Case Report

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Spinal Cord Injury due to the Giant Cell Tumor of the Second Thoracic Vertebra: A Case Report

Hee-Sang Kim, MD[1], Jong Eon Lee, MD[1], Sang Soo Jung, MD[1], Jinmann Chon, MD[1], Dong Hwan Yoon, MD[1], Yong-Koo Park, MD[2], Eun Hye Cho, MD[1]

Departments of [1]Physical Medicine and Rehabilitation and [2]Pathology, Kyung Hee University College of Medicine, Seoul, Korea

Giant cell tumor (GCT) is a relatively rare neoplasm. In GCT, the bone affection of the axial skeleton is extremely rare. Most GCT arises in the meta-epiphyseal ends of the long bones. Its peak incidence is between 30 to 40 years of age. GCT is usually classified as benign, but shows locally aggressive behavior and may occasionally undergo a malignant transformation. The patients with GCT in the spine often complain of the lower back pains, as the tumors primarily involve the sacrum. We report a case of an adolescent female complaining of the upper back pain with a sudden weakness of the lower extremities, later diagnosed with the GCT of the T2 vertebra. The present patient showed American Spinal Injury Association Impairment Scale (AIS) D before the surgery, which changed to AIS E after the treatments including the surgery, radiation therapy and rehabilitation.

Keywords Giant cell tumor, Spinal cord injuries

INTRODUCTION

Giant cell tumors (GCT) constitute approximately 5% of the bone tumors and are frequently found in the long bones but rarely in the spine. Only 2% to 5% of the GCT cases have been found in the vertebra above the sacrum [1,2]. The GCT generally occurs in the skeletally mature individuals, with its peak incidence in the fourth decade of life [3].

The patients with GCT in the spine often complain of the lower back pains, as the tumors primarily involve the sacrum. As tumors become enlarged, a weakness due to the compression of the spinal cord or nerve roots may occur [4]. Several cases have reported the GCT at the ends of the long bones in adults, but the GCT found in the vertebra above the sacrum in the adolescents are seldom reported in the literature.

In this paper, we report a case of a patient with the GCT of the T2 vertebra, whose initial presentations were the upper back pains and a sudden weakness of the lower extremities, which was recovered completely.

CASE REPORT

A 16-year-old female presented with a 3-month history of progressive upper back pain. She showed a visual analogue scale result of 50 mm, with the pain being worse in the supine position at night. On the first visit, she

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Corresponding author: Eun Hye Cho
Department of Physical Medicine and Rehabilitation, Kyung Hee University College of Medicine, 26 Kyunghee-daero, Dongdaemun-gu, Seoul 130-701, Korea
Tel: +82-2-958-8565, Fax: +82-2-958-8560, E-mail: grace2010@hanmail.net

was treated with a conservative management. However, the pain did not subside and a sudden weakness of the lower extremities developed after 5 days. She reported a radicular pain along the T1 dermatome and hypoesthesia below the T1 dermatome, along with constipation. This patient's neurologic classification according to the American Spinal Injury Association (ASIA) International Standards for the neurological classification of the Spinal Cord Injury (SCI) is as follow: sensory and motor level of injury, T1 bilaterally; and degree of completeness, ASIA Impairment Scale (AIS) grade D. She demonstrated 3+ reflexes at the both patellas and ankles and a positive Babinski sign. The Modified Ashworth Scale (MAS) was graded as 1. Her strength was generally of a fair grade in the lower extremities. There was tenderness on percussion of the T2 thoracic spine. On the radiographs, there was an osteolytic bony lesion at the T2 vertebra. The magnetic resonance imaging (MRI) revealed a large mass in the T2 vertebral body with the involvement of the left pedicle, transverse process, both lamina and spinous process. In addition, there was high signal intensity in the spinal cord at the T2 level, which suggested compressive myelopathy (Fig. 1).

After the patient was transferred to the department of neurosurgery, she was treated with a tumor resection and laminectomy of the T2 vertebra, with the posterior fixation of T1, T3, and T4 (Fig. 2). On the pathologic report, the large mass was confirmed to be GCT (Fig. 3). To optimize the local disease control, the patient underwent the CyberKnife (Accuracy Inc., Sunnyvale, CA, USA) three

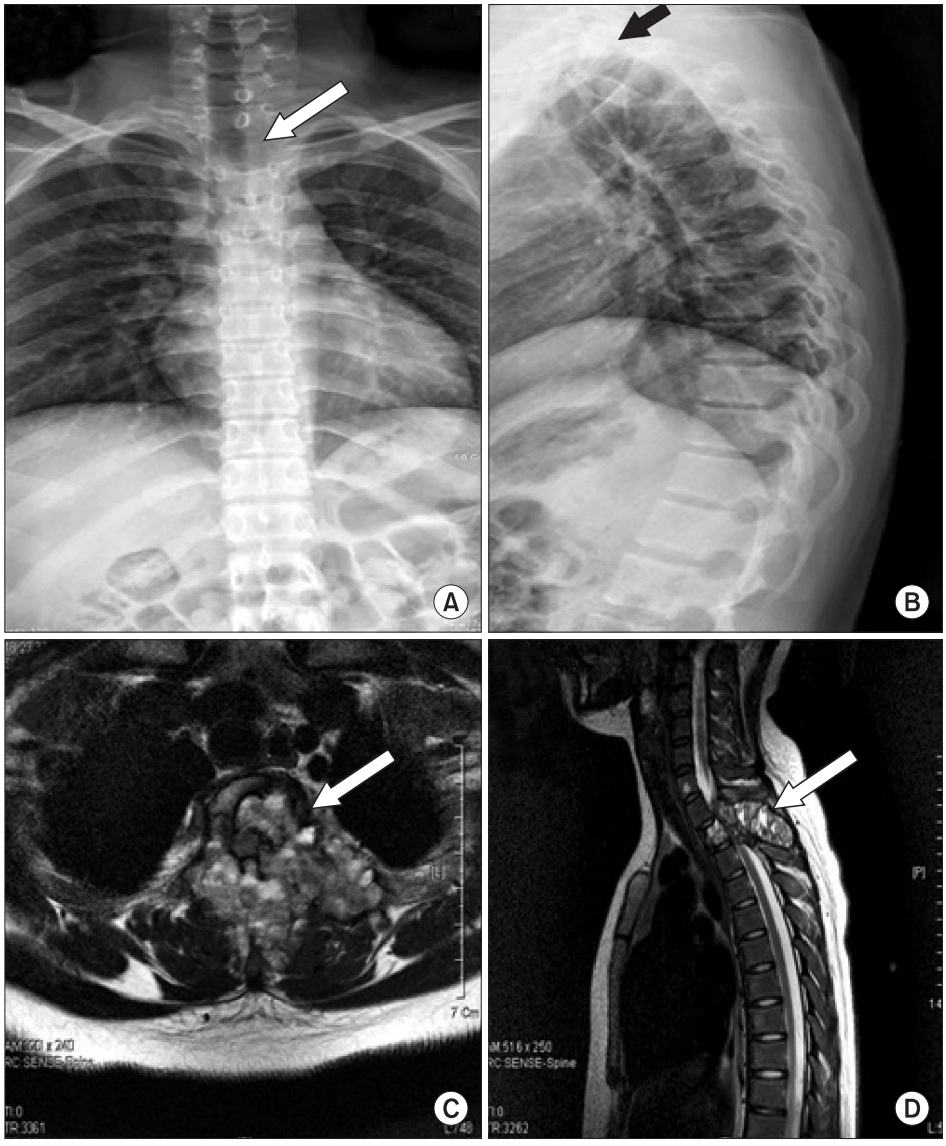

Fig. 1. (A) Plain radiographs showed an osteolytic bony lesion at T2 vertebra (arrow), onset time of weakness, anterior-posterior view. (B) Lateral view. (C) Magnetic resonance imaging suggestive of giant cell tumor (arrow). There is signal change in the spinal cord at the T2 vertebra level suggesting a cord compression, T2 axial view. (D) T2 sagittal view.

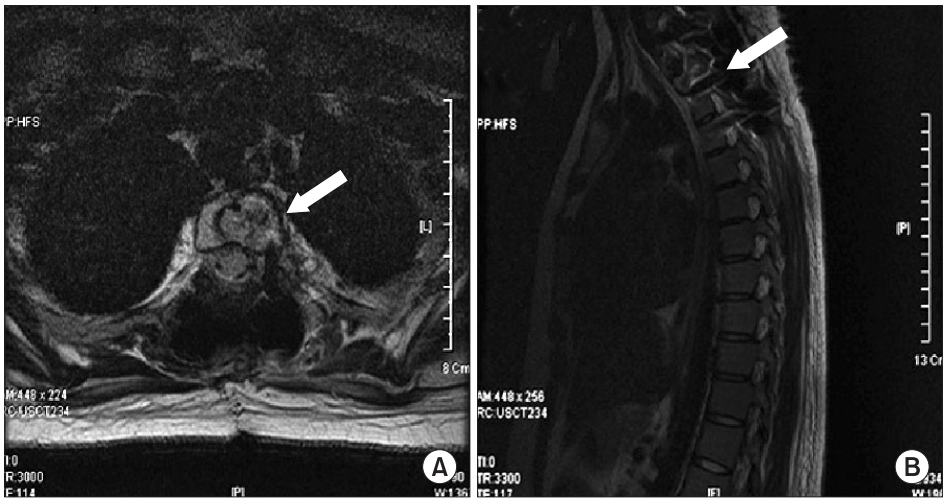

Fig. 2. Magnetic resonance imaging of the operative site (arrow), 15 days after operation. (A) T2 axial view, (B) T2 sagittal view.

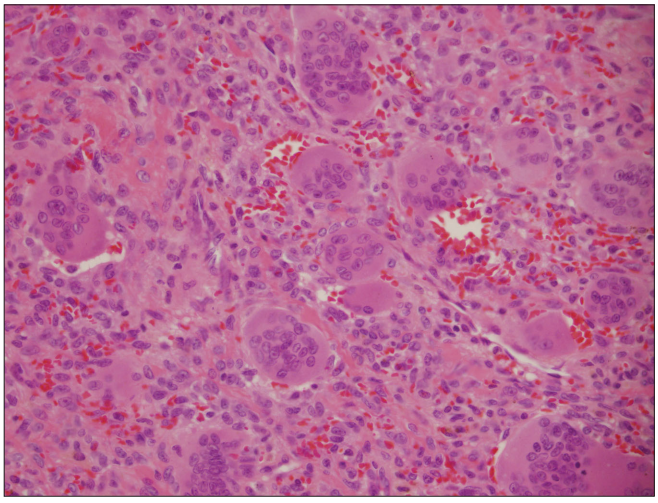

Fig. 3. The hematoxylin and eosin stained biopsy showed multinucleated giant cells with scant stroma (×400).

times over three days. The postoperative anterior-posterior plain film and the lateral plain films of the thoracic spine revealed a good screw position (Fig. 4).

Six weeks after the surgery, the patient was transferred to the department of physical medicine and rehabilitation. The radicular pain was subsided, but the mild hypoesthesia from T1 to T3 dermatome remained. She demonstrated no hyperreflexia and fair+ to good strength in the lower extremities. The MAS was graded as 0. A moderate assistance was required for walking and the lower body dressing. The patient was placed in a cervicothoracic orthosis for stabilizing the operative site. She practiced walking with a high walker and a cane later. She was trained in using a dressing stick. The function of the bladder was normal when checked with a bladder chart and the measurement of the residual urine. However, the patient complained of constipation. She was given a high-fiber diet regimen, along with the timed bowel program and the abdominal wall massage. As a result, her constipation subsided. After one month, the patient was able to walk independently, and the impairment scale was changed to AIS E (sensory and motor functions are normal) without any evidence of recurrence (Fig. 5). The patient is now two years out of the surgery and the radiation therapy. She has returned to school as a student, has no significant complaints and remains neurologically intact.

DISCUSSION

GCT in the spine above the sacrum represents approximately 0.1% to 0.25% of the bone tumors [4]. GCT typically arises in the metaphyseal and the epiphyseal regions of the long bones and are most commonly found in the distal femur, proximal tibia and distal radius [5]. GCT in the spine usually occurs in the vertebral body as opposed to the posterior elements. Its peak incidence is between 30 to 40 years of age. Patients with GCT of the spine most commonly present with pain, especially at the lower back. The diagnosis may be delayed as the first symptom of the back pain is extremely frequent and easily misinterpreted [3]. These patients may also report the radicular symptoms and the varying degrees of paraplegia or other neurologic symptoms due to the spinal cord compression [4]. In this case, the patient was an adolescent and complained only of the upper back pain without any neurologic signs. Thus, the imaging of the spine was

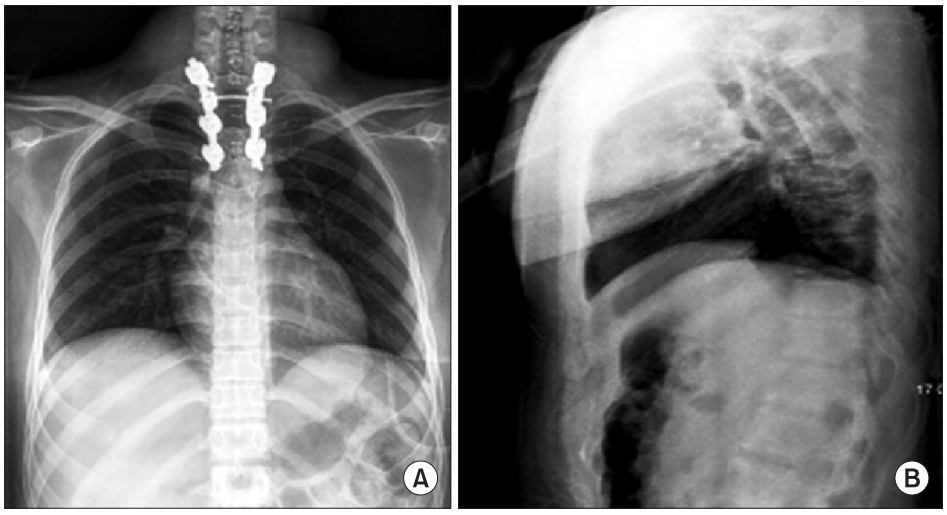

Fig. 4. Plain radiographs, 2 days after the operation. (A) Anterior-posterior view, (B) lateral view.

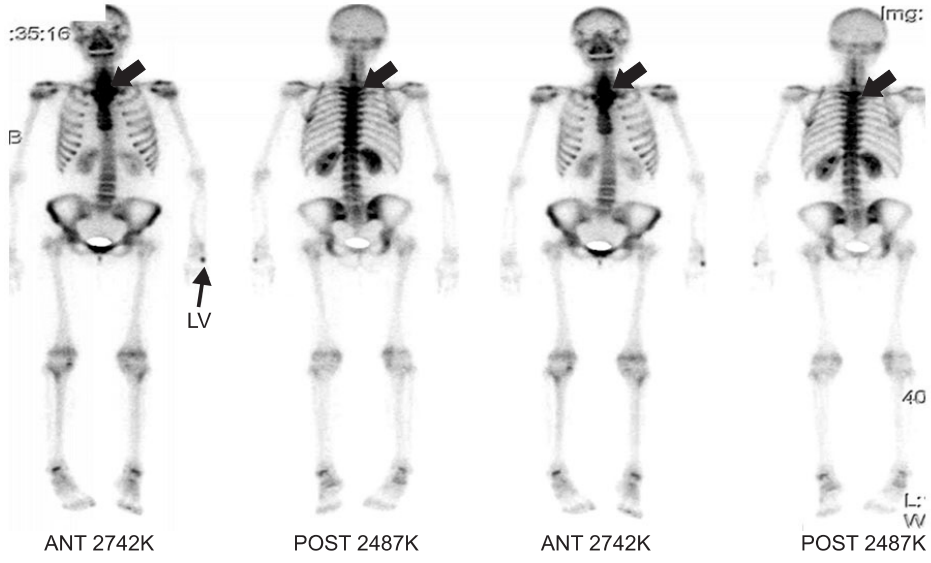

Fig. 5. Whole body positron emission tomography showing increased fluorodeoxyglucose (FDG) uptake in the T3 posterior aspect related to operative site (arrow), two months after the operation.

not obtained on her first visit, and the diagnosis of the tumor was delayed until the weakness of lower extremities was developed. This may be a shortcoming of this case.

Radiographically, the GCT usually manifests as a destructive, osteolytic lesion on the plan films [2]. They are distinguishable from other bony tumors in that GCT usually has a non-sclerotic and sharply defined border [6]. The computed tomography and MRI provide information on the extent of the bony involvement and the degree of the marrow and the surrounding soft tissue involvement. Furthermore a histologic analysis of the biopsy specimen is required to render the diagnosis of GCT [7]. The optimal management of the GCT is a complete tumor resection with wide margins. The management of patients with GCT of the spine is challenging because of its anatomical features [4]. A wide or marginal excision of the tumor or en bloc resections may result in a lower recurrence rate, but often cause unacceptable neurological impairments [8]. Because the GCT exhibits a propensity for aggressive local recurrence unlike other benign bone tumors, the patient undergoes a radiation therapy to the tumor resection [4]. In this case, the patient presented with a tumor which had invaded most of the T2 vertebral body with a severe narrowing of the spinal canal. Thus, a removal of the mass and a fixation of the T1, T3, and T4 pedicle were completion. In addition, there were three treatments of the radiotherapy.

Following the treatments, an early initiation of the SCI-specific rehabilitation regimen is extremely important. It is essential to determine the potential functional outcome of a person after the SCI, when formulating the rehabilitation plan. The functional outcomes are deter-

mined based on the level of SCI and the AIS classification [9]. The present patient showed AIS D before the surgery, which changed to AIS E after the treatments including the surgery, radiation therapy and rehabilitation.

We have presented a rare case of the GCT of the thoracic spine, with well-documented preoperative and postoperative imaging and management. In the clinical practice, the adolescent patients with the upper back pain and neurological change should be clinically evaluated for tumors.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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