

ORIGINAL ARTICLE

# Surgical Outcome of Anterior Decompression, Grafting and Fixation in Dorsolumbar Caries Spine

**IJAZ HUSSAIN WADD, AINULLAH KHAN, ABDULLAH HAROON***Anjum Habib Vohra**Department of Neurosurgery Unit – I, Lahore General Hospital, Lahore*

## ABSTRACT

To evaluate the surgical outcome of anterior decompression, grafting and fixation in tuberculosis of the dorsal and lumbar spine.

**Study Design:** Retrospective study.

**Place and Duration of Study:** Department of Neurosurgery Unit – I, Lahore General Hospital, Lahore, From Jan 2008 to March 2012.

**Materials and Methods:** Patients with caries spine having compression over the thecal sac with neurological deficit and kyphosis were included in the study. Patients below 17 years and above 56 year of age; patients with bed sores and unfit patients for anesthesia were excluded from the study. Complete blood picture with ESR, X-ray Chest, X-ray of the relevant spinal level and MRI were done. All patients were treated with corpectomy, debridement, drainage of abscess and grafting followed by fixation with poly-axial screws and rods. All patients were assessed by ASIA Impairment Scale before and after surgery and with Bridwell grading after surgery.

**Results:** Among 79 patients, 47(59.49%) Male and 32(40.51%) Female patients, mean age was  $37.2 \pm 3$  years. The commonest involved level was the dorsolumbar junction 53.16% (N = 42). Backache, sensory motor deficit and deformity were main presenting complains. Anterior decompression and grafting followed by fixation with poly axial screw and rods were done in all patients who fulfill the inclusion criteria. Lower limb power improved to ambulatory level in 60% of patients with complete paraplegia and recovery was excellent in patients with partial weakness; only n = 2 patients (2.53%) deteriorated to a lower grade. There was no postoperative mortality and one patient had long ICU stay due to lung injury. All patients have pain at the intercostal area and graft donor site that were treated with analgesia.

**Conclusion:** According to our study, corpectomy followed by grafting and fixation is safe and effective procedure. Even those patients presenting with complete paraplegia showed improvement in motor power to ambulatory level and those who had partial deficit showed excellent improvement.

**Keywords:** Caries spine, anterior spinal decompression, ASIA Impairment Scale, Bridwell grading, motor deficit.

## INTRODUCTION

Pott's disease, also known as Tuberculous Spondylitis, is one of the oldest demonstrated diseases of the humankind, having been documented in spinal column, remains from the Iron Age and in ancient mummies from Egypt and the Pacific coast of South America.<sup>1</sup> In 1779, Percivall Pott, after whom the disease is named, presented the classic description of spinal

tuberculosis.<sup>2</sup> Spinal tuberculosis has become rare in industrialized countries, although it is still a significant cause of disease in developing nations. Tuberculous involvement of the spine has the potential to cause serious morbidity. The anterior aspect of the vertebral body adjacent to the subchondral plate is usually affected. Tuberculosis may spread from that area to adjacent intervertebral disks. In adults, disk disease is

secondary to the spread of infection from the vertebral body. In children, the disk, because it is vascularized, can be the primary site.<sup>3</sup> Bone and soft – tissue tuberculosis accounts for approximately 10% of extrapulmonary tuberculosis cases and between 1% and 2% of total cases. Tuberculous spondylitis is the most common manifestation of musculoskeletal tuberculosis, accounting for approximately 40 – 50% of cases.<sup>4</sup>

In the Netherlands, between 1993 and 2001, tuberculosis of the bone and joints accounted for 3.5% of all tuberculosis cases (0.2 – 1.1% in patients of European origin, and 2.3 – 6.3% in patients of non-European origin).<sup>5</sup> The frequency of Pott's Disease is related to socioeconomic factors and history of exposure to the patient with infection. In the United States and other developed countries, Pott's disease occurs primarily in adults. In countries with higher rates of Pott's disease, involvement in young adults and older children predominates.<sup>6,7</sup> Deformity and motor deficit are the most serious consequences of Pott's disease and continue to be a serious problem when diagnosis is delayed or presentation of the patient is in advanced stages of the disease.<sup>8</sup>

Careful long-term follow up is also recommended, since late-onset complications can still occur (disease reactivation, late instability or deformity).<sup>9</sup> Pott's disease most commonly involves the thoracic and lumbosacral spine. However, published series have shown some variation.<sup>10-13</sup> The lower thoracic vertebrae make up the most common area of involvement (40 – 50%), followed closely by the lumbar spine (35 – 45%). In other series, proportions are similar but favour lumbar spine involvement.<sup>14</sup> Approximately 10% of Pott's disease cases involve the cervical spine. The presentation of Pott's disease depends on the following: stage of disease, affected site, presence of complications such as neurologic deficits, abscesses, or sinus tracts.<sup>15</sup> Potential constitutional symptoms of Pott's disease include fever and weight loss. The reported average duration of symptoms at diagnosis is 4 months<sup>11</sup> but can be considerably longer.<sup>13,16</sup> The clinical presentation of spinal tuberculosis in patients infected with the Human Immunodeficiency Virus (HIV) is similar to that of patients who are HIV negative; however, spinal tuberculosis seems to be more common in persons infected with HIV.<sup>17</sup> Many persons with Pott's disease (62 – 90% of patients in reported series<sup>10,11</sup>) have no evidence of extra-spinal tuberculosis.

CBC with ESR, X-Ray Chest, X-Ray of the related spinal segment and MRI spine (plain and contrast)

are the investigations of choice. Magnetic Resonance Imaging (MRI) is the gold standard for evaluating disc space infection and osteomyelitis of the spine and is most effective for demonstrating the extension of disease into soft tissues and the spread of tuberculous debris under the anterior and posterior longitudinal ligaments. MRI is also the most effective imaging study for demonstrating neural compression.<sup>18,19</sup> Contrast – enhanced MRI findings are useful in differentiating tuberculous spondylitis from pyogenic spondylitis. MRI findings in Pott's disease include thin and smooth enhancement of the abscess wall and a well – defined paraspinal abnormal signal. Thick and irregular enhancement of the abscess wall and an ill – defined paraspinal abnormal signal suggest pyogenic spondylitis.<sup>20</sup> Opinions differ regarding whether the treatment of choice should be conservative chemotherapy or a combination of chemotherapy and surgery. The treatment decision should be individualized for each patient. Because of the risk of deformity exacerbations, children with Pott's disease should undergo long-term follow-up until their entire growth potential is completed.<sup>21</sup> Isoniazid and rifampicin should be administered during the whole course of therapy. Additional drugs are administered during the first 3 months of therapy. The use of second – line drugs is indicated in cases of drug resistance.<sup>22</sup> While most patients should respond to medical treatment, a surgical approach needs to be evaluated and considered. Indications for surgical treatment of Pott's disease generally include the following: neurologic deficit – acute neurologic deterioration, paraparesis, and paraplegia, spinal deformity with instability or pain, no response to medical therapy – continuing progression of kyphosis or instability, large para-spinal abscess, non-diagnostic percutaneous needle biopsy sample.<sup>23,24</sup>

Surgery plays an important part in the management. It confirms the diagnosis, relieves compression, permits evacuation of pus, and reduces the degree of deformation and the duration of treatment.<sup>25</sup> Surgical procedure for these pathologies can be performed through both anterior and posterior approaches but anterior approach has the advantage of better canal clearance and better chances of graft fusion and deformity correction than posterior approach. Considering these factors anterolateral approach is applied to enhance spinal decompression and reconstruction of anterior column in our study. Complications include loss of alignment, presence of anterior compression and failure of fusion and fixation. There are many options and materials used for anterior fixation but we use autologous bone

graft followed by fixation because of low cost and easy procedure with good results. The degree of kyphosis, the area of affected vertebrae and the lack of sphincter control all correlate with the chance of recovery from paraplegia.<sup>26</sup> Newer modalities and techniques are being reported, such as thoracoscopic decompression.<sup>27</sup>

**MATERIALS AND METHODS**

This study was retrospective study, carried out in Department of Neurosurgery Unit I, Lahore General Hospital, Lahore from January 2008 to March 2012.

**Inclusion Criteria**

1. Patients of both sexes.
2. Caries spine with compression over spinal cord.
3. Neurologic deficit and / or kyphosis.

**Exclusion Criteria**

1. Patients not fit for anaesthesia
  2. Patients with bed sores
  3. Patients below 17 years and above 56 years of age
- This study was approved by the ethical committee of the hospital and informed consent was taken from all of the patients included in this study. All patients were graded according to the Impairment Scale defined by American Spinal Injury Association (ASIA), ranging from A through E for spinal cord injuries.<sup>28,29</sup> (Table 1).

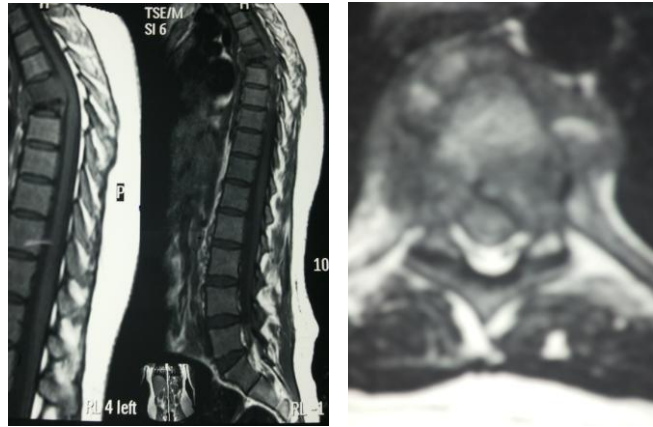
**Table 1: ASIA Impairment Scale.**

A	Complete. No motor or sensory function
B	Sensory only. No motor function, preservation of sensory function
C	Motor useless. Some motor function present, but not useful
D	Motor useful. Motor function present but somewhat weak
E	Intact. Normal sensory and motor function

CBC with ESR, C-Reactive Protein, X-Ray Spine of the involved level with X-Ray Chest and MRI of the spine (plane and contrast) were done and level of pathology identified (Figure 1).

Post-operative improvement was also assessed

according to ASIA Impairment Scale. Radiological analysis was done according to percentage of deformity correction, and the evidence of fusion was assessed according to Bridwell Criteria<sup>30</sup> (Table 2).



**Figure 2: Pre-operative MRI scan of dorsolumbar spine with sagittal and axial cuts.**



**Figure 2: Post-operative CT 3D with sagittal reconstruction.**

**Table 2: Bridwell Criteria.**

Anterior Fusion Grades	
Grade I	Fused with remodelling and trabeculae
Grade II	Graft intact, not fully remodelled or incorporated, though no lucencies
Grade III	Graft intact but definite lucency at the top or bottom of the graft
Grade IV	Definitely not fused with resorption of the graft and with collapse

In all patients corpectomy, debridement and anterior decompression were done followed by iliac crest grafting and fixation with poly-axial screws and rods. Post-operative check X-Rays done on second post-operative day, and CT scan of the relevant spine with 3D reconstruction were done on tenth day when patients were relatively pain free.

Average hospital stay was 11.4 days after surgery. Follow up was done at 3 and 6 months after surgery and then at the ends of first and second years of surgery.

All patients underwent physiotherapy schedule including postural turning every 2 to 4 hours, skin care, bowel and bladder care both preoperatively and postoperatively. Bedding were changed frequently particularly for those patients suffering from urinary incontinence. Post-operative ATT was continued along with good analgesia.

The data about the age, gender, disease level, presenting complaints, MRI findings and surgical outcome was entered into a proforma for collection and analysis. The data was analysed with the help of statistical program statistical package for social sciences (SPSS), version 12. Chi square test was applied and a P value of less than 0.05 was considered significant.

**RESULTS**

During the study period 79 patients underwent anterior decompression with grafting and fixation.

**Sex Incidence**

Among them 47 (59.49%) were male and 32 (40.50%) were females (Fig. 3). Male to female ratio was 1.5:1.

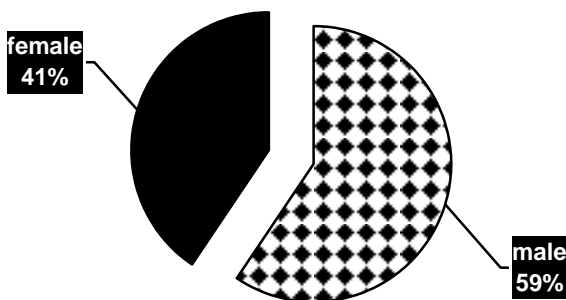


Fig. 3: Distribution of patients according to sex.

**Age Incidence**

Mean age at presentation was 37.2 ± 4 yrs. (ranging from 17 to 56 years). The common age group was 31 to 37 years of age (Fig. 4, Table 3).

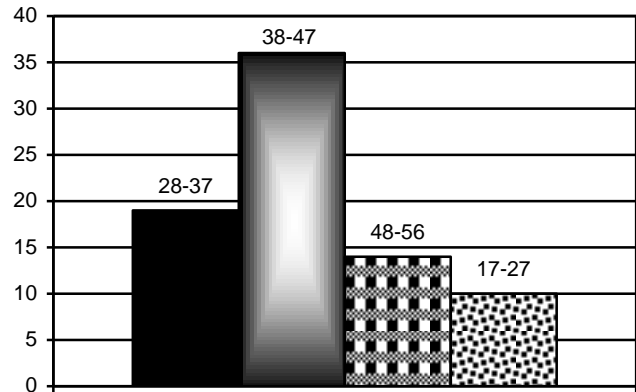


Fig. 4: Distribution of patients according to age group.

Table 3: Age Incidence.

Age	Number	Percentage
17 – 27	10	12.6
28 – 37	19	24
38 – 47	37	46.8
42 – 50	15	18.9

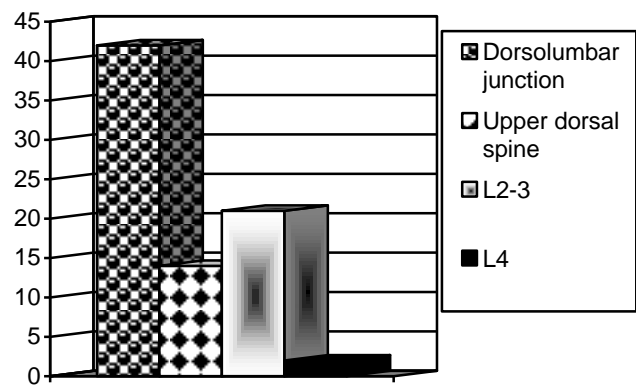


Fig. 5: Distribution of patients according to spine involvement.

**Clinical Presentation**

Backache, limbs weakness and spinal deformity were

present in all patients (n = 79, 100%). On radiological basis (plain X-Ray and MRI), the commonest level of involvement was at the dorsolumbar junction (n = 42, 53.16%) and then upper dorsal spine (n = 14, 17.72%). Lumbar L<sup>2-3</sup> (n =21, 26.58%) and lumbar L<sub>4</sub> (n = 2, 2.53%). The outcomes of this study, in terms of ASIA Impairment Scale, are shown in the table below.

There was no post-operative mortality. On 2<sup>nd</sup> post-operative day check X-Rays were done in all cases. On 10<sup>th</sup> post-operative day, when patients were relatively pain free, CT – scan with 3D reconstruction was done. Overall hospital stay was 10 to 15 days.

**Complications**

In one patient there was post-operative CSF leak which resolved spontaneously. And in one patient there was haemothorax for which chest tube was changed and haematoma was drained. All patients had pain at the graft donor site.

**Outcome**

There were grade I and grade II bony fusion in 100% of patients according to Bridwell criteria (Table 4) after 1 year of surgery. Average improvement in kyphotic angle was 30°.

**Table 4:** Showing preoperative and postoperative ASIA Impairment Scale.

Pre-operative Status		Post-operative Outcome
ASIA Impairment Scale before Surgery	No. of Patients	ASIA Impairment Scale after Surgery with No. of Patients in each Scale
A	5	A – 1 C – 1 D – 3
B	9	C – 5 D – 3 E – 1
C	34	D – 6 E – 28
D	26	B – 1 D – 1 E – 24
E	5	B – 1 E – 4

**DISCUSSION**

This study evaluated the outcome of anterior decompression, grafting and fixation with polyaxial screws and rods according to the ASIA Impairment Scale. Pott’s disease is usually secondary to an extra spinal source of infection. Kumar R. reported that it is the result of haematogenous dissemination from primary focus in the lungs, lymph nodes, etc.<sup>31</sup> In adults, disk disease is secondary to the spread of infection from the vertebral body. In children, because the disk is vascularized, it can be a primary site.<sup>3</sup> Benzagmout *et al.* reported that Pott’s disease occurs primarily in adults. In countries with higher rates of Pott’s disease, involvement in young adults and older children predominates.<sup>6,7</sup> Older age can affect the surgical outcome to some extent in terms of good healing.

Duration of symptoms range from 3 weeks to 3 months. Majority of patient came to us for medical help within 3 month of symptoms. Pola *et al.* reported average duration of symptoms at diagnosis is 4 months.<sup>11</sup> Most common presenting symptoms in our study was lower limb weakness, deformity, pain, and palpable mass. Turgut M. reported that the presenting symptoms were leg weakness (69%), gibbus (46%), pain (21%), and palpable mass (10%).<sup>12</sup> Most common associated factors were low socioeconomic status, immunocompromised patient and exposure to patients with pulmonary tuberculosis.

Most common level of involvement of caries spine in our study is dorsolumbar junction. Turgut M. Reported that Tuberculosis affecting the spine was commonly localized in the thoracic region and involved the vertebral body.<sup>12</sup> Caries spine can be treated conservatively as well surgically. In 1970s, middle path regime was followed by the surgeons in India.<sup>38</sup> They considered a fair trial of conservative therapy for a few weeks (3 – 4 weeks) before advocating surgery. An absolute non-operative approach to Pott’s paraplegia is considered unjustifiable because valuable time may be lost while irreparable may progress to complete loss of motor function (Tuli, 1969).<sup>32</sup> Surgical options include an anterior approach, a posterior approach, or a combined anterior and posterior approach all followed by Anti Tuberculous Treatment (ATT). The anterior approaches are best used at the dorsolumbar junction; posterior approaches are ideal for lower lumbar and lumbosacral areas that result in complete spinal cord injuries, while the combined anteroposterior surgeries are typically reserved for the highly unstable spine. Anterior debridement and fusion through anterior approach

has been the most common standard surgical treatment of spinal tuberculosis. Prolonged external immobilization or more recently posterior fusion and instrumentation via posterior approach are also proposed.<sup>33</sup> Recently, a variety of new approaches were introduced to facilitate and simplify the surgery. Posterior lumbar inter-body fusion and posterior instrumentation is one of this approaches described by Lee for the lumbar tuberculous spondylitis.<sup>34</sup> In the past, most surgeons had some concerns about anterior instrumentation in the presence of tuberculous infection partly because of introducing foreign material into infected tissue. In one of the first reports related to applying anterior instrumentation in the patients with tuberculous spondylitis in 1999, Yilmaz et al observed no recurrence of the disease.<sup>35</sup> Average correction of the deformity which they reported was 64% and 81% in the cases with one or two levels of involvement and the patients with more than two levels, respectively. They propose that anterior is more effective than posterior instrumentation for reducing the deformity and stabilizing the vertebral column in patients who have kyphosis due to spinal tuberculosis. In 2003, Benli<sup>36</sup> reported their surgical results of 63 patients with Pott's disease who underwent anterior radical debridement, fusion and instrumentation. The mean age of the patients in his study was 46.8 years. They observed that the addition of anterior instrumentation increased correction rate of the deformity and maintaining it. Out of 25 patients with neurologic deficit, 20 had full and 4 had partial recoveries. They reported very few intra and postoperative complications. They employed an aggressive neo-adjuvant chemotherapy prior to surgery (except in urgent cases with recently developed or progressive neurologic deficit) and reported no disease reactivation at all. Finally, they concluded that anterior instrumentation is a safe and effective method in the treatment of tuberculous spondylitis. Similarly Jin<sup>37</sup> reported the surgical results of one stage anterior inter-body auto-grafting and instrumentation in thoracolumbar spinal tuberculosis in 23 cases with spinal tuberculosis; while 14 out of 15 patients with neurological deficit showed obvious improvement. A mean of 18° kyphosis correction was achieved after surgery but a moderate progressive kyphosis occurred after 2½ years in a 9 years child. Ultimately, they recommended one – stage anterior inter-body auto-grafting and instrumentation in the surgical management of spinal tuberculosis in selected cases and suggested supplementary posterior fusion in children. We did in all our patients anterior decompression, debridement, iliac crest grafting and fixation

with poly-axial screws and rods in a single sitting.

Post operatively in our study, one patient had CSF leak that resolved spontaneously, and one patient had haemothorax that was treated with re-adjustment of chest tube and all patients had pain in intercostal area and graft donor site that was treated with analgesics.

Postoperative protocol used was similar in all cases. All patients had drain removal on the second postoperative day and were made to sit up. Chest and limb physiotherapy was started and when the neurology permitted, they were out of bed from that day onwards. Stitch removal was usually on the 10th day and the average postoperative hospitalization was 11.4 days.

Patients were followed up at the end of 1, 3, 6 and 12 months and then once yearly for two years. All patients had a full anti-tuberculous chemotherapy (4 drugs for 3 months, 2 drugs for next 15 months). All patients had regional X-Rays and blood complete with ESR and CRP measurement at 3 months, 6 months and one year followed by once every year.

## CONCLUSION

According to our study, anterior decompression, debridement, grafting and fixation is an effective and safe procedure in patients with dorsolumbar caries spine. Patients who have complete motor weakness achieve some improvement in power but those who have partial motor deficit achieve excellent improvement in power and in the degree of kyphosis.

*Address for Correspondence:*

*Dr. Ijaz Hussain Wadd, FCPS*

*Department of Neurosurgery, LGH, Lahore*

*Cell: 0301-7873093*

*E-mail: drejazns@gmail.com*

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