OBJECTIVES

• Discuss normal anatomy & physiology of the thyroid gland.
• Define abnormal conditions.
• Explain treatment modalities available for multiple disease states.
• Perianesthesia considerations of the operative patient.
ANATOMY

Thyroid Gland

- Bilobed structure
- Lies anterior and lateral to junction of larynx & trachea
- Lobes joined at midline by isthmus
- Layer of connective tissue, part of fascia, around the thyroid also surrounds the trachea
• Blood Supply: Arteries from carotid and subclavian arteries.

• Lymphatic System

• Parathyroid Glands: 4 glands located on posterior of thyroid gland.
Nerves

- Recurrent Laryngeal Nerve: Controls both tension & length of vocal cords.
- Superior Laryngeal Nerve: Innervates the larynx and the cricothyroid muscles which tense the vocal cords.
PHYSIOLOGY

Function- Primarily to secrete hormones

• Triiodothyronine (T3) – Most biologically active. ½ life is 8-12 hours
• Thyroxine (T4) – Majority of hormone released. ½ life is 7 days.
• Thyroglobulin (Tg)
• Calcitonin
PHYSIOLOGY

• Storage of hormones – Stores up to 2 weeks worth of thyroid hormones.

• Iodine – Essential for production of thyroid hormones.
  – Body does not produce iodine
  – NIH recommends 150 mcg/day.
    Iodized Salt ¼ tsp salt = 95 mcg
  – World Health Organization
REGULATION OF SECRETIONS

- Classic endocrine feedback system
- Hypothalamic-Pituitary-Thyroid Axis
- TRH - Thyrotropin-Releasing Hormone
- TSH - Thyroid Stimulating Hormone

Hypothalamus

TRH

TSH

Pituitary Gland

Thyroid

T3 & T4

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INHIBITION of THYROID SYNTHESIS

• Drugs: Propylthiouracil (PTU) & Methimazole (Tapazole)

• Iodine - Large doses temporarily halts the binding process. Preop use

• Corticosteroids - Suppresses Pituitary-Thyroid axis.

• Beta Blockers - Blocks CV effects of hyperthyroidism
TESTS OF THYROID FUNCTION

Laboratory Tests:
• Free T4 – non bound T4
• TSH Level: Evaluates the Pituitary-Thyroid Feedback loop
• TRH test: IV TRH should see increased TSH
• Autoantibody Levels: Used in autoimmune diseases
• Calcitonin Level: Screens for MEN type 2. Not used routinely for thyroid nodules.
TESTS OF THYROID FUNCTION

Thyroid Imaging

• Ultrasound- Portable & Cost-Effective.
• Radioisotope Scanning- “Hot” (excess uptake) “Cold” (no uptake)
• Fine-Needle Aspiration (FNA)
• CT/MRI
BENIGN DISORDERS

Hypothyroidism

- Endemic Goiter - Iodine deficiency
- Post Irradiation –Rx for Graves, Radiation Therapy
- Post Surgical
- Pharmacological – Lithium, Amiodarone, Cytokines
BENIGN DISORDERS

Thyroiditis

- Hashimoto's - Alteration in follicular cells.
- Subacute Thyroiditis - Females, 40, viral or autoimmune origin
- Riedel’s Struma - Rare, chronic inflammatory process
- Acute Suppurative - Extremely rare
Benign Disorders

Hyperthyroidism

• Graves Disease- Most common.
• Toxic Nodular Goiter/ Toxic Adenoma- Nodule within an enlarged gland
• Nontoxic Goiter- Asymmetric nodules
• Substernal Goiter: Unusual

Exophthalmos (bulging eyes)
MALIGNANCIES OF THYROID

- Papillary: Most common. 70-80%
- Follicular: Second most common. 10%
  - Hurthle Cell – Type of Follicular
- Medullary: 6%
- Anaplastic: Most aggressive. < 1%
- Primary Thyroid Lymphoma: Rare

Townsend 2008
SOLITARY THYROID NODULE INCIDENCE

- Incidence of STN: 5% in Females, 1% in Males
- Ultrasound can detect STN in 19-67% of randomly selected individuals with higher incidence in females & elderly. Cooper 2009
- Thyroid Cancer occurs in 5-15% of nodules, most are benign
- Yearly incidence of thyroid cancer has increased: 3.6/100,000 in 1973
  8.7/100,000 in 2002
  9.6/100,000 in 2006 (NCI)

A Dooley 2011
SOLITARY THYROID NODULE

• Since most STNs are benign deciding on treatment varies.

• Rapid growth & signs of invasion are most suggestive but not conclusive of malignancy.

• Clinical groups with highest risk of cancer are: children, males, adults <30 or >60, those exposed to radiation especially during childhood.
SOLITARY THYROID NODULE

• Controversy exists in many areas including, diagnosis, treatments, and therapies in STN.

• American Thyroid Association (ATA) developed treatment guidelines in 1996 and recently published the revised guidelines in “Thyroid” November 2009. The taskforce used a strategy similar to NIH Consensus Development. Cooper 2009
• Position: Supine, Head Extended
• Incision: Incorporates normal skin lines
• If recurrent laryngeal nerve is injured during surgery an attempt to repair it with visualization and microvascular technique is imperative.
SURGICAL PROCEDURES

• Approaches: Cervical- Majority of cases Median Sternotomy

• Types of Procedures
  – Sub-Total
  – Total: Complete removal of all visible thyroid tissue. Preserve the parathyroids.
  – Modified Neck Dissection
COMPLICATIONS OF SURGERY

• Airway Compromise

• Laryngeal Nerve Injury - A Primary Complication!
  – Recurrent Laryngeal Nerve Injury
    Causes vocal cord paresis or paralysis
    Voice changes & weakened cough
    Not always apparent at the time of surgery
  – Superior Laryngeal Nerve: Voice changes-
    huskiness, poor volume, or voice fatigue.
    May have swallowing difficulties as a branch
    innervates the base of the tongue.
PREVENTION OF NERVE DAMAGE

• Nerve Monitoring - Controversial. Monitoring does not change occurrence of transient injury but reduces incidence of permanent paralysis. 
  
  Fenton 2008

• Study: Dr. Chiang from Taiwan. Clinical Trials.Gov from NIH. Looking at using an ET tube with electrodes imbedded to monitor the RLN during surgery. Anticipated completion 2012.
COMPLICATIONS OF SURGERY

• Parathyroid Deficit: Hypocalcemia –secondary to devascularization of the parathyroids.
  – S & S: numbness & tingling of lips, hands, feet
  – Symptoms can occur 8-72 hrs postop

• Esophageal Injury: Overaggressive manipulation of thyroid mass

• Thyroid Storm: Toxic state from hyperactivity of thyroid gland. Tachycardia, fever, restless, shaking, sweating, agitation, delirium
COMPLICATIONS OF SURGERY

• Postoperative Bleeding- Occurs < 1% requires immediate re-exploration.

• Infection

• Chylous Fistula=Damage to thyroid duct of lymphatic system

• FYI: Complication rates are affected by surgeon experience. The lowest rates in surgeon who performed > 100 neck explorations annually.  
  Sosa 1998
PRE-OPERATIVE CONSIDERATIONS

Nursing Assessment

- Hyperthyroid state: HR, BP, Weakness, Palpitations, Moist skin
- Voice Quality: Essential for postop detection of early evidence of nerve injury such as hoarseness
- Swallowing or Breathing difficulties pre-op
- Cervical Spine Issues: Positioning in OR
- Psychological: Cosmetic impact of surgery
POST-OPERATIVE CONSIDERATIONS

• Assess Airway: Tracheotomy set nearby, O2 suture removal kit available.
• Semi Fowlers position
• Assess for bleeding/swelling
• Ask patient to state name: voice quality
• Assess for hypocalcemia: Numbness & tingling around mouth, hands or feet. Trousseaus sign. Chvosteks sign.
CALCIUM LEVELS

• Partial lobectomies: Rare hypocalcemia
• Calcium levels: Check within 8 hrs post-op

• Calcium Replacements:
  - Calcium Carbonate: Cheap, Common ie: TUMS
  - Calcium Citrate: More expensive ie: Citracal

• Calcium Absorption decreases as dose increases. Take in divided doses.
DISCHARGE TEACHING

• Signs & Symptoms of Hypocalcemia: May occur 8-72 hours postoperatively
• Any Changes in voice characteristics
• Incision Care
• Medications
• Follow up Appointments & Labs- Calcium level
OUTPATIENT THYROID SURGERY?

• Trottier et al 2009 (University of Ottawa, Canada) N=232. 231 went home. Four pts readmitted within 1 week.

• Inabnet et al 2008 (Columbia University, NY) N=224. Local n=184, 88% (162) went home. General n=40, 45% (18) went home. One ER visit for hypocalcemia.
MORE INFORMATION

• Canadian Cancer Society Research Institute.  
  www.cancer.ca

• National Cancer Institute at the National Institutes of Health. (USA)  
  www.cancer.gov

• National Cancer Research Institute. (United Kingdom)  
  www.ncri.org.uk

• Ireland-Northern Ireland National Cancer Institute.  
  www.allirelandnci.com
THANK YOU

• For taking the time to attend this conference
• For growing professionally to meet the needs of your patients.
REFERENCES


REFERENCES


