Post-traumatic Osteomyelitis with Spinal Epidural Abscess of Cervical Spine in a Young Man with No Predisposing Factor

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Spinal osteomyelitis with epidural abscess is a rare disease. Most patients have 1 or more predisposing factors, such as impaired immune system secondary to diabetes mellitus, chemotherapy for cancer, immunological compromised disease, and chronic renal or hepatic impairment. We present a case of a physically steady young man without any predisposing risk factor who suffered from cervical osteomyelitis with epidural abscess after neck blunt injury. This patient recovered well after one-stage anterior surgical debridement with implant instrumentation and proper antibiotics treatment. The initial accurate diagnosis rate of spinal epidural abscess is low, even in patients with predisposing factor(s). We present this case to raise the attention of medical staff to this disease in patients with or without any predisposing factor(s) in order to establish early diagnosis and treatment. Our case report also indicates that with adequate debridement and antibiotic coverage, one-stage surgery is a safe and efficacious method to treat patients with cervical spinal epidural abscess. [*J Chin Med Assoc* 2009;72(4):210–213]

Key Words: cervical spine, epidural abscess, osteomyelitis

Introduction

Osteomyelitis of the spine is rare, representing about 1% of all bone infections. Among these, only 3–6% are confined to the cervical spine. Spinal osteomyelitis is commonly caused by hematogenous seeding.[1] Predisposing factors that compromise the immune system render the host more susceptible to spinal infection. Spinal epidural abscess is a rare condition that has an estimated incidence rate of 0.2–2.8 cases per 10,000 per year, with the peak incidence occurring in the 6th to 7th decades. The signs and symptoms of epidural abscess are nonspecific and can range from back pain to sepsis, which often leads to a delayed or missed diagnosis.[2] Hematogenous spread is the most common route of infection (about half of the cases) followed by contiguous spread (about a third of cases).[3] Like patients with spinal epidural abscess, most patients with spinal epidural abscess usually have 1 or more predisposing factors contributing to immunocompromised states. Both osteomyelitis and spinal epidural abscess are critical clinical processes that may lead to severe neurologic deficit and even death, especially when the cervical spine is involved. Physicians' high suspicion and awareness of this disease can lead to early diagnosis and a favorable outcome with appropriate treatment.

Case Report

A 31-year-old robust fireman was accidentally hit on his neck by a water pipe during a fire training session. He came to the emergency room the next day because he felt neck pain during flexion and extension. The pain did not deteriorate as a result of any other daily activity. In the emergency department, physical examination revealed usual anatomic position of the neck without any wound. There was no tenderness upon

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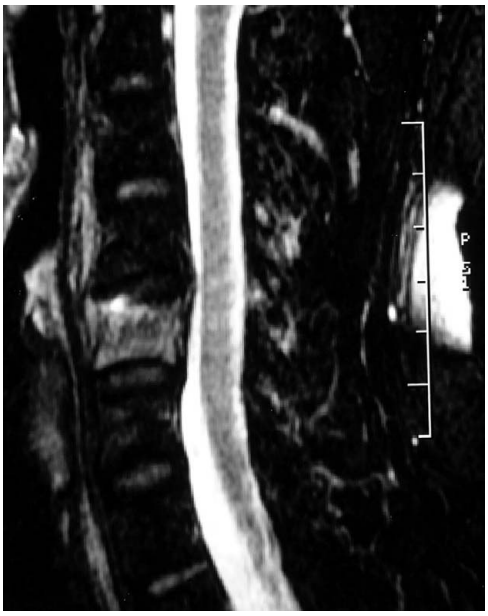

Figure 1. Sagittal magnetic resonance imaging of the cervical spine, T2W2, shows wedge-shaped deformity of C5 with high signal intensity.

Figure 2. Contrast-enhanced magnetic resonance imaging shows enhancement of the C5 body and the prevertebral soft tissue.

palpation and percussion over the neck. Neurologic examination showed no neurologic deficit. Cervical spine X-ray revealed no bony fracture or subluxation. Analgesics were given for symptomatic relief.

Three days later, the patient continued to feel neck pain, so he sought help at the neurosurgical department. Neurologic examination there also showed no sign of neurologic abnormality except for some neck pain on flexion and extension. Analgesics were given for symptomatic treatment.

Unfortunately, 7 days after his accident, the patient came back again, with more severe motion neck pain. Cervical spine magnetic resonance imaging (MRI) was arranged and showed low signal intensity on T1-weighted and high signal intensity on T2-weighted imaging over the 5th cervical spine (C5) body without significant destruction of the end plate (Figure 1). Contrast-enhanced MRI showed enhancement of the C5 body and the prevertebral soft tissue (Figure 2). Occult compression fracture of C5 with post-traumatic edema was suspected, and analgesics were given for symptomatic treatment. However, the neck pain persisted for 1 week, so he was admitted for further investigation.

Upon admission, physical examination showed tenderness over the posterior aspect of the neck. The range of neck motion was limited due to pain, and there was no neurologic deficit. Routine blood panel showed mild leukocytosis (9,800/mm^3), but erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) were elevated (64 mm/hr and 4.5 mg/dL, respectively). Computed tomography (CT) demonstrated C5 body wedge shape deformity with end plate destruction and abscess over the epidural space (Figure 3). Under the impression of cervical spine osteomyelitis with epidural abscess, the patient underwent operation. Surgical exploration revealed destruction of the C4/5 disc and C5 upper body by epidural abscess formation. The patient underwent anterior C4/5 disectomy, C5 subtotal

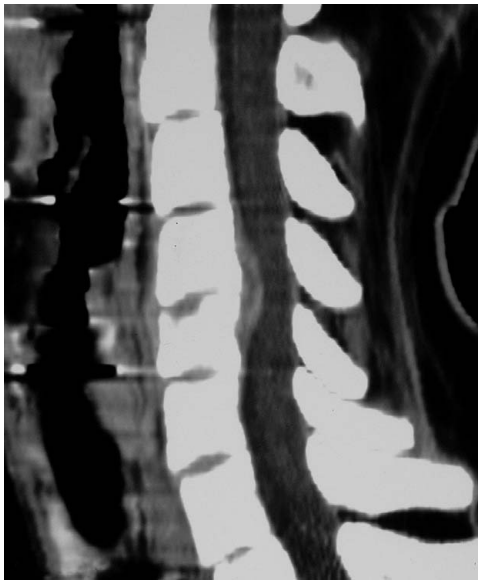

Figure 3. Reformatted contrast-enhanced sagittal computed tomography of the cervical spine reveals deformity of C5 with epidural compression by the abscess.

corpectomy, and removal of the epidural abscess followed by iliac bone graft fusion with cervical plate fixation. The surgical specimen revealed Gram-positive cocci, and the bacterial culture was *Staphylococcus aureus*. After 4 weeks of amoxicillin/clavulanate potassium treatment, CRP and ESR returned to normal. The patient recovered well and spinal fusion was good after 6 months of clinical follow-up.

Discussion

Pyogenic spinal infection has been described variously as spondylodiscitis, discitis, spine osteomyelitis, and epidural abscess according to the involved portion of the spine. In general, pyogenic infection of the spine has been reported as either spondylodiscitis or osteomyelitis. Pure discitis is rare because MRI findings suggest evidence of spondylodiscitis in all cases with a radiographic diagnosis of pure discitis. Pure pyogenic spondylitis without disc involvement has not been reported with certainty. Epidural abscess can complicate pyogenic infection of the spine and is referred to as secondary epidural abscess. When it is found as an entity independent of spondylodiscitis, it is referred to as primary epidural abscess. In most cases, spinal osteomyelitis is caused by hematogenous spread.[4] Trauma is a less common cause of spinal osteomyelitis. In 2000, Hadjipavlou et al reviewed 101 patients with pyogenic spinal infection; only 1 (1%) patient had back trauma history. They also stated that of the 101 patients, 29 had spinal epidural abscess. Of these 29 patients, 27 had occurred as a complication of spinal osteomyelitis.[5]

Spinal epidural abscess is a disease of geriatric patients, with the peak incidence in the 6th to 7th decades of life. The disease usually occurs in patients with predisposing medical condition such as diabetes mellitus, chronic renal failure, alcoholism, liver cirrhosis, long-term steroid therapy, post spinal procedure, neoplasm and intravenous drug use.[6] Hematogenous spread is most common, coming from infection of the skin, teeth, respiratory tract, and middle ear, genitourinary tract, endocarditis or phlebitis. Direct spread may occur from a neighboring focus of bony vertebral column, intervertebral disc or paravertebral soft tissue due to previous spinal surgery or epidural or spinal puncture procedure.[7,8] Trauma may play a role in spinal epidural abscess; about 10% of patients with spinal epidural abscess have a history of extraspinal or spinal trauma history.[9]

The majority of the abscesses are caused by *Staphylococcus*, followed by *Streptococcus* and Gram-negative bacilli. Anaerobic infection of the spinal epidural space is rare.[10] The main symptom of the spinal epidural abscess is pain, followed by signs of infection such as fever and malaise. Laboratory data of patients with spinal epidural abscess are usually nonspecific. Elevation of leukocyte counts range only from 13% to 60%; levels of ESR and CRP are elevated more commonly, ranging from 70% to 100%, and are also good indicators in representing the response of the infection to treatment.[7] Plain X-rays are abnormal in only 30–70% of cases, but more likely to be abnormal in chronic abscess with gross osseous change.[8] CT is helpful in cases when MRI is unavailable or inappropriate; it may show bony destruction with extradural lesion. Contrast-enhanced MRI has become the investigation of choice for spinal infection, because of its excellent visualization of the abscess, vertebral, disc space or paraspinal infection foci.[11] Management of this disease consists of surgical and antibiotic treatment. Surgical debridement and decompression with systemic antibiotic therapy is the treatment of choice for most patients because the rate of progression of neurologic deficit is difficult to predict. Empirical intravenous antibiotic therapy should be commenced preoperatively and then be modified when a microorganism has been identified. The duration of treatment should usually consist of 4–6 weeks of specific intravenous antibiotics followed by 2–6 weeks of oral therapy, and disease progression should be assessed with CRP, ESR and imaging studies.[12] A few studies have reported successful results in selected patients who were treated with antibiotics alone; however, most of these patients had no or mild neurologic deficit and smaller abscesses.[3]

The indications for surgical treatment include presence of spinal cord compression, significant deformity of the spine, poor response to nonoperative treatment or obtaining a bacteriological diagnosis when close biopsy is negative or deemed unsafe. Surgical treatment consists of debridement of the infected foci, thecal sac decompression and reconstruction of spinal stability. Radical debridement of the infected tissue with thecal sac decompression is the most important procedure, but it bears the risk of spinal instability.[13] Whether to place an implant to obtain adequate stability is controversial due to concern about placement of a foreign body over the infected tissue. Bone grafting, bed rest and bracing with a second-stage implant placement have been advocated in the past. Since the first report of anterior debridement with posterior instrument fixation by Fountain in 1977, the trend has shifted to single-stage debridement and instrumentation for the treatment of spinal epidural abscess.[9] The placement of implant via a second non-contaminated field has been

advocated in several reports with excellent outcomes. In recent years, some authors have challenged the necessity of the placement of instrumentation through a different route.[14] In 1999, Rezai et al reported 18 consecutive patients who underwent anterior debridement, with 14 receiving anterior implant and 4 receiving anterior and posterior instrument implantation. Only 1 patient experienced recurrent cervical spine infection and was treated successfully with removal of the hardware and abscess drainage. Since then, several reports have confirmed the safety and efficacy of single-stage anterior debridement and anterior instrumentation.[15] In the present case, we removed all the infective tissue followed by immediate bone grafting and implant fixation by anterior approach with excellent result.

Spinal epidural abscess is a rare disease. Delay in diagnosis may lead to neurologic deficit, sepsis and even mortality. Unfortunately, the initial accurate diagnosis rate is low in clinical practice. A study by Tang et al in 2002 revealed that the initial accurate diagnosis rate was as low as 26%.[16] Most patients with spinal epidural abscess have 1 or more predisposing conditions, such as an underlying disease, a spinal abnormality or intervention, or a potential local or systemic source of infection.[2] This case report reminds us that spinal epidural abscess could occur in a healthy young man without any predisposing factor, and initial unawareness of this condition could lead to delayed diagnosis. When treating patients with neck or back pain, keeping awareness of the aforementioned disease and holding high suspicion with close follow-up of its clinical process in every patient is strongly recommended. This case report also reminds us that with adequate debridement and antibiotic coverage, single-stage debridement and instrumentation may be a safe modality of treatment for patients with cervical spinal epidural abscess.

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