PRIMARY
HYPERPARATHYROIDISM:
OPERATIVE MANAGEMENT AND
PERIOPERATIVE ADJUNCTS

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CASE PRESENTATION

HPI

› 45 yo female
› Increased calcium level during evaluation for joint pain/arthritis
› W/U showed serum calcium **11.5** and PTH **147pg/ml** (Normal 11-67pg/ml)
› Otherwise asymptomatic
CASE PRESENTATION

- **PMH/PSH**
  - Arthritis
  - Tonsillectomy 1972

- **NKDA**

- **MEDS**
  - Naproxen
  - Flexeril
PHYSICAL EXAM

- Vitals within normal, no tachycardia
- Right thyroid nodule
- No lateral or paratracheal lymph nodes
- Otherwise completely normal
CASE PRESENTATION

○ WORK UP
  › TFTs- normal
  › Thyroid sonogram
  › FNA biopsy
  › Tc99m Sestamibi scan
CASE PRESENTATION

NECK SONOGRAM

Multiple nodules
Dominant nodule in the right lobe with internal vascularity

Left posterior nodule, mid-lobe, possibly exterior to the thyroid; R/O parathyroid lesion


CASE PRESENTATION

- FNA BIOPSY

  Left nodule- colloid nodule; nomalignancy
  Right nodule- follicular lesion with microfollicular pattern
CASE PRESENTATION

- **Tc 99m SESTAMIBI SCAN**

  Abnormal retention seen in the lower portion of the left thyroid lobe compatible with a **PARATHYROID ADENOMA**
CASE PRESENTATION
CASE PRESENTATION

○ Planned Operative Procedure

Left Parathyroidectomy with IOPTH measurement and a Right Thyroid Lobectomy with Frozen Section possibly Total Thyroidectomy.

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OPERATIVE FINDINGS

- **Baseline PTH 167**
- Standard Kocher incision
- 1-2cm intrathyroidal left upper parathyroid adenoma with a normal left lower parathyroid
- Left thyroid lobectomy
- 5mn postexcision PTH 7.8pg/ml
CASE PRESENTATION

OPERATIVE FINDINGS

- Right thyroid lobectomy
- Identification of 2 normal right parathyroid glands
- Frozen section- benign thyroid nodule
Gross Specimen

PT ADENOMA

THYROID LOBE

PT ADENOMA
CASE PRESENTATION

PATHOLOGY

› Left parathyroid adenoma (intracapsular)
› Left thyroid lobe- Occult sclerosing thyroid papillary microcarcinoma (1.5mm)
› Right lobe- Hyperplastic nodules
CASE PRESENTATION

POST-OPERATIVE COURSE

- Postoperative calcium decreased to 9.9
- Discharged on POD#1
OPERATIVE MANAGEMENT OF PRIMARY HYPERPARATHYROIDISM WITH REVIEW OF PERIOPERATIVE ADJUNCTS
WHEN TO OPERATE?

Symptoms

- Nephrolithiasis
- Declining renal function
- Severe hypercalcemia
- Hypercalcemic crisis
- Pathologic bone fractures
- Etc.
<table>
<thead>
<tr>
<th>Guidelines for Surgical Intervention in Asymptomatic Patients with PHPT Based on the National Institutes of Health Workshop</th>
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<tbody>
<tr>
<td>• <strong>Age &lt; 50 years</strong></td>
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<td>• <strong>Calcium ≥ 1 mg/dl above normal</strong></td>
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<tr>
<td>• <strong>24 hours urinary calcium &gt; 400 mg</strong></td>
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<tr>
<td>• <strong>Creatinine clearance reduced by 30%</strong></td>
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<tr>
<td>• <strong>Bone mineral density t score ≤ 2.5 any site</strong></td>
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<tr>
<td>• <strong>Failure of medical management</strong></td>
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WHAT TO DO?

CONVENTIONAL BILATERAL NECK EXPLORATION

MINIMALLY INVASIVE PARATHYROIDECTOMY AND UNILATERAL EXPLORATION
Conventional Bilateral Neck Exploration (BNE)

- Safe operation
- Cure rates 95% with low complication rates
- Identify all four glands before resection
- 15-20% ectopic/aberrant glands
- 20% intrathymic
Open and inspect the thyroid capsule; palpate thyroid; intra-op ultrasound

Dissect the superior thymic/paratracheal tissue; Cervical thymectomy

Mobilize the pharynx and esophagus to look in the Parapharyngeal and retropharyngeal spaces

Open the carotid sheath

Ligate the ipsilateral inferior thyroid artery and/or perform thyroid lobectomy
Minimally Invasive Parathyroidectomy and Unilateral Exploration (MIP)

- May be done under regional or local anesthesia
- 2.5-4 cm Kocher incision or lateral incision over border of SCM
- Needs preoperative localisation and IOPTH measurement and/or other adjuncts
BNE VS MIP

- Cure rate similar (96-98%)
- Complications similar (1.5-3%)
- MIP > BNE
  - Lower pain intensity and analgesia needs
  - Shorter scar length
  - Better cosmetic results up to 1 yr
  - Shorter hospital stays

INTRAOPERATIVE ADJUNCTS

- IOPTH measurement
- Radioguided PT Surgery (RGP)
- Methylene blue, FNA, IOTCL
Preincision baseline level

Propofol interferes with iPTH levels

Postexcision levels @ T+5mn, T+10mn and T+15mn

iPTH drop of > 50% from baseline at 10mn ⇒ successful extirpation of the disease

If drop < 50% or plateauing or increase ⇒ residual disease
IOPTH: Pitfalls in Interpretation

- **High pre-incision PTH ⇒ High T+5 and T+10**
  - expecting drops to normal ranges ⇒ \( \uparrow \)
  - false negatives

- **Pre-removal PTH levels**
  - Can be \( > \) pre-incision levels
  - Due to manipulation of the PT
  - Addition of Pre-removal levels increases sensitivity by using the higher baseline as reference (83-93% T+5; 87-97% T+10)

IOPTH: Pitfalls in Interpretation

- Difficult dissection with a lot of manipulation
- Multi-gland disease

Increase threshold to >70% drop from baseline?

Wait up to 30 mn post-excision with multiple PTH levels?

Radio-guided Parathyroid Surgery (RGP)

- 10-20mCi of T99m MIBI given 60-90mn before surgery
- Background count obtained before incision
- Gamma probe used to find tissue with high count intra-operatively
- Ex-vivo counts obtained

Counts ≥ 20% of background indicate parathyroid tissue.

Should be confirmed with IOPTH
### RGP: Origin of the 20% Rule (Murphy and Norman 1999)

<table>
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<th>Condition</th>
<th>Percentage of Background</th>
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<tr>
<td>Lymph nodes, normal parathyroid, fatty tissue</td>
<td>≤ 2.2%</td>
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<tr>
<td>Thyroid gland</td>
<td>≤ 5.5%</td>
</tr>
<tr>
<td>Parathyroid hyperplasia</td>
<td>7.5-16%</td>
</tr>
<tr>
<td>Parathyroid adenoma</td>
<td>≥ 20%</td>
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Based on their study of 1290 tissue specimen from 350 patients
The amount of radiation emitted is directly related to the size of the tissue.

Recent studies showed no difference between Hyperplasia and Adenoma in terms of percentage of background radiation.

Threshold may also be higher, up to 40% to signify diseased parathyroid.

Other Adjuncts

- **Methylene Blue**
  used in conjunction with RG P stains normal and abnormal PT glands
  7.5mg/kg in 500D5 started 60-90mn pre-op and adjusted to end before skin incision

- **FNA w/ iPTH measurement**
  Should be done ex-vivo due to risk of parathyromatosis
  Can be done in lieu of frozen section
A Comprehensive Evaluation of Perioperative Adjuncts During Minimally Invasive Parathyroidectomy. Which Is Most Reliable?

- Prospective trial
- 254 patients w/ PHPT
- Single surgeon/single institution
- 242 sestamibi scanning/12 thallium-Tc subtraction scan
- 252 RG P/254 IOPTH
- Overall cure rate 98%

Sensitivities of Sestamibi Scanning, RGP and IOPTH Testing

- Sestamibi: 84%
- RGP: 93%
- IOPTH: 99%
Positive Predictive Value of Sestamibi, RGP and IOPTH Testing

- Sestamibi: 81%
- RGP: 88%
- IOPTH: 99.60%
Accuracy of Sestamibi, RGP and IOPTH Testing

- Sestamibi: 72%
- RGP: 83%
- IOPTH: 98%
Intraoperative Monitoring of Kinetic Total Serum Calcium Levels in Primary Hyperparathyroidism Surgery

- Prospective, open single blinded study
- 35 patients
- All patients had preoperative sestamibi scanning
- 34 patients confirmed adenoma
- 2 patients had double adenomas
- Pre-incision samples and at T+5, T+10, t+15 and T+20mn
- iPTH, total calcium level (TCL), albumin and protein

RESULTS

- TCL dropped to normal at T+5mn
- 100% of patients and remained normal at 2 yrs follow up
- iPTH decreased by >50% at T+10
- iPTH decreased to normal at T+15
Conclusions

- IOTCL seems to be as reliable as iPTH
- Easy to perform
- Less expensive than PTH
- Further studies needed
SUMMARY

- MIP is becoming more and more the procedure of choice for PHPT
- Peri-operative adjuncts needed
- IOPTH measurement seems to be the most sensitive and accurate in detecting multi-gland disease
- Is there a role for IOTCL monitoring as a cheaper alternative to IOPTH?
REFERENCES

- **Roman S, Udelsman R.** Primary Hyperparathyroidism, in Cameron’s Current Surgical Therapy, 9th Edition
- **Slepavicius A, Beisa V, Janusonis V et al.** Focused versus conventional parathyroidectomy for primary hyperparathyroidism: a prospective, randomized, blinded trial. Langenbecks Arch Surg 2008; **393(5)**: 659-666
