European Journal of Radiology Open 7 (2020) 100279

Contents lists available at ScienceDirect

European Journal of Radiology Open

journal homepage: www.elsevier.com/locate/ejro

Case report

Spondylodiscitis initially presenting as exudative pleural effusion: A case report and review of the literature

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ARTICLE INFO

Keywords:
Pleural effusion
Spondylodiscitis
CT
MRI

ABSTRACT

Pleural effusions are associated with a variety of disease states, rendering the differential diagnosis challenging. Spondylodiscitis is an uncommon disease, and its prompt diagnosis can reduce morbidity and mortality. However, an atypical manifestation of the disease, such as pleural effusion, can result in delayed diagnosis. A 76-year-old woman presented with back pain and right pleural effusion. Magnetic resonance imaging revealed paravertebral soft tissue infiltration, with enhancement of bone marrow and intervertebral disk at the T8 and T9 levels, suggesting spondylodiscitis. In patients with exudative pleural effusion, spondylodiscitis may be the cause, so careful analysis of imaging is necessary.

1. Introduction

Pleural effusions are associated with a wide variety of disorders of the lungs as well as some systemic disorders. Despite a proper diagnostic workup, the cause can remain unknown in up to 20% of cases [1]. The reported incidence of spondylodiscitis in developed world is estimated at 2.2-5.8 cases per 100,000 person years and spondylodiscitis can be a rare cause of exudative pleural effusion [2,3]. Since the initial focus of the investigation for pleural effusion is usually on the pleural diseases, its diagnosis may be delayed in such a case. A careful analysis of early imaging studies can reduce this delay.

Herein, we report a case of exudative pleural effusion caused by pyogenic spondylodiscitis of a thoracic vertebra.

2. Case presentation

A 76-year-old woman was admitted to our hospital with mid-thoracic back and left flank pain of three weeks duration. She had no cough, sputum, or other upper respiratory infection symptoms. She had a history of hypertension, controlled with medication, and no other underlying diseases.

On admission, her body temperature was 36.4 °C. Laboratory study showed a white blood cell (WBC) count of 11070/uL, C-reactive protein (CRP) of 9.02 mg/dL, erythrocyte sedimentation rate of 75 mm/h, total protein of 7.6 g/dL, and serum lactate dehydrogenase (LDH) of 144 U/L.

A chest x-ray revealed opacification of the right lower lung field and blunting of the right costophrenic angle, suggesting pleural effusion (Fig. 1). Chest computed tomography (CT) showed a loculated right pleural effusion with pleural thickening, as well as passive atelectasis in right lower lobe (Fig. 2a and b). There was neither pneumonic consolidation nor mediastinal lymphadenopathy. Thoracentesis to determine the cause of the pleural effusion yielded exudates with an LDH level of 201 U/L, and a protein level of 5.0 g/L. WBC count was 200/mm^3, with 58.3% lymphocytes. Adenosine Deaminase was 23.7 IU/L. Gram staining and Ziehl-Neelsen staining were negative. Culture of the pleural fluid demonstrated no growth of a micro-organism, and there were no malignant cells upon cytologic examination. Urinalysis revealed pyuria, and *Escherichia coli* (E.coli) was yielded in both the urine and blood

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https://doi.org/10.1016/j.ejro.2020.100279
Received 27 August 2020; Received in revised form 22 September 2020; Accepted 23 September 2020

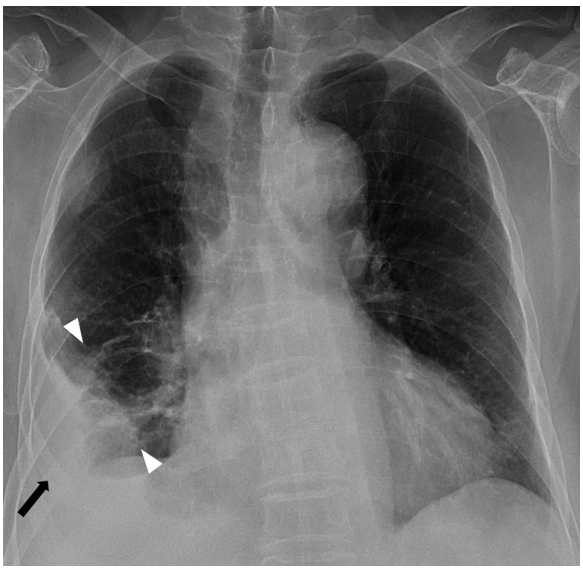

Fig. 1. Chest radiograph shows opacification in the right lower lung field with a blunt costophrenic angle (arrow) suggesting pleural effusion. Consolidations (arrowheads) are also noted in right lower lung field.

cultures. Our initial diagnostic impression was urinary tract infection, such as an acute pyelonephritis (APN). Abdomen CT showed no radiologic evidence of APN, and the patients had no complaint of costovertebral angle tenderness. Also the pleural effusion was not sufficiently explained by a consideration of urinary tract infection.

Interestingly, after careful review of the chest CT images, a mild paravertebral soft tissue infiltration was demonstrated at the T8-9 levels (Fig. 2c and d). Subsequent magnetic resonance imaging (MRI) displayed a high signal intensity on T2-weighted images in the bone marrow and paraspinal soft tissue of T8-9 vertebrae. After intravenous injection of contrast agent, bone marrow and paraspinal soft tissue was enhanced. The enhanced T1-weighted image also demonstrated that enhancement of the paraspinal soft tissue contiguously spread to the adjacent right pleura (Fig. 3). These MRI findings suggested that inflammation due to spondylodiscitis of the thoracic vertebrae had spread to the adjacent right pleura, which may have caused the exudative pleural effusion.

Paravertebral soft tissue or involved spinal segment by image-guided biopsy was not obtained. The patient was treated with meropenem and amikacin intravenously, and a chest tube was inserted into the right hemithorax for drainage of the pleural effusion. The patient had an uneventful recovery, her back pain still remained, and her CRP dropped to 1.61 mg/dL on the day of discharge, nearly two months after admission.

3. Discussion

Pleural effusions accompany a wide variety of diseases of the lungs and pleura as well as systemic disorders. To appropriately manage the pleural effusion, it is important to first determine its cause [1]. The most common causes of exudative pleural effusion include malignancy, tuberculosis, and pneumonia [4]. Less frequently, contiguous spread from adjacent infection, such as a liver abscess or pancreatitis, can give rise to pleural effusions [1].

Incidence of spondylodiscitis or vertebral osteomyelitis is increasing in the developed world and estimated at 2.2-5.8 cases per 100,000 person years [2]. Early diagnosis of spondylodiscitis and appropriate

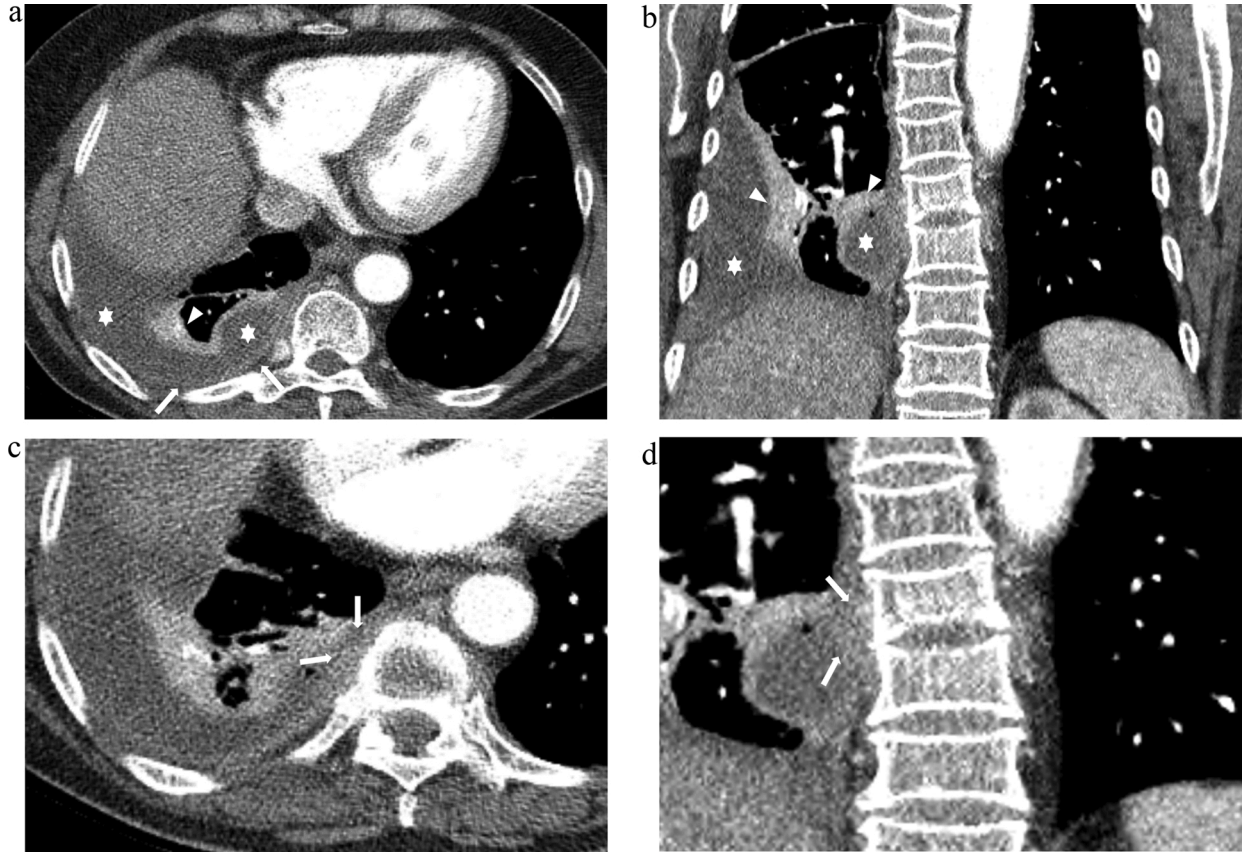

Fig. 2. Contrast enhanced axial (a) and coronal (b) CT images show loculated pleural effusion (asterisks) and pleural thickening (arrow) with atelectasis (arrowheads). Magnified axial (c) and coronal (d) CT images show paravertebral soft tissue infiltration (arrows) in the T8-9 levels.

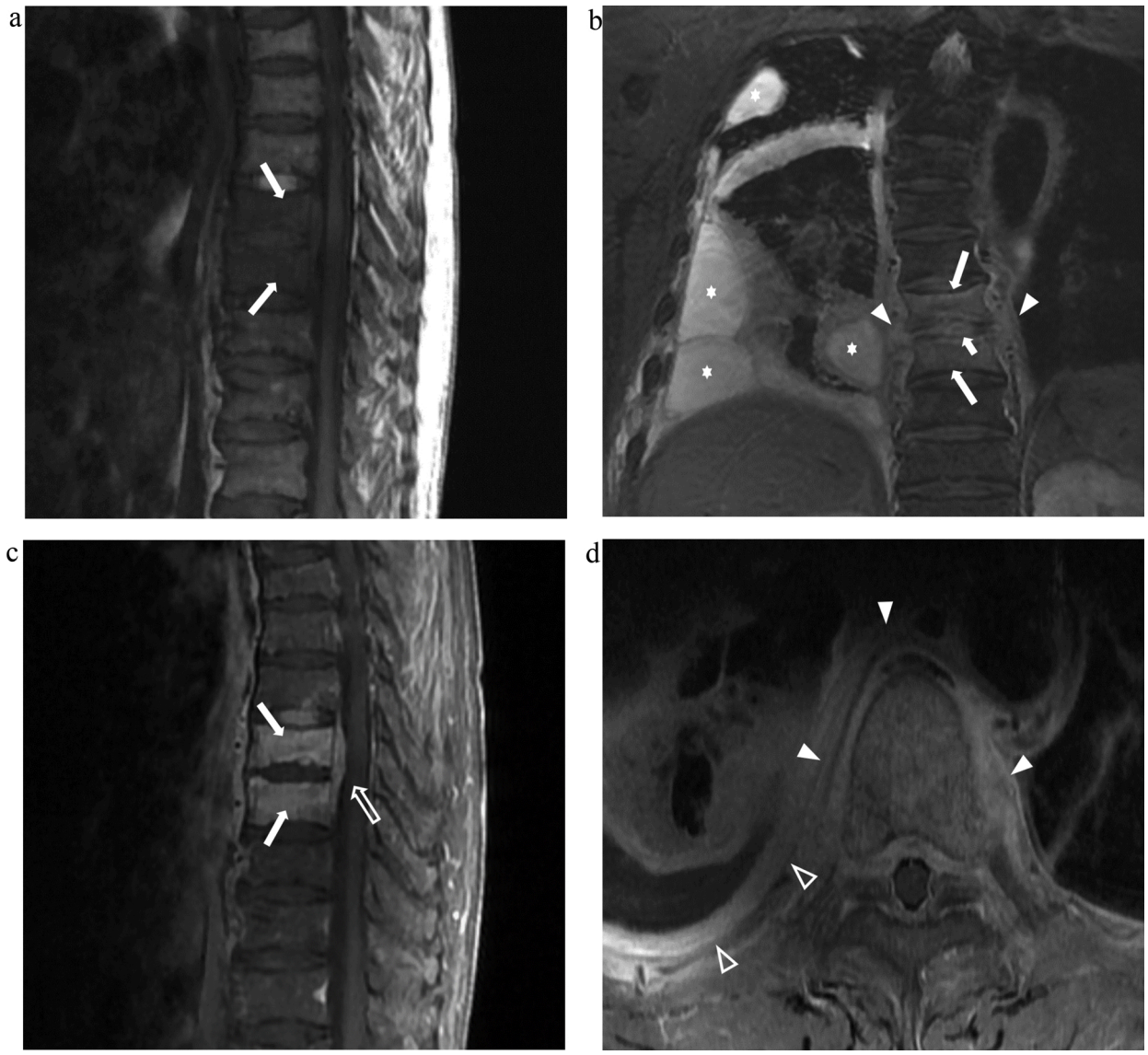

Fig. 3. MRI images of the T8-9 levels. T1 weighted sagittal image (a) shows low signal intensity in the bone marrow of the T8-9 vertebral body (arrows). T2 weighted coronal image with fat suppression (b) shows high signal intensity in bone marrow (arrows) and intervertebral disc (short arrow) and paravertebral soft tissue (arrowheads). Loculated pleural effusion was also demonstrated (asterisks). Fat-suppressed contrast enhanced T1 weighted sagittal and axial images (c-d) show enhancement of bone marrow (arrows) and paraspinal soft tissue (arrowheads). Contiguous enhancement spreading to adjacent right pleura (blank arrowheads) from paravertebral soft tissue is also demonstrated. Phlegmon (blank arrow) causing mild central canal compromise is also noted in the epidural space.

treatment can reduce hospital stay, morbidity, and mortality. However, non-specific clinical symptoms and signs of this disease make early diagnosis difficult [5].

Although back pain is a common presentation in spondylodiscitis, osteomyelitis is usually not at the forefront of diagnostic considerations. Therefore, diagnosis of the disease often delayed, potentially leading to severe consequences and resulting in long-term neurological impairment [6].

Several cases of spondylodiscitis, or vertebral osteomyelitis, associated with pleural effusion have been reported [3,6–10] (Table 1). Most of the patients presented with a chief complaint of back pain or thoracic pain; lesions affected by osteomyelitis were at the mid-lower thoracic vertebral levels. CT findings included pleural effusions, vertebral body height loss, and bony destructive change. MRI findings for patients with spondylodiscitis included vertebral signal change, paraspinal infiltration or mass, and decreased disc height.

We reported a case of exudative pleural effusion caused by thoracic spondylodiscitis. The chest CT revealed mild paravertebral soft tissue infiltration at the T8-9 levels; a subsequent MRI demonstrated that the visualized enhancement of the paraspinal soft tissue had contiguously spread to the adjacent right pleura. Therefore, the exudative pleural effusion of the patient may have resulted from the contiguous spread of inflammation due to the thoracic spondylodiscitis. Although the chest CT showed neither destructive change nor decreased vertebral height in our case, careful review of chest CT demonstrated a mild paravertebral infiltration, leading to a suspicion of vertebral osteomyelitis prior to the appearance of bony change or paravertebral soft tissue mass.

CT-guided biopsy for diagnosis of spondylodiscitis is often requested to identify the causative microbial pathogen when clinical and laboratory sign of infection and MRI finding are equivocal. However, CT-guided biopsy of the spine is rather invasive procedure and may result in complications such as pain, paresis or hematoma formation [11,12]. Most cases of spondylodiscitis or vertebral osteomyelitis resulted from hematogenous spread from a remote site of infection, most commonly the urinary tract [13]. In present case, although no CT-guided paravertebral soft tissue biopsy or involved spinal segment biopsy was

Table 1
Cases of vertebral osteomyelitis with pleural effusion.

Authors (Ref. No.)	Year	Age/ Sex	Symptom	Level	CT findings	MRI findings
S K Gupta [3]	2004	17/F	Left loin pain	T9-11	Right pleural effusion, loss of height of the vertebra	Bone marrow edema and paraspinal mass of soft tissue around vertebrae
Steven N., et al. [6]	1998	59/M	Left back pain	T11	Bilateral pleural effusions, soft tissue swelling around the endplate of thoracic vertebra with destructive changes	N/A
Steven N., et al. [6]	1998	74/F	Dyspnea	T8-10	N/A	Increased signal intensity at the level vertebra and loss of disk space height
Steven N., et al. [6]	1998	62/M	Back pain and cough	T6-7	Right pleural effusion	Destruction of vertebral endplates and increased signal intensity in the disk space
Steven N., et al. [6]	1998	55/F	Left back pain and fever	T4-8	Left pleural effusion with atelectasis	Evidence of vertebral osteomyelitis and a posterior epidural mass in the middorsal spine
Steven N., et al. [6]	1998	69/M	Back pain	T6-7	N/A	Increased signal intensity in the disk space with epidural extension and posterior displacement of the cord.
S Jari, et al. [7]	1996	58/M	Left flank pain	T10-11	Left pleural effusion, destruction of vertebra, paraspinal soft tissue mass	N/A
Stéphane Jouneau et al. [8]	2004	66/M	Basithoracic pain	T7-8	Bilateral pleural effusions, decrease in the intervertebral disc height with erosion of the adjacent vertebral endplates	N/A
Stéphane Jouneau et al. [8]	2004	61/M	Back pain and right thoracic pain	T9-10	Bilateral pleural effusions, extensive destruction of vertebral endplates	Vertebral hypersignal intensity with spinal cord compression
Xiujun Zheng, et al. [9]	2009	42/M	Thoracolumbar junction pain	T11-12	Bilateral pleural effusions, compression of the vertebra	Destruction and compression of vertebral body with large bilateral psoas muscle abscesses
Ioannis Papaioannou, et al. [10]	2017	57/M	Thoracic pain	T11-L1	Left pleural effusion, destruction of the vertebral body and intervertebral discs with paravertebral abscess	N/A

obtained, spondylodiscitis was final diagnosis as considering clinical course, laboratory and culture results.

This case suggests that pyogenic spondylodiscitis can be a rare cause of pleural effusion, and also gives an outline of the usefulness of a comprehensive analysis of imaging to assist in the diagnosing of unexplained exudative pleural effusion.

4. Conclusion

Spondylodiscitis is a rare etiology of exudative pleural effusion. Careful examination of the thoracic spine on initial imaging studies may be helpful in order to discover the cause of pleural effusion.

Declaration of Competing Interest

The authors report no declarations of interest.

Acknowledgement

The authors would like to thank Enago for the English language review. The authors received no specific funding for this work.

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