The head and neck surgeon's role in the management of hypercalcemic crisis due to primary hyperparathyroidism

Michael Friduss, MD[1*]; Matthew Lando, MD[2*]; Alex Moskovitz, MD[2]; Bharat Pancholy, MD[2]; Julia Noel, MD[1];
Ayaka J. Iwata, MD[2]; Cassandra Puccinelli, MD[1]; Austin Hoke, BS[3]; John Peterson, MD[2]
[1]Department of Otolaryngology-Head and Neck Surgery, Stanford University School of Medicine, Stanford, California
[2]Department of Otolaryngology-Head and Neck Surgery, The Permanente Medical Group, Santa Clara, CA
[3]University of North Carolina School of Medicine, Chapel Hill, NC
*retired

Introduction

The head and neck surgeon may be consulted for emergency surgical management of patients admitted for severe hypercalcemia due to primary hyperparathyroidism. Patient care must be integrated between hospitalists, the anesthesia team, and the managing surgeon. The crisis can be associated with secondary dyselectrolytemia and metabolic acidosis which can greatly complicate any planned surgical intervention. A thoughtful approach for fluid resuscitation can mitigate additional metabolic disturbances. The surgeon must be fully aware of the increased risk of metabolic perturbations, ectopic target locations, and parathyroid cancer in this patient subset.

Methods

Four patients from two senior authors that demonstrate a range of pathologies which can cause parathyroid crises are reported. The clinical presentation, laboratory data and preoperative imaging studies were reviewed. The medical resuscitation protocol, the surgical findings, final pathology and postsurgical course are summarized

Case Legend

Case	Ca^{2+}	PTH	Pathology
1	15.3	1258	Double adenoma
2	16.0	1371	Parathyromatosis vs. Parathyroid carcinoma
3	19.2	813	Retropharyngeal adenoma
4	12.2	587	Parathyroid carcinoma

Case Summaries

Patient 1. Double Adenoma

- Normal saline-induced hyperchloremic acidosis and hemodynamic instability

Case Presentation

50 y.o. male admitted from ER w/ severe nausea & vomiting
- **Ca^{2+} 15.3 ; PTH 1258 Cr 3.46**
- Hospitalization - Tx- volume repletion followed by normal saline / furosemide diuresis, pamidronate
- Patient signed out AMA.

Readmitted 8 days later: Recurrent nausea & vomiting
- 9L urine output / 24 hours
- **nephrogenic diabetes insipidus due to hypercalcemia**

Urgent surgical preparation begins. Hypercalcemia treated w/ **normal saline diuresis**, calcitonin, and bisphosphonate with goal of Ca^{2+} <12 prior to induction of anesthesia

Labs morning of surgery
- Na 147 ; Potassium 3.8

ABG after induction of anesthesia
- **pH 7.11** ; pCO2 34

Patient **hypotensive** after induction of anesthesia

Bicarbonate drip started to correct anion gap acidosis → stabilized hemodynamic status and surgery successfully completed

Surgery





iOPTH	T_0	10	15	20	45	60	10	25
	1262	326	299	238	177	118	66	69

Operative findings

Left inferior parathyroid adenoma
- 4.2 x 2.4 x 1.2 cm
- 9.9 grams

Right superior parathyroid adenoma
- 1.5 x 1.2 x 0.4 cm
- 0.5 grams

Pathology: hypercellular

1 year post-op
- Ca^{2+} 8.7 ; PTH 105 ; Cr 1.36

Patient 2. Parathyromatosis and mediastinal adenoma

- 4 prior parathyroid surgeries

Surgical Hx

1994: Bilateral exploration
- R: 5x3 cm cystic mass adherent to thyroid extending from the superior pole into superior mediastinum

2010: Bilateral neck dissection
- Ca^{2+} > 19 ; PTH > 2000
- R: 2.1 cm cystic parathyroid mass
- L: 1.5 cm cystic parathyroid mass
- Biopsies and reimplanted into SCM

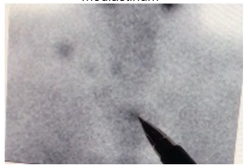
2011: Bilateral neck dissection
- Removal of innumerable parathyroid nodules

2014: Tx with Sensipar
- Ca^{2+} > 12

2015: Bilateral neck dissection
- > 20 tumors removed from R and L neck

2017: Bilateral exploration
- Ca^{2+} 16.0 ; PTH 903
- Mibi: uptake R neck and mediastinum
- Two nodules firm with cicatrix → surgeon concerned for parathyroid cancer

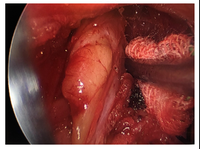
2017 imaging
Mibi scan: uptake in L lower neck and mediastinum



Gamma probe identifying **cervical** parathyroid lesion



Video assisted **thoracic** surgery showing **mediastinal** lesion



3 year post-op:
Ca^{2+} 9.1 ; PTH 326 ; Cr 2.0

Patient 3. Ectopic retropharyngeal parathyroid adenoma

Initial Presentation

63 y.o. female admitted w/ lethargy & constipation for 4 days
- Ca^{2+} 19.2 ; PTH 813 Cr 2.2
- Tx- volume repletion followed by normal saline / furosemide diuresis
- Pamidronate
- 2 Mibi scans performed: inconclusive
- D/c home eucalcemic

Readmission in 2 weeks in crisis URI/dehydration
- Ca^{2+} 19.2 ; PTH 755
- Brought to surgery for extensive exploration
  - Benign retropharyngeal parathyroid adenoma
- Final path: benign parathyroid adenoma

Postop Course
- Ca^{2+} 7.4 on POD 1
- Oral calcium treatment → Ca^{2+} 7.9
- D/c on POD 2
- **1 year post-op**
  - Ca^{2+} 9.1 ; PTH 9.0 ; Cr 1.27

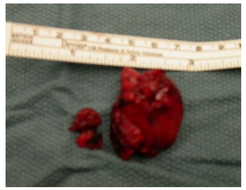
Patient 4. Parathyroid carcinoma

Case Presentation

69 y.o. male admitted w/ progressive lethargy
- Ca^{2+} 12.2 ; PTH 587
- Cr 2.2

Surgery
- Large tumor adherent to thyroid, extending into upper mediastinum
- Final path: parathyroid carcinoma





5 year post-op
- Ca^{2+} 8.8 ; PTH 39 ; Cr 1.95

Discussion

Hypercalcemic crisis is a life-threatening condition most commonly due to primary hyperparathyroidism.[1] Prior to 1960, hypercalcemic crisis had a high fatality rate due to lack of prompt medical therapy.[2,3]

Hyperparathyroidism crisis is characterized by a cycle of volume depletion leading to renal dysfunction/osmotic diuresis resulting in further volume contraction and hypercalcemia.[4]

The rate of calcium change determines the clinical presentation[8]:
- Renal dysfunction: polyuria, polydipsia (early), oliguric (late)
- GI symptoms: nausea, vomiting, constipation
- Neurologic symptoms: agitation, lethargy, coma

Initial Care[5]:
- Fluid resuscitation – Normal saline
  - Beware of hyperchloremic **metabolic acidosis**[6,7]
  - **Consider alternative fluids**
- Lowering of serum calcium
  - Lasix, Bisphosphonate, Calcitonin
- Maximize renal function

Imaging considerations: 4D CT may be contraindicated due to renal failure

Surgical delay may result in worsening of hypercalcemic relapse and life-threatening complications. Consider surgical intervention at initial hospitalization.[4]

Conclusions

- Volume expansion and lowering calcium priority
- First report - normal saline resuscitation causing hyperchloremic acidosis subsequent to treatment of hypercalcemia
- Monitor chloride and bicarbonate
- Consider urgent surgery at same hospitalization
- Surgical considerations
  - Ectopic parathyroid adenomas
  - Multiglandular disease
  - Parathyromatosis
  - Parathyroid carcinoma

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