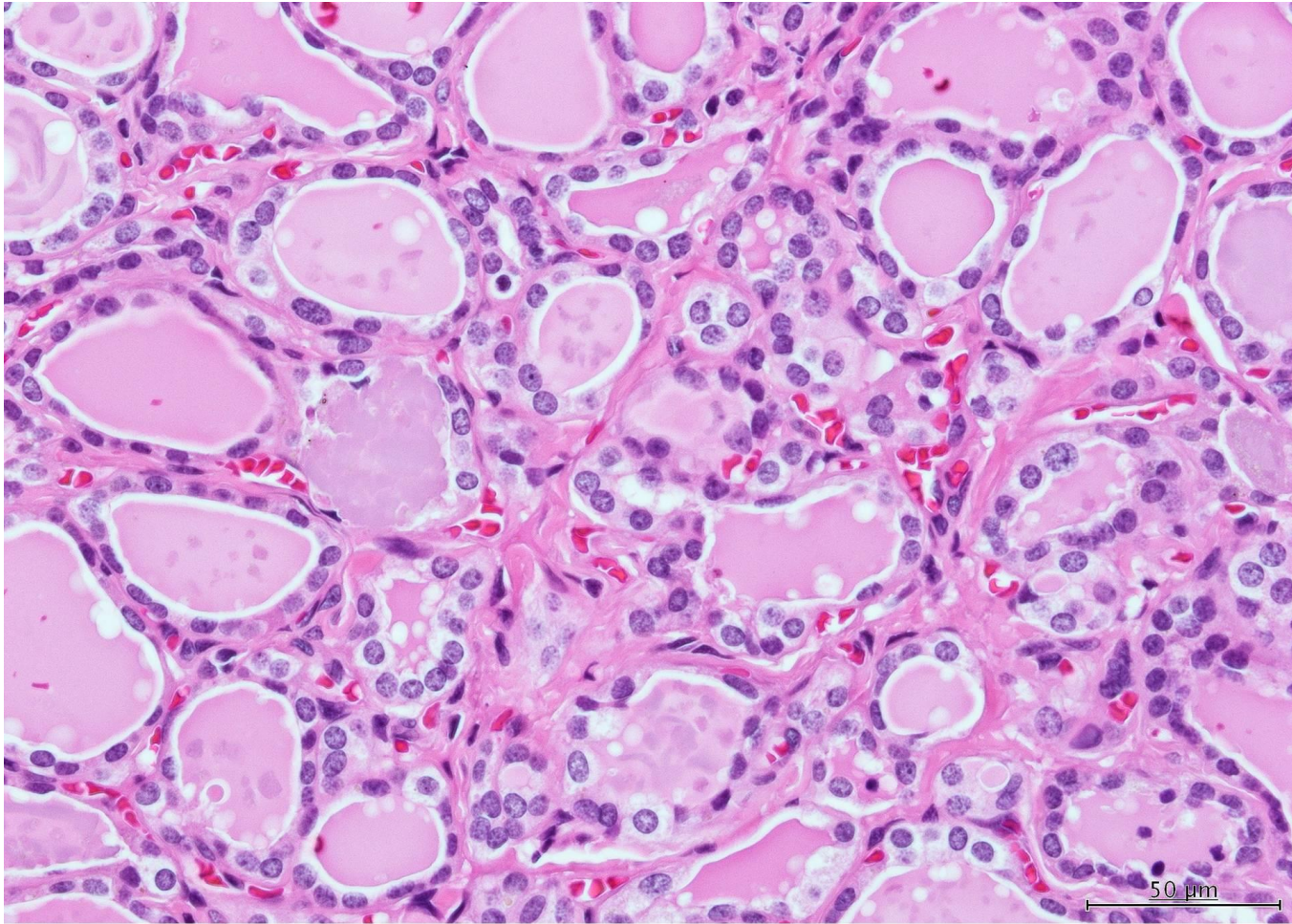
RMO Teaching

Anatomy



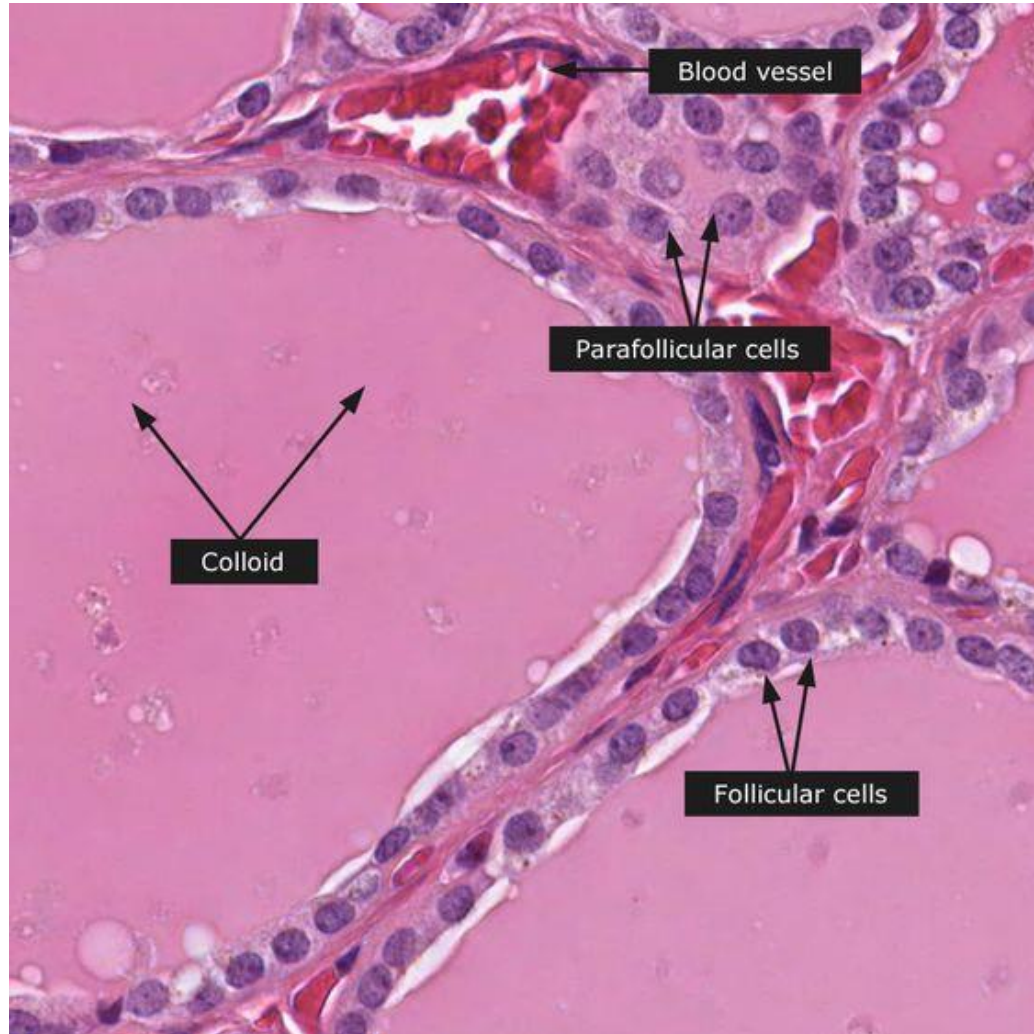


Microanatomy

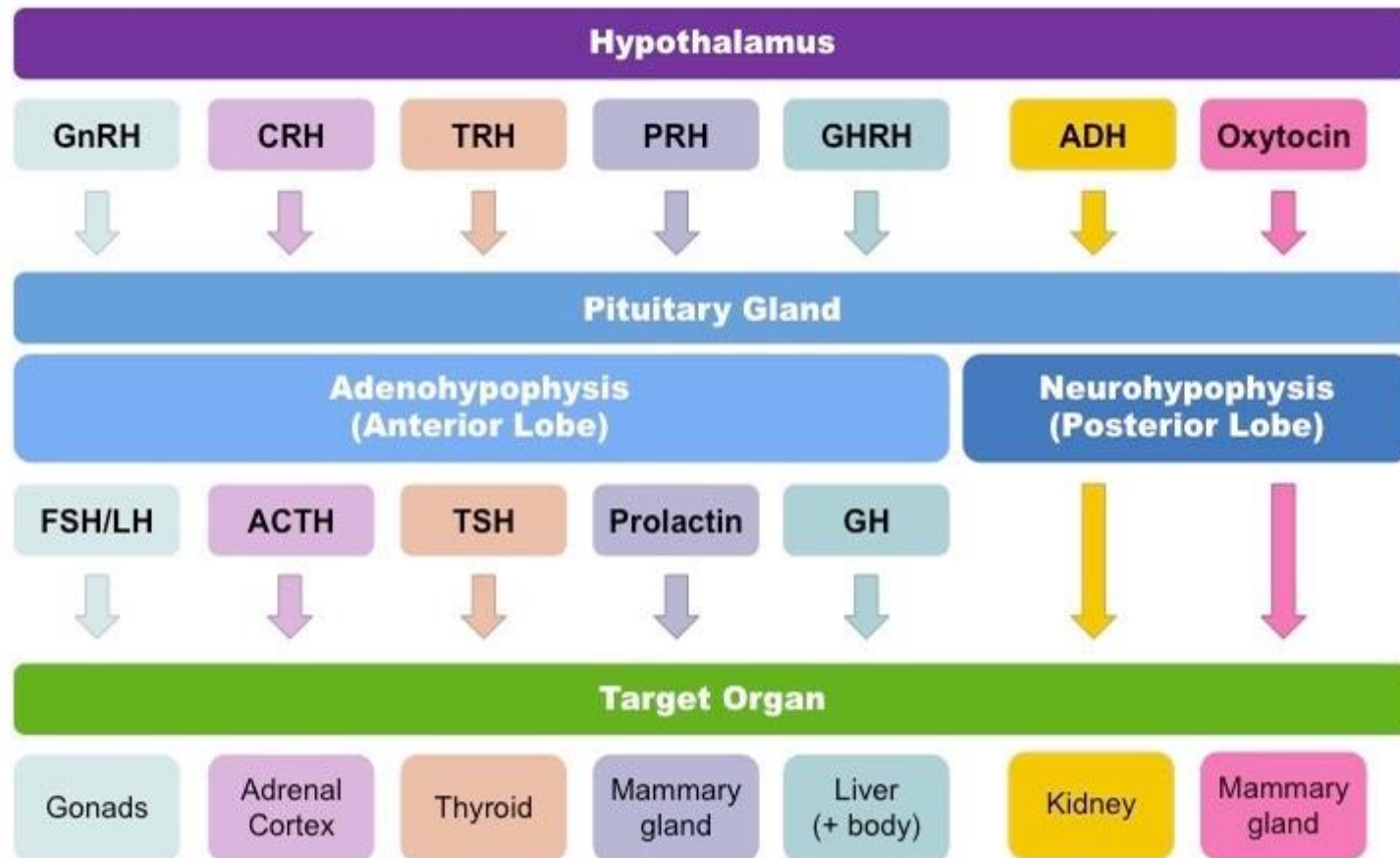


Microfollicular thyroid:
small follicles around 50 μm in diameter (H&E, high power)

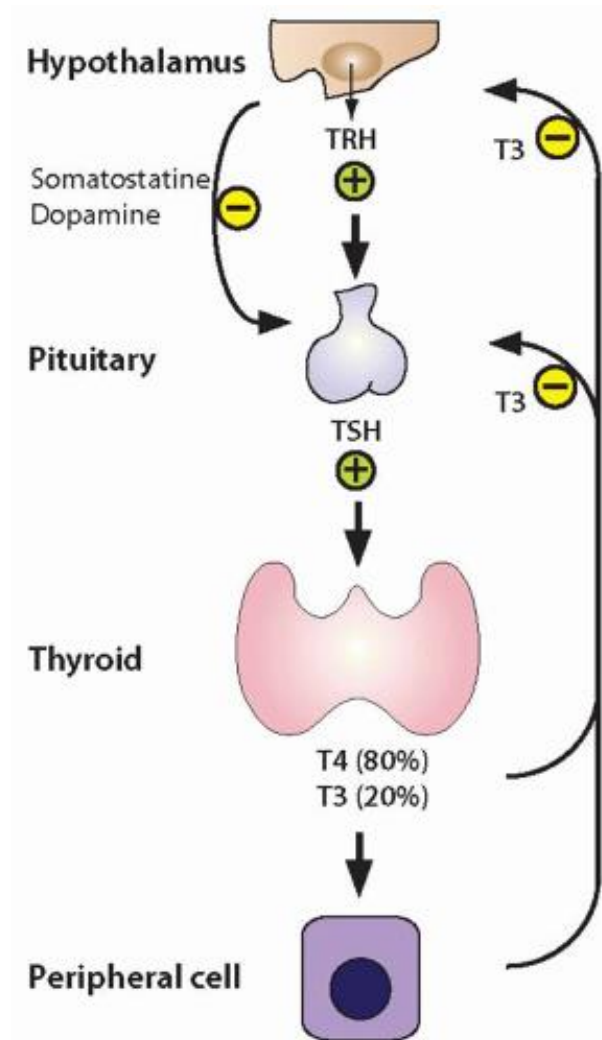




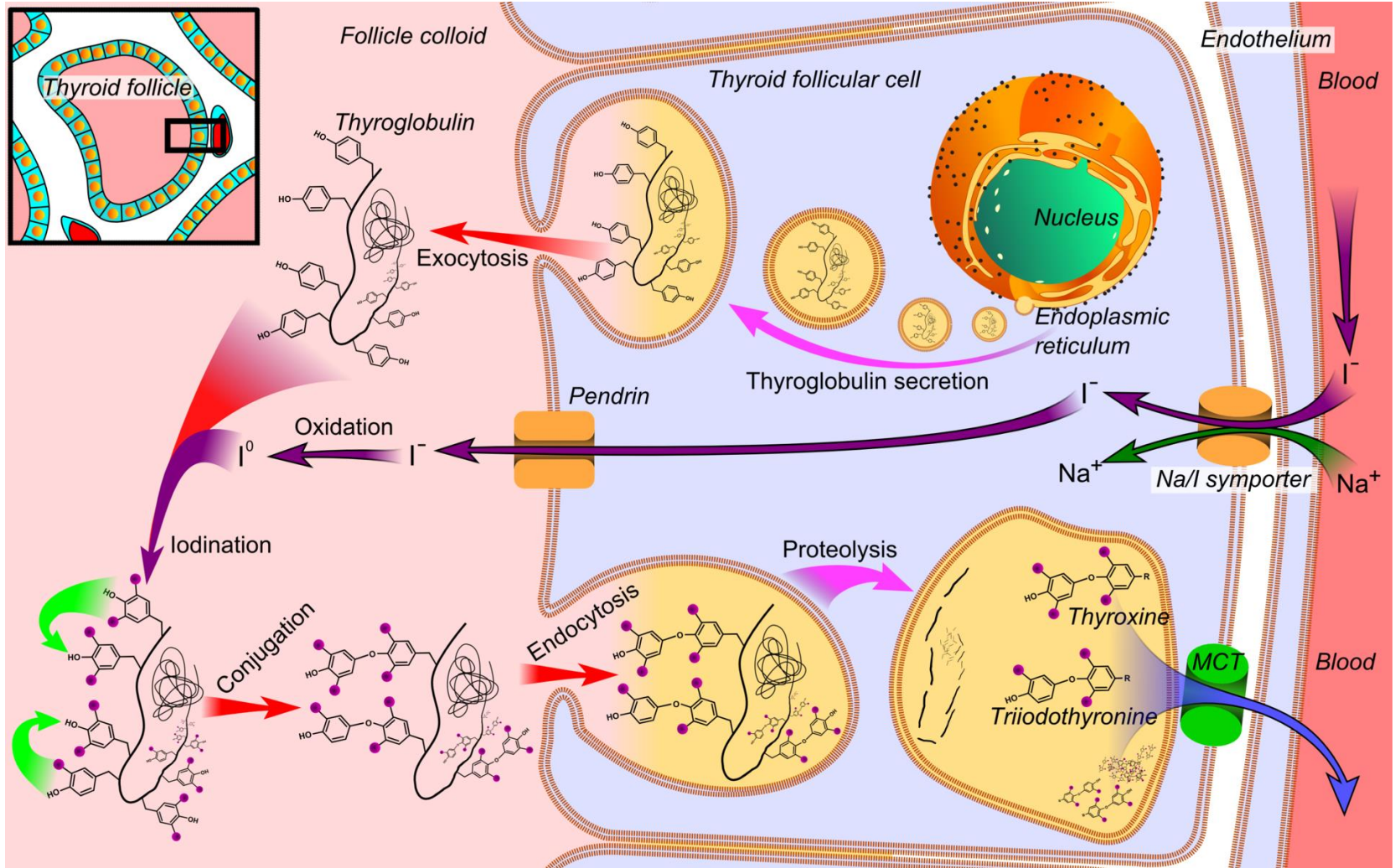
Hypothalamic-pituitary Axis



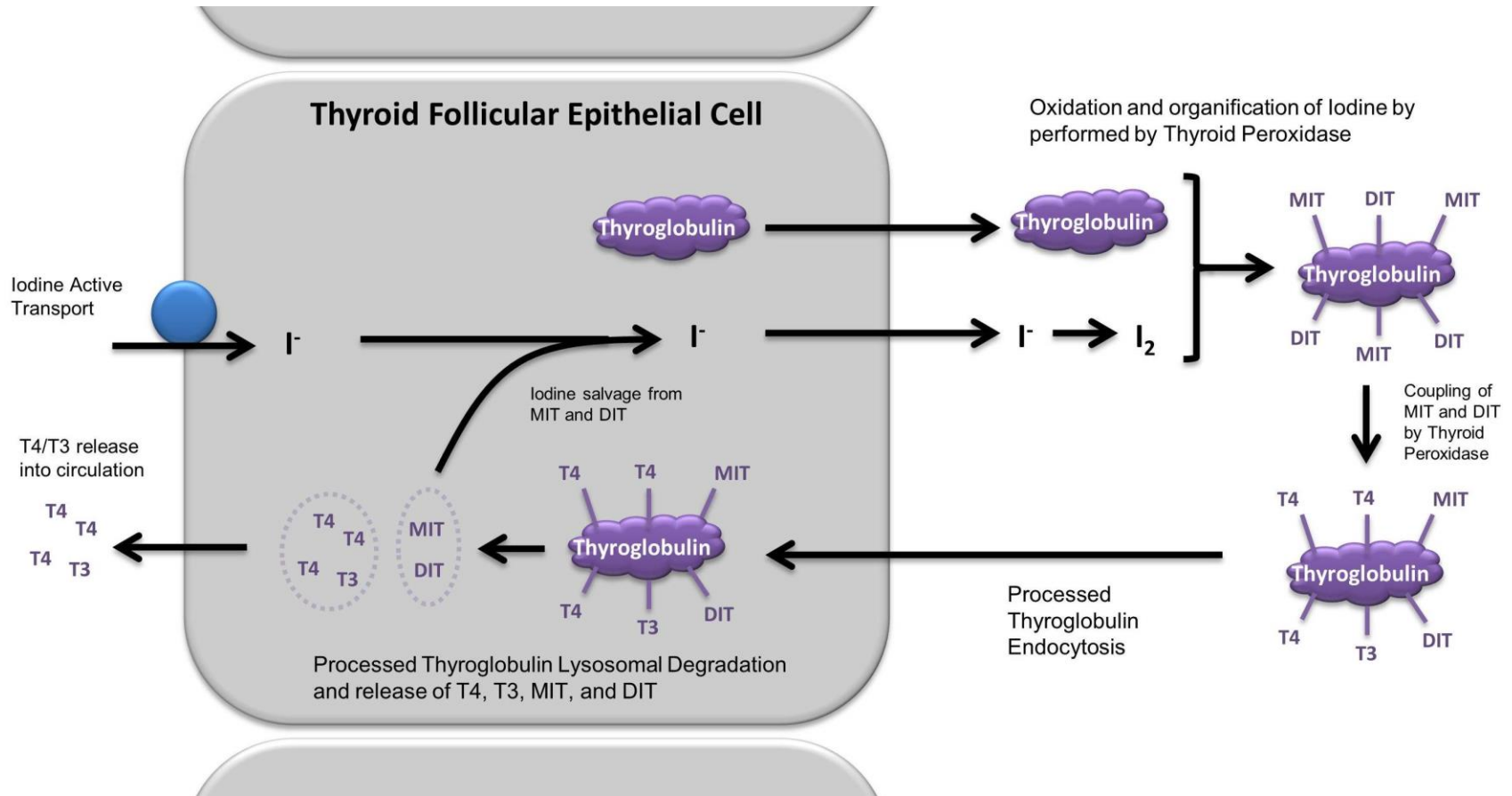
Hypothalamic-pituitary-thyroid Axis



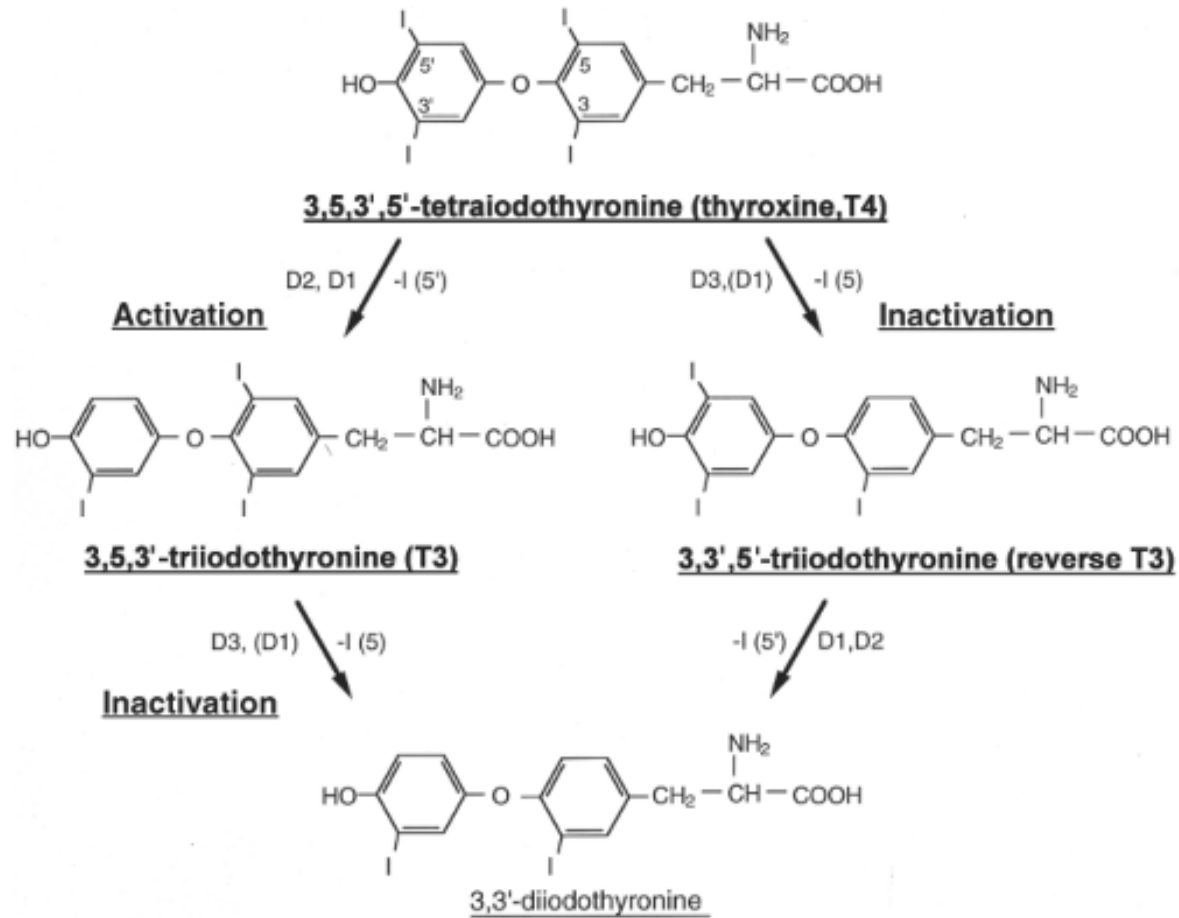
Pathophysiology



Thyroid hormone formation



De-iodination



Thyroid Function Tests

What do we order?



Thyroid Function Tests

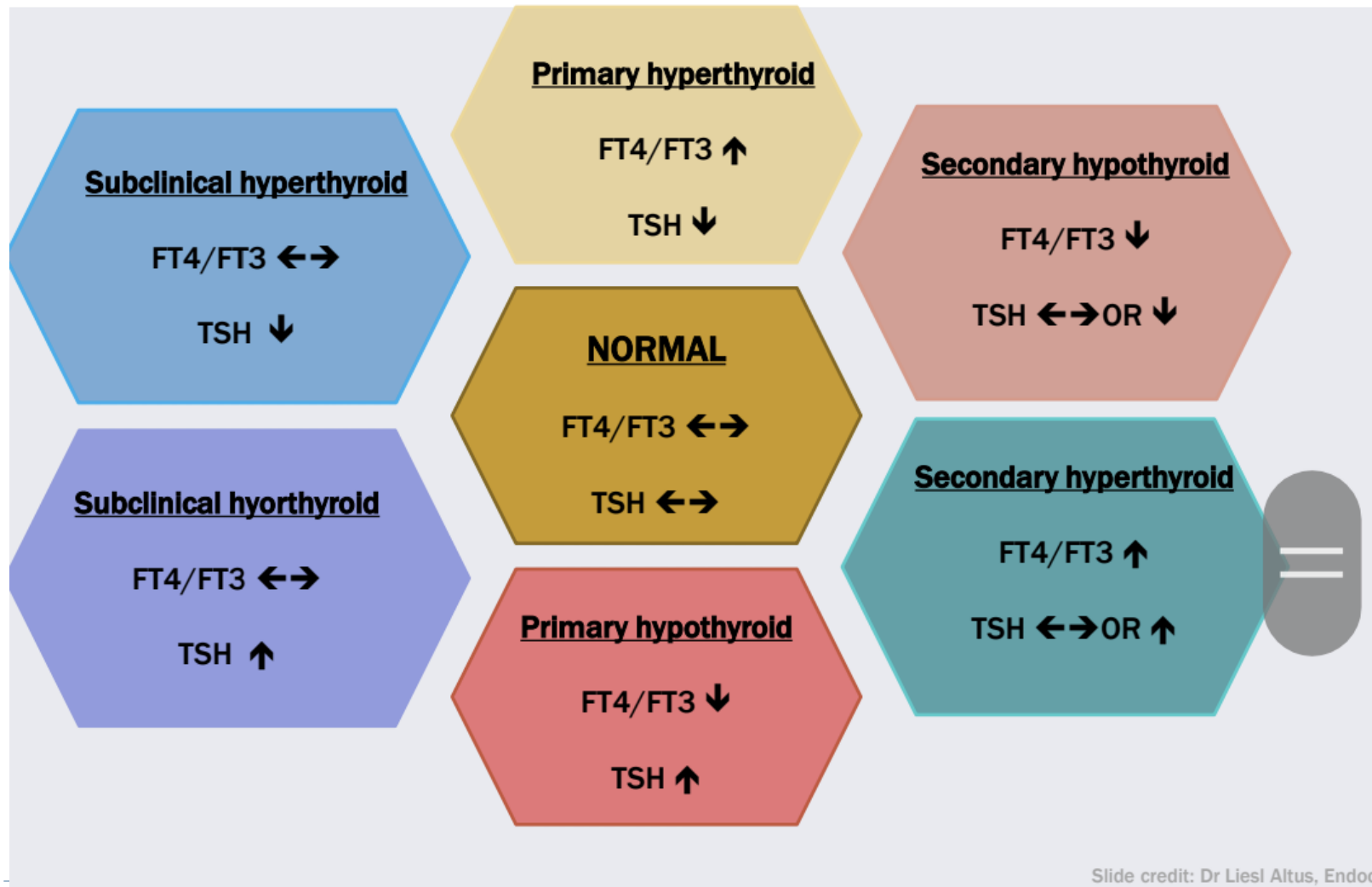
- ▶ TSH
- ▶ FT4
- ▶ FT3

- ▶ +/- antibodies?



BNORMAL THYROID FUNCTION TESTS

Adapted from: Gurnell M, Halsall DJ, Chatterjee VK. What should be done when thyroid function tests do not
Endocrinology. 2011;74:673-678



Common Clinical Scenarios



What is this?

- ▶ TSH 30mIU/L (0.27-4.2)
- ▶ FT4 6pmol/L (12.0-22.0)
- ▶ FT3 4pmol/L (3.1-6.8)



Hypothyroidism



Hypothyroidism

▶ Symptoms:

- Fatigue/sluggishness
- cold intolerance
- weight gain
- constipation - decreased GI motility
- dry, cool skin (reduced sweating)
- hair: coarse. Hair loss
- Nails: Brittle

▶ Causes:

- Autoimmune thyroiditis - Hashimoto's
- Thyroiditis – Granulomatous (Sub-acute or De Quervains's), post-partum
- Iatrogenic: post RAI or thyroidectomy
- Iodine deficiency (and also Iodine excess)
- Drugs: Lithium, amiodarone, TKI's – imatinib, sunitinib
- Infiltrative diseases - fibrous thyroiditis (Riedel's), hemochromatosis, sarcoidosis
- Central hypothyroidism

▶ Investigations:

- Anti-TPO antibody?
-



What is this?

- ▶ TSH <0.005mIU/L (0.27-4.2)
- ▶ FT4 90pmol/L (12.0-22.0)
- ▶ FT3 32pmol/L (3.1-6.8)



Hyperthyroidism



Hyperthyroidism

▶ Symptoms:

- fatigue
- weight loss, despite increased appetite
- palpitations/tachycardia
- heat intolerance/diaphoresis
- anxiety/irritability
- tremor
- diarrhoea - increased GI motility

▶ Causes:

- Grave's disease
- Early thyroiditis
- MNG
- Toxic adenoma
- Hyperemesis
- TSH producing adenoma
- Struma Ovarii

▶ Ix:

- TSH receptor antibody
 - Radioactive uptake scan
-



What is this?

- ▶ TSH 6.0mIU/L (0.27-4.2)
- ▶ FT4 13.0pmol/L (12.0-22.0)
- ▶ FT3 3.4pmol/L (3.1-6.8)

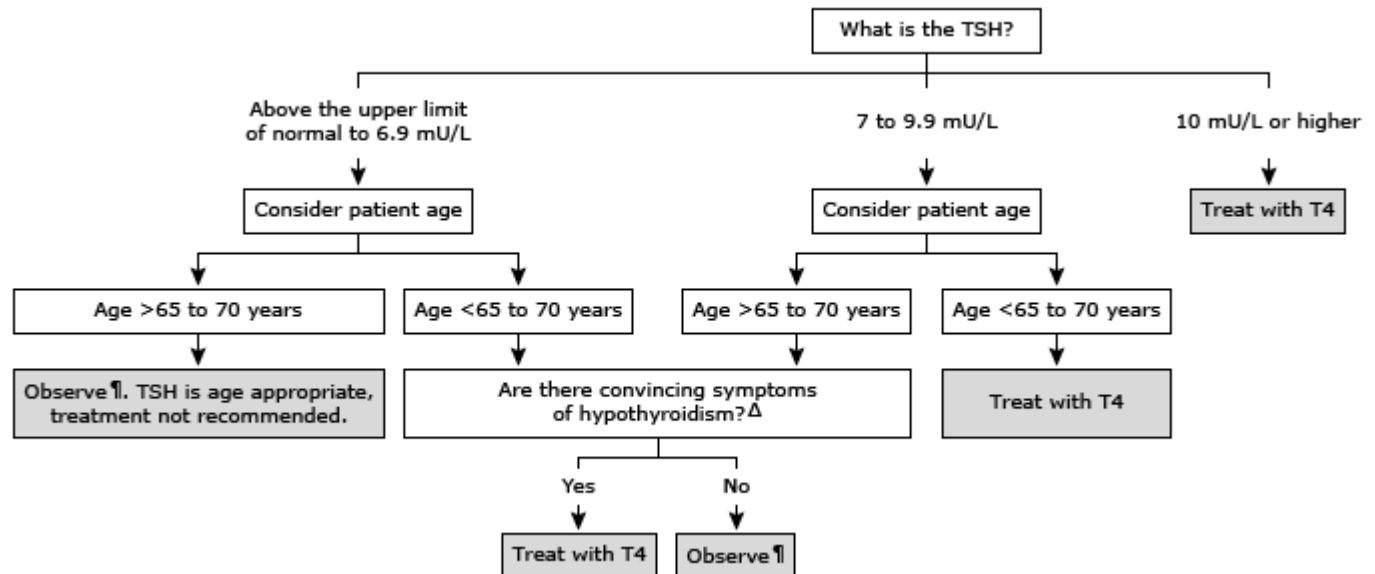


Subclinical Hypothyroidism

▶ TSH elevated with FT4 normal

▶ Considerations:

- Are they symptomatic
- Are they TPO positive?
- How elevated is the TSH?
- Age
- CV risk



What is this?

- ▶ TSH 0.15mIU/L (0.27-4.2)
- ▶ FT4 16pmol/L (12.0-22.0)
- ▶ FT3 5.0pmol/L (3.1-6.8)



Subclinical Hyperthyroidism

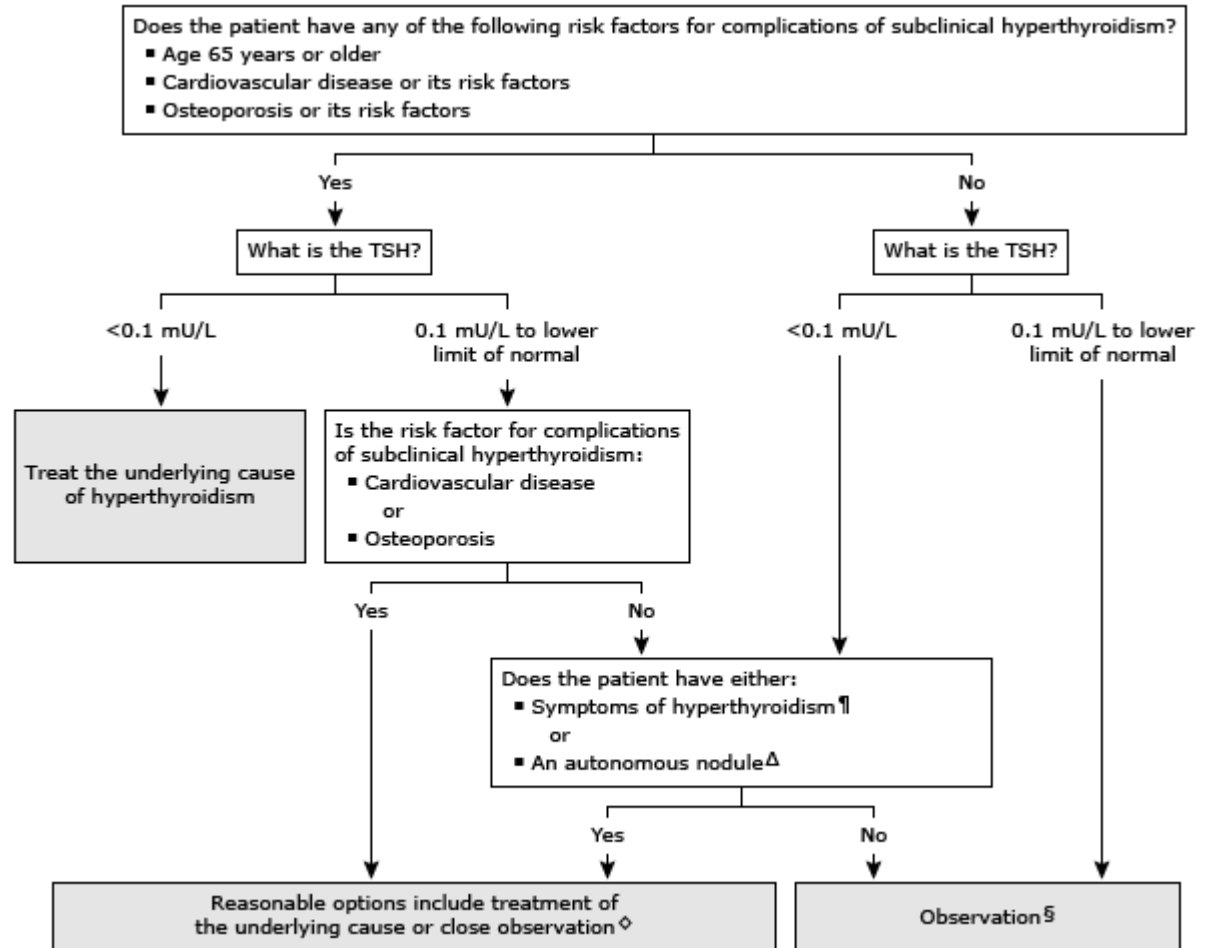
Suppressed TSH with normal FT4/FT3

Can progress to overt hyperthyroidism

Considerations:

- Bone density
- Arrhythmia risk
- CV risk
- Heart failure

If for treatment, treat the cause.



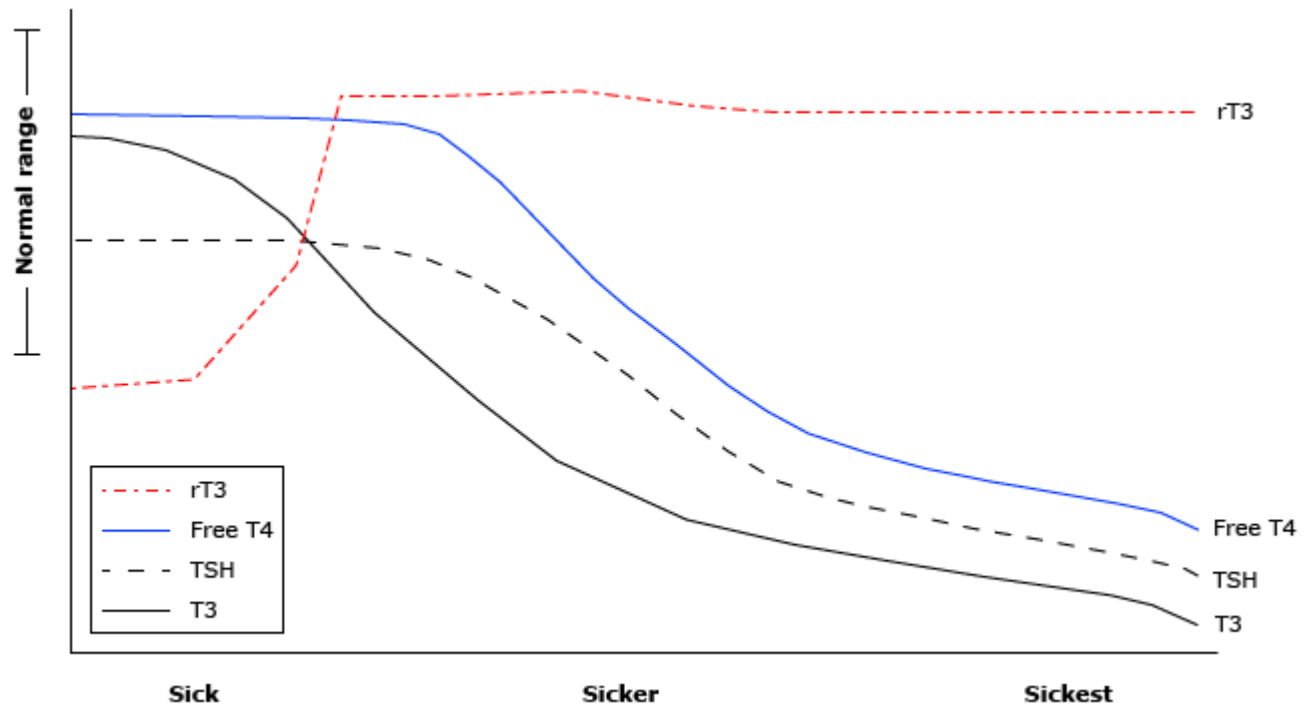
Common Issues

- ▶ Medication Administration
- ▶ Adherence
- ▶ Assay interference
- ▶ Non thyroidal Illness



Non Thyroidal Illness

- ▶ Critically ill: Typically FT3 will be low & FT4 & TSH low or normal
- ▶ If no obvious underlying thyroid disorder, then repeat in 1 week



Case 1

- ▶ 24 F
- ▶ 4 months post-partum
- ▶ Presents to ED with palpitations
- ▶ TSH <0.005 , FT4 40, Reverse T3 1000



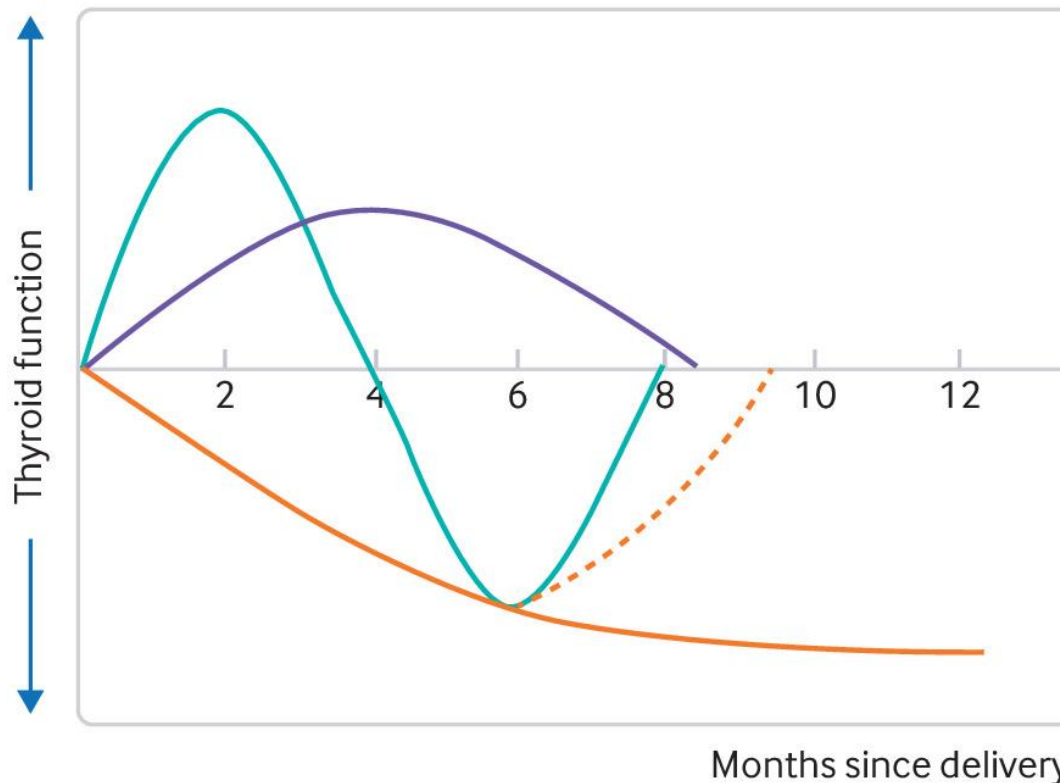
Case 1

- ▶ 24 F
- ▶ 4 months post-partum
- ▶ Presents to ED with palpitations
- ▶ TSH <0.005 , FT4 40, Reverse T3 1000
- ▶ TPO Ab 131 IU (0-34)
- ▶ Hyperthyroid phase post-partum thyroiditis
- ▶ Commenced propranolol
- ▶ Natural history?



Post partum thyroid

- Destructive thyroiditis - biphasic (25%)
- Transient hyperthyroidism (25%)
- - - Transient hypothyroidism (50%)
- Persistent hypothyroidism



Case 1

- ▶ Repeat TFTs Feb 22nd

TSH 20, FT4 12

Asymptomatic – nil treatment

- ▶ Repeat TFTs April 19th

TSH 170, FT4 5



Case 2

- ▶ 91 yo F
- ▶ Previous treatment for hyperthyroidism - Multinodular goitre
- ▶ Hepatotoxicity with carbimazole
- ▶ I-131 therapy 2017
- ▶ Thyroxine replacement since, usually 100microg daily of Eutroxsig

TFTs:

- ▶ TSH 19.8 mIU/L
 - ▶ T4 20.6 pmol/L
 - ▶ T3 1.9 pmol/L
-



Case 3

- ▶ 59 yo F
- ▶ Referred for review of TFTs & Thyroid U/S
- ▶ Clinically euthyroid

TFTs	August 2021	Sept 2021 (DHM)	March 10th 2022
TSH	0.29	0.21	0.18
FT4	11.3	11.4	10.7
FT3	4.1	3.5	4.4

- ▶ Thyroid U/S 22nd march 2022
- ▶ R lobe 6x1.5x2.4cm. Vol 10cc. L lobe 5.3x1.8x2.2 cm. Vol 10cc
- ▶ Echotexture: homogenous and normal vascularity
- ▶ five nodules:
- ▶ 2x TIRADS 1 both <5mm
- ▶ 2x TIRADS 3:

Left lobe upper pole 4x3x4mm, solid and isoechoic

Left lobe mid pole 6x4x5mm (previously 5x3x5mm), solid and isoechoic



BMD at RHW Dec 2020

- ▶ Femoral neck: 0.992g/cm² T-score 0.1 (was 0.963 in 2014)
- ▶ L2-L4: 1.119g/cm² T-score -0.7 (was 1.194 in 2014)

Concerned?



TI-RADS

ACR TI-RADS

COMPOSITION (Choose 1)		ECHOGENICITY (Choose 1)		SHAPE (Choose 1)		MARGIN (Choose 1)		ECHOGENIC FOCI (Choose All That Apply)	
Cystic or almost completely cystic	0 points	Anechoic	0 points	Wider-than-tall	0 points	Smooth	0 points	None or large comet-tail artifacts	0 points
Spongiform	0 points	Hyperechoic or isoechoic	1 point	Taller-than-wide	3 points	Ill-defined	0 points	Macrocalcifications	1 point
Mixed cystic and solid	1 point	Hypoechoic	2 points			Lobulated or irregular	2 points	Peripheral (rim) calcifications	2 points
Solid or almost completely solid	2 points	Very hypoechoic	3 points			Extra-thyroidal extension	3 points	Punctate echogenic foci	3 points

Add Points From All Categories to Determine TI-RADS Level



COMPOSITION	ECHOGENICITY	SHAPE	MARGIN	ECHOGENIC FOCI
<i>Spongiform</i> : Composed predominantly (>50%) of small cystic spaces. Do not add further points for other categories. <i>Mixed cystic and solid</i> : Assign points for predominant solid component. Assign 2 points if composition cannot be determined because of calcification.	<i>Anechoic</i> : Applies to cystic or almost completely cystic nodules. <i>Hyperechoic/isoechoic/hypoechoic</i> : Compared to adjacent parenchyma. <i>Very hypoechoic</i> : More hypoechoic than strap muscles. Assign 1 point if echogenicity cannot be determined.	<i>Taller-than-wide</i> : Should be assessed on a transverse image with measurements parallel to sound beam for height and perpendicular to sound beam for width. This can usually be assessed by visual inspection.	<i>Lobulated</i> : Protrusions into adjacent tissue. <i>Irregular</i> : Jagged, spiculated, or sharp angles. <i>Extrathyroidal extension</i> : Obvious invasion = malignancy. Assign 0 points if margin cannot be determined.	<i>Large comet-tail artifacts</i> : V-shaped, >1 mm, in cystic components. <i>Macrocalcifications</i> : Cause acoustic shadowing. <i>Peripheral</i> : Complete or incomplete along margin. <i>Punctate echogenic foci</i> : May have small comet-tail artifacts.

*Refer to discussion of papillary microcarcinomas for 5-9 mm TR5 nodules.

Case 4

- ▶ 37yo Female
- ▶ Presents to GP with tremor and anxiety.
- ▶ History of thyroid disease 5 years ago, previously on medication then weaned off, well for 5 years

- ▶ TFTs:

TSH <0.02 mIU/L

FT4 52 pmol/L

FT3 >30 pmol/L



Case 4

- ▶ What this the most likely cause?
- ▶ What was the likely previous medication?
- ▶ What is your intervention now?
- ▶ What further Ix do you need?
- ▶ Why do we need to avoid recurrences?



Long Term Complications of GD

- ▶ Atrial Fibrillation
- ▶ Bone Mineral Density loss
- ▶ CHF
- ▶ Grave's ophthalmopathy
- ▶ Dermopathy
(pretibial myxoedema)



Case 5

32 yo M, Fijian

Construction worker. Unable to work for a month.

Present to ED with falls following pizza and movie night.

TFTs:

TSH <0.005 mIU/L

FT4 94.0 pmol/L

FT3 47.3 pmol/L

Antibodies:

Tg Ab: 180 IU/mL (high)

TPO Ab: 126 IU/mL (high)

TSH Receptor Ab: 9.5 IU/L (high)

Normal serum potassium

Diagnosis?



Thyrotoxic Periodic Paralysis

- ▶ Acquired form of hypokalemic Periodic Paralysis
- ▶ Attacks of generalized weakness occur, often precipitated by rest after strenuous exercise or a high-carbohydrate load
- ▶ More prevalent in Asians, and males more than in females.
- ▶ Any cause of hyperthyroidism can be associated with thyrotoxic PP
- ▶ Diagnosis of thyrotoxic PP made when a patient presents with a paralytic attack that is associated with hypokalaemia and hyperthyroidism.
- ▶ For treatment of an acute attack → IV potassium chloride
- ▶ For acute weakness, which is not responding to potassium administration, can use IV propranolol
- ▶ Treat hyperthyroidism! Attacks of PP will cease with return to euthyroid state.
- ▶ Interim measures to ameliorate attacks include avoiding strenuous exercise and high-carbohydrate loads.



Questions?

