
DIAGNOSIS AND MANAGEMENT OF TUBERCULOSIS OF THE SPINE

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Tuberculosis affects all systems of the human body. Approximately 15% of patients with active tuberculosis have an extra pulmonary form of the disease¹. The most common sites for extra pulmonary tuberculosis are the highly vascular areas such as the kidney, meninges, lymph nodes, spine and the growing end of long bones².

Historical: The classical paper by Percival Pott³ has led to paraplegia of tuberculous origin being named as Pott's paraplegia and also to the current understanding of the tuberculosis of spine and the accompanying neurological lesions .

Incidence: Among all forms of tuberculosis, nearly one to 3 percent of patients have involvement of the bone and joints. Among them, tuberculosis of the vertebral column (caries spine) accounts for about 50% of skeletal tuberculosis^{4,5,6,7,8,9,10,11}. The neurological involvement in TB spine has been reported to vary from 10 to 30%¹².

Pathological changes observed in the spine: Three kinds of pathological changes are observed in the spine, viz.,

- (a) Central type of vertebral body involvement.
- (b) Para-discal lesion
- (c) Anterior type of involvement of vertebral bodies.

The lesions may be of "Caseous exudative type" or "granuloma" type.

Loracca¹³ describes a central type of lesion, which extends centrifugally to involve the whole body resulting in hyperaemia and osteoporosis. The body gets softened, leading to compression, collapse and bony deformity. Arterial occlusion due to thrombo-embolic phenomenon results in endarteritis and periarteritis; necrosis takes place resulting in infarction of segments of bones¹⁴. Ischaemic necrosis is described as a contributing factor responsible for osseous and vertebral collapse. Caseation and necrosis is almost diagnostic of tuberculous pathology.

The para-discal lesion begins in the vertebral metaphysis, erodes the cartilage plate and destroys the disc. The cartilaginous end plate is a sort of barrier for spread into the adjacent tissue but once invaded,

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destruction of the disc rapidly occurs because of its relative avascularity and the infection spreads to adjacent vertebrae. The early resorption of the disc leads to narrowing of disc space. Sometimes the space may be widened due to accumulation of debris.

Tuberculosis of the Neural arch:

Tuberculosis of vertebral arches was considered to be very rare and of the 2202 cases of vertebral tuberculosis treated by Novak, only 8 (0.4%) had involvement of the arch¹⁵. According to Kumar¹⁶, only 5% of spinal tuberculosis were confined to posterior elements. However based on MRI and CT findings, Hoffman¹⁷ reported 50% involvement of posterior elements of spine. He states that the tuberculous involvement of arch is not as rare as observed by earlier workers.

Pathology in Pott's paraplegia: Tuli¹⁸ reported that among patients with paraplegia, tuberculous pathology contributed in nearly 50% of cases. Paraplegia may result from active or healed disease of spine.

Diagnosis: The diagnosis of caries spine is based on clinical findings, imaging of the spine, bacteriological and histopathological examination of the biopsy specimens/operated specimens and immuno-diagnostic methods.

Clinical presentation: The clinical picture has 3 components

- (a) The systemic illness

- (b) The osseous lesion

- (c) Neurological complications.

As with tuberculosis elsewhere in the body, there may be malaise, pyrexia, loss of appetite and weight loss. Back pain is a predominant clinical feature¹⁹. The spine becomes stiff and painful on movement, with spasm of the paravertebral muscles. Progressive backache is so often seen that many authors are of the opinion that TB must be considered in its differential diagnosis when the patient belongs to an endemic region²⁰. A soft tissue swelling is often obvious and in late cases a draining sinus may be seen in some cases. Sinuses were reported in 10 to 50% of patients with TB spine^{21,22,23,24}. Angulation of the spine in the form of kyphosis is diagnostic and it was reported in 95% of cases seen by Tuli and in 84% (including 40% with more than 30°) of 260 patients of Tuberculosis of spine studied by TRC²⁵.

Associated lesions: Associated pulmonary and other system tuberculosis may point the diagnosis towards caries spine. The incidence of associated visceral lesions varied between 14 to 50% in different series. In studies done in TRC, 45% of patients with Pott's paraplegia and 14% of spine TB patients had abnormal chest x-ray suggestive of tuberculosis.

Neurological deficit: In the majority of the patients with spinal tuberculosis the onset of neurological symptoms is slow and

progressing, even though in a small percentage of cases the paraplegia may be of sudden onset and nearly complete.

The clinical picture of Pott's disease is broadly classified into 3 groups. (1) Paraplegia arising in a known case of spinal tuberculosis. (2) Paraplegia as the presenting symptom of spinal tuberculosis. (3) Paraplegia due to tuberculosis of other posterior neural arch.

Based on the clinical suspicion a provisional diagnosis of TB spine is made and this is confirmed by plain x-rays of the spine, magnetic resonance imaging and radio-isotope bone scans.

Plain x-rays: The para-discal lesion is the commonest lesion seen. This finding when found associated with the narrowing of the disc space is the earliest radiological finding on plain X-rays.

Plain films typically show a destructive process of the vertebral body, narrowing of the disc space and spinal deformity, the destructive process of the vertebrae can be either in the form of vertebral body collapse or decreased height of the vertebral body or pedicular erosion or a combination of these. Spinal deformity is frequently present.

CT Tomography: CT in the axial plane with bone and soft tissue windows will clearly define the extent of bony destruction and the para-spinal mass. CT scan is useful in assessing the extent of destructive lesions

in the vertebral column. CT myelography was the diagnostic procedure of choice of defining the relationship between bone, epidural soft tissue mass and adjacent neural elements. However this procedure is largely replaced by non invasive MRI.

Magnetic resonance Imaging: MRI is the superior imaging modality for the assessment of neural compression by soft tissues, because of its multi planar (sagittal, axial and coronal plane) capacity and superior soft tissue resolution. MRI is very useful to alert the surgeon of impending neurological complications, which may be of extrinsic or intrinsic origin and to assess the extent of decompression required. Compression of the spinal cord leading to neurological involvement is the most serious complication of tuberculosis of spine.

MRI is now an established technique for imaging the spine²⁶. One of the major areas of impact of MRI has been in the investigation of the problem of acute neurological deterioration in patients with tuberculosis of spine.

Percutaneous computed Tomography guided needle biopsy: CT guided needle biopsy is an accurate, safe and rapid procedure to obtain specimens of the bony elements such as ribs, transverse process, vertebral body, posterior elements and soft tissue para-spinal masses. The samples obtained can then be subjected to both histopathological and bacteriological

examinations for *M. tuberculosis*. Additional benefits of this technique is the therapeutic drainage of large paraspinal abscess. This procedure helps to diagnose in 75% of cases.

Immuno diagnostics: The sero-diagnosis probably has decreased utility in smear negative patients, with minimal pulmonary tuberculosis but it may have increased potential in some forms of extra pulmonary tuberculosis²⁷.

Currently a number of rapid diagnostic methods such as Elisa and PCR are being evaluated for the diagnosis of various extra pulmonary forms of TB. Immuno diagnosis of TB despite its apparent promise has not become established in medical practice for reasons such as lack of readily available and well standardised reagents and the complexity introduced by the experienced in the interpretation of results in terms of predictive values.

Thus the diagnosis of skeletal TB needs an awareness and increased sense of suspicion for spinal TB among patients with back pain, soft tissue masses and para-spinal spasm. This is strengthened by imaging procedures and confirmed by CT guided biopsy.

Treatment: In the pre anti TB chemotherapy era, the traditional treatment for Pott's disease was prolonged bed rest or plaster of paris casts. The belief then was most of the vertebral destruction was

secondary to weight bearing on weakened vertebrae involved with tuberculous infection. The mortality rate was high in the range of 20-30% and relapses were also high (20-30% in the pre chemotherapeutic era).

Chemotherapy: Short course regimens consisting of sterilising drugs such as Rifampicin (R) and Pyrazinamide (Z) are now universal in the treatment of extra Pulmonary tuberculosis. In the past 20 years a large number of highly effective regimens with different drug combinations for treating pulmonary and extra-pulmonary forms of tuberculosis have been evolved through controlled clinical trials.

Similarly studies done at the Tuberculosis Research Centre, Madras on TB spine with or without Pott's paraplegia^{25,26} have shown that regimens containing Rifampicin, Isoniazid and Pyrazinamide for 6 to 9 months have been effective. Revised National Tuberculosis Control Programme recommends Rifampicin, INH and Pyrazinamide three times a week for 2 months in the first phase followed by Rifampicin and INH for 4 months in the follow-up phase. In severe cases Ethambutol will be added in the first phase. If initial drug resistance is suspected, or the disease is severe, the chemotherapy may be changed to second line of drugs such as Kanamycin/ Amikacin, Ofloxacin depending on, the sensitivity test results, and chemotherapy may be extended for 12 months.

In HIV infected patients with suspected mycobacterial disease, treatment of TB is generally more urgent. The first phase should include INH, Rifampicin, Pyrazinamide and Ethambutol. After 2 months of therapy, Rifampicin and INH should be continued for at least 7 months. Agents that are effective against *M. avium* complex are Clofazamine, Rifabutin, Ciprofloxacin and Clarithromycin.

Surgical treatment in tuberculosis of the spine: Many operative treatments have been described and developed, including laminectomy by Macewen in 1888, costo-transversectomy by Michaud in 1900, spinal fusion by Albec in 1911, lateral rhachotomy by Capener in 1933, anterolateral decompression by Alexander in 1946, costo-transversectomy and curettage of the vertebral body by Wilkinson in 1952 and anterior trans-thoracic decompression by Hodgson in 1956. The main principle of operative treatment is to drain the abscess and remove diseased tissue (debridement) as early and as thoroughly as possible. The aims of these operations were to shorten the period of immobilisation in bed and to provide permanent internal stability. The operation of radical resection of the lesion with anterior spinal fusion when undertaken by the Hong Kong group did have some advantages over simple debridement in terms of less further vertebral destruction and deformity and more rapid healing by bony fusion. With the introduction of antituberculous drugs, the indications for surgery became more selective such as (a) for

prevention and correction of deformities and complications and (b) for improving the strength of the involved joints (Tuli 1985).

The results of the Madras (ICMR 1989) study on short course chemotherapy in tuberculosis of the spine and the Korean study (BMRC 1993) indicate the success of chemotherapy alone, and has reduced the role of the surgery to a mere diagnostic one. Management of complications may occasionally require surgery, but anti-tuberculous treatment has been established as the essential basis of treatment.

The recent concepts in the management of spinal TB was evolved based on number of controlled clinical trials done by BMRC and TRC. The salient findings of these trials are:

- (1) Ambulatory out-patient chemotherapy with no splinting or surgery gives about 96% success rate in the treatment of spinal TB. Immobilising patients gave no advantage and operative debridement did not result in a better outcome.
- (2) Chemotherapy alone is sufficient in majority of cases and surgery can be advised in a select few cases who have associated neurological complications abscesses/more than three vertebral lesions.
- (3) A radical spinal surgery²⁹ by using anterior approach to the spine with decompression of neural elements and autologous bone grafting documented 94% success rate.

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