Spine Infections

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KEYWORDS

• Spinal infections • Fungal • Tuberculosis

KEY POINTS

- Infections of the spine represent a rare but potentially debilitating and neurologically devastating condition for patients.
- Early diagnosis, imaging, and intervention may prevent some of the more critical complications that may ensue from this disease process, including alignment abnormalities, central canal compromise, nerve root impingement, vascular complications, and spinal cord injury.
- A variety of imaging modalities are used to diagnose infections of the spine and spinal cord.

INTRODUCTION

Infection of the vertebral column without (spondylitis) or with involvement of the disk space (spondylodiscitis) constitute fewer than 2% to 4% of all cases of osteomyelitis.[1,2] A progressive increase has been seen in the number of vertebral infections in the setting of tuberculosis in HIV-positive patients and the homeless, and in hematogenous seeding in intravenous drug abusers and immunocompromised patients. The relative incidence of infectious spondylitis is more common in men than women, with a relative ratio of 1.5 of 3:1. It has a relative peak incidence in the sixth decade of life, although infections have been reported at all age ranges.[3] Risk factors for the possibility of spinal infection include recent surgery, immunocompromised state, diabetes, recent genitourinary surgery in male patients, and older age.[4,5]

CLINICAL PRESENTATION

Patients typically present with back pain, tenderness, and rigidity at the site of involvement.[6] Accompanying fever should alert clinicians to the possibility of infection. Paravertebral involvement and involvement of the neural foramina and exiting nerve roots may present as a radiculopathy or polyradiculopathy. Additional involvement of the thecal sac and contents may lead to worsening neurologic deficits. Delay in diagnosis may be the result of a nonfocal neurologic examination.[4,7] Patients may also present with nonrelating symptoms, such as pleural effusion, which may delay diagnosis.[8,9]

SPONDYLITIS AND SPONDYLODISCITIS

Pathogenesis

Infection to the spinal column may occur through several routes. The most common manifestation is through hematogenous seeding directly to the vertebral bodies, usually resulting from septicemia. The segmental arteries providing the blood supply to the vertebral bodies provide the vascular blood supply to the peripheral third of the end plates. At each motion segment, the segmental

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artery supplying the subjacent end plates provides nutrients to the disk space through simple diffusion. In adults, no vessels service the intervening disk space, although bridging arteries exist in children between the segmental arteries, servicing the superior and inferior end plates at the motion segment. These vessels enter the disk space through the ossification center of the end plates and from the longitudinal ligaments. By 13 years of age, this network of vessels within the disk space is no longer present.[10,11] Hematogenous spread occurs at the end arterioles at the site adjacent to the end plates posterior to the anterior longitudinal ligament both superiorly and inferiorly, with inoculation of organism within the vertebral bodies. In the setting of pyogenic infection, the infection then spreads from the vertebral body into the disk space and to the adjacent end plate. In children, the organisms may inoculate the bridging arteries within the disk space, and thus children may initially present with only discitis. With stretching of the anterior longitudinal ligament from traction, children may present with abdominal pain as their initial presenting symptom (**Fig. 1**).

Organisms that lack the proteolytic enzymes to digest the disk (tuberculosis) may initially present with spondylitis, and disk space involvement is spared in the early course of disease. Eventual collapse of the vertebral body may lead to secondary collapse and destruction of the disk space late in the disease process (**Fig. 2**).

Another mode of hematogenous spread is through a transvenous route. Batson plexus, which forms the epidural venous plexus within the central canal, represents a series of valveless veins that extend the length of the spinal canal. Cases have been described of transvenous hematogenous seeding in patients with inflammatory bowel disease, urinary tract infections, and septic abortions.[3]

Direct inoculation of the spine may occur in penetrating trauma or direct exposure related to skin breakdown or open wounds. Nosocomial infections may also occur as a rare complication of spine surgery or secondary to inadvertent exposure related to nonspinal surgery. Interventional or diagnostic procedures such as lumbar puncture; pain management procedures such as epidural block, nerve block, facet block, vertebroplasty, and kyphoplasty; and the use of indwelling catheters may result in infection.[12,13]

The lumbar spine is the most common location for spondylodiscitis in 50% of cases, followed by

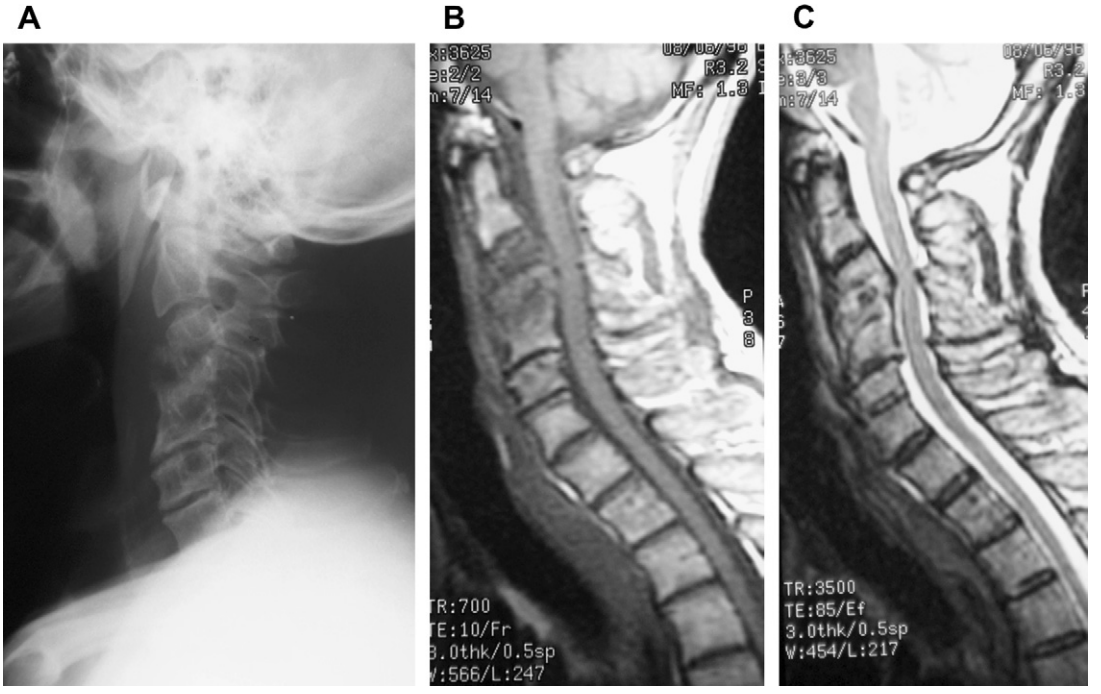

Fig. 1. *Staphylococcus aureus* spondylodiscitis. (*A*) Lateral plain film shows disk space narrowing with erosion of the end plates at the C3-4 level. Also note C4-5 severe disk space narrowing and fusion related to prior infection. (*B*) T1 sagittal image shows decreased signal of C3 and C4 vertebral bodies with loss of the hypointense band of the adjacent end plates. Note obliteration of the C4-5 disk space. (*C*) T2 sagittal image shows increased signal intensity of the C3-4 disk space.