online © ML Comm
www.jkns.or.kr http://dx.doi.org/10.3340/jkns.2015.58.4.389
Print ISSN 2005-3711 On-line ISSN 1598-7876
J Korean Neurosurg Soc 58 (4) : 389-392, 2015

Case Report

Brown Tumor of the Thoracic Spine : First Manifestation of Primary Hyperparathyroidism

Erkin Sonmez, M.D.,[1] Tugan Tezcaner, M.D.,[2] Ilker Coven, M.D.,[3] Aysen Terzi, M.D.[4]

Departments of Neurosurgery,[1] General Surgery,[2] Pathology,[4] Baskent University School of Medicine, Ankara, Turkey
Department of Neurosurgery,[3] Baskent University Konya Training and Research Hospital, Konya, Turkey

Brown tumors also called as osteoclastomas, are rare nonneoplastic lesions that arise in the setting of primary or secondary hyperparathyroidism. Parathyroid adenomas or hyperplasia constitute the major Brown tumor source in primary hyperparathyroidism while chronic renal failure is the leading cause in secondary hyperparathyroidism. Most of the patients with the diagnosis of primary hyperparathyroidism present with kidney stones or isolated hypercalcemia. However, nearly one third of patients are asymptomatic and hypercalcemia is found incidentally. Skeletal involvement such as generalized osteopenia, bone resorption, bone cysts and Brown tumors are seen on the late phase of hyperparathyroidism. The symptoms include axial pain, radiculopathy, myelopathy and myeloradiculopathy according to their locations. Plasmocytoma, lymphoma, giant cell tumors and metastates should be ruled out in the differential diagnosis of Brown tumors. Treatment of Brown tumors involve both the management of hyperparathyroidism and neural decompression. The authors report a very rare spinal Brown tumor case, arisen as the initial manifestation of primary hyperparathyroidism that leads to acute paraparesis.

Key Words : Brown tumor · Primary hyperparathyroidism · Spine · Treatment.

INTRODUCTION

Brown tumors (BTs), also called as osteoclastomas, are rare nonneoplastic lesions that arise in the setting of hyperparathyroidism[3,19]. Hyperparathyroidism is overactivity of the parathyroid glands resulting in excess production of parathyroid hormone (PTH). PTH regulates calcium and phosphate metabolism of the body[3]. Excessive PTH secretion may be due to problems in the parathyroid glands such as adenomas, hyperplasia or carcinoma. This is known as primary hyperparathyroidism[3,19]. However, it may also occur in response to low calcium levels in such conditions as vitamin D deficiency or chronic renal disease that is known as secondary hyperparathyroidism[3,19]. BTs can arise as solitary or multiple lesions of any bone, more common in extremities, clavicle, ribs and pelvis. Spinal involvement is very rare[1-20].

In this study, we report a rare thoracic BT case that occured in the setting of primary hyperthyroidism. Tumor was treated succesfully by cooperation of endocrinology, general surgery and neurosurgery departments.

CASE REPORT

50-year-old man was admitted to our neurosurgery department with the chief complaint of difficulty in standing and walking due to leg weakness for nearly 2 days. He also described back pain while sitting and standing. Neurological examination demonstrated paraparesis with impaired anal sphincter tonus. He had no history of trauma or any systemic illness.

Thoracic magnetic resonance imaging (MRI) and computerized tomography (CT) revealed expansile mass lesion that was compressing the spinal cord at T9 level. Homogenously enhancing mass lesion was found to originate from the anterior portion of the spinous process and both laminas of T9 vertebra (Fig. 1). Routine blood tests were uneventful except a calcium value of 14.3 mg/dL (8.4−10.2). As blood parathormone (PTH) test also revealed a very high value of 547.45 pg/mL (15−68.3), endocrinology consultation was ordered to rule out primary hyperparathyroidism. Neck sonography demonstrated hyperplasia and multiple nodules on the thyroid gland. However, any cystic or solid pathologic lesion compatible with adenoma were not seen on the parathyroid regions. Parathyroid scintigraphy with Tc-99m

• Received : October 29, 2014 • Revised : March 20, 2015 • Accepted : March 23, 2015
• Address for reprints : Erkin Sonmez, M.D.
Department of Neurosurgery, Baskent University School of Medicine, Ankara, Turkey
Tel : +90 3122126868/1080, Fax : +90 3122237333, E-mail : erkinso@gmail.com

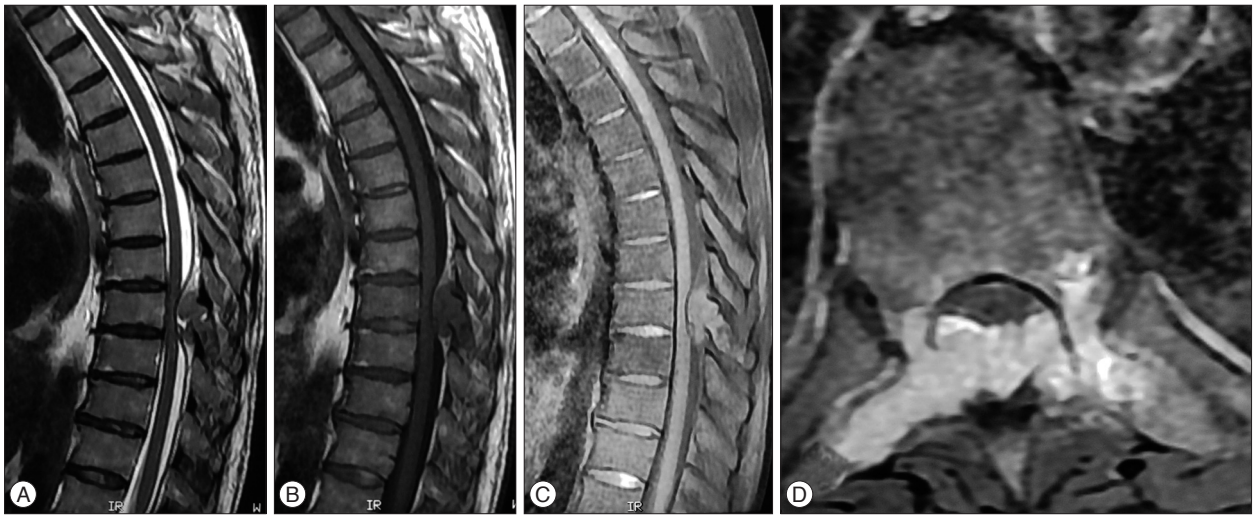

Fig. 1. Sagittal T2W (A), sagittal T1W (B), sagittal T1W postcontrast (C) and axial T2W MR (D) images showing an expansile mass lesion that was compressing the spinal cord at T9 level. Homogenously enhancing mass lesion was found to originate from the anterior portion of the spinous process and both laminas of T9 vertebra.

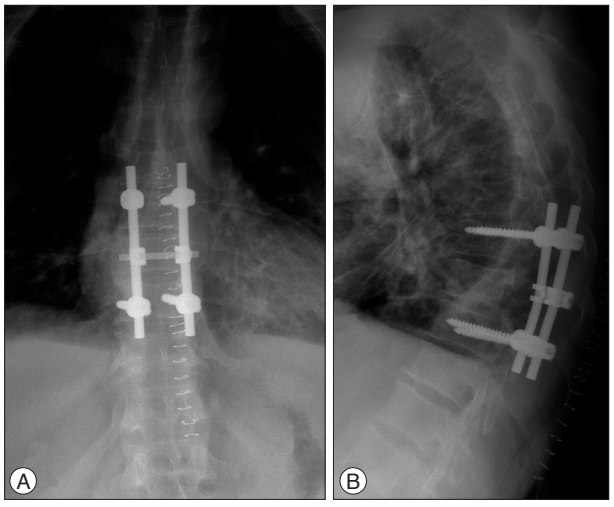

Fig. 2. AP (A) and lateral (B) X-Ray images demonstrate a short segment spinal instrumentation and fusion with transpedicular screws and rods at the level of T8–10.

MIBI revealed focal activity retention on the inferior portion of the right thyroid lobe. Abdomen and thorax CT were uneventful. Endocrinology department insisted for the urgent parathyroidectomy in order to minimize hypercalcemia-related complications. So, patient with the diagnosis of primary hyperparathyroidism underwent surgery for parathyroidectomy first. Pathological parathyroid tissue was found and excised. Total thyroidectomy was also performed since frozen examination of a suspected thyroid nodule was reported as micropapillary carcinoma. The day after parathyroid and thyroid surgery blood calcium and PTH levels decreased to 10.2 mg/dL and 10.42 pg/mL, respectively. Patient underwent spine surgery. Tumor was excised in piecemeal fashion. Wide posterior decompression (T8 partial/T9 total laminectomy+bilateral T9 transvers process and pedicle excision) was followed by T8−10 posterior instrumentation and fusion (Fig. 2). Paraparesis resolved postoperatively. Patient was mobilised with a brace on postoperative day 1. Absolute pathology reports were consistent with the parathyroid adenoma and spinal Brown tumor (Fig. 3).

DISCUSSION

Brown tumors occur due to increased osteoclastic activity in the setting of either primary or secondary hyperparathyroidism[3,8,19]. Parathyroid adenomas or hyperplasia constitute the major BT source in primary hyperparathyroidism while chronic renal failure is the leading cause in secondary hyperparathyroidism[3]. BTs are localized form of osteitis fibrosa cystica (OFC) that is commonly associated with hyperparathyroidism. OFC is a process that is characterized by hyperstimulation of osteoclastic proliferation via longstanding excessive PTH production causing bone resorption and bone marrow fibrosis[3,7,10,14].

Histopathologically, BTs are composed of osteoclast-like giant cells and hemosiderin with a fibrovascular stroma. The name Brown tumor comes from the accumulation of hemosiderin that gives the surrounding stroma a brown color[3,8]. BTs look like similar histologically to other giant cell lesions such as giant cell tumor, aneursymal bone cyst and reparative giant cell granuloma[8]. Only the clinical manifestation and endocrinologic status help to differentiate BTs from other giant cell lesions.

BTs usually develop in the third or fourth decades of life[8]. In the beginning, BTs that develop in primary hyperparathyroidism were seen much more common. However, they are seen more often recently as a result of secondary hyperparathyroidism that is closely related with increased life expectancy of chronic renal disease patients who require hemodialysis[3,8]. Most of the patients with the diagnosis of primary hyperparathyroidism present with kidney stones or isolated hypercalcemia[3]. However, nearly one third of patients are asymptomatic and hypercalcemia is

found incidentally. Skeletal involvement such as bone resorption, bone cysts, BTs and osteopenia is seen on the late phase of hyperparathyroidism[3,11].

The symptoms of spinal BTs include axial pain, radiculopathy, myelopathy and myeloradiculopathy according to their locations[1,3,12-20]. Radiographically, BTs do not have a pathognomonic appearance. It can mimic multiple myeloma, metastases, sarcomas and other giant cell lesions[6,7,10,19]. X-Rays demonstrate solitary or multiple, lytic, expansile lesions. Bone cortex might be thinned and expanded but it is not penetrated by the tumor frequently. On CT scan, relatively well demarcated soft tissue mass with local bone erosion and expansion is observed. MRI is the diagnosis modality of choice in evaluating the location, extent of spinal tumor and neural compression. On MRI, BTs are commonly seen hypointense on T1-weighted images, hypointense or hyperintense on T2-weighted images and homogenous enhancement is noted after contrast injection. Intratumoral hemorrhages lead to fluid-fluid level appearance on MRI[3,8,19].

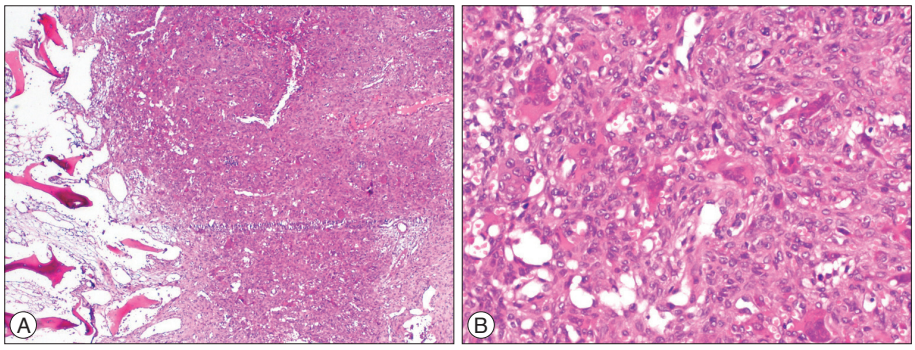

Fig. 3. A : There is marked resorption of bone trabeculae with marrow fibrosis (left sided) and clustering of osteoclasts that create a brown tumor (right sided) (×40, hematoxylin and eosin staining). B : Clusters of giant cells and hemosiderin-laden macrophages in the fibrous cellular stroma are seen on higher magnification (×200, hematoxylin and eosin staining).

Table 1. Literature review of spinal Brown tumors seen in primary hyperparathyroidism

Authors (year)	Sex	Age	Affected spinal level	Symptoms	Treatment
Shaw and Davies (1968)[15]	F	58	T10 pedicle	Paraparesis, urinary retention	Resection of lesion and parathyroidectomy
Shuangshoti et al. (1972)[16]	M	32	L4 posterior element	Paraparesis, radicular pain	Resection of lesion and parathyroidectomy
Sundaram and Scholz (1977)[18]	F	63	T10 body and pedicle	Paraparesis, urinary retention	Resection of lesion and parathyroidectomy
Siu et al. (1977)[17]	F	64	T10	Paraplegia, urinary retention	Resection of lesion and parathyroidectomy
Ganesh et al. (1981)[4]	M	40	T2 body and pedicle	Paraparesis, radicular pain	Parathyroid adenoma excision only
Yokota et al. (1989)[20]	F	58	T5 pedicle	Paraparesis, numbness	Resection of lesion and parathyroidectomy
Daras et al. (1990)[2]	F	54	T9 pedicle	Paraparesis	Resection of lesion
Kashkari et al. (1990)[7]	F	51	T6/T7 body	Paraparesis	Resection of lesion, instrumentation, fusion and parathyroidectomy
Sarda et al. (1993)[14]	F	23	T3/T4	Paraparesis, radicular pain	Resection of lesion and parathyroidectomy
Motateanu et al. (1994)[12]	M	57	L4–5 facet joint	Radiculopathy	Resection of lesion, instrumentation and fusion
Mustonen et al. (2004)[13]	M	28	L2 posterior elements	Radiculopathy, numbness	Resection of parathyroid adenoma only
Haddad et al. (2007)[5]	F	26	T2/T3 posterior elements, T4 body	Paraparesis, numbness	Resection of lesion and parathyroidectomy
Khalil et al. (2007)[9]	M	69	T2 body and pedicle	Radiculopathy	Resection of lesion
Altan et al. (2007)[1]	F	44	Left lateral side of S2	Radiculopathy, low back pain	Resection of lesion and parathyroidectomy
Hoshi et al. (2008)[6]	F	23	Sacrum	Radicular pain	Resection of parathyroid adenoma only
Lee et al. (2013)[10]	M	65	L2 body and L1 posterior elements	Low back pain, radicular pain	Resection of lesion, instrumentation, fusion and parathyroidectomy
Khalatbari and Moharamzad (2014)[8]	M	16	L2 pedicle and posterior elements	Paraparesis, sphincter dysfunction	Resection of lesion, instrumentation, fusion and parathyroidectomy
Khalatbari and Moharamzad (2014)[8]	F	46	L3 posterior elements	Paraparesis, low back pain	Resection of lesion and parathyroid adenoma
Khalatbari and Moharamzad (2014)[8]	F	52	C6 lamina and pedicle	C6 radiculopathy, neck pain	Resection of lesion, instrumentation, fusion and parathyroidectomy
Khalatbari and Moharamzad (2014)[8]	M	38	T7 body, pedicle and lamina	Paraparesis, sphincter dysfunction	Resection of lesion, instrumentation, fusion and parathyroidectomy
Sonmez et al. (present study)	M	50	T9 pedicle and posterior elements	Paraparesis, sphincter dysfunction	Resection of lesion, instrumentation, fusion and parathyroidectomy

Plasmocytoma, lymphoma, giant cell tumors and metastates should be ruled out in the differential diagnosis of BTs[3,6,8,19]. When a solitary lesion that correspond to BT is found on the spine, differential diagnosis might include true giant cell tumor, aneurysmal bone cyst and giant cell reparative granuloma. Also, hyperparathyroidism associated bone changes such as loss of lamina dura of the teeth roots and generalized demineralization of the medullary bone of the jaw could help the surgeon to differentiate BT from other giant cell lesions[8].

Treatment of BTs involve both the management of hyperparathyroidism and neural decompression. Total or subtotal parathyroidectomy is the gold standard for the treatment of primary hyperparathyroidism[3,7,11,19]. Parathyroid surgery rapidly decreases the excessive amount of PTH thus achieving complete regression of the lesions with remineralization[3,4,6]. Parathyroidectomy and medical treatment may also be used together. Neurological status is the main determinant in case of neural compression in the treatment of BTs[3,7]. Immediate surgical decompression could be necessary for achieving good outcome. Unless the decompression procedure does lead to instability, patients can be mobilized in braces without spinal fixation. However, spinal instrumentation and fusion is needed if the tumor is too large, affects multiple levels or pathological spinal fractures exist[7,10,12,19].

Our search in English literature demonstrated 20 spinal BT patients with primary hyperparathyroidism (Table 1). 12 of 20 patients (60%) were women. The patients' age ranged from 16 to 69 with a mean of 45.3 years. Thoracic spine was the most affected part of the spine (55%) followed by lumbar, sacral and cervical regions. Almost all the patients were presented with major neurologic deficit. 15 patients (75%) underwent double surgeries for both removing the mass and to treat the primary hyperparathyroidism. 6 patients (35%) underwent instrumentation and fusion surgery whilst 11 patients (65%) underwent only decompression surgery. After surgery, improvement of symptoms were observed in all patients.

CONCLUSION

BTs should be kept in mind in the differential diagnosis of lytic, expansile spinal tumors, especially with the histopathological diagnosis of giant cell tumors. Treatment consists of both treating the underlying primary pathology and decompression of the neural structures, if necessary. Urgent surgery can be needed to preserve neural function and stabilize the spine.

References

1. Altan L, Kurtoğlu Z, Yalçinkaya U, Aydinli U, Ertürk E : Brown tumor of the sacral spine in a patient with low-back pain. **Rheumatol Int 28** : 77-81, 2007
2. Daras M, Georgakopoulos T, Avdelidis D, Gravani A, Tuchman AJ : Spinal cord compression in primary hyperparathyroidism. Report of a case and review of the literature. **Spine (Phila Pa 1976) 15** : 238-240, 1990
3. Fargen KM, Lin CS, Jeung JA, Yachnis AT, Jacob RP, Velat GJ : Vertebral brown tumors causing neurologic compromise. **World Neurosurg 79** : 208.e1-e6, 2013
4. Ganesh A, Kurian S, John L : Complete recovery of spinal cord compression following parathyroidectomy. **Postgrad Med J 57** : 652-623, 1981
5. Haddad FH, Malkawi OM, Sharbaji AA, Jbara IF, Rihani HR : Primary hyperparathyroidism. A rare cause of spinal cord compression. **Saudi Med J 28** : 783-786, 2007
6. Hoshi M, Takami M, Kajikawa M, Teramura K, Okamoto T, Yanagida I, et al. : A case of multiple skeletal lesions of brown tumors, mimicking carcinoma metastases. **Arch Orthop Trauma Surg 128** : 149-154, 2008
7. Kashkari S, Kelly TR, Bethem D, Pepe RG : Osteitis fibrosa cystica (brown tumor) of the spine with cord compression : report of a case with needle aspiration biopsy findings. **Diagn Cytopathol 6** : 349-353, 1990
8. Khalatbari MR, Moharamzad Y : Brown tumor of the spine in patients with primary hyperparathyroidism. **Spine (Phila Pa 1976) 39** : E1073-E1079, 2014
9. Khalil PN, Heining SM, Huss R, Ihrler S, Siebeck M, Hallfeldt K, et al. : Natural history and surgical treatment of brown tumor lesions at various sites in refractory primary hyperparathyroidism. **Eur J Med Res 12** : 222-230, 2007
10. Lee JH, Chung SM, Kim HS : Osteitis fibrosa cystica mistaken for malignant disease. **Clin Exp Otorhinolaryngol 6** : 110-113, 2013
11. Marcocci C, Cianferotti L, Cetani F : Bone disease in primary hyperparathyrodism. **Ther Adv Musculoskelet Dis 4** : 357-368, 2012
12. Motateanu M, Déruaz JP, Fankhauser H : Spinal tumour due to primary hyperparathyroidism causing sciatica : case report. **Neuroradiology 36** : 134-136, 1994
13. Mustonen AO, Kiuru MJ, Stahls A, Bohling T, Kivioja A, Koskinen SK : Radicular lower extremity pain as the first symptom of primary hyperparathyroidism. **Skeletal Radiol 33** : 467-472, 2004
14. Sarda AK, Arunabh, Vijayaraghavan M, Kapur M : Paraplegia due to osteitis fibrosa secondary to primary hyperparathyroidism : report of a case. **Surg Today 23** : 1003-1005, 1993
15. Shaw MT, Davies M : Primary hyperparathyroidism presenting as spinal cord compression. **Br Med J 4** : 230-231, 1968
16. Shuangshoti S, Hongsaprabhas C, Chandraprasert S, Rajatapiti B : Parathyroid adenoma, brown tumor and cauda equina compression. **J Med Assoc Thai 55** : 251-258, 1972
17. Siu K, Sundaram M, Schultz C, Kirwan L : Primary hyperparathyroidism presenting as spinal cord compression : report of a case. **Aust N Z J Surg 47** : 668-672, 1977
18. Sundaram M, Scholz C : Primary hyperparathyroidism presenting with acute paraplegia. **AJR Am J Roentgenol 128** : 674-676, 1977
19. Tayfun H, Metin O, Hakan S, Zafer B, Vardar AF : Brown tumor as an unusual but preventable cause of spinal cord compression : case report and review of the literature. **Asian J Neurosurg 9** : 40-44, 2014
20. Yokota N, Kuribayashi T, Nagamine M, Tanaka M, Matsukura S, Wakisaka S : Paraplegia caused by brown tumor in primary hyperparathyroidism. Case report. **J Neurosurg 71** : 446-448, 1989