Tuberculosis of the spine

Tuberculosis of the spine is an age-old disease with a recorded history which dates back to the time of Hippocrates, and possibly before. Until the middle of this century, it was a common orthopaedic disorder throughout the world but in the last 30 years or so it has become mainly a problem of the Third World. More recently, the disease has been appearing again in developed countries because of immigration and association with such chronic debilitating conditions as alcoholism and acquired immunodeficiency syndrome. Its relative rarity in developed countries has led to a decreased awareness of the condition and sometimes to delay in its diagnosis.

Before the advent of antituberculous therapy in the 1940s, treatment was by bed-rest, improvement of the patient's nutritional status, and, in some cases, posterior spinal fusion to rest the disease focus locally. Consistently effective treatment began after the discovery of streptomycin, para-aminosalicylic acid, and isoniazid. These 'first-line' drugs were later supplemented in resistant cases by 'second-line' drugs. In 1944, Wilkinson revived an interest in active surgical intervention for tuberculosis of the spine (Wilkinson 1950). This was popularised and much expanded by the work of Hodgson and his coworkers in Hong Kong. On the other hand, Konstam and Konstam in 1958 and Konstam and Blesovsky in 1962 reported encouraging results from Nigeria using chemotherapy alone, and allowing the patients, if not incapacitated by paraparesis, to be ambulatory. Plaster jackets were used initially, but later only sparingly. In the face of such conflicting claims of good results from two different methods of treatment, the Medical Research Council of Great Britain (MRC) started prospective multi-centre clinical trials in Asia and Africa to attempt to find a scientific answer to this controversy.

The first report of the MRC was published in this Journal in 1973. Since then a series of such trials has added greatly to our knowledge of the treatment of Pott's disease of the spine.

In this issue of the Journal (p. 240), there is a report of a study by the MRC of short-course regimens of chemotherapy in the ambulatory treatment of spinal tuberculosis after three years of follow-up. The trial protocol is almost exactly the same as the first one in 1973. Although many criteria were used to measure the outcome the report places most emphasis on whether or not the patient reached a 'favourable status' which is defined as no sinus, no clinical abscess, no involvement of the central nervous system, no surgical treatment or additional chemotherapy, full activity, and a disease focus which is quiescent both clinically and radiographically. Among the criteria not included as necessary components of a favourable status are complete bony fusion, maintenance of vertebral body-height and the degree of kyphosis. The radiographic appearances of quiescent disease were defined as bony fusion or sclerosis of the contiguous surfaces of the affected vertebral bodies with reduction or disappearance of the intervening disc space. Thus, the radiographic classification of quiescent disease did not necessarily require unequivocal bony fusion to be present.

The aim of the study was to test the efficacy of six regimens of chemotherapy, namely (1) isoniazid plus rifampicin for six months, (2) the same drugs for nine months, (3) isoniazid plus PAS for nine months, (4) isoniazid plus ethambutol for nine months, and (5) and (6) the same drugs as (3) and (4) but for 18 months. At three years 77% of all the patients had a favourable status, and a further 15% had a favourable status in all respects except radiographically; only 8% had an unfavourable status. The most important finding was that a six-month course of isoniazid and rifampicin was as effective as the 18-month regimen of isoniazid and PAS reported in 1973. It is well known that drug compliance is poor when patients are prescribed a long course of treatment and six months is a significant reduction from 18 months.

When the criteria not included in the definition of favourable status are considered, however, the picture is perhaps less rosy. By the end of three years, only 44% of patients had achieved complete bony fusion and 16% had

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no radiological evidence of any bony fusion at all. In regard to the angle of kyphosis, there was a mean increase in the first 18 months in all six patient groups, ranging from 8.5° to 15.3° and further increases between 18 and 36 months, ranging from 11.7° to 17.7°. Although the authors state that "most of the patients have no change or an increase of less than 30°", the fact remains that 32% to 52% of the patients had an increase in angle of 11° to 30°, and 18% to 23% of the patients had an increase of 31° or more. The mean angle of kyphosis on admission was 40° and these figures therefore represent significant deterioration, the more so since over half of the patients were children and the follow-up was short.

In the absence of radiological evidence of fusion, clinical quiescence can still be associated with an increasing kyphosis. This is particularly so in a growing child, and if several vertebrae are involved. Indeed, when the 10-year results of the earlier MRC trials (Medical Research Council 1982, 1985) were published, the patients treated by a conservative regimen had a mean increase in the angle of kyphosis of 17.8° in thoracic and thoracolumbar lesions, and 5.2° in lumbar lesions. Of the 125 patients then assessed, 52 had increased by 11° to 30°, and 27 by 31° to 50°. Those treated by radical surgery and anterior spinal fusion showed a mean decrease of 1.4° for thoracic and thoracolumbar lesions, and of 0.5° for lumbar lesions. Such severe deterioration of the kyphosis in conservatively treated patients, although it occurred in only some 20%, is quite unacceptable, and could eventually lead to paraplegia of late onset. Even at ten years, 27% of patients treated conservatively still did not have radiographic fusion, compared with only 3% treated by radical surgery.

The second paper on spinal tuberculosis in this issue, by Hoffman, Crosier and Cremin (p. 233), is a comparison of the diagnostic value of standard radiography, CT and MRI. The ideal imaging technique should give the clinician the following information: 1) the number of vertebrae involved; 2) the severity of the bone destruction; 3) the site of involvement within the vertebra, confined to the anterior column or also including the posterior elements; 4) the angle of kyphosis; 5) soft-tissue involvement, including the presence of paraspinal abscesses and disc sequestration; and 6) the extent of compression of the spinal cord or cauda equina. Compression can be due to extrinsic causes, which in active disease include fluid or caseous abscess, granulation tissue, and sequestrated bone or disc, and in healed disease, a transverse ridge of bone within the kyphos and fibrosis of the dura. Intrinsic cord involvement is due to the spread of tuberculous inflammation through the dura to involve the meninges and the spinal cord.

Standard radiography, if necessary supplemented by linear tomography, can usually provide adequate information of the number of vertebrae involved, the extent of bone destruction, and the angle of kyphosis but involvement of the posterior elements is not well shown and the assessment of paraspinal abscesses is at best only crude. Myelography can demonstrate spinal canal compression but is of little help in determining its cause.

Both CT and MRI can accurately define the site and extent of bone involvement. Hoffman et al report that 25% of their patients who had a CT and MR scan showed more extensive involvement than was visible on the standard radiographs. In one patient the radiographs showed involvement of T5 and T6 vertebrae only, but CT and MRI showed disease from T3 to T8, information which is very useful if surgical treatment is planned. More interestingly, this series shows that posterior element involvement is much more common (56%) than has been reported in series studied by standard radiography alone. If there is significant involvement of the posterior elements bilaterally, instability may result. Anterior strut grafting will not then be adequate, and posterior instrumentation is required as well.

Compression of the spinal cord leading to neurological involvement is the most serious complication of tuberculosis of the spine. Paraplegia due to extrinsic compression will usually resolve completely or nearly completely when treated either by antituberculous chemotherapy alone, or in combination with surgical decompression, but some believe that surgical intervention is urgently needed if paraplegia is due to intrinsic causes (Hodgson, Skinsnes and Leong 1967).

Hoffman et al report that neurological deficits occurred in the thoracic spine only when dural decompression diminished the canal by at least 60%, and that two patients with extradural compression of more than 60% involving the cauda equina had no neurological signs. These interesting observations should be confirmed in a larger series of patients and the authors' method of assessment of percentage compression needs to be refined. The resolution of MRI is not yet good enough to diagnose the causes of intrinsic compression. Nevertheless, MRI is very useful to alert the surgeon to impending neurological complications, be they extrinsic or intrinsic and to assess the extent of decompression required.

The Medical Research Council, in their series of excellent clinical trials, has done a great service to patients with tuberculosis of the spine. It has been shown that the condition can be treated effectively by antituberculous chemotherapy alone and that the duration of treatment can be significantly reduced by the use of the newer drugs. Conservative treatment, however, achieves only a low fusion rate, and allows the kyphosis to deteriorate in a proportion of patients. The health authorities in those countries in which the disease is rife may have to decide between conservative and surgical treatment on the basis of cost-effectiveness, but ideally modern imaging techniques should be used to define the site and extent of the disease so that surgical treatment can be better tailored to the individual case.
REFERENCES


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Bone-marrow oedema syndrome

In 1959 Curtiss and Kincaid described a clinical syndrome characterised by pain and transient osteoporosis of one or both hips which affected women in the last trimester of pregnancy. This was distinguished from other types of 'secondary' osteoporosis by the absence of any obvious triggering factor or underlying hip pathology. It regressed spontaneously, with restoration of normal function and bone density over a period of 6 to 12 months. It is now known that the condition may occur in patients of either sex and at all ages from late adolescence onwards.

The combination of pain, limp, restricted mobility, regional osteoporosis and increased activity on radioscintigraphy suggests a range of possible diagnoses, which include septic arthritis, tuberculosis, monarticular rheumatoid disease, pigmented villonodular synovitis and coxitis bone lesions such as osteoid ostema or subacute osteomyelitis. In the knee or ankle, these findings would suggest algodystrophy. In all of these conditions there are leads to the diagnosis in the history or radiographic or laboratory investigations, but transient osteoporosis comes and goes like a cloud across the landscape, leaving no clue as to its origin and no mark of any lingering abnormality.

The pathogenesis of transient osteoporosis remains a mystery although some of its features suggest a local neurovascular disorder, possibly related on the one hand to reflex sympathetic dystrophy and on the other to non-traumatic ischaemic necrosis (Resnick and Niwayama 1988).

When clues run dry, try MRI. In 1988, Wilson et al reported ten patients with clinical and radiological features typical of transient osteoporosis. All showed similar abnormalities on MRI: low signal intensity on T1-weighted images with matching high signal intensity on T2-weighted images which extended from the femoral head to the intertrochanteric region and corresponded to the areas of increased scintigraphic activity. They attributed these abnormalities to bone-marrow oedema; all ten patients recovered spontaneously.

Neither the clinical nor the imaging features in these cases suggested the presence of ischaemic necrosis, and biopsy specimens from three patients showed normal marrow and bone. A series of nine patients (ten hips) with what appears to be the same disorder is reported by Hofmann et al in this issue of the Journal (p. 210). In these cases bone biopsies showed histological changes consistent with bone-marrow oedema; here again, however, there were no convincing signs of bone death. The patients in this series were treated by core decompression of the femoral head and neck, with rapid and complete relief of symptoms and a return to normal MRI signal patterns.

Is this, as the authors suggest, a very early (and reversible) stage of ischaemic necrosis? There will be much argument on this issue. Supporters of the idea will point to the fact that in cases of proven avascular necrosis the typical focal changes in MRI are sometimes accompanied by diffuse abnormalities that are characteristic of bone-marrow oedema. Sceptics will argue that this is not surprising, since the reductive phase of avascular necrosis is associated with inflammation, hyperaemia, marrow congestion, a decrease in marrow fat and an increase in interstitial fluid. In early avascular necrosis the 'oedema signal' in MRI appears at the periphery of the necrotic segment, where vascular ingrowth and new bone formation are commencing (Mitchell et al 1987). More difficult to refute is the report by Turner et al (1989) of five patients who presented with hip pain and MRI evidence of marrow oedema and then subsequently developed focal changes of osteonecrosis or were shown on biopsy to have marrow and bone necrosis.