

## Original Article

# Spinal Tuberculosis: Comparative Study Between Surgical & Conservative Management

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**Abstract:**

Background: Due to globalization, spinal tuberculosis is no longer a disease limited to developing nations and accounts for 50%-60% of osseous TB. Worldwide conservative treatment including anti-tubercular therapy is popular but along with surgical treatment plays a vital role.

Methods: This hospital-based comparative study was conducted in a multi-disciplinary hospital for two years. A total of 38 cases were enrolled into the study out of which 22 cases with spinal tuberculosis underwent surgical management and 16 cases were treated conservatively. All patients were treated with standard anti-TB drugs and the addition of add-on therapy by Levofloxacin as per National Antitubercular Therapy Guideline pre- and postoperatively where applicable and were followed regularly after 3 months. Neurological function and pain were evaluated in all cases during admission and post procedure where applicable by ASIA grade scale and visual analogue scale (VAS) respectively. Outcomes were finally assessed 3 months after initiation of treatment.

Results: Out of 38 cases, 4 were lost to follow-up. Among the available 34 cases, 18 were men and 16 were women. The mean age was 37.10 ( $\pm 14.70$ ) years and age range was 18 to 56 years. At 3 months final follow-up, the VAS score significantly improved from 7.97 ( $\pm 1.27$ ) pre-procedure to 1.23 ( $\pm 0.69$ ) post procedure ( $P < 0.001$ ) and all patients became pain less, with final VAS score 0-3. At the 3 months follow-up, the ESR and CRP significantly improved from preoperative status ( $P < 0.001$ ). Thirty-one (91.76%) patients improved by at least one ASIA grade and the remaining three (8.82%) patient maintained their preoperative ASIA grade as before. Post-operative deterioration was observed in three cases who developed bed sore and its complications. Out of 13(38.23%) cases with bowel bladder dysfunction before surgery 9 (83.9%) recovered within three months.

Conclusion: Surgical management has a satisfactory outcome but certain cases can be managed conservatively depending on several factors. Clinicians must judiciously select cases for optimum outcomes.

Keywords: Spinal Tuberculosis, Pott's Paraplegia, Spine TB, Surgery Vs Conservative Treatment, TB Infection

## Introduction:

Bangladesh is one of the high TB burden countries with 4% of the world's total TB cases reported in 2019. 1 About 10% of all TB cases present with musculoskeletal involvement and 50% of these involve the spine. 2 These data emphasize the necessity for preparation for a future resurgence of spinal TB. The treatment for spinal TB remains a challenging decision making process, given the lack of evidence and guidelines on the optimal treatment

and management strategies. 3,4 Methods such as immobilization using body casts or plaster beds, as well as a healthy diet and anti tubercular therapy with addition of second line antibiotics are considered as conservative treatment options for spinal TB. Among antitubercular therapy, besides Rifampicin, Isoniazide, Ethambutol and pyrazinamide, Bangladesh National guideline and Operational Manual For Tuberculosis suggests continuation of

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second line anti tubercular therapy either Levofloxacin, Moxifloxacin, Bedaquiline, Linezolid as group A, Clofazimine, Cycloserine or Terizidone as group B, Ethambutol, Delamanid, Pyrazinamide, Imipenem, Cilastatin or Meropenem, Amikacin (OR streptomycin), Ethionamide or Prothionamide or p-aminosalicylic acid as group C drugs. 5 But anti-TB drugs may not be suitable in all cases where patients are at risk of progression of neurological deficit, at risk of instability or patients who are refractory to medical treatment. Furthermore, the lengthy course of anti-TB therapy, typically 12-18 months and longer, is both a social and economic burden, as well as a personal burden to the quality of life of the patient. 6 Regarding surgical management, various methods are available worldwide. Different approaches for different locations with or without instrumentation are practiced. Anterior, antero-lateral, posterior or combined approach showed their own benefits and limitations. Some studies hold the superiority of posterior approach for dorsal and lumbar regions. 7-9 Nevertheless, the indication for different surgical procedure remains blurred. Given the lack of literature on the safety, neurological outcomes and complication rates of surgical intervention for spinal TB, surgeon's preference always took place for decision making strategy.

The objective of this study is to evaluate different treatment approaches of spinal TB, including conservative therapy and decompression surgery-autologous bone grafting and anti-TB chemotherapy and thereby conclude the efficacy and clinical outcomes of different approaches. We present our experience with both conservative and surgical treatment of a prospective consecutive series of spinal TB from a multi-center study and describe clinical and neurological outcomes.

#### Methods:

The local institutional ethics board approved the multi-center study ethics. Written informed consent was obtained from all patients or guardians. This was a quasi-experimental study conducted in the Department of Neurosurgery, Chattogram Medical College and Hospital, Chattogram, Bangladesh for a period of 1 year from July 2018 to June 2019 and from East West Medical College Hospital for a period of 1 year from February 2022 to January 2023. Clinically suspected patients of TB spine and supported by

clinico-radiological investigation findings including Fine Needle Aspiration Cytology (FNAC) in certain cases were selected as the study population. Patients were selected using consecutive sampling technique where patients with a prior history of spinal injury were excluded from this study. Patients were selected based on precise inclusion and exclusion criteria. The inclusion criteria were:

1. Clinico-radiological feature suggestive of spine TB.
  2. Progressive or severe neurological deficit.
  3. Unstable spine compressing spinal cord.
  4. Severe or progressive spinal kyphosis
- Patient or patient's attendant denied to undergo surgery or the patient or attendant refused to participate in the study were the exclusion criteria.

Based on above inclusion criteria, clinico-radiological features suggestive of TB patients who had developed progressive or severe neurological deficit which includes paraparesis or paraplegia, decreased muscle power in limb (<3/5 in more than or equal 50% of limb muscle group) assessed by ASIA classification, radiological evidence of unstable spine compressing the spinal cord or pathological fracture with cord compression due to spine TB, severe or progressive spinal kyphosis and pain not responding with conventional analgesic after initiation of Anti Tubercular drug were selected for surgery. Patients who had minimal or no neurological deficit, pain which responded to analgesic and after initiation of anti-tubercular therapy, muscle power >3/5 in more than or equal 50% of limb muscle group assessed by ASIA classification, no radiological evidence of unstable spine fracture or significant cord compression, no spinal kyphosis and patient who did not want to undergo operative management due to financial issue were treated conservatively.

Every patient was evaluated with a detailed history, clinical and physical examination including neurological examination using a standardized data collection form and analyzed. The diagnosis was done based on plain Xray and MRI of spine or CT scan of spine, Fine Needle Aspiration Cytology (FNAC) in applicable available cases. Preoperative neurological evaluations were recorded by ASIA grading. Assessment of bowel bladder involvement was recorded. Pain assessment was done using VAS scoring system.

A total 38 cases were included in the study within the time frame of one year. Among them, 22 patients agreed to surgery and 16 patients denied surgical management, so they were managed conservatively. Patients who were lost to follow-up were excluded from the analysis.

Quadruple antituberculosis agents (Isoniazid 0.3 g/d, Rifampicin 0.45 g/d, Ethambutol 0.75 g/d, and Pyrazinamide 0.75 g/d) were administered in all patients. As per National Guideline, 2nd line anti-tubercular drug- Levofloxacin was added in all patient once daily. In patients with progressive aggravating neurological dysfunction, surgical treatment was performed if no improvement after 4 weeks of standardized anti-TB treatment to relieve the compression on the spinal cord and promote the recovery of neurological function. The surgical method includes decompression of neural elements by laminectomy as desired level, evacuation of pus, and debridement of dead necrosed tissue where needed followed by stabilization by fixation with pedicle screw and rod with autologous bone grafting.

**Statistical analysis:**

SPSS for Windows (version 16.0; SPSS, Inc., Chicago, IL, USA) was used for data analysis. A paired t-test was used to compare the pre-treatment and post-treatment clinical data including ASIA Grade and VAS score. The results are described descriptively or as mean ± standard deviation (SD). Proportions were compared using the chi-square test. An Independent sample t-test was used for between-group comparisons of the mean. P value of less than 0.05 was considered statistically significant.

**Study flow chart:**

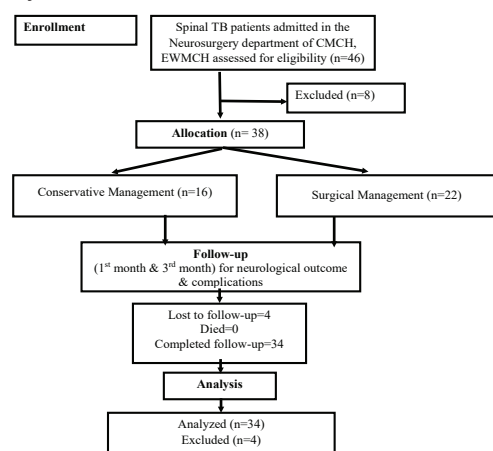


Figure 1: Patient flow diagram (Modified CONSORT diagram)

**Results:**

Both the groups were similar in terms of age and sex distribution. Among the available 34 cases, 18 were men and 16 were women. The male represents slight preponderance. Table I shows that, Overall

The mean age was 37.10 (±14.70) years and the age range was 18 to 56 years. More than three-fourths of the patients in both group were from the age group of > 20 years (73.83%). Male to female ratio was almost equal in both groups (p = 0.374). Majority (58.82%) of the patients was from rural area and 14 (41.17%) patients came from urban area.

Table III: Demographic characteristics of the patients (n=34)

| Variables                           | Frequency (%) |              |
|-------------------------------------|---------------|--------------|
| <b>Age (years)</b>                  | Mean ±SD      | 37.10 ±14.70 |
|                                     | Range         | 18-56        |
| <b>Sex</b>                          | Male          | 18 (53.3)    |
|                                     | Female        | 16 (46.7)    |
| <b>Residence</b>                    | Rural         | 20 (58.82)   |
|                                     | Urban         | 14 (41.17)   |
| <b>Age at the time of Treatment</b> | 40 (18-56)    |              |

Data are expressed as frequency (percentage) if not otherwise mentioned.

Table II depicts that, comparison between conservative group and surgical group in baseline clinical presentation where 4 (25%) patients have previous history of PTB in conservative group and only 2 (6.7%) of patients have history of PTB in surgical group. Motor weakness and pain were prime symptoms present in both group which is 87.5% and 93.3% in motor weakness and 93.75% and 86.7% pain respectively. The autonomic disturbance was present in 68.75% in conservative group and 36.7% of the patients in surgical group. Mean duration of the anti-TB chemotherapy in conservative group was 1.68 months (ranged: 0.264 to 6 months) and in surgical group was 1.48 months (ranged: 0.27 to 6 months).

Table II: Baseline Clinical characteristics of the patients (n=34)

| Characteristics                 | Frequency (percentage)    |                       |
|---------------------------------|---------------------------|-----------------------|
|                                 | Conservative Group (n=16) | Surgical Group (n=22) |
| History of PTB                  |                           |                       |
| Yes                             | 4 (25)                    | 2 (6.7)               |
| No                              | 12 (75)                   | 20 (93.3)             |
| Symptoms at admission           |                           |                       |
| Motor weakness                  | 14 (87.5)                 | 28 (93.3)             |
| Pain                            | 15 (93.75)                | 26 (86.7)             |
| Autonomic disturbance           | 11 (68.75)                | 11 (36.7)             |
| Anorexia and weight loss        | 6 (37.5)                  | 9 (19.5)              |
| Night sweat                     | 3 (18.75)                 | 6 (13.6)              |
| Gross deformity                 | 2 (12.5)                  | 3 (10)                |
| Duration of anti-TBa (in month) |                           |                       |
| Mean ±SD                        | 1.68±0.96                 | 1.48±0.92             |
| Range                           | 0.024-6.00                | 0.27-6.00             |

From Table III, we can observe Dorsal vertebra was the commonest site of lesion in both group which is 50% and 54.54% in conservative and surgical group respectively followed by Dorso-lumbar vertebrae (31.25%) and (31.81%) respectively. Cervical vertebrae involvement was not present in conservative group but 1 (4.54%) in surgical group. The number of involved segments was single level in 50% of conservative group and 22.72% in surgical group whereas multiple level involvement was observed in 11 (50%) of surgical group.

Table III: Characteristics of the lesion of the patients with spinal TB (n=38)

| Spinal Involvement:     |                         |                      |
|-------------------------|-------------------------|----------------------|
| Level of Involvement:   | Frequency (percentage)  |                      |
|                         | Conservative Group n=16 | Surgical Group n= 22 |
| Single Level            | 8 (50)                  | 5 (22.72)            |
| Multiple Level          | 5 (31.25)               | 11 (50)              |
| Vertebral body only     | 1 (6.25)                | 1 (4.54)             |
| Vertebral body and disc | 2 (12.5)                | 5 (22.72)            |
| Site of Involvement:    |                         |                      |
| Cervical Vertebrae      | 0                       | 1 (4.54)             |
| Dorsal                  | 8 (50)                  | 12 (54.54)           |
| Dorsolumbar             | 5 (31.25)               | 7 (31.81)            |
| Lumbar Vertebrae        | 3 (18.75)               | 2 (9.09)             |

The mean duration of antibiotic therapy was 12 months (range, 8–16 months). No drug resistance or side effects were reported during this period. Medical treatment consisted of restricting of the spine with spine orthosis for at least 12 weeks and complete bed rest of the same duration. Conservative treatment was effective in 14 patients (87.5%) who developed inter-somatic fusion with the stability of the spine and blood tests normalization; Only 2 (12.5%) patients required surgical intervention.

Table IV: Conservative Treatment and Outcome:

|                                       |           |
|---------------------------------------|-----------|
| Antitubercular therapy duration       | 18 [8-16] |
| Side effects or drug resistance noted | 0 [0]     |
| The success of conservative treatment | 14 [87.5] |
| Required Surgical Intervention        | 2 [12.5]  |

On admission neurological status of the patients is shown in Figure 2. According to the ASIA scale classification (Grade A: completely paralyzed; Grade B: means there is incomplete sensory (some feeling), but no motor function (ability to move) is preserved below the level of injury.; Grade C: means there is motor function which is receiving some messages (muscle contractions) below the level of injury, but more than half of the key muscles\* below the level have a muscle grade of less than 3 (so they are unable to lift against gravity; Grade D: means there is motor function (movement) below the level of injury, and at least half the key muscles\* below the injury level have a muscle grade of 3 or more (able to move and lift against gravity); Grade E: Motor (movement) and sensory function(-feeling) are normal (back to where they were before the injury). Key muscles in the body were: Elbow flexors, Wrist extensors, Elbow extensors, Finger flexors and abductors, Hip flexors, Knee extensors, Ankle dorsiflexors, Long toe extensors, Ankle plantar flexors. The majority of the patients 23 (66.65%) were either in Grade B or Grade C, followed by 6 (17.64%) in Grade A. Only 5 (14.70%) patients were in Grade D and none of the patients were in Grade E.

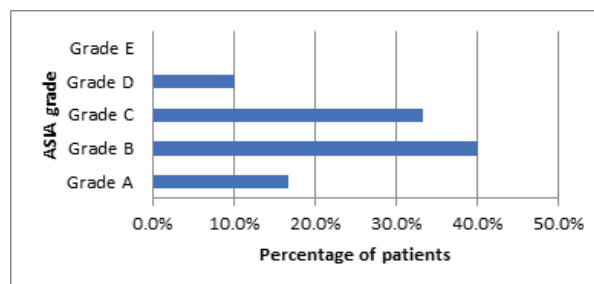


Figure 3: Pre-operative neurological status in 34 patients with spinal TB.

A visual Analogue Scale (VAS) score was used in the study to measure the intensity of pain. Figure 4 shows that 10 patients reported score 7 and 7 patients reported score 7 in the scale. Three patients had constant severe pain and scored 10 (highest score) in the scale. Rest of the 14 patients had a different range of scores where Mean VAS score was 7.97 (±1.27) in the studied patients.

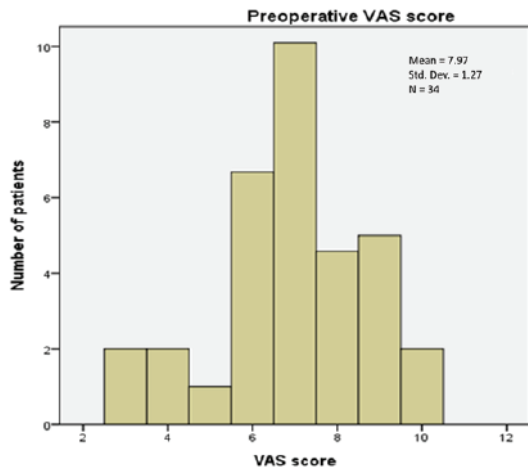


Figure 4: Distribution of preoperative VAS score in the patients in both conservative and surgical group

In the present study, pain was significantly reduced in 3 months following treatment either conservative or surgery. Preoperative mean ( $\pm$ SD) VAS score was 7.97 ( $\pm$ 1.27) and 3 months after the mean score decreased to 1.23 ( $\pm$ 0.69). The mean difference of 6.74 VAS score was statistically significant ( $P < 0.001$ ) (Table VI).

Table V: Comparison of admission and 3 months VAS score in 34 patients of spinal TB

| Preoperative                                | Mean ( $\pm$ SD) VAS score |  | P value                          |
|---|----------------------------|--|----------------------------------|
|   | Final follow-up            |  |                                  |
| 7.97 ( $\pm$ 1.27)                          | 1.233 ( $\pm$ 0.69)        |  | <0.001<br>(Paired sample t test) |
| Mean difference (95% CI): 6.74 (4.84-7.97). |                            |  |                                  |

In the present series, ESR and CRP provided a great value where ESR was significantly reduced in 3 months following surgery. Preoperative mean ( $\pm$ SD) ESR level was 70.54 ( $\pm$ 28.25) mm in 1st hour which decreased at 3 months after surgery to 22.78 ( $\pm$ 7.34) mm in 1st hour. The mean difference of 44.45 ESR level was statistically significant ( $P < 0.001$ ) (Table VI). CRP was significantly reduced in 3 months following surgery. The preoperative mean ( $\pm$ SD) CRP level was 24.42 ( $\pm$ 19.65) mg/dL and 3 months after the mean level decreased to 8.95 ( $\pm$ 5.75) mg/dL. The mean difference of 15.16 ( $\pm$ 7.81-23.24) CRP level was statistically significant ( $P < 0.001$ )

Table VI: Comparison of admission and 3 months Clinical parameter (ESR & CRP) level in 34 patients of spinal TB

| Trait     | On admission         | Final follow-up     | Mean ( $\pm$ SD) ESR level |  | P value                |
|-----------|----------------------|---------------------|----------------------------|--|------------------------|
|           |                      |                     | Mean difference (95% CI)   |  |                        |
| ESR Level | 70.54 ( $\pm$ 28.25) | 22.78 ( $\pm$ 7.34) | 44.45 (36.75-52.68)        |  | <0.001                 |
| CRP Level | 24.42 ( $\pm$ 19.65) | 8.95 ( $\pm$ 5.75)  | 15.16 (7.81-23.24)         |  | (Paired sample t test) |

ASIA grading at presentation and at final follow-up was analyzed. Four patients (80%) recovered neurologically to ASIA grade E and both of them were in Grade D preoperatively. Twenty three patients (67.64%) who showed neurological recovery to ASIA grade D, preoperatively 3 of them were in grade A, 10 in grade B and 9 in Grade C and 1 in Grade D (Table VII).

Table VII: Neurological outcome according to the ASIA classification grading system on admission and at 3 months follow up (n=34)

| Baseline ASIA Grading | n  | Outcome in ASIA Grading at 3 months after Treatment |                  |                  |                   |               | P value                     |
|-----------------------|----|---|------------------|------------------|-------------------|---------------|-----------------------------|
|                       |    | A   | B                | C                | D                 | E             |                             |
| A                     | 6  | 0 (0)   | <b>2 (33.33)</b> | <b>1 (16.66)</b> | <b>3 (50.0)</b>   | 0 (0)         | <0.001<br>(chi-square test) |
| B                     | 14 | 0 (0)   | 0 (0)            | <b>6 (42.85)</b> | <b>10 (71.42)</b> | 0 (0)         |                             |
| C                     | 9  | 0 (0)   | 0 (0)            | 0 (0)            | <b>9 (100)</b>    | 0 (0)         |                             |
| D                     | 5  | 0 (0)   | 0 (0)            | 0 (0)            | <b>1 (20)</b>     | <b>4 (80)</b> |                             |

Data are expressed as frequency (percentage). Figure in bold faces had at least one ASIA grade improvement.

Figure 5 depicts that, before surgery, the majority of the cases had ASIA grade B or C. In contrast at 3 months follow up majority of the patients had ASIA grade D or C. Conservative group had similar outcome.

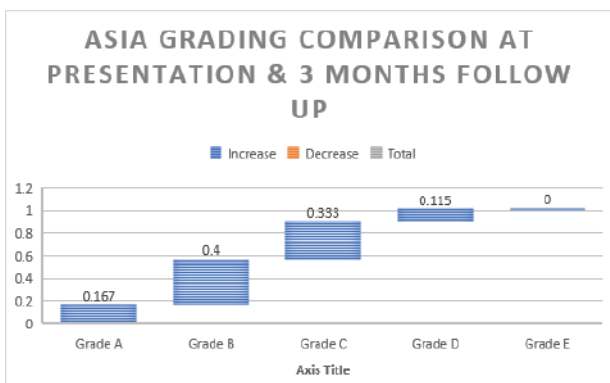


Figure 5: ASIA grading for patients at presentation and final follow-up

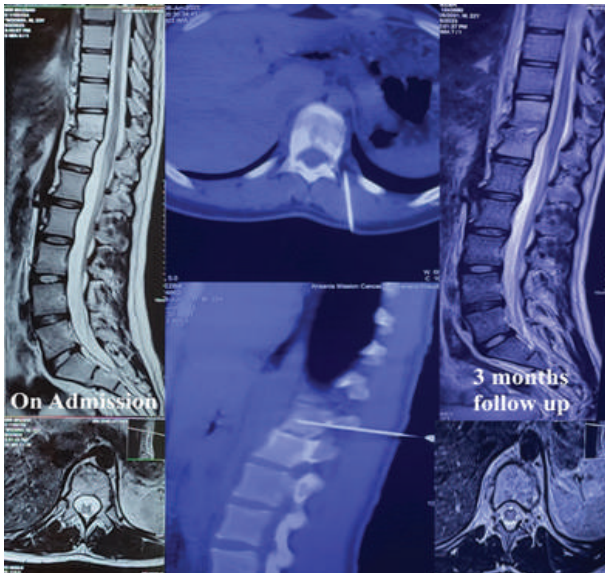
In the present series, out of 34 patients of spinal TB, majority 31 (91.76%) had one grade improvement in their preoperative ASIA grade and the remaining 3 (8.82%) patient maintained their pre operative ASIA grade at 3 months follow up.

The surgical wounds healed uneventfully in 29 patients but in 5 patients, superficial infection was observed. This patient underwent regular sterile surgical dressing. Among them, 2 patient had developed deep wound infections which were healed by secondary closure after regular dressing. Grave complications like, cerebrospinal fluid leak, implant failure, malposition of screws, vascular injury were not observed in the present series.

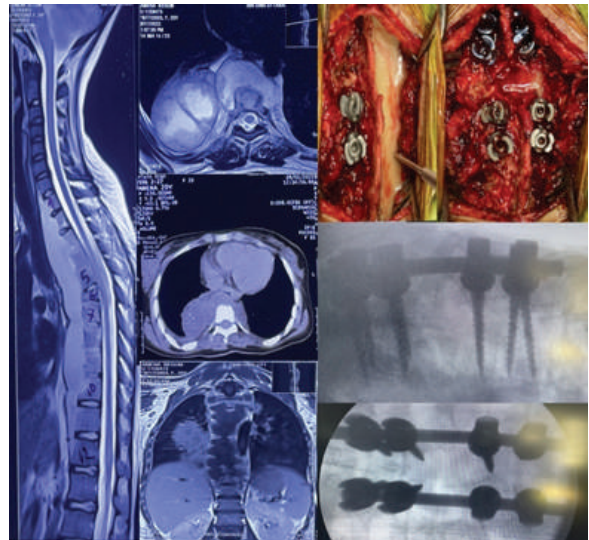
Table VIII: Complications in patients with spinal TB (n=34)

| Complications         | Frequency (%) |
|-----------------------|---------------|
| Superficial infection | 5 (14.70)     |
| Deep infection        | 2 (5.88)      |

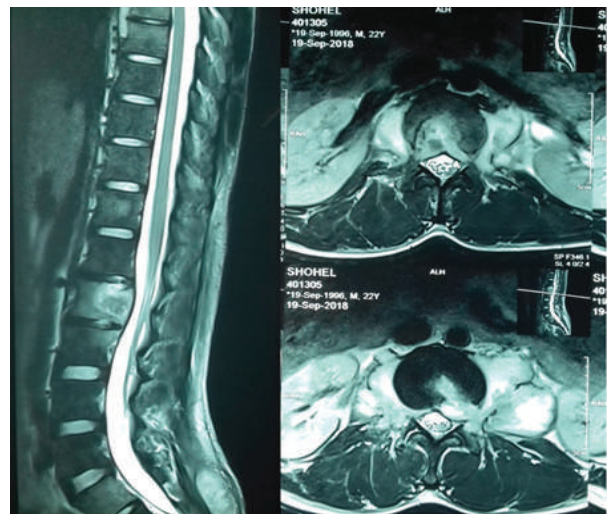
**Illustrative cases:**



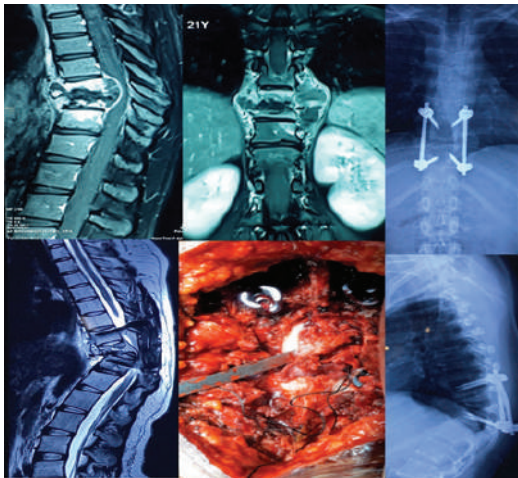
Case 1: 20 years male was presented with pain and progressive weakness of both lower limb for 3 months. MRI revealed Tubercular spondylodiscitis involving D11-D12 level with intervening disc space. There was mild pre and para-vertebral abscess. Patient was managed conservatively and at 3 months follow up, the patient was pain-free with out any weakness in lower limb or neurological deficit.



Case 2: 20 Years Female presented with severe upper back pain, breathlessness and progressive kyphosis for 4 months. MRI revealed Tubercular spondylodiscitis extending C7 to D12 with compression fracture at D6 vertebra with extensive pre vertebral abscess. Patient was managed surgically with evacuation of pus and Decompressed neural elements with stabilization by fixation with pedicle screw and rod from D4-D8. Histopathology confirms it was granulomatous inflammation.

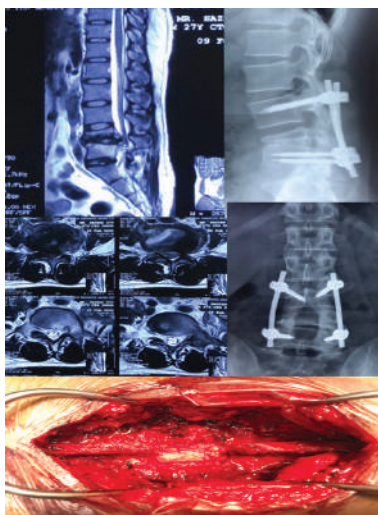


Case 3: 22 years male was presented with pain and progressive weakness of both lower limb for 2 months. MRI revealed Tubercular spondylodiscitis involving L1 level with out intervening disc space. Patient was managed conservatively and at 3 months follow up, patient was pain free with out any weakness in lower limb or neurological deficit.



Case 4:

21 years female presented with low back pain, weakness of both lower limb and progressive kyphotic deformity for 6 months. Patient was managed surgically. Pre operative MRI showing Tuberculous Spondylodiscitis at D9-10 level with the collection of pus. Postoperative MRI of dorsal spines T2 weighted image in sagittal view and Xray of dorsal spines both anteroposterior and lateral view showing pedicle-screws and rods placement at D8 and D10 levels



Case 5:

27 years male presented with low back pain, weakness of both lower limb including bowel and bladder dysfunction. Patient was managed surgically. Pre operative MRI showing Tuberculous Spondylodiscitis at L4-5 level with compression fracture of L4 vertebrae. Decompression was done by L4 laminectomy and stabilization by fixation with pedicle screw and rod from L3-L5.

Discussion:

Tuberculosis is an ancient disease, yet it continues to have a worldwide impact with an incidence rate of 9 million new cases per year and a mortality rate of 2 million deaths per year. 10,11 Although Anti tubercular medication is a popular conservative treatment option among physicians, it has limited efficacy in certain cases due to the rapid increase in drug resistance to first-line therapies and where there is a progressive neurological deficit, conservative treatment alone can not improve the deteriorating condition of the patient. 12 Additionally, the duration of anti-TB chemotherapy still remains a concern for the patient and clinician, with some treatment programs lasting up to 18 months.

Bangladesh is ranked 5th globally in terms of TB incidence with over 70,000 deaths per year in this country alone as per World Health Organization. Extrapulmonary TB, especially spine TB remains the most prevalent spine infection globally, and in cases with extensive spine involvement, vertebral body collapse, or severe deformity, surgical options may be considered more tempting, permitting for simultaneous treatment of infection and deformity along with continuation of antitubercular medications.

As per Bangladesh National Guideline and Operational Manual For Tuberculosis Management, we started Anti-Tubercular Therapy in all patients. We offered surgical treatment in all patients regardless of clinical findings and neurological status due to the reduction of pain. Our proposed surgery was decompression of neural elements by laminectomy at the desired level, evacuation of pus, and debridement of dead necrosed tissue where needed followed by stabilization by fixation with pedicle screw and rod with autologous bone grafting. However our observation was after the initiation of conservative treatment and long operative que due to the huge number of patients who needed different neurosurgical procedures, few patients responded with conservative treatment alone during the que time- their pain decreased significantly, muscle power improved, with the add on physiotherapy, few patients started mobilization. Also, surgical treatment is costlier so patients and attendants always try to avoid surgery unless it is causing physical disability and significant morbidity. So despite our proposal was operative intervention initially, we had to divide these populations into two groups. Patients who needed surgery but were conservatively managed due to multifactorial issues and patients who were managed with operative treatment.

Spinal tuberculosis may occur at any age but is most common during the first three decades of life. 13 In our series, male represents slight predominance but the overall mean age was around 37.10 ( $\pm 14.70$ ) and 73.83% of patients were from >20 years age group. Garg series also shows the highest incidence in the first three decades of life and it is 73%. 14 At present, there is a propensity of engrossment in the adult age group particularly in developed countries due to the high incidence of AIDS, intravenous drug abuse and other causes of immune suppression. 15

In our study, baseline clinical characteristics in both conservative and surgical groups, most of the patient has no prior history of PTB (75% in the conservative and 93.3% in surgical group). Motor weakness (87.5% in the conservative group and 93.3% in the surgical group), pain (93.75% in the conservative group and 86.7% in the surgical group), and autonomic disturbance were more frequent symptoms in both groups. Similar findings were observed by Cormican et al. where chronic back pain was the only symptom in 61% of patients with spinal TB. 16

We observed dorsal vertebrae (50% and 54%) were most commonly affected followed by dorsolumbar vertebrae (31.25% and 31.81). Sharma et al and Liu et al. found similar results in their study however Garg et al. found thoracolumbar level was most commonly involved. 17-18

The results of surgical treatment were satisfactory with neurological recovery (95%). The neurological recovery from spinal tuberculosis was 70% after conservative treatment. Several researchers reported that patients with spinal TB who suffered from functional neurological disturbance obtain satisfactory functional restoration and recovery from tuberculosis through debridement, stabilization, and decompression of the spinal cord. 17-19 In our series, only three patients (8.82%) with preoperative ASIA grade maintained in same grade even after treatment either by conservative or surgery but the majority 31 (91.76%) had at least one grade improvement in their preoperative ASIA grade.

Several studies have shown that the majority (82–95%) patients of spinal tuberculosis respond very well to medical treatment alone in the form of pain relief, decrease in neurological deficit, and even correction of spinal deformity. Patients with medically resistant spinal tuberculosis need careful reassessment of the differential diagnosis before surgery is planned surgery. 19 In our study, Antitubercular therapy duration was 18 months with an additional of 2nd line anti tubercular medicine as per National Guideline of TB management protocol - Group 1. There was no side effects of drug resistance and success of conservative treatment was 87.5% in our series. Only 12.5% of patients needed additional surgical procedures apart from conservative treatment.

The role of surgery in addition to chemotherapy in spinal tuberculosis conducted by A Cochrane Database Review concluded that evidence was insufficient for the routine use of surgery and there findings were no statistically significant differences for any of the outcome measures: kyphosis angle, neurological deficit, bony fusion, absence of spinal tuberculosis, death from any cause, activity level regained, change of allocated treatment, or bone loss. Later on, the guidelines published by the Royal College of Physicians noted that there was no additional advantage of routinely carrying out anterior spinal fusion over standard chemotherapy. 20-21 In some circumstances, however, surgery appears to be beneficial and may be indicated where pan-vertebral lesions, refractory disease, severe kyphosis, an evolving neurological deficit, and clinical deterioration or lack of clinical improvement. 21

Pain is the main symptom of spinal TB and previous studies also in line with the findings of the present study. At the last follow-up examination, remarkable improvement of pain reduction was noted in both study group. All of the patients reported mean SD VAS score 7.97 ( $\pm 1.27$ ) to 1.233 ( $\pm 0.69$ ) at 3 months after treatment in the present study which is statistically significant.

Certain limitations were observed in our study. All cases could not be uniformly investigated for preoperative Fine Needle Aspiration Cytology (FNAC), post operative MRI changes because of constraints of availability and affordability. Due to costlier surgery, all patients could not managed with surgical intervention even if required. Quick discharge of the patient was done from the hospital in case of conservative treatment due to a shortage of hospital beds. This present study provides evidence that, apart from conservative treatment alone, surgical intervention along with the anti-TB medication is safe for patients with spinal TB and it provides symptomatic relief as well as recovery of neurological deficit. However, larger prospective stratified controlled trials could be further helpful to get more reliable results of surgical outcomes in spinal TB.

Conclusion:

Conservative treatment is effective for patients with spinal TB in certain cases. The duration of therapy according to the WHO protocol and National TB Guideline, Bangladesh has proven to be adequate in our sample of patients with the necessary adjustments derived from monitoring clinical, laboratory, and radiographic progress. A belligerent diagnosis of spinal TB is essential and combined surgical intervention and medical treatment is related with a better outcome.

Limitation

This study is limited by its design and duration and the small number of patients. Treatment of tuberculosis is a long process. Treatment of tuberculosis is a long and costlier process. Although Anti Tubercular Therapy is provided by the Government of Bangladesh with the collaboration of different Non-Government Organizations (NGO's) completely free of cost, all patients could not afford the cost of surgical treatment so it could be a confounding variable that may affect the study outcome. Anti-TB therapy is given for a period of 1 year therefore, it is necessary to assess the clinical course of patients with a long follow-up period.

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