Vesalius SCALpel™ : Thyroid (see also: head and neck folios)

Anatomic

lingual thyroid
- most common ectopic location normal thyroid tissue
- patients may have no thyroid in neck
- manifest as teenager, may enlarge
- 70% of pts with lingual thyroid are hypothyroid
  - Rx w synthroid, may shrink
  - 10% incidence of cretinism if not recognized
- Dx by scan
- in 70% of patients with lingual thyroid, it is the only thyroid tissue
- no need to remove asymptomatic

substernal thyroid/goiter
- CT scan to diagnose inferior extension
  - US inadequate for Dx
- growth, airway obstruction, SVC syndrome
- 85% anterior
- primary substernal thyroid blood supply from thoracic, v secondary from neck
- posterior type danger recurrent nerve injury
- most from inferior extension of goiter
- almost always accessible from neck, source of blood supply

goiter
- Grave's, solitary nodule, multinodular, Hashimoto's, subacute thyroiditis (DeQuervain's), Reidel's
- may be asymptomatic, hyperthyroid, or cause compression, hoarseness, stridor, dyspnea

Thyroid function

- thyrotropin releasing hormone from hypothalamus stimulates pituitary to release thyroid stimulating hormone (TSH)
- TSH stimulates thyroid to release iodinated thyroglobulin stored in cells
- thyroglobulin hydrolyzed to T3 and T4 which are released into the circulation
- most (80%) of circulating thyroid hormone is T4
- T3 is also generated by peripheral conversion of T4
  - T3 is more metabolically active than T4
- thyroglobulin is not normally released into circulation except in pathological conditions, cancer

Benign

Grave's
- autoimmune
  - Graves and Hashimotos: antithyroglobulin and antimicrosomal antibodies
- T3 X 10d should decrease TSH 50%

in Graves, toxic nodule, TSH is already suppressed
Dx: clinical, decreased TSH, antimicrosomal & antithyroglobulin antibodies
medical Rx mild: PTU, tapazol 4-6w to improvement
10% incidence rash, nausea, headache, fever, agranulocytosis, aplastic anemia, thrombocytopenia, hepatic toxicity
methimizole passes through placenta
beta block for tachycardia, hypertension
steroids for eye manifestations
50% remission 6-24mo
radioactive iodine (RAI)
failed drug treatment
recurrence, pts > 55, non-operative candidates
contraindicated in pregnancy, lactation
RAI passes placenta and into breast milk
20-70% become hypothyroid
5-20% recurrence, repeat in 6mo
incidence of recurrence of Graves equal with subtotal and RAI
no RAI in child or woman of childbearing age
surgery
indications: failed drug therapy, rapid need (pregnancy), large goiter, non-compliance, woman of childbearing age, severe eye manifestations
lugols soln. 8 drops/d starting 10d pre-op
near total thryroidectomy
thyroid storm
fever, tachycardia, confusion, coma, congestive heart failure, nausea, vomiting, diarrhea
10-20% mortality from high output CHF
most common cause non-compliance with meds
start treating before lab results or multiorgan failure
Rx: PTU, beta block, steroids/IV hydrocortisone (prevent peripheral conversion of T4 to T3), treat underlying cause
propranalol 1mg/m to 10mg max dose for tachycardia
PTU 200mg
KI 5-10 drops decreases T3 and T4 release
hydrocortisone 200mg IV initial, then 100mg Q8h to decrease thyroid hormone release
IV with glucose (thyroxin increases glucose metabolism)
no ASA (displaces T4 from thyroglobulin, worsens storm)
iodine to inhibit sodium pump and slow release of T3,4 from gland
O_2, Tylenol for fever, ice packs PRN

solitary toxic adenoma (Plummer's)

RAI failure, > 3cm do surgical lobectomy
1/1000 risk of Ca

Hashimoto's thyroiditis

- most common cause of hypothyroidism in US
- associated with hyperlipidemia, increased risk ASCVD
- T cells activate B cells which secrete antibodies to thyroid cells and contents
  - (thyroglobulin, thyroid peroxidase)
- lymphocyte infiltration B & T cells, follicles with germinal centers, ultimate fibrosis
- also called chronic lymphocytic thyroiditis
- thyroid lymphoma: rapidly enlarging
  - associated with Hashimotos
- autoimmune, firm, diffuse bilateral goiter
- young to middle age women 8:1
- eu/hypothyroid (25%)(early may be hyperthyroid, poor prognostic indicator)
- antimicrosimal and antithyroglobulin antibodies
- biopsy dominant nodule (FNA)
  - controversial, but some have linked to increased cancer incidence
- synthroid may make goiter shrink

subacute thyroiditis (DeQuervain's)

- self-limiting inflammatory thyroiditis
- young to middle age women
- fatigue, headache, muscle ache, fever
- minimal to moderate enlargement, tenderness
- salicylates, NSAIDS, steroids

Reidel's thyroiditis

- rare, fibrous thyroiditis
- middle aged women
- progressive hard woody enlargement, rock-hard gland
- bx to differentiate from anaplastic carcinoma
- isthmusectomy to maintain airway, often need permanent tracheostomy
- steroids, TAM main Rx, goal to stabilize

Thyroid cancer

most common endocrine cancer
thyroid nodule
- solitary in child rare, associated with radiation, more malignant (40% in child < 14) than adult
  - MEN2a and b risk in child, young
  - FNA 6% false negative; if positive to OR, no scan needed
    - full US to assess other lobe and lymph nodes
    - high index suspicion child despite negative tests

cancer risk: solitary non-functioning nodule (12-15% malignant), > 4cm (26% cancer risk), age < 20, > 40, firm, fixed, rapid growth, lymphadenopathy, radiation exposure (after 20y)
    >4cm: higher false negative FNA rate, do minimum of lobectomy
favorable prognosis pap/follic: women < 50, men < 40, tumor < 5cm
poor prognosis: lymphatic invasion
FNA 98-100% accurate for papillary

papillary
    numerous histologic variants, some with poorer clinical outcomes
        tall cell and columnar cell variants of papillary more aggressive
    RET (tyrosine kinase) oncogene: papillary, MENIIA, B, familial MTC
    80% of thyroid cancer
    papillary and follicular = well differentiated thyroid cancers
    papillary Ca most common, best prognosis
        tall cell variant worse prognosis
    FNA Dx papillary confirmed 98-100% on final path
    painless mass, euthyroid, microscopically multicentric common, no markers
    15% of well differentiated thyroid cancers have hx of goiter
    history of neck radiation, most node positive
    Gardner's, Crohn's and FAP associated with thyroid Ca
        patients with FAP have a 2% chance of getting papillary thyroid cancer
    nodes
        risk: age < 20, > 70, local tumor invasion, blood vessel invasion, hi nuclear grade
            child more common LN mets, most after RT
        closest nodes central and carotid sheath, 50% micromets
            central node dissection with palpable nodes
            lateral compartment modified neck dissection (not cherry picking)
        elective node dissection without palpable nodes does not influence survival
            20% subsequent palpable mets, dissect with same survival
            LN mets correlates with local recurrence
            positive nodes do not change prognosis
    female to male pap and folic 3:1, males worse prognosis, 2X mortality
    ablative I131 post total thyroidectomy decreased recurrence rate
    thyroid hormone post-op to suppress TSH

follicular
    15% of thyroid cancer
    20% met to lung and bone
    ablative I131 post total thyroidectomy decreased recurrence rate
    thyroid hormone post-op to suppress TSH
    follicular: multicentricity increases with size, 4cm do total

Hurthle cell/oncocytic
    older pts (>60)
    variant of follicular, < 5% of differentiated thyroid cancers
    Hurthle cell same prognosis, but more recurrence

positive nodes in Hurthle worse prognosis (v no change prognosis in other well differentiated thyr cancers)

surgery
- rationale for near total: 80% multicentric, 15% local recurrence, with routine neck dissection up to 80% positive nodes, ability to monitor thyroglobulin, use RAI, no difference distant mets or survival
- 80% get near total
- complications
  - 1% bleeding
  - 15% transient hypocalcemia
    - monitor Q 8h X 3, if Ca++ > 8 no further monitor or Rx
  - 1-2% hypopara > 6mo
  - 5% transient recurrent laryngeal N injury
    - recovery 3-6mo
    - 1% permanent injury

thyroglobulin: produced by most papillary and follicular cancers, tumor marker for recurrence

medullary (MCT)

- 5-10% of thyroid malignancies
- neuroendocrine parafollicular C cells release calcitonin
  - calcitonin release normally in response to elevated calcium
  - inhibits osteoclast activity, minor role in calcium balance
  - elevated basal or stimulated calcitonin indicates medullary cancer already present
- FNA spindles
- 25% genetic
  - RET protooncogene mutation, chromosome 10, autosomal dominants
    - RET (codes for tyrosine kinase receptor) mutation stimulates cell growth
    - DNA test on peripheral lymphocytes
  - also mutation tumor suppressor gene on chromosome 11 responsible for protein menin
  - 3 phenotypes
  - MEN-IIA: MCT, pheo (50%), hyperpara (20%)
    - bilateral/multifocal MCT, C-cell hyperplasia
    - (MEN-2A:MEN-2B 3:1)
  - MEN-IIB: MCT, Marfanoid, mucosal neuroma, ganglioneuroma
    - phenotype: marfanoid, prognathism, puffy lips, bumpy tongue, hyperflexible
  - adrenal surgery preceeds MCT
  - familial MCT (FMCT): MCT alone
- for familial/genetic prophylactic total thyroidectomy as young as 6
  - screening and surveillance not appropriate
- Ca/parathormone, 24h urine VMA, total and fractionated metanephrine to r/o MEN2
- 65% sporadic, 35% MEN2
  - sporadic usually unilateral without family hx

80% of pts. positive central neck nodes, 80% ipsilateral, 50% contralateral
surgery only effective Rx, multicentric, total thyroidectomy, central neck dissection
palpable nodes 75% positive
f/u: calcitonin, CEA (some produced)

anaplastic
long hx goiter or differentiated thyroid cancer, rare, 1%
older, rapid growth, local, nodal, hematogenous spread
3-6mo survival
< 5cm, limited to thyroid do total, XRT, taxol, rare
palliative in most, maintain airway