Anatomy

4 total
Posterior aspect of thyroid gland
Produce and release PTH
iCal determines level of PTH secretion in body indirectly. Decreased Ca^+ = increased PTH
PTH causes bone resorption, kidney absorption and GI absorption of Ca^+
Prinicipal cells secrete PTH
Half-life of PTH is 4-5 minutes
Alkalosis = decreased Ca^+

Calcium

50% bound to albumin
40-45% free/ionized
5-10% bound/unionized
ionized levels are regulated and affected by pH and temperature
low pH (acidotic) = increased ionized Ca^+
high pH (alkalosis) = decreased ionized Ca^+
Normal iCal = 4.4-5.4mg/dL
Normal total calcium = 8.9-10.1mg/dL
Small changes in iCal leads to large changes in PTH secretion

Hypercalcemia Lab Values and Treatment

Normal serum Ca^+ levels = 8.9-10.1mg/dL	
Normal iCal = 4.75-5.7mg/dL; 1.19-1.33-mmol/L	
Mild = <3mmol/L; 12mg/dL	hydration
Moderate to severe = 3.2-3.7 mmol/L; 13-15 mg/dL	NS and lasix
Other treatments	
Ethacrynic acid - Na^+/Ca^+ diuresis	
Biphosphonates - inhibit bone resorption	
Calcitonin - hormone to oppose PTH (decrease Ca^+)	

Hypocalcemia

Airway	Neuromuscular & CNS	ECG
Recurrent laryngeal nerve damage. Unilateral (hoarseness) Bilateral (stridor, obstruction)	Muscle cramps	negative inotropy
Bleeding - tracheal compression and edema	Chovstek's sign and Trousseau's Sign	prolonged QT
Hypocalcemic tetany - laryngospasm	Parasthesias	
	Psychosis	
	Seizures	

Hyperparathyroidism

HYPERCALCEMIA

Hypercalemia = >10.4 mg/dL

Primary - most common - due to malignancy or parathyroid malfunction. 30-40 year olds. Single gland is usually benign - 80% prevalence. **Secondary** - 15% - Hereditary and associated with MEN1 and MEN2A.

Signs and Symptoms: Renal - Ca^+ deposits with recurrent stones. Skeletal - pathologic fractures, skeletal demineralization. CNS - confusion, depression. Neuromuscular - weakness, fatigue. GI - nausea, vomiting, constipation, PUD, anorexia. Cardiac - prolonged PR, short QT, HTN and Osborne J waves.

Diagnosis: PTH assay with Ca^+ level. Will show increased levels of PTH and hypercalcemia.

Treatment: Mithramycin - inhibits osteoclasts, respiratory alkalosis, Calcitonin (stimulates osteoblasts; inhibits osteoclasts. i.e. Ca^+ is removed from the blood and used to build bone)

Most common cause of hypercalcemia is cancer. 25-50% of the time it is breast cancer

Anesthetic Considerations: Pts will be sensitive to succinylcholine and antagonize non-depolarizing NMBs

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Surgical considerations

Arms will be tucked - IV access

NIM endotracheal tube to access nerve integrity

Consider a deep extubation

Intraop serum PTH. PTH levels should drop 20 minutes after removal

Post-op hypocalcemia

Hypoparathyroidism

HYPOCALCEMIA, HYPOMAGNESEMIA and HYPERPHOSPHATEMIA

Absence of deficiency of PTH secretion or resistance of peripheral tissues to PTH

Cause: Iatrogencic (i.e. inadvertent removal during thyroid surgery)

Signs and Symptoms: neuronal irritability, muscle spasms, tetany, seizures, fatigue, stridor, apnea, CHF, hypotension, prolonged QT, decreased response to beta agonists, fatigue, Chvostek's sign, Trousseau's sign and mental status changes

Treatment: electrolyte replacement, avoid respiratory alkalosis (decreases Ca^+ further), phosphate binders (Sevalamir). *Severe hypocalcemia:* 10-20 mL (90mg; 0.46mEq/L) of 10% Calcium Gluconate or 3-5 mL (270mg; 1.36 mEq) of Calcium Chloride followed by 1-2mg/kg/hr or Calcium infusion. *Calcium is incompatible with sodium bicarbonate*

Anesthetic Management: be mindful that laryngospasm can occur, seizures, prolonged QT (zofran)