Multicentric Spinal Tuberculosis with a Possible Concomitant Bacterial Infection

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Spinal tuberculosis (TB), the most common form of skeletal TB, is considered the most dangerous form because involvement of the spinal cord results in neurologic impairment. In adults, the lower thoracic and upper lumbar vertebrae are the most common sites of involvement. The cervical spine is rarely affected; cervical involvement occurs in approximately 0.03% of all TB cases and 3% of cases of tuberculous vertebral osteomyelitis.[1,2]

Multicentric involvement in spinal infection is unusual. Concomitant bacterial infection is even more rare, and only one case of tuberculous cervical spondylitis with a concomitant pyogenic infection has been reported to date.[3] This article describes a rare case of TB involving multicenters of the spine (ie, cervical, thoracolumbar, sacroiliac regions) with a possible concomitant bacterial infection of the cervical lesion. Epidemiology, pathogenesis, diagnosis, and treatment are also discussed.

CASE PRESENTATION

A 30-year-old Mexican immigrant with no significant medical history presents to the emergency department for evaluation of neck pain and bilateral arm weakness of approximately 2 months' duration. The patient was healthy until 2 months before presentation when he started to experience pain at the midportion of the neck. He denies any associated injury. Gradually the pain started to radiate to the shoulders and both arms. For the previous 2 weeks he has experienced difficulty in raising his arms to comb his hair.

The patient has not sought any prior medical advice. He has had a few episodes of night sweats but denies any history of cough, sputum production, or hemoptysis. He has not recently lost any weight. The patient also denies any history of headache, convulsions, visual disturbances, focal neurologic deficit, incontinence, or bowel disturbances. He does not smoke or abuse alcohol or other drugs. The patient does not have diabetes, hypertension, or active TB. He denies any contact with persons who have active TB.

Physical Examination

On examination the patient is afebrile and his vital signs are stable. Physical examination reveals tenderness in the midcervical region with restricted movement. No swelling exists, and no signs of inflammation are present. Weakness of the arms is predominantly proximal, with a power grading of approximately 3/5. Triceps and biceps reflexes are 2+. Power in the lower limbs is normal, with brisk deep tendon reflexes of 3+. The plantar reflex is downbearing bilaterally. No sensory deficits are found in the upper or lower limbs.

Examination of the patient's throat shows no abnormality. Significant findings in the physical examination of other systems include the presence of diminished breath sounds on the right side, with dullness to percussion. No lymphadenopathy is noted.

Laboratory Evaluation and Diagnostic Testing

Baseline findings from the patient's blood studies are within normal limits, except for an elevated erythrocyte sedimentation rate of 62 mm/hr. Chest radiography

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Figure 1. A radiograph of the cervical spine demonstrates compression of the C4 vertebral body and a prevertebral soft-tissue bulge at the C4 level.

reveals a left lower lobe infiltrate with minimal pleural effusion. A plain cervical radiograph demonstrates compression of the C4 vertebral body with associated abnormalities in the alignment of vertebral bodies. A prevertebral soft-tissue bulge is also noted at the C4 level (**Figure 1**). The patient is immediately stabilized with a Philadelphia collar.

A radiograph of the lumbosacral spine reveals sacroiliitis with disc disease at C5 to S1. A radiograph of the thoracolumbar spine shows a localized area of T12 destruction with involvement of the corresponding rib.

A magnetic resonance image (MRI) of the cervical spine reveals complete destruction of the C4 vertebral body with displacement of adjacent discs (**Figure 2**). A large subligamentous, paraspinal soft-tissue mass is noted. Mild cord compression at the level of the C4 vertebra is also noted. TB, fungal infection, and bone tumor are considered in the differential diagnoses.

Treatment and Outcome

Because the patient has neurologic impairment (bilateral arm weakness) secondary to cord compression, surgery is performed immediately. The C4 lesion is approached through an anterior cervical route. No abscess is found. Because the diagnosis is uncertain, frozen histopathologic examination of the lesion is

Figure 2. A magnetic resonance image of the cervical lesion shows destruction of the C4 vertebra and a large subligamentous mass.

performed. This procedure shows a necrotizing granulomatous lesion with acid-fast bacilli (AFB). Bacterial and fungal stains are not performed. Débridement is performed, followed by vertebral corpectomy and interbody fusion, with bone fragments taken from the iliac crest. The cervical spine is stabilized with an Orion plate (Sofamor-Danek, Memphis, TN).

Following surgery, the patient regains full strength in both arms. His postoperative course is uneventful. The patient is started on a four-drug antituberculous

regimen of isoniazid, rifampin, pyrazinamide, and ethambutol. The presence of *Mycobacterium tuberculosis* is confirmed by polymerase chain reaction, and tissue culture yields *Staphylococcus aureus* sensitive to oxacillin. The patient is subsequently treated with a course of oxacillin. Culture and susceptibility patterns for AFB testing are not yet available.

Computed tomography (CT) scan of the patient's chest is performed to delineate the thoracolumbar lesions detected previously by the radiograph and nuclear bone scan. The CT scan reveals a destructive lesion on the right side of the T12 vertebral body and pedicle, with a soft-tissue mass that is most consistent with another focus of TB infection (**Figure 3**). A left lower lobe infiltrate with pleural reaction is also present.

Two consecutive sputum tests for AFB yield negative findings. The patient is then discharged home with a referral to the health department for directly observed therapy. He is scheduled to receive antituberculous treatment for 6 to 12 months, depending on culture, susceptibility for AFB, and clinical improvement. The patient is also advised to make follow-up visits to the outpatient clinic for evaluation of treatment progress.

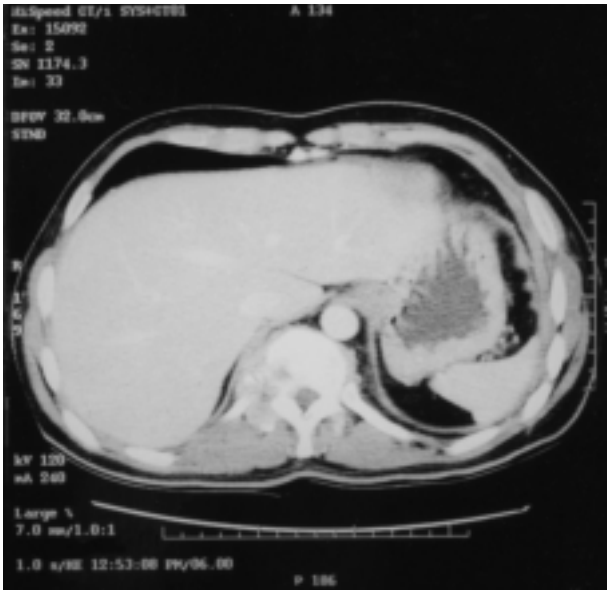

Figure 3. A computed tomographic scan at the level of the T12 vertebrae demonstrates a destructive lesion on the right side of the T12 vertebral body and pedicle, with a soft-tissue mass.

DISCUSSION

Epidemiology

TB of the spine has been documented in 5000-year-old Egyptian mummies.[4] The clinical characteristics of spinal TB were originally described by Hippocrates.[5] In the 18th century, English physician Percival Pott (1714–1788) described a syndrome of spinal deformity and paraplegia caused by spinal TB, hence the eponym *Pott's disease*.[6]

Extrapulmonary TB involving the skeletal system is not uncommon. Earlier reports have indicated an incidence of skeletal TB in 8% to 10% of extrapulmonary TB cases.[7] Although the incidence of TB has increased as a result of the increased incidence of HIV, the number of cases of skeletal TB has decreased because of its infrequent observation in HIV-infected patients.[7] Weightbearing joints involved in extrapulmonary TB are the spine, hip, and knees, in order of decreasing frequency. Involvement of the spine constitutes 60% of bone TB. In children, the upper thoracic vertebrae are commonly affected, whereas, in adults, the lower thoracic and upper lumbar vertebrae are more often affected.[7]

The usual pattern of spinal TB is of contiguous or continuous vertebral involvement. Multicentric involvement is extremely rare (even in immunocompromised adults). This case is interesting because the patient has atypical spinal TB with multicentric involvement (ie, cervical, thoracolumbar, sacroiliac regions). A possible concomitant bacterial infection of the cervical lesion may also exist.

Pathogenesis

Tuberculous spondylitis usually results from hematogenous spread of Mycobacteria, by either an arterial or venous route.[8] The initial foci of infection are in the anterior part of the vertebral body near subchondral bone, which has an extensive anastomosis of arterial and venous plexuses. The intervertebral disc is an avascular structure and thus is initially spared. As the disease advances, the adjacent vertebra is involved through the vascular communications and subligamentous pathways.[8] When only one vertebra is involved, the disc receives its nutrition from the adjacent normal vertebra and remains normal.[9] However, involvement of two adjacent vertebral bodies blocks nourishment to the intervertebral disc, which leads to its destruction and displacement. Although this pattern of bone and disc involvement is characteristic of spondylitis caused by infection, this pattern is insufficient to differentiate infectious spondylitis from malignancy.[10]

As the spinal TB progresses further, necrotic caseous debris collects to form an abscess that may be localized or may spread to adjacent areas. Instead of an

abscess, a soft-tissue nonpurulent mass may be present, as in the patient discussed here. Abscess occurs more frequently in Asians and Africans than in westerners,[11] but overall the incidence of a dry, soft-tissue mass is higher than the incidence of abscess.[11,12]

TB inflammatory exudate lacks the proteolytic enzymes required for bone lysis. Thus, the presence of bone fragments in the abscess or soft-tissue mass on CT (which is superior to MRI) is characteristic of TB infection.[13] Associated pyogenic infection is extremely rare, and only one case has been reported thus far.[3] In contrast to the patient in that case, the patient discussed in this case had no purulent abscess and no persistently waxing and waning fever. This finding can be explained by the early stage of bacterial coinfection for which no primary source of infection was found.

Clinical Manifestations

Systemic manifestations such as fever, weight loss, and night sweats may be present in conjunction with spinal TB. Local symptoms depend on the vertebrae involved and the extent of the lesion. For cervical lesions, symptoms may vary from simple cervicobrachial pain and weakness in the arms (as occurred in this patient) to quadriplegia. For thoracolumbar lesions, symptoms may vary from back pain to paraplegia. These neurologic symptoms may be caused by one or more of the following:[14]

- Subluxation of vertebra on vertebra
- Impingement of a bone, disc, or abscess on the spinal cord or a nerve root
- Local inflammatory response
- Tuberculous vasculitis

Patients may also manifest signs or symptoms depending on the extent of abscess spread along the bony and fascial planes. For cervical abscess, signs and symptoms may include one or more of the following: retropharyngeal abscess with dysphagia, mediastinal mass, and neck mass. Abscess in the lower thoracic/upper lumbar region may track down along the psoas muscle to present as a swelling in the groin. Usually these symptoms occur 6 to 7 months after the involvement of the vertebra. By that time, extensive damage to the bone has already occurred.[15]

Investigation and Diagnosis

Although standard laboratory investigations such as complete blood count, erythrocyte sedimentation rate, blood chemistries, and the Mantoux tuberculin skin test are helpful, these assessments do not contribute significantly to the diagnosis. Plain radiographs of the spine remain the diagnostic cornerstone for TB. Radiography is useful to localize the site of the lesion, determine the extent of bony disease, and assess alignment and spinal deformity. Typical radiographic changes indicative of vertebral osteomyelitis include vertebral destruction and narrowing intervertebral space.[16]

CT scan with windows at the level of bone and soft-tissue abnormality is helpful to define the anatomy, size, and extent of bony destruction. MRI is useful in evaluating the presence and extent of compression of neural elements by the adjacent bone and soft tissue. Nuclear bone scan is helpful in diagnosing lesions in other areas, as occurred in this patient. Of the diagnostic modalities (plain radiograph, CT scan, MRI, and nuclear bone scan), MRI is considered to be the most sensitive in detecting abnormalities in bone and soft tissue at an early stage, when plain radiographs appear normal. Changes on both T_1- and T_2-weighted images are mainly a result of the increased water content of the inflammatory and ischemic changes in the bone marrow. These changes noted on MRI result in early detection of pathologic processes.[11] In a study by Gupta et al,[10] MRI showed gross abnormalities in 63% of patients with tuberculous spondylitis who had normal plain radiographic findings.

It is difficult to differentiate spinal infections from one another or from neoplasms based on clinical examination and MRI.[17] However, the presence of an abscess or bone elements (in an abscess or soft tissue) as revealed on MRI or CT scan is a strong clue for differentiating Pott's disease from neoplastic disease.[10]

No single imaging or laboratory finding is pathognomonic for Pott's disease; therefore, a CT-guided needle biopsy is indicated in most patients unless precluded because of rapid neurologic deterioration,[18] as occurred in this patient. CT-guided biopsy is a safe and rapid method for diagnosing TB in patients who do not need surgery. Because the symptoms of Pott's disease appear at a relatively later stage (by the time most of the destruction would have occurred), a high index of suspicion helps to detect the disease at its earlier stage by using the previously described diagnostic methods.

Treatment

The objectives of management in tuberculous spondylitis are bacteriologic control and spinal stabilization with minimal deformity. Spinal TB without unsightly kyphosis and neurologic symptoms is a medical condition rather than a surgical condition. Surgery should be reserved for patients who have advanced TB

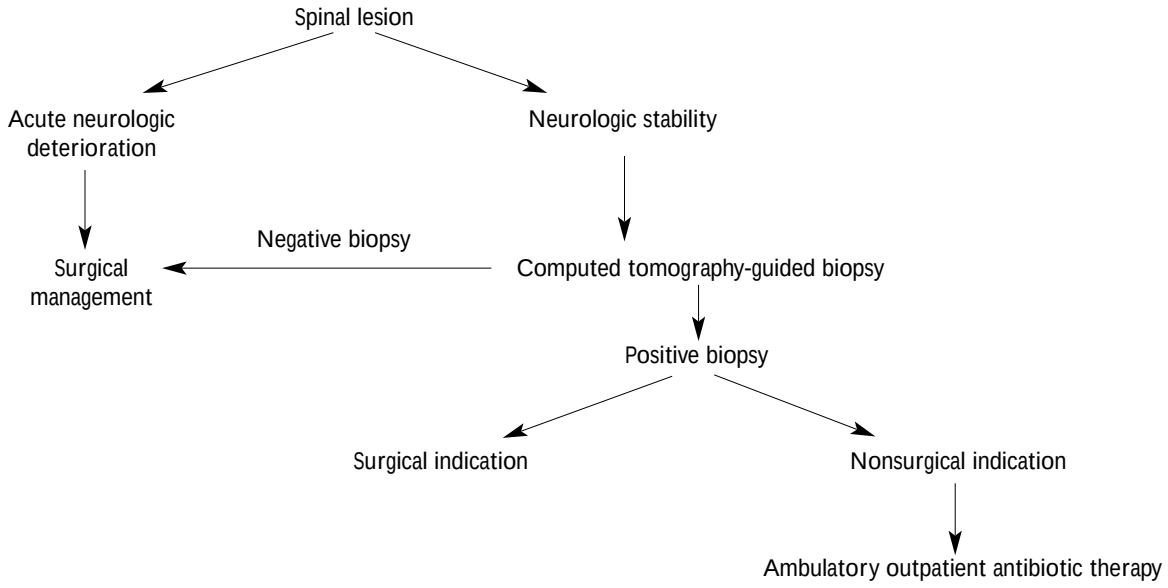

Figure 4. Treatment guidelines for the management of tuberculous spondylitis. Data from Rezai AR, Lee M, Cooper PR, et al: Modern management of spinal tuberculosis. *Neurosurgery* 1995;36:87–98.

with unacceptable complications, such as paraplegia or deformity.[19] Recently Rezai et al[20] formulated simple treatment guidelines for the management of tuberculous spondylitis (**Figure 4** and **Table 1**). A 6-month antibiotic regimen is adequate if combined with débridement and fusion with bone grafting.[21] Otherwise a minimum treatment period of 12 months is necessary to achieve the best results.[22]

Table 1. Indications for Surgical Management of Pott's Disease

Neurologic deficit*
Spinal instability/deformity†
Nonresponse to medical therapy‡
Noncompliance with medication‡
Nondiagnostic biopsy

*Includes acute neurologic deficit.

†More than 50% vertebral body collapse or destruction; spinal deformity of more than 5 degrees.

‡As manifested by development or progression of neurologic deficits, spinal deformity, intractable pain, and progression of disease.

Data from Rezai AR, Lee M, Cooper PR, et al: Modern management of spinal tuberculosis. *Neurosurgery* 1995;36:87–98.

SUMMARY

Multicentric spinal TB with a concomitant bacterial infection of the cervical lesion tends to occur in high-risk patients (eg, HIV-positive persons, immigrants, and homeless persons) who present with back or neck pain. In such patients, a high index of suspicion helps the clinician detect the spinal lesions in their early stages. Prompt diagnostic evaluation and proper treatment prevent the predictable catastrophic outcome (ie, permanent neurologic deficit, death). When spinal TB is detected, involvement of other sites should be investigated. If concomitant infection is present, it should be treated with appropriate parenteral antibiotics. **HP**

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