The 5-hour parathyroidectomy: How is this possible?

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Department of Otolaryngology / Head & Neck Surgery

Disclosures

- Director of thyroid courses (Genzyme)
- Royalties from endocrine books

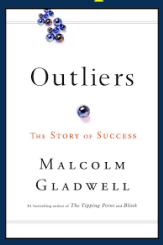
2009 2012 2013 2014 2016

2 ways to ponder this:

- Inexperienced surgeon (maybe shouldn't undertake this operation?)
- Experienced surgeon who encounters series of unanticipated findings

Volume-outcome relationship

- 10,000 hours to achieve mastery (baseball, violinist, surgeon)



Parathyroidectomy in Maryland: Effects of an endocrine center

Herbert Chen, MD, Martha A. Zeiger, MD, Toby A. Gordon, ScD, and Robert Udelsman, MD, Baltimore, Md.

The Importance of Surgeon Experience for Clinical and Economic Outcomes From Thyroidectomy

Julie Ann Sosa; Helen M. Bowman; James M. Tielsch; Neil R. Powe; Toby A. Gordon; Robert Udelsman

Volume-outcome relationship

Who performs endocrine operations in the United States?

Brian D. Saunders, MD, Reid M. Wainess, BS, Justin B. Dimick, MD, Gerard M. Doherty, MD, Gilbert R. Upchurch, MD, and Paul G. Gauger, MD, Ann Arbor, Mich

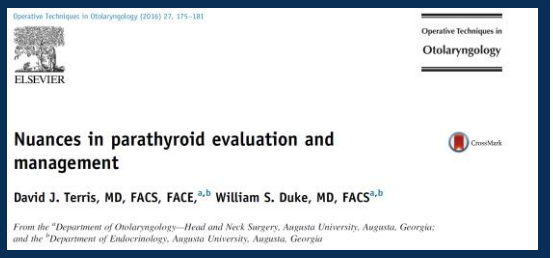
- 6100 surgeons – 14,323 operations
- 80% of operations by surgeons doing ≤3 *per year*

Saunders et al, Surgery, 2003

10,000 hours

- Outliers - Gladwell
- Saunders – low-volume PTH surgeons
- An operation more than any other where volume and *cumulative experience* matter
- Learning curves/inflection points - still improving after 1200 cases

5 most common pitfalls:



1. Misdiagnosis

It's not surgical

- Vitamin D deficiency (elevated PTH)
- FHH (rare); 24-hour calcium may be spuriously low
- Non-pth mediated hypercalcemia

It is surgical

- "Normal" PTH

1. Misdiagnosis

- In presence of hypercalcemia, PTH should be zero (or close to it)
- If PTH is not low, at least one of the 4 glands is "non-suppressed"
- The "normal" PTH level is not normal relative to the calcium

1. Misdiagnosis

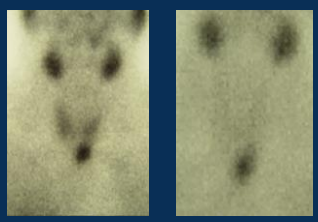
It's not surgical

- Vitamin D deficiency (elevated PTH)
- FHH (rare); 24-hour calcium may be spuriously low
- Non-pth mediated hypercalcemia

It is surgical

- "Normal" PTH
- True normocalcemic hyperparathyroidism

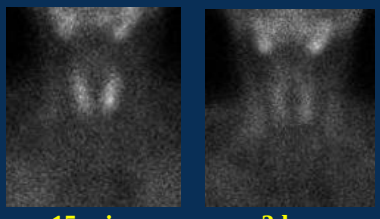
2. Imaging misinterpretations



15 minutes 2 hours

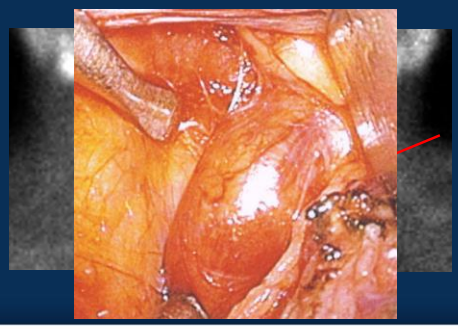
Rapid washout

Outside sestamibi negative



15 min 3 hr

Sestamibi repeated at AU



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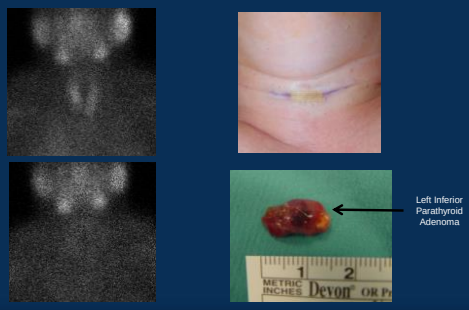
Read your own scans



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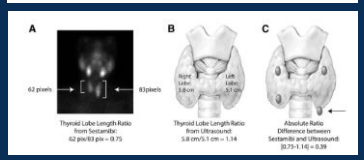
Read your own scans

A novel technique to improve the diagnostic yield of negative sestamibi scans

Sapna Nagar, MD,[a] David D. Walker, MD,[b] Omran Embia, MD,[a] Edwin L. Kaplan, MD,[a] Raymon H. Grogan, MD,[a] and Peter Angelos, MD, PhD,[a] *Chicago, IL.*



Nagar et al, Surgery, 2014

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Volume-outcome relationship

Improved Localization of Sestamibi Imaging at High-Volume Centers

Michael C. Singer, MD; Darko Pucar, MD, PhD; Manoj Mathew, BS; David J. Terris, MD

Among 18 outside negative scans

- **5 = read as positive**
- **13 = study repeated at AU**
- **All 13 patients (100%) localized**

Singer et al, Laryngoscope, 2012

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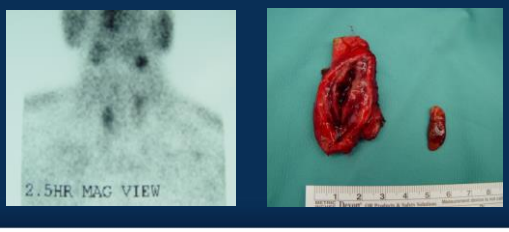
Limitations of Sestamibi

False Positives



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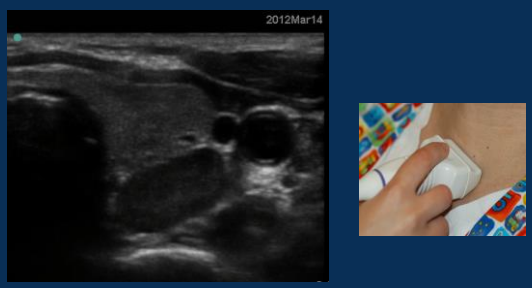
Surgeon-performed ultrasound



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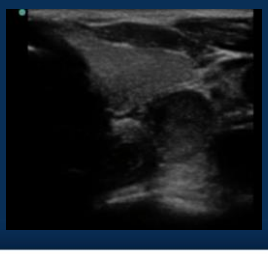
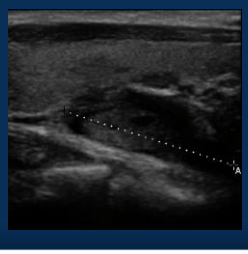
Ultrasound pearls

- Turn the probe to demonstrate orientation of the adenoma (distinguish from lymph node)

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Ultrasound pearls

- Turn the probe to demonstrate orientation of the adenoma (distinguish from lymph node)
- Explore for pedicle with Doppler
- If adenoma not seen on US, suspect deep gland

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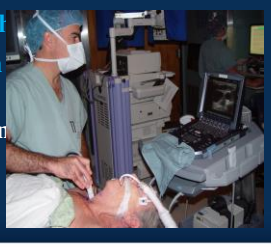
Ultrasound pearls

- Turn the probe to demonstrate orientation of the adenoma (distinguish from lymph node)
- Explore for pedicle with
- If adenoma not seen on gland
- Immediate preop US on



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Interpreting reports

- If the US report says "normal thyroid" except for "posterior hypoechoic thyroid nodule"

  That's the parathyroid adenoma

- If the US report says "normal thyroid" except for "posterior hypoechoic thyroid nodule", and then an FNA is done showing follicular cells, favor follicular neoplasm

  That's STILL the parathyroid adenoma

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3. Overly descended superior gland

- Most common cause for needing reoperative surgery
- Etiology – planar imaging reveals "lower pole adenoma", presumed to be inferior gland

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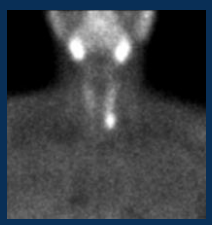
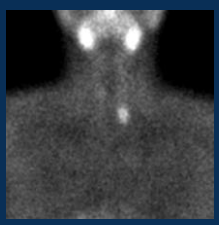
3. Overly descended superior gland

15 minutes 2 hours

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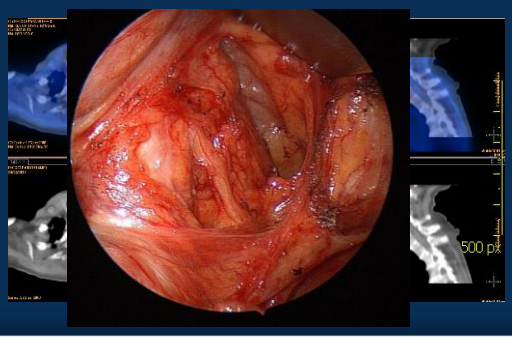
Beware of planar imaging

- Overly descended superior adenoma is most common reoperative surgery
- Etiology – planar imaging reveals "lower pole adenoma", presumed to be inferior gland
- Dissection insufficiently deep; paraesophageal

CT-Mibi



Overly-descended superior

- If inferior gland looks normal do not remove it
- Dissect dorsal to the RLN, expose the esophagus

Reoperative Parathyroidectomy: Overly Descended Superior Adenoma

William S. Duke, MD[1], Hampton M. Vernon[1], and David J. Terris, MD[1]

Duke et al, Otolaryngol HNS, 2016

4. Inappropriate (inadequate) access

- Lateral incision ("inhibitory" to bilateral exploration)
- Remote access (eliminates bilateral)
- Insufficient opening (in proper location)

5. Other technical issues

- Bleeding ("color surgery")
- LN (especially Hashimoto's); thymus; thyroid nodules (tubercle); muscle
- Look for the fat
- Nerve dysfunction (monitoring/guarding against bilateral paralysis)

What about the high-volume (high-experience) surgeon?

- Do the math
- Lab-based "rapid" iopth assay = 35 minutes; POC = 8 minutes

Turbo PTH

Future Diagnostics

What about the high-volume (high-experience) surgeon?

- 15 minutes to find and remove

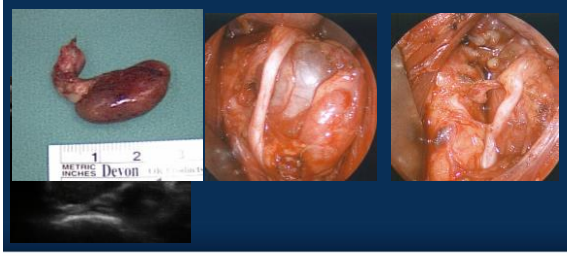
Augusta Algorithm

What about the high-volume (high-experience) surgeon?

- 15 minutes to find and remove
- Won't even know double adenoma for 38 minutes (1 hour 5 minutes)
- An additional 38 (or 65) minutes for each additional abnormal gland (assuming 15 minutes to find each one
- What about 4-gland hyperplasia

Case 1: 59 y.o. primary HPT

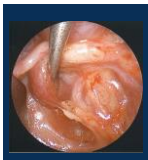
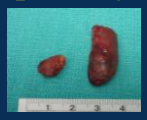
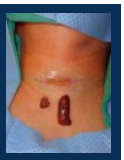
- Imaging co-localized to left superior; explored and 1.1 gm left superior adenoma removed



59 y.o. primary HPT

	Time	Level
Baseline	X	372.1
Excision	821	X
5 min	826	222.0
10 min	831	158.7
20 min	844	111.3
30 min	852	113.3

59 y.o. primary HPT

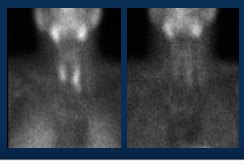
	Time	Level		Time	Level
Baseline	X	372.1			
Excision	821	X	ERC #2	0907	X
5 min	826	222.0	5	0912	88.2
10 min	831	158.7	10	0917	71.0
20 min	844	111.3	15	0922	61.4
30 min	852	113.3	25	0932	54.1

Case 1:

- Straightforward double adenoma
- With POC pth, still took 1½ hours . . . (with the Turbo pth – 2½ hours)

Case 2:

- C.N. – 66 y.o. male with calcium 11.4, pth 147; kidney stones
- Imaging: solitary parathyroid adenoma inferior lateral to the inferior margin lower pole left thyroid lobe in the same coronal plane



Case 2:

- Intraoperatively: 4 normal eutopic glands identified

Final Pathologic Diagnosis
A) LEFT SUPERIOR PARATHYROID (BIOPSY):
- Normocellular parathyroid tissue.

B) LEFT INFERIOR PARATHYROID (BIOPSY):
- Normocellular parathyroid tissue.

C) RIGHT SUPERIOR PARATHYROID (BIOPSY):
- Normocellular parathyroid tissue.

D) RIGHT INFERIOR PARATHYROID (BIOPSY):
- Normocellular parathyroid tissue.

Now what??

Physiologic adjuncts

- Bilateral jugular venous PTH levels exploring for differential to lateralize
  - Preoperatively (10% difference)
    Carneiro-Pla, AAES 2009
  - Intraoperatively – Chen (5% difference)
    Ito F and Chen H, Ann Surg 2007
  - "poor man's" selective venous sampling

- Bilat
- Furt
  remo
  skele

Final Pathologic Diagnosis
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D) RIGHT INFERIOR PARATHYROID (BIOPSY):
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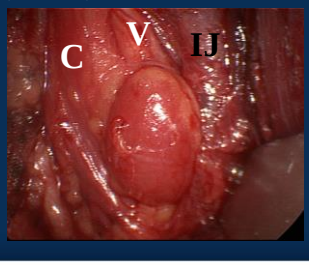
E) LEFT THYROID (HEMITHYROIDECTOMY):
- Thyroid negative for significant pathologic change.
- Negative for parathyroid tissue.

F) LEFT THYMUS (THYMECTOMY):
- Atrophic thymic tissue with benign thymic cyst, 0.5 cm.
- Negative for parathyroid tissue.

plored

Case 2:

- Just prior to raising the white flag, carotid sheath opened (further):



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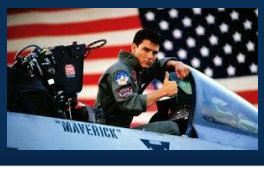
- Negative for parathyroid tissue.

G) PARATHYROID ADENOMA, LEFT CAROTID SHEATH (PARATHYROIDECTOMY):
- Parathyroid adenoma, 0.45 g.

- 2 hours, 50 minutes (with Turbo pth, >5 hours)

A need for speed

- Doing an operation fast does not necessarily correlate with success (as a well-known colleague discovered)



MIRP is "retired"

ORIGINAL SCIENTIFIC ARTICLES

Abandoning Unilateral Parathyroidectomy: Why We Reversed Our Position after 15,000 Parathyroid Operations

James Norman, MD, FACS, FACE, Jose Lopez, MD, FACS, Douglas Politz, MD, FACS, FACE

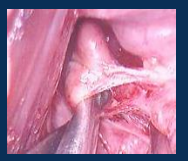
- 6% recurrence rate
- Now 4-gland exploration (and biopsy) in 97%
- Still call it a MIRP

Norman et al, JACS, 2012

Reason for 6% recurrence rate

- Reliance on flawed logic of a"20% rule"
- Stubborn arrogance in refusing to to utilize intraoperative assay (at least in the OR)
- Obsession with doing operation fast
- Puts both nerves and all 4 glands at risk resulting in unnecessary disasters

Conclusions



5-hour parathyroidectomy ok, as long as . . .

- Normal pth glands preserved
- Recurrent laryngeal nerves are preserved
- And especially if the adenoma was removed
- It happens rarely