Factors in the decision for surgery other than cytology

- Age: <20 and > 60
- Male Gender
- Family Hx of thyroid malignancy
- Exposure to ionizing radiation
- History of a rapidly growing mass
- Pre-op laryngeal exam
State of the Art

- Fine Needle Aspiration
- Cytopathologist present
- Surgeon performed Ultrasound Guided FNA
- Molecular Markers & Molecular Classifier

Fine Needle Aspiration (FNA)

- To compare thyroid fine needle aspiration (FNA) using Monolayer Technique (MT) versus Conventional Smear (CS) cyto-preparatory techniques with final histology.
- Retrospective review of 100 consecutive thyroidectomies.

- 26% percent of MT aspirates were inadequate compared with 3% of CS aspirates (p<0.05).
- Improved NPV & PPV
- A higher % of pts with malignant tumor will receive thyroidectomy with CS technique for FNA.

Neuro-monitoring
Neuromonitoring

- Rosato et al, Lo et al, Chiang et al. Patients with thyroid carcinoma, temporary RLN injury- 0.7 to 4% of cases while permanent paralysis rates 1.6-10.6%.


- First 107 consecutive recurrent laryngeal nerves dissected were unmonitored.
- Subsequent 83 consecutive recurrent laryngeal nerves dissected were monitored.

### Transient VFI

- Unmonitored 4/83 (4.8%)
- Monitored 3/107 (2.8%)
- (Overall-3.6%)
- p>0.05

### Permanent VFI

- Unmonitored 1/107 (0.9%)
- Monitored 2/83 (2.4%)
- (Overall-1.5%)
- p>0.05

Neuro-monitoring

- Thomusch 2001
  - Nerves at risk-7133
  - Permanent Paresis Monitored vs Not 0.4% vs 0.8% (p<0.05%)
  - Temporary Paresis, Monitored vs Not 1.4% vs 2.1% (p<0.05)

- Dralle 2004
  - Nerves at risk-29,998
  - Permanent Paresis Monitored vs Not No significant difference
Neuromonitoring

- Can help in ID of RLN
- Notify surgeon of stretch on RLN
- Electrophysiological Integrity of the ipsilateral side can impact decision to operate on contralateral lobe
- I use it on every case.

Recurrent Laryngeal Nerve Meta-Analysis

64,699 nerves at risk
No significant difference for benign disease, low risk groups, revision surgery, malignant, and high risk groups (Higgins et al 2011)

<table>
<thead>
<tr>
<th>Monitored</th>
<th>Non-monitored</th>
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</thead>
<tbody>
<tr>
<td>Overall incidence: 3.52%</td>
<td>3.12% (95% CI .76-1.12)</td>
</tr>
<tr>
<td>Transient VFP: 2.74%</td>
<td>2.49% (95% CI .95-1.20)</td>
</tr>
<tr>
<td>Persistent VFP: 0.75%</td>
<td>0.58% (95% CI .79-1.23)</td>
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</tbody>
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MEDICOLEGAL IMPLICATIONS

- 30-50% of endocrine malpractice litigation involves thyroid and parathyroid surgery
- 70-90% pertain to RLN injury with bilateral paresis accounting for nearly 30% of the cases
- One in three judgments is in favor of the defendant.

Initial Surgical Management

85% of PTC patients are low risk
Risk Stratification Schemes for Mortality (AGES, AMES, MACIS, MSKCC)

- Age > 60.
- Metastasis
- Extra thyroidal extension
- Size > 4cm
- Male Gender
- High grade histology
- ? Lymph node metastasis (older patients)
- RX: Total Thyroidectomy

Rx for low risk patients (85%)

- Bilimoria et al:
  - 52,000 patients-national cancer data base
  - PTC > 1cm
  - Significant improvement in survival and recurrence at 10 yrs with total thyroidectomy

Total Thyroidectomy

- The American Thyroid Association (ATA) advocates total thyroidectomy for low-risk patients with PTC.
- 2009 ATA: language has changed from “most patients” to “patients” with PTC >1 cm are Rxed with total thyroidectomy.
  (? molecular biology PTC/RET vs BRAF)

Thyroid lobectomy in low risk patients

- National Comprehensive Cancer Network (NCCN) recommends either thyroid lobectomy or total thyroidectomy for low-risk patients.
- Low risk patient-T1 or T2 N0 M0, <45, >16, no bilat disease, no fam hx thyroid ca, no aggressive histo-type
- 85% of pts low risk
Overriding principle in surgical RX of WDTC

- Surgeon on 1st surgery should encompass the gross disease in the thyroid and neck
- Microscopic disease in contralateral lobe and neck nodes has little clinical significance

Can some thyroid cancers be observed and not treated?

- Presently: generally NO
- Comparing autopsy rates for PTC of 5-35% with SEER clinical prevalence rates, it is estimated that only 2% of existing PTC lesions in humans present with clinical disease.
- (future molecular biology)

ATA high risk for recurrence

- Distant mets
- Residual Macroscopic tumor
- Macroscopic Tumor invasion
- High TG out of proportion to WBS
- (Intermediate risk: Aggressive histology or vasc invasion, RAI uptake outside thyroid bed)
- Low risk with none of the above

? Success of RX

A paradigm shift: Treatment of macroscopic disease to the treatment of macroscopic and microscopic disease monitored by increasingly sensitive tests including:

- Serial high resolution ultrasound
- Stimulated thyroglobulin levels
- Detection of thyroglobulin messenger RNA with polymerase chain reaction.
- (Molec Bio)
Mark the planned skin incision in the pre-op holding area with the patient sitting up

- 3 cm incision
- Prophylactic antibiotics are ineffective (Johnson JT et al Otolaryngol Head Neck Surg)

Positioning

Incision for a large mass

- The length and size of the incisions should not be driven by cosmetic surgical considerations alone.
- A small incision for a large thyroid mass will increase the rate of complications.

Strap Muscles

- Adequate exposure of the superior pole; STM can be divided.
- Lateral retraction of the SHM allows exposure of the STM and division of the STM close to its superior attachment preserves innervation by the ansa hypoglossus.
- The STM may be resected w Extra Thyroidal Extension.
- A large goiter may require division of STM and SHM.
Approached to the RLN

- Classic Inferior approach-find RLN at thoracic inlet, reduce risk of traumatizing arborizing branches of RLN; very low in the neck approach for revision thyroidectomy.
- Lateral approach-initially mobilize sup and inf poles, landmarks: inf cornu of thyroid cart, RLN and ITA crossing, acceptable for routine thyroid surgery
- Superior approach-reduce risk to the PG

I have evolved from Inferior/Lateral Approach to Superior Approach to reduce hypoparathyroidism

Low threshold for dividing the Sternothyroid muscle and Dividing the Isthmus early

3 Variations in the ESLN-
1. superficial to the IC m.
   - ESLN particularly vulnerable when the nerve crosses the STA-20% of cases (Cernea et al)
   - ESLN vulnerable w large goiter
   - Low threshold on using a nerve stimulator

2. EBSL pierces the IC 1 cm above the CT membrane
3. ESLN runs deep to IC muscle

- Ligation of individual br of sup thyroid art.
  - Caution on ligating ITA as it may be main blood supply to SPG

Vessels in the vicinity of superior pole cauterized cautiously with bipolar coagulation.

- Both parathyroids usually receive blood supply from ITA.
  - 1. Wide span of tissue extending laterally from PG
  - 2. PG has not been dissected away from surrounding fat
  - 3. Good Color
  - = PG will function
ID of RLN via Superior Approach

- RLN laryngeal entry is 1 cm caudal to infer horn of thyroid cartilage
- Helps reduce devascularization of PG

Mid Lobe Dissection

- Middle thyroid v. ligated often before ID of RLN

ID of RLN should occur in all cases.

- The point where the RLN disappears is under the inferior constrictor muscle.

Inferior Pole Dissection
Terminal br of ITA ligated

Relationship RLN to ITA

3 Variations

1. RLN deep to ITA- 50% of cases (Hollinshead et al)
   • ITA extends to the thyroid at the midpolar level not at level of inf pole as its name would imply.
   • 1 cm above RLN and ITA crossing: the SP gland often found

2. Between branches-25% cases (Hollinshead et al)
RLN anterior to ITA-25% cases (Hollinshead et al)

- Variable patterns of nerve-ITA crossing
- Varying course of ITA
- Suboptimal landmark for ID of RLN

Variations of RLN to Tuberculum of Zuckerkandl
1. Usually deep to TZ

2. Medial to TZ

Nodular enlargement may displace RLN laterally placing RLN at risk.
Anatomic Relationship RLN to TE groove

1. Most common courses along TE groove and passes deep to Berry’s Ligament

2. Variation ant to TE groove 5% (Hisham et al)

3. Variation-along para-esophogeal line posterior to TE groove
Left RLN crosses ant to aortic arch loops under it - more constant position in TE groove

R RLN crosses ant to subclavian a, starting more lateral - less predictable

In Goiter RLN can be displaced anteriorly and delivery of goiter can result in injury - use superior approach

- ID of RLN in thoracic inlet (inferior approach) is not possible

Removal of Goiter is trans-cervical except:

- 1. recurrent intrathoracic goiter
- 2. previous mediastinal or cardiothoracic surgery
- 3. previous radiation to neck or mediastinum
- 4. malignant tumor abutting great vessels.
- 5. Isolated intra-thoracic goiter.
- 6. Retrotracheal goiter extending below carina
Non-recurrent RLN assoc w retro-esophageal r subclavian artery.

Common sites of residual thyroid tissue
- Sup poles
- Berry’s ligament
- Pyramidal lobe

Sacrifice of RLN
- If infiltrated w tumor and non-functional pre-operatively.
- If functional and tumor can be resected easily from RLN it should be preserved.
- RAI less likely to be effective in older patients with residual thyroid cancer left behind.
- RLN paralysis in older patients more likely to be poorly tolerated.

Complications
- Hematoma usually within 6 hours after surgery.
- Strap muscles should be approximated loosely.
- Severe edema may require intubation by an experienced clinician.
Complications

• Transient RLN injury-thermal and traction injury
• Permanent RLN injury-transection, thermal, and traction

• Hypocalcemia increases in re-operative surgery and paratracheal dissection (Lin et al Laryngoscope)
• Ionized Ca++ not effected by ADH or low albumin level.
• Ionized Ca++ 8-12 hrs and 20-22 hrs post-op
• Rx: Oral Ca Carbonate and Vit D
• D/C if NI Ca++

Complications

• Severe hypocalcemia-IV Calcium Gluconate 2-4 gm IV over 2 hours.
• Serum Magnesium levels.
• Consult Endocrinology

Conclusions

• Ultrasound Guided FNA w Cytopathologist Present
• Neuro-monitoring
• The length and size of the incisions should not be driven by cosmetic considerations alone.
• 3 Variations of the ESLN.
• Consider superior approach, over lateral/inferior dissection of RLN to reduce hypocalcemia.
Conclusions

• Variations in the relationship of the RLN to the ITA
• Nodular enlargement may displace RLN laterally placing RLN at risk.
• Meticulous Surgical Technique can reduce the rate of VFI, Hypocalcemia, and Hematoma