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CASE REPORT

Possible prevention of hungry bone syndrome following parathyroidectomy by preoperative use of pamidronate

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A 73-year-old female was admitted to our institution after laboratory results during an outpatient follow-up visit for a longstanding hyperparathyroidism revealed a serum calcium concentration of 14.5 mg/dL.

She was diagnosed with primary hyperparathyroidism 8 years prior to current presentation. Throughout this time her serum calcium and intact PTH (iPTH) concentrations ranged from 10.2 to 15.0 mg/dL and 56.2 to 2000 pg/mL, respectively. She repeatedly refused parathyroidectomy and was treated with cinacalcet, 30 mg twice a day, for 2 months prior to admission without clear-cut improvement. Her relevant medications also included alendronate during the previous 6 years.

Her physical examination was unremarkable. Results of initial laboratory studies revealed calcium 13.9 mg/dL (normal range 8.6-10 mg/dL), phosphorus 4.1 mg/dL (2.6-4.5 mg/dL), albumin 3.5 g/dL (3.9-4.9 g/dL), alkaline phosphatase 158 U/L (30-125 U/L), and vitamin D 25-OH 9 ng/mL (20-100 mg/mL).

Treatment with normal saline intravenously was initiated and followed by furosemide diuresis. Cinacalcet was continued at a dose of 30 mg twice a day. Pamidronate, 30 mg, was administered intravenously. Five days later two more doses of pamidronate, 30 mg each, were administered intravenously for a cumulative dose of 90 mg. On day 7 of hospitalization patient was discharged with serum calcium concentration of 11.2 mg/dL.

Two weeks later the patient was readmitted with symptoms similar to the first admission. Her serum calcium concentration was 14.6 mg/dL. She received one dose of pamidronate, 90 mg, intravenously. At this point she agreed to undergo parathyroidectomy. Parathyroid scan was consistent with parathyroid adenoma in the posterior left lower pole of the thyroid gland.

An adenoma weighing 419 mg was excised from the area of the left inferior thyroid region. Pathologic evaluation confirmed parathyroid adenoma. Intraoperative intact PTH measurements are shown in Table 1. Serial determinations of serum calcium, phosphorus, and albumin are shown in Table 2.

DISCUSSION

Hungry bone syndrome is a consequence of parathyroidectomy manifested by severe and prolonged, sometimes life-threatening, hypocalcemia. The incidence of this entity is approximately 12%.[1] This syndrome is related to a sudden decrease in PTH release and attenuation of its effect on bone's contribution to serum calcium concentration. Features predictive of development of the hungry bone syndrome are high serum calcium, elevated serum alkaline phosphatase, and mean PTH concentrations of 95.8 ± 16.8 pg/mL or higher, as well as size of adenoma and patient's mean age of 61.0 ± 2.9 or older.[1]

Bisphosphanates inhibit osteoclast-mediated bone resorption. Since bone formation is coupled with bone resorption by products from the resorbed matrix and from osteoclasts themselves, administration of bisphosphonates may lead to inhibition of bone formation/mineralization[2] and prevention of hungry bone syndrome.

The first report describing the use of bisphosphonates to prevent hungry bone syndrome[3] involved a 62-year-old woman with severe hyperparathyroidism (iPTH 1271

Table 1
Intraoperative intact PTH concentrations

Time after resection of adenoma	0 (pre-op)	1 min	4 min	6 min	17 min
Intact PTH (pg/mL) (reference range 10-69 pg/mL)	2332	2070	215	130	31

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Table 2
Serial determinations of serum calcium, phosphorus, and albumin concentrations

Factor	Reference range	Day 1 pre-op	post-op	Day 1 post-op	Day 2 post-op	Day 3 post-op	Day 15 post-op	Day 104 post-op
Calcium (mg/dL)	8.6-10.0	12.2	12.3	9.8	9.5	11.1	9.1	9.8
Phosphorus (mg/dL)	2.6-4.5	2.4	2.8	2.6	2.7	2.0		
Albumin (g/dL)	3.9-4.9	3.5					4.4	

ng/L) and hypercalcemia who received a total of 60 mg of intravenous pamidronate prior to parathyroidectomy. A 4.6-g adenoma was resected. There was no postoperative hypocalcemia. The authors speculated that inhibition of bone mineralization by pamidronate might have reduced the uptake of calcium into the bone.

Another study[4] retrospectively reviewed medical records in order to determine postoperative effect of preoperatively administered bisphosphonates on serum calcium levels following parathyroidectomy. Two groups of patients were identified: 9 patients (group 1) had hungry bone syndrome, 14 patients (group 2) did not. Out of the 14 patients in the latter group, 6 had received bisphosphonates prior to surgery. None of the patients from group 1 had received preoperative treatment with bisphosphonates.

Our patient had fulfilled several proposed criteria for the development of hungry bone syndrome. She was also treated with a calcimimetic, cinacalcet, which was shown to be associated with this syndrome.[5] Despite her age, elevated alkaline phosphatase levels, very high circulating PTH concentrations, and cinacalcet use, she was able to avoid this complication.

It also needs to be acknowledged that chronic use of alendronate by our patient could be a confounding factor in the aforementioned outcome, although we were not able to find any literature on the effects of alendronate therapy on hungry bone syndrome. Because severe hypercalcemia in our patient developed in spite of the use of alendronate, its effectiveness in reducing bone resorption sufficiently to prevent hungry bone syndrome in our patient is doubtful.

In conclusion, as suggested by our case and several other cases in the literature, preoperative administration of pamidronate may be beneficial in preventing hungry bone syndrome. Prospective randomized studies are needed to resolve this question definitively.

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AUTHOR CONTRIBUTIONS

Yuriy Gurevich, data collection, writer; **Leonid Poretsky,** data collection, adviser.

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None.

DISCLOSURE

Institutional Review Board at authors' institution does not require approval of case reports.

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