SURGICAL MANAGEMENT OF THYROID DISEASE: PEARLS FOR THE PCP

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Pituitary and Thyroid Update
September 2015
Disclaimer

- I have no financial interests with any of the companies or technologies discussed in this presentation
Overview

- History
- Anatomy
- Workup
- Indications for Surgery
- Purpose of Surgery
- What can the Patient expect?
- Case Studies
History

- Medical treatment of goiters
  - 1600 BC – Chinese used burnt sponge and seaweed
- Surgery first discussed in 990 AD in the Middle East
- 1880-Ludwig Rehn – 1st known thyroidectomy
History

- By 1920s, fairly commonplace
- William Halstead
  - “feat which today can be accomplished by any competent operator without danger or mishap”
Anatomy
Anatomy
Anatomy

- Thyroid Gland – 15-25 gms
  - Triiodothyronine (T3)
  - Tetraiodothyronin (T4, thyroxine)
  - Calcitonin

- Parathyroid Glands
  - 4 pea sized glands which regulate calcium levels
Thyroid Nodule

- On ultrasound, up to 50% of women and 20% of men over the age of 50 can have nodules.
- Clinically can affect up to 5% of population.
- Thyroid cancer present less than 10% of all nodules.
Thyroid Nodule Symptoms

- Compression
  - General rule of thumb, >3 cm in diameter
- Dysphagia
- Dyspnea
- Hoarseness
- Pressure

- In general does not cause pain!
  - Hemorrhagic cyst, thyroiditis
  - Thyroid cancer is painless
Thyroid Nodule - Benign

- Benign
  - 3% - False negative by FNA
  - Generally require yearly U/S for surveillance
    - Can be extended if nodules are stable
  - If there is a significant increase in size (>20% in 2 dimensions or >50% in volume), recommend repeat FNA
Indications for Surgery – Benign Disease

- Symptoms of compression
  - Nodule generally has to be at least 3 cm
  - Quality of life
  - Hemi vs total thyroidectomy dependent on nodule size and location

- Treatment of hyperthyroidism if medical treatment is not indicated or tolerated
Thyroid Cancer Snapshot
NCI and SEER data

- 62,450 new cases of thyroid cancer in 2015
  - 15K Men, 47K Women
- 1,950 will die of thyroid cancer
  - Median age at death is 73
- Incidence of thyroid cancer is increasing more rapidly than any other cancer in the US
  - More than doubled between 1992-2012
  - Mortality is steady during same timeframe
- 1.1% of men and women will be diagnosed with thyroid cancer at some point in their lifetime
Thyroid Cancer Statistics – NCI and SEER data

- Overall 5 yr survival – 97.9%

- Staging
  - Localized (Primary site) – 68%
  - Regional (ie LN) – 26%
  - Distant – 4%

- 5 yr relative survival rates
  - Localized – 99.9%
  - Regional – 97.8%
  - Distant – 54.1%
Thyroid Cancer Statistics

- 10 yr survival
  - Papillary cancer – 93%
  - Follicular – 85%
  - Medullary – 75%
  - Undifferentiated/Anaplastic – 14%
    - Most studies cite 5yr survival at <7%
Papillary Thyroid Cancer

- 70-80% of all thyroid cancers
- >3 F: 1 M
- 30 – 50 yo
- Prior XRT is risk factor

- Excellent long term prognosis
  - Better with younger age <45
  - Smaller size (<4cm)
  - > 90% 5 yr survival
  - Up to 30% recurrence
  - Up to 50% lymph node involvement
Follicular Thyroid Cancer

- FNA – Follicular lesion
- 20-30% of follicular lesion/neoplasm by FNA are cancer
- 10-15% of all thyroid cancer
- 3 F: 1 M
- Tends to be in middle age population (40-60 yr)
- Overall cure rate > 80-90%
- More common to have hematogenous than lymphatic spread
Medullary Thyroid Cancer

- Approximately 5%
- Arise from parafollicular cells – calcitonin
- Early spread to LN
- Better prognosis when confined to thyroid
- Most are spontaneous (80%)
- Can be associated with MEN IIA/B
- Prophylactic LN dissection is recommended
Anaplastic Thyroid Cancer

- Very aggressive
- Fast growing with early metastases
- Median survival is 5 months
- Invariably lethal <5% - 5 yr survival
- Most common in men > 65
Neck Dissection in Thyroid Cancer

- Central nodal dissection is commonly advocated for thyroid cancer
  - Area between hyoid bone, carotid artery and suprasternal notch/innominate artery
  - Decreases risk of nodal recurrence
  - Decreased risk of injury to RLN, parathyroid in re-do operations
Benefits of Central Nodal Dissection

- Studies show up to 40-65% prophylactic N0 central nodal dissections have positive disease
- RLN and parathyroid are generally clearly defined
- If there is positive disease, treatment (ie RAI) may be more aggressive and vice versa
- Older patients may not have iodine avid disease
  - Surgery is primary treatment modality
Benefits of Central Nodal Dissection

- Incidence of neck recurrence (15%) is predominantly in the central neck compartment (up to 90%).
  - In those cases with recurrence, central nodal dissection is always advocated even if disease is only clinically evident laterally

- Much higher incidence of RLN injury and permanent hypoparathyroidism in salvage CND
Benefits of Central Nodal Dissection

- Traditional teaching was that lymph node status did not affect survival.
- Recent study reviewing 10,000 records in Surveillance, Epidemiology and End Results (SEER) shows +LN in pts >45yo with PTC and all pt with FTC were associated with 46% increased risk of death.
Risks of Central Nodal Dissection

- Increased risk of temporary and permanent hypoparathyroidism
- Increased risk of nerve injury?
Risks of Central Nodal Dissection

- While up to 90% of pts may have micrometastases, only 10% of these will have clinically significant disease.

- Current 2009 guidelines from the American Thyroid Association (ATA) regarding this issue does recommend central nodal dissection in pt with thyroid cancer.
Neck Dissection in Thyroid Cancer

- Lateral compartment should be addressed for gross nodal metastases
  - Should be done in conjunction with central neck
- Preoperative Neck Mapping U/S
Neck Dissection in Thyroid Cancer

- Nodal disease should be looked in terms of compartments
  - Surgical management should reflect this philosophy

- In general, node sampling should be avoided
  - SLNB has not been shown to be beneficial

- If extensive disease is seen and thought to be overwhelming, then better to close than to sample nodes
2009 American Thyroid Association (ATA) Guidelines

- T1/2 PTC – Total/near-total thyroidectomy without CND may be sufficient

- For T3/4 PTC, Grade C (expert opinion) recommendation given for prophylactic central compartment neck dissection
Complications of Thyroid Surgery

- Bleeding
- Infection
- Nerve Injury
  - Recurrent Laryngeal Nerve
  - Superior Laryngeal Nerve
- Hypoparathyroidism/ Hypocalcemia
Complications of Thyroid Surgery

- Bleeding (2%)
  - Can cause dysphagia, airway compression
  - Treating team should be immediately notified with any question
  - If pt is in extremis, the incision should be opened immediately
    - Suture removal kit should always be at the bedside
Complications of Thyroid Surgery

- Nerve injury
  - Recurrent laryngeal nerve (1-5%)
  - Superior laryngeal nerve (2-6%)
RLN Injury

- Unilateral
  - Initially can be in paramedian position with relatively normal voice
  - Can get worse over days
  - Breathy, hoarse voice
  - Aspiration
  - Dysphagia

- Bilateral
  - Airway obstruction/Distress
RLN Injury

- Diagnosis
  - Laryngoscopy
  - EMG
Complications of RLN Injury

- **Prevention**
  - 1-2% - if nerve is identified
  - 4-6% if nerve is not identified
  - 2-12% for repeat surgery
RLN Injury

- Intraoperative Nerve Monitoring
  - Helps to confirm nerve anatomy
- Cons –
  - No studies have shown difference
  - Equipment malfunctions
Hypoparathyroidism

- Only relevant in total thyroidectomy/completion thyroidectomy
- Permanent hypoparathyroidism occurs in 1-10%
- Transient hypocalcemia is 5-40%
- Percentage is inversely correlated with surgeon experience
- Treatment is oral calcium supplementation and Vitamin D
- Greater than 6 months is considered permanent
Complications of Thyroid Surgery—Hyperthyroidism

<table>
<thead>
<tr>
<th>Uncomplicated Thyrotoxicosis</th>
<th>Thyroid Storm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Heat intolerance, diaphoresis</td>
<td>1. Hyperpyrexia, temperature in excess of 106°F, dehydration</td>
</tr>
<tr>
<td>2. Sinus tachycardia, heart rate 100-140</td>
<td>2. Heart rate faster than 140 beats/min, hypotension, atrial dysrhythmias, congestive heart failure</td>
</tr>
<tr>
<td>3. Diarrhea, increased appetite with loss of weight</td>
<td>3. Nausea, vomiting, severe diarrhea, abdominal pain, hepatocellular dysfunction-jaundice</td>
</tr>
<tr>
<td>4. Anxiety, restlessness</td>
<td>4. Confusion, agitation, delirium, frank psychosis, seizures, stupor or coma</td>
</tr>
</tbody>
</table>
Complications of Thyroid Surgery

- In general is avoided pre-operatively with thyroid suppression
  - Propylthiouracil (PTU), methimazole (MMI)
- Dx – Elevated TFTs, LFTs, Ca, Glucose
- Tx – Block thyroid hormone synthesis
  - PTU is preferred as it also blocks peripheral conversion of T3 to T4
  - Iodine can inhibit thyroid iodine uptake
  - Propanolol also blocks T3-T4
Purpose of Surgery – Thyroid Cancer

- Diagnostic Lobectomy in cases with suspicious pathology
- Remove primary disease and any extension
  - Lymph nodes
  - Local extension
- Permit accurate staging
  - Prognostication
- Facilitate postoperative treatment
  - Lower thyroid tissue load helps radioactive iodine ablation
- Long term surveillance
What to expect?

- 40 yo F with an incidental, asymptomatic 2 cm solid nodule
- TFTs normal
- No risk factors
- FNA – Follicular lesion of undetermined significance (FLUS)
What to expect?

<table>
<thead>
<tr>
<th>Category Description</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>I – NONDIAGNOSTIC or UNSATISFACTORY</td>
<td>1-4%</td>
</tr>
<tr>
<td>* Cyst fluid only; virtually acellular specimen;</td>
<td></td>
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<tr>
<td>II – BENIGN</td>
<td>0-3%</td>
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<tr>
<td>* Benign follicular nodule; adenomatoid nodule, colloid nodule, etc.</td>
<td></td>
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<tr>
<td>• Lymphocytic thyroiditis (Hashimoto’s)</td>
<td></td>
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<tr>
<td>• Granulomatous (subacute) thyroiditis; others.</td>
<td></td>
</tr>
<tr>
<td>III – ATYPIA OF UNDETERMINED SIGNIFICANCE or FOLLICULAR LESION OF UNDETERMINED SIGNIFICANCE</td>
<td>5-15%</td>
</tr>
<tr>
<td>• NOR BENIGN OR MALIGANT CRITERIA FOR CATEGORIZATION</td>
<td></td>
</tr>
<tr>
<td>IV – FOLLICULAR NEOPLASM or SUSPICIOUS FOR A FOLLICULAR NEOPLASM</td>
<td>15-30%</td>
</tr>
<tr>
<td>V – SUSPICIOUS FOR MALIGNANCY</td>
<td>60-75%</td>
</tr>
<tr>
<td>• Suspicious for papillary carcinoma;</td>
<td></td>
</tr>
<tr>
<td>• Suspicious for medullary carcinoma;</td>
<td></td>
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<tr>
<td>• Suspicious for metastatic carcinoma;</td>
<td></td>
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<tr>
<td>• Suspicious for lymphoma;</td>
<td></td>
</tr>
<tr>
<td>• Others</td>
<td></td>
</tr>
<tr>
<td>VI – MALIGNANT</td>
<td>97-99%</td>
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<tr>
<td>• Papillary thyroid carcinoma</td>
<td></td>
</tr>
<tr>
<td>• Poorly differentiated carcinoma</td>
<td></td>
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<tr>
<td>• Medullary thyroid carcinoma</td>
<td></td>
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<tr>
<td>• Anaplastic carcinoma</td>
<td></td>
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<tr>
<td>• Metastatic carcinoma</td>
<td></td>
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<tr>
<td>• Others</td>
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Figure 2 - The Bethesda cytological classification system and its correlation with the risk of thyroid nodule malignancy. Adapted from Theoharis et al. (60).
What to expect?

- ~20-30% of all FNA are indeterminate lesions
- Veracyte – Afirma test
  - Extracts gene expression data from sample and compares it to a database of known benign and malignant disease
Implementing Afirma Thyroid FNA Analysis into Practice
(A Representative Schematic)

Physician Performs FNA

Cytopathology

Benign
Follow with Ultrasound

Indeterminate
Gene Expression Classifier

Suspicious / Malignant
Surgical Consult

BENIGN
>94% NPV

SUSPICIOUS
What to expect?

- Afirma testing
- Cost - $5200
- Estimated to eliminate 1/3 of the 75,000 surgeries done yearly for indeterminate thyroid nodules
- Avg cost of surgery - $10-15,000
- 5% of cancers are missed with Veracyte
What to expect?

- Incision length
  - Traditional
    - 8-10 cm
  - Minimally invasive
    - 4-5 cm
  - Robotic/Scarless
    - Transaxillary

- Recovery
  - 1 week
What to expect?

- Many surgeons will send hemithyroidectomies home the same day
- Some centers advocate this to have total thyroidectomy done as an outpatient
  - Readmission rate (up to 5%)
  - Hypocalcemia
  - Seroma
Case Study 1- Thyroid

- 69 yo retired RN with long history of a substernal goiter
- Worsening dyspnea, orthopnea, dysphagia
- Followed by endocrine (not here)
  - Recommended not to have surgery
- Eventually sought care herself
Case Study 1 - Thyroid
Case Study 1 - “Thyroidzilla”

- OR – Substernal thyroidectomy, limited sternotomy
- 2 day hospitalization
- 2 week recovery
- Normal voice and calcium
- Normal swallowing and breathing
- Hiking at 1 month
Case Study 2

- 43 yo F with increasing DOE and SOB
- PSH for attempted thyroid surgery 3 yrs ago
- PE –mass above sternal notch
- Obvious stridor
- Recent political asylum (2 days in US)
Case Study 2
Case Study 2- Thyroid

- Joint case with Thoracic Surgery
- Full Sternotomy, excision of substernal goiter to diaphragm
- Marked improvement in breathing and swallowing
- Normal voice/swallowing/calci um
Conclusion

- Thyroid surgery can be a safe and rewarding surgery for patients
- Indications for thyroid surgery are well studied
- Care pathways are continuously defined through the American Thyroid Association (ATA)
- Coordination of care with endocrinology and surgery can provide the best outcome for patients