Management of a Cervical Spine Infection: Case Report

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Increasingly, neurosurgeons are treating patients with spinal infections. Management of these patients requires antibiotic therapy and often surgical intervention. We report a patient with a severe infection who was initially treated with an external orthosis and antibiotics due to his multiple medical comorbidities. After a surprising neurologic improvement, he underwent surgical fixation and made an excellent recovery.

Key Words: infection, instrumentation, osteomyelitis, spinal fusion, spine

Abbreviations Used: AIDS, autoimmune deficiency syndrome; CT, computed tomography; MR, magnetic resonance

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Spinal infections can have devastating consequences, including paralysis and death. Administration of antibiotics is a mainstay of treatment. When neural elements are compressed or deformed, surgery may be required. We report a patient who developed a neurologic deficit related to a cervical spine infection and his subsequent treatment.

Illustrative Case

A 47-year-old man with a complicated medical history sought treatment at an outside hospital complaining of progressive paraparesis. Three months earlier his right arm had been amputated to treat necrotizing fasciitis, and he had been discharged to a skilled nursing facility on oral antibiotics. His medical history was significant for hepatitis C, liver cirrhosis, hypertension, bipolar disorder, and chronic pain syndrome. His paraparesis rapidly progressed to complete paralysis of the lower extremities with involvement of his left, and only remaining, upper extremity. The patient was placed in a halo brace at the outside hospital, and he was transferred to our institution for further treatment.

On arrival, the patient was awake and alert. Bilaterally, his lower extremity motor function was graded 0/5. His left upper extremity function was graded as follows: deltoid 2/5, biceps 4/5, triceps 2/5, and grip 1/5. He had no sensation in his lower extremities. CT of the cervical spine showed cervical kyphosis and osteolytic changes in the vertebral bodies of C3 to C6 (Fig. 1). MR imaging showed osteomyelitis, diskitis, and an epidural abscess posterior to the C5 and C6 vertebral bodies (Fig. 2). Because the pa-

Figure 1. Sagittal CT reconstruction of the cervical spine shows extensive infection involving the anterior vertebral bodies and the resulting kyphotic deformity.

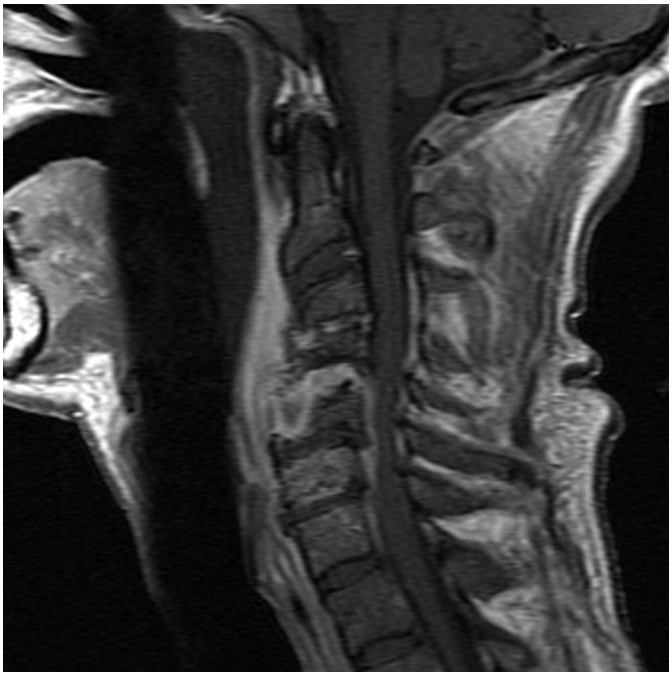

Figure 2. Sagittal T1-weighted MR image with gadolinium shows infection involving the vertebral bodies, disc spaces, prevertebral tissues, and epidural space.

tient had no motor function for 3 days before his arrival and because he had multiple medical comorbidities, we elected to treat him conservatively. The patient's blood cultures grew oxacillin-resistant *Staphylococcus aureus*. He was treated with linezolid and rifampin, as recommended by our infectious disease service. He was maintained in halo fixation. He experienced respiratory failure due to pneumonia and required a tracheostomy for long-term ventilation. He was discharged to a skilled nursing facility.

Over the next 3 months, the patient's physical examination improved. Sensation returned to his lower extremities. His motor function also improved. With the exception of the deltoid muscle, which was graded 4/5, strength in his upper left extremity returned to normal. His lower extremity function improved to 3/5 on the right and to 1 to 2/5 on the left. By this time the patient had stabilized medically, his infection was thought to be treated. Reimaging of the patient's cervical spine showed no changes, and he continued to wear the halo brace.

Because the bony destruction caused by the infection was extensive, we recommended cervical fusion. The patient underwent a C2 to T1 posterior fusion. We performed a C2 to C7 laminectomy and placed C2 pars interarticularis, C3 to C6 lateral mass, and T1 pedicle screws. Bone morphogenic protein and locally harvested autograft were used for a lateral fusion (Fig. 3A and B). After surgery the halo brace was removed, and the patient was placed in a Miami-J collar (Jerome Medical, Moorestown, NJ). He was discharged to a rehabilitation facility 1 week later.

At his 3-month follow-up examination, the patient's motor function had improved and was graded 5/5 in his left upper extremity and 4/5 in both lower extremities. He had a spastic gait and hypertonia but was ambulatory with a walker. A follow-up CT scan showed bony fusion, and the collar was removed.

Discussion

Spinal infections are often classified by anatomic location as diskitis, osteomyelitis, or epidural abscess. As in our patient, an infection commonly involves more than one location. Although spinal infections are relatively rare, their incidence, which is about 1/100,000, is increasing.[5] This increase reflects the growing number of patients affected by AIDS, those using intravenous drugs, and those with medical conditions like diabetes and renal disease. Mortality rates as high as 20% have been reported.[4]

Diagnosis

Prompt diagnosis of a spinal infection is important to minimize neurologic complications. Patients typically become symptomatic with back pain and are often febrile. An elevated erythrocyte sedimentation rate and C-reactive protein level can also help make the diagnosis. Diagnosis may be easier in patients with a predisposing condition like AIDS or other immunosuppressive states.

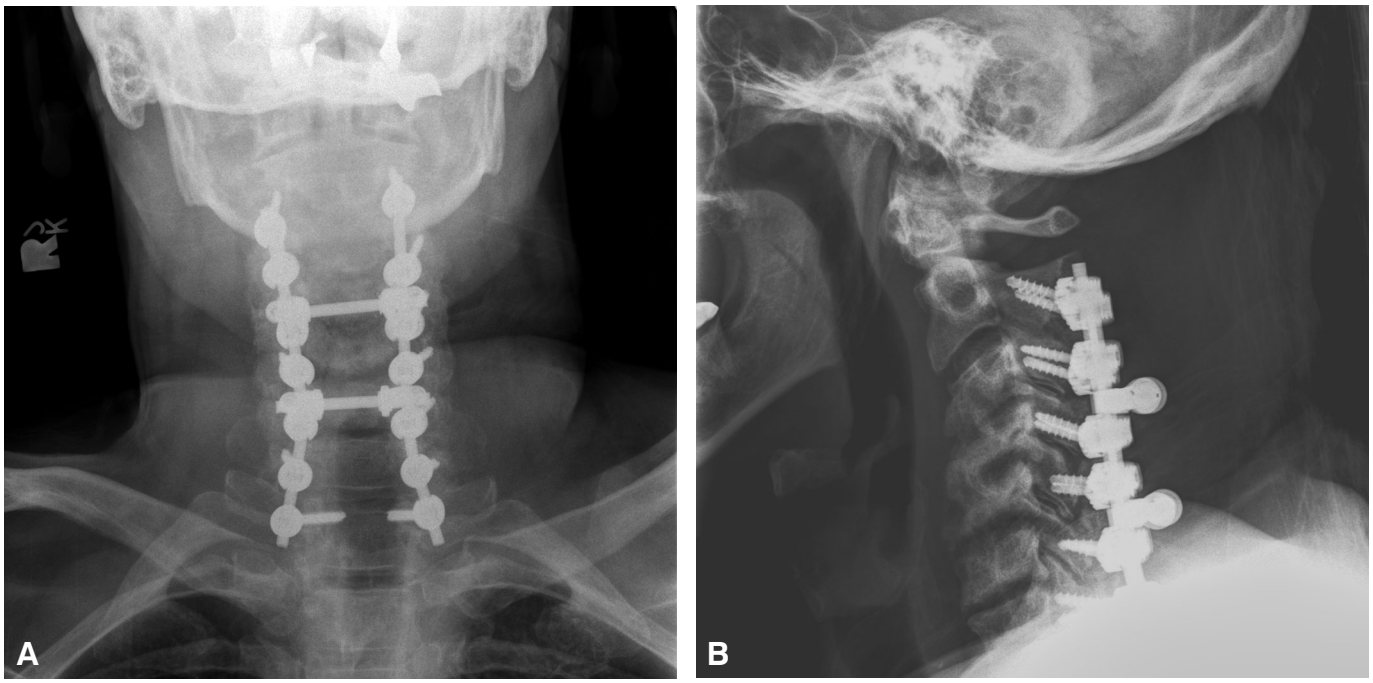

Figure 3. Postoperative (*A*) anteroposterior and (*B*) lateral radiographs show posterior fixation from C2 to T1.

However, the index of suspicion must be high when patients present with this constellation of signs and symptoms.

MR imaging has proven to be the most sensitive modality for the diagnosis of spinal infections.[3] On T1-weighted MR images, infection tends to appear as low to intermediate signal intensity while on T2-weighted MR images it appears as high to intermediate signal intensity. Gadolinium enhancement of infection is usually diffuse. CT can help determine bone involvement and deformity. If MR imaging is unavailable, the extent of soft tissue involvement may be visualized with contrast CT.

Microbiology

Gram-positive organisms are the most common cause of spinal infections, and *Staphylococcus aureus* is the most common organism involved.[1] Gram-negative organisms are less common but are likely to be associated with genitourinary or gastrointestinal sources of infection. Every attempt should be made to isolate a causative organism before antibiotic treatment is initiated. Direct culture, CT-guided biopsy, or blood cultures can be used to obtain the diagnosis. In septic or deteriorating patients, awaiting the results of cultures should not delay treatment. In such cases, broad-spectrum antibiotics should be started immediately.

Treatment

Once a spinal infection has been diagnosed, appropriate antibiotic therapy must be instituted. Some patients require surgical intervention for decompression, debridement, or fixation. Most patients with acute or progressive neurologic deficits should undergo emergent decompression and debridement of their infection. When spinal instability is obvious, internal fixation may be performed during the initial surgery.[2] Some patients require delayed fixation, especially those who develop progressive deformity despite appropriate medical treatment. Because our patient had suffered a fixed neurological deficit for 3 days and because he had multiple medical comorbidities, we elected to treat him with an external orthosis and antibiotics. Despite his poor medical and neurologic condition at presentation, he made an excellent recovery.

Conclusions

The severity and presentation of spinal infections vary. Appropriate treatment requires an individualized approach that includes antibiotic therapy. Surgical intervention may be required for immediate decompression or may be delayed for spinal stabilization.

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