What’s new in Endocrine Surgery?

THE COOL, THE CONTROVERSIAL AND THE CRAZY

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SECTION OF ENDOCRINE SURGERY
Objectives

- Define endocrine surgery
- Review changes over past decades
- Discuss the current controversies
- Explore the newest technologies
What is endocrine surgery?

- **Thyroid, parathyroid, adrenal and neuroendocrine pancreas and GI tumors**
- **Who does it?**
  - General, ENT and surgical oncologists
  - AAES – [EndocrineSurgery.org](http://EndocrineSurgery.org)
- **Why do it?**
  - High-rent territory (meticulous dissection)
  - Patients do well (outpatient or next-day surgery)
  - Cancer with great prognosis
  - Interesting diseases
- **Where to start?**
Endocrine Surgery Fellowships

1. Brigham & Woman's
2. Calgary, Alberta CANADA
3. Cleveland Clinic
4. Columbia
5. Johns Hopkins
6. Massachusetts General
7. Mayo Clinic
8. Medical College of Wisconsin
9. Mount Sinai
10. North Shore (Illinois)
11. Scott & White/TX A&M
12. U. of California, S.F.
13. University of Chicago
14. University of Miami
15. University of Michigan
16. University of Pittsburgh
17. M.D. Anderson
18. University of Wisconsin
19. Yale

Australia (x2), Mexico
Why an Endocrine Surgeon?

**Surgeon volume as a predictor of outcomes in inpatient and outpatient endocrine surgery.** (Surgery 2007)
- Surgeon volume correlates inversely with complication rates, LOS, and TC, in endocrine surgery. The lowest complication rates are achieved by surgeons performing $\geq 100$ endocrine operations annually.

**The importance of surgeon experience for clinical and economic outcomes from thyroidectomy.** (Ann surg 1998)
- Individual surgeon experience is significantly associated with complication rates and length of stay for thyroidectomy.
Thyroid

THE BIG, THE BAD & THE UGLY
“Can the thyroid in the state of enlargement be removed? Emphatically experience answers no...every stroke of the knife will be followed by a torrent of blood and lucky will it be for him if his victim lives long enough for him to finish his horrid butchery. No honest and sensible surgeon would ever engage in it.”

- Samuel Gross 1848
Father of Thyroid Surgery

- Emil Theodor Kocher
- Nobel Prize 1909—thyroid
  - Physiology, pathology & surgery
- Kocher collar incision
- Substantially decreased mortality
- Total, capsular dissection
Graves’ Disease

- Traditionally less was more
  - Attempt to avoid hypothyroidism
  - Subtotal thyroidectomy
  - Lower-dose RAI
- Total thyroidectomy is surgical treatment of choice
  - ATA guidelines, multiple studies
- Ablate-to-kill dose for RAI

thyroidguidelines.org
Hashimoto’s Thyroiditis
Parathyroid

FUN WHEN YOU FIND THEM,
HE** WHEN YOU DON’T
The Glands of Owen

- Richard Owen
- Granted right of first refusal on any freshly dead animal at the London Zoo
- Indian rhinoceros – 1850
- ‘a small compact yellow glandular body attached to the thyroid at the point where the vein emerged’
- Ivar Viktor Sandström
  - Discovered in humans in 1880
## What’s new for HPT?

<table>
<thead>
<tr>
<th>Localization</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Nuclear medicine scans</td>
<td>• Intraoperative PTH monitoring</td>
</tr>
<tr>
<td></td>
<td>• Gamma probe monitoring</td>
</tr>
<tr>
<td>• Planar</td>
<td></td>
</tr>
<tr>
<td>• SPECT</td>
<td></td>
</tr>
<tr>
<td>• SPECT/fusion</td>
<td></td>
</tr>
<tr>
<td>• Ultrasound</td>
<td></td>
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<tr>
<td>• 4D CT scan</td>
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</table>

20 g !!!
How does it help?

- Tell us **where to start and when to stop**
- Directed “minimally invasive” parathyroidectomy
  - Versus 4-gland exploration
  - Decreases injury to contralateral structures
Now what...
Outpatient what??

Sleep in your own bed, thyroid
“Dr. Lee, she’s going home??”

- SURELY NOT...
- Biggest concern: Life-threatening hematoma
- Portland, U. Cincin., NY, Ottawa, France...
- 2010–Snyder, et. al., Journal of Am. Coll. Surgery
  - 1063 patients planned thyroidectomy (613 totals)
  - Hematoma 0.19%
  - Symptomatic hypoparathyroidism 5.2%
  - Transient nerve injury 3.7%
  - Permanent nerve injury 0.4%
How do you do it?

- **TONS of counseling**
  - Pre-op in clinic with patient and family (if present)
  - With patient and family in holding room
  - With family after surgery
  - Provide paperwork
  - Make sure they know what to do

- **Semi-selective**
  - Consider distance
  - Consider intelligence
  - Consider social issues (no transportation)

- **Provide all scripts & schedule all appts pre-op**
Current Controversies

KEEPING THINGS LIVELY
Controversies

• Routine central neck dissection for papillary
  o Change in prognosis vs. increase in complications
  o Does it help? ... maybe
  o Does it hurt? ... maybe

• Routine use of nerve monitoring
  o Makes one less of a surgeon
  o Standard of care?

• Routine use of gamma probe
  o Is it a waste of time?
  o Does it help when lesions are localized?
  o Should it just be used on reoperative cases?
Central (Level VI) Node Dissection

**Boundries**
- Hyoid/thyroid notch
- Carotids
- Innominate

**Pros**
- ~50% central nodal metastases
- Prevent future central neck surgery

**Cons**
- Increased risk of hypoparathyroidism
- Does not change prognosis
The problems with neck surgery...

1. The Nerve
2. The Parathyroids
3. Bleeding
4. Infection
Nerve Monitoring
<table>
<thead>
<tr>
<th>Modes of Application</th>
<th>Essential Elements of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Nerve identification</td>
<td>1. Pre-op laryngoscopy</td>
</tr>
<tr>
<td>2. Mapping during dissection</td>
<td>2. Pre-surgical vagal stimulation</td>
</tr>
<tr>
<td>3. Prognostication of post-op function</td>
<td>3. Post-surgical vagal stimulation</td>
</tr>
<tr>
<td></td>
<td>4. Post-op laryngoscopy</td>
</tr>
</tbody>
</table>
Beware of the Branched RLN

- Injuries usually are to a visually-intact nerve
- **Traction** to anterior motor branch
Nerve Take-home Message

- Good surgical technique trumps
- Find the nerve
- Subtotal doesn’t prevent nerve injuries
- Nerve monitor definitely helps, but...
- “A fool with a tool is still a fool.”
- Surgeon volume matters.
Influence of Imaging

- Ultrasound first used in the 1960s
- Changed the way we approach “goiters”
- Thyroid scan no longer first test of choice
- Directed parathyroidectomy vs. 4-gland exploration
- Lateral neck staging
- The invent of adrenal “incidentalomas”
Surgeon-performed Ultrasound & FNA

- Part of the physical exam
- Invaluable first-hand knowledge
  - Anatomical relationships
  - Surgical decision making
- Patient flow— a “One-stop shop”
  - Diagnose
  - FNA
  - Schedule surgery
- Patient satisfaction
Areas of Interest on Ultrasound

- **Thyroid**
  - Nodules vs. cysts
  - Characteristics (hypo, iso, hyperechoic; calcifications, etc.)
  - Office FNA with immediate cytopathology interpretation

- **Lateral neck lymph nodes**
  - Stage papillary thyroid cancer
  - FNA dominant nodes

- **Parathyroid adenomas**
  - Pretty sensitive in experienced hands
  - Superior glands difficult to see
Accuracy of surgeon-performed ultrasound assessment of the lateral cervical lymph node basin for metastatic papillary thyroid cancer

Cortney Y. Lee, M.D., Samuel K. Snyder, M.D., Terry C. Lairmore, M.D., Sean C. DuPont, B.A., Daniel C. Jupiter, Ph.D.

Background

Ultrasound (US) is known to be operator-dependent. Surgeons proficient in US assessment of the neck and experienced in the management of papillary thyroid cancer (PTC) appear uniquely qualified to assess the lateral cervical lymph nodes for metastatic disease. Much has been published on the use of US for staging of the lateral neck in thyroid cancer. The accuracy of surgeon-performed US of primary thyroid tumors has been evaluated and published. To our knowledge there is no published data on surgeon-performed evaluation of the lateral neck nodal basin in patients with PTC.

Hypothesis

Surgeon-performed US of the lateral neck lymph nodes can accurately stage PTC to reliably direct surgical management.

Methods

- Of 275 patients treated for PTC from 2000 to 2008, 99 patients were evaluated by surgeon-performed US and included in the study
- Diagnostic US and US-guided FNA of any suspicious or dominant lateral neck lymph node was performed by the surgeon
- Lateral neck dissection was performed based on results of FNA
- Ultrasound findings were compared to FNA and surgical pathology specimens
- Metastatic disease was defined as lateral neck disease detected on post-operative imaging studies within 6 months of initial evaluation

Results

- Patient characteristics
  - 75.8% female
  - Age: 53.9 yrs (±16.7)
  - BMI: 29.1 (±5.3)
- Tumor characteristics
  - Primary tumor size: 1.81cm (±1.2)
  - 41% multifocal
- Lymph node characteristics
  - 102 lymph nodes underwent FNA
  - Average nodal size 1.38cm (±0.54)
- Surgery
  - Total thyroidectomy with central lymph node dissection for all patients
  - 29 modified radical neck dissections on 27 patients
- Postoperative imaging
  - RAI scans obtained in 93% of patients
  - US was primary imaging study used for long-term surveillance
- Mean follow-up: 37 months

Results of surgeon-performed ultrasound evaluation of lateral neck lymph nodes

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Positive predictive value</th>
<th>Negative predictive value</th>
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<td>88%</td>
<td>60%</td>
<td>37%</td>
<td>97%</td>
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Conclusions

- Surgeon-performed ultrasound with US-guided FNA of suspicious lymph nodes can accurately stage PTC
- The high sensitivity and low specificity are due to liberal FNA of dominant lymph nodes even if suspicion is low
- False positives were proven negative by FNA and no patient underwent non-therapeutic neck dissection
- The low positive predictive value is felt to be acceptable because FNA has little to no morbidity
- Only four patients were found to have missed metastatic disease within 6 months of surgery
- Sensitivity of 88% and negative predictive value of 97% are higher than published in prior studies of radiology-performed US

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Adrenal

TO FUNCTION OR NOT TO FUNCTION
Adrenal Incidentaloma—Now what?

- **Biochemical evaluation of all adrenal lesions**
  - Plasma metanephrines, low-dose dexamethasone/cortisol, renin/aldo

- **Determine risk of cancer**
  - Size and growth
  - Imaging

<table>
<thead>
<tr>
<th>Size of Tumor</th>
<th>Risk of Cancer</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 4 cm</td>
<td>2 to 3%</td>
<td>Observation</td>
</tr>
<tr>
<td>4 to 6 cm</td>
<td>7%</td>
<td>Adrenalectomy (if the patient is healthy enough)</td>
</tr>
<tr>
<td>Greater than 6 cm</td>
<td>25%</td>
<td>Adrenalectomy</td>
</tr>
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Posterior Retroperitoneoscopic Adrenalectomy (PRA)

- Prone positioning
- Avoid the abdomen
- Less mobilization
- Dr. Walz in Germany
  - Single-incision
- M.D. Anderson
  - 100 patients
  - Safe feasible
Pheochromocytomas via PRA
The Maximally Invasive
The Crazy
Why a robot?

- Space limitations
  - Pelvis (urology, rectal surgery)
  - Thorax (cardiac, esophageal)
  - Retroperitoneum (adrenal)
  - Oral cavity (base of tongue, etc)
- Better visualization
- Less morbid surgery
- Quicker, less painful recovery
- Cosmesis?
Back to our problem...
Robotic Intrathoracic Parathyroidectomy
Intraoperative & Gross Photos

7 mm adenoma
Armpit Thyroidectomy

- Pioneered in Korea
  - Sigma of neck incision
  - High keloid rates
- NOT minimally invasive
  - More invasive than standard
- Limited criteria
  - Intermediate <4 cm
  - Papillary <2 cm
  - BMI <30
  - Unilateral initially
The Approach
### The Two Camps

<table>
<thead>
<tr>
<th>Da Vinci’s Advertisement</th>
<th>My concerns</th>
</tr>
</thead>
<tbody>
<tr>
<td>• “Superior cosmetic outcomes” ... okay</td>
<td>• MORE invasive, not less</td>
</tr>
<tr>
<td>• “No neck scars”... yes</td>
<td>• Selection criteria</td>
</tr>
<tr>
<td>• “Avoids laryngeal nerve injury” ... Really?</td>
<td>• Long run, Short slide</td>
</tr>
<tr>
<td></td>
<td>• Cost</td>
</tr>
<tr>
<td></td>
<td>• Hassle</td>
</tr>
<tr>
<td></td>
<td>• Overnight stay</td>
</tr>
<tr>
<td></td>
<td>• Drain</td>
</tr>
<tr>
<td></td>
<td>• Is it worth it??</td>
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The Result
Stay tuned...