

Hyperparathyroid Crisis in a Patient with a Giant Brown Tumor of the Iliac Bone: a Case Report.

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ABSTRACT

We observed a patient with a giant brown tumor of the iliac bone due to hyperparathyroidism. There was a risk of pathologic fracture due to huge cysts produced by bone absorption. In hyperparathyroid crisis, control of severe hypercalcemia is difficult without resection of the parathyroid gland.

Key words: *Brown tumor, Hyperparathyroid crisis, Hypercalcemia*

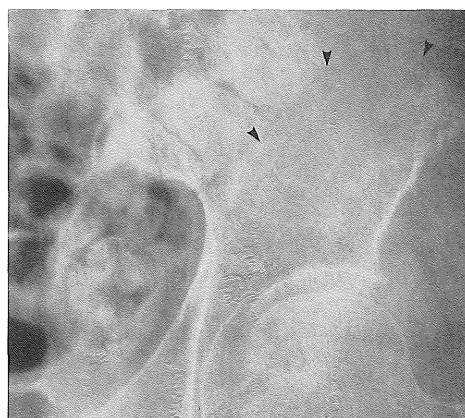
Patients with primary hyperparathyroidism and severe hypercalcemia who do not respond to drug administration are diagnosed as having hyperparathyroid crisis, which has previously been described as parathyroid storm, parathyroid intoxication, or acute hyperparathyroidism. Hyperparathyroid crisis occurs only in 1% to 3% of patients with hyperparathyroidism^{6,8)} who undergo surgical resection of tumors of the parathyroid gland.

Hyperparathyroid crisis is difficult to treat because many patients with hyperparathyroidism have a relatively high serum calcium level, but are without evidence of the acute symptoms of hyperparathyroid crisis, making detection of hyperparathyroidism difficult before onset of the crisis. The mortality rate for patients with hyperparathyroid crisis who have not undergone surgical resection of the parathyroid tumor is approximately 100%. The electrolyte balance can be recovered by resection of the parathyroid tumor, but bone lesions heal slowly. Huge cysts induced by bone absorption increase the risk of secondary pathologic fractures.

We treated a patient with hyperparathyroid crisis secondary to an adenoma of the parathyroid gland. The patient had been referred to our hospital for examination of the tumorous lesion in her left iliac bone. Here, we review the clinical features of hyperparathyroid crisis and the radiological findings of the patient.

CASE REPORT

A 47-year-old woman was referred to our hospital with a 3-month history of pain in the left buttock and weakness in the grip power of both hands. The latest menstruation was 3 weeks before admission. On arrival at the hospital, she was



1-A



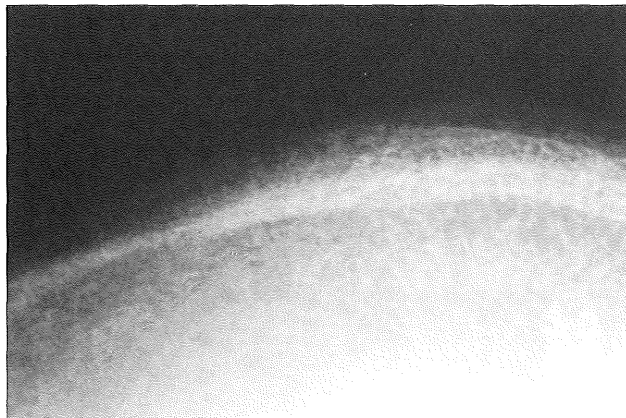
1-B

Fig. 1-A and 1-B. A huge bone tumor was seen in the left iliac bone and the cortex was destroyed.
1-A: plain radiograph on admission (arrow heads indicate the lesion).
1-B: Computed tomography on admission.

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2-A



2-B

Fig. 2-A and 2-B. Plain radiograph upon admission.

2-A: Osteitis fibrosa was seen on the left metacarpal bone.

2-B: The cortex of the skull was absorbed.

conscious but had severe anorexia, constipation, nausea, and vomiting. Plain radiographs showed a huge osteolytic tumorous lesion in the left ilium and the pubis (Fig. 1-A). Osteitis fibrosa was radi-

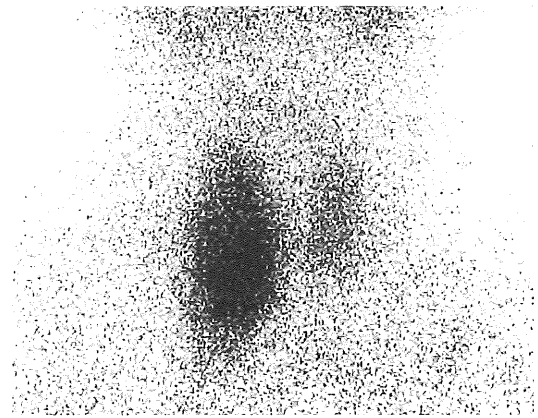


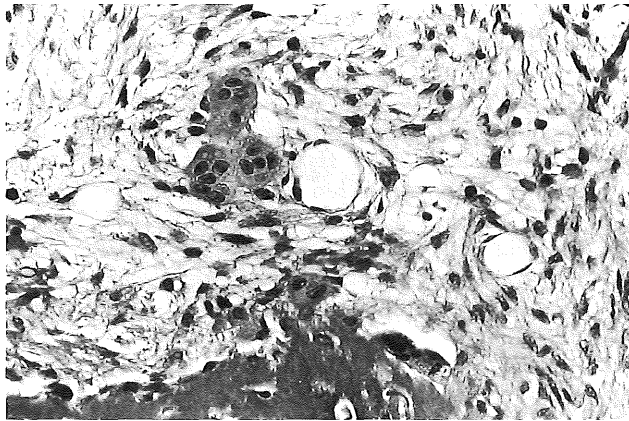
Fig. 3. A giant adenoma (3.5 by 3.0 cm) was observed at the inferior position of the right parathyroid by ^{201}Tl scintigraphy.

ologically observed throughout the whole body. (Figs. 2-A and 2-B). The size of the tumorous lesion was 16×7.5 cm. A coronal T1-weighted magnetic resonance image, which was made after injection of gadolinium-diethylenetriaminepentaacetic acid, showed a low signal intensity mass in the left ilium. Computed tomography showed destruction of the cortex of the iliac bone (Fig. 1-B). A bone scan revealed hot spots in the left hip, the neck of the left femur, and the left clavicle. A high uptake of the isotope (^{201}Tl) (3.5×3.0) was detected in the parathyroid gland by scintigraphy (Fig. 3) and a giant adenoma by ultrasonography.

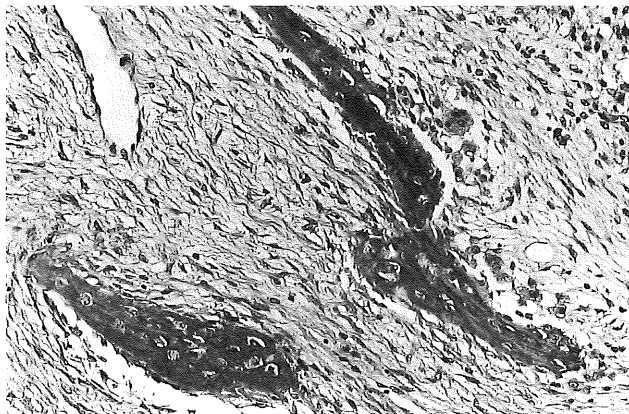
The serum biochemical markers are summarized in Table 1. The serum levels of intact parathyroid hormone (PTH) and calcium were extremely high. Bone mineral density (BMD) at the lumbar vertebrae was shown to be 0.434 g/cm^2 (Z score: -4.29 SD) by dual-energy X-ray absorptiometry (DXA) using a Hologic QDR-1000 densitometer (Biologic

Table 1. Biochemical measurements before and after surgery

	Admission	2 months after surgery	11 months after surgery	Normal range
Ca (mg/dl)	20.1	7.6	6.2	8.0–9.5
IP (mg/dl)	2.9	2.1	2.7	2.5–4.6
ALP (IU/liter)	598	711	364	41–127
BUN (mg/dl)	40.2	19.3	22.0	8.0–22.0
TP (g/dl)	7.04	6.91	—	6.5–8.0
intact PTH (pg/ml)	1000 <	120	360	15–50
C-PTHrP (MPmol)	43.9	—	—	13.8–55.3
1,25(OH) $_2$ D (pg/ml)	< 5.0	51.9	86.4	20–60
25 (OH)D (ng/ml)	6	7	7	10–55
osteocalcin (ng/ml)	310	66	27	2.5–13
IL-1 β (pg/dl)	< 10	< 10	< 10	< 30
IL-6 (pg/dl)	37.6	2.3	1.5	< 4.0
Pyr (mmol/mol/Cr)	835	345	72	13–36
Dpyr (mmol/mol/Cr)	158	39	8	< 7
L1-L4 BMD (g/cm^2)	0.434	0.450	0.536	0.910–1.102



4-A



4-B

Fig. 4-A and 4-B. Histological findings of a brown tumor.

4-A: Giant cells can be seen in a fibrous stroma.

4-B: Fibrous tissue fills the defect seen on plain radiographs.

Inc., Waltham, MA, USA).

The patient was hydrated intensively with normal saline solution (2500 ml), furosemide (20 mg), KCl (6 mol), and calcitonin (80 IU) everyday for 4 weeks. Simultaneously, bisphosphonate (45 mg per week) was administered intravenously. After 4 weeks of treatment, her serum calcium level decreased to 12.4 mg/dl, but it was still beyond the upper limit of the normal range.

Resection of the parathyroid gland including adenoma was performed and the biopsy sample was obtained from the iliac lesion one month after admission. The histological diagnosis was adenoma of the parathyroid gland and brown tumor of the left iliac bone (Figs. 4-A and 4-B). After resection of the adenoma of the parathyroid gland, the serum calcium level returned to normal in one day. The nausea, vomiting, and pain in the left iliac lesion disappeared completely. Menstruation began at 4 months after the previous period.

DISCUSSION

Several cases of hyperparathyroid crisis have been reported⁵⁻⁷⁾ since the report of Hanes in 1939³⁾. The most dangerous, life-threatening condition in hyperparathyroid crisis is hypercalcemia^{1,5)} accompanied by a markedly elevated serum level of parathyroid hormone. The osteitis fibrosa throughout the body and local brown tumors indicate the effect on the bone. Levine et al⁴⁾ defined a brown tumor as a focal, bony lesion of hyperparathyroidism caused by parathyroid hormone on bone increasing osteoclastic activity with bone resorption and trabecular fibrosis. This leads to microfractures, hemorrhage, and finally to the appearance of brown tumors. The operation on the patient was successful and, although hypercalcemia improved after resection of the adenoma, she was not permitted to walk unaided for 3 months to prevent pathologic fracture due to the huge brown tumor at the left iliac bone. At 11 months after the operation, the patient could walk with a cane and without coxalgia. Plain radiographs showed a slow decrease in the size of the brown tumor and gradual recovery of bone mass. The BMD of the lumbar spine increased 23.5%, but it was still lower than the normal range (Z score: - 3.17 SD) and recovery was slow⁸⁾.

In the bone absorption markers, the urinary levels of pyridinoline and deoxypyridinoline were high and in the bone formation marker, the serum level of osteocalcin was also high. This high turnover may be explained by the fact that osteoblasts have receptors of PTH, but not osteoclasts. Thus bone was absorbed by the osteoclasts after activation of the osteoblasts. A significant increase of bone resorption represents a high serum level of IL-6. In this patient, the concentration of IL-1 β was low in blood. This was because IL-1 β may not have been measured accurately due to the short half-life in blood. Brossard et al²⁾ reported a low level of 1,25(OH) $_2$ D in patients with the most severe form of the disease. They suggested that higher levels of serum calcium concentration inhibit renal hydroxylation of 25(OH)D, and that PTH could not stimulate 1,25(OH) $_2$ D synthesis. This would explain the low levels of 1,25(OH) $_2$ D and 25(OH)D in our case.

In the biochemical markers, the high turnover of bone was improved after resection of the lesion, the serum levels of calcium became lower, but the serum levels of intact PTH were still higher than the normal level. The latter may be a rebound phenomenon in the course of healing.

As patients with local pain and abnormal bone shadows may have hyperthyroidism, the orthopedic surgeon should check the serum calcium level of the patient. When hypercalcemia continues and is resistant to conservative therapies, it may lead

to a hyperparathyroid crisis and parathyroidectomy is subsequently required.

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