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POSTOPERATIVE NEUROLOGICAL OUTCOME IN SPINAL TUBERCULOSIS PATIENTS PRESENTING WITH SEVERE NEUROLOGICAL DEFICITS

Neurosurgery

Dr Anchal Chauhan* Senior Resident, Department Of Neuro Surgery Mahatma Gandhi Hospital And Medical College, Jaipur *Corresponding Author

Dr Rohin Bhatia Professor, Department Of Neuro Surgery Mahatma Gandhi Hospital And Medical College, Jaipur

Dr Pankaj Gupta Professor And Head Of Department, Department Of Neuro Surgery Mahatma Gandhi Hospital And Medical College, Jaipur

ABSTRACT

Introduction- High incidence of neurological involvement has been seen in tuberculous spine (TB) patients from developing countries. The aim of present study was to assess the postoperative neurological outcome in spinal tuberculosis patients presenting with severe neurological deficits. **Material And Methods-** The present retrospective study was conducted at department of neurosurgery of a tertiary care hospital among 108 patients of spinal tuberculosis with severe motor deficits. Patient's outcome was assessed using Frankel grading system. Results were analysed sing SPSS version 25.0. **Results –** In the present study mean age of patients 32.6 years. The number of female patients was 40 and male patients were 68. The most common clinical feature found was bladder involvement (72.2%), spasticity (90.7%), sensory loss (91.6), pain (78.7%). Preoperatively there was 1 patient of grade A, 72 patients of grade B and 36 patients of grade C but at follow up time after operation 23 patients improved to grade D and 85 patients improved to grade E. **Conclusion –** The neurological prognosis significantly improved after the surgical decompression. Surgical decompression and fusion is a viable choice for individuals with severe impairments, unless the patient is medically unsuitable.

KEYWORDS

Frankel grading, tuberculosis, neurological deficits, neurological outcome, spinal tuberculosis

INTRODUCTION

Global tuberculosis infection rates reached 10 million individuals.[1] This disease mainly affects the lungs, but it is not uncommon for it to also affect other parts of the body. Spine tuberculosis is the most prevalent form of extra-pulmonary TB.[2] The thoracolumbar spine is the most often affected region, followed by the lumbar spine and then the cervical spine.[3]

Spinal tuberculosis has a range of symptoms, although it consistently starts gradually and progresses slowly.[4] The presentation of the disease is influenced by its severity, length, location, and any associated complications [5]

Spinal TB is primarily an anterior pathology of the spine. It affects the metaphysis of vertebral bodies. If one vertebra is affected the disc will remain normal but if two vertebrae are affected, the intervening disc which is a vascular and cannot receive the proper nutrition ultimately collapses. This leads to caseous necrosis, pus formation, and destruction of the vertebral bodies. This usually affects the thoracolumbar region but it can affect any part of the spine from the cranio-vertebral junction down to the lumbosacral region.[6]

The compression of the spinal cord and nerve roots which leads to neurological deficits. Clinically there should be a high index of suspicion in patients having constitutional symptoms, weight loss, low-grade fever, and presenting with back pain. Pain at rest is pathognomonic of infection but sometimes the radicular pain is the presenting symptom in patients of spinal tuberculosis. In complicated cases, the patients will present with spinal deformity, instability, or with neurological deficits.[7]

Neurological deficits are due to compression of the nervous tissue or due to spinal instability which causes the mechanical traction of the spinal cord and leads to neurological deficits. The gold standard in the diagnosis of spinal tuberculosis is the MRI of the spine with intravenous contrast. This demonstrates the disc space infection, osteomyelitis, its extension into the paravertebral tissues, and destruction of longitudinal ligaments. The spinal cord status and nerve root compression are very clearly demonstrated on MRI. [8,9] Sometimes the diagnosis is not clear, so tissue diagnosis with needle biopsy under CT guidance is required to obtain tissue diagnosis.

Patients who fail medical management or those who develop neurological deficits, spinal deformities, or severe pain due to spinal instability need surgical treatment. The primary goals of surgery are drainage of the pus, debris, and necrotic material, decompression of the neural elements, and spinal stabilization and fusion. These goals can be achieved by the anterior approach, anterolateral approach, posterolateral approach, or the posterior approach to the spine. [10]

In our study the posterior approach, laminectomy or transpedicular decompression is done which is followed by transpedicular screw fixation and fusion with bone graft. In both cases, the ultimate goals of surgery including debridement, decompression of neural tissue, and fusion must be achieved.

Nevertheless, there is a scarcity of literature that examines the neurological recovery following neurological deficits and fixation in patients with spinal TB. Hence the present study was done with an aim to assess the postoperative neurological outcome in spinal tuberculosis patients presenting with severe neurological deficits.

MATERIAL AND METHODS

The present retrospective study was conducted at department of neurosurgery of a tertiary care hospital among patients of spinal tuberculosis who had undergone surgery for treatment. The study period was from year 2017 to 2023. Ethical clearance was taken from institutional ethics committee before commencement of study. As it was a retrospective study hence patients consent was not needed.

Through convenient sampling method a total of 108 patients were selected for the study on the basis of inclusion and exclusion and criteria.

Inclusion Criteria- Patients of age between 22 to 65 years, patients with severe motor deficits (grade A,B,C) due to spinal tuberculosis were included in the study.

Exclusion Criteria- Patients who had involvement of cervical spine and those with inadequate neurological examination charting or missing clinic-radiological data during the course of follow up were excluded from the study.

Surgical Approach- All patients have undergone surgery. The surgical approach varies depending on the level of the lesion, extension of the pus and necrotic material, and goals to achieve. A posterior surgical approach was done in which decompression with laminectomy and instrumental fusion was done with transpedicular screws.

The data was gathered from the case files containing follow-up records and the operation theatre registry. The data were collected regarding age, gender, clinical presentations, duration of illness, imaging characteristics, Frankel grading at presentation (Frankel grades A, B, C

are considered poor grades and Frankel D, E are considered good grades for neurological involvement), surgery, and outcomes at follow-up.

The procedure followed was decompression ± fusion using Pedicle Screw And Rod fixation and patients were followed for minimum 6 months to maximum 60 months post-operatively. Data was entered into Microsoft Excel and analyses were done using the Statistical Package for Social Sciences (SPSS) for Windows software (version 25.0; IMB Corp). Descriptive statistics such as mean and standard deviation (SD) for continuous variables and frequencies and percentages for categorical variables were determined. Association between variables was analysed by using chi-square test for categorical variables. Paired t test was used to compare scores over time. Level of significance was set at less than .05.

RESULTS

In the present study mean age of patients 32.6 years. The number of female patients was 40 and male patients were 68. The most common clinical feature found was bladder involvement (72.2%), spasticity (90.7%), sensory loss (91.6), pain (78.7%), as shown in table 1.

Table 1 Demographic And Clinical Characteristic Of Patients

Variable		Values
Mean age		32.6±3.8
Gender	Male	68 (62.9)
	Female	40 (37.0)
Clinical features	Bladder involvement	78 (72.2)
	Spasticity	98 (90.7)
	Sensory loss	99 (91.6)
	Motor grade 1-3	39 (36.1)
	Motor grade-0	70 (64.8)
	Pain	85 (78.7)
	Fever	28 (25.9)

Preoperatively there was 1 patient of grade A, 72 patients of grade B and 36 patients of grade C but at follow up time after operation 23 patients improved to grade D and 85 patients improved to grade E but 1 patient of grade A remained in that grade only as shown in table 2.

Table 2 Frankel grading at presentation and at follow-up

Frankel grade	Preoperative	Follow up
A	1	1
B	71	0
C	36	0
D	0	22
E	0	85

As far as factors affecting neurological improvement were concerned, age was checked for patients with neurological improvement. Patients were taken of more than 45 years of age and they were compared to young patients as shown in Table 3

Table 3 Factors Affecting The Neurological Outcome

Variable	Improvement in 3-6 months	Improvement in 9-15 months	P value
Age >45	26%	74%	0.001
Duration of ND more than 1 month	18%	82%	0.43
Bladder involvement	30%	66%	0.01
Spinal cord changes	28%	72%	0.03
ASA B	24%	70%	0.13
ASA C	18%	84%	0.02

DISCUSSION

Spinal TB is classified as a medical illness until the patient has a neurological deficiency. In such cases, surgery is necessary to relieve pressure, even if the patient is already undergoing treatment for tuberculosis.[11,12,13] There are no clear-cut protocols for the diagnosis and management of spinal TB.[14] Recent research indicates that both anti-tuberculosis therapy and conservative treatment have demonstrated favorable medical outcomes in patients who did not have surgery.[15,16] There are some circumstances that require surgical interventions rather than relying solely on medicinal treatment. The absence of recovery or recurrence after medical treatment, acute weakness in the lower limbs at the time of presentation, and static structural or functional instability in the form of incapacitating pain or deformity are the key indicators. [17] Prompt identification and medical intervention are crucial in order to avert enduring neurological impairment and mitigate spinal malformation. [18]

In our study there were 40 female and 68 male patients. The mean age of patients was 32.6 years, the results were similar to study done by Liu Z et al and Alam MS et al. [19,20] In our study he most common surgical approach used was Laminectomy, decompression and fusion (46.2%). The choice of surgical method primarily relies on the specific nature of the disease and the level of expertise possessed by the operating surgeon. The anterior technique is typically favored for cases involving the cervical and lumbar regions. Regarding the dorsal spine, it can be either anterior (thoracotomy, extrapleural) or posterior (extracavitatory transpedicular). The thoracotomy method requires a skilled and experienced surgical team, consisting of a thoracic surgeon, and a well-equipped operating theater. Postoperative mortality rates in cases of paraplegia might reach up to 11%.[21,22]

In our study there was significant improvement in Frankel grading of patients. maximum patients had grade D and E at follow up period. Results were similar to study done by Jin D et al and Cui X et al. [23,24] One study shows no such overall difference in the outcome between these group (87% in Frankel grade A/B dysfunction vs. 92.8% of those with Frankel grade C).[25] Moon and colleagues observed poor motor in patients with paraplegia of more than 6 months duration.[26]

CONCLUSION

The surgical decompression resulted in a significant enhancement of the neurological outcome. Surgical decompression and fusion is a highly recommended choice for patients with significant impairments, unless the patient is medically unable to undergo the procedure. The causes that could potentially cause delays are advanced age and other complications.

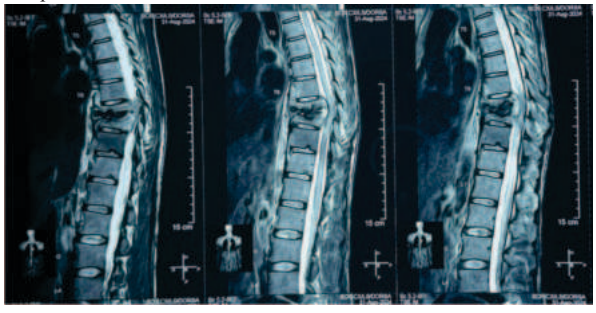

Image 1 Showing sagittal MRI (T2) dorsal spine with D9 involvement

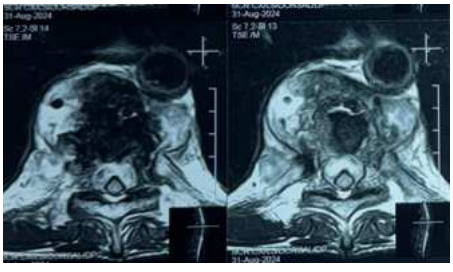

Image 2 showing axial MRI (T2) dorsal spine with D9 involvement

Image 3 Image showing intra-operative exposure before screw placement

Image 4 showing intra-operative exposure after screw placement

Image 5 Post operative image after pedical screw and rod fixation with neural decompression

Image 6 showing O-arm being used inter-operatively

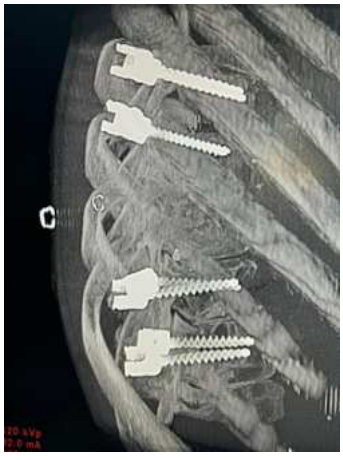

Image 7 Intra-operative x-ray image using O arm for confirmation of screw placement

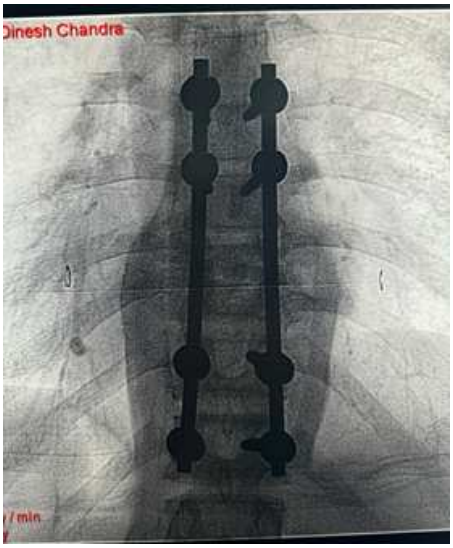

Image 8 a Post operative x-ray image showing pedical screw and rod in-situ (AP View)

Image 8 b Post operative x-ray image showing pedical screw and rod in-situ (Lateral View)

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