

Primary hyperparathyroidism

A rare cause of spinal cord compression

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ABSTRACT

We report a case of a 62-year-old postmenopausal hypertensive lady who was treated for osteoporosis with calcium and Vitamin D. She presented with progressive lower limb weakness and paresthesia with sensory level at T4. Investigations revealed high parathyroid hormone 1152 ng/dl, calcium 10.9 mg/dl, and low phosphorus of 2.4 mg/dl after stopping calcium supplement. Chest x-ray showed an expansile mass lesion of the right 6th rib confirmed by chest CT. Thoracic MRI showed a mass lesion extending from the T3 vertebral body and compressing the spinal cord. There were multiple lytic lesions of the scalp, ribs, femur, and pelvis suggesting metastatic lesions. A neck ultrasound and SESTA MIBI parathyroid scan confirmed a right lower parathyroid adenoma. Excision biopsy of the rib lesion confirmed a vascular lesion with features of brown tumor (BT). Decompression surgery of the thoracic spine was performed, and the histopathology confirmed BT. Two weeks later the patient underwent right parathyroidectomy that proved to be a parathyroid adenoma. She showed a remarkable improvement in her clinical condition and there were some regression of the bony lesions observed 12 months post parathyroidectomy. This case should alert physicians to the association of multiple brown tumors in PHPT and that the presentation may be an aggressive one mimicking metastasis, patients with osteoporosis warrant at least calcium profile to rule out a secondary cause.

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The parathyroid glands are primarily responsible for maintaining extra cellular calcium concentrations through the secretion of parathyroid hormone (PTH). Hyperparathyroidism is a disease characterized by excessive secretion of PTH.¹ The main effects of PTH are to increase the concentration of plasma calcium by increasing the release of calcium and phosphate from the bone matrix, increasing calcium reabsorption by the kidney, and increasing renal production

of 1, 25-dihydroxyvitamin D-3 (calcitriol), which increases intestinal absorption of calcium.¹ Thus, overproduction of PTH results in elevated levels of plasma calcium. Parathyroid hormone also causes phosphaturia, thereby decreasing serum phosphate levels.^{1,2} Primary hyperparathyroidism (PHPT) is a common disorder causing hypercalcemia and bony metabolic disturbances. Most recently, the prevalence of PHPT is reported to be approximately 4 cases in 100,000 persons.² Women are being affected approximately twice as frequently as men. Prevalence increases with age, but can affect persons of all ages, including children. The incidence of brown tumors in patients with PHPT is 1.5-1.7%.³ Osteitis fibrosa cystica (OFC) that represents the end stage of bone erosion and the deossification process during PHPT is rare nowadays; nevertheless in our part of the world we still encounter advanced cases of OFC of PHPT.⁴ Brown tumors can affect any part of the skeleton,^{3,5-7} however, only few cases of spinal involvement have been reported.⁸⁻¹¹ We herewith report a case of multi-focal brown tumor with spinal involvement causing spinal cord compression and describing the management and favorable outcome of this case.

Case Report. A 62-year-old postmenopausal lady was referred to our service for management from rehabilitation service with progressive weakness of lower limbs and paresthesia of both feet. She was unable to climb stairs and to get up from a squatting position without help. She

was maintained on calcium carbonate and one alpha D3 supplement as part of osteoporosis treatment. The history started with left loin pain; urinalysis showed abundant red blood cells and urine culture revealed *Escherichia coli*. Renal ultrasound showed mild to moderate hydronephrosis of left pelvicaliceal system and the intravenous uroterogram proved a kidney stone of left pelviureteric junction with proximal hydro-ureter and hydronephrosis. She then passed a stone and the pain resolved, revision of her tests at that time showed that calcium was high 12.4 mg/dl (normal 8.5-10.2 mg/dl) and low phosphorus (PO₄) 2.1 (normal 3.1-4.3 mg/dl) and alkaline phosphatase (ALP) 636 (normal 90-290 IU). She has a history of hypertension on Enalapril 20 mg/ twice daily and Furosemide 40 mg once daily and has been menopausal for 8 years. She indeed had a waddling gait, proximal myopathy, and generalized bony aches and pains. There was a sensory level up to T4 level; and there was a mass like lesion over the right 6th rib on clinical examination. Laboratory results showed high calcium 10.7 mg/dl and low PO₄ at 2.9 mg/dl after stopping calcium supplements for 2 months and high alkaline phosphatase (436), normal total protein and albumin level, chloride was elevated at 107 mEq. The PTH was markedly elevated >1000 pg/ml on 2 occasions (normal 25-52). She had a mild

normochromic normocytic anemia with hematocrit of 35%, otherwise, a normal blood count; the erythrocyte sedimentation rate (ESR) was 31 mm/hr. Her kidney and liver function tests, lipid profile and thyroid function test were normal, both pyrilink-D (15.7, normal 3-7.4 nmol/mg/creatinine) and osteocalcin (>100 ng/ml; normal: 3-13.7) were elevated. Radiological investigations revealed an expansile mass lesion of the right 6th rib (**Figure 1a**) and multiple osteolytic lesions of the scalp, ribs, pelvis rami and both femur bones (**Figures 1b & c**). These lesions were confirmed further by bone isotope scan, which suggested metastatic lesions versus metabolic process. The right rib lesion was excised to rule out metastasis that will divert the clinical management of the case; the histopathological diagnosis did not reveal malignancy and revealed a vascular lesion of brown tumor (**Figure 2a**). Her lower limb weakness and sensory level was more pronounced at this stage, and there was an absent knee and ankle reflexes, the planter reflex was mute, lower limb muscle power was 4/5, and there was no sphincter dysfunction. Thoraco-lumbar MRI confirmed an expansile lesion at T3 level acutely compressing the spinal cord (**Figure 3a**). Exploration by a neurosurgeon found a fleshy and vascular mass lesion involving the lamina of T2,3 the pedicles and the facets of T3 compressing the spinal cord extending from the

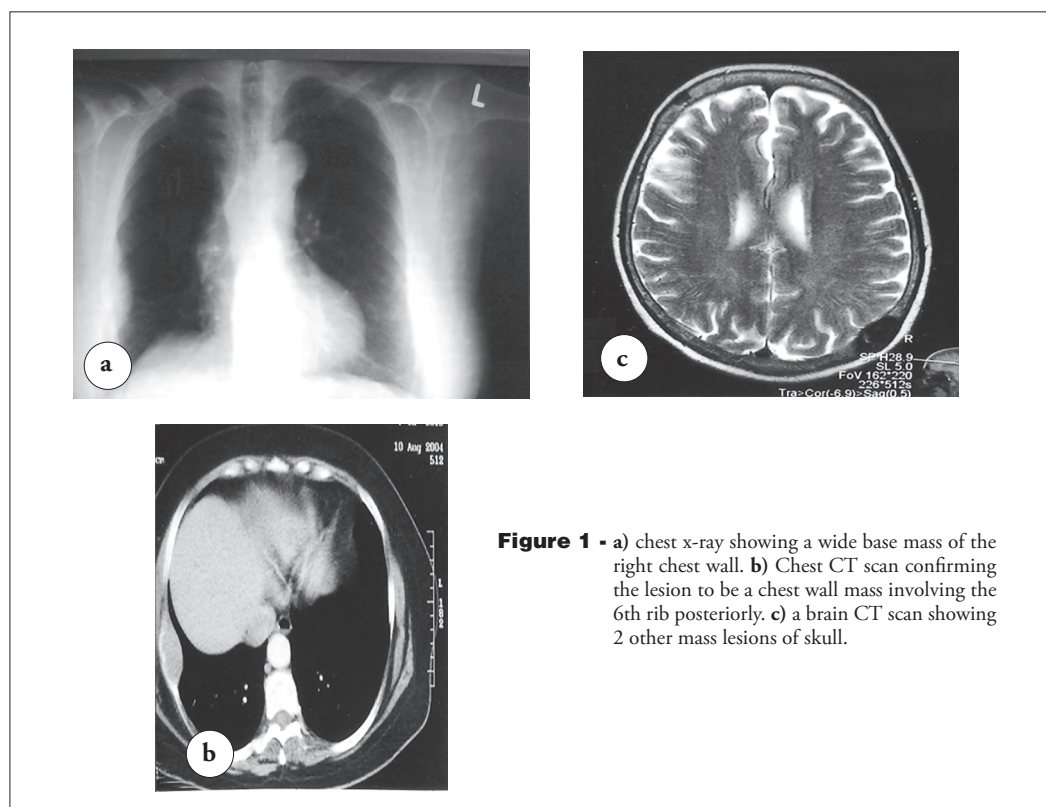


Figure 1 - a chest x-ray showing a wide base mass of the right chest wall. **b** Chest CT scan confirming the lesion to be a chest wall mass involving the 6th rib posteriorly. **c** a brain CT scan showing 2 other mass lesions of skull.

vertebral body inward. The inner portion of the lesion was excised with relief of compression (**Figure 3b**). The histopathology again confirmed vascular tumor of brown type lesion. There was an immediate improvement in muscle power (5/5) along with improvement in sensory function and normalization of the reflexes. Two weeks later the calcium level was still high with high PTH. Parathyroid SESTA MIBI isotope scan confirmed a parathyroid adenoma of the right inferior parathyroid gland. She underwent minimally invasive right inferior parathyroidectomy by an experienced surgeon; the histological diagnosis confirmed parathyroid adenoma (**Figure 2b**). The patient was given calcium supplements and vitamin D immediately post surgery for acute symptomatic hypocalcemia and showed dramatic improvement in her symptoms and biochemical findings with normalization of her PTH/calcium profile (**Table 1**). Follow up MRI of the spine showed a stable T4 vertebral body lesion with some regression of the bony lesion and no spinal compression (**Figure 3b**).

Discussion. Primary hyperparathyroidism is a common disease.^{1,2} The most frequent presentation is the incidental finding of hypercalcemia, brown tumors (BT) are seen in less than 5% of hyperparathyroidism case, nevertheless, we still encounter advanced bony lesions, mainly in the looser zones.⁴ The association of brown tumor with PHPT is recognized but is more commonly seen with secondary HPT and in patients on hemodialysis.^{8,11} There are few reports of spinal compression, and most are associated with secondary HPT on hemodialysis.^{8,11} Only a few cases of spinal cord compression due to PHPT have been reported so far.^{10,12,13} Because hyperparathyroidism is treated before such lesions develop, they are now uncommon. Clinically, brown tumors most often manifest as slowly growing, painful masses. They are rarely associated with complications, but occasionally may compress neural structures as they enlarge.¹⁴ These tumors can occasionally behave aggressively and can be destructive

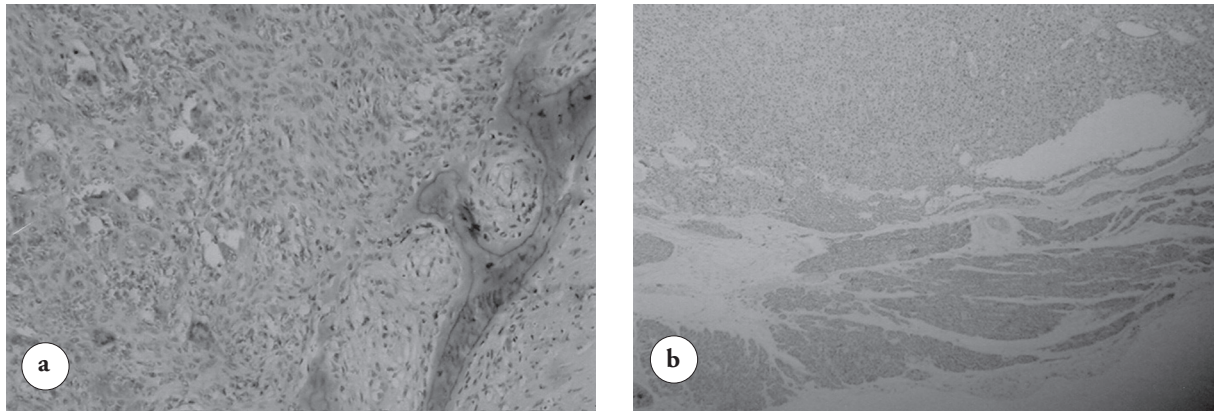


Figure 2 - a) Hematoxylin and eosin x40 stains of the 6th rib lesion showing a vascular tumor suggestive of brown tumor. b) parathyroid adenoma; monotonous cell line of parathyroid adenoma.

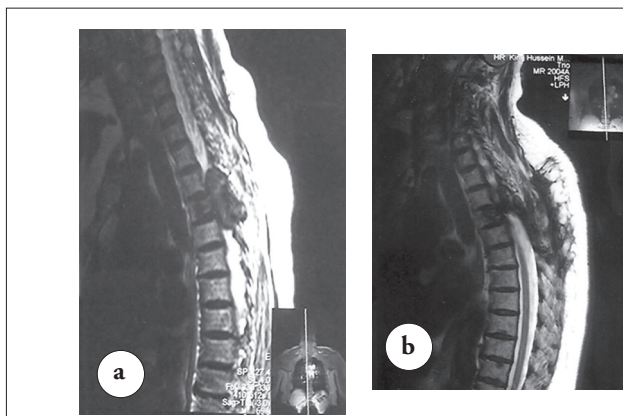


Figure 3 - a) Thoracic spine MRI showing a large mass lesion compressing the spinal cord at T3 level. b) Post operative thoracic spine MRI showing remnant lesion of the vertebral body with no spinal cord compression.

Table 1 - Shows the natural follow up of the calcium, alkaline phosphatase and parathyroid hormone level over period of follow up

Biochemical findings	Dec 2003	Jul 2004	Aug 2004	Oct 2004	Nov 2004	Feb 2005	Jul 2005	Dec 2005
Calcium (8.5-10.2 mg/dl)	12.4	10.1	12.3	7.9	6.7	8.1	9.7	9.1
Alkaline phosphatase (90-290 IU)	636	929	707	565	655	143	197	188
Parathyroid hormone (25-52 pg/ml)		1182	1300		106	52.8	72.6	52.7

and multiple mimicking metastases.^{7,8,15-17} Only compressive brown tumors associated with neural impairment may require surgical removal. Removal of the parathyroid adenoma eliminates excessive activation of the parathyroid hormone and usually leads to significant regression of small and medium-sized brown tumors.¹⁵ The improvement in neurological findings immediately after surgical decompression of the spinal cord indicates that the compression by brown tumor rather than the hypercalcemia was the cause of these neurological abnormalities, as parathyroidectomy and resolution of hypercalcemia took place 2 weeks later. This lady underwent 3 major surgeries in less than one month because of confusion with metastatic lesions, which is not uncommon to be mistaken for.¹⁵ This presentation should raise the index of suspicion and PHPT should be included in the differential diagnosis of wide spread metastasis mainly if PTH and calcium levels are raised. The management of this case illustrates the need for a multidisciplinary team approach of similar cases and the collaboration between surgeons and endocrinologists. Long term follow up of these cases should be adopted to assess the regression of such lesions despite the reports of regression of these lesions in the first 3-6 months.

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