

E-ISSN: 2395-1958
P-ISSN: 2706-6630
IJOS 2020; 6(3): 01-05
© 2020 IJOS
www.orthopaper.com
Received: 01-05-2020
Accepted: 02-06-2020

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Evaluation of functional and Radiological outcome of anterior spinal decompression and stabilisation in the thoracolumbar potts's spine: A prospective study

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DOI: <https://doi.org/10.22271/ortho.2020.v6.i3a.2166>

Abstract

Background: Spine is one of the intriguing regions in orthopaedics where the treatment of pathology has drawn much controversy. Common pathologies affecting spine are trauma, infection and malignancy. Among infections, tuberculosis is most common in vertebral body. The advent of effective combination chemotherapy and surgical intervention has drastically changed the management and the results of the disease.

Methods and Materials: We prospectively analyzed 12 patients with thoracolumbar tuberculosis with neurological deficit treated with chemotherapy for 18 months and treated with anterior decompression and stabilization with mass Miami system with iliac crest bone graft. All patients were followed up for a minimum of 2 years and the outcome was analyzed using frankel's grading for neurological assessment, Dennis pain and work scale for post-operative pain and ability to return to their previous work.

Result: In this study we operated twelve patients. Mean age of the patient was 40 years, There were 9 paradiscal and 3 central presentations. Post operatively all the patients improved by at least one grade according to Frankel's grading system. Post operatively 10 patients (83.4%) recovered to Frankel grade E and 2 patients (16.6%) recovered to Frankel grade D. As per Dennis pain Scale, Post operatively 8 patients (75%) had complete pain relief and 4 patients (25%) required occasional medication for pain relief. According to Dennis work scale, post operatively 83.4% patients were able to return to their previous employment (sedentary) and none of the patients were completely disabled.

Conclusion: Following middle path regimen, and using anterior approach for spinal decompression and stabilization along with iliac graft when indicated aided in early neurological recovery and return to work with minimal or no residual pain.

Keywords: Tuberculosis spine, middle path regimen, anterior spinal decompression

Introduction

Spine is one of the intriguing regions in orthopaedics where the treatment of pathology has drawn much controversy. Common pathologies affecting spine are trauma, infection and malignancy. Among infection tuberculosis is most common in vertebral body.

Potts spine was first described by Percival Pott in the late 18th century, as a kyphotic deformity of spine associated with paraplegia ^[1]. Since then treatment has gradually evolved from "reducing the mortality" to "reducing the morbidity" to "reducing the deformity" ^[2]. The advent of effective combination chemotherapy has drastically changed the management and the results of the disease. Along with anti-tubercular drugs, surgical intervention is limited to specific indications. The concept of radical debridement and anterior fusion was introduced by Hodgson and Stock in 1960 ^[2]. Anterior instrumentation was avoided because of reactivation of the infection. Oga *et al.* proved in their study that there was no reactivation of the disease with anterior instrumentation ^[3].

Aim of Study

To evaluate the effect of anterior decompression and anterior stabilization in thoracic and lumbar vertebral infection in terms of Neurological recovery, residual pain, Ability to return to work and Kyphosis angle.

Materials and Methods

This is a prospective study conducted in C.S.I Mission Hospital, Tiruchy, Annai Nursing Home, Cuddalore and Aarupadai Veedu Medical College and Hospital, Pondicherry from August 2012 to August 2019. In this study we included 12 patients with thoracolumbar vertebral tubercular infection with neurological deficit which is not responding to medical management. All patients were started standard Anti-tubercular drugs and continued for 18 months. All patients underwent anterior decompression and anterior stabilization with mass miami system with iliac crest bone graft.

All patients were initially assessed in out-patient department or casualty according to their presentation. Patients underwent clinical, radiological and biochemical evaluation. Frankel’s grading was used for neurological assessment during pre op, post op and follow up period. After complete investigations, all surgeries were performed under general anesthesia in left up lateral position. All patients received prophylactic intravenous antibiotics. Thoracic vertebra exposed through transthoracic transpleural approach and lumbar vertebra exposed through extraperitoneal anterior approach. Vertebrectomy was done along with removal of the disc above and below the level of vertebrectomy. All unhealthy granulation tissue and abscess drained till canal was decompressed and material sent for HPE and Culture and sensitivity test. Corpectomy site was distracted and tricortical iliac crest bone graft which was harvested and prepared was snugly placed between vertebral bodies centrally and anteriorly. All lesions were fixed anteriorly one level above and one level below using Moss Miami system. Under fluroscopic guidance screws were inserted parallel to end plate. Contoured rod used to connect the proximal and distal screws. Post operatively chest tube/ negative suction drain were removed once collection reduced to less than 50 ml.

Post operatively, all patients were made sit with tailors brace support from 2nd day onwards. Neurological status was assessed. Ambulation was started with walker support according to their neurological status. Post-operative X rays were taken and implant position and Kyphosis angle measured. All patients were advised to ware tailors brace for 3 months post operatively. Patients were followed up in out - patient department every 6 weeks for 6 months and 3 months for a year and six monthly for next year. At each follow up clinical and radiological examinations were done.

We used frankel grading for assessing the neurological status. Dennis pain and work scale was used to assess post-operative pain and ability to return to their previous work.

Radiologically, we assessed site of involvement, number of vertebral bodies involved and status of implant and graft fusion on every follow up. Kyphosis angle was measured by using Dickson’s method.

Frankel grade	Definition
A	Complete injury, no motor or sensory function below the level of injury
B	Incomplete injury, no motor function
C	Incomplete injury, motor function useless, sensory incomplete
D	Incomplete injury, motor function useful, sensory incomplete
E	Incomplete injury, motor function normal, sensory normal

Fig 1: Frankel Grading of Neurological Injury

P1	No pain
P2	Occasional minimal pain; no need of medication
P3	Moderate pain; occasionally medication, no interruption of work or activities of daily living
P4	Moderate to severe pain; occasionally absent from work, significant changes in activities of daily living
P5	Constant, severe pain; chronic pain medication

Fig 2: Dennis Pain Scale

Analysis of Results

In this study we operated twelve patients. Mean age of the patient was 40 years (range 20 – 56). There were 11 females and one male. Our study infection occurred between D4 and L5 with higher incidence at D7 to D9 and L1 to L3. There were 9 paradiscal and 3 central presentations. Two vertebral bodies were involved in 8 patients and one in 3 patients.

We used Frankel grading for neurological assessment. When compared with the pre-operative neurological grading, post operatively all the patients improved by at least one grade according to Frankel’s grading system. Post operatively 10 patients (83.4%) recovered to Frankel grade E and 2 patients (16.6%) recovered to Frankel grade D.

Residual pain was assessed by Denis pain scale. Post operatively 8 patients (75%) had complete pain relief and 4 patients (25%) required occasional medication for pain relief. No patient had any incapacitating pain which needed chronic medication.

Ability to return to work was assessed by Denis work scale. Post operatively 83.4% patients were able to return to their previous employment (sedentary) and none of the patients were completely disabled.

Kyphosis angle was measured by Dickson method. On comparing preoperative and postoperative kyphosis angle, 28.6% of reduction was achieved and it is statically significant (tested with student –t test for paired observation, t = 3.7, p = 0.004).

At the end of follow up period, the patient had no complaints of pain. The fusion of grafts was confirmed by clinical absence of pain and radiological presence of trabecular bone bridging between graft and vertebrae.

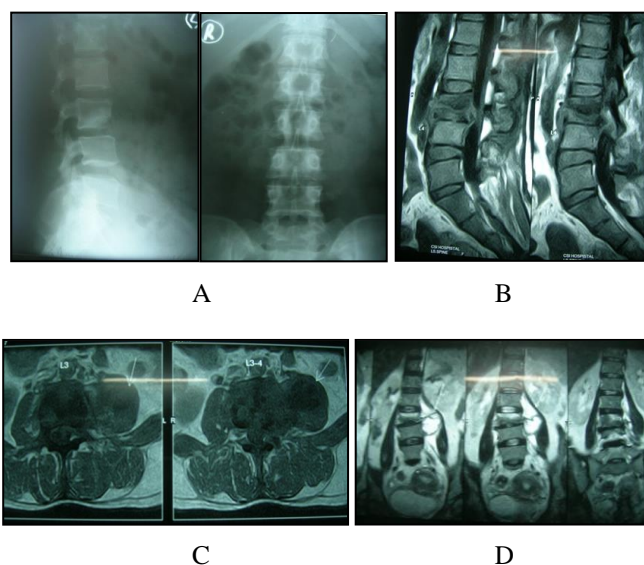


Fig 3: Pre op X-ray (a), Pre op MRI (b, c and d).

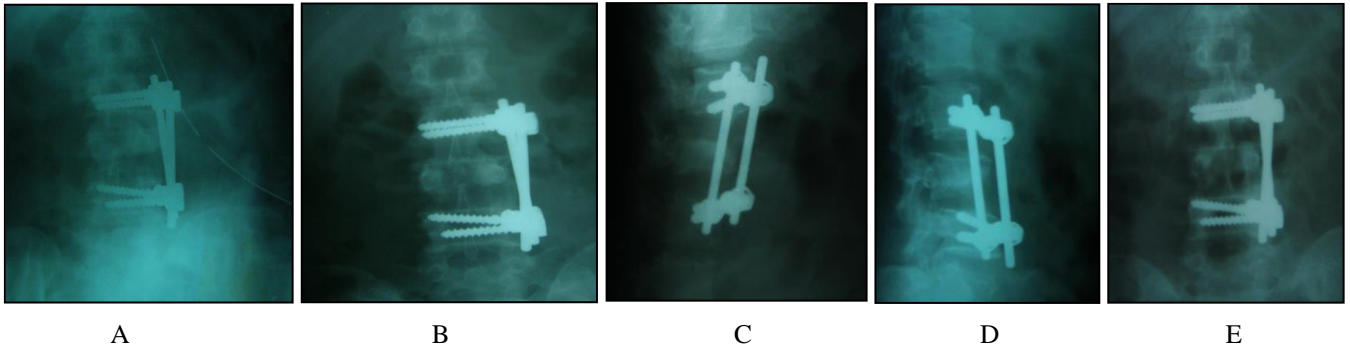


Fig 4: Immediate Post Op X – Ray (a, b), Follow up X – Rays (c, d and e)



Fig 5: Range of motion at 6 months post op – Flexion (a) and Extension (b). Surgical Scar (c)

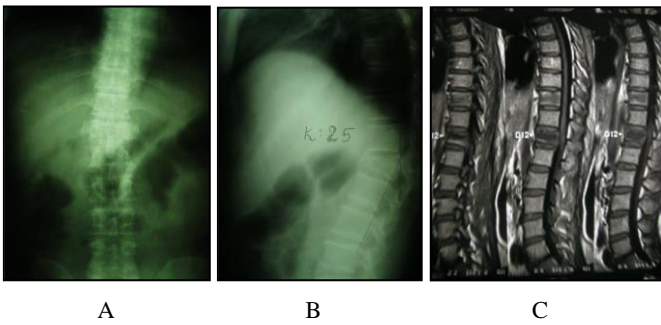
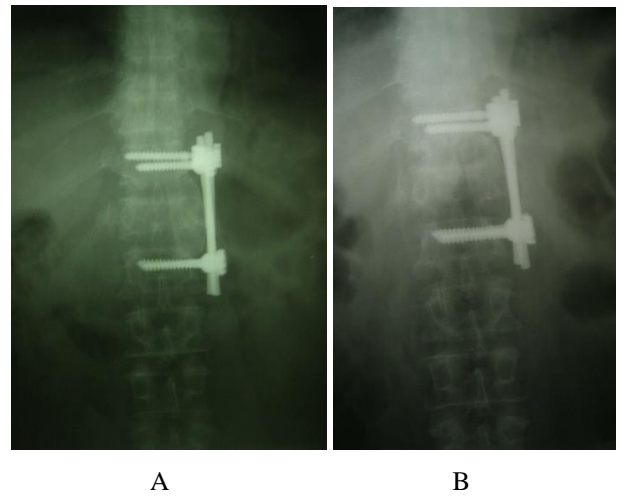


Fig 6: Pre op X – Ray (a and b) and MRI (c).

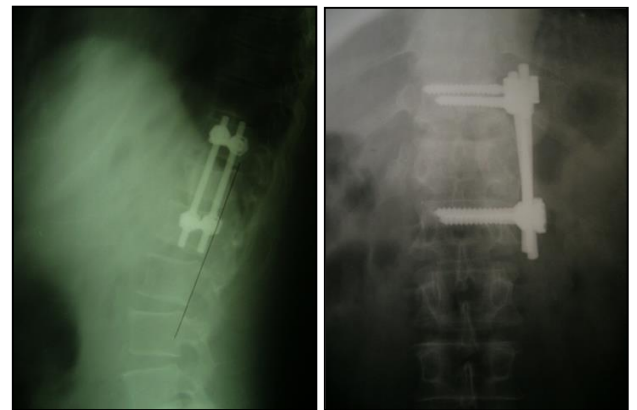


Fig 8: Follow up X – Rays (a, b, c and d).

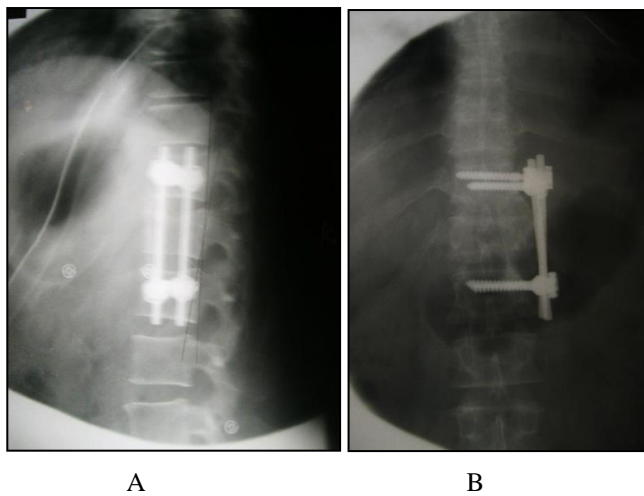


Fig 7: Immediate Post Op X – Rays (a and b).

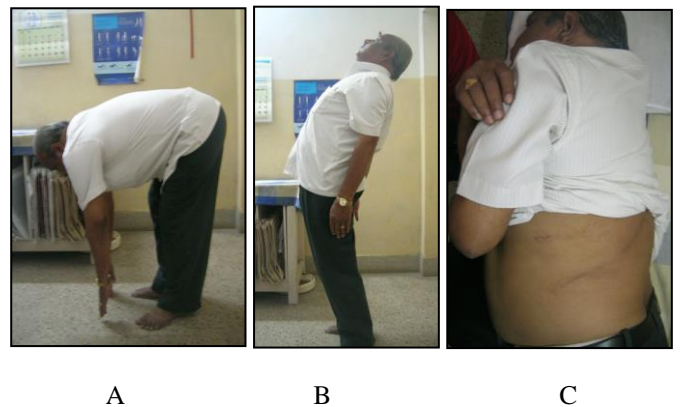


Fig 9: Range of motion at 6 months Post Op – Flexion (a), Extension (b) and Surgical scar (c).

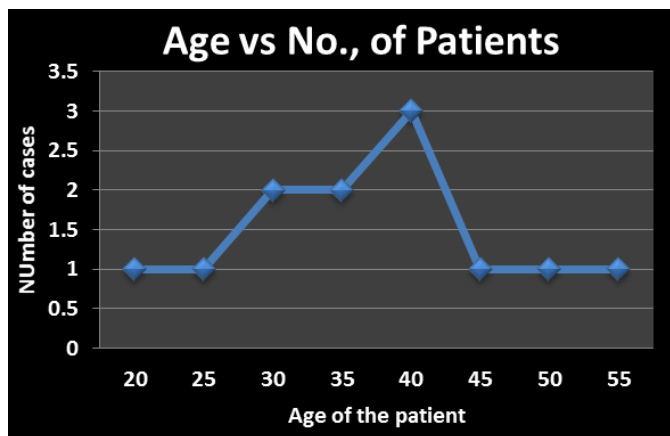


Fig 10: Graph of age distribution of the cases.

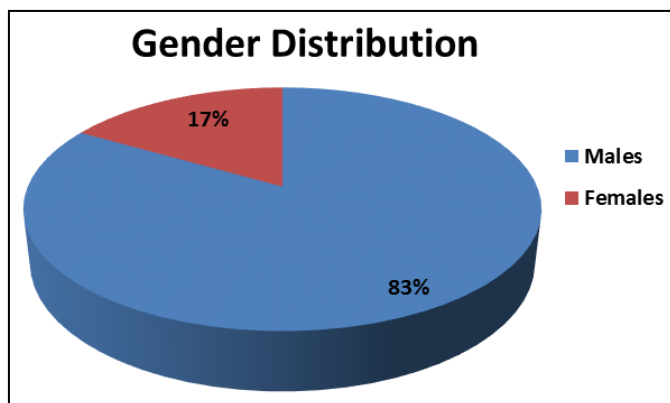


Fig 11: Graph of gender distribution of the patients.

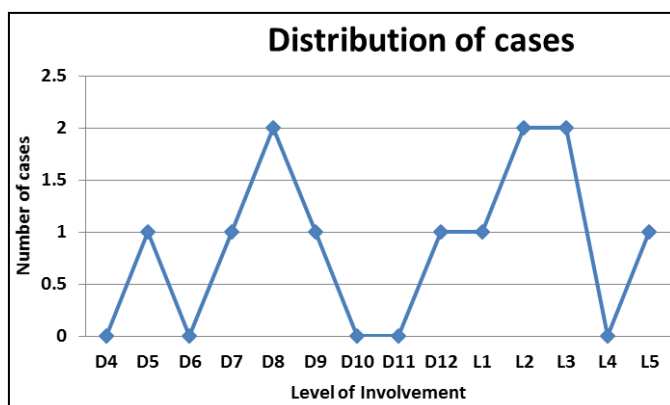


Fig 12: Graph showing the distribution of cases according to the level of involvement.

Complication

During follow up one patient’s screw (8.4%) had breakage and patient did not developed any pain, recurrence of deformity, worsening of neurological deficit or worsening of kyphosis angle.

Discussion

Standard Anti-tubercular treatment (4 drugs – H, R, Z, E) were started in all patients and observed for 4 weeks. Those patients indicated for surgery, underwent anterior decompression and stabilization with iliac crest bone graft.

Indications for surgery [5, 6] are:

1. Onset of paraplegia during conservative treatment, worsening or static neurological deficit despite of adequate conservative treatment
2. Rapid onset of paraplegia, painful paraplegia and recurrent paraplegia.

3. Flaccid paraplegia, paraplegia in flexion, sphincter involvement.
4. Doubt about diagnosis.

Neurological dysfunction in association with active tuberculosis of spine can be prevented or reversed by early diagnosis and prompt treatment. Tubercular infection primarily affects vertebral bodies, therefore anterior decompression allows direct access to disease pathology and allows adequate decompression of cord [7].

In 1960, Hodgson and Stock used anterior approach to decompress cord and fuse vertebral body without instrumentation for first time ever [8, 9]. The aim of treatment was excision of diseased and avascular vertebral body to allow free access for anti-tubercular drugs to the site of infection. The important problem of this method was progressive kyphotic deformity despite high fusion rate [10]. Kyphotic deformity was successfully treated by posterior instrumentation [11].

Anterior instrumentation was avoided because of reactivation of infection. Teoman Benli *et al.* [12, 13], Jae Kwan *et al.* [14] concluded in their study that anterior instrumentation was effective in correction of deformity, facilitating solid fusion without reactivation of infection. Dai LY, Chen WH concluded in their study that anterior instrumentation is safe and effective in pyogenic spondylitis [16].

Advantages of anterior surgery are encountering pathology directly. It allows excising the diseased, avascular part of vertebral body and facilitates free access to drugs to the site of infection. Anterior approach allows for obtaining biopsy directly from diseased tissue. Anterior approach ensures complete decompression of spinal cord.

G.D Sundararaj *et al.* [17], Guven *et al.* [18], Domanic *et al.* [19], Yau *et al.* [20] concluded in their individual studies that combined anterior (radical debridement and fusion) and posterior (instrumentation and fusion) surgeries has advantages of early mobilization, avoids graft related problems and maintenance of kyphosis were better than anterior surgery alone.

Conclusion

We are following middle path regime for tuberculosis of spine. When indicated we use anterior approach to decompress spinal cord and stabilize the vertebral body along with iliac crest bone graft, which aided in early neurological recovery and return to work with minimal or no residual pain. The deformity correction post anterior decompression was found to be satisfactory as well.

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