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Surgical treatment of thoracolumbar tuberculosis: A prospective study in a tertiary care teaching hospital in Telanagana India

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Abstract---Introduction: Over last forty years a lot of changes has occurred in the diagnosis, medical treatment and surgical procedures in the treatment of spinal tuberculosis. Objective: To study the functional outcome of surgical management of thoracolumbar tuberculosis. Materials and Methods: Twenty two patients with tuberculosis of thoraco-lumbar spine who underwent decompression and spinal instrumentation were included in this study.Pre-operative Clinical examination was performed and neurological status also evaluated. Kyphotic angle was measured using Cobb method and documented.The affected vertebral body is approached posteriorly, decompressed, infected bone and disc material evacuated. Pedicle screws fixed to the spine.All patients were seen at 1, 3, 6, and 12 months after surgery.At each follow-up evaluation, plain radiographic studies were obtained to determine the fusion status, progression of deformity after surgery, and instrumentation failure. Results : out of the 22 patients 17 patients were in the age group of 21 to 60 with mean age of 45.5 years.10 patients(45.5%) with tuberculosis in the thoracic spine of which 6 were in single level, 3 were in two levels and one was in

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three levels . There were 8 (36.4%) patients with tuberculosis at thoraco-lumbar level(T11 to L2).Kaplan's method was used and patients were divided into three groups depending on the pre-operative kyphosis angle.9 patients with pre-operative kyphosis angle less than 30 degrees, 12 patients kyphois angle between 30 and 60 degrees whereas one patient with kyphosis angle more than 60 degrees were seen respectively. The mean kyphotic angle pre-operatively was 45.3 degrees which was corrected to 29.7 degrees. At the final follow up, there was mean loss of 2 degrees. Neurological status of the patients was assessed pre-operatively and post-operatively using Frankel grading. 6 patients had each with Frankel grade A and B, 4 each in grade C and D and 2 in grade E pre-operatively.At the final follow up one patient with grade A remained unchanged where as 14 patients were in grade E and 5 in grade D; there were 2 patients in grade C. Conclusion :The transpedicular instrumentation provided rapid relief of instability and early reconstruction of spinal instability plays an important role in treating active spinal Tuberculosis.

Keywords---thoracolumbar, kyphotic angel, surgical management, spinal tuberculous, posterior approach.

Introduction

Spinal Tuberculosis is still extremely common in our country and the fact that it is basically a "medical" disease cannot be over-emphasized. Paraplegia and kyphotic deformity development are two major disease-related problems. The aims of treatment are to eradicate the disease and also to prevent the development of paraplegia and kyphotic deformity and if exists, to manage the pathological fracture and to allow early ambulation and to return the patient back to work. However, chemotherapy alone or long periods of bed rest or external supports combined with chemotherapy may not be effective in the prevention of paraplegia and kyphosis.[1,2] The British Medical Research Council recommended that spinal tuberculosis is best treated by specialist surgeons and by chemotherapy and radical intervention under appropriate conditions.[1,3]In the absence of major deformity, the primary goal of surgery in tuberculosis of spine is debridement of dead and necrotic tissue to achieve adequate cord decompression and good healing with fusion.

The role of spinal instrumentation in caries spine has been addressed in the current literature on two issues. The first issue to be considered is about putting in a foreign body in an infected zone. The first clinical and biological study of the same was published about 15 years back and was shown to be experimentally safe with the added newer generation antitubercular medicines.[4] Subsequently it was questioned whether it is better to put in posterior hardware only given the fact that the infected zone is basically the anterior structures because posterior element tuberculosis is quite uncommon.[5] Subsequently it has been shown that anterior instrumentation also is very safe so far as the problem of persistent infection relating to the usage of foreign body is concerned.[5,6,7] Potential

advantages of spinal instrumentation are correction of deformity, increased rate of fusion, especially multilevel spinal fusion, early mobilization, wider resection of unhealthy bone without fear of instability and addressing the problem of instability when present. The treatment objective in tuberculosis of the spine is to avoid the sequelae of neural complications and achieve the healed status with a near-normal spine. In TB, the spine may become unstable if all three columns are diseased. Pathological fracture/dislocation of a diseased vertebral body may occur secondary to mechanical insult. Surgical decompression adds further instability, as part of the diseased vertebral body is excised. The insertion of a metallic implant is to provide mechanical stability and the use of an implant in tubercular infection is safe Indications for instrumented stabilisation can be categorised as: (a) pan vertebral disease, in which all three columns are diseased b) long-segment disease, in which after surgical decompression a bone graft >5 cm is inserted with instrumentation to prevent graft- related complications and consequent progression of kyphosis and neural complications and(c) when surgical correction of a kyphosis is performed when both anterior decompression and posterior column shortening is required The implant choice should be individualized according to case[8]

Materials and Methods

This Prospective study titled “Surgical Treatment of Thoracolumbar Tuberculosis: A Prospective Study in a Tertiary Care Teaching Hospital in Telanagana India” was carried out during the period of September 2017 to October 2019. The study was conducted on 22 patients of with tuberculosis of dorsal, dorso-lumbar and lumbar spine who underwent surgical decompression and fusion with posterior instrumentation in Chalmeda Anand Rao Institute Of Medical Sciences, Karimnagar with an aim to study the Surgical Treatment of Thoracolumbar Tuberculosis.The patients who were available for regular follow up for a minimum period of 12 months were included in the study.

Inclusion criteria

- Adult patients with clinical and radiological evidence of active tuberculosis involving vertebral body from the first thoracic to the first sacral level.
- The patients available for full follow up observation.

Exclusion criteria

- Patients younger than 18 years.
- Involvement or having disorders of central nervous system
- History of major surgery for any other disease of the spine

Ethics

This study was approved by the Institutional Ethics Committee Chalmeda Anand Rao Institute Of Medical Sciences,Karimnagar. An informed written consent was taken from all the patients involved in the study after explaining regarding the study.

Study Procedure

Adult patients with clinical and radiological evidence of active tuberculosis involving vertebral body from the first thoracic to the first sacral level were included in the study. Clinical examination was done to evaluate neurological status with bowel and bladder function. Kyphotic angle was measured using Cobb method and documented. The affected vertebral body is approached posteriorly, decompressed, infected bone and disc material evacuated. Pedicle screws fixed to the spine.All patients were seen at 1, 3, 6, and 12 months after surgery. At each follow- up evaluation, plain radiographic studies were obtained to determine the fusion status, progression of deformity after surgery, and instrumentation failure. Clinical examination was also performed at each follow-up visit to evaluate the neurological status. The kyphotic angle was measured and documented. Neurological assessment was done using Frankel's grading. The functional disability and ability was assessed using Denis work scale.

Results

Twenty two patients with tuberculosis of thoraco-lumbar spine who underwent decompression and spinal instrumentation were included in this study.

Table 1
Age distribution

Age group(in years)	Number of cases	Percentage
18-20	1	4.5
21-40	7	31.8
41-60	10	45.5
61-75	4	18.2
Total	22	100

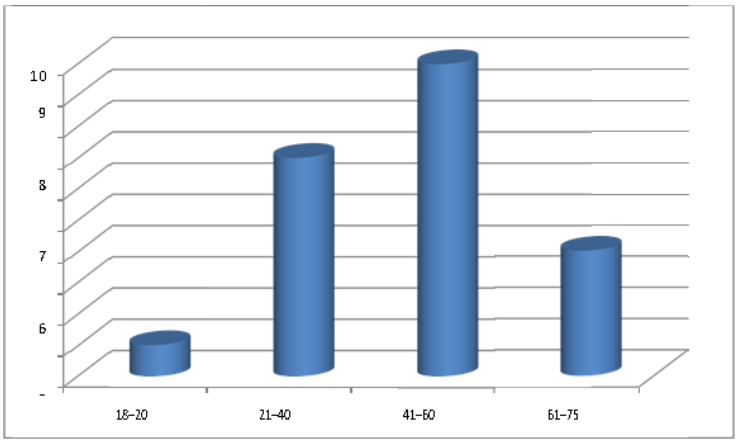

Figure 1. Age distribution

Majority of our patients were in the age group of 21 to 60; we had one patient who was 18 and 4 patients above the age of 60. Most of our patients were men

Table 2
Gender distribution

Gender of the patient	Number of cases	Percentage
Female	7	31.8
Male	15	68.2
Total	22	100

Duration of symptoms

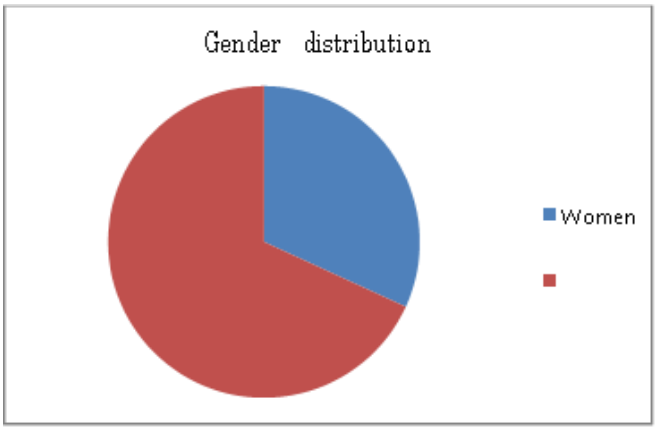

Figure 2. Gender distribution

Of the 22 patients, 14 patients had symptoms of the disease for less than three months and only two patients had problems of back pain and weakness of lower limbs for more than 6 months. None of our patients had symptoms of more than a year.

Table 3
Duration of symptoms

Duration of symptoms	Number of patients	Percentage
Less than 1 month	6	27.3
1 month to 3 months	8	36.4
3 months to 6 months	6	27.3
6 months to 12 months	2	9
Total	22	100

Level of involvement

Of the 22, we had 10 patients (45.5%) with tuberculois in the thoracic spine of which 6 were in single level, 3 were in two levels and one was in three levels. There were 8 (36.4%) patients with tuberculosis at thoraco-lumbar level (D11 to L2).

Table 4
Level of involvement

Levels	Thoracic (D4 to D10)	Thoaco Lumbar (D11 to L2)	Lumbar (L3 to L5)
Single level	6	1	2
Two levels	3	5	2
More than two	1	2	
Total	10	8	4

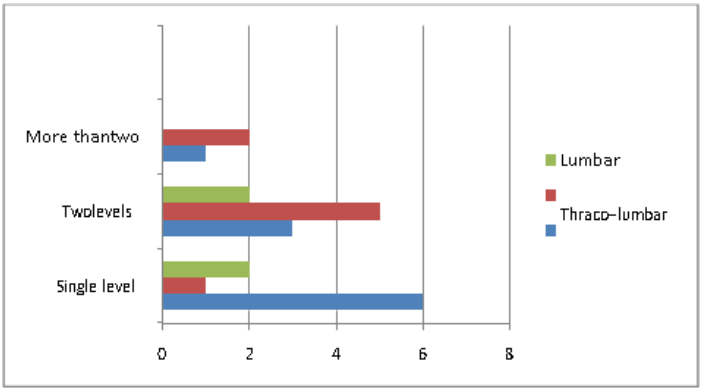

Figure 3. Level of involvement

Pre-operative antitubercular medication

Only 5 of the 22 patients were on anti-tubercular treatment when they were admitted to the hospital for surgical treatment. Bearing in mind the high incidence of tuberculosis in immunocompromised patients all were tested for HIV using an enzyme-linked immunoadsorbent assay. None was HIV-positive.

Table 5
Pre-operative anti-tubercular medication

	Number of patients	Percentage
ATT	5	22.7
No treatment	17	77.3
Total	22	100

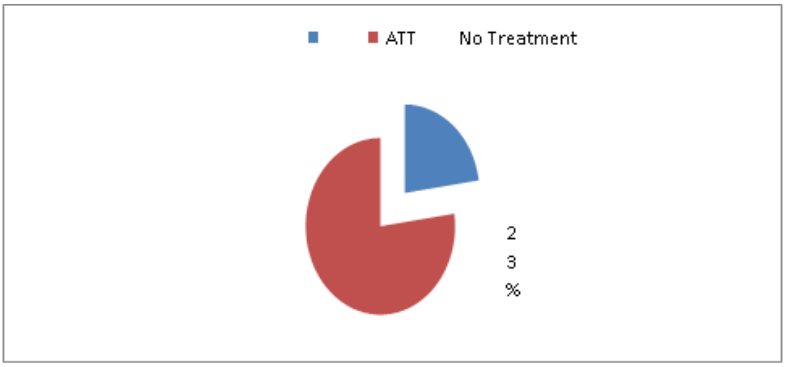

Figure 4. Pre-operative anti-tubercular medication

Level of instrumentation

Pedicle screw with rods were used at four levels in 11 patients five levels in 6 patients and three in rest of the patients. The number of vertebra to be used were decided by the location of the vertebra (whether thoracic, thoraco-lumbar or lumbar), number of vertebra involved and the extent of collapse of the involved vertebrae.

Table 7
Levels of stablilization

Number of levels stabilised	Numberof patients	Percentage
Three	5	22.7
Four	11	50
Five	6	27.3
Total	22	100

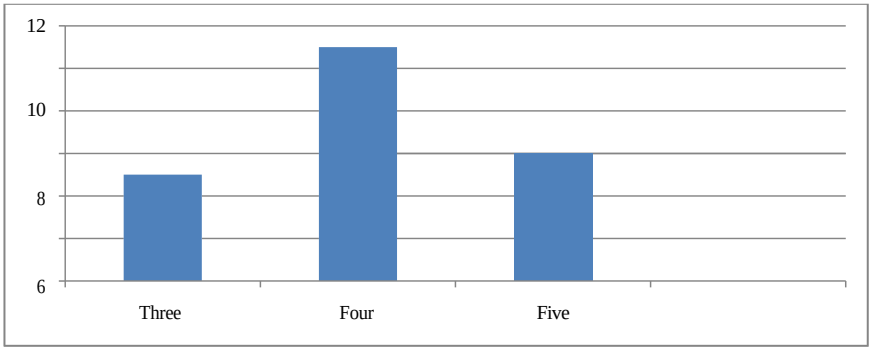

Figure 5. Levels of stablilization

Kyphosis angle

We used Kaplan's method and grouped our patients into three groups depending on the pre-operative kyphosis angle. We had 12 patients with pre-operative kyphosis angle between 30 and 60 degrees whereas there was one patient with kyphosis angle more than 60 degrees. Pre-operative, immediate post-operative and final kyphosis angle were as given in the chart.

Table 8
Kaplan's group and kyphosis angle

Kyphosis Angle				
Patient groups	Number of patients	Pre- operative	Post- operative	Final follow up
A:<30	9	26.7	15.7	17.3
B: 30 to 60	12	47.1	31.5	33.6
C:> 60	1	62	42	44
Total/Mean angle	22	45.3	29.7	31.7

Figure 6. Kyphosis: Pre-operative kyphosis angle of 30 degree

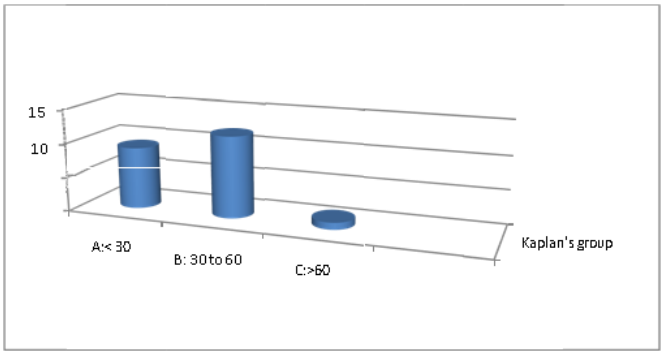

Figure 7. Kaplan's group

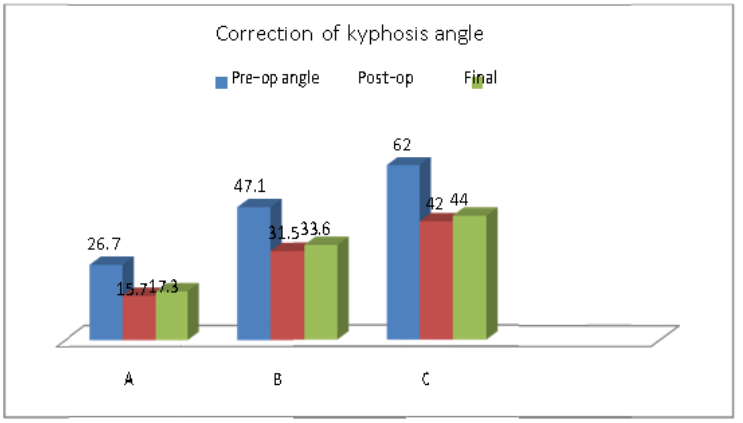

Figure 8. Correction of kyphosis angle

Neurological function

Pre-operative and post-operative assessment was done using frankel grading. Except 2 patients all other 20 patients had neurological involvement of some grade, which improved after surgery. We had 6 patients each with frankel grade A and B, 4 each in grade C and D and 2 in grade E pre-operatively. At the final follow-up, 1 patient with grade A remained unchanged whereas 14 patients were in grade E and 5 in grade D.

Table 9
Neurological recovery assessed by Frankel grading

Frankel Gradin g	Pre- operative	Post -op 2 wee ks	Post -op 4 wee ks	Post -op 3 mont hs	Post -op 6 mont hs	Post-op 12 months
A	6	6	4	3	2	1
B	6	5	2	3	2	0
C	4	5	8	5	3	2
D	4	4	6	7	7	5
E	2	2	2	4	8	14

Total	22	22	22	22	22	22

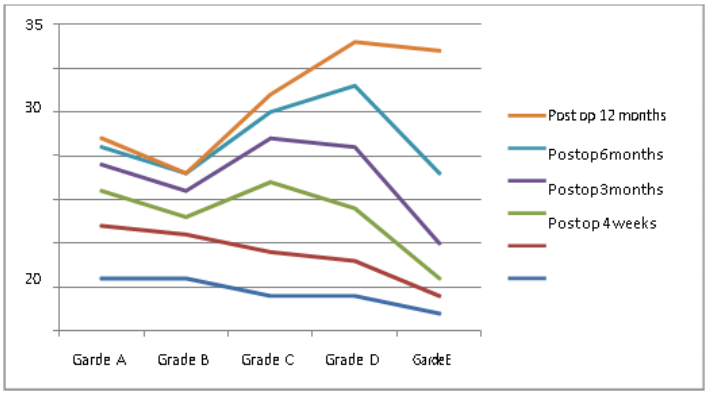

Figure 9. Neurological recovery assessed by Frankel grading

Work ability status using Denis work scale

Working ability of the patients were assessed using Denis work scale. This scale has 5 grades, W1 being the normal and W5 is completely disabled. The work ability of our patients is given in the following table.

Table 10
Work ability assessment by Denis work scale

Grad e	Pre- operati ve	Post- op 2 week s	Post- op 4 week s	Post- op 3 mont hs	Post- op 6 mont hs	Post- op 12 mont hs
5	20	17	6	1	1	1
4	2	5	15	12	3	0
3	Nil	Nil	1	8	13	7
2	Nil	Nil	Nil	1	5	14
1	Nil	Nil	Nil	Nil	Nil	Nil
Total	22	22	22	22	22	22

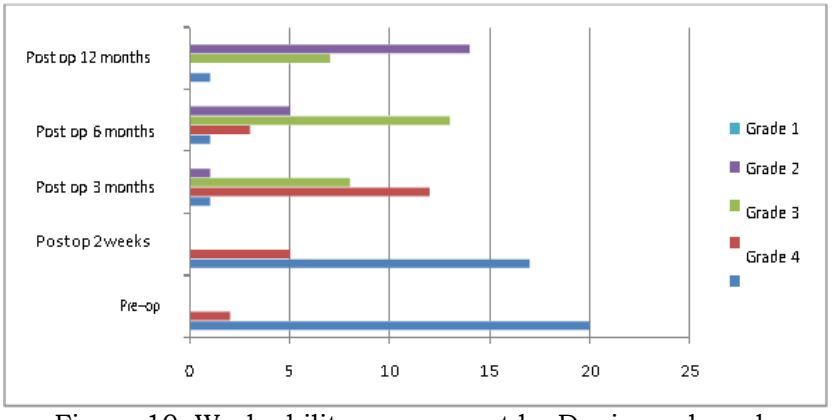

Figure 10. Work ability assessment by Denis work scale

Figure 11. Pre-operative radiographs showing tuberculosis at L2-L3 level

Figure 12. Immediate post operative radiograph

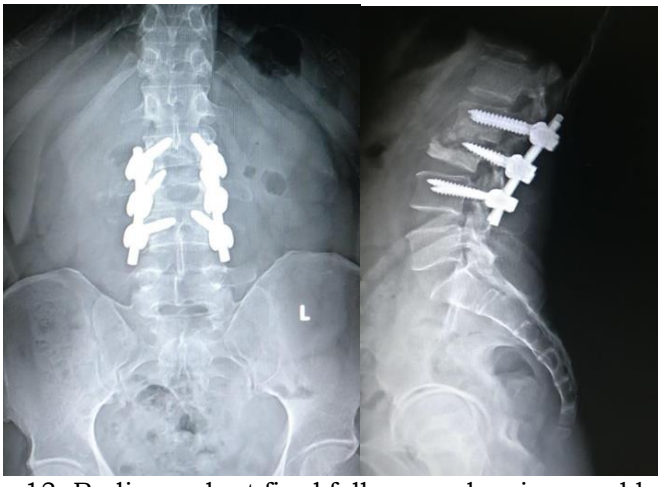

Figure 13. Radiograph at final follow up showing good healing

Discussion

In our study of functional outcome of surgical management of tuberculosis of spine 22 patients were selected of dorsal, dorso-lumbar and lumbar tuberculosis who were treated with chemotherapy, debridement, bone grafting using cage and surgical stabilization using posterior pedicle screws and rods. Those patients who were finally available for regular follow up for a minimum period of 12 months were included in this study.

Age and gender distribution

Gokce[9] and others in their studies had 54 patients had 28 females and26 males with a mean age of 39.2 (22-76) years. Saumyajit Basu, Sandip Chatterjee had 27patients, 12 males and 15 females.Of the 22 patients in our studies 17 patients were in the age group of 21 to 60 with mean age of 45.5 years. We had men in majority.

Level of involvement

Saumyajit Basu, Sandip Chatterjee reported 3 in the thoracic region(T4 to T10), 4 in the thoracolumbar junction (T11/12/L1/L2) and 8 in the lumbar region (L3/4/5) and one in the lumbosacral junction (L5/S1).Gokse[9] and others reported tuberculous involvement in one vertebral body in 14 patients, two vertebral body infection in 34 patients, three vertebral body infection in 6 patients. There were not any patient affected more than three levels of infection Of the 22, we had 10 patients (45.5%) with tuberculosis in the thoracic spine of which 6 were in single level, 3 were in two levels and one was in three levels. There were 8 (36.4%) patients with tuberculosis at thoraco-lumbar level (T11 to L2). We had the highest incidence of disease seen in the dorsal spine (45.5%) as reported by Sundararaj G.D et al[10]rather than the dorso lumbar spine reported by Tuli[12] Hodgson et al[11] Hodgson and Stock

Kyphosis correction

Nitin Garg and others[13] in their series of 12 patients treated by anterior debridement and ventral-column reconstruction reported mean preoperative kyphosis of 19.8°, with a 4° correction achieved postoperatively and a1.6° loss of correction at last follow up.We used Kaplan's method[14] and grouped our patients into three groups depending on the pre-operative kyphosis angle. We had 9 patients with with pre-operative kyphosis angle less than 30 degrees, 12 patients kyphois angle[16] between 30 and 60 degrees whereas there was one patient with kyphosis angle more than 60 degrees. The mean kyphotic angle pre-operatively was 45.3 degrees which was corrected to 29.7 degrees. At the final follow up, there was mean loss of 2 degrees

Neurological recovery

Nitin Garg and Renuka Vohra[13] In their series of 22 patients reported that neurologic deficits in their patients recovered completely with no motor deficits at Follow up; 13% improved by three grades, 53% by two grades, and 33% by one

grade.We assessed the neurological status, pre-operatively and post-operatively using Frankel grading. We had 6 patients each with Frankel grade A and B, 4 each in grade C and D and 2 in grade E pre-operatively. At the final follow up one patient with grade A remained unchanged where as 14 patients were in grade E and 5 in grade D; there were 2 patients in grade C.

Work ability status

Gokce and others[9] in their series of 54 patients reported improvement in work ability in 61% of the patients.We assessed the working ability of the patients using Denis work scale[15]. This scale has 5 grades, W1 being the normal and W5 is completely disabled. In our series pre- operatively 20 patients were in grade 5 where as at the end of one year there was one patient who did not show recovery where as 14 patients were in grade 2 and 7 were in grade 3.

Conclusion

From the results it can be concluded that transpedicular instrumentation provided rapid relief of instability and early reconstruction of spinal instability plays an important role in treating active spinal tuberculosis. Apart from increasing the stability of the spinal column, instrumentation also help encourage neurological recovery, as rigid stabilisation of the spine has been shown experimentally to promote neurological recovery. Posterior approach utilizing only extra pleural approach, is an effective option to debride the infected vertebra, decompress the spinal cord and stabilize the spine. It allows decompression of spinal cord under direct vision. Our results confirm that neurological deficits clinically improved at least one grade according to the Frankel grading system after surgery. The immobilisation effect achieved through posterior instrumentation during the operation might also be useful in suppressing infection. In the present study, debridement and instrumentation arrested infection and promoted lesion healing as demonstrated radiologically.

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