Objectives: Thyroid, Parathyroid

- Learn about key anatomical points
- Understand physiological principles
- Describe essentials of thyroid imaging
- Discuss functional disorders
- Review surgical management

Thyroid Gland

- Embryology
  - foramen cecum – lingual
  - thyroglossal duct cyst
  - rx - excise cyst with hyoid bone
- Anatomy
  - weight -15-25 gm
  - pyramidal lobe
  - Ligament of Berry

Thyroid Gland: Anatomy

- Follicular cells
  - thyroid hormone
- Parafollicular cells
  - calcitonin
- Vascular supply
- Nerve supply
  - RLN LN (Amelita Galli-Curci)
- Parathyroid relationship/lymphatic relationship
  - central & lat. post.
Amelita Galli-Curci

- From the day of her sensational American debut with the Chicago Opera in 1916, till the night she bade a premature farewell to opera, Amelita Galli-Curci was rated “the world’s greatest coloratura.” A signal of success was a review of her performance as Gilda in Verdi’s Rigoletto headlined “Galli-Curci debut makes opera history!”
- As the years rolled by, her voice no longer caressed the ear with “sultry sweetness and lyrical loveliness,” as one critic described it.
- A tumor in her throat was removed in 1935 in a Chicago hospital, but when she returned to the stage, after her first aria, a pall fell upon the audience: their one-time goddess had feet of clay.

Thyroid Disease: Physiology

- Hypothalamic-pituitary-thyroid axis
- TRH-TSH: negative feedback
- Thyroid hormone - 1/2 life of 7 days
  - thermogenic, modulate catecholamines
  - protein synthesis & CHO, lipid metab.
  - decrease vascular resistance
  - increase cardiac contractility

Thyroid Imaging

- Ultrasound - safe, noninvasive, sensitive
  - malignant lesions - hypoechoic
  - calcifications - psammoma bodies
  - Drawbacks - non-specific
- Radionuclide imaging – function
  - Tc 99m, iodine 123, iodine 131
  - “cold nodules” - malignant in 10-20%

Functional Disorders

- Exophthalmos (bulging eyes)
  - Normal thyroid
  - Enlarged thyroid
- Diffuse goiter
Thyroid Diseases: Functional Disorders

- Hyperthyroidism
  - Graves Disease
    - antithyroid drugs
    - RAI - ophthalmopathy
    - surgery - total
    - thyroid steal
    - Toxic Multinodular Goitre
    - Autonomic toxic adenoma

- Toxic Multinodular Goitre
- Solitary Toxic Adenoma - lobectomy
- Thyroiditis
  - Hashimoto’s autoimmune increase % lymphoma
  - Multinodular Goitre - total thyroidectomy

Surgery cures these disorders

Thyroid Testing

- FNA
  - sensitivity of 68-98%
  - specificity of 56-100%
- TSH single best test
- Frozen Section
  - useless

Evil villain paralyzed thyroid glands and made victims swollen and ugly. They were cured by injecting thyroid extract!!!
Thyroid Carcinoma

- Spectrum of well diff. to anaplastic
- Occult in 5-28%
- Females 3:1
- Increased virulence in elderly
- History of irradiation
  - family history

Thyroid Carcinoma: Papillary

- 80% of thyroid cancers
  - Multicentricity in 20-30%
  - LN metastases common
  - Occult < 1cm.
  - 10 year survival - 92%

Thyroid Carcinoma: Follicular

- “Neoplasm” by FNA
- Vascular, capsular invasion
- Frozen section definitely useless
- LN metastases uncommon
- Rx – total thyroidectomy
- 10 year survival - 72%

Thyroid Carcinoma: Hurthle Cell

- Most aggressive
- Total thyroidectomy for larger lesions
- I131 resistant
- 10 year survival - 70%
Thyroid Carcinoma: Medullary
- 80% sporadic
- Autosomal RET protooncogene
- RAI not effective
- Children with MEN-IIA
- More aggressive in MEN-IIIB
- Calcitonin levels

Thyroid Carcinoma: Other
- Anaplastic
  - rare, locally invasive
  - Impossible to resect
- Lymphoma
- RX - radiotherapy and chemotherapy
- Metastatic Carcinoma
  - breast and lung
  - isolated – kidney

Surgical Management
- Extent of Thyroid Resection
  - controversy continues
    - total vs. near total

Surgical Management
- Technique of Thyroidectomy
  - adequate incision length
  - mobilization
  - ligation of middle thyroid veins
  - identify inferior thyroid artery
  - RLN crosses artery
  - superior pole vessels

Surgical Management
- Complications of Surgery
  - RLN injury: 0-4%
  - External branch of SLN: 1%
  - Hypoparathyroidism - <2%
Parathyroid Diseases

- Anatomy - 4 glands
  - 5-7mm x 3-4mm x 0.5-2mm
  - weight: 30-50mg
  - arterial supply - inf. thyroid

- Locations - variable
  - 15% in thymus

Parathyroid Hormone (PTH)

- 84 amino acid peptide hormone responsible for regulation of serum calcium levels within a narrow range
- Secreted in response to decrease in serum calcium levels by increasing renal reabsorption of calcium and lowering reabsorption of phosphorus
- PTH assays assist in the diagnosis of tumors and hyperplasia of the parathyroid gland as well as in localizing hyperfunctioning parathyroid tissue by assay of samples obtained via venous catherization

Parathyroid: Rapid PTH Assays

- Obtain baseline preoperatively
- Remove the abnormal gland and allow time for circulating PTH to degrade
- Obtain additional samples
- If value does not drop – residual hyper-functioning tissue or tissue removed was not the abnormal gland
**Parathyroid Diseases: Physiology**

- PTH - single most important regulator Ca
  - bone - resorption and formation
  - kidney - increased reabsorption
- Vitamin D - intestinal absorption
  - mineralization

**Parathyroid Diseases: Hypercalcemia**

- Malignancy
  - solid tumors – PTHrP
    - lung - 25%
    - breast - 20%
    - squam. cell - 19%
    - renal – 8%
  - hematologic
    - multiple myeloma, leukemias
  - medical conditions

**Hyperparathyroidism**

- Primary - single vs. multiple gland disease
  - Adenoma - 76%
  - Double adenoma - 6%
  - Hyperplasia – 18%

**Hyperparathyroidism**

- Diagnostic Work-up
  - elevated Ca, PTH
    - decreased PO4
  - sestamibi scan
    - reliable
  - ultrasound

**Hyperparathyroidism**

- Surgical management
  - traditional vs. minimally invasive
  - unilateral vs. bilateral exploration
  - intraop. PTH
  - role of frozen section
In Summary

- Surgery in Endocrinology of the Thyroid and Parathyroid is challenging and needs to be exact but is safe in the hands of an experienced surgeon.