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_3 & T_4 → T_3 & T_4 maintain normal levels in blood → Normal function maintained → Normal levels "turn off" hypothalamus

Hypothyroidism

Underactive thyroid; not enough T_3 and T_4

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

Propiothiouracil (PTU) - stops T_3 & T_4; doesn't harm gland; can take in 1st trimester, but can cause liver failure
Tapazole (Methimazole) - causes anemia, safer

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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
T_3	↓	↑
T_4	↓	↑
TSH = 0.4-4	↑	↓
TSH Assay	↑	↓

Thyroid Labs - T_3, T_4, TSH

TSH Assay - r/t central hypothyroidism

Thyroid Peroxidase (TPO) - enzyme in follicle cells important to hormone production; converts T_4 to T`3; (+) 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 (bronchospams, 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
- **Biphophates**: 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

Diagostic 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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