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Infectious Spondylitis Mimicking Osteoporotic Vertebral Compression Fractures - Report of Two Cases -

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Study Design: Case study of two cases.

Objectives: The aim of our study is to describe the rare MR imaging patterns of infectious spondylitis.

Summary of the Literature Review: It is generally accepted that the intravertebral cleft sign is not shown in cases of infection or malignancy, and thus, its recognition can obviate unnecessary imaging or biopsy because of its benign significance.

Materials and Methods: Two patients are presented who developed worsening back pain after a minor trauma. Preoperative MR images of these patients showed intravertebral fluid and benign vertebral compression fractures. Anterior decompression and fusion were done and the bacteria isolated from the intraoperative cultures were *Listeria monocytogenes* and *Mycobacterium tuberculosis*, respectively.

Results: After 2 years of follow-up, the patients were free of pain, without signs of infection, and showed correct fusion.

Conclusions: MR findings in infectious spondylitis may simulate the patterns of osteoporotic VCFs.

Key Words: Infectious spondylitis, Vertebral compression fractures, MR findings, Intravertebral cleft sign, Hematological parameters

INTRODUCTION

MR imaging has become the modality of choice for evaluating potential spinal infection because of its excellent contrast resolution between the abnormal and normal bone marrow.¹⁾ Several MR imaging characteristics have been described to be indicative of spinal infection, including increased signal intensity on T2-weighted images, disk enhancement, erosion or destruction of the vertebral endplates, presence of paraspinal or epidural inflammation.¹⁾ On the other hand, the presence of an intravertebral cleft sign in vertebral compression fractures is considered indicative of vertebral osteonecrosis.²⁾ Furthermore, it is generally accepted that the intravertebral cleft sign is not shown in cases of infection or malignancy, and thus, its recognition can obviate unnecessary imaging or biopsy because of its benign significance.²⁾

Vertebroplasty is a useful technique for treating painful osteoporotic vertebral compression fractures, multiple myelomas, lymphomas, vertebral metastatic lesions and hemangiomas.

However, as the procedure became popular, various complications were documented, such as, leakage of cement into the spinal canal, pulmonary embolism, cement dislodgement or fragmentation and pyogenic spondylitis. Several reports have addressed the issue of infected vertebroplasty and several authors

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have questioned whether vertebral fractures in some cases were the result of a preexisting unrecognized spondylitis, or whether infections developed after procedures.³⁾ In this report, we present two cases of infectious spondylitis which MR images mimicked osteoporotic vertebral compression fractures.

CASES REPORT

Case 1

A 73-year-old woman with past medical history of generalized atherosclerosis developed a compression fracture of L3 from a slip down injury. At another hospital, vertebroplasty was planned based on imaging diagnosis. However, she was



Fig. 1. Sagittal CT and MR images of a 73-year-old woman who developed low back pain after slip down injury. She was thought to have osteoporotic vertebral compression fracture. However, CRP and blood cultures indicated a vertebral osteomyelitis, which was confirmed by open bone biopsy. **(A)** Lateral radiograph shows a compression fracture of L3 **(B)** Sagittal CT demonstrates the intravertebral cleft sign in the body of L3. **(C)** T1-weighted image (620/13) shows diminished height of the L3 vertebral body. **(D)** T2-weighted image (4000/114) shows intravertebral fluid and a minimal amount of epidural inflammatory tissue at the L3 level, which were initially interpreted as hematoma. **(E)** T1-weighted fat-suppressed contrast-enhanced image (639/15) shows marginal enhancement of the vertebral body.

referred to our hospital because she was taking warfarin. Although the patient was afebrile, erythrocyte sedimentation rate (ESR) was 60 mm/hr (reference range < 20 mm/hr) and C-reactive protein (CRP) was 19.68 mg/dL (reference range < 0.5 mg/dL). CT and MRI showed a typical benign osteoporotic vertebral compression fracture (Fig. 1). Blood cultures were positive for *Listeria monocytogenes* and therefore, there was a strong clinical suspicion of infectious spondylitis. Although radiologist insisted that infectious spondylitis cannot be the possible diagnosis for this patient, we administered intravenous antibiotics for 2 weeks before the definitive surgery. Intraoperatively, there was no active inflammation sign, so we believed that strut allograft can be a proper option if the patient managed adequately with postoperative antibiotics. Intraoperative bone cultures were also positive for *Listeria monocytogenes*, therefore, the patient was finally treated with intravenous antibiotics (ampicillin and gentamycin) for 6 weeks. Two years after the anterior corpectomy and posterior

stabilization, the patient was free of pain, without any sign of infection, and a solid bony fusion was achieved (Fig. 2).

Case 2

A 61-year-old woman presented approximately 10 months after developing persistent back pain without any trauma history. Initially, her only symptomatology was an inconsistent, nonradiating pain of her mid back; however, the pain worsened in intensity and frequency over time and was refractory to any conservative treatment. MRI was performed due to her severe pain and progressive kyphosis (Fig. 3). Complete blood counts, electrolytes, BUN, creatinine, albumin were normal. ESR was 25 mm/hr and CRP was 0.01 mg/dL. Although ESR was slightly elevated, she did not have any fever history and normal CRP. So, we did not have any impression for the diagnosis of infectious spondylitis. Under the diagnosis of Kümmell's disease, she underwent T10 corpectomy with anterior fusion and there was no sign of infection intraoperatively. We chose



Fig. 2. (A) AP and (B) lateral radiographs which were taken after 2 years of follow-up show a solid bony fusion.



Fig. 3. Lateral radiograph and sagittal MR images of T10 vertebral lesion simulating osteoporotic vertebral compression fracture in a 61-year-old woman who suffered from chronic back pain without any trauma history. She was initially thought to have the typical Kümmell's disease, but her final diagnosis was tuberculous spondylitis. **(A)** Radiograph shows severe vertebral collapse of the T10 vertebra. Note that standing lateral radiograph makes T10 vertebra more kyphotic comparing to MR images. **(B)** T1-weighted image (550/13) shows diminished height of the T10 vertebral body. **(C)** T2-weighted image (4000/101) shows intravertebral fluid and mild cord compression. **(D)** T1-weighted fat-suppressed contrast-enhanced image (664/13) shows marginal enhancement of the vertebral body.

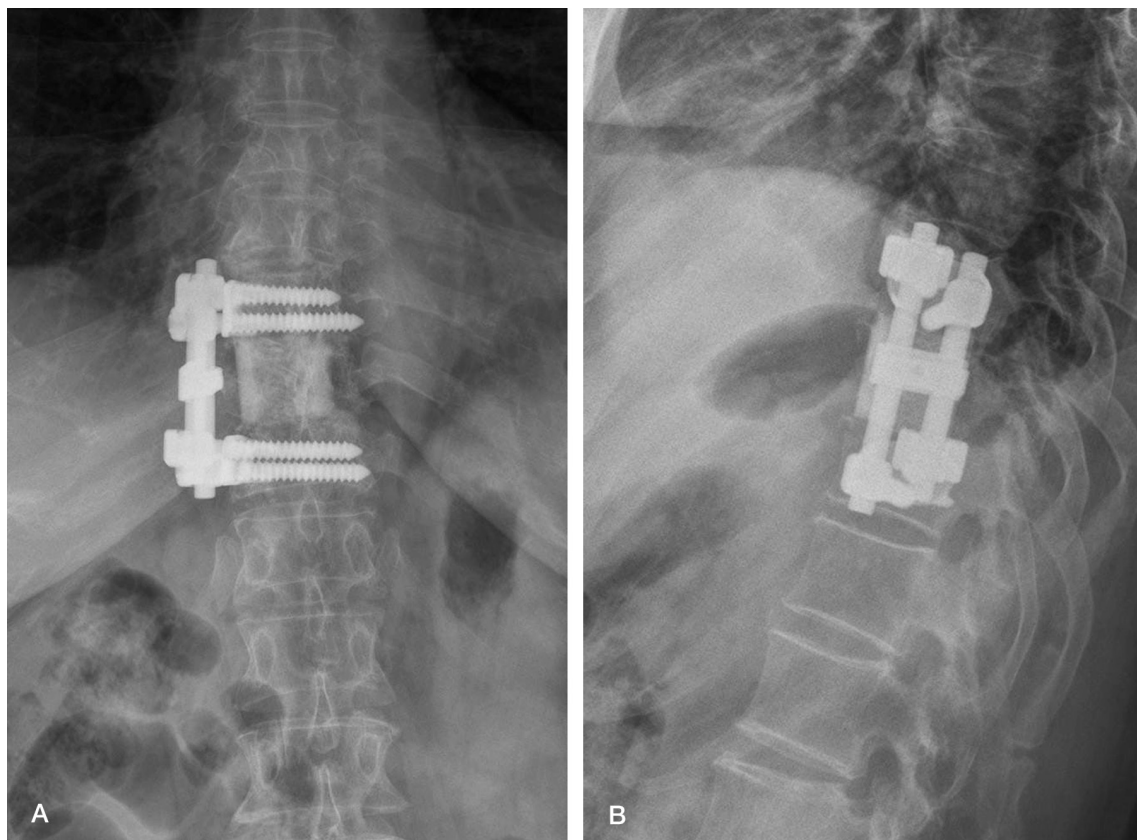


Fig. 4. **(A)** AP and **(B)** lateral radiographs which were taken after 2 years of follow-up show a solid bony fusion.

an open procedure for the management of this patient instead of vertebroplasty, because she had myelopathic symptoms. Unexpectedly, pathology revealed chronic granulomatous inflammation with caseation necrosis and intraoperative tissue cultures were positive for *Mycobacterium tuberculosis* 6 weeks later. We do not routinely perform the intraoperative tissue culture during the surgery for the patient with osteoporotic vertebral compression fracture. She was started on a daily regimen of INH, rifampin, pyrazinamide, and ethambutol, and successfully completed 12 months of anti-tuberculosis treatment with resolution of her symptoms. She was well during the 2 year follow-up interval (Fig. 4).

CONSIDERATIONS

After we treated these two patients, we learned that MR findings in infectious spondylitis may simulate the patterns of osteoporotic vertebral compression fractures. We believe that the intravertebral cleft sign can be shown in cases of atypical spinal infections. In such cases, cortical erosion of an adjacent vertebral body on MR images might be helpful in differentiating vertebral osteomyelitis from osteoporotic vertebral compression fractures. Also, adjacent vertebral body cortical erosion might provide an important clue regarding the diagnosis of infectious spondylitis, despite the presence of the intravertebral cleft sign on MR images.

Although the characteristic MR imaging findings of spinal infections are well-known, they could be misinterpreted as osteoporotic vertebral compression fractures in cases with unusual manifestations. Atypical MR findings have been documented in some types of nonpyogenic spondylitis, particularly in tuberculosis and certain fungal infections.⁴⁾ The MR imaging patterns of spinal infections are classically described as hypointense on T1-weighted images and hyperintense on T2-weighted images, with contrast enhancement.⁵⁾ However, MR appearances may be atypical at the early stage of infectious spondylitis.⁶⁾ In particular, individuals with a tubercular infection can present with back pain and tenderness and not exhibit a typical radiographic presentation.⁴⁾ Tuberculous and nontuberculous mycobacterial infections after injury have been reported including one case of Pott's disease followed by percutaneous vertebroplasty.⁷⁾

It is believed that intravertebral cleft sign is not associated

with acute fracture, infection or neoplasm.²⁾ At MR imaging, the presence of the intravertebral cleft sign in association with a vertebral compression fracture has frequently been considered pathognomonic for avascular necrosis of the vertebral body.⁸⁾ However, Baur et al. reported the presence of intravertebral cleft sign in two (6%) patients among 35 with a neoplastic compression fracture.⁹⁾ Furthermore, in one report the intravertebral vacuum phenomenon was found to be associated with spinal infections.¹⁰⁾ Therefore, the several clinical and hematological parameters suggestive of an infection should be carefully reviewed before the diagnosis of vertebral compression fractures.

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골다공증성 압박 골절로 오인된 감염성 척추염 - 2례 보고 -

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연구 계획: 증례보고

목적: 감염성 척추염 환자의 자기 공명 영상 소견이 골다공증성 압박 골절로 판독된 증례를 경험하였기에 문헌 고찰과 함께 보고하고자 한다.

선행 문헌의 요약: Intravertebral cleft sign은 척추체 무혈성 괴상의 특징적인 소견으로 알려져 있어서, 영상에서 이것이 확인되는 경우 불필요한 조직 검사를 피할 수 있게 한다는 데 임상적 의의가 있다.

대상 및 방법: 두 명의 환자가 경한 외상 이후 발생한 요통을 주소로 내원하였다. 두 명의 환자 모두에서 intravertebral fluid가 있어서 골다공증성 압박 골절로 진단되었다. 전방 감압술 및 유합술을 시행하였고, 수술장에서 시행한 균 배양 검사에서 각각 *Listeria monocytogenes*와 *Mycobacterium tuberculosis* 균이 검출되었다.

결과: 2년 추시 결과 환자들은 모두 견고한 골유합을 얻었다. 감염 소견도 없었고, 요통도 소실되었다.

결론: 감염성 척추염 환자의 자기 공명 영상 검사 소견이 드물게는 골다공증성 압박 골절과 유사하게 나타날 수 있다.

색인 단어: 감염성 척추염; 골다공증성 압박 골절; 자기 공명 영상; intravertebral cleft sign; 혈액학적 결과

약칭 제목: 비전형적인 감염성 척추염