THE AMAZING THYROID!

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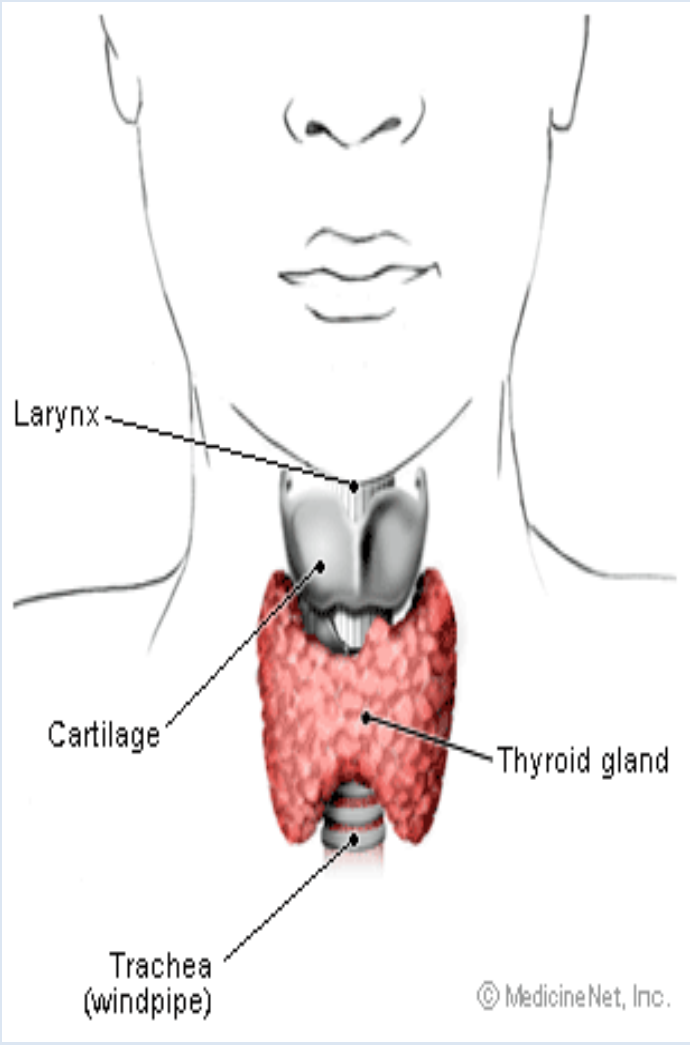
OBJECTIVES

- 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

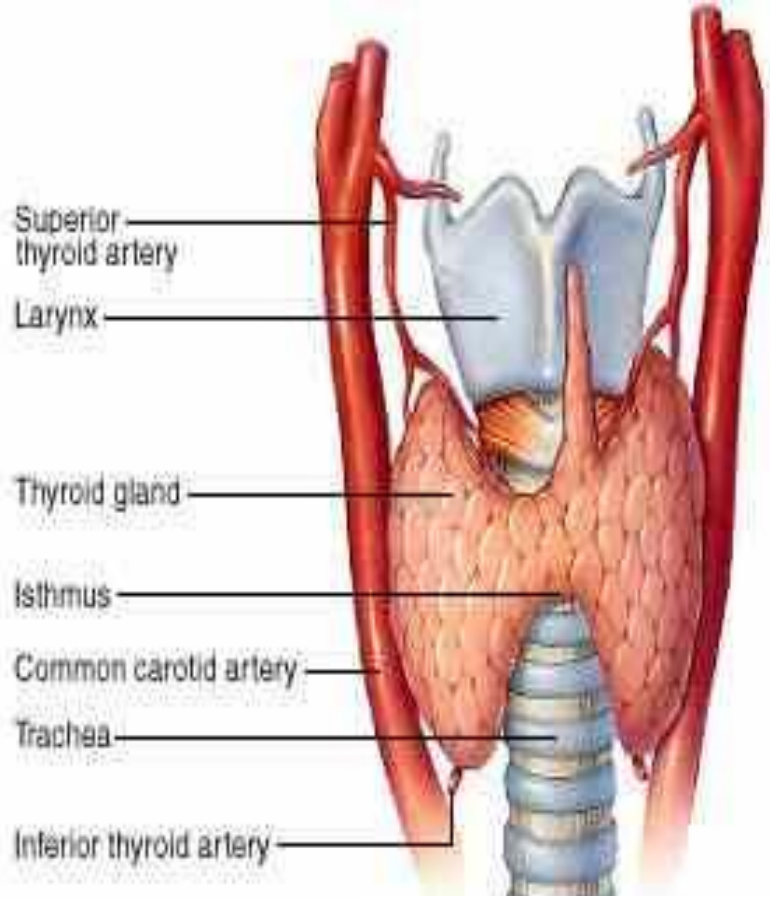


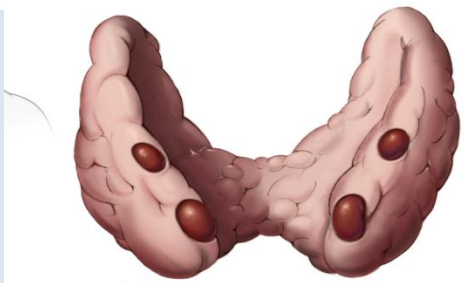
STRUCTURES

- Blood Supply: Arteries
  from carotid and subclavian arteries.

- Lymphatic System

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

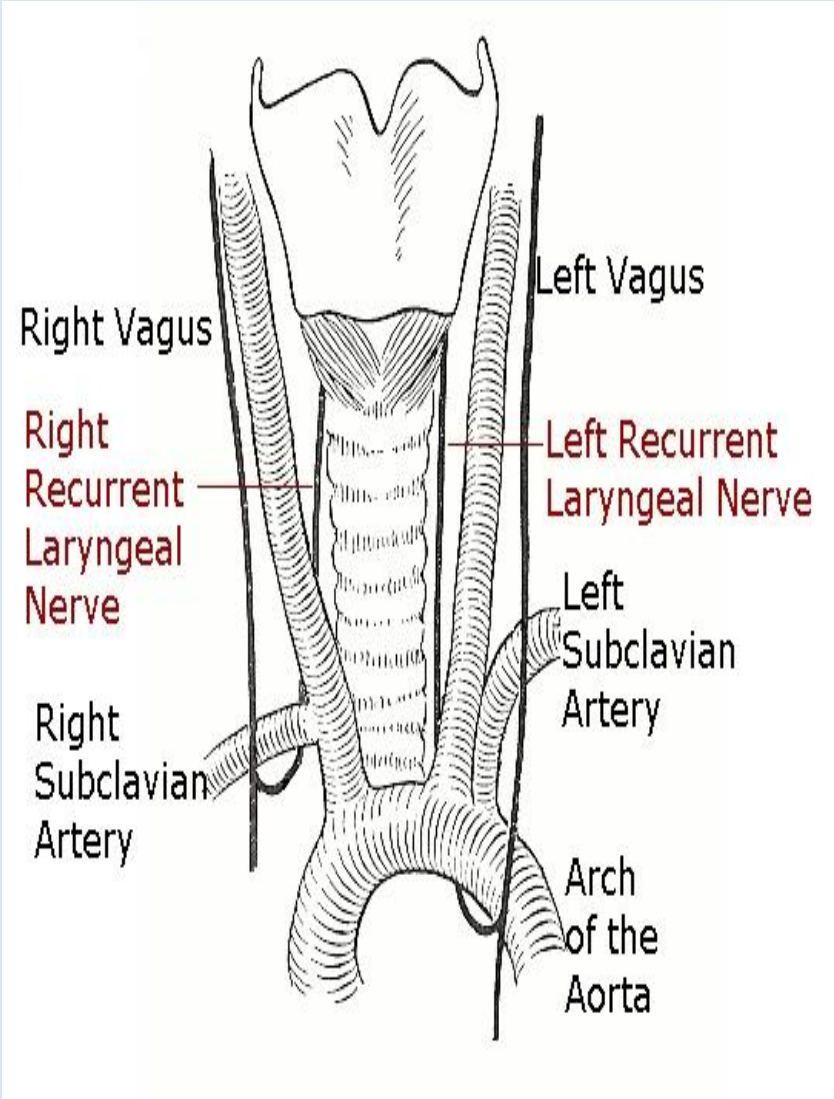




STRUCTURES

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

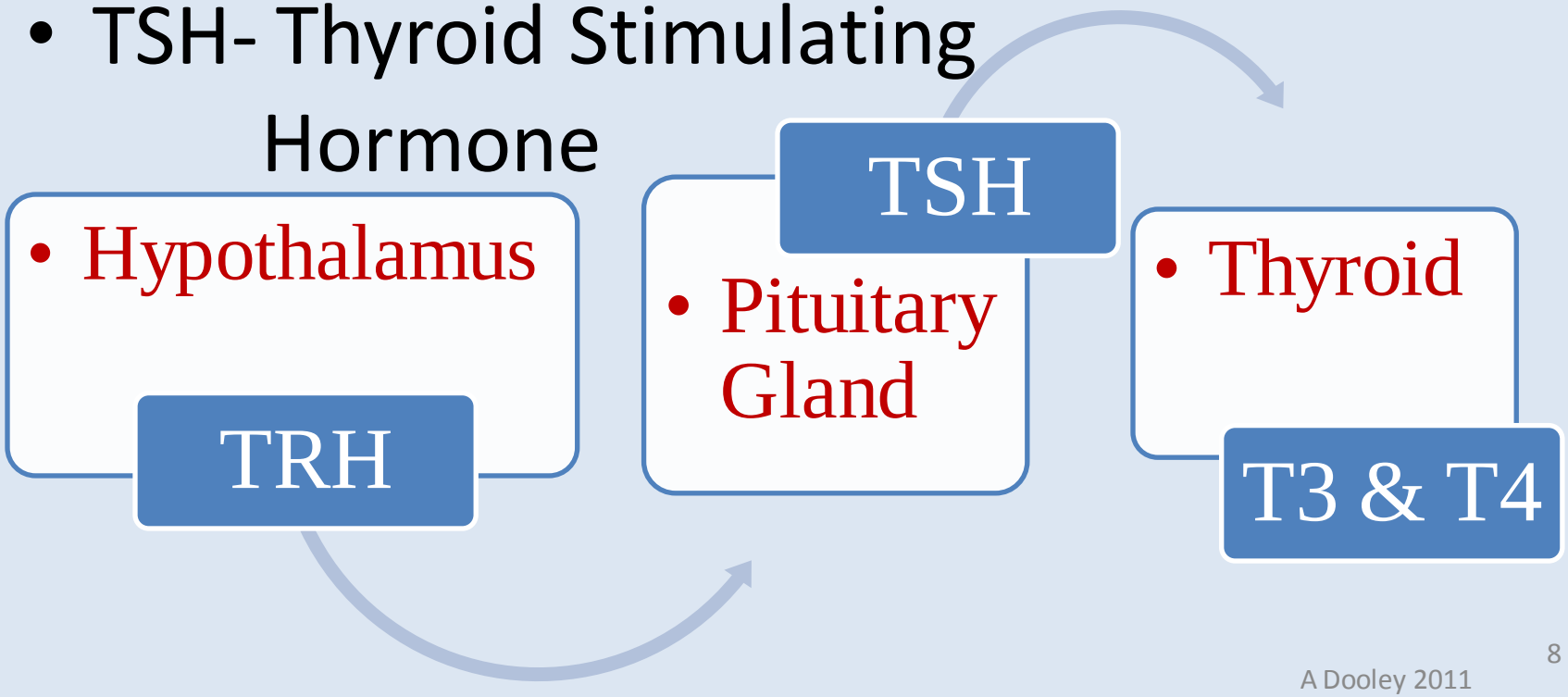
- Triodothyronine (T3) –Most biologically active. ½ life is 8-12 hours
- Thyroxine (T4) – Majority of hormone released. ½ life is 7 days.
- Thyroglobulin (Tg)
- Calcitonin

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

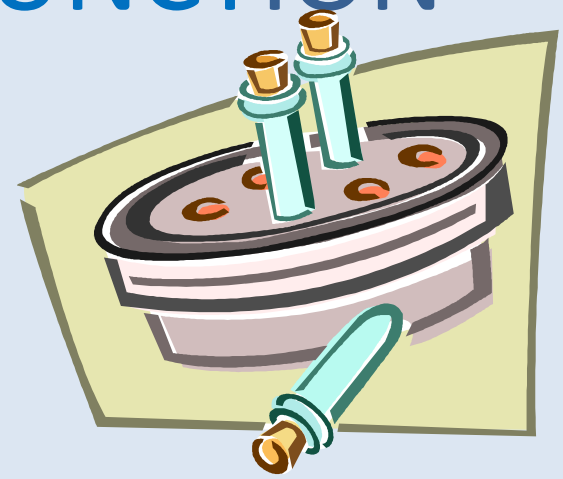
- Classic endocrine feedback system
- Hypothalamic-Pituitary-Thyroid Axis
- TRH- Thyrotropin-Releasing Hormone
- TSH- Thyroid Stimulating Hormone



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



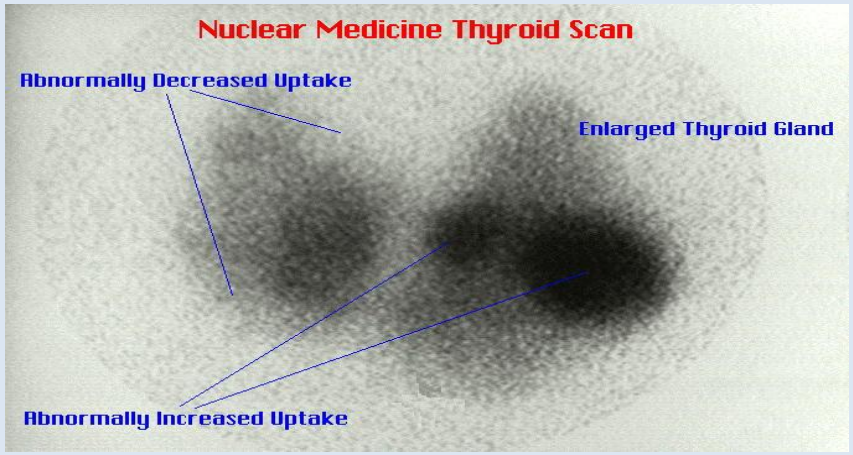
Laboratory Tests:

- 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

- Hashimotos- 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: 3.6/100,00 in 1973
  8.7/100,000 in 2002
  9.6/100,000 in 2006 (NCI)

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

SURGERY

- Position: Supine, Head Extend
- 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 postoperative
- 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

- Cooper, D., Doherty, G., Haugen, B., Kloos, R., Lee, S., Mandel, S., Mazzaferri, E., McIver, B., Pacini, F., Schlumberger, M., Sherman, S., Steward, D., Tuttle, R.M. 2009. Revised American Thyroid Association Management Guidelines for Patients with Thyroid Nodules and Differentiated Thyroid Cancer. *Thyroid.* 19 (11) pg 1167-1214. DOI: 10.1089=thy.2009.0110
- Chiang, Feng-Yu. (2008) Intraoperative Electromyographic Monitoring of the Recurrent Laryngeal Nerve in Thyroid Surgery. Kaohsiung Medical University Chung-Ho Memorial Hospital, http://clinicaltrials.gov/ct2/show/NCT00629746
- Fahmy, FF., Gillett, D., Lolen, Y., Shotton, JC. 2004. *Management of serum calcium levels in post-thyroidectomy patients.* Clinical Otolaryngology. 29, 735-739.
- Foote,J. MD (1924) Lippincott's Nursing Manuals. State Board questions and answers for nurses. Philadelphia: J.B.Lippincott Company.
- Gullooglu,B,. Manikyan, M., Cingi,A., Yegen,C., Yalin,R., Aktan, O. (2005). *Early Prediction of Normocalcemia after Thyroid Surgery*. World Journal of Surgery. 29, 1288-1293.
- Hanks, J., Salomone, L. (2008). Thyroid. In C. Townsend, R. Beauchamp, B. Evers, K. Mattox. *Sabiston Textbook of Surgery. The Biological Basis of Modern Surgical Practice* 18th ed (pp917-954). Philadelphia: Saunders.

REFERENCES

- Inabnet, W., Shifrin, A., Ahmed, L., Sinha, P. (2008). *Safety of Same Day Discharge in Patients Undergoing Sutureless Thyroidectomy: A Comparison of Local and General Anesthesia.* Thyroid. 18 (1), 57- 61
- Lee, S. Iodine Deficiency eMedicine from WebMD. Accessed 1-25-2010 http://emedicine.medscape.com/article/122714-overview
- Lockhart, J. (1995). Nursing Interventions for Potential Complications After Thyroidectomy. Society of Otorhinolarngology Nurses and Head-Neck Nurses. Retrieved January 26, 2010, from http://www.sohnnurse.com/thyroidectomy.html.
- Sosa, JA, Bowman HM, Tielsch JM. (1998) The importance of surgeon experience for clinical and economic outcomes from thyroidectomy. *Annals of Surgery.* 228, 320-330.
- Trottier, D., Barron, P., Moonje, V., Tadros, S. (2009). Outpatient thyroid surgery: Should patients be discharged on the day of their procedures*? Canadian Journal of Surgery.* 52 (3), 182-186.
- O'Neill, J., Fenton J. (2008). The Recurrent Laryngeal Nerve in Thyroid Surgery. *Surgeon*. 6(6), 373-377.