27. **Head and Neck**

**Diseases/Conditions**

- Core
  - Neck Mass – Evaluation
    - Upper Airway Obstruction

- Advanced
  - Oral Cavity/Pharynx, Laryngeal, and Salivary Gland Cancer

**Operations/Procedures**

- Core
  - Lymph Node Biopsy
  - Tracheostomy

- Advanced
  - Modified Neck Dissection
  - Parotidectomy
14. Endocrine

Diseases/Conditions

Core
- Adrenal Mass – Incidental
- Hyperaldosteronism – Primary
- Hypercortisolism – Cushing Syndrome/Disease
- Hyperparathyroidism
- Hyperthyroidism
- Hypothyroidism – Postoperative
- Pheochromocytoma
- Thyroid Cancer
- Thyroid Nodule
- Thyroiditis

Advanced
- Adrenal Cancer
- Multiple Endocrine Neoplasias
- Parathyroid Cancer

Operations/Procedures

Core
- Parathyroidectomy
- Thyroidectomy – Partial or Total

Advanced
- Adrenalectomy
- Ultrasound of the Thyroid
## Neck Mass Evaluation

**Location**: L, L

**History and Exam**

**DDX**
- **Brachial plexus**
- **Lymph node stations**

**DDX Buzz words**
- Diagnosis: TB, Pharyngitis, sialadenitis, cat scratch, child = cervical lymphadenopathy
- Treatment: Abx trial, Can monitor for 4 wks if high suspicion

**Neoplasm**
- Hx malignancy, HIV, IS, Tob/EtOH, “B” symptoms, fixed/immobile
- Diagnosis: Lymphoma, oral ca, Salivary gland ca, Thyroid, metastases
- Treatment: Imaging (U/S, neck CT w/IV), Biopsy (FNA vs excisional) or resect

**Congenital**
- Prenatal ultrasound
  - Moves w/ swallow +tongue protrusion
- Diagnosis: Brachial cleft cyst, Cystic hygroma, Thyroglossal duct cyst, Hemangioma
- Treatment: Resect Sistrunk, Observe w/ bb first few years, then steroids
# Head and Neck Cancer

<table>
<thead>
<tr>
<th>If obvious + lymph nodes</th>
<th>Primary treatment</th>
<th>lymph node dissection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benign salivary (more for Major glands-PAROTID)</td>
<td>Resection of primary tumor</td>
<td>+</td>
</tr>
<tr>
<td><strong>#1 pleomorphic adenoma</strong>&lt;br&gt;<strong>#2 papillary cystadenoma (Warthin)</strong></td>
<td>Surgical excision (+superficial parotidectomy)</td>
<td>-LN</td>
</tr>
<tr>
<td>Malignant salivary (tend minor glnd)</td>
<td>Total parotidectomy + adjuvant chemo/rads</td>
<td>+ LN</td>
</tr>
<tr>
<td><strong>#1 mucoepidermoid ca (parotid)</strong>&lt;br&gt;<strong>#2 adenoid cystic ca (submand, subling)</strong>&lt;br&gt;- Tend perineural spread (painful)</td>
<td>+/-facial nerve sacrifice</td>
<td></td>
</tr>
<tr>
<td>Mucosal malignancy (laryngeal, hypopharynx) <strong>AIRWAY</strong></td>
<td>Definitive chemo-rads (otherwise total laryngectomy +rads)</td>
<td>- &gt;4cm oropharynx mrnd</td>
</tr>
<tr>
<td>Oral Cavity SCC (tongue, floor mouth)</td>
<td>Resect w/ 1cm margin</td>
<td>MRND &gt;4cm</td>
</tr>
<tr>
<td>Lip ca (#1 lower) SCC</td>
<td>Wedge resection w/ 5mm border, <strong>if &lt;1/3 lip primary closure</strong></td>
<td></td>
</tr>
</tbody>
</table>
H&N Procedures

- Modified radical neck dissection
  - Stations: I to V
  - Save sternocleidomastoid muscle, spinal accessory nerve, and internal jugular vein (radical neck dissection).
  - For medullary thyroid CA or bx + lymph node mets in diffn thyroid ca
  - Certain H&N cancers
  - *ID thoracic duct on L (+injury), +nerves

- Central neck dissection
  - Level VI lymph nodes.
  - Borders: hyoid bone (superior), innominate artery (inferior), carotid artery (lateral), deep cervical fascia (posterior), superficial layer of the deep cervical fascia (anterior)
H&N Procedures

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  - Stations: I to V
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Thyroid Nodules

• 1\textsuperscript{st} step (history/physical)
• 2\textsuperscript{nd} step TFT
• **Functional** (Low TSH/high t\textsubscript{4}) = subclinical hyperthyroidism
  - radioisotope scan (Technetium 99m)
  - Hot nodule treat monitor resect
  - Cold nodule (incr risk malignancy) -> U/S
• **Nml** or High TSH/low t\textsubscript{4} = Hashimoto thyroiditis (low risk malign)
• 3\textsuperscript{rd} step ultrasound (know features)
• 4\textsuperscript{th} step biopsy if suspicious (>1cm) or growing

(1) local compressive or inflammatory sx
(2) hyperfunction
(3) malignancy/ concern
Thyroid Nodules

• Thyroid u/s- malignant features:
  • Solid hypoechoic
  • solid hypoechoic w/partially cystic nodule
  • irregular margins (infiltrative, microlobulated, interrupted rim calcification=disrupted halo sign),
  • microcalcifications,
  • taller than wide shape,
  • evidence of extrathyroidal extension

• Benign
  • Cystic
  • Intact Halo sign
  • Low vascularity

Consider biopsy at smaller sizes (1-2cm)

Consider biopsy for larger sizes >2cm
American Thyroid Association (ATA) nodule sonographic patterns and management guidelines for patients with thyroid nodules and differentiated thyroid cancer.

### Molecular testing

<table>
<thead>
<tr>
<th>BETHESDA CATEGORY</th>
<th>IMPLIED MALIGNANCY RATE ACCORDING TO BETHESDA SYSTEM (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1—Nondiagnostic or unsatisfactory</td>
<td>1-4</td>
</tr>
<tr>
<td>2—Benign</td>
<td>0-3</td>
</tr>
<tr>
<td>3—AUS/FLUS</td>
<td>5-15</td>
</tr>
<tr>
<td>4—FN or SFN (specify if Hurthle cell type)</td>
<td>15-30</td>
</tr>
<tr>
<td>5—Suspicious for malignancy (specify type)</td>
<td>60-75</td>
</tr>
<tr>
<td>6—Malignant (specify type)</td>
<td>97-99</td>
</tr>
</tbody>
</table>

**USUAL MANAGEMENT**

- Repeat FNA with image guidance
- Clinical follow-up
  - Repeat FNA or lobectomy
  - Lobectomy
  - **Molecular testing**
  - Lobectomy or total thyroidectomy
- Total thyroidectomy

*AUS/FLUS*, atypia of undetermined significance/follicular lesion of undetermined significance; *FN*, follicular neoplasm; *FNA*, fine-needle aspiration; *SFN*, suspicious for follicular neoplasm.
<table>
<thead>
<tr>
<th>Ca type</th>
<th>path</th>
<th>features</th>
<th>Treatment</th>
<th>Follow up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papillary (popular) (85%)</td>
<td>Path: psammoma bodies, orphanannie nuclei (eccentric)</td>
<td>Incidental imaging, palpable</td>
<td>OR- total if high risk of requiring post op rai, &lt;1cm lobectomy +preop Ln investigation</td>
<td>Post op u/s surv. 20% risk CL lobe, +/- RAI</td>
</tr>
<tr>
<td>Follicular (7%)</td>
<td>Path: need vascular/capsular invasion (no FNA). Hurtle</td>
<td>rare lymph nodes since spreads hematogenously</td>
<td>OR</td>
<td>+/- RAI Mets to bone, lung,</td>
</tr>
<tr>
<td>Medullary (6%)</td>
<td>Path: amyloid infiltrate, tissue +CEA, +calcitonin</td>
<td>80% sporadic, Test for MEN 2</td>
<td>OR- total thyroidectomy (MEN2a 6yo, MEN2b 1yo) + prophylactic level VI LN +/- ipsilateral mrnd (if known pos VI ln)</td>
<td>Serum calcitonin surveil, never RAI</td>
</tr>
<tr>
<td>Anaplastic (1%)</td>
<td>Path: heterogeneous multinucleated cells</td>
<td>Elderly patients, rapid growth</td>
<td>OR if caught early- total thyroid +/- rads. If locally adv+ trach or pall rads</td>
<td>palliation</td>
</tr>
</tbody>
</table>
Thyroid CA

- After diagnosis of thyroid cancer, ultrasound of central and lateral neck lymph nodes must be performed.
  - Abnormal lymph node (FNA)
    - Enlarged (>8-10mm)
    - Loss of fatty hilum
    - Round shape
    - Cystic
    - Hyperechoic
    - Peripheral vascularity

- Normal lymph node. Fatty echogenic hilum (arrow) in the center is preserved, small, oval.

- All medullary thyroid cancer must undergo evaluation for MEN2 syndromes.
  - RET mutation
  - Pheo eval

- Malignant lymph node round shape, markedly hypoechoic appearance, and lack of fatty hilum.
### Thyroid CA - Prognosis

<table>
<thead>
<tr>
<th>ATA classification</th>
<th>Distant mets</th>
<th>Residual disease</th>
<th>Invasion</th>
<th>Histology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk. Papillary thyroid cancer</td>
<td>- No lymph nodes or &lt;5 micromet &lt;0.2cm lymph nodes</td>
<td>-</td>
<td>-</td>
<td>No high risk</td>
</tr>
<tr>
<td><strong>ATA intermediate risk.</strong></td>
<td>&gt;5 lymph nodes, &lt;3 cm largest dimension Multifocal papillary microca</td>
<td>+RAI mets in neck</td>
<td>Microscopic invasion perithyroidal soft tissue.</td>
<td>Tall cell, Hobnail, columnar</td>
</tr>
<tr>
<td>ATA high risk age &gt;45 Hx head + neck irradiation</td>
<td>LN Met In &gt;3cm dimension</td>
<td>Incomplete tumor resection or distant mets. Elev post op tg</td>
<td>Macroscopic invasion perithyroidal soft tissue</td>
<td>Follicular ca with extensive vascular invasion</td>
</tr>
</tbody>
</table>
Thyroiditis

1. Hashimoto’s (autoimmune, high anti TPO AB)
   a. Path: lymphocytic infilt, Germinal centers and fibrosis
   b. Px: middle age women, hypothyroidism **painless** goiter
   c. **T4 low, TSH high**
   d. TX: thyroid hormone replacement, OR only for enlarging mass, compressive sx

2. Autoimmune: postpartum, sporadic (painless)
   a. Path: lymphocytic infiltration
   b. High anti-thyroid peroxidase (TPO) antibodies
   c. Risk smoking, insufficient dietary iodine

3. Other thyroiditis:
   a. **Infectious**/suppurative-Staph/Strept, TX abx, abscess drainage →
   b. **painful** subacute (**de Quervain’s**)- related to URI, TX nsaids, steroids
   c. **Riedel’s** thyroiditis (fibrous)- euthyroid or **T4 low, tsh high** TX
      Synthroid, tamoxifen, **steroids**, OR if compression remove constricting portion
Parathyroid Anatomy

- **Embryology**: 3rd (inferior) and 4th (superior) pharyngeal pouch
- **RLN**: Innervates all muscles to larynx except cricothyroid m (ext SLN- poor volume/projection)
  - Injury: paralysis of vocal cord (horseness, breathy)
- **PTH** (responds to low serum ca)- increases bone calcium resorption (osteoclast)
  - Increases production of calcitriol (active Vit D) in kidney
  - Stimulates calcium absorption in small intest
  - Increases resorption in kidney, decrease phos resorption
- **Inferior thyroid artery** supplies x4

<table>
<thead>
<tr>
<th></th>
<th>Relation to inf Thyroid a</th>
<th>Relation to RLN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superior parathyroid</td>
<td>superior</td>
<td>Postero-Lateral</td>
</tr>
<tr>
<td>Inferior parathyroid</td>
<td>inferior</td>
<td>Antero-medial</td>
</tr>
</tbody>
</table>
# Hyperparathyroidism

<table>
<thead>
<tr>
<th>Type</th>
<th>PTH</th>
<th>Ca</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMARY</td>
<td>++</td>
<td>++</td>
<td>Single adenoma most common. MEN 1, 2A- multiglandular</td>
</tr>
<tr>
<td>SECONDARY</td>
<td>+</td>
<td>-/nml</td>
<td>Vit D deficiency (can’t respond to low serum calcium levels) or CKD. Med management limit oral phos/binder (sevelamer), vid d supp,</td>
</tr>
<tr>
<td>TERTIARY</td>
<td>++</td>
<td>Nml/+</td>
<td>Post renal transplant. <strong>Requires subtotal parathyroidectomy</strong></td>
</tr>
<tr>
<td>PARATHYROID CARCINOMA</td>
<td>++</td>
<td>+++</td>
<td>Very rare, very aggressive. Ca&gt;14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Resect w ipsilateral thyroid lobe + adjacent lymph nodes or Urgent radiation if unresectable/adjuvant</strong></td>
</tr>
<tr>
<td>BFHH = benign familial hypocalciuric hypercalcemia-</td>
<td>nml</td>
<td>+</td>
<td>Low 24hr U calcium (&lt; 100 mg/24 h) and a low calcium-creatinine clearance ratios (CCCR) (&lt; 0.01). Benign disorder in Renal calcium-sensing receptor not parathyroid gland</td>
</tr>
</tbody>
</table>
Hyperparathyroidism

Who gets Surgery:
Primary: INDICATED for all symptomatic disease and asymptomatic with clinical signs (+neuropsych symptoms)

Imaging for localization:
- Sestamibi scan (sen >80%) - can be combined with 3D SPECT imaging (PPV 92%)
- Ultrasound (sen >75%, user experience)
- CT/MRI especially if previous neck surgery (sen 89%)
- intraop 4-gland bilateral exploration

Missed gland: #1 normal anatomic position (at reop) TE Groove, ant mediastinum/thymus, intrathyroidal

Ectopic gland:
- SUPERIOR - #1 TE Groove, carotid sheath, intrathyroidal
- INFERIOR* - #1 thyrothymic ligament, carotid sheath, intrathyroidal

TABLE 2. NIH Criteria for Parathyroidectomy

| Markedly elevated serum calcium (1–1.6 mg/dL above normal, i.e., >12 mg/dL) |
| History of an episode of life-threatening hypercalcemia |
| Creatinine clearance reduced by 30% with age-matched normal subjects |
| Markedly elevated 24-hour urine calcium (>400 mg/dL) |
| Nephrolithiasis |
| Age < 50 |
| Osteitis fibrosa cystica |

Substantially reduced bone mass as determined by direct measurement (e.g., Bone mass > 2 SD below controls matched for age, gender, and ethnic group)

Neuromuscular symptoms: documented proximal weakness, atrophy, hyper-reflexia, and gait disturbance

- Single adenoma resection (85%)
- 3 and ½ resection +/- autotransplantation
- Serial intraop pth to ensure removal of correct gland (50% drop from pre excision = Miami Criteria)
- Recurrence = after 6 mon of cure
- Persistence = failure of hyperca to resolve

Rarely seen, fractures of vertebrae or osteoporosis of lumbar spine, hip, femoral neck, distal radius
## Multiple endocrine neoplasia (MEN) syndromes.

<table>
<thead>
<tr>
<th>Syndrome</th>
<th>Major Clinical Components</th>
<th>Associated Clinical Components</th>
<th>Site of Genetic Abnormality</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEN 1</td>
<td><strong>#1 Nonfunctional NET gastrinoma</strong></td>
<td>- Thyroid adenoma</td>
<td>- <em>Menin</em>—tumor suppressor gene</td>
</tr>
<tr>
<td></td>
<td>• Hyperparathyroidism</td>
<td>- Adrenal adenoma</td>
<td>- Mutation eliminates function from one allele</td>
</tr>
<tr>
<td></td>
<td>• Duodenopancreatic neuroendocrine tumors</td>
<td>- Thymic carcinoid tumor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Pituitary adenomas</td>
<td>- Subcutaneous lipoma</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>prolactinoma</strong></td>
<td>- Cutaneous collagenomas and angiofibromas</td>
<td></td>
</tr>
<tr>
<td>MEN 2A</td>
<td>• Medullary thyroid cancer</td>
<td>- Lichen planus</td>
<td>- <em>Ret</em>—protooncogene</td>
</tr>
<tr>
<td></td>
<td>• Hyperparathyroidism</td>
<td></td>
<td>- Mutation causes constitutive receptor activation</td>
</tr>
<tr>
<td></td>
<td>• Pheochromocytoma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEN 2B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Medullary thyroid cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Pheochromocytoma</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Neurofibromas of lips and tongue</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Marfanoid habitus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Familial medullary thyroid cancer</td>
<td>• Medullary thyroid cancer</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*Usually sx B/L*
Adrenal mass-incidentaloma

Benign adrenal adenoma.
- Rapid enhancement w/ IV contrast
- rapid washout 78%

Blood Supply
- Superior Adrenal – inferior phrenic
- Middle Adrenal- aorta
- Inferior Adrenal- renal
# Adrenal mass–incidentaloma

<table>
<thead>
<tr>
<th>Benign</th>
<th>Malignant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smooth contour, no growth</td>
<td>Irregular Contour, heterogeneous, rapid growth</td>
</tr>
<tr>
<td>Adenoma: rapid enhancement and rapid washout</td>
<td>ACC: poor enhancement before and after</td>
</tr>
<tr>
<td>Unenhanced CT&lt;10 HU (98%spec), 3 phase CT: Relative Absolute % washout</td>
<td>&gt;10HU</td>
</tr>
<tr>
<td>Unenhanced CT&lt;10 HU (98%spec), 3 phase CT: Relative Absolute % washout</td>
<td>Mets: rapid enhancement prolonged washout &lt;60%</td>
</tr>
<tr>
<td>MRI- loss of signal on MRI opposed phase</td>
<td></td>
</tr>
<tr>
<td>Pheo: CT avid enhancement &gt;110-120HU. MRI high T2 intensity</td>
<td>If history of malignancy- PETCT can rule out malignancy</td>
</tr>
<tr>
<td>Myelolipoma: macroscopic fat (*) (-20HU)</td>
<td></td>
</tr>
<tr>
<td>Adrenal hemorrhage/hematoma- nearby inflammation, (HU 50-90, no enhancement)</td>
<td></td>
</tr>
<tr>
<td>Adrenal Cysts – uncommon, (HU -10-20), no enhancement</td>
<td></td>
</tr>
</tbody>
</table>
**Functional Eval**

**Cortisol** - wt gain, bruising, central obesity, DM, HTN, HLD, virilization, osteoporosis, ?EXOGENOUS STEROIDS

**HyperAldo** - HTN, hypokalemia, low renin

**Pheo** - headache, palpitation, sweating (episodic), HTN

History of cancers, smoking, wt loss family history (MEN), medications

---

**Vital signs**

**Physical appearance:**
- obesity, anxiety, hirsutism, facial plethora, proximal muscle wasting, striae, skin thinning, tremor, headaches.

- **Cortisol**: Low dose (1mg) dexamethasone suppression test (serum cortisol >5ug/dL)
  - confirm ACTH level (low) +24hr urine free cortisol, 2 day low dose dex supp

- **Hyperaldosteronism**: BMP (K), serum aldosterone/renin (ratio >30)
  - confirm aldo suppression testing on high Na diet
  - adrenal vein sampling

- **Pheo**: plasma free metanephrines + normetanephrines
  - confirm w/ 24hr total urine catechol +fractionated

- **Sex Hormones**: plasma DHEA, urine testost, 17-estradiol for feminization
Resect if

- Hormonally active
- Hormonally inactive but large >4cm, or suspicious imaging features
- Rapid growth - more likely carcinoma or risk of symptoms developing
- Diagnostic Uncertainty
- Known/suspected ACC
- Large symptomatic myelolipomas
- Metastatic tumors (if resectable/reasonable)
- NONFUNCTIONING ADENOMA SCREENING RPT SCAN + FUNCTIONAL EVAL IN 6 MON THEN 1 YEAR THEN ANNUALLY X 5 YEARS
THANK YOU
Andrea Gillis
gillisa@amc.edu
@DrAndreaGillis1
Adrenalectomy

- Laparoscopic via lateral decubitus flexed position
- Retroperitoneal approach
  - Preferred for patients with prior intrabdominal surgeries
- Open approach
  - Preferred for patients with high suspicion of carcinoma
  - Very large tumor
- Take vein first to control hormonal secretion intraop for pheochromocytomas
Upper Airway Obstruction

• Cause
  • Trauma (blunt, penetrating)
  • bleeding from oral or facial trauma
  • previous surgery

• Cricothyrotomy
• Tracheostomy
• Mallampati
• Intubation
Vocal cord paralyses

Respiration

S, Phonation

w/o paralysis
unilateral paralysis
bilateral paralysis
Extras

• Parathyroid imaging:
• Hyperthyroidism: Graves disease (autoimmune ab against tsh receptor =TRAb), toxic multinodular goiter, and toxic adenoma.
• TX antithyroid meds - GIVE PTU IN PREG (1st trimester)
• But methimazole works more efficiently
• RAI tx to avoid surgery but NOT in pregnant /breastfeeding pts, severe ophthalmic disease (may worsen w/ rai), risk of thyroid storm
• **Thyroid storm:** severe tachycardia, fever, confusion, vomiting, mania and coma
  • Tx: propranolol, lugols iodine solution, steroids, methimazole, steroids, plasmapheresis
  • Manage medically before thyroidectomy
Anatomy of Thoracic Duct

Subclavian artery and brachial plexus

Subclavius muscle

Costoclavicular ligament

1st rib

Anterior scalene muscle

Subclavian vein

Cords of brachial plexus

Subclavian artery

Subclavian vein

Superior trunk of brachial plexus

Middle trunk of brachial plexus

Lower trunk of brachial plexus

Scalenus anterior muscle

Phrenic nerve

T1

C7

C6

C5

Level I, submental (IA) and submandibular (IB); level II, upper internal jugular nodes; level III, middle jugular nodes; level IV, low jugular nodes; level V, posterior triangle nodes; level VI, upper visceral nodes; level VII, superior mediastinal nodes.