

Surgery For Tuberculosis Of The Cervical Spine

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Abstract

Spinal tuberculosis is the commonest extrapulmonary manifestation of tuberculosis. This study includes 10 patients with cervical tuberculosis, treated between 2001 to 2004, their mean age 37 ys [average 28 -55 ys] with an average follow up period of 15 months [12- 48 months].

Clinical findings of cervical tuberculosis included neck pain, restricted neck movements, quadriparesis, radicular manifestations, kyphosis, and sensory disturbance. All of our patients presented with neurologic deficits for short duration with average 2 - 6 months. The inflammatory process was localized from C3 to C7 vertebrae. The aim of this work to study the postoperative neurologic improvement, the progress of interbody fusion, extent of correction of kyphosis and its maintenance with early mobilization, and the incidence of graft and implant-related problems.

All patients received antituberculous medications for 9-12 months. ; 8 of them treated by anterior cervical approach for decompression followed by fixation by iliac bone graft and cervical plating, another two patients with C3 tuberculosis managed by single stage- combined anterior decompression and fusion by iliac bone graft followed by posterior occipitocervical fixation by Ransford Loop.

Postoperative follow up showed good clinical and radiological outcome, good bony fusion, reduction and maintenance of lordosis, and no implant complications. Surgery for decompression and stabilization of tuberculous spondylitis of the cervical spine is an effective method with good neurologic and radiologic outcome.

INTRODUCTION

Spinal tuberculosis, the most common form of skeletal TB, is considered the most dangerous because involvement of the spinal cord results in neurologic impairment. Lumbar and thoracic regions are more often involved, whereas the incidence of cervical involvement is 2 to 3 %. [1,2]

The sites of spinal involvement with tuberculous spondylitis are paradiscal lesion which is the most common site, central body lesion, anterior type in the anterior part of the vertebrae, appendicular type in the pedicle, lamina, transverse process and articular type in the posterior intervertebral joint. [3,4]

The neurologic deficit occurring with tuberculous spondylitis due to cold abscess, granulation tissue, necrotic debris and sequestrae from bone or the intervertebral disc tissue, and occasionally vascular thrombosis of the spinal arteries. [5]

Treatment of tuberculous spondylitis remains controversial; some of the authors have advocated chemotherapy alone whereas others have recommended chemotherapy with surgical intervention. The reports of the Medical Research

Council suggested that the overall outcome was the same for both operative and non-operative modality. However, patients with neurologic deficit, abscess, kyphosis or intractable pain required radical surgery. The advantage of surgical treatment over medical treatment is early ambulation of the patient, less hospitalization, early neurologic recovery, and less deterioration of the angle of kyphosis. [6]

The aggressive decompression of neural tissue, antituberculous drugs for 9-12 months regimen and spinal stabilization maximize the preservation of neurologic function. This study was conducted to evaluate the surgical treatment of tuberculosis of the cervical spine and its outcome as regard the neurologic improvement, bony fusion, and spinal stability.

PATIENTS & METHODS

Between January 2000 and April 2004, 10 patients presented with cervical tuberculous spondylitis. Their mean age was 37 years [28 -55 years], the group consisted of eight men and two women, and the mean follow up was 15 months [12-48 months]. All patients had tuberculous spondylitis in

the cervical spine were complicated by neurologic deficit .Preoperative work up included check of the erythrocyte sedimentation rate ,tuberculin test ,sputum culture to detect acid fast bacilli Radiological work –up included plain x-ray of the spine, chest x-ray , CT spine in 6 cases to show the degree of vertebral destruction, and MRI was performed in all cases to show the epidural abscess and degree of spinal cord compression. Inflammatory process localized from C3 to C7 vertebrae.

All patients in the series were placed on four drug antituberculous regimen [rifampicin 600 mg /d , isoniazid 300 mg / d ,ethambutol 15 mg /kg /d , and pyrazinamide 20 –30 mg /kg /d], pyrazinamide continued for 3 months while other 3 drugs continued for a total of 9-12 months .

As regard the approach, 8 patients were operated by anterior cervical approach for decompression and fusion by bone graft and cervical plating. Other two patients with C3 tuberculosis combined anterior decompression and bony fusion by iliac bone graft and in the same stage posterior occipitocervical fusion by Ransford Loop.

Aspirate from cold abscess was sent for AFB culture and sensitivity for confirmation of the diagnosis. Postoperatively, all the patients received antituberculous drugs. Postoperative plain x- ray were performed immediate, 1 , 3, 6 ,12 months postoperatively . Patients were mobilized between the 4th and 10 th postoperative day with a cervical orthosis [Philadelphia neck collar] which was continued for an average 8-12 weeks until plain x –ray showing good vertebral fusion and good alignment.

Bony fusion, graft height, graft related problems [fracture, absorption, subsidence and slippage] and implant related problems [loosening and breakage] were recorded and assessed.

RESULTS

Cervical compression due to spinal tuberculosis was diagnosed in 10 patients, 7 were male and 3 were female with age ranging from 33 to 55 years [mean 37.2 years].The signs and symptoms are summarized in Table 1. Myelopathy manifested as varying degree of weakness and spasticity. The onset of cord compression was gradual, occurring over a period of 4-8 weeks after the onset of neck pain.

Table 1: Clinical presentation

Table 2:Grading of the motor power

The erythrocyte sedimentation rate was checked and was uniformly elevated. Serologic tests for brucellosis, human immune deficiency virus were done in 6 cases, was negative in all cases.

RADIOGRAPHIC EXAMINATION

Plain x-ray , MRI were done in all cases ,and CT cervical spine in 6 cases. Diagnostic imaging studies included plain x ray showed endplate disruption and bone destruction with localized angulation. Plain x-ray chest were obtained in all cases and revealed evidence of healed TB in two patients. CT of the affected spine delineated bone destruction with paravertebral abscess extension .MRI demonstrated clearly the extent of vertebral affection, the degree of spinal compression, extent of epidural abscess, the extent of paravertebral involvement. Prevertebral abscess were seen in 6 observations [60 %].

SURGICAL PROCEDURE

In this study, indications for a surgery were neurologic deficit, spinal instability, failure of medical treatment. Debridement was performed through the anterior cervical approach followed by vertebral corpectomy [partial or complete] and interbody fusion with bone graft taken from the iliac crest, followed by cervical plating. Microbiological and histopathological studies of the operative specimen revealed specific, granulomatous infections consistent with tuberculosis. Fluid pus was drained from all patients, during the follow up, there was no evidence of recollection of the abscess, no development of sinuses, and only two patients had superficial wound infection, managed successfully by systemic antibiotic and debridement. All patients had positive culture or histological evidence of tuberculosis.

CLINICAL OUTCOME

All patients received antituberculous drugs for 9 –12 months duration. Neurological recovery was good, all patients showed improvement of their quadrimyelopathic manifestations and no patients have been deteriorating in the postoperative follow up period. There was no incidence of reactivation or recurrence of tuberculosis. Neurological recovery and relief of pain was achieved more rapidly with early mobilization after surgery. All patients experienced complete relief of their neck pain within 1 –2 months postoperatively.

After six –months postoperative evaluation, patients who had radical surgery showed correction of their deformity which was successfully maintained up to final follow up

evaluation.

In all patients, the tuberculous infection was controlled by antituberculous agents, abscess drainage, and surgical resection followed by spinal stabilization, successful management was confirmed by the cessation of destructive bone changes, corrected kyphotic deformity from an average of 20 degrees to 6 degrees and fusion on imaging studies, as well as ,a decline in the ESR to the normal range .

During postoperative follow up, radiographic healing of bone graft was seen at six months, and completely healed at 12 months follow up. All patients returned to active social life within 1-3 months and continued the full course of antituberculous drugs.

DISCUSSION

Tuberculosis of the spine is an ancient disease seen in 5000 –year- old Egyptian mummies. [7] The cervical spine affection represents about 3% to 9 % of spinal TB .Tuberculous lesions of the cervical spine have the potential to cause instability and neurological deficits. [8,9]

Tuberculous infection causes destruction, caseation, and necrosis of vertebrae or may present as an abscess. The abscess may remain close to the vertebra and present on the radiograph as prevertebral or paravertebral abscess or it may move distally along the tissue planes to present as cold abscess.[3,10] The fact that the neuroogic deficits are so common in the cervical region can be explained by the relatively small cross- sectional diameter of the spinal canal relative to the diameter of the cervical cord . The neurologic symptoms may be caused by one or more of the following: subluxation of vertebrae, impingement of bone, disc, abscess on the spinal cord or nerve root, local inflammatory response, and tuberculous vasculitis.

INVESTIGATIONS AND DIAGNOSIS

Although standard laboratory investigations such as complete blood count, erythrocyte sedimentation rate, blood chemistries, and the Mantoux tuberculin test are helpful, these assessments do not contribute significantly to the diagnosis.

Plain x-rays show narrowing of the disc space in the earliest finding ,and when associated with a loss of paradiscal margin ,the diagnosis is obvious in paradiscal type which is the commonest type ;also plain x-rays show the kyphotic deformity ,soft tissue shadow .[11]

Kyphosis is usually present but is seldom severe because the articular process is usually spared and provides sufficient support to the cervical spine. CT of the affected spine show body lysis and destruction at an earlier stage more accurately; additionally it can show paraspinal and granulation tissue. [5,12]

MRI is useful in evaluating the presence and extent of compression of neural elements by the adjacent bone and soft tissue. MRI is considered to be the most sensitive tool in detecting abnormalities in bone and soft tissue at an early stage especially gadolinium enhanced T1- weighted image, changes on both T1 and T2-wieghted images are mainly a result of the increased water content of the inflammatory and ischemic changes in the bone marrow .In a study by Gupta et al [13] MRI showed gross abnormalities in 63 % of patients with tuberculous spondylitis who had normal plain radiographic findings . The use of gadolinium is promising in detecting the disease earlier, as it invariably results in bone enhancement. [10]

On the basis of MR imaging ,Pattisson [14] and Hoffman et al [11] stated that 60 % or more compression of the spinal cord results in neurological deficit . Al Mulhim et al [15] proposed that less than 50 % narrowing of the canal produces only mild to moderate deficits and more than 75% narrowing cause severe neurologic deficits.

Tuberculous affection can present as destructive lesion in a single vertebral body which may be difficult to differentiate from metastatic disease. [16]

TREATMENT

Optimum treatment of spinal tuberculosis remains controversial and should be individualized in each case. Once a definitive diagnosis of tuberculous spondylitis has been made, the optimal management strategy for a particular patient will depend on the extent and location of the bony destruction, the presence of spinal deformity and instability, and the severity of neurological impairment. [1,3,5,17,19]

Patients who are neurologically intact without significant bone destruction are generally treated with biopsy, antituberculous medication and external bracing.[18,19] On the basis of studies by the Medical Research Council ,recommended that spinal tuberculosis was best treated with appropriate chemotherapy and radical operation if adequate surgical indication is available [6]

Surgical intervention may be indicated for diagnostic biopsy,

drainage of large abscess, decompression of neural elements, correction of spinal deformity and stabilization of the affected spine. The presence of neurologic deficit resulted from either marked bone collapse with spinal canal compression or granulomatous epidural abscess producing mass effect .Because both epidural infection and bone destruction typically progress for a variable length of time after antituberculous chemotherapy is instituted, the presence of even mild neurologic deficit may be taken as a strong indication for surgical intervention.[^{18,19}]

According to the literature, spinal instability and angulation ,once present ,are likely to progress without surgery .The overall results of early postoperative treatment in patients with neurologic deficit and spinal deformity are superior to those of non operative management .

Chemotherapy is mainstay of the treatment of spinal tuberculosis and as shown by the Medical Research Council in their prospective trial on thoracolumbar tuberculosis, the best surgical adjunct is excision of the diseased bone, replacing the gap with a bone graft [the Hong Kong operation] .[⁶] Anterior debridement is performed for localized disease because there is high incidence of progressive angulation and a low rate of fusion after treatment by chemotherapy alone .Radical anterior surgery with interbody fusion offers good clinical improvement with early mobilization.

Spontaneous fusion is not as common in tuberculous spondylitis, and progressive kyphotic deformity is frequent .This may lead to progressive neurological deterioration. Although medical therapy continue to be the cornerstone of treatment, surgical intervention is commonly performed to optimize functional outcome.

In general, the use of interbody grafts in patients with spinal osteomyelitis is accepted. Autologous grafting in the setting of an active infection was first reported for chronic vertebral osteomyelitis by Wiltberger[²¹] in 1952 ,and has been used safely every since .

Anterior debridement, the application of autologous bone graft is a useful method to promote local bone healing and accelerate the attainment of spinal stability and therefore the prevention of late deformity. Instrumentation is not a contraindication in the presence of infection if debridement is adequate and taken back to normal bleeding bone. [¹⁹]

Hodgson ,Stock , and co-workers [¹⁷] in Hong Kong used an anterior approach for decompression and autologous bone

grafting and reported that 94 % of patients made a complete recovery . The bone fusion occurs earlier and decreased vertebral body loss with a lesser degree of kyphosis is expected postoperatively. Cahill et al [²⁴] presented a series of 10 patients with spinal infection and demonstrated that those received anterior debridement and fusion without instrumentation but with medical treatment and external brace immobilization for 3 months did well. However that instrumentation may have decreased the need for prolonged external immobilization, also avoid graft dislodgement Fibula allograft have also been shown to be effective in the cervical spine. Ozdemir et al [²²] and Govender [²³] attempted to address concerns regarding implantation of devitalized bone in actively infected spine by assessing the efficacy of allograft fibular fusion and anterior instrumentation as an alternative treatment for tuberculous spondylitis. Bone fusion was achieved in 96% of cases, with one experiencing instrumentation failure that necessitated revision.

Moreover posterior stabilization have been advocated in addition to anterior surgery. The combined single –stage anterior and posterior approach to C3 tuberculosis provides immediate rigid stabilization of the cervical spine, prevent graft complications and eliminate the need for halo immobilization postoperatively. Furthermore, a higher rate of fusion was achieved with the combined approach [^{19,20}]

Surgical extirpation of the disease focus and its replacement by autologous iliac bone graft in structurally sound position has shown to be the most effective method, in addition graft fixation in cancellous bone slots with cervical instrumentation by plate and screws . With this technique, no graft resorption occurs .In this study ,autologous iliac crest graft is the preferred graft material because vascularization and ossification occur more rapidly than when allograft is used .

There is no additional risk of persistent infection after adjuvant instrumentation confirming the conclusion by Oga et al .[²⁵] Radical debridement has the additional advantage of removing necrotic tissue ,thereby resulting in a more rapid resolution of neurological deficits .It results in a more rapid and effective alleviation of pain than treatment with chemotherapy alone .

CONCLUSION

- Patients should receive at least 9 months of appropriate antituberculous therapy
- Individuals with neurologic deficit should undergo

surgical management.

- When vertebral body involvement has produced wedging and kyphosis
- Aggressive debridement and fusion are indicated to prevent delayed instability and progression of the disease.
- Early diagnosis and treatment are important in the prevention of long term neurologic sequale .
- The use of instrumentation and autogenous bone grafting in the presence of tuberculous infection does not appear to lead to a higher risk of persistence or recurrence of infection .Therefore, the single stage procedure should be the goal.
- Anterior cervical approach for decompression and stabilization of tuberculous spondylitis of the cervical spine is an effective method with good neurologic and radiologic outcome.

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