Vesalius SCALpel™ : Parathyroid, pituitary (see also: head and neck folios)

Hyperparathyroidism

84% solitary adenoma, 12% hyperplasia, 3% multiple, 1% cancer
primary: 90% idiopathic
df: simultaneous high Ca++ and PTH
may also have normocalcemic hyperparathyroidism
renal stones indication for surgery
increased total and ionized Ca, urine Ca, renal camp
risks: ionizing radiation, MEN1 & 2, lo calcium, high phosphate diet, chronic lasix

secondary: renal failure, chronic PO4 retention stimulates parathormone production
renal hydroxylase (secreted by afferent tubules) converts 1-25 dihydroxycholecalciferol to vit D which promotes calcium absorption in ileum and mobilization from bone
increased bone resistance to PTH in renal failure
decreased clearance of parathormone
chronic low serum Ca++ causes increased PTH secretion
10% require subtotal parathyroidectomy because of non-compliance with medical regimen or because of associated symptoms
tertiary: continued autonomous function of glands after correction of renal failure
< 3% require parathyroidectomy: if symptomatic, Ca++ > 12.5
Rx: phosphorous replacement
persistent = < 6mo > = recurrent

parathormone
increases calcium absorption renal tubules
stimulates osteoclast activity/bone breakdown
stimulates conversion of 1-25 dihydroxyCC to active vit D
decreases serum PO4 and HCO3 by increasing renal secretion
PTH circulating 1/2 life 4 min: post excision should see 50% drop @ 5 & 10 min
5% of sustained elevation of PTH have additional glands

symptoms of hypercalcemia
general: polydypsia, wt. loss, fatigue
renal: colic, hematuria (stones), polyuria
musculoskeletal: aches, arthritis, pathologic fractures
10% subperiosteal resorption phalanges, distal clavicles, bone cysts
<10% overt osteopenia/porosis
GI: anorexia, nausea, vomiting, constipation, dyspepsia, abdominal pain
neuro: depression, weakness, confusion, psychosis, insomnia
cardiovascular: heart block, hypertension
other causes of hypercalcemia
malignancy: bone mets, ectopic parathormone (small cell lung Ca, hypernephroma, leukemia, lymphoma, multiple myeloma)(get assayable PTH to differentiate ectopic)
endocrine: hyper or hypothyroid, addisons, pheo, acromegaly, VIPoma, berylliosis

XS ingestion: vit D, A, milk alkalai, thiazide diuretics, lithium, danazol
granulomatous: sarcoid, Tb, histoplasmosis
benign familial hypocalcuric hyercalcemia (BFHH)
prolonged immobilization
artifact: tourniquet on too long when draw (venous congestion); low albumin (get ionized calcium)

medical treatment of hypercalcemia
goals: stabilize/decrease calcium, hydrate, increase urinary calcium excretion, inhibit osteoclast activity, discontinue meds associated with hypercalcemia, treat cause
saline and loop diuretic to increase excretion of calcium
bisphosphonates decrease osteoclast bone resorption
calcimimetics: sensipar, pamidronate, etidronate
calcitonin decreases serum calcium, adjunct for acute hypercalcemia
other agents minimal effect or toxic

hypercalcemic crisis:
hydration
calcitonin increases urinary excretion
mithramycin inhibits bone resorption

post-op hypocalcemia: bone hunger, hypomagnesemia, autograft failure

malignant hypercalcemia
no elevation of intact PTH, c-terminal PTH
hematologic: MM, lymphoma, leukemia-lytic bone disease
IL-1B & TNF beta increase osteoclast activity
lo urine c-AMP
solid tumors: breast, lung, kidney, pancreas neuroendocrine
normal serum PTH, increased urine c-AMP
tumor produces PTH-related peptide

calciphylaxis
vascular calcification in end stage renal disease, secondary hyperpara, not associated with diabetes or hyperthyroidism (normal glucose and TSH)
tissue necrosis, mottling, ulcer, gangrene, palpable pulses
amputate before infection, a-gram, revascularization not helpful
high parathormone, normal calcium, high calcium phosphate product > 70
rapid progression, poor prognosis (50% mort 1y, usually from sepsis)
long term: lower calcium and phosphate
total parathyoidectomy helps some
calcium-free hemodialysis (does not alter gangrene)

Dx & Rx hyperparathyroidism
sestamibi/Tc concentrated in para: differentiate single from multiple, localize 80%, 5% false positive

US: 50% accurate, can't detect substernal (CT)
double localization increases sensitivity
MRI: bright on T2
selective venous sampling: reserved for reoperation, lateralize 80%
arteriogram: rarely needed
experienced surgeon 95% successful identifying

asymptomatic indications

age < 50 (50% complications in 10y)
marked elevated calcium (> 1unit above normal)
hx of life threating hypercalcemia
reduced creatinine clearance
r/o kidney stones
osteoporosis
patient desires surgery
poor follow up
coexisting illness

observation: monitor increasing symptoms, annual creatinine, abd films, bone mass Q1-2y

localization

inferior from 3rd branchial pouch, travels farther, more variable
>50% within 0.5cm of lower pole
63% ,1cm below lower pole
majority or remainder in thyrothymic ligament
1% intrathyroid
superior: may migrate posterior to recurrent nerve, behind inferior thyroid a., esophagus, posterior superior mediastinum

minimally invasive radioguided parathyroidectomy (**MIRP**)

sestamibi injection 2-2 1/2h pre-op, gamma probe
intraop parathormone assay

median sternotomy

necessary only 1-2% of cases after localization studies
rarely at 1st operation
90% success localizing
most missed parathyroid adenomas are in neck

hyperplasia

remove 3 1/2, leave half of best vascularized
or total and reimplant in three packets
can freeze in case pt remains hypoparathyroid post op

Hyoparathyroidism/hypocalcemia

transient post op parathyroid adenoma (other glands suppressed)
2% after total thyroidectomy
bone hunger: rapid bone absorption of administered calcium after reversal of osteodystrophy
20X incidence after thyroidectomy for Graves
not altered by pre-op correction of hyperthyroidism
aggravated by hyperventilation/respiratory alkalosis
low Mg skeletal resisance to parathormone, decreased synthesis
mild treat w oral calcium/D, severe IV
untreated hypocalcemia convulsions, opisthotonus
chronic symptoms: dizziness, brittle nails, cataracts, alopecia

Parathyroid cancer

1% of hyperparathyroidism
1st operation best chance: gland, thyroid lobe
LN dissection for involved nodes

vit D primarily UV activated in skin

Pituitary

prolactinoma most common pituitary tumor in MEN I
prolactinoma in male: decreased potency, fertility
DI: decreased ADH/vasopressin, hypothalamic, pituitary injury
ADH promotes release of c-AMP from distal renal tubules -> free water resorbtion
increased urine volume, serum Na, osmolarity
Rx: DDAVP (deamino-D-arginine vasopressin)
ACTH circadian rhythm easily overcome by stress
ACTH secretion: pit adenoma most common (70%) cause of increased cortisol
80% pit microadenoma, no X-ray changes
Sheehan's: pituitary hypertrophy during pregnancy
hypoperfusion from blood loss -> infarction, panhypopituitarism
amenorrhea, hypothyroidism most common manifestations
Nelson's: pituitary hypertrophy from decreased feedback
increased MSH, ACTH, pigmentation

References:

Pasieka J. What's new in general surgery: endocrine surgery. JACS 199(3), Sept. '04: 437-445.