Spinal infection caused by *Mycobacterium avium* complex in a patient with no acquired immune deficiency syndrome: a case report

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ABSTRACT

Spinal infection caused by *Mycobacterium avium* complex (MAC) is rarely seen in people who do not have acquired immune deficiency syndrome. We report such a case in a 60-year-old man who underwent anterior spinal fusion after treatment with antibiotics had failed. The presentation of MAC spinal infection is different from that seen in MAC lung infection, with more than half presenting with urgent or semi-urgent neurological deficits. Younger patients who are not immunocompromised can also be infected. It should be considered as a differential diagnosis in patients with tuberculosis of the spine. The use of antibiotics should be based on the cultured organism’s sensitivity results. Indications for surgery are progressive bony destruction, abscess formation, and neurological compression.

**Key words:** mycobacterium avium complex; osteomyelitis; psoas abscess; spine; spondylitis

CASE REPORT

In March 2004, a 60-year-old man presented to our hospital with a 6-month history of back pain, unrelated to any trauma. Two years earlier, one of his fingers became infected and the culture grew *Proteus*, *Staphylococcus aureus*, and *Serratia*. The finger was partially amputated and the wound healed eventually.

He was hypertensive and had gout but was not diabetic, immunocompromised or using steroids. A physical examination found diffuse tenderness over the mid-lumbar region but no other signs suggestive of neurological involvement. He was afebrile and had a negative psoas sign. Radiographs revealed erosion of the lower endplate of L2 and upper endplate of L3 vertebral bodies (Fig. 1). The psoas shadows were not noticeably increased on both sides. Blood tests showed a raised erythrocyte sedimentation rate of 44 mm/hr and a C-reactive protein level of 16 mg/l with a normal white cell count. The white cell differential counts were within normal ranges (neutrophil count, 5.2 x10⁹/l; lymphocyte count, 1.6 x10⁹/l). The fasting blood sugar was 5.4 mmol/l. The renal and liver
function tests were normal (albumin level, 41 g/l). The bone alkaline phosphatase level was normal. The Mantoux test was positive, but chest radiographs showed clear lung fields and his sputum culture did not grow acid-fast bacilli. Computed tomography of the spine confirmed the eroded endplates at the L2 to L3 level (Fig. 2a).

Tuberculosis spondylitis was suspected and a bone biopsy was taken using a transpedicular approach. A histopathological examination found chronic granulomatous inflammation with Langhans giant cells, suggestive of mycobacterial infection with no malignancy. A Ziel-Neelson stain was negative. Anti-tuberculosis chemotherapy (using isoniazid, rifampicin, pyrazinamide, and ethambutol) was commenced while awaiting the mycobacterial culture results. A hard corset was given for immobilisation and pain relief.

After 3 months of anti-tuberculosis chemotherapy, a discharging sinus developed over the biopsy site. The original bone biopsy culture grew *Mycobacterium avium* complex (MAC). The organism was resistant to clarithromycin and ethionamide, but sensitive to amikacin, ethambutol, and rifampicin. A human immunodeficiency virus serology test was negative. Bony erosion of the L3 vertebral body was increased and a psoas abscess had developed on the left side (Fig. 2b). The patient underwent excision of the sinus tract, debridement, and L3 corpectomy with anterior spinal fusion, using a combined anterior and posterior approach, followed by intravenous injections of amikacin 750 mg twice per week for 2 months and oral ethambutol 800 mg daily and rifampicin 600 mg daily for one year.

At the 36-month follow-up, the patient was able to ambulate independently without aids, with minimal back pain and no neurological deficits. The blood parameters for infection were normal and the bone union was solid (Fig. 2c).

**DISCUSSION**

MAC consists of 2 bacteria species: *M avium* and *M intracellulare*. They can be separated by genetic methods such as deoxyribonucleic acid probes.
### Table

Review of spinal infections caused by *Mycobacterium avium* complex (MAC) in patients with no acquired immune deficiency syndrome

<table>
<thead>
<tr>
<th>Study</th>
<th>Sex/age (years)</th>
<th>Back pain</th>
<th>Fever</th>
<th>Neurology</th>
<th>Risk factors for being immunocompromised</th>
<th>Cutaneous test</th>
<th>Sputum culture for MAC</th>
<th>Radiology</th>
<th>Biopsy</th>
<th>Initial treatment as spinal tuberculosis</th>
<th>Surgery</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zverina et al.</td>
<td>M/35</td>
<td>Yes</td>
<td>No</td>
<td>Leg weakness, bedridden</td>
<td>Leg weakness, bedridden, SLE, long-term steroid use</td>
<td>-</td>
<td>-</td>
<td>Gibbus deformity with almost complete destruction of L1, psoas abscess</td>
<td>-</td>
<td>-</td>
<td>Laminectomy</td>
<td>Complicated with GIB, bed ridden, aspiration pneumonia, died</td>
</tr>
<tr>
<td>Brocklin</td>
<td>F/27</td>
<td>Yes</td>
<td>Yes</td>
<td>Leg weakness, loss of jerks</td>
<td>SLE</td>
<td>-</td>
<td>-</td>
<td>L5 lytic destruction, soft tissue abscess into spinal canal</td>
<td>Needle biopsy of vertebra</td>
<td>-</td>
<td>Drainage</td>
<td>Abscess recurrence 20 months later, died during 2nd drainage</td>
</tr>
<tr>
<td>Pirofsky et al.</td>
<td>M/79</td>
<td>Yes</td>
<td>No</td>
<td>Urinary incontinence</td>
<td>SLE, steroid-induced osteoporosis</td>
<td>-ve</td>
<td>-ve</td>
<td>Paraspinal soft-tissue mass, marked kyphosis, severe collapse of lower thoracic spine</td>
<td>Open biopsy (laminectomy), MRI-guided needle biopsy</td>
<td>Until 9 weeks after biopsy</td>
<td>Laminectomy</td>
<td></td>
</tr>
<tr>
<td>King et al.</td>
<td>F/31</td>
<td>Yes</td>
<td>No</td>
<td>-</td>
<td>No</td>
<td>-ve</td>
<td>Paraspinal mass/abscess, destruction of T7 and T8</td>
<td>Aspiration of abscess</td>
<td>Until final culture result</td>
<td>Drainage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Igram et al.</td>
<td>M/39</td>
<td>Yes</td>
<td>No</td>
<td>Paraplegia</td>
<td>No</td>
<td>-ve</td>
<td>Complete destruction of T6 and T7 with cord compression</td>
<td>Open biopsy</td>
<td>Until final culture result</td>
<td>Anterior spinal fusion with corpectomy (T6 &amp; partial T7), posterior spinal fusion with Luque rectangle (T3 to T10), No (patient refusal)</td>
<td>Good recovery, occasional back pain</td>
<td></td>
</tr>
<tr>
<td>Weiner et al.</td>
<td>F/70</td>
<td>Yes</td>
<td>No</td>
<td>Paraplegia, incontinence</td>
<td>No</td>
<td>-</td>
<td>+ve</td>
<td>Nearly complete destruction of T12, kyphosis deformity</td>
<td>Needle biopsy of vertebra, open transpedicular biopsy</td>
<td>Until final culture result</td>
<td>Anterior spinal fusion with cage, posterior spinal fusion with instrumentation</td>
<td>Good recovery</td>
</tr>
<tr>
<td>Chan et al.</td>
<td>F/62</td>
<td>Yes</td>
<td>No</td>
<td>Blunt trauma</td>
<td>-</td>
<td>-</td>
<td>Paraspinal abscess, destruction of endplate of L5/S1, progression of destruction and psoas abscess</td>
<td>CT-guided needle biopsy of vertebra and soft tissue</td>
<td>-</td>
<td>Anterior spinal fusion with cage, posterior spinal fusion with instrumentation</td>
<td>Good recovery</td>
<td></td>
</tr>
<tr>
<td>Niazi et al.</td>
<td>F/60</td>
<td>Yes</td>
<td>No</td>
<td>DM, splenectomy, long-term steroid use</td>
<td>-</td>
<td>+ve</td>
<td>Complete collapse of T8, multiloculated paraspinal abscess into canal with compression</td>
<td>CT-guided needle biopsy of vertebra</td>
<td>Until final culture result</td>
<td>Open drainage</td>
<td>Good recovery</td>
<td></td>
</tr>
<tr>
<td>Mehta et al.</td>
<td>F/72</td>
<td>Yes</td>
<td>Yes</td>
<td>Leg weakness, decrease in sensation and jerks</td>
<td>No</td>
<td>-ve</td>
<td>Destruction of T11 to L1, extradural mass with cord compression</td>
<td>CT-guided needle biopsy of soft tissue, open biopsy</td>
<td>Until final culture result</td>
<td>Open drainage and debridement</td>
<td>Slight motor weakness</td>
<td></td>
</tr>
<tr>
<td>Yamashita et al.</td>
<td>M/69</td>
<td>Yes</td>
<td>Yes</td>
<td>Stomach carcinoma, splenectomy, pancreatectomy</td>
<td>+ve</td>
<td>-</td>
<td>Osteonecrotic and osteolytic lesion of thoracic spine</td>
<td>Biopsy of vertebra</td>
<td>-</td>
<td>No</td>
<td>Improved symptoms</td>
<td></td>
</tr>
<tr>
<td>Higuchi et al.</td>
<td>M/65</td>
<td>Yes</td>
<td>Yes</td>
<td>Intermittent claudication</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>L4/L5 discitis, osteomyelitis, and paravertebral abscess</td>
<td>Open biopsy</td>
<td>Until 4 weeks after biopsy</td>
<td>Open drainage and debridement</td>
<td>Good recovery</td>
</tr>
<tr>
<td>Present study</td>
<td>M/60</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>+ve</td>
<td>-ve</td>
<td>L2, L3 endplate erosion, destruction L3 body with psoas abscess</td>
<td>Open transpedicular biopsy</td>
<td>Until 3 months after biopsy</td>
<td>Anterior spinal fusion with corpectomy of L3, excision of posterior sinus</td>
<td>Good recovery</td>
<td></td>
</tr>
</tbody>
</table>

* SLE denotes systemic lupus erythematosus, DM diabetes mellitus

† MRI denotes magnetic resonance imaging, CT computed tomography

‡ GIB denotes gastrointestinal bleeding

**Review of spinal infections caused by *Mycobacterium avium* complex (MAC) in patients with no acquired immune deficiency syndrome**
Clinically they are nearly identical and therefore usually grouped together. They can be found in water, soil, plants, and other environmental sources. Infection caused by these bacteria is common in patients with acquired immune deficiency syndrome (AIDS) or in immunocompromised patients. Infection caused by MAC has been reported in knee, ankle, and shoulder joints. Spinal infections are rare in non-AIDS patients; only 12 such cases (including ours) have been reported (Table).

Before the emergence of human immunodeficiency virus (HIV)–AIDS, MAC infection was usually only seen as an indolent lung infection, similar to tuberculosis, in elderly Caucasian men with underlying lung disease. Spinal infection in elderly Caucasian men with underlying lung disease is rare. In contrast, of the 12 patients with spinal infection reported (Table), their CD4 T-lymphocyte counts typically fell below 50/ml and 8 were not elderly (<65 years old). Six presented in an urgent or semi-urgent manner with neurological deficits or even paraplegia. All 12 presented with back pain, 4 were febrile, and some did not present with respiratory symptoms. Several were immunocompromised (3 had systemic lupus erythematosus, one had diabetes mellitus with long-term steroid use, and one had carcinoma of the stomach). One had a history of blunt trauma. All 12 patients presented with osteomyelitis with bony destruction (no cervical vertebrae were involved, lower thoracic and upper lumbar vertebrae being the most common site; 7 had multiple-level involvement with kyphosis deformities). Eight developed psoas or paraspinal abscesses, and 3 had cord compression. No gender predilection was found.

In our patient, the association between the earlier finger infection and the MAC spinal infection is difficult to evaluate. Trauma and surgical procedures have been reportedly associated with MAC infection. A case of MAC spinal infection was reported after blunt trauma to the lower back 6 months before presentation, probably due to locus minoris resistentiae. In our patient, the period between the finger and spinal infections was more than 2 years, rendering the chance of concomitant infection low.

The diagnosis of MAC spinal infection is easily missed in people who are not infected with HIV. Its symptoms and radiological features mimic spinal tuberculosis. MAC has a long incubation period; it usually takes more than 6 weeks to grow, which often delays diagnosis. Sputum smears are a less reliable means of diagnosing MAC than tuberculosis. Specimens from sputum and pleural fluid were reportedly negative in one study. It is recommended that biopsies (needle or open or image-guided) to obtain tissue or bony specimens are used for diagnosing MAC spinal infection. Cutaneous and blood tests are not useful for diagnosis and differentiation from other infections. Some authors have suggested using the dual skin test (M avium sensitiin and purified protein derivative) to differentiate MAC from tuberculosis infection, but its use in MAC spinal infection has not been reported. It is difficult to differentiate between the 2 entities using imaging alone because of their similar radiological features.

MAC is usually resistant to most anti-tuberculosis drugs. In one case it was resistant to isoniazid, streptomycin, ethionamide, and pyrazinamide. Obtaining a final positive culture and sensitivity for MAC is time-consuming. A 2- or 3-drug regimen may be actually ineffective and create more drug resistance. A 4-drug (isoniazid, rifampicin, ethambutol, and streptomycin) regimen should be used initially for patients suspected of having disseminated mycobacterial infection until the culture result is available. In our patient, despite the 4-drug regimen being commenced following the biopsy, bony destruction, psoas abscess, and sinus formation still progressed. Therefore, more sensitive antibiotics and appropriate surgical procedures were performed.

Traditional drugs used to treat MAC infection include rifampicin, ethambutol, ethionamide, and streptomycin. Isoniazid is not used alone due to its low activity against MAC, in contrast to tuberculosis infection. Since 1994, macrolide antibiotics such as clarithromycin or azithromycin have also been used. According to guidelines issued by the American Thoracic Society and Infectious Disease Society of America, clarithromycin or azithromycin and ethambutol with or without rifabutin should be used in patients with disseminated MAC infection. In our patient, the organism was resistant to clarithromycin, so amikacin injections were used instead. It is suggested that drug susceptibility testing be performed before patients with MAC infection commence treatment.

One patient who refused surgery for cord compression was left with dense neurological deficits. Another who had a biopsy only, with no drainage nor decompression, did not, however, develop any neurological deficits or abscesses. Decompression by means of laminectomy has been reported, but the neurological recovery outcomes were not satisfactory. Surgical debridement of all necrotic tissues and stabilisation using anterior spinal fusion to treat tuberculosis of the spine has been recommended. Good neurological recovery has been reported after anterior fusion and posterior instrumentation.
CONCLUSION

In MAC spinal infection the presentation is different from that seen in MAC pulmonary infection. Younger patients with no immunocompromising diseases can also be infected. It should be considered as a differential diagnosis in patients with tuberculosis of the spine. In view of MAC multiple-drug resistance, antibiotic treatment should be based on the sensitivities of cultured organisms. Indications for surgery are progressive bony destruction, abscess formation, and neurological compression.

REFERENCES