We have reviewed, retrospectively, 66 adult patients who were treated for lumbar or lumbosacral tuberculosis. A total of 45 had a paravertebral or epidural abscess, 24 had clinical instability and 18 presented with a radiculopathy, of which six also had a motor deficit. The diagnosis was usually made on clinical and radiological grounds and they were followed up until there were clinical and radiological signs of full recovery.

Conservative treatment with antituberculous drugs was successful in 55 patients (83%). None had persistent instability, radiculopathy or neurological compromise. We feel that tuberculous spondylodiscitis, especially in the lumbar spine, can usually be satisfactorily managed conservatively and that there are few indications for surgical treatment.

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Tuberculosis is once more widespread, with an estimated worldwide total of eight million new cases in 1990.1 Today, around one-third of the world’s population is affected with tuberculosis and about five million new cases are thought to occur annually in Asia. The increasing incidence of HIV disease has contributed to the resurgence. Spinal tuberculosis accounts for about 2% of cases of tuberculosis.2 Recent advances in its pharmacological treatment, and the understanding of drug resistance, have changed the management of this disease. Specific and effective chemotherapy is now the mainstay of treatment.1,3-7 There have, in recent years, been few reports on the management of tuberculosis of the lumbosacral spine and there are no guidelines for its treatment.8 Surgery may be offered to patients when the indications are unclear.9,10 We present a series of 66 adult patients with lumbosacral tuberculosis and attempt to redefine these indications and to highlight the effectiveness of non-surgical management.

Patients and Methods

Between August 1998 and August 2000, 66 adult patients with lumbar and lumbosacral tuberculosis were included in the study. There were 26 men and 40 women with a mean age of 40 years (19 to 78). Patients who had not completed their adolescent growth spurt were excluded, as were those with lesions in the dorsolumbar spine. The mean follow-up was 1.5 years (1 to 5). No patient had received any previous treatment for tuberculosis and none represented reactivation of the disease.

Of the 66 patients, 55 had lumbar and 11 had lumbosacral lesions. The mean number of levels involved was two (1 to 4). L4-L5 was the commonest affected area, and L1 the least commonly affected region. Five patients had skip lesions, either in other areas of the spine or elsewhere in the body, including the lung and lymph nodes.

All patients were assessed clinically for signs of instability, radiculopathy, and sensory or motor deficit at each follow-up. Four presented with a history suggestive of neurological claudication. Of the 18 who had radiculopathy and associated nerve-root pressure because of tuberculous granulation, as shown on MRI, six had a motor deficit. Instability was diagnosed clinically in 24 patients, all of whom had severe back pain, paraspinal muscular spasm, restricted movement of the lumbar spine and an ‘instability catch’.11-13 In all patients there was a strong clinical suspicion of spinal tuberculosis and the diagnosis was confirmed by radiological studies.14,15

Bearing in mind the high incidence of tuberculosis in immunocompromised patients all were tested for HIV using an enzyme-linked immunoadsorbent assay. None was HIV-positive.

On plain radiographs, abnormal features included osteopenia, paravertebral abscess, reduction of the disc space, endplate erosions and gross bony destruction with deformity. Ultrasonography of the abdomen and pelvis was undertaken to monitor the size of psoas abscesses.

In 45 patients MRI showed abscesses which were either prevertebral, paravertebral or epidural; of these 17 were larger than 2.5 cm in diameter. Classical spondylodiscitis,
with involvement of the adjacent vertebral bodies and the intervening disc, was present in 44 patients (Fig. 1), of whom 12 had involvement of the adjacent vertebral bodies with sparing of the intervening disc, eight had osteitis on MRI without bony destruction, and two had a miscellaneous presentation, including posterior involvement and lesions involving the centre of a single vertebral body.

**Conservative treatment protocol.** The standard four-drug therapy with isoniazid (5 mg/kg), rifampicin (10 mg/kg) ethambutol (15 mg/kg) and pyrazinamide (25 mg/kg) was given as a first-line treatment for four months, followed by rifampicin, isoniazid and ethambutol for eight months, or until there was regression of symptoms with laboratory and radiological signs of resolution, whichever was later. Intramuscular streptomycin (30 mg/kg) may be used as a first-line drug in place of ethambutol. This treatment was regularly supervised by chest physicians.

Full blood counts, the ESR, liver function tests and serum uric acid levels were monitored at six weeks for the first three months, and then at three months thereafter until the end of treatment to judge the efficacy of the treatment and to monitor possible side-effects.

Plain radiographs and MR scans were repeated at three and 12 months after starting treatment. CT with intravenous gadolinium contrast was carried out at these intervals, instead of MRI, in seven of the 11 patients whose surgical treatment included the use of MRI-incompatible implants.

Patients who were ambulatory at the time of diagnosis were allowed to remain so during treatment, but with restriction in carrying heavy weights and for contact activities. Lumbosacral supports were also used. Patients who were confined to bed at the time of diagnosis, continued to be treated by bed rest until improvement allowed mobilisation using the protocol for ambulatory patients.

If there was no clinical or laboratory response after six weeks of treatment, the patients were presumed to be resistant to first-line antituberculous drugs, and additional medication was started according to a protocol using such drugs as kanamycin, ciprofloxacin, sparflaxcin and ethionamide. In case of drug intolerance, the therapy was adjusted by our chest physicians.

If there was a failure to respond to both primary- and secondary-line drugs, surgical treatment was undertaken after 12 weeks. Its nature (biopsy, debridement, decompression and/or stabilisation) depended on the type of lesion and its clinical presentation (Fig. 2). These patients were grouped as failures of conservative treatment.

**Results**

After starting conservative treatment, 47 patients showed some clinical response within three weeks which was con-
firmed radiologically three months later. The 19 patients who remained unchanged clinically and radiologically after three months had their drug regime modified; eight showed a good response to second-line drugs. A total of 55 patients responded to conservative treatment with either first-line or second-line drugs. The duration of antituberculous treatment ranged from 12 to 24 months until there was regression of symptoms and laboratory and radiological signs of resolution.

Clinical improvement resulted in marked reduction in pain and paraspinal muscular spasm and an increase in the level of physical activity. These patients regained the level of activity enjoyed before the disease, with excellent spinal function and no signs of persistent instability. The radiological signs of recovery were regression of the abscess and granulation tissue, reduction in root compression and restoration of the normal signal of bone marrow on MRI (Figs 1b and 2b). Radiological resolution was complete in all 55 patients. Those vertebrae which showed bony collapse at the time of diagnosis did not, however, regain their original height.

Conservative treatment failed in 11 patients with progression of disease clinically and radiologically, despite adjustment of the treatment regime. These patients then had surgical treatment. Three had persistent instability and eight an unresolving or enlarging abscess.

We classified the results of conservative treatment as excellent, good, fair and poor. Forty patients (61%) had an excellent result, with complete resolution of disease with first-line treatment for 12 months. Fourteen (21%) had a good result, with complete resolution of the disease with first-line treatment for longer than 12 months or with second-line treatment for 12 months or longer. One patient who developed complications to the antituberculous treatment requiring adjustment of the regimen eventually showed complete resolution and was considered to have a fair result.

The 11 patients (16.5%) who did not respond to conservative treatment, and required surgical treatment, were regarded as having a poor result. The eight patients who did not respond to standard antituberculous drugs, but eventually healed after second-line therapy, were considered to have drug-resistant disease. All required treatment with six or more drugs including ciprofloxacin, ofloxacin, sparfloxacin, kanamycin, ethionamide and para-amino salicylate, before resolution was obtained.

Discussion

The lumbosacral region may ‘accommodate’ tuberculosis better than other areas of the spine, but particular anatomical features of the lumbar and lumbosacral spine make tuberculous infection in this region amenable to conservative treatment. A capacious spinal canal, with floating nerve roots which behave like peripheral nerves, can be relatively tolerant to compression because of abscess or granulation tissue, which may develop slowly. A natural lordosis, with the normal axis of weight-bearing lying posterior to the centre of the vertebral bodies, retards the tendency of anterior disease to cause a kyphosis. Hence, much destruction of a vertebral body is required before a kyphosis is induced. Thus, a cosmetic deformity is less common in this region of the spine as compared with the thoracic spine. Lesions of the lumbosacral spine are easily accessible to...
needle biopsy and open surgery to establish the diagnosis is rarely required.

The diagnosis of tuberculous spondylitis is traditionally made on clinical and radiological grounds. In countries such as India, where tuberculosis is endemic, histopathological confirmation is not usually undertaken, not because it is expensive but because of the large case load and the confidence of making the diagnosis clinically and radiologically.14,15 A therapeutic trial of antituberculous treatment is a practical alternative to taking a biopsy. In countries where tuberculosis is rare, it is prudent to confirm the diagnosis by biopsy.

The clinical features of lumbosacral tuberculosis are pain and muscle spasm, with or without signs of neurological compression, such as radiculopathy, sensory or motor deficit and claudication. There are often associated constitutional symptoms, such as fever, loss of weight and anorexia. Osteopenia with reduction of disc space and endplate erosion, with or without paravertebral soft-tissue shadows, may be seen on plain radiographs. Particular features which are seen on MRI include marrow oedema, end-plate erosion, granulation tissue or the formation of abscess.17-21 Biopsy of the lesion for tissue diagnosis is invasive and rarely necessary. We used CT-guided biopsy in 15 patients in whom the clinical and radiological diagnosis was uncertain and where there was adequate pathological soft tissue. Biopsy was not attempted in patients with osteitis or lesions in the centre of vertebral bodies without much associated pathological soft tissue. A therapeutic trial of antituberculous treatment was usually given on the basis of a suspected clinical and radiological diagnosis.14,15 Most of our patients (93%) were diagnosed and treated satisfactorily on the basis of clinical and radiological evidence, and without histopathological diagnosis.

The standard conservative treatment of lumbar and lumbosacral tuberculosis consists of a four-drug therapy with

Fig. 3a

T2-weighted axial MR images showing a large bilateral psoas abscess a) before treatment and b) after 12 months of standard antituberculous treatment, when it had resolved.

Fig. 3b

MRI of the sacral spine showing a) a T2-weighted image with an abnormal marrow signal in the S1 vertebra, destruction of the superior endplate and involvement of the upper disc and b) a T1-weighted image with effacement of the thecal sac by epidural soft tissue and compromise of the lateral recess, more severe on the left.

Fig. 4a

Fig. 4b

Fig. 4a

Fig. 4b

Fig. 4a

Fig. 4b
isoniazid, rifampicin, ethambutol and pyrazinamide administered for four months, followed by three-drug treatment with rifampicin, isoniazid and ethambutol for eight months, or until there are regression of symptoms and laboratory and radiological signs of resolution.\textsuperscript{7,10,16}

The disease may be drug-resistant, however, and therefore a poor response to standard chemotherapy at the end of six to 12 weeks does not imply that surgery is indicated. Our protocol in patients with clinical or radiological progression of disease despite receiving antituberculous treatment, was to start second-line drugs empirically, in consultation with a chest physician and to attempt a CT-guided needle biopsy in order to obtain tissue for culture. We had eight such patients who required second-line treatment before they showed a satisfactory response.

This series includes patients with large abscesses, which resolved completely with chemotherapy (Fig. 3). None, however, had symptoms or signs attributable to the abscess. There were others who presented with signs of instability, in whom there was resolution with the reconstitution of nearly normal architecture after conservative treatment. There were also patients with neurological deficit caused by neural compression by granulation tissue which recovered satisfactorily.\textsuperscript{4,10} There were no patients with significant kyphosis in our series since we excluded those who were skeletally immature. Kyphosis is rare in adequately treated tuberculosis of the lumbosacral spine because of the inherent lordosis.\textsuperscript{7,22,23}

We feel that the indications for surgery in lumbosacral tuberculosis are few and specific. A lesion of uncertain pathology (Fig. 4) or a patient with a significant or progressive neurological deficit represents absolute indication for early surgery. During our study, three such patients underwent early operation and were excluded from the review. Surgery may be indicated after a trial of conservative therapy of at least six weeks. These relative indications for operation include patients with a persistent neurological deficit or persistent pain and instability, and these are represented by the poor results in this series.

Tissue diagnosis is not mandatory in the management of all patients with lumbosacral tuberculosis. All paravertebral abscesses need not be drained since they may resolve with chemotherapy (Fig. 3). Drainage of an abscess may be indicated if it causes symptoms which are simply due to its size and location, such as a flexion deformity of the hip. A neurological deficit is not an absolute indication for surgery. Minor radiculopathies and early sensory or motor deficits respond well to conservative treatment. Satisfactory bony healing may be obtained with conservative treatment. Most lumbar and lumbosacral tuberculous lesions resolve after conservative treatment. Instability or deformity which persists after the resolution of active disease may require elective surgery in some of these patients.

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