The 5-hour parathyroidectomy: How is this possible?

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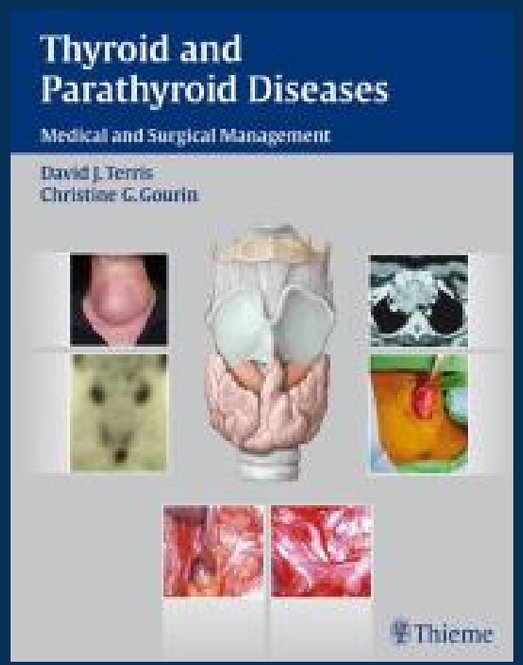
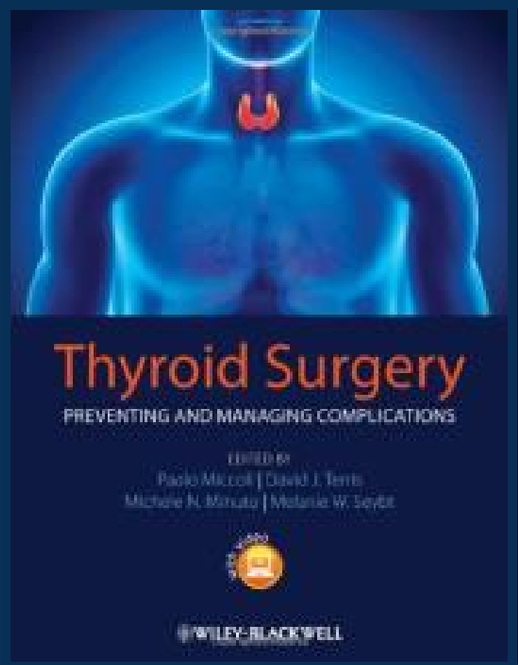
Disclosures

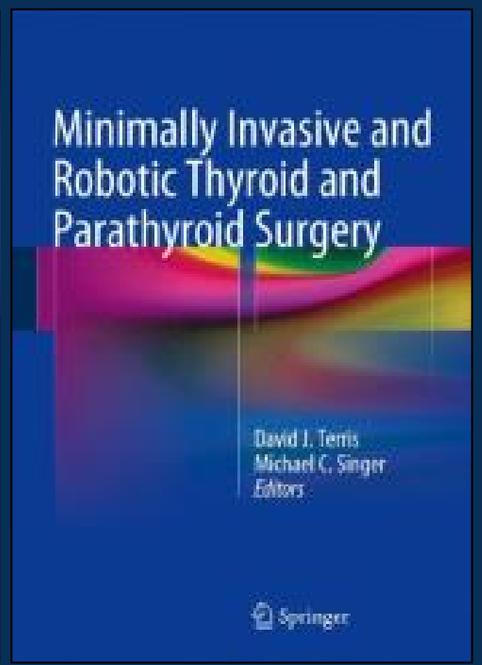
- **No dualities of interest**
- **Royalties from endocrine books**



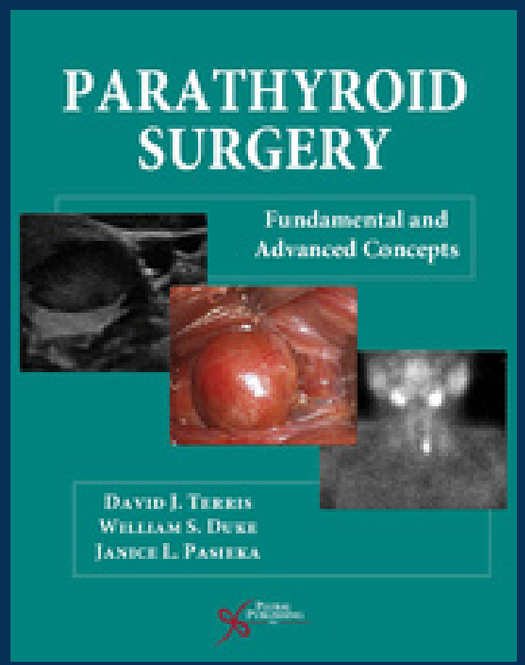
2009



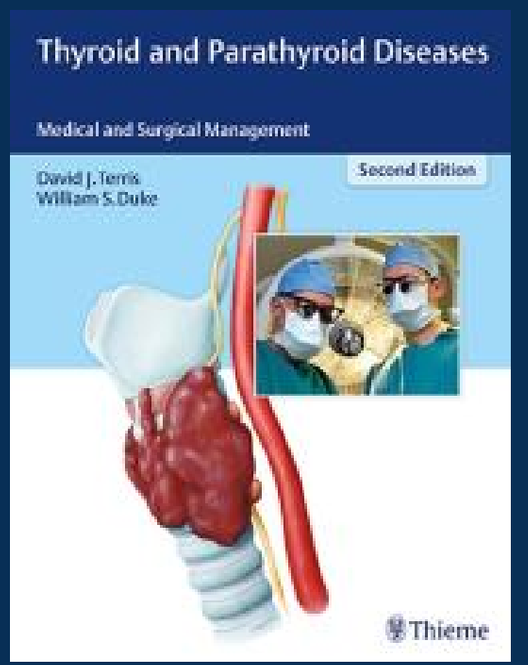
2012



2013



2014



2016

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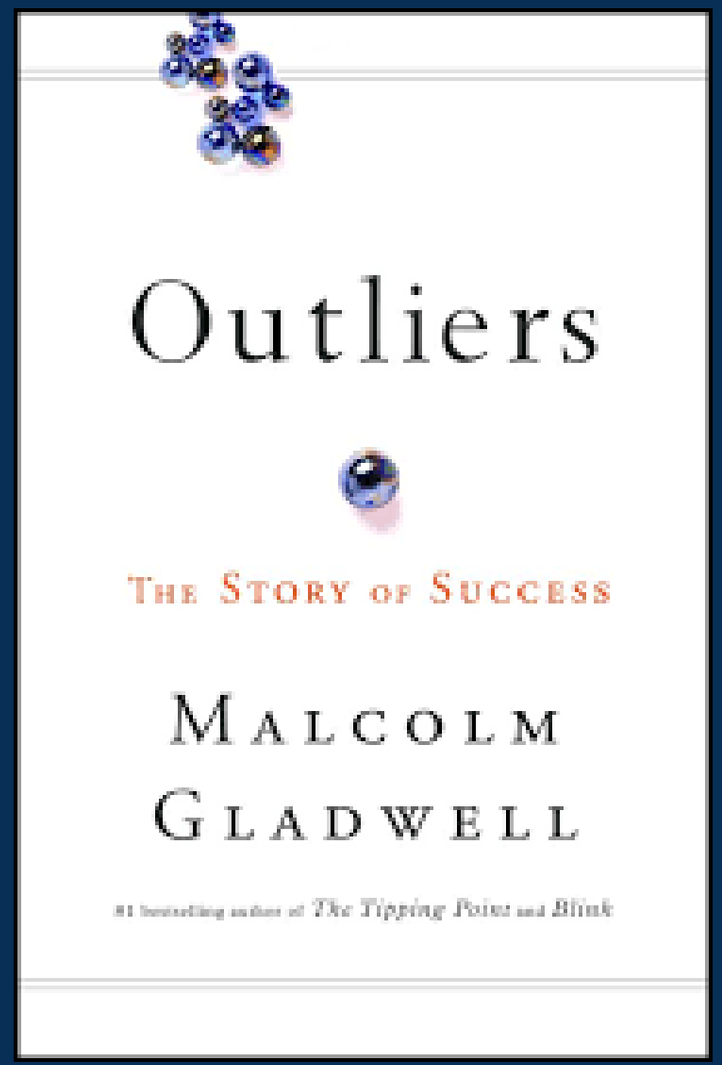
2 ways to ponder this:

- 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

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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:

Operative Techniques in Otolaryngology (2016) 27, 175–181

ELSEVIER

Operative Techniques in

Otolaryngology

Nuances in parathyroid evaluation and management

David J. Terris, MD, FACS, FACE,[a,b] William S. Duke, MD, FACS[a,b]

From the [a]Department of Otolaryngology—Head and Neck Surgery, Augusta University, Augusta, Georgia; and the [b]Department of Endocrinology, Augusta University, Augusta, Georgia

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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 <u>is</u> 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

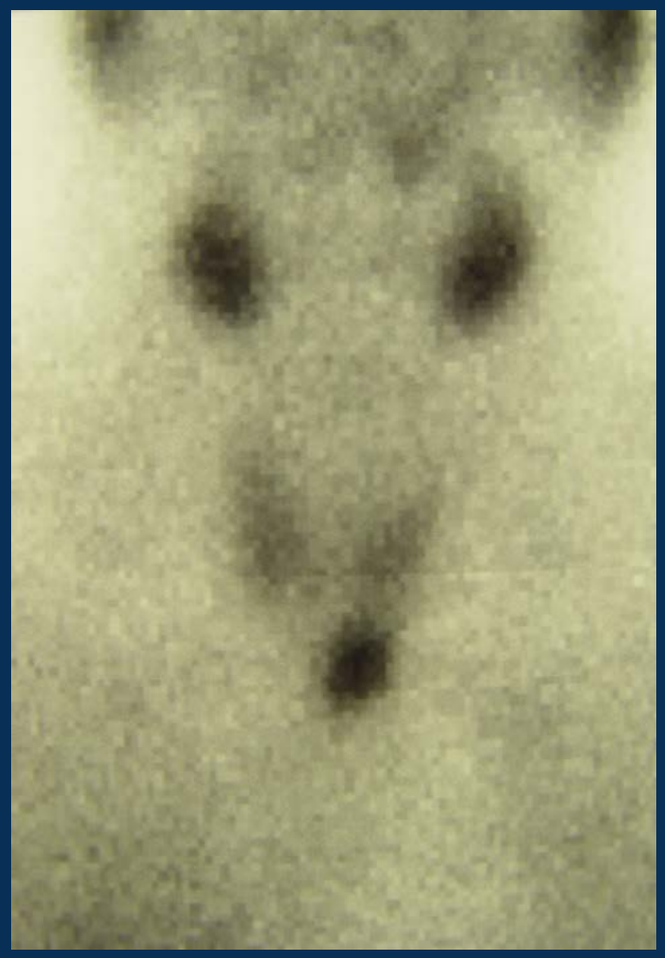
It's not surgical

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

It <u>is</u> surgical

- **"Normal" PTH**
- **True normocalcemic hyperparathyroidism**

2. Imaging misinterpretations

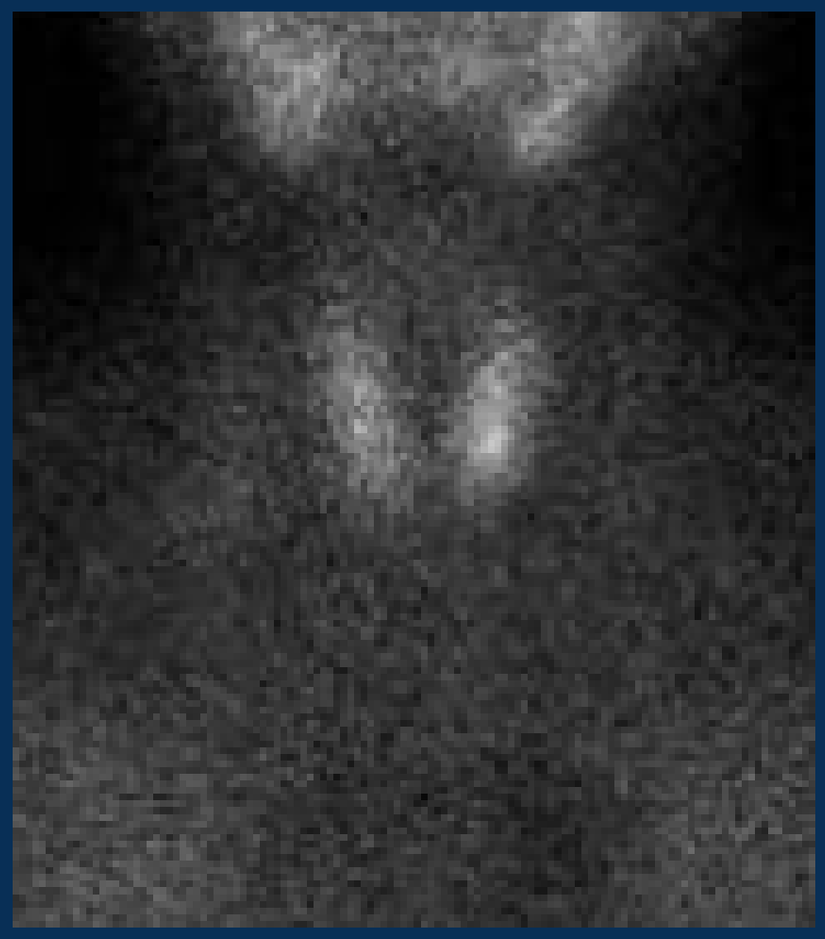


15 minutes

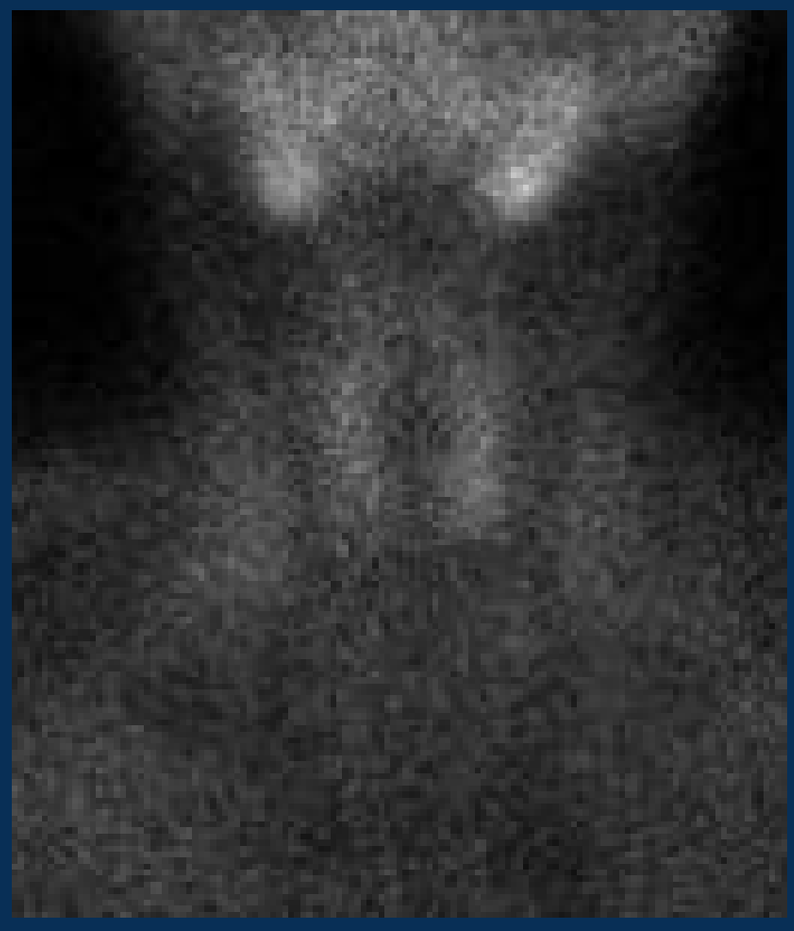
2 hours

Rapid washout

Outside sestamibi negative

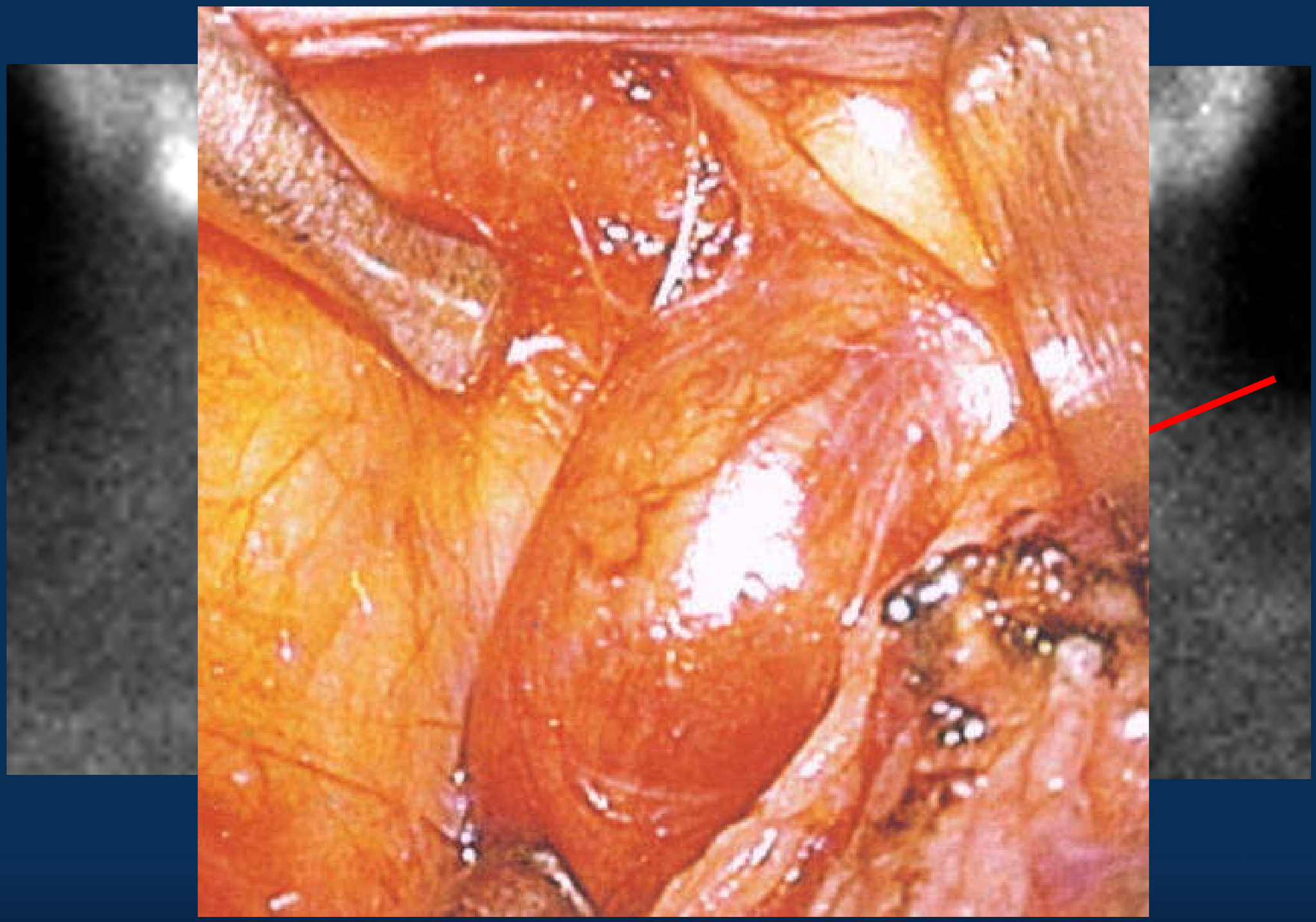


15 min

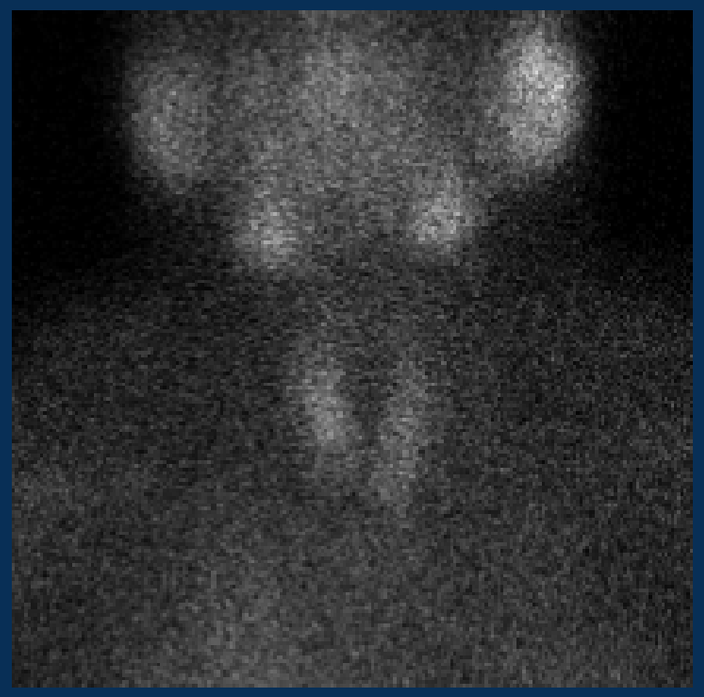


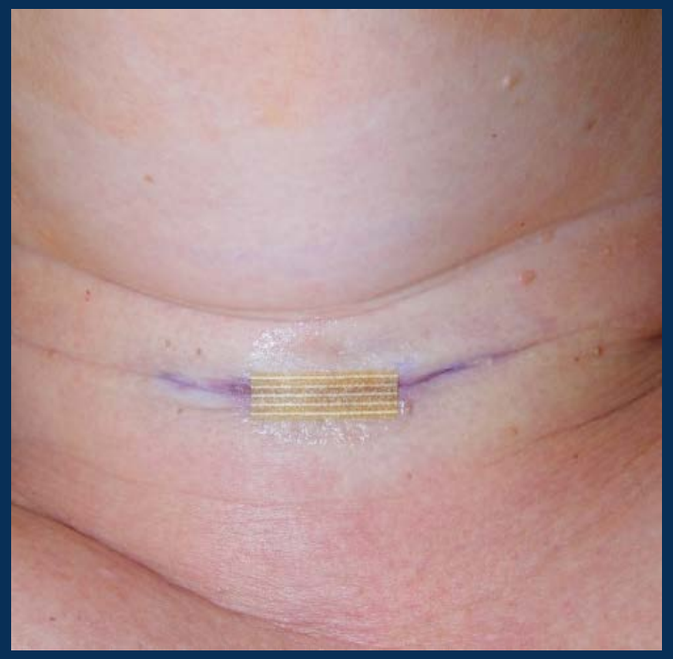
3 hr

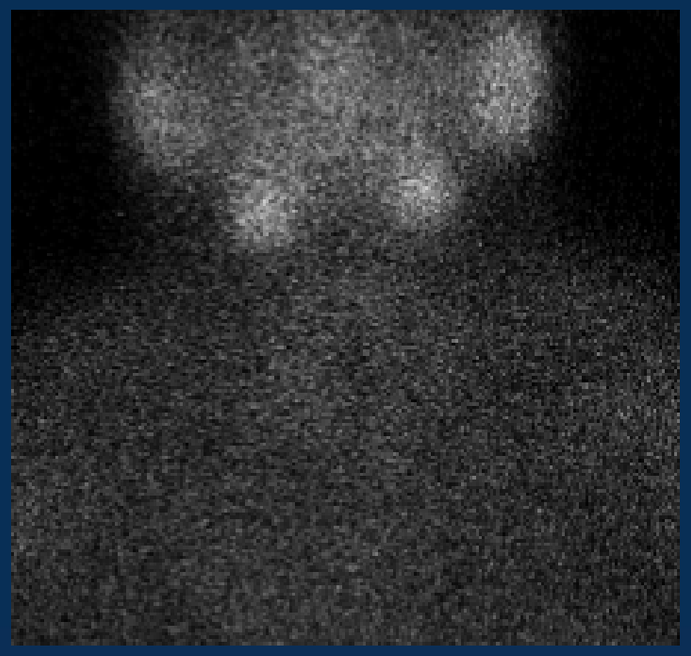
Sestamibi repeated at AU

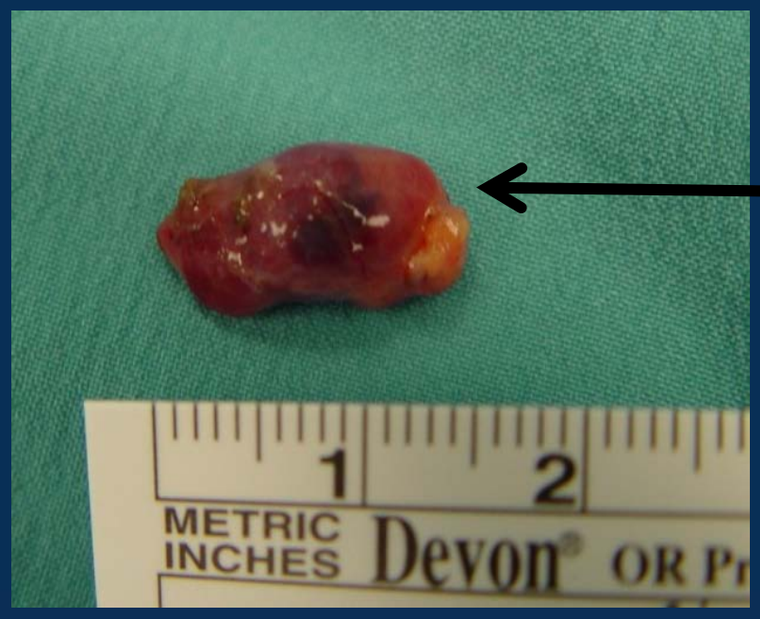


Read your own scans







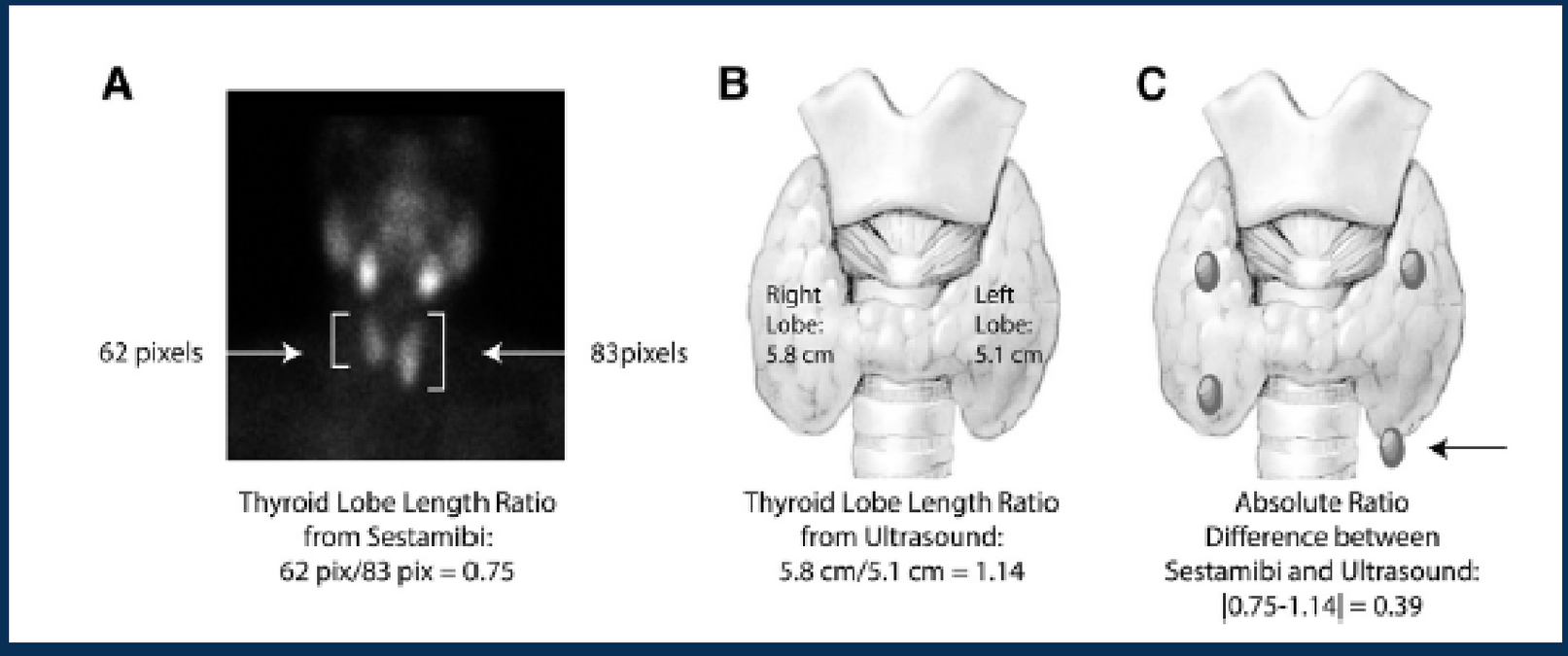


Left Inferior Parathyroid Adenoma

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

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

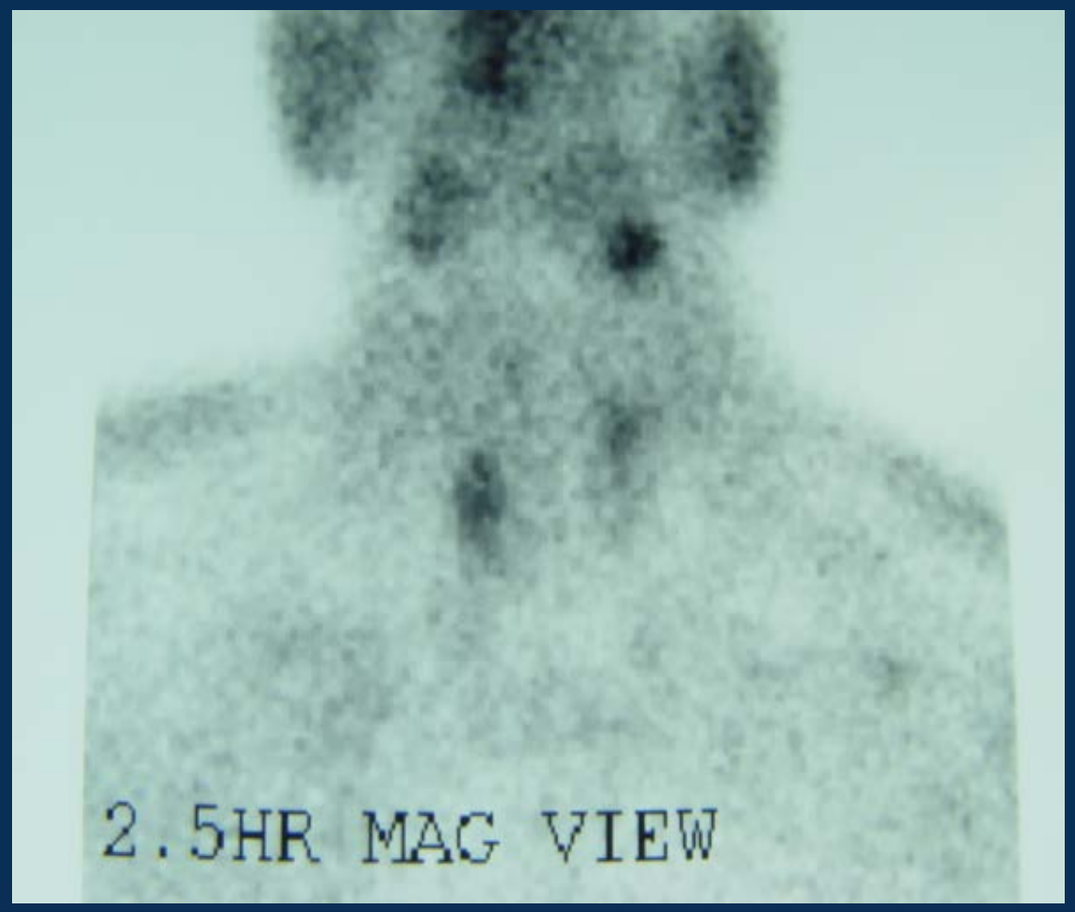
Among 18 outside negative scans

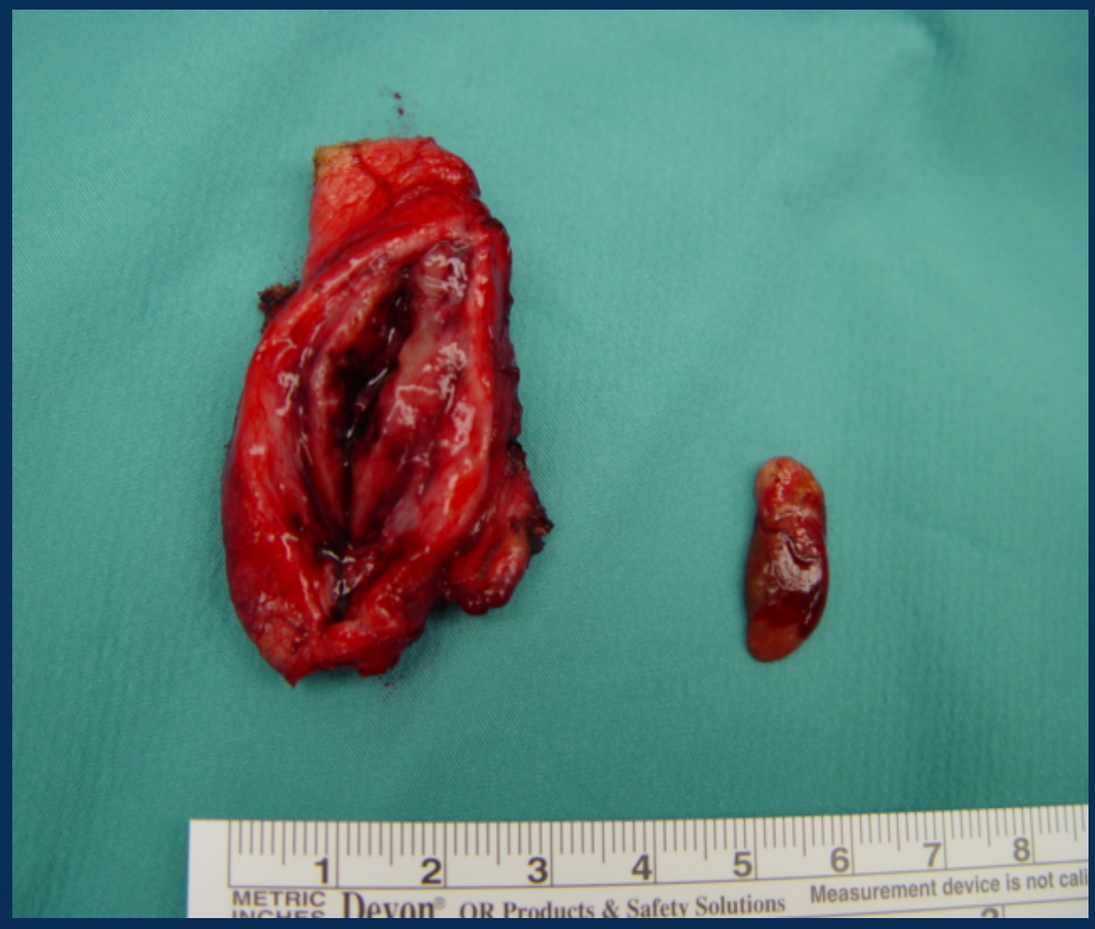
- **5 = read as positive**
- **13 = study repeated at AU**
- **All 13 patients (100%) localized**

Singer et al, Laryngoscope, 2012

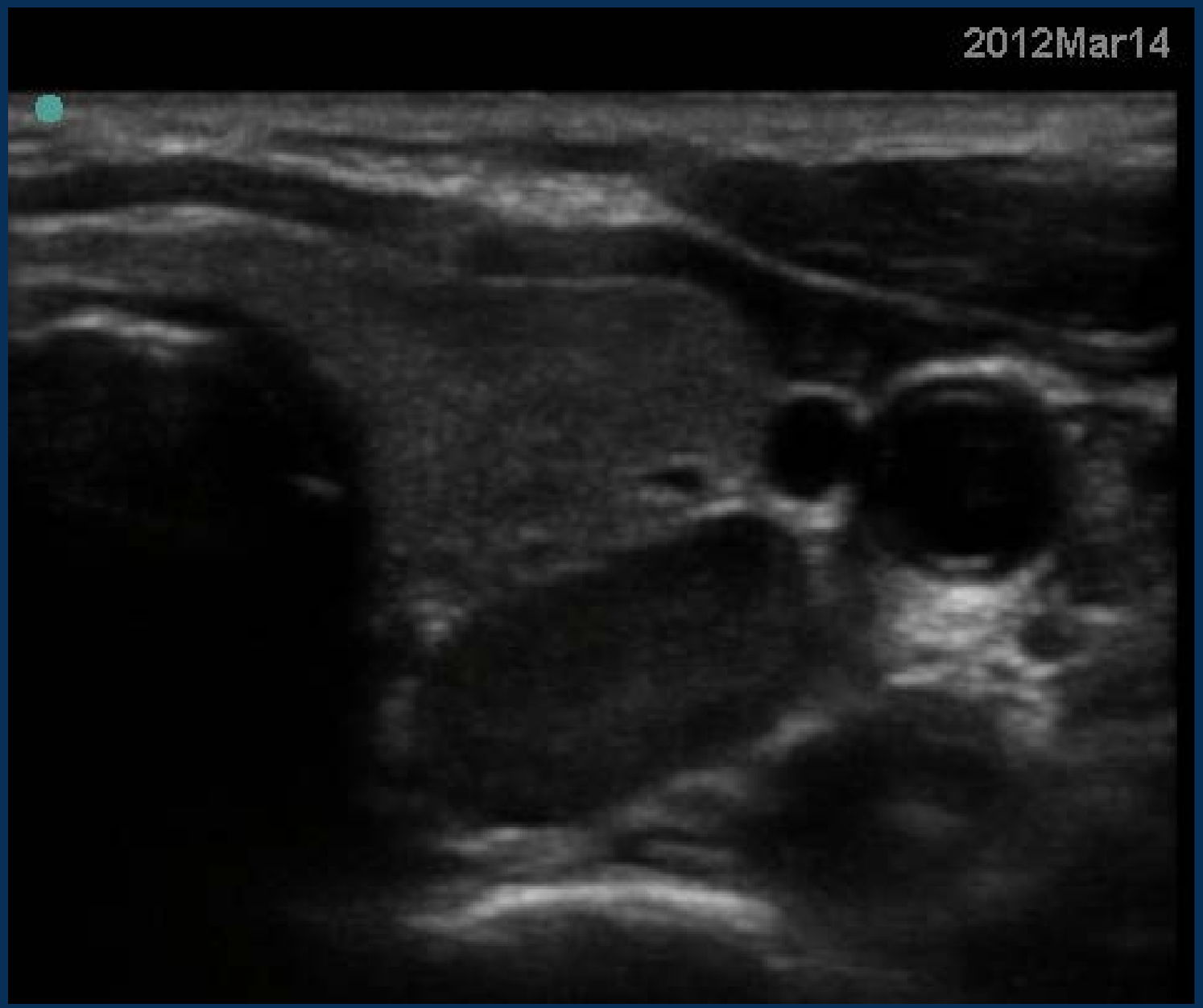
Limitations of Sestamibi

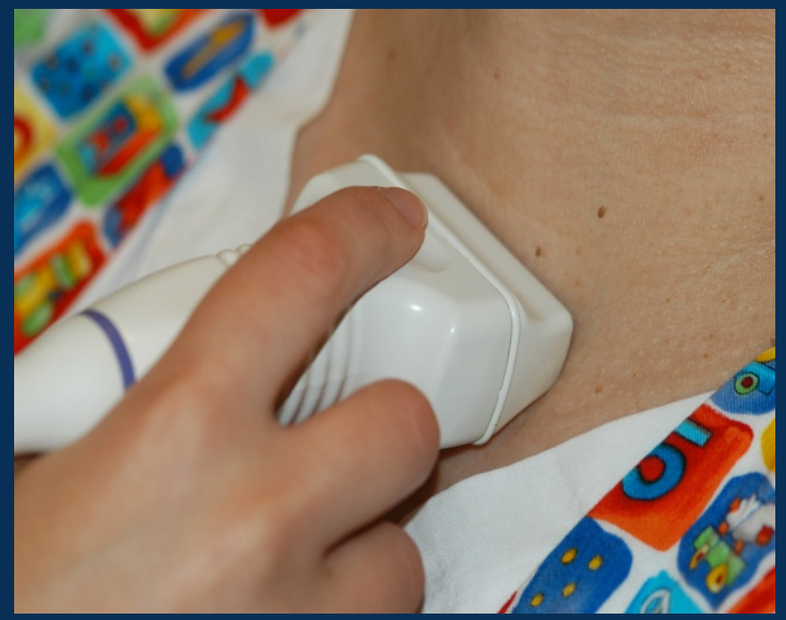
False Positives





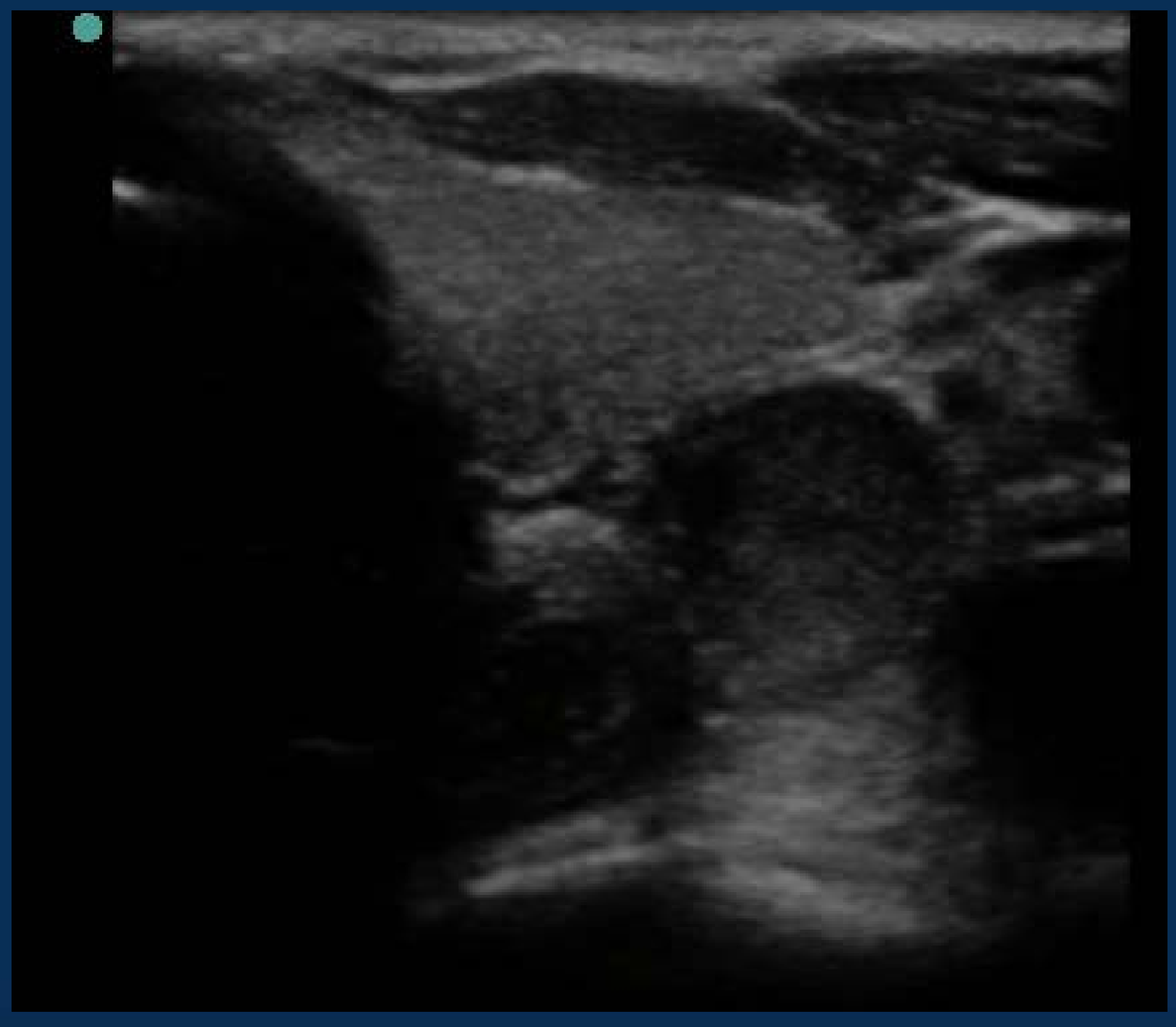
Surgeon-performed ultrasound

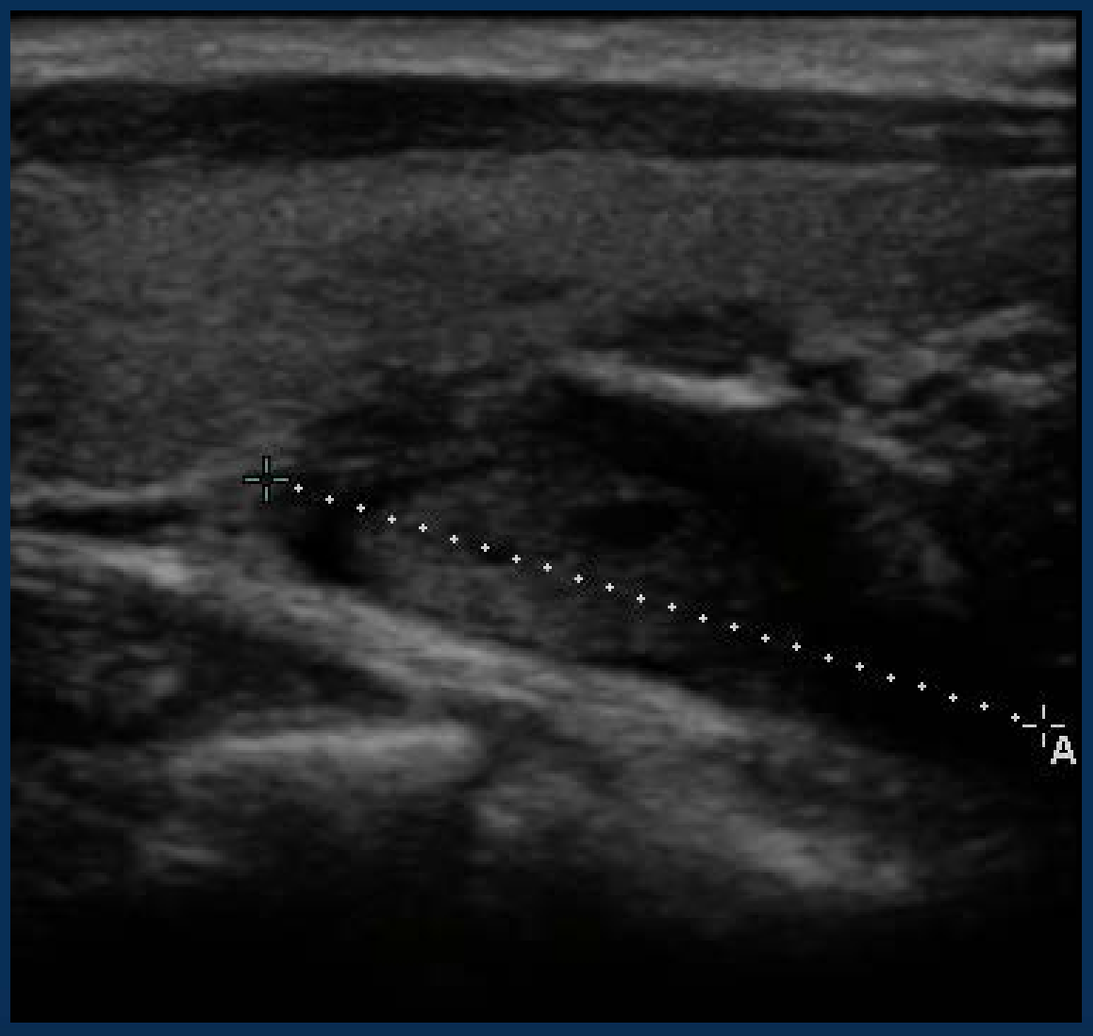




Ultrasound pearls

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



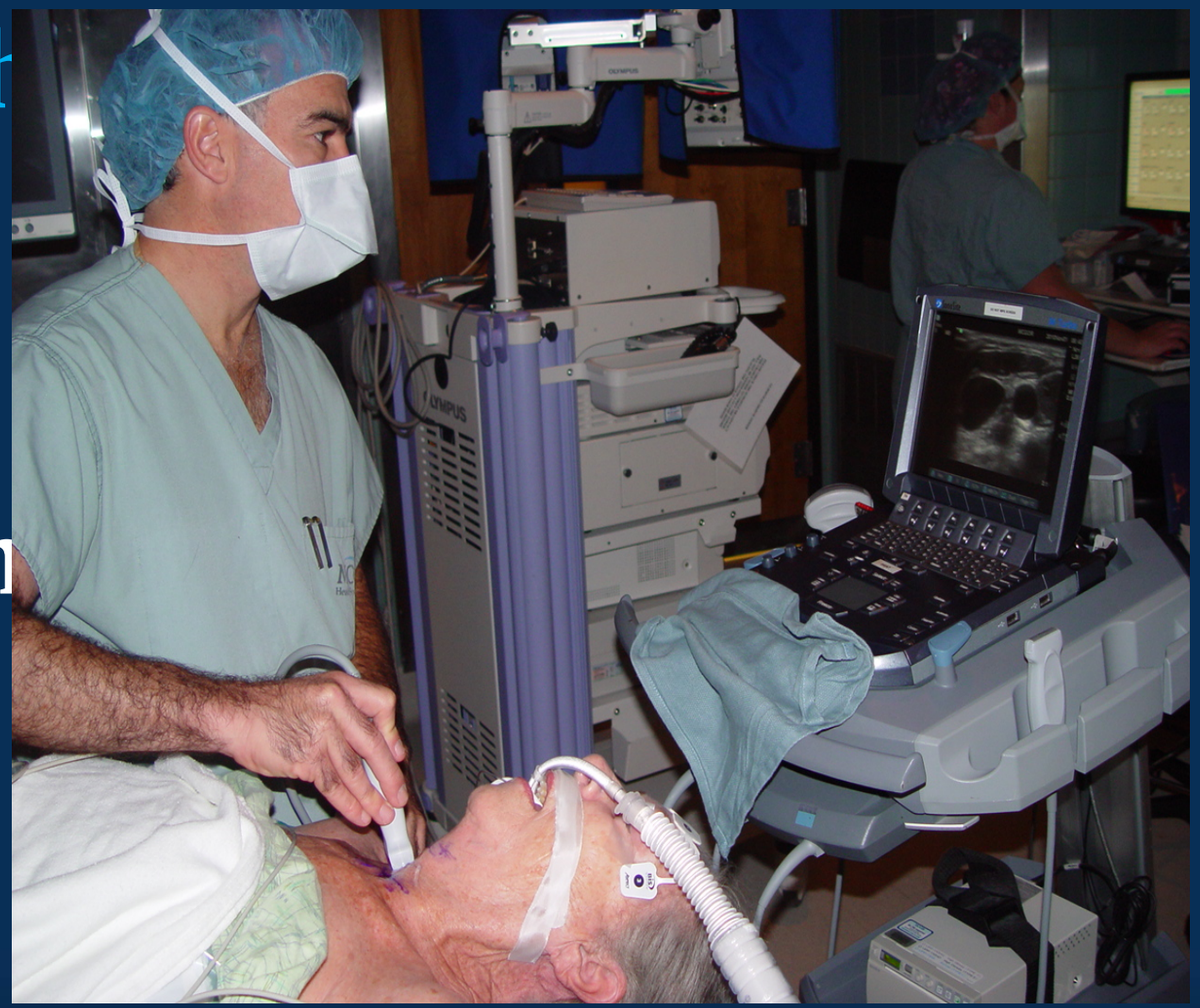


Ultrasound pearls

- 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

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



Interpreting reports

- **If the US report says “normal thyroid” except for “posterior hypoechoic thyroid nodule”**

That’s the parathyroid adenoma

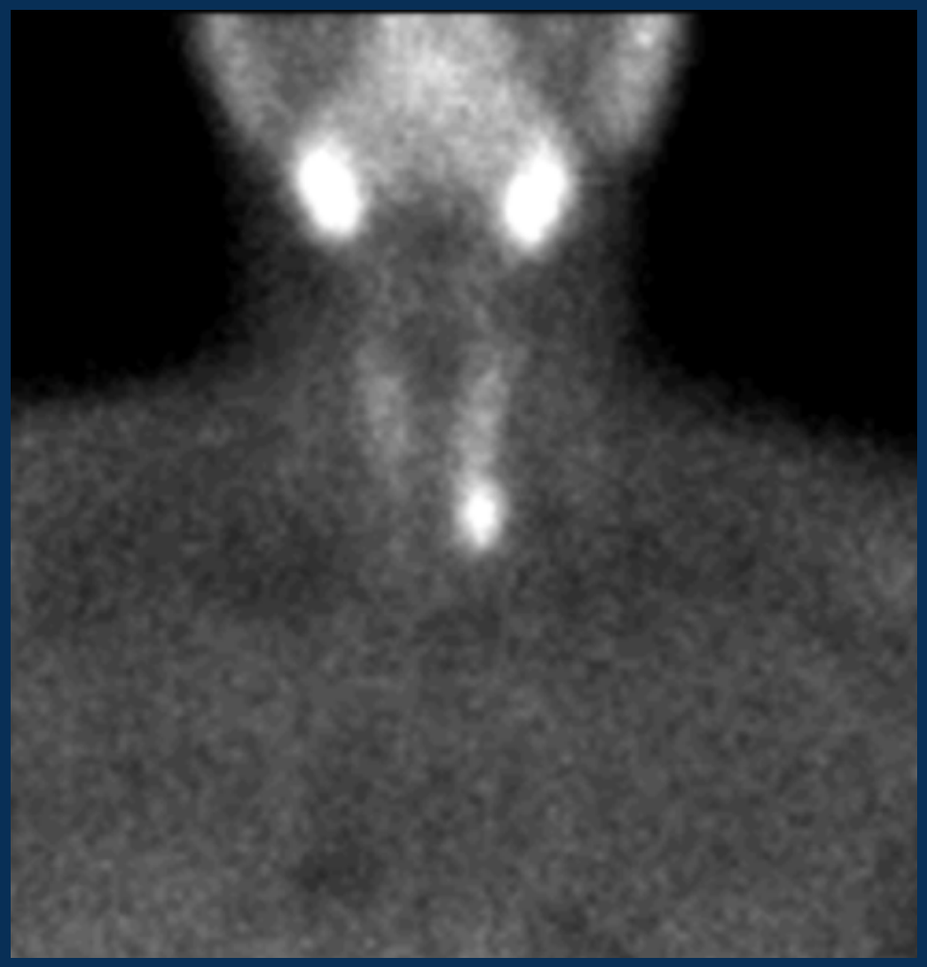
- **If the US report says “normal thyroid” except for “posterior hypoechoic thyroid nodule”, and then an FNA is done showing follicular cells, favor follicular neoplasm**

That’s STILL the parathyroid adenoma

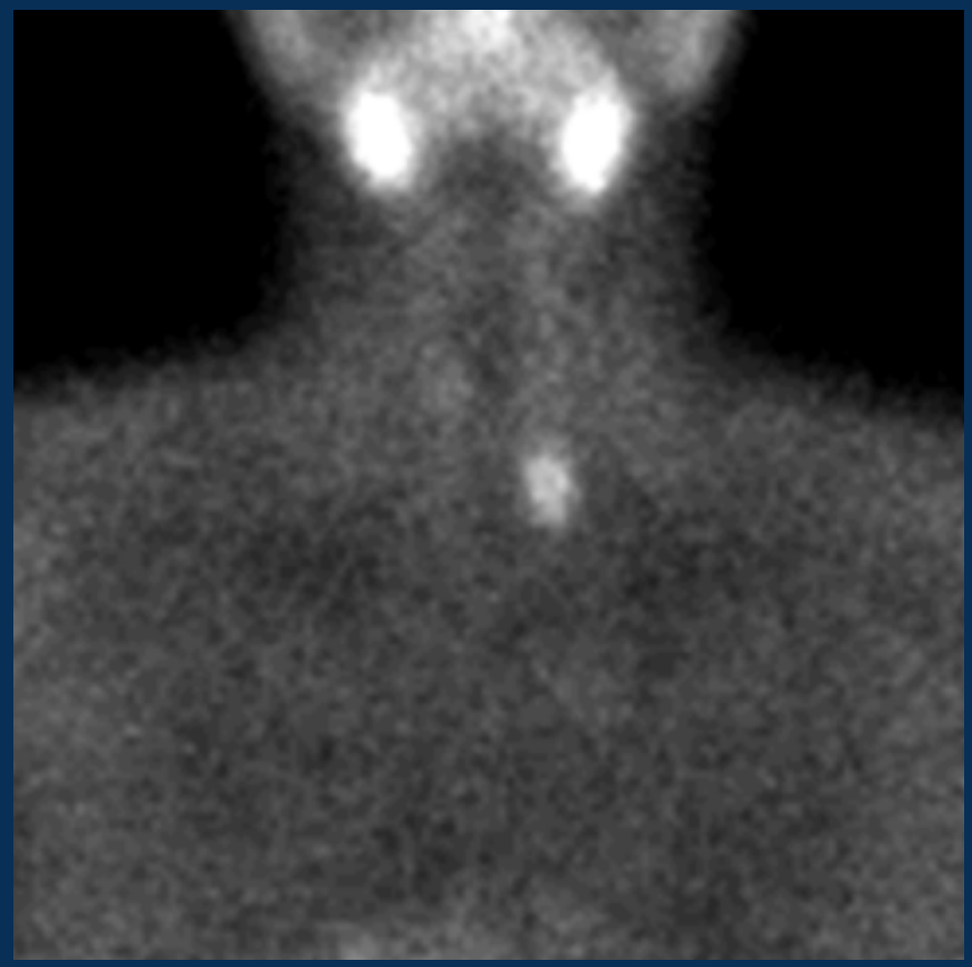
3. Overly descended superior gland

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

3. Overly descended superior gland



15 minutes

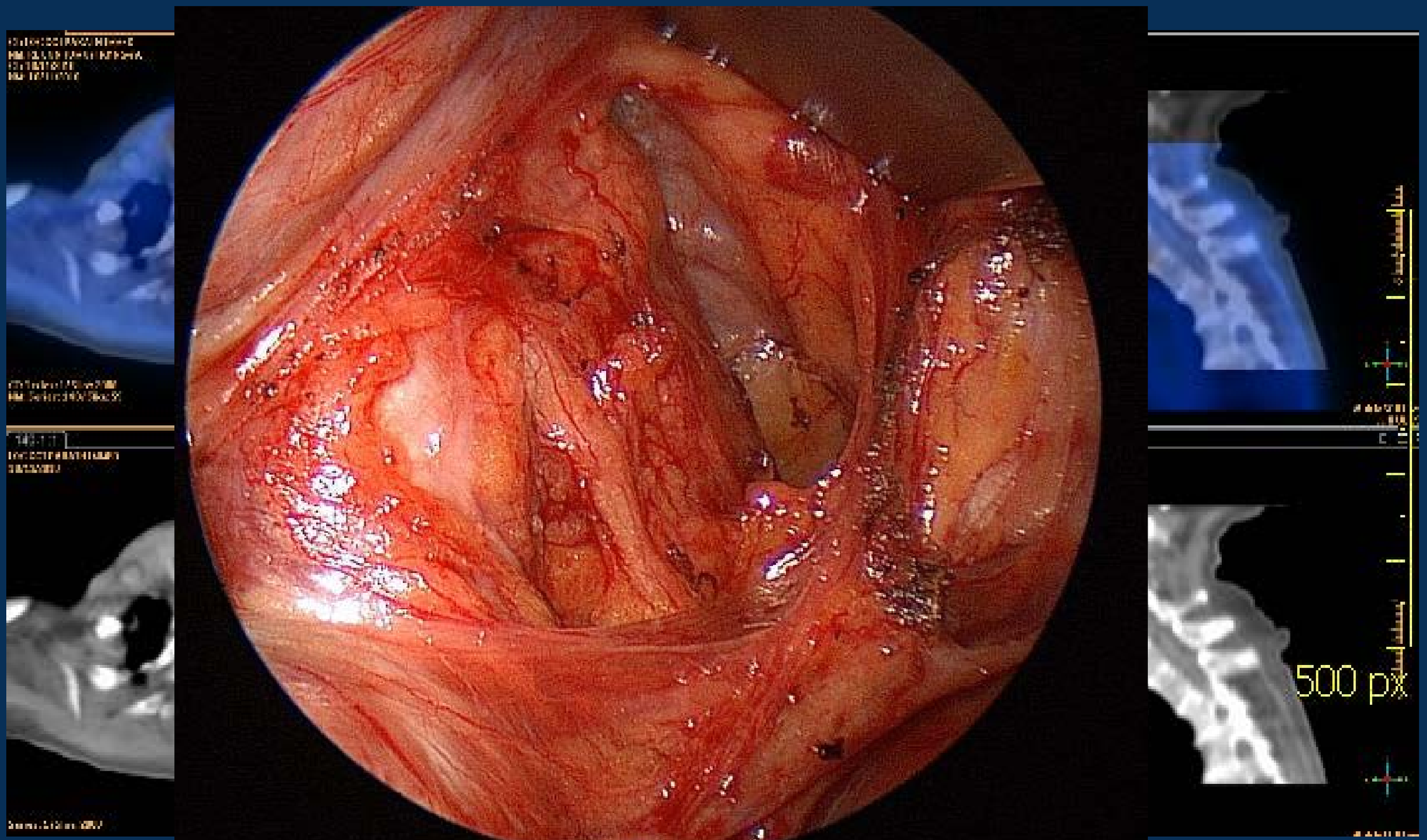


2 hours

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

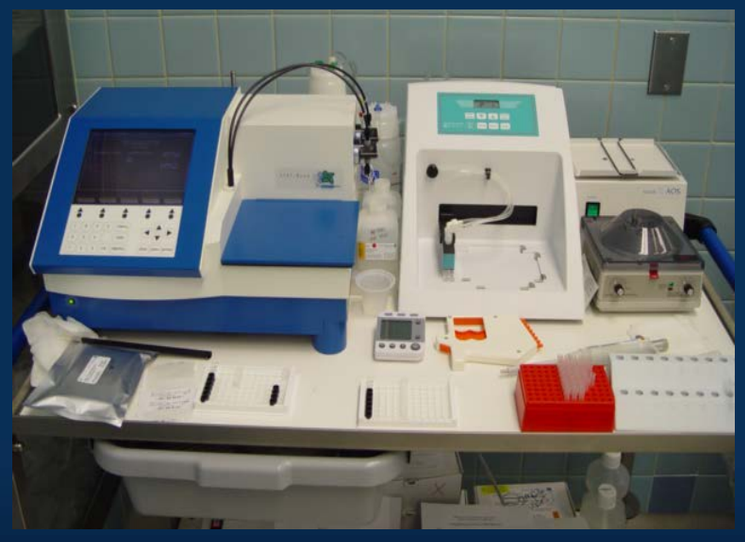
- **Bloodless, magnified dissection (color surgery)**
- **LN (especially Hashimoto's); thymus; thyroid nodules (tubercle); muscle**
- **Look for the fat**
- **Low threshold to identify RLN**
- **Monitoring: guard against bilateral paralysis**
- **Use ballotment to reveal adenoma**
- **Low threshold for taking the upper pedicle (especially if superior gland is elusive)**
- **Avoid removing normal parathyroid glands**

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

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

Turbo PTH

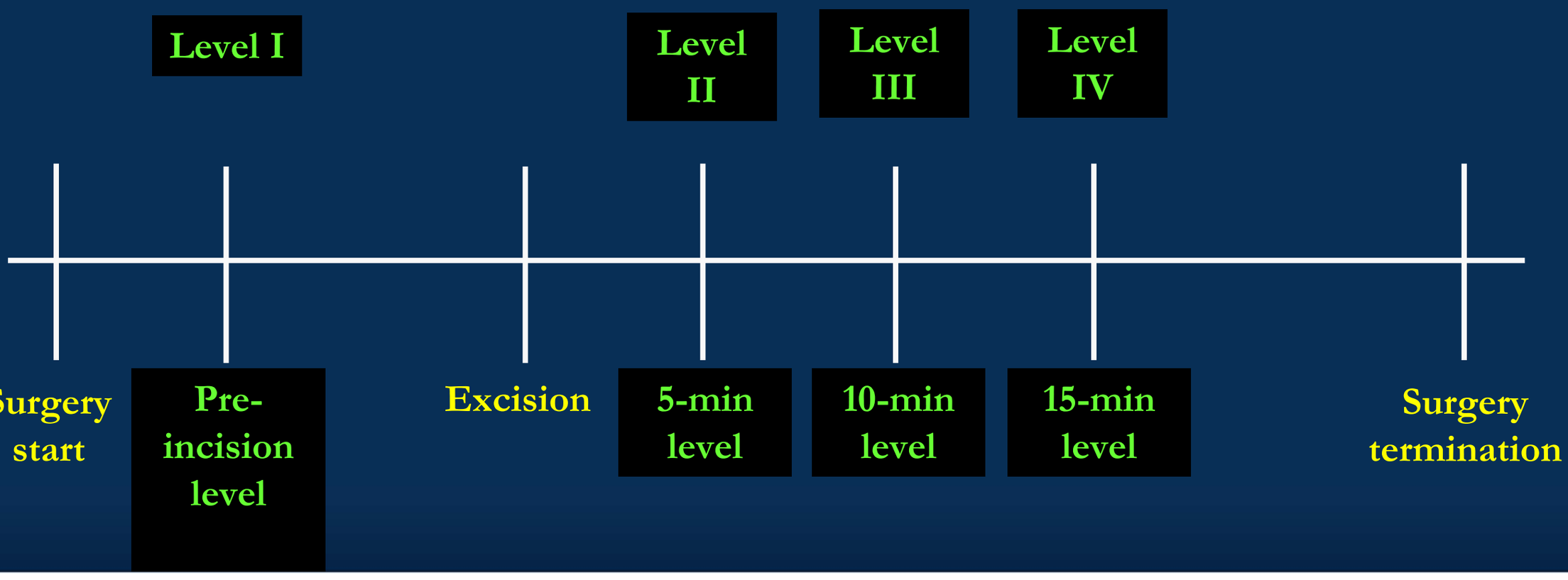
Future Diagnostics



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

- 15 minutes to find and remove

Augusta Algorithm

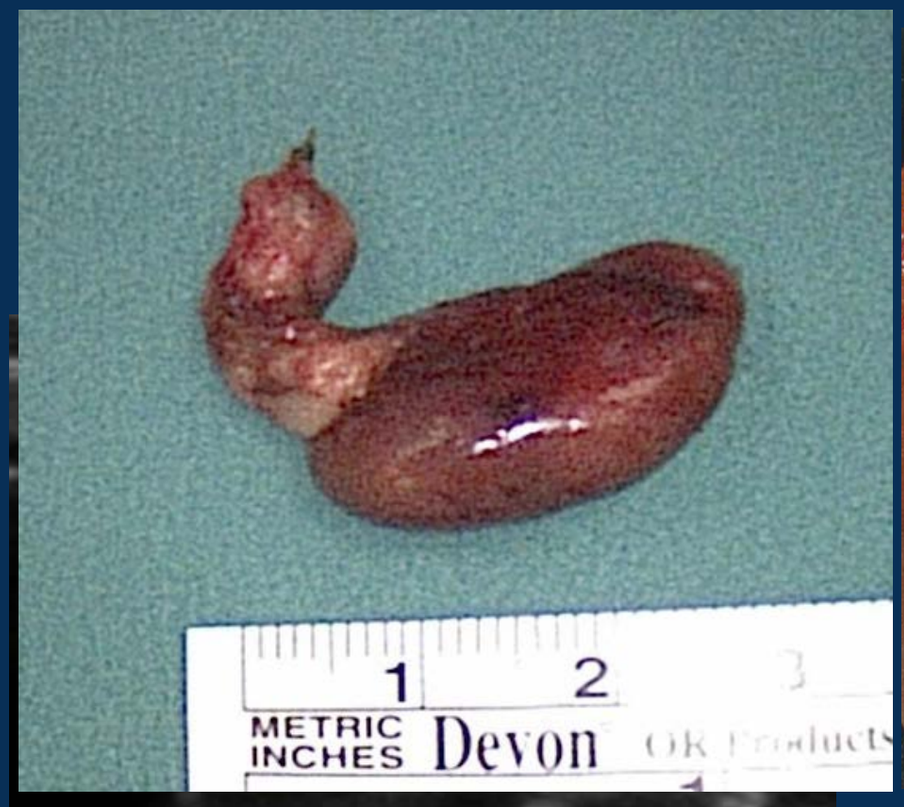


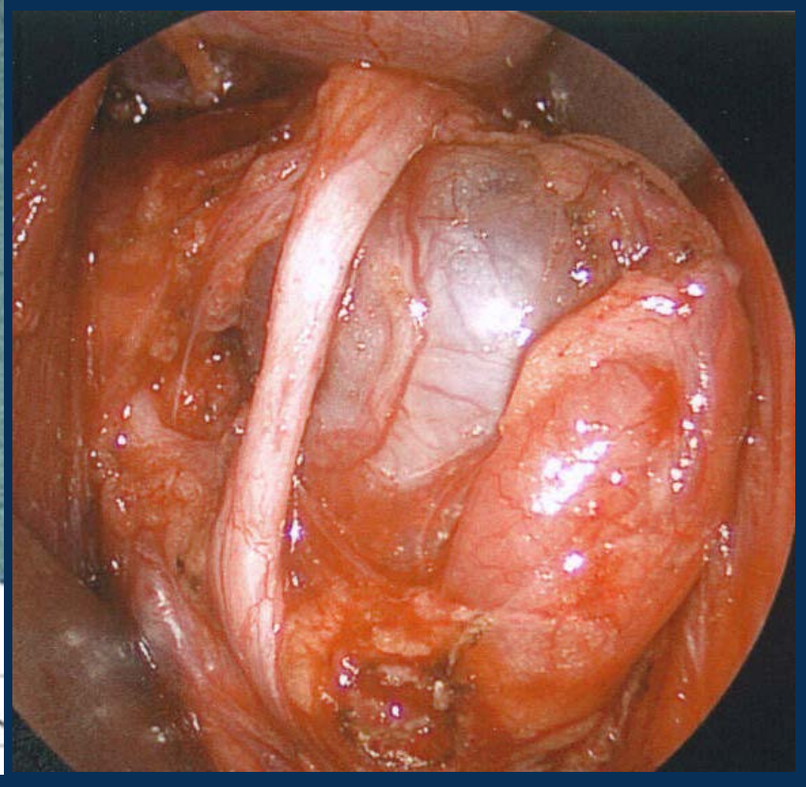
What about the high-volume (high-experience) surgeon?

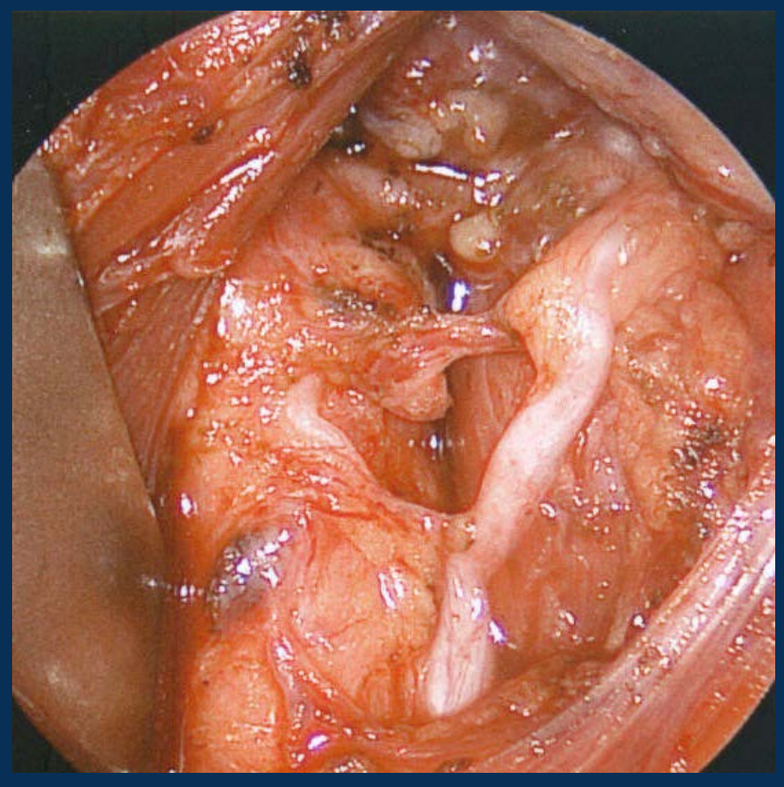
- 15 minutes to find and remove
- Won’t even know double adenoma for 38 minutes (1 hour 5 minutes)
- An additional 38 (or 65) minutes for each additional abnormal gland (assuming 15 minutes to find each one
- What about 4-gland hyperplasia

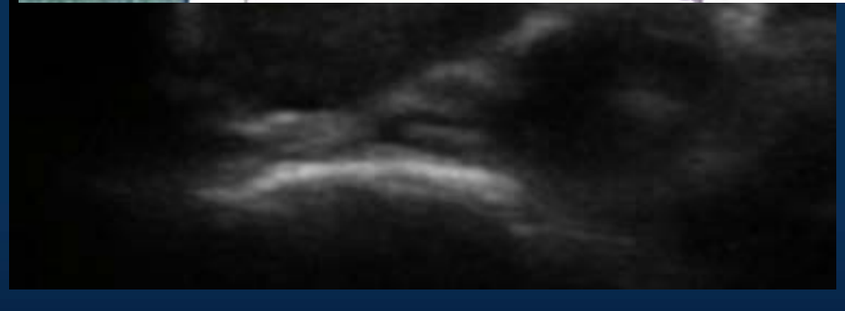
Case 1: 59 y.o. primary HPT

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





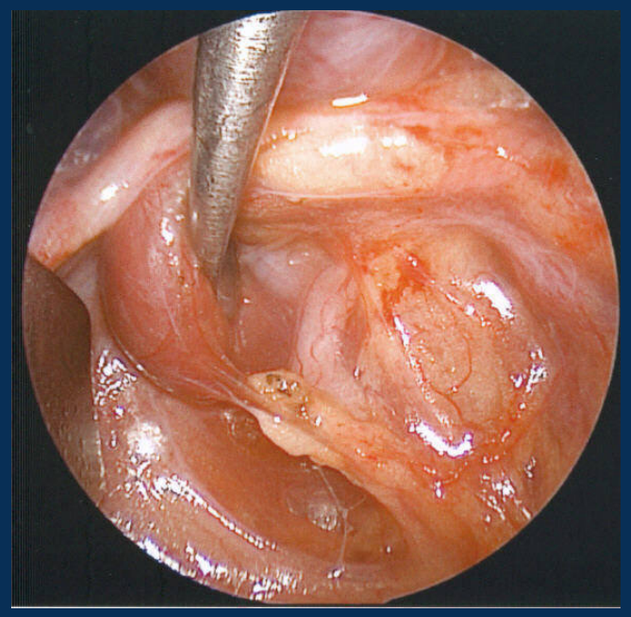


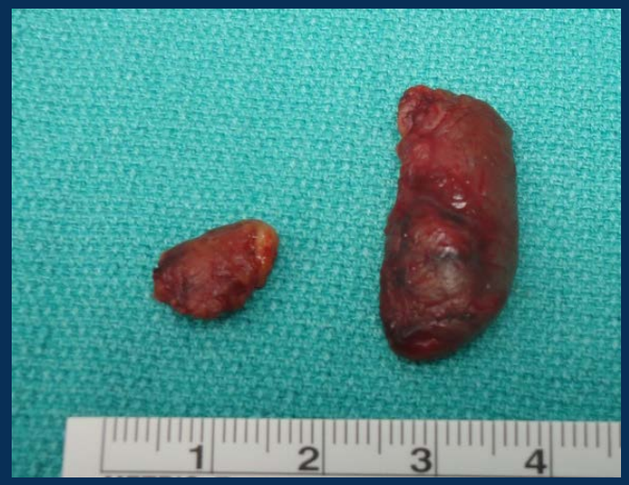


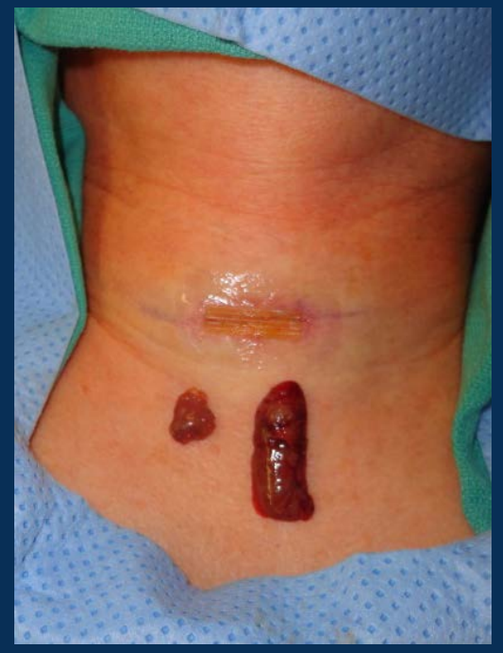
59 y.o. primary HPT

	Time	Level
Baseline	X	372.1
Excision	821	X
5 min	826	222.D
10 min	831	158.7
20 min	844	111.3
30 min	852	113.3

59 y.o. primary HPT







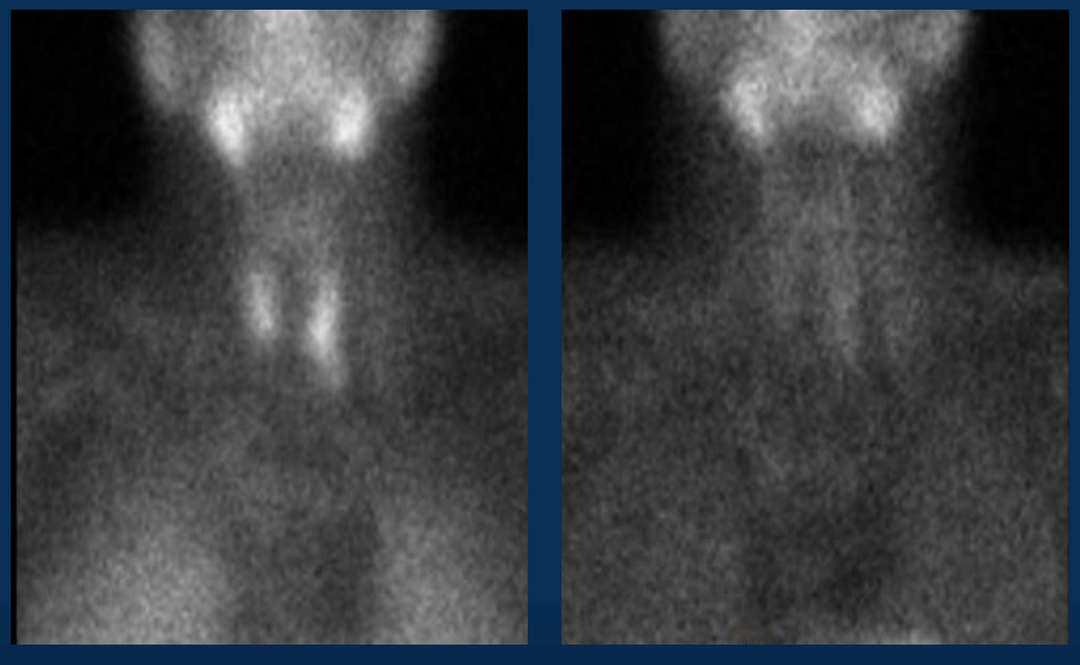
	Time	Level		Time	Level
Baseline	X	372.1			
Excision	821	X	Exc #2	0907	X
5 min	826	222.0	5	0912	88.2
10 min	831	158.7	10	0917	71.0
20 min	844	111.3	15	0922	61.4
30 min	852	113.3	25	0932	54.1

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**
- **Furth**
  remo
  skele **plored**

Final Pathologic Diagnosis

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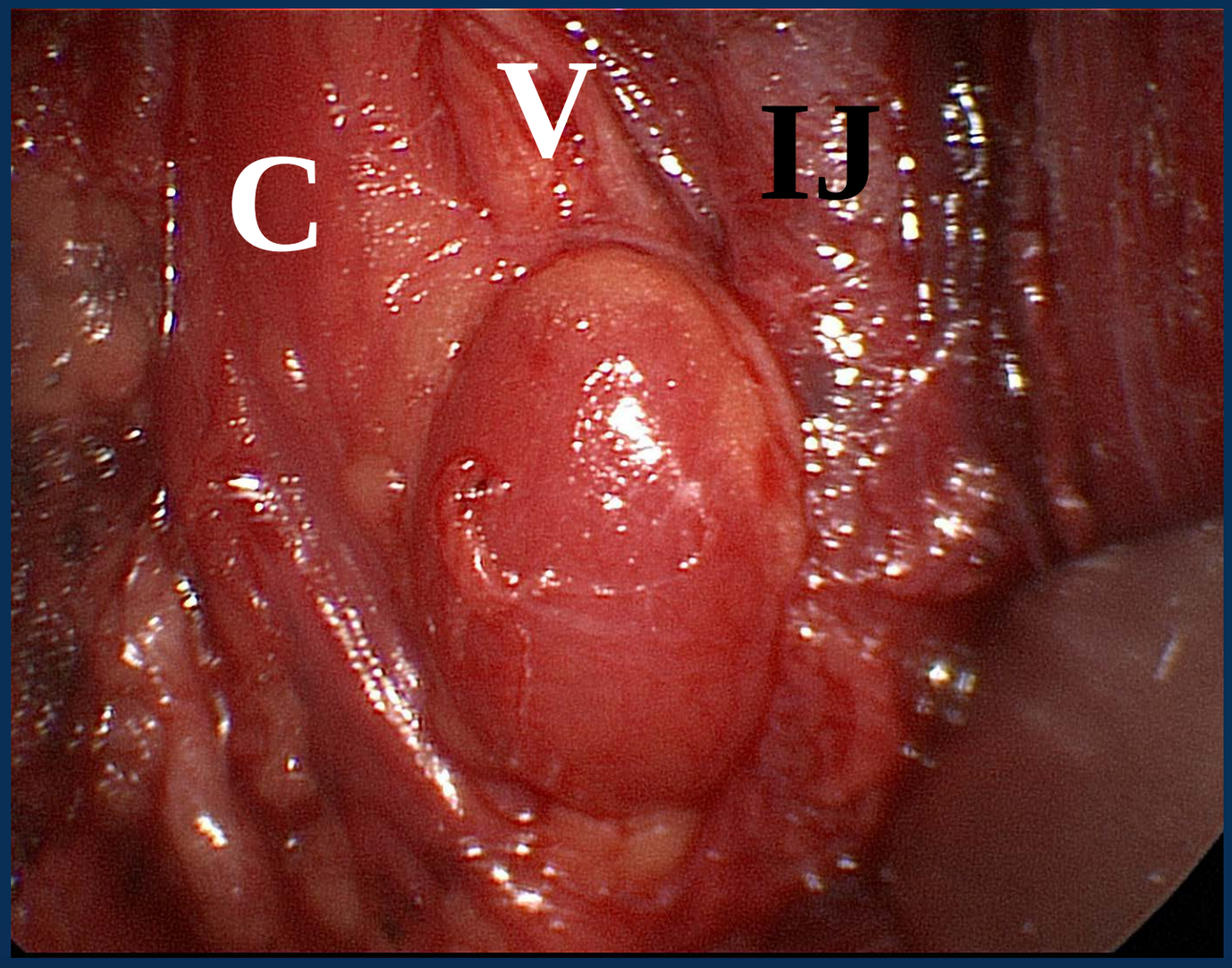
D) RIGHT INFERIOR PARATHYROID (BIOPSY):
- Normocellular parathyroid tissue.

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.

Case 2:

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



Case 2:

Final Pathologic Diagnosis

A) LEFT SUPERIOR PARATHYROID (BIOPSY):
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B) LEFT INFERIOR PARATHYROID (BIOPSY):
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C) RIGHT SUPERIOR PARATHYROID (BIOPSY):
- Normocellular parathyroid tissue.

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

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.

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

MI Parathyroidectomy

Many definitions have been proposed:

- **Local anesthesia**
- **Endoscopic**
- **Mini-incision**
- **Remote access**
- **Radioguided**

MI Parathyroidectomy

Critical elements

- ***Single-gland surgery***
- Image-guided
- Confirmation of cure (PTH)
- Outpatient
- ½ to ¾ inch incision
- Endoscopically-assisted

Persistent Eucalcemic HPT

- **In up to 40% of patients who undergo curative parathyroidectomy, PTH remains elevated for up to 12 months after surgery**
- **Vitamin D deficiency; renal dysfunction; normal glands finding new “set-point”**

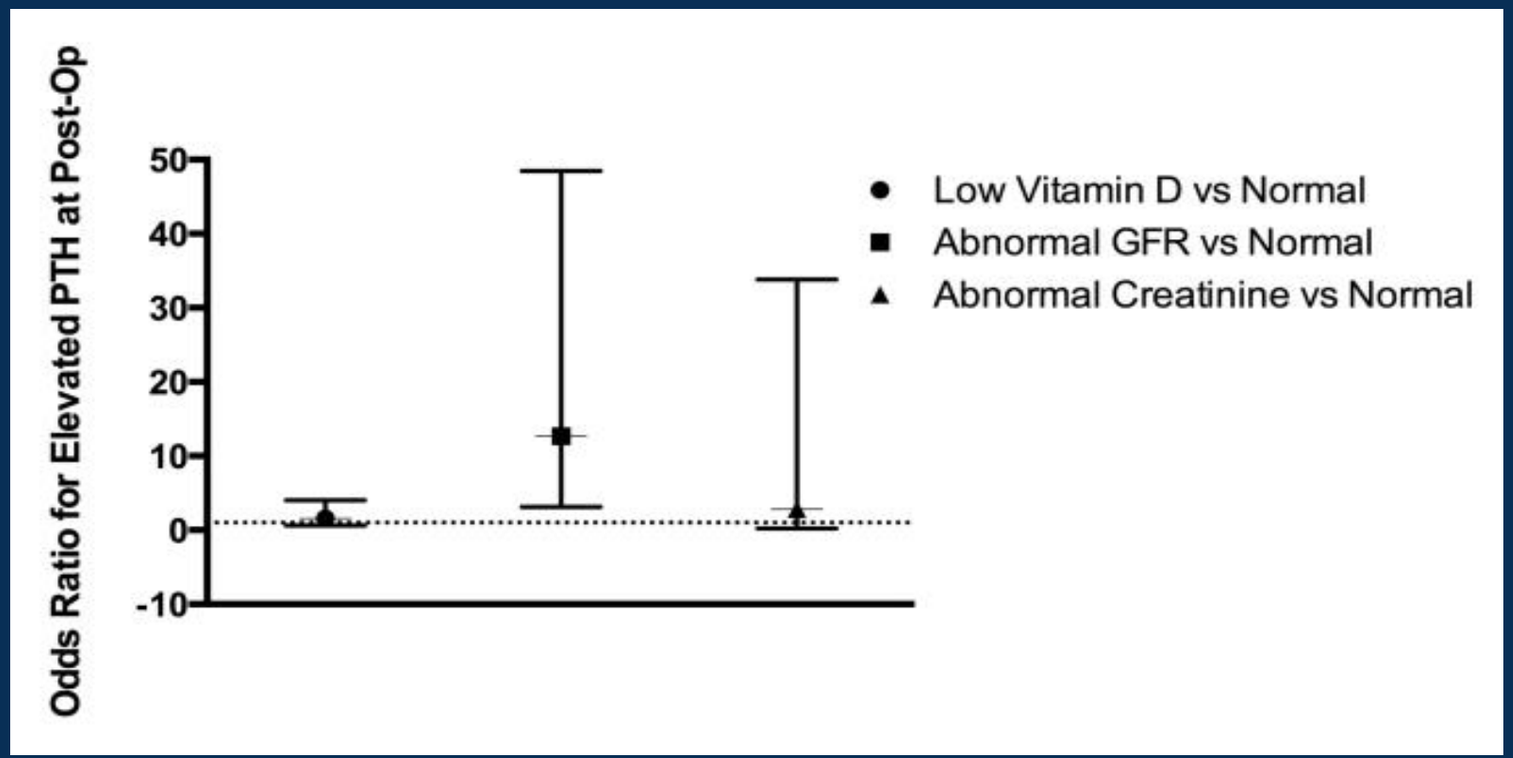
The Laryngoscope

Persistently Elevated Parathyroid Hormone After Successful Parathyroid Surgery

William S. Duke, MD; Anna Song Kim, BS; Jennifer L. Waller, PhD; David J. Terris, MD

Persistently elevated pth

- 314 parathyroidectomies, 187 pHPT and single gland disease, 119 met criteria
- 25.2% with eucalcemic HPT



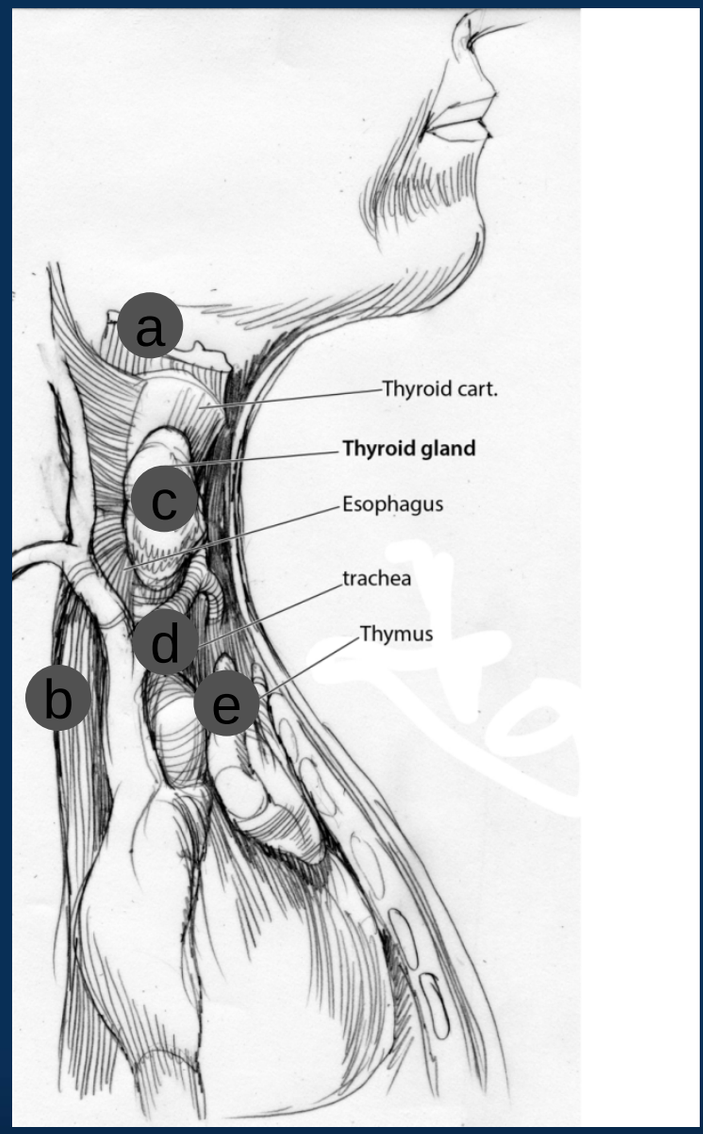
Duke, Terris et al, Laryngoscope, 20126

Jon van Heerden

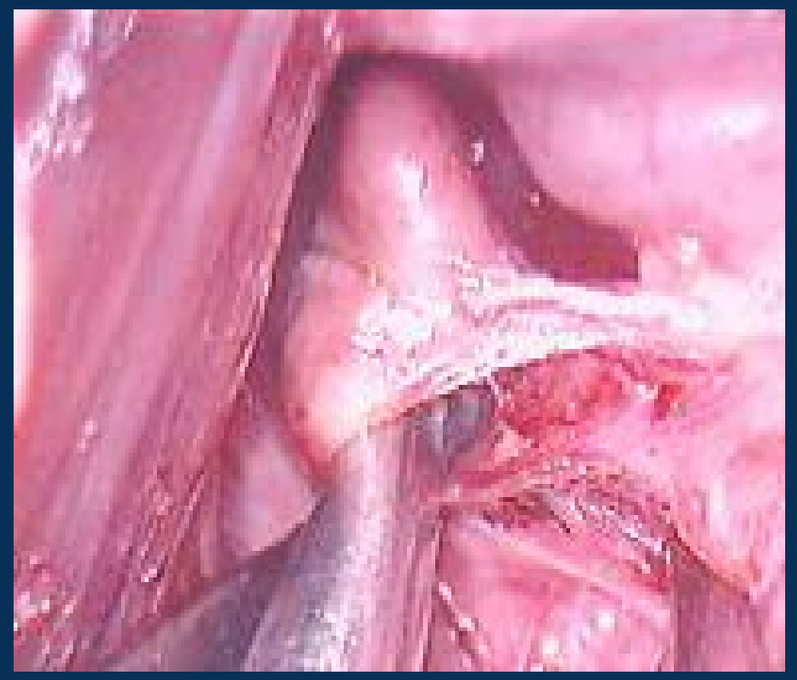
- **“for the missing superior gland look inferior to the inferior gland; for the missing inferior gland, look superior to the superior gland”**

Final surgical thoughts

- Find the fat
- Pass nothing off
- Let the ioPTH tell its story
- Biopsy as needed (and especially if failing)
- Mediastinal usually thymic
- Know the common hiding places



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**