

HYPOTHYROIDISM

deficiency of thyroid hormone

- 1° - caused by thyroid gland dysfunction, failure or absence
- 2° - caused by pituitary or hypothalamic disease

Epidemiology: Women > men. ↑ w/ age.

Causes

① Loss of thyroid tissue

autoimmune (Hashimoto's thyroiditis)

TPO antibodies → destruction of thyroid tissue → extensive infiltration of lymphocytes/plasma cells.

Permanent hypothyroidism

- De Quervain's: painful mass. No thyroid antibodies.
- Silent/lymphocytic: painless antibodies.
- Acute/suppurative: S. aureus. painful. ILL. abx.
- Reidel's: firm, hard, "woody"

post-surgical, post radioiodine ablation, congenital

② Decreased thyroid hormone production

medications (lithium, amiodarone)
iodine deficiency

Clinical: fatigue, weight gain, cold intolerance, hair loss, constipation, dry skin/hair, poor memory due to

1. Slowing of metabolism and target organ function
2. accumulation of glycoaminoglycans

Diagnosis: test if multiple sx, famhxx.

Women > 60, use of above meds, exposures

	TSH	FT4	T3
Primary -	↑	↓	N/↓
Subclinical -	↑	N	N
Secondary -	↓/N	↓	N/↓

Treatment: levothyroxine daily in AM

separate from antacids. NO BIOTIN.

1.6 mcg/kg for full replacement
25-50 mcg empirically and titrate

Monitor TSH every 6-8 weeks.

HYPERTHYROIDISM

excess thyroid hormone

Causes

endogenous

① Excess thyroid hormone production

- graves disease - women 20-50yo
- toxic multinodular goiter - elderly, f.
- toxic adenoma - 20-40yo "hot" nodule
- TSH secreting tumor (2°) - rare (mental disturbances)

② excess thyroid hormone release - thyroiditis

exogenous: excess thyroid hormone dosage or surreptitious use

Clinical: due to accelerated metabolism and target organ hyperfunction

- Weight loss, ↑HR, heat intolerance, sweating, anxiety, fatigue, ↑appetite

GRAVES DISEASE: autoimmune disorder

TSI (immunoglobulin) activate TSH receptor on thyroid gland → enlargement of gland → ↑TH + goiter + exophthalmos

Epidemiology: 20-50yo female

Clinical: diffusely enlarged, painless goiter ± thyroid bruit.

- graves ophthalmopathy → proptosis
- graves dermopathy → skin swelling
- acropachy → finger clubbing, hands swell

Toxic Multinodular Goiter: nodules become autonomous over years. Monoclonal expansion of follicles ± activating mutations in TSH-R

Epidemiology: older. F > M.

Clinical: asymmetric, enlarged nodular gland
• compressive symptoms (dysnea, dysphasia)

Diagnosis:

	TSH	FT4	T3
Primary -	↓	↑	↑
Subclinical -	↓	—	—
Secondary -	↑	↑	↑

Antibody testing: ↑TSI/TSH-R in graves

Nuclear studies: radioactive iodine uptake scans

Treatment: methimazole (for graves) and propylthiouracil (preg)

radioactive iodine, surgery (for toxic nodules)

• Ancillary/adjunctive: iodine (SEVERE), b-blockers for cardiac sx

MYXEDEMA COMA

Severe hypothyroidism

BAD

Chronic non-compliance or undiagnosed hypothyroidism, after precipitating event:

- severe illness
- surgery, sedatives, anaesthetics
- elderly women in winter

high mortality rate

Clinical: bradycardia, hypotension, hypothermia, hypoventilation, coma

Diagnosis: Clinical

Treatment: IV thyroid hormone

- treat underlying cause
- ICU admission
- aggressive supportive care
- passive warming

THYROID STORM

Severe hyperthyroidism

In borderline or untreated disease after precipitating event:

- severe illness, infection
- surgery, trauma, sepsis
- iodine loads
- post-partum

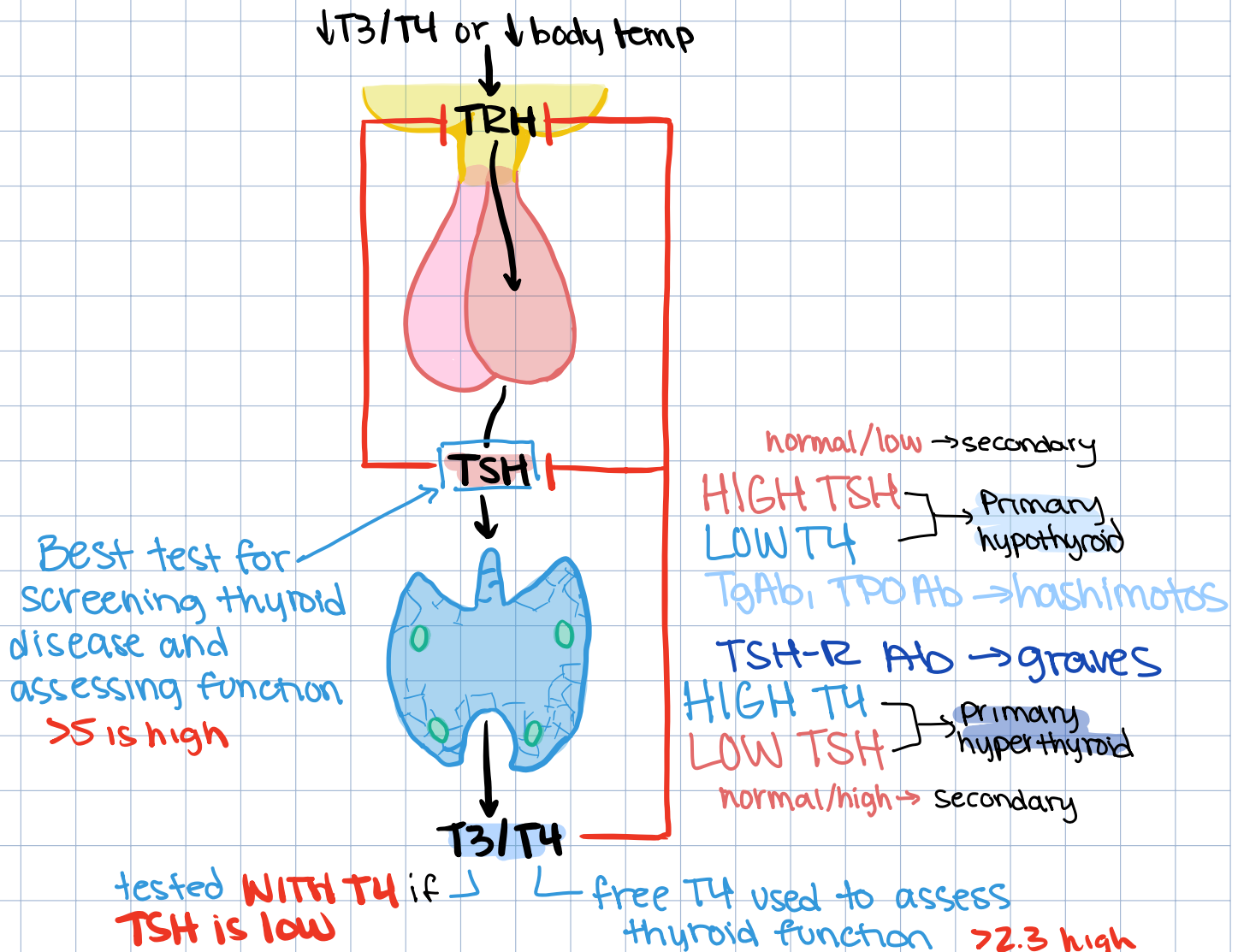
high mortality rate

Clinical: fever, mental status changes, palpitations, tachy, afib, n/v, psychosis, tremors

Diagnosis: Clinical

Treatment: high dose IV PTU

- then iodine, propranolol, dexamethasone
- treat underlying cause



THYROID MASSES/NODULES

Very common. ↑ with age.
Often multiple.

BENIGN

- ① Hyperplastic nodules
- ② Adenoma (neoplastic): may be autonomously functional
- ③ Cysts
- ④ Nodules associated w/ thyroiditis

Nontoxic Goiter

- **Multinodular**: hyperplastic growth of thyroid. Tends to grow slowly over multiple years associated with **iodine deficiency**. More common in **women**. thyroid function → **normal** but may cause **compressive symptoms**.
- **Substernal**: indication for **operation** even if asymptomatic due to risk of **airway compromise**. Removed **transcervically** (through neck)

Treatment: TSH suppression to decrease mass. **Levothyroxine** at low dose → increase to keep **TSH low**. BUT risk of **arrhythmia**.

CANCER

Clinically silent thyroid cancer is very common
Increasing incidence → incidental detection.

① **Papillary** (80-85%): >50% w/ **lymph node mets**. Often **multifocal**. Diagnosed w/ **FNA**.
Aggressive variants: **insular** (unencapsulated) and **tall cell**

② **Follicular** (10-15%): typically present w/ **distant mets**. **unifocal**. NOT diagnosed w/ FNA.
Histology: similar to follicular adenoma but **MUST** see **vascular/capsular invasion**.
Hürthle cell cancer - **mitochondrial** DNA mutations. **worse** prognosis.

MACIS for prognosis: based on **age, tumor size, resection, local invasion, distant mets**
<6 → 99% chance of survival. >8 → 24% survival

Treatment for differentiated: **Observation** → **Surgery** → adjuvant **TSH suppression, RAI** → drugs

③ **Medullary** (5%): derived from **neuroendocrine C-cells** (synthesize Ca^{2+}). **RET** mut.
total thyroidectomy, central neck dissection

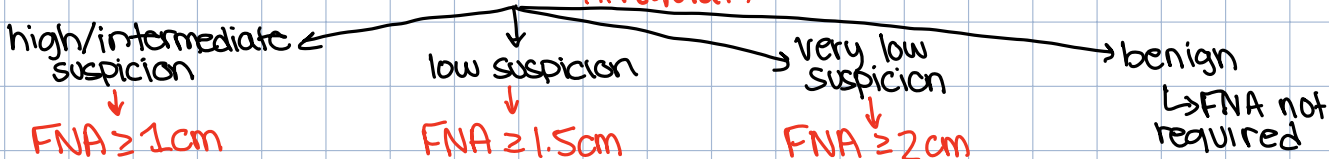
④ **Anaplastic** (1%): highly undifferentiated. **FATAL**. **Surgery, chemo, radiation**

Detection:

- **Thyroid function tests** → **TSH, free T4**
- **radioactive iodine uptake scans** → most nodules **cold**
- **Ultrasound** → **highly useful** in determining size and characteristics

heterogeneous nodule echogenicity

Features of malignancy: **microcalcifications, hypoechoic** (appear dark but internally **homogenous**), **increased vascularity, infiltrative margins, taller than wide (irregular)**



FNA: **fine needle aspiration** is **test of choice** for the thyroid to obtain tissue
ultrasound guided. Rarely need core biopsy. >4cm have high incidence of cancer

- I non-diagnostic → 1-4% risk → **repeat FNA**
- II benign → 0-3% risk → **Clinical FU**
- III atypia of unknown sig. → 5-15% risk → **repeat FNA**
- IV follicular neoplasm suspicion → 15-30% risk → **surgical lobectomy**
- V malignancy suspicion → 60-75% risk → **lobectomy OR total thyroidectomy**
- VI malignant → 97-99% risk → **total thyroidectomy**

Risk of injury to recurrent laryngeal nerve

Thyroid Cancer

Differentiated

Papillary

80-85%

local lymph node mets

multifocal

diagnosed by FNA

Variants: follicular, insular, tall cell

Follicular

10-15%

distant mets

unifocal

impossible to diagnose by FNA

variant: Hürthle cell

Same management

① Observation

② Surgery is mainstay of thyroid cancer tx

Risks: injury to recurrent laryngeal nerve
hypoparathyroidism

total thyroidectomy vs. lobectomy

- ↓ risk of recurrence in contralateral lobe (common in papillary)
- allows use of RAI
most common

- less risk of damage to recurrent laryngeal
- small papillary (<1.5cm) or follicular w/ ↓ invasion
microcarcinomas or low risk (1-4cm)

③ TSH Suppression → ④ Radioactive Iodine

- inhibits TSH mediated stimulation of thyroid gland function and growth.
- give slightly high dose thyroid hormone → ~0.1
- tailored to risk of recurrence → suppression in high risk patients

- ablate remnants of thyroid tissue until thyroglobulin levels are undetectable
- destroy remnants of malignancy
- treat known/suspected mets
3-6wks after surgery IF TSH > 30
Indicated for high risk pts.

⑤ Targeted drugs: measurable, progressive, or symptomatic

1. Sorafenib
2. Lenvatinib

not differentiated

Medullary

5%

neuroendocrine C-cells (make calcitonin)

associated w/ MEN II

RET mutation

Management

- Total thyroidectomy
- central neck dissection
 - lateral, functional for positive nodes
- Palpable → likely have lymph node mets

• Systemic therapy

1. Vandatinib
2. Cabozantinib

Anaplastic

1%

highly undifferentiated

may arise from papillary cancer

uniformly fatal

older age groups

Management

- Surgery
- chemo
- radiation

Surveillance

- serum thyroglobulin (level should be close to zero after thyroidectomy)
- "stimulated" Tg: raise TSH → assess thyroid hormone
- neck ultrasound
- PET/CT for poorly differentiated cancers and tumors that don't take up iodine