

### Thyroid Disease

Affects metab., growth, development; temp. regulation, HR, RR (every cell, tissue, organ)

Endocrine system = "duct system"

How does it work?

**Negative feedback loop...**

- Hypothalamus releases TRH → Pituitary releases TSH → Thyroid releases T<sub>3</sub> & T<sub>4</sub>
- T<sub>3</sub> & T<sub>4</sub> maintain normal levels in blood
- Normal function maintained → Normal levels "turn off" hypothalamus

### Hypothyroidism

Underactive thyroid; not enough T<sub>3</sub> and T<sub>4</sub>

**Primary:** dec. thyroid tissue, dec. TH

**Secondary:** inadequate TSH production

**Pathophysiology:** Low metabolism →

Hypothalamus & anterior pituitary release TSH → TSH tries to get thyroid to release hormones → TSH binds to thyroid cells → Inability = thyroid gland enlarges → Goiter

Symptoms: (early = fatigue, vague)

- **Neuro:** memory loss, gait, AMS
- **CV:** low HR, low BP, eye/face edema
- **Lungs:** muscle weakness, dec. effort
- **GI:** dec. bowel, low metab., constipation
- **Renal:** dec. urine output
- **M/S:** weakness, myalgia
- **Skin:** dec. turgor, dry, stiff, puffy, PM
- **Psych:** depression
- **Reproductive:** irregular/heavy periods

**Drug therapy:**

- Levothyroxine (Synthroid) (most common), Liothyronine (Cytomel, Liotrix)

**Education:**

- Take first (30 min before/2 hr after meal)
- Therapy is LIFELONG!
- Don't take within 4 hr of GI meds, antacids
- Side effects: signs of hyperthyroidism

**Pretibial myxedema (PM):** r/t accumulations of mucopolysaccharides; reversible

### Hashimoto's Disease

**Most common cause of hypothyroidism**

**Cause:** immune system attacks thyroid  
- Also: dec. iodine, tumor, overtreated

**Manifestations:** dysphagia, enlarged thyroid

**Risk Factors:** sex, age, heredity, another autoimmune disorder, radiation

**Complications:** goiter, cardiac problems, mental health, myxedema, birth defects

### Myxedema Coma

A medical emergency; "severe" hypothyroidism (r/t untreated, stopping meds)

**Causes:** acute illness, surgery (thyroid), chemo, narcotics, d/c replacement therapy

**Presentation:**

- Coma
- Respiratory failure & hypotension
- Hypothermia
- Hyponatremia (r/t dec. glomerular fx)
- Hypoglycemia (r/t gluconeogenesis)

**Monitor:**

- Labs & electrolyte imbalance(s)
- Resp. rate & heart rhythms

**Interventions:**

- Maintain patent airway
- Cardiac monitoring
- IV: TH replacement, glucocorticoids
- Correct electrolytes
- Conserve body heat
- Narcan?
- NO vasoconstrictive drugs
- Seizure precautions (r/t low Na & AMS)

### Hyperthyroidism

Increased secretion of thyroid hormones

**Causes:**

- **Grave's disease** (most common)
- Multiple thyroid nodules
- Toxic multinodular goiter
- Excessive thyroid replacement hormones
- Thyroiditis
- Too much iodine

**Signs & Symptoms:**

- **Neuro:** tremors, restless, irritable, confusion, seizures
- **CV:** dysrhythmias, a fib.
- **Lungs:** inc. resp. drive = dyspnea
- **GI:** diarrhea, inc. peristalsis, dec. nutrients, losing electrolytes, weight loss
- **Renal:** r/t HTN
- **M/S:** restless & nervousness = fatigue
- **Skin:** smooth skin
- **Psych:** restless, moody, insomnia
- **Reproductive:** issues, irregular periods

**Interventions:**

- **Monitor:** EKG, HR, RR, VS; thyroid storm
- **Comfort:** calm, cool, comfortable
- **Diet:** avoid iodine, > calories (inc. metab.)
- **Education:** watch for toxicity, med compliance, avoid aspirin

**Treatment:**

**Drug therapy:** antithyroid meds & radioactive iodine = most common treatment

- **Thionamides:** PTU, Tapazole
- **Beta-blockers** (treat symptoms; HTN, inc. HR, palpitations)
- **Radioactive iodine** (kills thyroid slowly, more permanent cure; not if pregnant or BF)

**Surgery:** to remove all or part of thyroid  
**Combination therapy**

**Propylthiouracil (PTU)** - stops T<sub>3</sub> & T<sub>4</sub>;

doesn't harm gland; can take in 1st trimester, but can cause liver failure

**Tapazole (Methimazole)** - causes anemia, safer

### Grave's Disease

**Autoimmune; most common cause of hyperthyroidism**

**Cause:** antibodies attach to TSH receptors  
→ inc. # and size of cells → thyroid enlarges (goiter) → overproduction of hormones

**Additional Manifestations:**

- **Exophthalmos:** autoimmune → attacks area behind eyes, causes edema
- **Pretibial myxedema**
- **Grave's dermopathy:** resembles orange peel; r/t inc. protein under skin, legs, & feet

### Thyroid Storm (Thyrotoxic Crisis)

**What is it?** - Extreme exacerbation of hyperthyroidism

**Causes:** illness, Grave's disease, meds that inc. TH, untreated/undiagnosed tumor

**Signs & Symptoms:**

- **Inc. HR & BP** = severe cardiac problems
- **Inc. temp** = diaphoresis
- **Resp. failure**
- **Anxiety or agitation**

**Treatment:**

- **Interventions to counteract symptoms**
- **Block TH synthesis**
- **Control temp.** → NO ASA
- **Meds to suppress immune system?**

### Diagnostic Tests for Thyroid Problems

|             | HYPO | HYPER |
|-------------|------|-------|
| T3          | ↓    | ↑     |
| T4          | ↓    | ↑     |
| TSH = 0.4-4 | ↑    | ↓     |
| TSH Assay   | ↑    | ↓     |

**Thyroid Labs** - T3, T4, TSH

**TSH Assay** - r/t central hypothyroidism

**Thyroid Peroxidase (TPO)** - enzyme in follicle cells important to hormone production; converts T4 to T<sub>3</sub>; (+) may indicate autoimmune, not definite for thyroid disease

**Radioisotope Uptake Scan** - evaluates size, areas of over- or under-activity

**Thyroid Scan**

**Thyroid US** - uses sound waves to image, characteristics (nodules, blood flow)

**Fine Needle Aspiration (FNA)** - malignant vs. benign

### Thyroid Surgery

Total or subtotal thyroidectomy

**When?**

- Large goiter, poor response to drugs
- Can't/won't take meds
- Malignancy

**Pre-Op:**

- **Meds:** dec. hormone secretion, beta-blocker, steroids to dec. immune system (w/ autoimmune dx)
- **Control:** HTN, dysrhythmias, tachycardia

**Post-Op:** (BOWTIE)

- **B** leeding
- **O** pen airway
- **W** hisper
- **T** rach kit & suctioning ready
- **I** ncision (assess/clean dressing & splint)
- **E** mergency
- Also: monitor VS, semi-Fowler's, labs, humidify air, diet, cough & deep breathe

**Complications:** hemorrhage, resp. distress, parathyroid injury

### Hypoparathyroidism

Abnormally low levels of PTH

**Causes:**

- **Iatrogenic**
- **Idiopathic**
- **Hypomagnesemia** (inhibits PTH secretion)
- Other: **autoimmune**

**Signs & Symptoms:**

- **P** = paresthesias, positive Chvostek's & Trousseau's signs
- **T** = tetany (bronchospasms, seizures, EKG)
- **H** = hypocalcemia & hyperphosphatemia

**Diagnostics:**

- **EKG** = seizure activity, slow brain waves
- **Blood tests** = labs
- **CT scans** = specific compared to US, may show brain calcifications
- MRIs may be even more specific

**Interventions:**

- **Symptomatic hypocalcemia:** give Ca, vitamin D, Mg & seizure precautions
- Other meds: **phosphate binders, PTH inj.**
- **Monitor:** Ca, GI, paresthesias
- **Education:** medication regimen
- **Diet:** inc. Ca

**Chvostek's sign:** tap facial nerve, + when twitches (= dec. Ca)

**Trousseau's sign:** inflate BP cuff 20-30 mm Hg above normal for 3-5 min; + when involuntary arm movement

**PTH inj. (Natpara)** - last resort (inc. risk of osteosarcoma)

### Calcium in Parathyroid Disease

Major controlling factor of PTH secretion

Ca & PTH are **directly** related

- Increase in PTH = increase in Ca

Affects kidneys (*regulates P*), bones, GI tract

### Hyperparathyroidism

Abnormally high levels of PTH

Causes:

- **Primary:** hyperplasia, cancer growth
- **Secondary:** CKD (PTH overworked = inc. Ca absorbed), vitamin D deficiency

Signs & Symptoms:

- **B** = bones (inc. fractures)
- **E** = epigastric pain, constipation (r/t smooth muscle dec.)
- **D** = dehydration (r/t kidney compensation for inc. Ca)
- **S** = short QT interval (r/t inc. Ca)

Interventions:

- **Diagnostics** - inc. Ca & PTH, dec. P
- **Monitor:** labs, EKG (telemetry)
- **Diet:** dec. Ca, inc. P - watch in renal pt! (already inc. Ca & dec. P)

Medications: **GOAL = LOWER Ca LEVELS**

- **Loop diuretics:** hypocalcemia = side effect
- **Biphosphates:** given for osteoporosis, protect against losing Ca, *sit upright for 30 min & w/ full glass of water*
- **Calcimimetics** (ex - Sensipar): deceive thyroid that there's enough PTH

Education:

- **Medication compliance**
- **Monitor for s/s of hypocalcemia**
- **Diet**
- **Prevent complications:** osteoporosis, traumatic fractures

### Diagnostic Tests for Parathyroid Problems

Labs:

- **Calcium (total)** = 8.5-10 mg/dL - usually high enough, ionized if specificity desired
- **Phosphate** = 2.7-4.5 mg/dL
- **Magnesium** = 1.3-2.1 mEq/L
- **PTH** = 10-55 picograms/mm

Hypoparathyroidism:

- Decreased... Ca, Mg, PTH, vitamin D
- Increased... phosphate

X-rays

24-hour urine collection for calcium

### Parathyroidectomy

Total or subtotal

Pre-Op:

- **Get Ca in check**
- **Coags**

Post-Op:

- Similar to thyroidectomy (*dressing, emergency equip., etc.*)
- Check Ca levels
- Monitor for s/s hypoparathyroidism
- Voice (r/t laryngeal edema) - **hoarseness**
- May need lifelong treatment



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