

Research Article

Imaging and surgical findings of spinal epidural abscess caused by direct intraspinal spread of paraspinal infection: Correlation with spinal pneumorrhachis and its clinical implication

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Abstract

Background: The clinical outcome of spinal epidural abscess (SEA) can deteriorate rapidly especially in immune-compromised patient. Awareness of all possible causes is key to expeditious diagnosis and treatment of SEA.

Purpose: To report and analyze the imaging and clinical presentations characterizing an uncommon cause of SEA due to direct extension of intra-thoracic infections in immune compromised patients.

Methods: Medical histories and CT/MRI findings of 2 cases presented with intrathoracic infections with subsequent development of SEA and 1 case with pneumorrhachis were retrospectively analyzed. Further investigation into the anatomic pathways from intrathoracic cavities to epidural space was also carried out on a cadaver.

Results: One case with advanced esophageal adenocarcinoma on systemic chemotherapy complicated with esophageal obstruction and perforation requiring stomach pull-through surgery. MRI showed direct connection of thoracic infection to cervical and thoracic SEA which was caused by GI tract *Candida Albicans*. One case with systemic lupus erythematosus (SLE) on immune suppression therapy developed thoracic empyema, which directly extended into thoracic epidural space. The third case of pneumorrhachis and cadaveric study demonstrated the pathway from paraspinal tissue to the spinal epidural space.

Conclusions: Our data confirmed that the direct connections between thoracic and paraspinal compartments to spinal epidural space which could serve as a potential conduit to spread infections. It is likely more commonly occur in immune compromised patient. Its awareness should be raised to justify early spinal imaging in such patient groups even with only mild neurological symptoms.

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Keywords: Epidural abscess; Paraspinal infection; Pneumorrhachis

1. Introduction

Spinal epidural abscess is a critical clinical diagnosis which could result in grave consequences or could be life-threatening,

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if not correctly diagnosed and treated expeditiously [1,2]. However, in immune compromised patients, its outcome has not been favorable due to rapid disease progression, mandating early diagnosis in those patients and others who have been sedated [3,4]. The majority of SEA cases are caused by hematogenous seeding to epidural vasculature or due to inter-spinal disc infections (discitis/osteomyelitis) extending into the adjacent spinal epidural space [5–7].

It has been long recognized that air around the spine can travel into the spinal canal without causing symptoms

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(pneumorrhachis) [8,9], suggesting the existence of an (potential) anatomic communication between the paraspinal tissue and spinal canal [8]. The spinal venous plexus eventually reabsorbs the air from pneumorrhachis over a period of few days [8,10,11] if there is no subsequent infection. Similarly, this potential pathway can convey other materials including body fluid or secretions into the spinal canal. Whether SEA can be caused by this route has not been reported on imaging.

We retrospectively analyzed the history and imaging finding of 2 SEA cases caused by direct transmission of paraspinal infections and 4 case of pneumorrhachis which were directly dissected from paraspinal soft tissue emphysema caused by pneumomediastinum. We also reviewed one case-study of cadaveric investigation when we introduced air into the mediastinum to demonstrate this possible pathway of air tracking from thoracic cavity to the spine canal.

2. Methods

With IRB/HIPAA compliance, the CT/MRI findings of all 6 such patients were retrospectively investigated. Introduced pneumothorax and pneumomediastinum on a cadaveric case was performed and subsequently scanned on a clinical CT scanner.

3. Results

The first case was a 21-year old female with SLE on immune suppressant who presented with extensive cervical and thoracic SEA secondary to intra-thoracic infection. She had a SLE flare up episode and was hospitalized for large pleural effusion and left shoulder swelling and pain for 10 days. Chest CT exam demonstrated large bilateral pleural effusions requiring chest tube placement, which confirmed a thoracic empyema but negative blood culture for microorganisms. Worsening shoulder pain with arm weakness developed. Her cervical and thoracic spine MRI exams revealed extensive continuous dorsal SEA extending from skull base to L2 level with cord compression. Enhancing inflammatory phlegmon extending from posterior mediastinum to bilateral thoracic



Fig. 2. Saggital T1 weighted spine image demonstrating extensive ventral epidural abscess (arrows).

neural foramen at most thoracic levels were demonstrated. Multiple axial images demonstrated evidence of enhancing abscess fluid from paraspinal soft tissue and the posterior mediastinum communicating with the SEA (Fig. 1). Extensive segmental laminectomies for decompression and drainage surgery performed during which the direct communications of paraspinal abscesses with SEA were confirmed. After the surgery and subsequent antibiotics treatment, the patient had a satisfactory recovery.

The second case was a 64-year-old male diagnosed of advanced esophageal adenocarcinoma on chemo-radiation therapy, developed esophageal obstruction and perforation underwent Ivor Lewis esophagogastrrectomy surgery. On post-op day 7, he developed spiking fevers and chills with neck pain and mild right arm/shoulder weakness and numbness.

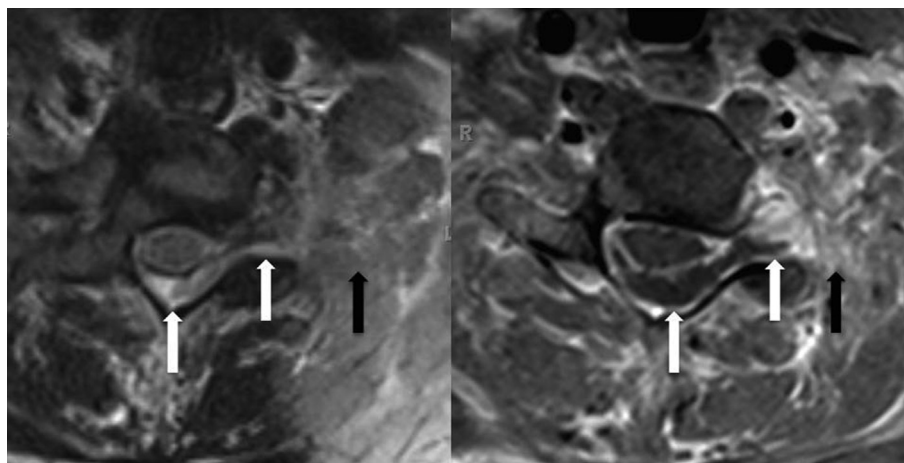


Fig. 1. Axial spinal T2 (left) and post gadolinium contrast T1 (right) weighted images demonstrating abscess extending from paraspinal tissue into dorsal epidural space (white arrows), and extensive paraspinal tissue inflammation (black arrow).

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