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The Myth of the Minimally Invasive Parathyroidectomy

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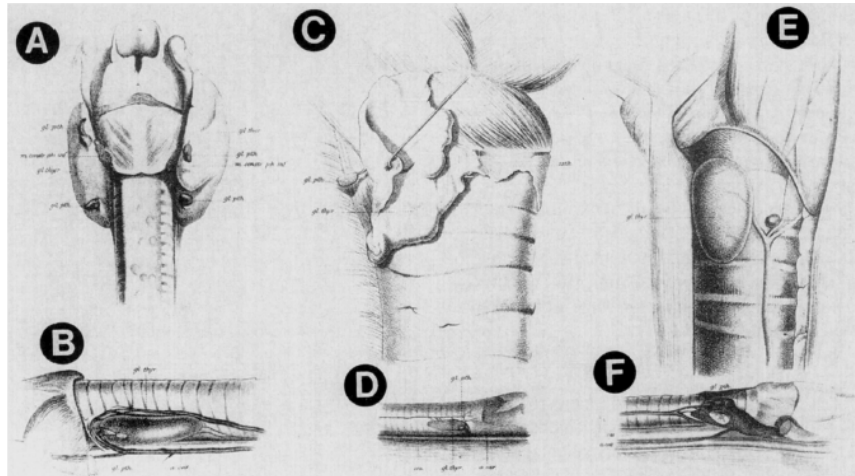
- History of parathyroid surgery
- Evolution from 4-gland exploration to focused exploration
- Meaning of minimally invasive parathyroidectomy

History

- Sir Richard Owen first discovered parathyroid glands in the Indian rhinoceros in 1849
- Anatomic identification only
- reproducible



- Discovered in humans—Ivar Viktor Sandstrom 1880
 - Identified glands near the thyroid
 - Glandulae parathyroidae



- Eugene Gley—thyroidectomy plus removal of “glandulae parathyroidae” results in tetany

History

- 1915—Friedrich Schlagenhauer
 - Suggested enlargement of a single gland may be the cause of bone disease
- Felix Mandl, Vienna, Austria
 - 1925 first parathyroidectomy to treat osteitis fibrosa cystica
 - Recurrent disease

Principles of Surgery for 1HPT

- Pt informed of risks of operation
- Exposure gained through transverse cervical incision
- All 4 glands must be identified anatomically

Breakthroughs in Parathyroid Surgery

- Dr. A.M. Hanson, Fairibault, MN—isolated parathyroid hormone 1923
- Solomon Berson and Rosalyn Yalow, Bronx VA Hospital 1963—radioimmunoassay for PTH
- Samuel Nussbaum, Boston, MA—1987, rapid PTH assay
 - 1988 suggested “rapid assay” can be used as surgical adjunct and guide extent of neck exploration

Biochemistry vs. Anatomy

- Endocrine surgery group at U of Miami—7% persistent or recurrent HPT
- PTH “quick” test:
 - 21 pts had parathyroidectomy; PTH sent as “quick” and standard samples.
 - All 4 glands identified in 53%
 - Biochemical cure in 19/21

Intraoperative PTH

- Conclusion: the PTH “quick” test will be a useful adjunct to the parathyroid surgeon and improve the success rate of parathyroidectomy

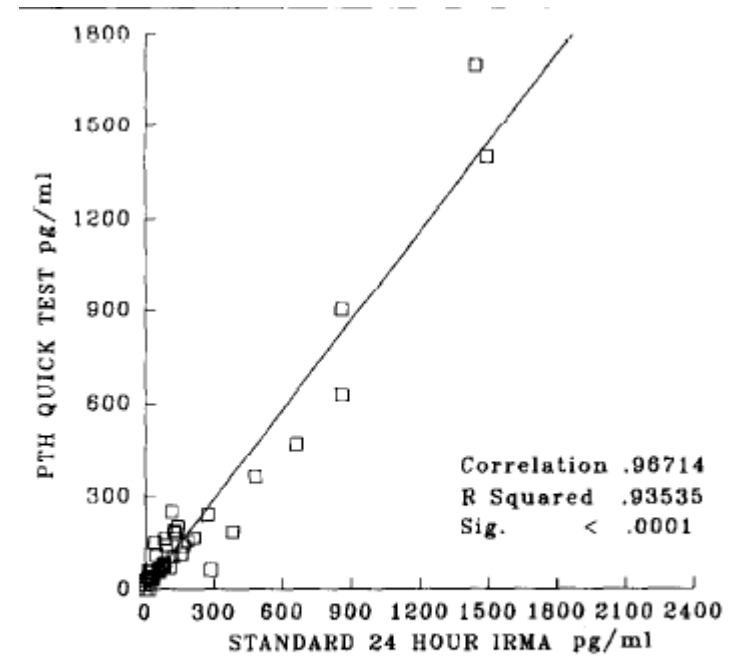


Figure 1. Correlation of PTH “quick” test and standard 24-hour intact PTH (1-84) immunoradiometric assay (IRMA) from 45 paired perioperative samples from 11 patients undergoing parathyroidectomy.

Principles of Surgery for 1HPT

- Bilateral neck exploration vs. focused exploration
- Shift toward focused exploration—
”minimally invasive parathyroidectomy”

What does Minimally Invasive Mean?

- Focused exploration?
- Bilateral exploration through small incision?
- Technique?
- Scar length?
- Operative time?

Radioguided Parathyroidectomy

- MIRP
- Technetium (^{99}Tc) sestamibi
 - Ideal window for surgery 1.5-3 hours post-injection
- Images obtained starting 15 minutes post injection with delayed scans 1 and 2 hours after
- Use gamma probe
- Adenomas contain more than 20% background activity



Radioguided Parathyroidectomy

- Probe positioning may lead to inaccurate results
- Sestamibi also persists in thyroid nodules
- Sestamibi may persist in scar tissue
- Operator dependent
- May help localize to side of neck rather than exact location
- Probably not best as a solitary method—gland physiology vs. morphology

Video-Assisted Parathyroidectomy

- Endoscopic
 - Use 1.5cm incision
 - Insert laparoscope through incision
 - Same exposure
 - Same preop localization
 - Adds time to operation
 - Adds cost to operation

Video-Assisted Parathyroidectomy

- Robot-assisted

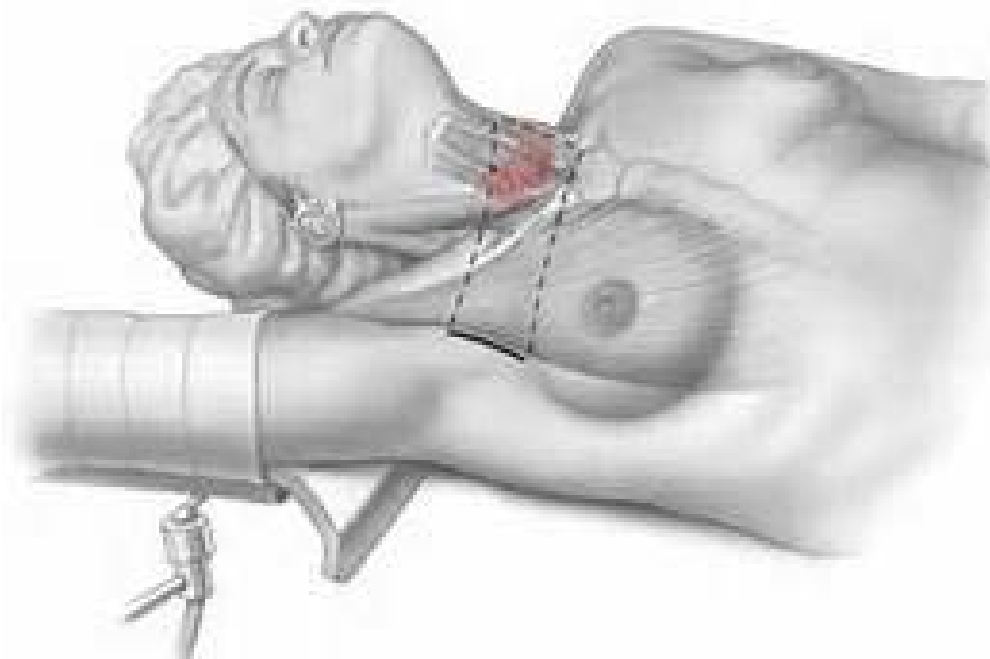


Image-guided Parathyroidectomy

- Variety of localization techniques
 - Ultrasound, sestamibi most common

Table VII. Operative success rates compared with the results of preoperative US and sestamibi imaging

<i>US</i>	<i>Sestamibi</i>	<i>Success rate (%)</i>
+	+	30/32 (94)
-	+	16/17 (94)
+	-	12/12 (100)
-	-	0/1 (0)

+, Suspicious lesion identified; -, no lesion identified.

- May be a substitute for IOPTH if not available

Image-guided Parathyroidectomy

- 500 consecutive pts taken to OR for MIP
- Preoperative localization with sestamibi
 - Ultrasound to guide incision placement, confirm location
- 97.4% cure rate
- Postop PTH data for 400/500 pts
 - Would have increased cure rate by 1% (not significant)

Image-guided Parathyroidectomy

Table 1. Relationship Between Imaging Findings and Surgical Outcome for Parathyroidectomy in Patients With Primary Hyperparathyroidism

Imaging Findings	Patients, No. (%)	Patients With Correct Localization, No. (%)	Patients With Incorrect Localization, No. (%)	Patients With Surgical Failure, No. (%)*
MIBI and US imaging positive for same site (concordant)	322 (57)	319 (99)†	3 (1)†	3 (1)‡
MIBI and US imaging discordant	201 (35)	125 (62)	76 (38)	6 (3)
MIBI and US imaging negative (no localization)	46 (8)	NA	46 (100)	1 (2)
Total	569 (100)	444 (78)	125 (22)	10 (2)

- Failure rate equivalent to MIP with IOPTH
- Reasons for failure include multigland disease and failure to localize to correct side of neck

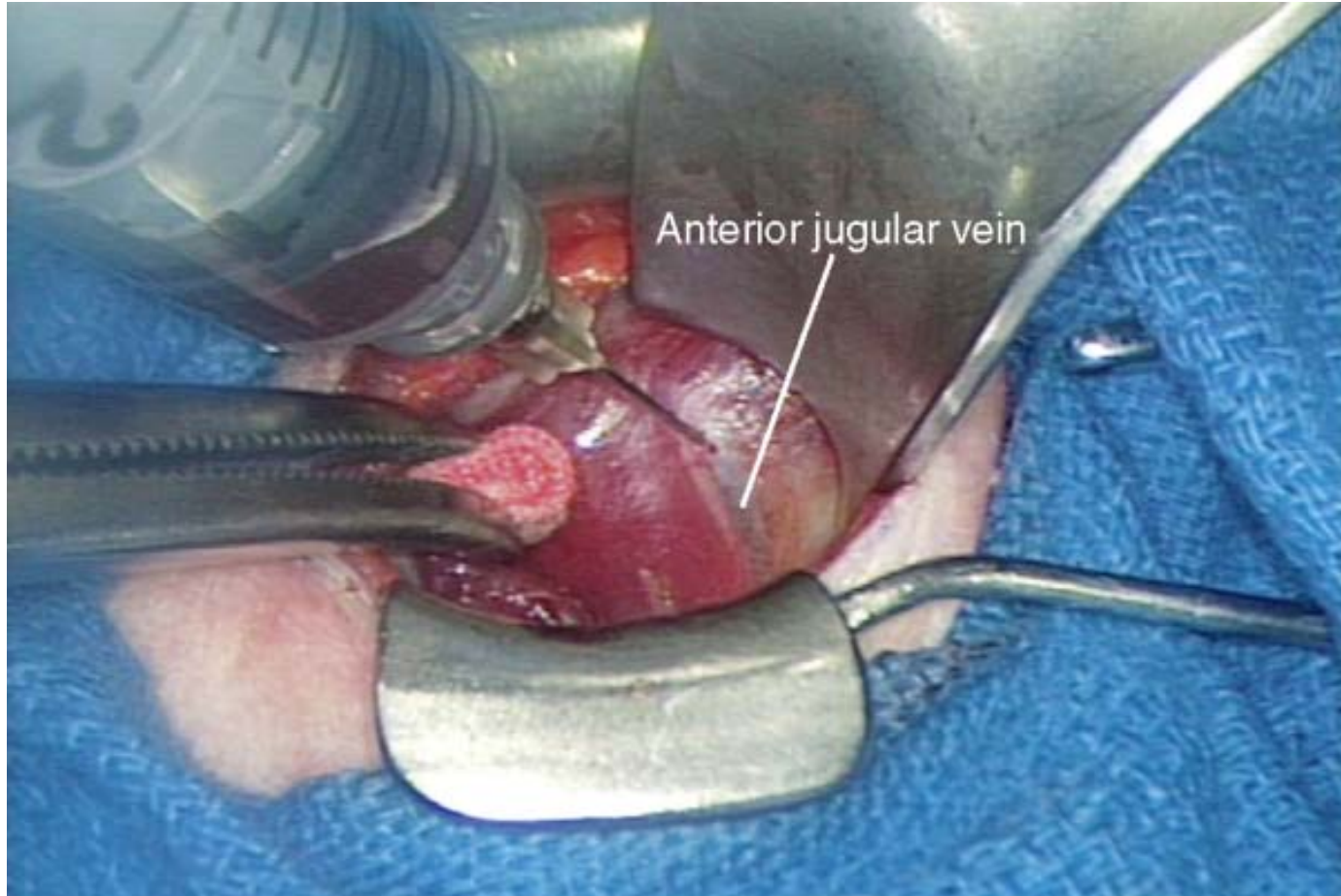
IOPTH-directed

- Small incision
- Preoperative localization
- Focused/Directed/Minimally Invasive
- Local/Conscious sedation or General Anesthesia
- Same day discharge















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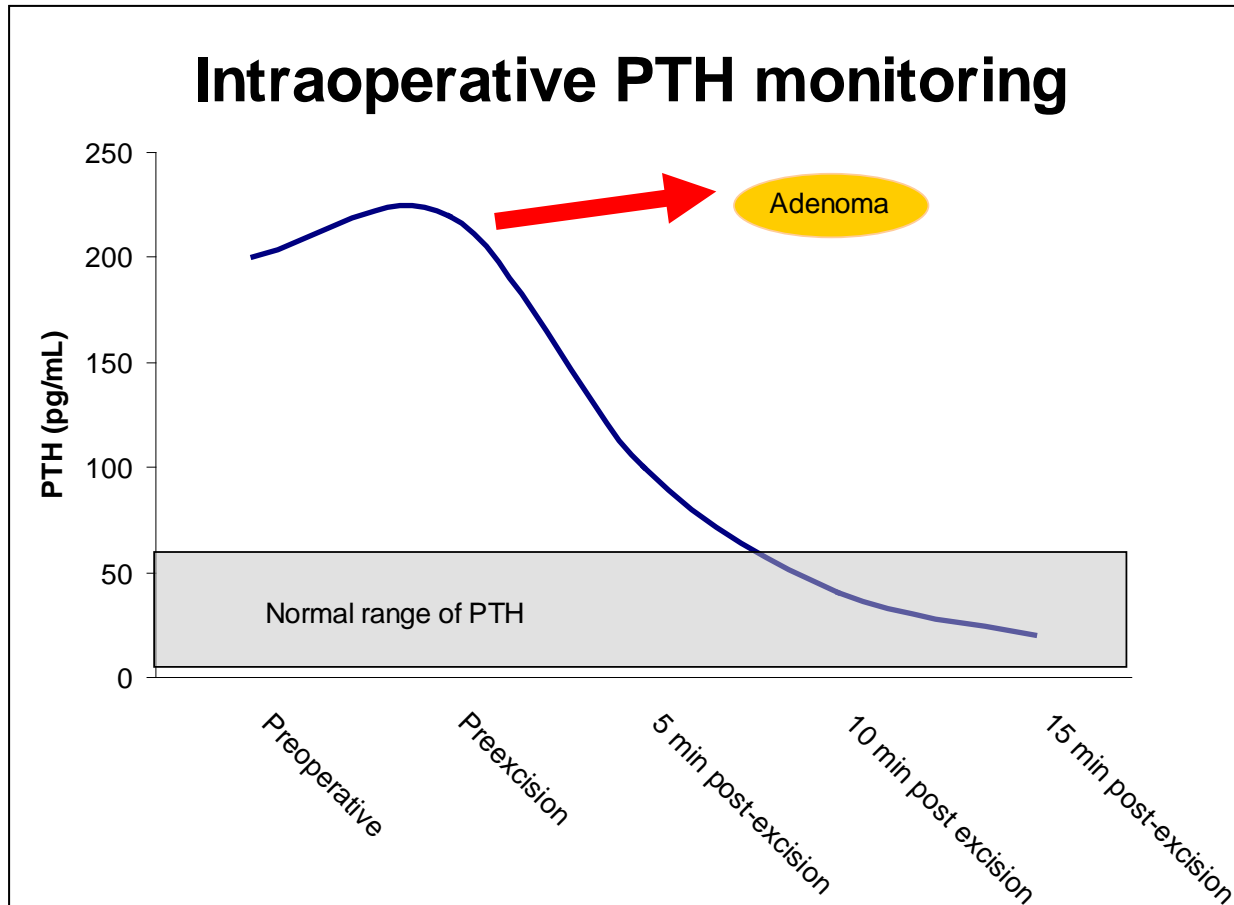


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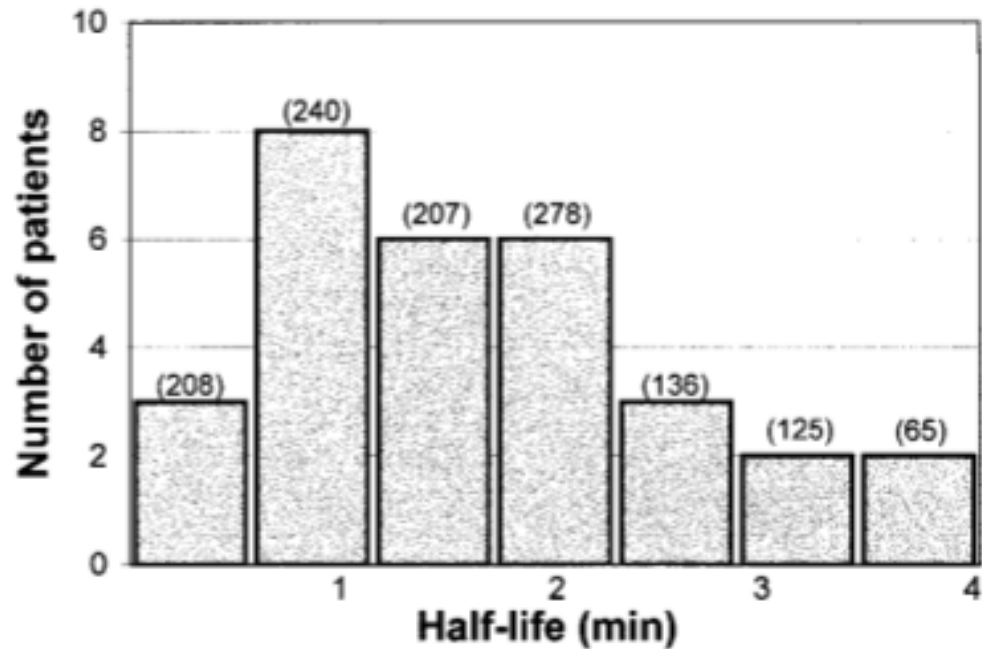
IOPTH Interpretation

- Levels drawn intraoperatively support biochemical cure
- Variety of methods
 - Baseline, pre-excision, 5-, 10-, 15-minute post-excision
 - Baseline, pre-excision, 12-minute post excision
 - Etc.
- Drop by 50% and into the normal PTH range (10-65 pg/mL)

Intraoperative PTH monitoring



- Half-life of PTH can vary yielding changes in kinetics (avg 3-5 min)
- May be more useful to plot PTH drop over time



How low should PTH go?

- 1108 pts, mean follow up 1.8 years
- Low morbidity
- Baseline, preexcision, 10-minute post-excision

Final IOPTH	N	Success, <i>n</i> (%) ^a	Persistence, <i>n</i> (%) ^b	Recurrence, <i>n</i> (%) ^c
≤40 pg/mL	773	771 (99.7)	2 (0.3)	0 (0)
41–65 pg/mL	259	255 (98.5)	1 (0.4)	3 (1.1)
> 65 pg/mL	76	63 (82.9)	10 (13.2)	3 (3.8)
All	1,108	1089 (98.2)	13 (1.2)	6 (0.6)
Significance		NS	<i>p</i> < 0.001	<i>p</i> = 0.016

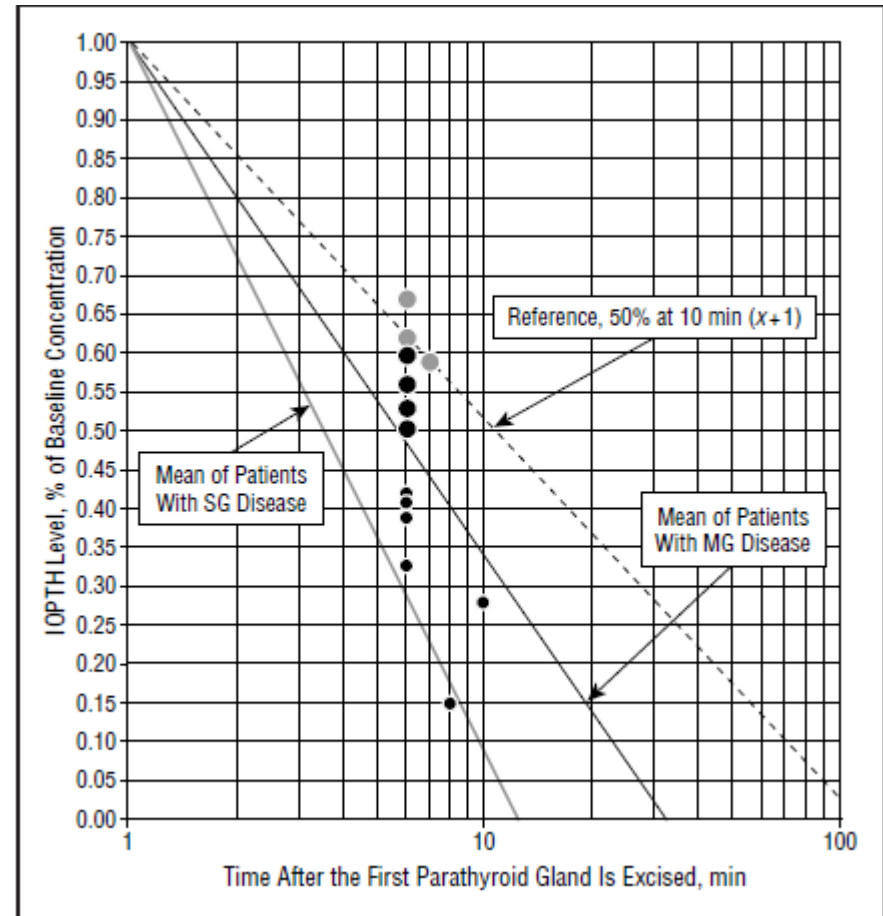
An Alternative Analysis of Intraoperative Parathyroid Hormone Data May Improve the Ability to Detect Multiglandular Disease

*Paul G. Gauger, MD; Michelle H. Mullan, MD; Norman W. Thompson, MD;
Gerard M. Doherty, MD; Keith A. Matz, BS; Barry G. England, PhD*

- Time-indexed IOPTH data better predicts multi-gland disease compared with using 50% decrease alone
- Increases true negative result rate
- Similar to data from other groups with same result (Libutti, et al. Surgery 1999)

What else does PTH tell us?

- Use of kinetic data better predicts single-gland and multi-gland disease
- Better depicts half-life of IOPTH



Where are we now?

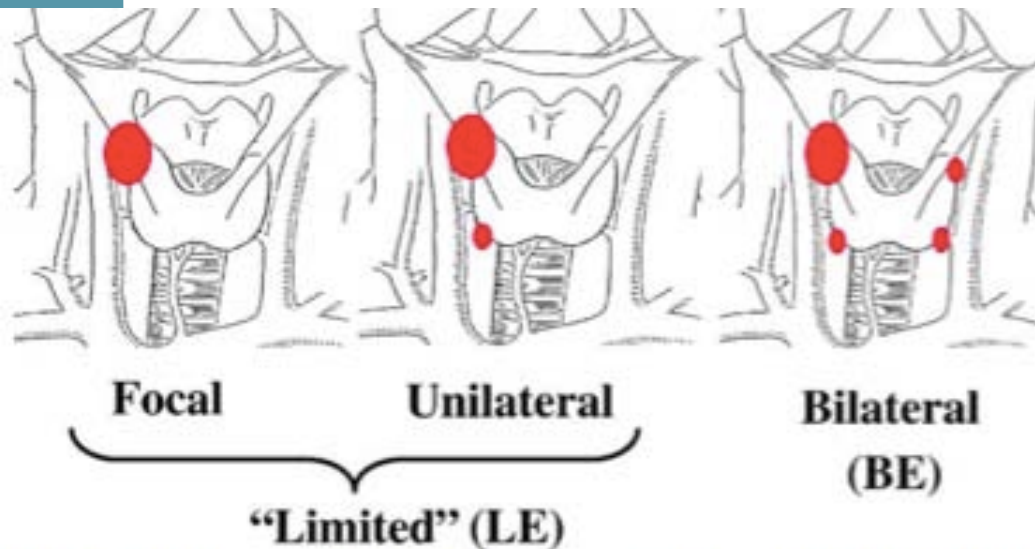


Figure 1. Three philosophical approaches to parathyroidectomy.

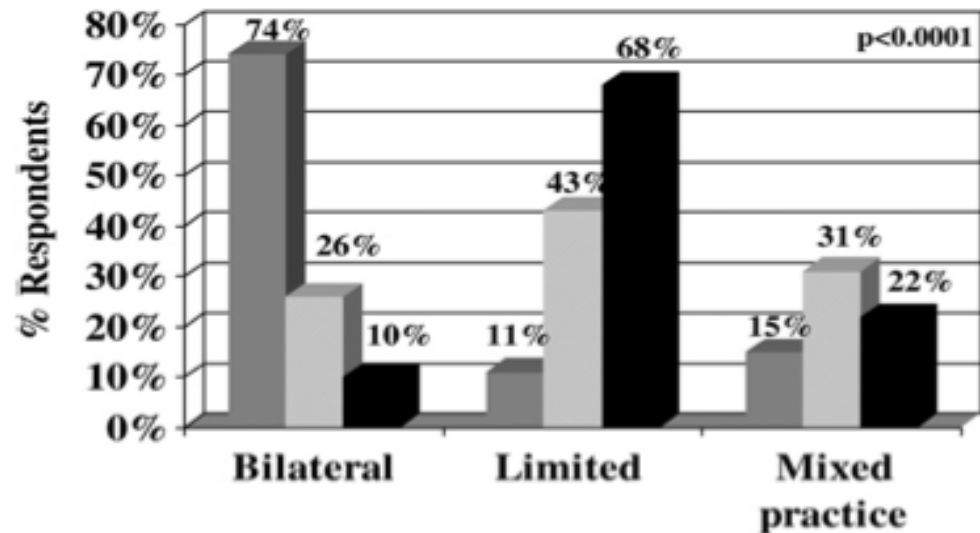


Figure 2. The shift in overall philosophy of practice with regard to parathyroid surgery from 1998 to 2008. Gray bar, 10 years ago; striped bar, 5 years ago; black bar, currently.

MIP

- Parathyroidectomy done through a small incision on the anterior neck
- Obtain preoperative localization—sestamibi, surgeon-performed ultrasound
- Use intraoperative PTH monitoring, same way every time
- Outpatient procedure
- +/- general anesthesia

Complications of Parathyroidectomy

- Bleeding - <1%
- Infection - <1%
- Hypocalcemia – Most if you did it right
 - Supplemental calcium +D
 - Calcitriol or IV calcium for severe symptoms
- Permanent hypoparathyroidism - <1%
- Failure/recurrence
 - Persistent hyperparathyroidism – 3%
 - Recurrent hyperparathyroidism – 2%

Medical treatment of hyperparathyroidism

- ****Consider parathyroidectomy first****
- Maintain hydration
 - Nephrolithiasis is uncommon in the elderly
- Avoid falls
- Bisphosphonates
 - Parathyroidectomy better in improving BMD
- Cinacalcet (Sensipar)
 - No increase in BMD
- Avoid thiazide diuretics
- Recheck calcium every 6 months

Thank You!!

