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
  - Autonomous toxic adenoma

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

Thyroid Diseases: Functional Disorders

- Surgery cures these disorders

Thyroid Diseases: Functional Disorders

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

Thyroid Diseases: Functional Disorders

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

Thyroid Testing

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-IIA
- 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 hyperfunctioning 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.