Work-up of Hypercalcemia
&
Treatment of Primary Hyperparathyroidism

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December 2, 2010
History

- 62 yo male was found to have hypercalcemia during a routine medical visit

- PMH: sleep apnea, chronic hep B, DM II, htn, hypercholesterolemia

- PSH/ FHx: denies

- SocHx: denies

- Meds: Micardis, Diovan, Janumet
Physical Examination

- VS 98° 130/90 98 16 98%
- Gen: in NAD
- Neck: no thyroid or neck masses, trachea midline
- Lymph: no cervical or supraclavicular LAN
- Cv: nl S1 S2, RRR, no m/r/g
- Chest: clear, BS = B/L
- Abd: soft, + epigastric tenderness, no rebound, ND
Parathyroid Adenoma

Laboratory work-up

UA – neg

PTH – wnl

downstatesurgery.org
Thyroid Ultrasound

- No focal lesions in thyroid
- 14 mm nodule in posterior L upper pole

Impression – adenoma of left upper parathyroid
- Normal thyroid uptake
- ↑ uptake of posterior upper pole of L thyroid lobe
- Delayed sestamibi shows thyroid washout
- No thyroid abnormalities

Impression – parathyroid adenoma
Operative Management/ Recovery

- 3cm transverse collar incision along fold of skin
- L recurrent laryngeal nerve protected
- Superior pole – Parathyroid adenoma ~16mm identified
- Lower pole – normal parathyroid gland

- Total OR time: 1:35
- EBL 20mL
- LR 1000mL
- POST-OP recovery
- Serial Ca ↓ 8.6
- D/C home POD#1
Parathyroid Adenoma
Parathyroid Adenoma

Pathology
Evaluation of Hypercalcemia
Calcium Physiology

- Calcium: 8.5 to 10.2 mg/dL
- PTH (Chief Cells)
  - Bone – stimulates Ca/Phos resorption
  - Kidney – stimulates resorption Ca, inhibits resorption Phos/Bicarb
- Vitamin D
  - Bone – stimulates transport Ca
  - Kidney – inhibits resorption of Ca
- Calcitonin (Parafollicular cells)
  - Bone – inhibits resorption Ca/Phos
  - Kidney – inhibits resorption Ca/Phos
Parathyroid Adenoma

Anatomy

- Superior parathyroids – posteromedial thyroid near tracheoesophageal groove
- Inferior parathyroids – below inferior thyroid artery
Location of Ectopic Parathyroid Adenoma

- Thymus (15%)
- Intrathyroidal (1%)
- Superior thyroid poles
- Carotid sheath
- Anterior and posterior mediastinum
- Anterior to the carotid bulb
- Retroesophageal
Primary Hyperparathyroidism

- Parathyroid adenoma
  - 80-90% of cases (mostly solitary)
  - 2-5% are double glands
- Parathyroid hyperplasia
  - Proliferation of parenchymal cells
  - 10-15% of 1º HPT
  - All cases of 2º HPT
- Parathyroid carcinoma
  - <1% of cases
Differential Dx of Hypercalcemia

- Parathyroid
  - 1º HPT
- Nonparathyroid endocrine
  - Thyrotoxicosis
  - Pheochromocytoma
  - Acute adrenal insufficiency
  - VIPoma
- Malignancy
  - Solid tumors
  - Lytic bone lesions
  - Lymphoma/leukemia
  - Parathyroid hormone-related peptide
- Granulomatous Dz
  - Sarcoidosis
  - Tuberculosis
  - Histoplasmosis
  - Coccidiomycosis
- Medications
  - Ca
  - Thiazide
  - Lithium
  - Estrogens
  - Testosterone in breast CA
- Other
Symptoms of Hypercalcemia

- Kidney stones
- Painful bones
- Abdominal groans
- Psychic moans
- Fatigue overtones

Today, >50% have nonrenal nonosseous manifestations

- 30-40% are Asx
- Nonspecific c/o
  - Fatigue
  - Lethargy
  - Depression
# Noninvasive Pre-op Localization

<table>
<thead>
<tr>
<th>Study</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Cost</th>
<th>Safety</th>
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<td>Moderate</td>
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<td>Sestamibi SPECT</td>
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<td>PET-CT</td>
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<td>High</td>
<td>Radiation</td>
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Parathyroid adenoma

Sestamibi Scan

- 91% & 99% sensitive & specific
- Technetium 99m pertechnetate
- Sestamibi – monovalent lipophilic cation
  - Mitochondrial uptake
- Identifies at least 1 gland
  - But only 62% of total hyperplastic glands
- SPECT allows localization of structures in the anterior-posterior plane
  - Localizes smaller lesions & those behind the thyroid
- 48-72% true positive
- In conjunction
  w/sestamibi ↑ 90%
- Hypoechoic and well-circumscribed
Other Radiologic Modalities

**CT**
- Sensitivity 70%
- Specificity 100%

**MRI**
- Hyperintense on T2 images
Invasive Pre-op Localization

- Selective arteriography w/ venous sampling for PTH
- Catheterization of multiple veins in the neck & mediastinum
- Adenomas appear as blush due to increased vascularity
- Sensitivity only 60% but few false-positives
- Time consuming & expensive
Treatment of Primary Hyperparathyroidism
Hypercalcemic Crisis

**Initial Management**
- Stop pharmacologic agents associated w/hypercalcemia
- IVF w/NS (2-300mL/hr)
  - Reverse IV vol contraction
  - Promote renal excretion Ca
- Loop diuretics
  - Reduce risk for volume overload
  - Inhibit Ca resorption in loop of henle

**Additional Agents**
- Glucocorticoids (2-400mg/day IV x3-5d)
  - Inhibit Vit D effects
- Gallium nitrate (200mg/m² daily IV x5d)
  - Inhibit osteoclast resorption
- Calcitonin (8IU/kg SQ x5d)
- Bisphosphonates
  - Inhibit osteoclast activity x1mo
Medical Management

- Mild to Moderate
- Expectant management & interval follow-up
- Avoid dehydration or intake of excess calcium
- Serum vit D levels monitored & restored
- Oral bisphosphonates may be beneficial against bone loss
- Biannual monitoring of serum Ca, iPTH, creatinine & urinary creatinine clearance
- Annual 24-hr urinary Ca excretion & bone mass density
- Prospective studies show 30% have dz progression
Guidelines for Surgery in ASx PHPT

- Age <50
- Serum Ca >1 mg/dL above normal
- 24hr Urinary Ca >400 mg
- Creatinine clearance reduced by 30%
- Bone mineral density t score < 2.5 any site
- Failure of medical management
Surgery or Surveillance in mild ASx PHPT

- Prospective Randomized trial
- 50 pts who did not meet NIH guidelines
- Randomly assigned to PTx or no PTx w/6 mo & 1 yr f/u

Bone Mineral Density

- LSpine (+4.16 +/- 1.13 for PTx vs. -1.12 +/- 0.71 for no PTx; P = 0.0002)
- Total hip (+2.61 +/- 0.71 for PTx vs. -1.88 +/- 0.60 for no PTx; P = 0.0001)

Quality of life measurement (36 item questionnaire)

- Bodily pain (P = 0.001), general health (P = 0.008), vitality (P = 0.003), and mental health (P = 0.017)

Ambrogini et al. 2007
Parathyroid adenoma

Operative Management

“Ah, Mr. Smith! We’ll get started as soon as I finish my warmup.”

To Be Continued...


