Osteoporotic Vertebral Fracture Misdiagnosed as Metastatic Vertebral Fracture

Tong Yu, Shuang Zheng, Xueliang Cheng and Jianwu Zhao

Department of Orthopaedics, The Second Hospital of Jilin University, Changchun, China

ABSTRACT

The purpose of this study was to report a patient with osteoporotic vertebral compression fracture (OVCF) which was misdiagnosed as metastatic vertebral compression fracture (MVCF). A 64-year male was admitted to our clinic for complaints of numbness, pain, and activity limitation in bilateral lower extremities. One year ago, he had a medical history of lung adenocarcinoma and bone metastasis. A month ago, he developed back pain and lower-limb paralysis. X-ray, computer tomography (CT), and magnetic resonance imaging (MRI) showed thoracic 11 (T11) vertebral compression fracture. Furthermore, emission computed tomography (ECT) indicated MVCF preoperatively. However, the histopathology findings suggested OVCF postoperatively. Consequently, the patient was discharged without chemoradiotherapy. During the 14-months follow-up period, no relapsed spinal neoplasm or recurrence of vertebral fracture was observed. In conclusion, OVCF in patients with a history of lung cancer is easily misdiagnosed as MVCF. It is important to differentiate OVCF from MVCF by clinical symptoms, laboratory examination, and imaging features before operation. Histological findings are the gold standard for accurate diagnosis.

Key Words: *Osteoporosis, Vertebral fracture, Metastasis.*

How to cite this article: Yu T, Zheng S, Cheng X, Zhao J. Osteoporotic Vertebral Fracture Misdiagnosed as Metastatic Vertebral Fracture. *J Coll Physicians Surg Pak* 2022; **32(JCPSPCR)**:CR171-CR173.

INTRODUCTION

Vertebral fracture is a common disease in spinal surgery clinics, mainly due to osteoporosis and diagnosed as osteoporotic vertebral compression fracture (OVCF),[1-4] and also due to spinal metastasis and diagnosed as metastasis vertebral compression fracture (MVCF).[4] It is challenging to make a correct diagnosis preoperatively without pathological examination[3,4] between OVCF and MVCF because the clinical symptoms and imaging features of the two diseases are similar. Moreover, improper treatment may lead to adverse complications. Therefore, accurate diagnosis is very important, which is beneficial to avoid adverse complications caused by inappropriate treatment.

Herein, we present a case of a patient who experienced a vertebral compression fracture following the previous history of lung adenocarcinoma. Preoperatively, MVCF was suggested by various examinations, such as ECT. However, OVCF was determined by pathological examination postoperatively. To the best of our knowledge, such a case is relatively rare in the literature.

Correspondence to: Dr. Jianwu Zhao, Department of Orthopaedics, The Second Hospital of Jilin University, Changchun, China
E-mail: jianwu@jlu.edu.cn

Received: December 07, 2020; Revised: June 09, 2021; Accepted: July 18, 2021
DOI: https://doi.org/10.29271/jcpsp.2022.JCPSPCR.CR171

CASE REPORT

This study was approved by the institutional review board of the second hospital of Jilin University (Research review No. 68, 2021). A 64-year male patient was admitted to our clinic due to numbness, pain, and activity limitation of bilateral lower extremities. In September 2019, the patient was diagnosed with lung adenocarcinoma and bone metastasis and received chemoradiotherapy. He took oxycodone hydrochloride sustained-release tablets, furosemide, and spironolactone orally. In July 2020, he encountered a T11 vertebral fracture. In August 2020, the patient developed paraplegia in both lower extremities. Subsequently, he was treated with prednisone and had poor symptom relief. Besides, he had dysfunctions of defaecation and urination.

Physical examination showed the muscle strength of bilateral iliopsoas, quadriceps femoris and anterior tibialis to be grade II, and the muscle strength of bilateral gastrocnemius, hallux extensor was grade III. The bilateral knee-tendon reflexes were hyperactive. Moreover, the CT scan indicated a T11 compression fracture (Figure 1). MRI showed a fracture of the T11 vertebral bodies with about 1/2 vertebral body height loss (Figure 1). Emission computed tomography (ECT) suggested T11 spinal metastastic fracture. Bone mineral density (BMD) examination demonstrated severe osteoporosis, T=-2.8 SD. Laboratory tests showed that the calcium was 2.26 mmol/L, and alkaline phosphatase was 61 U/L. The patient was preliminarily diagnosed as T11 vertebral fracture, incomplete paraplegia, and lung adenocarcinoma.

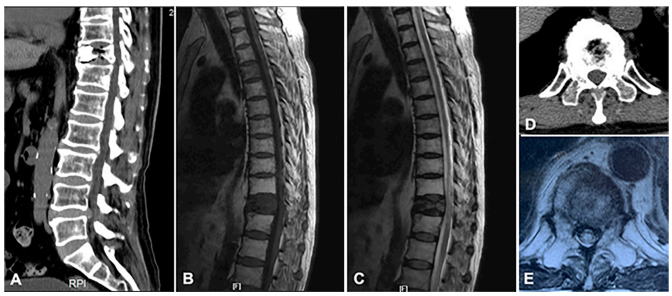

Figure 1: The sagittal plane of CT showing a compression fracture of T11 (A). The MRI (B-C) sagittal planes showing a compression fracture of T11 and mild spinal canal stenosis in the T11-T12 segment. T1WI (B) and T2WI (C) showed a low signal and a mixed signal in the T11 vertebra, respectively. The axial planes of CT and MRI (D-E).

The patient was treated with a mannitol injection of 50 g (Jilin Cornell Pharmaceutical Co., LTD., China, 250 ml: 50 g) once per day, parecoxib sodium injection 40 mg (Pfizer, INC., USA, 40 mg) once per day, dexamethasone injection 10 ml (Sui Cheng Pharmaceutical Co., LTD., China, 1 ml: 5 mg) once per day. Subsequently, he underwent laminectomy, spinal decompression, pedicle screw internal fixation, T11 vertebral biopsy, and T11 kyphosis vertebroplasty. Postoperative histopathological results reported that no atypical cells were detected, indicating the T11 fracture was caused by osteoporosis. Consequently, the patient was discharged from the hospital without chemoradiotherapy. During 14 months of follow-up, the muscle strength of both limbs improved, and the anal function returned to normal. No relapsed spinal neoplasm or recurrent fracture was observed.

DISCUSSION

In the present case, the OVCF patient was misdiagnosed as MVCF preoperatively. However, no inappropriate treatment options were used, and no adverse events affected the prognosis of the patient. Laminectomy and spinal decompression were performed to relieve the symptoms of lower limb paralysis. Pedicle screws were placed to restore spinal stability, and T11 kyphoplasty was carried out to relieve pain and restore spinal stability. Importantly, T11 vertebral biopsy was performed to determine the cause of the fracture. Moreover, the above treatment measures should be selected regardless of the preoperative diagnosis of OVCF or MVCF. After surgery, the spinal surgeon can choose the appropriate treatment according to the pathological results. OVCF should be treated with anti-osteoporosis therapy, while MVCF should be treated with radiotherapy and chemotherapy.

With regard to the causes of misdiagnosis, we believe that multiple factors led to the patient being misdiagnosed as MVCF, including lung cancer medical history, which is prone to metastasise to the spine,[5,6] and preoperative ECT findings suggesting MVCF. According to previous studies, many risk factors can cause BMD change in patients with malignant tumours, including osteolytic destruction caused by tumour bone metastasis, abnormal bone metabolism, chemoradiotherapy, and abnormal calcium and phosphorus metabolism.[7,8] In this case, we believe that chemoradiotherapy after lung cancer surgery caused osteoporosis, leading to vertebral fractures. Moreover, negative histopathology results may be due to the history of chemoradiotherapy. Whether the tumour cells in the vertebral body had been killed by chemoradiotherapy during the previous treatment cannot be established in this case. However, it is necessary to carefully determine the aetiology of a vertebral compression fracture in patients with malignant tumours.

Concerning the clinical symptoms and laboratory features of OVCF and MVCF, the two diseases have similar clinical symptoms, such as back pain. However, pain caused by MVCF is more severe than OVCF, especially at night. The tumour cells secrete inflammatory mediators to induce pain. However, the secretion of the hormones with analgesic effect in the human body decreases at night.[9] Visual analogue scale (VAS) score, as the common method of pain evaluation, is greatly influenced by individual subjective consciousness. Thus, it is challenging to identify the aetiology of a vertebral compression fracture only based on the pain symptoms. Moreover, serum calcium results are usually normal or decreased in OVCF patients because OVCF is caused by bone loss. However, it is elevated in MVCF patients because osteolytic changes are induced by MVCF-activated osteoclasts, leading to the release of calcium ions into the blood.

Regarding the radiological characteristics of OVCF and MVCF, X-ray, CT, and MRI are commonly used methods to evaluate lesions. MVCF has the radiological features of pedicle destruction, epidural and paravertebral masses. On the contrary, OVCF lacks these characteristics. In the present study, no pedicle destruction and epidural, paravertebral masses were found preoperatively, suggesting the diagnosis of OVCF. However, ECT, as a useful method to distinguish between OVCF and MVCF, suggested MVCF. Furthermore, the patient had a history of lung cancer, which increased the difficulty of accurate diagnosis.

In conclusion, OVCF in patients with a history of lung cancer can easily be misdiagnosed as MVCF. It is challenging to differentiate OVCF from MVCF based on clinical symptoms, laboratory examination and imaging features before operation. Histological findings are the gold standard for accurate diagnosis.

PATIENTS CONSENT:

Informed written consent was obtained from the patient for publication of the information and accompanying images.

COMPETING INTEREST:

The authors declared no competing interest.

AUTHORS' CONTRIBUTION:

SZ, JWZ: Participated in the study design and surgery, performed data analysis, and drafted the manuscript.

TY: Contributed to the design of the study and data collection.

XLC: Participated in surgery and radiographic outcome assessment.

JWZ: Responsible for the integrity of the work from inception to finished article.

All the authors have read and approved the final version of the manuscript to be published.

REFERENCES

1. Kelly MA, McCabe E, Bergin D, Kearns SR, McCabe JP, Armstrong C, *et al*. Osteoporotic vertebral fractures are common in hip fracture patients and are under-recognised. *J Clin Densitom* 2020; **24(2)**:183-9. doi: 10.1016/j.jocd. 2020.05.007.
2. Inose H, Kato T, Ichimura S, Nakamura H, Hoshino M, Togawa D, *et al*. Predictors of residual low back pain after acute osteoporotic compression fracture. *J Orthop Sci* 2020; **26(3)**:453-8. doi: 10.1016/j.jos.2020.04.015.
3. Arana E, Kovacs FM, Royuela A, Asenjo B, Nagib F, Perez-Aguilera S, *et al*. Metastatic versus osteoporotic vertebral fractures on MRI: A blinded, multicenter, and multispecialty observer agreement evaluation. *J Natl Compr Canc Netw* 2020; **18(3)**:267-73. doi: 10.6004/jnccn.2019.7367.
4. Yamamoto Y, Iwata E, Shigematsu H, Morita T, Tanaka M, Okuda A, et al. Differential diagnosis between metastatic and osteoporotic vertebral fractures using sagittal T1-weighted magnetic resonance imaging. *J Orthopaedic Science* 2019; **25(5)**:763-9. doi: 10.1016/j.jos.2019.10.004.
5. Miyashita H, Cruz C, Smith C. Risk factors of skeletal-related events in patients with bone metastasis from non-small cell lung cancer undergoing treatment with zoledronate-a post hoc analysis of a randomised clinical trial. *Support Care Cancer* 2020; **29(3)**:1629-33. doi: 10.1007/s00520-020-05665-w.
6. Fan Z, Huang Z, Hu C, Tong Y, Zhao C. Risk factors and nomogram for newly diagnosis of bone metastasis in bladder cancer: A SEER-based study. *Medicine (Baltimore)* 2020; **99(42)**:e22675. doi: 10.1097/MD.0000000000022675.
7. Chaudhary RK, Acharya S, Chahal RS, Kalra KL. Fluoroscopy guided percutaneous transpedicular biopsy of vertebral body lesion. *J Nepal Health Res Counc* 2019; **17(2)**:163-7. doi: 10.33314/jnhrc.v0i0.1863.
8. Luftner D, Niepel D, Steger GG. Therapeutic approaches for protecting bone health in patients with breast cancer. *Breast* 2018; **37**:28-35. doi: 10.1016/j.breast.2017.10.007.
9. McCabe E, Ibrahim A, Singh R, Kelly M, Armstrong C, Heaney F, *et al*. A systematic review of the Irish osteoporotic vertebral fracture literature. *Arch Osteoporos* 2020; **15(1)**:34. doi: 10.1007/s11657-020-0704-0.