



Posterior Fixation in Dorso-Lumbar Spine Tuberculosis (Study of 50 Cases)

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ABSTRACT

Spine tuberculosis is anterior disease, it heals well with antitubercular therapy and for stability of spine we can support with simple posterior fixation. Anterior surgical approach needs expertise and it leads to many surgical related complication. We choose to go with posterior fixation to show results in combination with antituberculous drug. We have studied 60 patients with tuberculous spine with or without neurological involvement and with/without kyphotic deformity, out of which 50 patients were fully followed up. All patients were operated only with only posterior decompression and fixation. Their neurological status (Gertzbein grading), rate of fusion (Bridwell score), pain status (Denis pain-scale), functional ability (Denis work-scale) and final (Seybold and Bayley score) was noted. Out of total 50 patients, 27 (54%) were males with average age of patients was 31-50 years. 23 (46%) patients had improvement of 1 grade in Frankel grade and 17 (34%) had improvement in the same Frankel grade. 8 (16%) patients had no neurological improvement. 25 (50%) had excellent outcome with 100% had correction of kyphosis post operatively. Patients with dorsal tuberculosis had an average score of 13.78 and lumbar tuberculosis had better score 15.72. Posterior stabilization and reconstruction of spine by posterior and posterolateral fusion by bony approximation and in some cases fusion with cage helps in preventing progression of deformity. There was significant correction in angle of kyphosis immediate after posterior fixation. Among neurologically compromised patients, posterior fixation with posterior decompression had significantly increased recovery. Functional outcome was significantly better in posteriorly fixed group of patients with average score being 14.66. After posterior decompression and fixation, functional outcome is better in form of pain relief, work performance, fusion and neurological outcome.

Introduction

Tuberculosis has been predicted to be the largest single infectious cause of death^[1]. Although the primary focus of disease is pulmonary, extra-pulmonary disease is quite frequent, with the spine being the commonest site for skeletal TB involvement. Thus, nearly one-third of all compressive lesions of the spine in developing countries are caused by tuberculosis^[1,2,3,4,5]. Spinal TB generally starts in the vertebral bodies and the intervertebral discs and is thus called "spondylodiscitis". It is not only important due to the high prevalence but also because up to 30% of cases develop serious neurological sequelae from compression of the spinal cord, such as paraparesis and paraplegia.

There is reason to believe that tuberculosis of the dorsal and lumbar spine region may differ from disease of the other regions of spine in the natural history due to anatomical and biomechanical differences. Tuberculosis at dorsal and lumbar level of spine is inherently unstable. Tuberculosis of spine is a common cause of anterior column destruction (paradiscal and central being most common) of spine and thus resulting into kyphosis, a sequelae which can present as late onset weakness^[6,7].

If the patients are diagnosed early, they can be treated conservatively. Although clinical and radiological findings are clear in tuberculosis of the spine, making an early and definite diagnosis is not yet easy, because disease progression is slow and insidious. If there are no complications and if the lesion is limited to the vertebrae, anti-tubercular chemotherapy can treat tuberculosis^[8,9]. However, with proper indications, surgical procedures are superior in the prevention of neurological deterioration, maintenance of stability, prevention of deformity, early recovery and early mobilization^[10,11,12,13]. Tubercular kyphosis is an unstable lesion that tends to progress at least until there is a sound bony fusion anteriorly. The wide lesions, abscess formations, sinuses,

vertebral deformities and neurological deficits due to spinal tuberculosis should be treated surgically anterior longitudinal ligamenty. To date, there are several surgical treatment methods in the literature. Nowadays, tuberculous spine treatment and management has greatly evolved.

Jacob^[14] suggested the early operative intervention for tuberculous spine with the goals of:

- Early decompression and protection of neural elements.
- Correction and maintenance of deformity.
- Early pain free mobilization

So, we study the results of only posterior decompression and fixation in dorsolumbar tuberculosis spine with aim of viewing neurological recovery, fusion status, amount of correction of kyphotic deformity and life style status over the period of time.

MATERIALS AND METHODS

TYPE OF STUDY- Prospective level II.

INCLUSION CRITERIA- Involvement of vertebra above and/or below the intervertebral disc, with or without neurological involvement and with or without kyphotic deformity was taken as inclusion criteria for dorso-lumbar tuberculosis.

DIAGNOSTIC CRITERIA FOR TUBERCULOSIS SPINE- Biopsy of vertebral body was taken as diagnostic method of tuberculosis of Dorsolumbar spine.

METHODS

60 patients were taken in the study initially anterior longitudinal ligamenty but out of them 10 did not come for regular follow up. So study consisted of 50 patients.

All patients (n=50) who were included in the study had tuberculosis of spine at dorsal and/or lumbar with or without neurological deficit and with or without deformity.

All of 50 patients were managed by only posterior decompression and fixation.

We studied the cases for development of deformity at dorsal and lumbar spine treated by posterior decompression and fixation and their neurological status according to GERTZBEIN GRADING^[15], rate of fusion according to BRIDWELL SCORE^[16], pain status by DENNIS PAIN SCALE^[17] and functional ability according to DENNIS WORK SCALE^[18] and final outcome was assessed according to **SEYBOLD AND BAYLEY SCALE**^[19].

Neurological function on admission was graded according to **Frankle et al**^[20].

The angle of kyphosis was measured by a technique similar to that described by konstam and bolsovsky. Two lines are drawn. One through the superior surface of the normal vertebrae cephalad to the lesion and one through inferior surface of the first normal vertebrae caudal to the lesion. Then we draw perpendicular line to above lines and we measured the angle at the point where these perpendicular lines intersect each other.

Minimum follow up was 12 month and Average follow up of patients was 15 months.

CLASSIFICATION OF TUBERCULOSIS OF SPINE

[Table 1] TULI'S CLASSIFICATION OF TUBERCULOUS PARAPLEGIA^[1]

stage		clinical features
1.	Negligible	Patient unaware of neural deficit, physician detects plantar extensor and/or ankle clonus
2.	Mild	Patient aware of deficit but manage to walk with support
3.	Moderate	Non-ambulatory because of paralysis (in extension), sensory deficit < 50%
4	sever	3 + flexor spasms/paralysis in flexion/flaccid/sensory deficit > 50%/sphincters involved

Seddon classification of potts paraplegia^[22,23]

Griffiths, Seddon and Roaf classified tuberculous paraplegia in two grades, Group A and Group B :

Group A with early onset, within 2 years after onset of symptoms of tuberculosis, and

Group B with late onset, i.e. after more than 2 years

INVESTIGATIONS :

Blood investigations:

Radiological investigations:

- X-ray spine
- Chest x ray
- MRI spine with whole spine screening
- Occasionally CT SCAN used as and when indicated.

TREATMENT

Regarding treatment modalities, patients were treated by only posterior fixation and decompression

OBSERVATIONS AND RESULTS

DISTRIBUTION OF PATIENTS ACCORDING TO AGE AND SEX

RESULTS:

Out of total 50 patients 27(54%) were males and 23(46%) were females. Average age of patients was 31-50 Years. 31-40 years age group has maximum incidence of disease (28% of allpatients).

[TABLE II] : FUNCTIONAL OUTCOME (SEYBOLD AND BAYLEY SCALE) ACCORDING TO LEVEL OF DISEASE (n=50)

Score	dorsal	lumbar	dorsolumbar	Total
Poor(0-5)	0(0%)	0(0%)	0(0%)	0(0%)
Fair(6-10)	5(10%)	0(0%)	2(4%)	7(14%)
Good(11-15)	8(16%)	6(12%)	4(8%)	18(36%)
Excellent (16-20)	10(20%)	12(24%)	3(6%)	25(50%)

RESULTS: 40% of the patients had frankel grade E , 24% had frankel grade D, 14% had grade C, 20% patients had frankel grade A. All frankle grade B patients belonged to dorsal group.

[TABLE III]:DENNIS PAIN SCORE ACCORDING TO LEVELS OF DISEASE (n=50)

LEVEL	DORSAL	LUMBAR	DORSOLUMBAR	TOTAL
SCORE (HIGHER IS BETTER)	0	0(0%)	0(0%)	0(0%)
	1	0(0%)	0(0%)	0(0%)
	2	0(0%)	0(0%)	0(0%)
	3	4(8%)	0(0%)	1(2%)
	4	12(24%)	9(18%)	6(12%)
5	7(14%)	9(18%)	2(4%)	18(36%)

RESULTS: . Among the 50 patients 36% patients were **pain free** and 54% patients had occasional pain. Dorsal group had best outcome where all were either **pain free** or had **occasional pain** and only 8% required medication. 18% Lumbar group patients had occasional pain whereas 12% dorsolumbar group of patients had occasional pain.

[TABLE IV]: DENNIS WORK SCORE ACCORDING TO DISEASE LEVELS (n=50)

Level	Dorsal	lumbar	Dorsolumbar	Total
Score (Higher Is Better)	0	6(12%)	1(2%)	2(4%)
	1	0(0%)	0(0%)	0(0%)
	3	1(2%)	0(0%)	1(2%)
	4	7(14%)	6(12%)	1(2%)
	5	9(18%)	11(22%)	5(10%)

RESULTS: Among 50 patients,25(50%) patients returned to **previous heavy work** and 14(28%) patients returned to **light work** and lumbar group had best outcome where 11(22%) of them could return to their **previous heavy work**. 9(18%) patients of Dorsal group were returns to **previous heavy work**, whereas 9(18%) patients of allpatients were completely disable. lumbar group of patients had significantly better results regarding return to work .

[TABLE V]: BRIDWELL FUSION SCORE ACCORDING TO DISEASE LEVELS (n=50)

Level	Dorsal	lumbar	Dorsolumbar	Total
Score (Higher Is Better)	0	0(0%)	0(0%)	0(0%)
	1	1(2%)	0(0%)	1(2%)
	3	7(14%)	4(8%)	1(2%)
	5	15(30%)	14(28%)	7(14%)

RESULTS: Among 50 patients, 36(72%) patients had **definitive fusion**. 15(30%) dorsal group and 28% of lumbar group of patients had definitive fusion, whereas only 2(4%) patients had probably not fused.

[TABLE VI] : GERTZBEIN NEUROLOGICAL IMPROVEMENT SCORE ACCORDING TO LEVEL OF DISEASE (n=50)

Level		dorsal	lumbar	Dorso lumbar	Total
SCORE	Minus (poor)	0(0%)	0(0%)	0(0%)	0(0%)
	0(even)	3(6%)	1(4%)	3(6%)	7(16%)
	1(fair)	8(16%)	6(12%)	3(6%)	17(34%)
	3(good)	11(22%)	11(22%)	2(4%)	24(46%)
	5(excellent)	2(4%)	0(0%)	0(0%)	2(4%)

RESULTS: Among 50 patients, 23(46%) patients had improvement of 1 grade in frankle grade and 17(34%) had improvement in the same frankle grade. 8(16%) patients had no neurological improvement. There was better neurological outcome in dorsal group as compared to lumbar group.

[TABLE VII] : GERTZBEIN NEUROLOGICAL IMPROVEMENT SCORE ACCORDING TO LEVEL OF DISEASE (n=50)

Level		dorsal	lumbar	Dorso lumbar	Total
SCORE	Minus (poor)	0(0%)	0(0%)	0(0%)	0(0%)
	0(even)	3(6%)	1(4%)	3(6%)	7(16%)
	1(fair)	8(16%)	6(12%)	3(6%)	17(34%)
	3(good)	11(22%)	11(22%)	2(4%)	24(46%)
	5(excellent)	2(4%)	0(0%)	0(0%)	2(4%)

RESULTS Among the 50 patients, 25(50%) had **EXCELLENT** outcome and 18(36%) had **GOOD** outcome and 7(14%) had **FAIR** result and among them lumbar group of patients had best outcome where 12(24%) had the **EXCELLENT** result. Among dorsal patients, 10(20%) had **EXCELLENT** result and 8(16%) patients had good results.

[TABLE VIII] : CORRECTION OF KYPHOSIS (CHANGE IN KYPHOSIS ANGLE) ACCORDING TO LEVEL OF DISEASE (n=50)

Level		Dorsal	lumbar	dorsolumbar	Average
Change In Angle	-15° To 0°	0(0%)	0(0%)	0(0%)	0(0%)
	0° To +15°	13(26%)	7(14%)	2(4%)	22(44%)
	+15° To +30°	6(12%)	6(12%)	7(14%)	19(38%)
	+30° To +45°	5(10%)	4(8%)	0(0%)	9(18%)
	Total	24(48%)	17(34%)	9(18%)	50(100%)

RESULTS : Among 50 patients 100% had correction of kyphosis post operatively. 19(38%) patients had kyphotic deformity within 15 to 30 degree. 22(44%) patients had kyphotic deformity within 0 to 15 degree and 9(18%) patients had kyphotic deformity within 30 to 45 degree.

[TABLE IX] : AVERAGE FINAL SCORES (ACCORDING TO SEYBOLD AND BAYLEY SCALE) ACCORDING TO LEVEL OF DISEASE (n=50)

dorsal	lumbar	dorsoLumbo	Average
13.78	15.72	13.66	14.66

0-5 (POOR), 6-10 (FAIR), 11-15 (GOOD), 16-20 (EXCELLENT)

RESULTS: patients with dorsal tuberculosis had an average score of **13.78 (GOOD)**. Lumbar region tuberculosis had marginanterior longitudinal ligamenty better score **15.72**

(**GOOD**) .dorsolumbar region tuberculosis patients had score of **13.66(GOOD)**. Average is 14.66 (**good**).Functional outcome was better in patients treated with posterior fixation and decompression.

CASE STUDY

[A] POSTERIOR FIXATION AND DECOMPRESSION DONE IN DORSAL REGION- EXCELLENT RESULT

NAME- RAJKUMAR GANGARAM SONI

AGE/SEX- 50/male

C/o- pain in mid back region, bilateral lower limb weakness since 3 months.

DIAGNOSIS: TUBERCULOSIS spine D9-D10 with paraplegia with B/B involved

Frankel grade- A

MANAGEMENT: posterior fixation and decompression

FOLLOW UP: 15months

Frankel grade - E

CHANGE IN KYPHOSIS ANGLE- minus 9°

DENNIS PAIN SCORE- 4

DENNIS WORK SCORE- 3

BRIDWELLS FUSION SCORE- 5

GERBZSTEIN NEUROLOGICAL SCORE- 5

SEYBOLD AND BAYLEY SCORE- 17 (EXCELLENT RESULT)

Pre-operative presentation :



PRESENTATION



FINAL FOLLOW UP



FINAL FOLLOW UP

DISCUSSION

Spinal tuberculosis heals with sequelae of spinal deformities with consequent long term biomechanical consequences. Even if biological control of disease is achieved, the biomechanical damage of the skeleton keeps on adding morbidities and reduction in the functional performance in future life.

In our study, 48% of all the patients were between age 30 to 50 years. Incidence was found to be slightly more in males as compared to females. The male:female ratio was 1.17:1. This may be due to the reason that men are more prone to get exposed to infected people due to their outdoor work and activities and greater social circle as compared to females.

Majority of the patients were having frankel grade E(40%). 60% of the patients had neurological compromise with 24% having frankel grade D and 14% having grade C. dorsal region had the highest incidence of neurological compromise(30%). lumbar region patients were mostly neurologically normal. This could be attributed to narrow spinal canal in dorsal region of spine and relatively large space of spinal canal in lumbar region. So tuberculous pathology causes more compression on neural elements in dorsal regions of spine leading to neurological compromise.

In a series of prospective studies during the Medical Research Council^[30,31,32,33] chemotherapy was established as an effective treatment for the majority of patients with spine tuberculosis. These patients having gross kyphosis, neurological deficit and delayed bony union as a complication. From biomechanical point of view destruction of the vertebral body will induce kyphosis deformity, which markedly increase the torque of compression and speed the collapse of vertebral body^[34]. Surgical treatment may be necessary when risk of kyphotic deformity is higher.

Hodgkin and stock reported in 1960, radical debridement and anterior fusion has been advocated as the treatment of choice in tuberculous spondylitis. For successful results, anterior radical surgical extirpation of the tuberculous focus and the replacement with a bone graft as well as placing the graft in a structural sound position were essential.^[35]

However the graft is prone to failure or resorption. The kyphosis increased after radical debridement and anterior grafting, when the graft was inadequate size, fractured, slipped or was resorbed.

Moon et al reported that anterior arthrodesis was unsuccessful in preventing the progression of kyphosis or correcting preexisting deformity.^[8]

Since Dr. M.M.Prabahkar and Dr. Bhavin jadav in 2007, primary posterior corrective fixation with appropriately selected instrumentation and second stage anterior debridement and reconstruction with appropriate chemotherapy advocated as treatment of choice for tuberculous spondylitis. For successful results anterior debridement of tuberculous focus and reconstruction in a structural sound position were the key factor to effectiveness.^[36]

Rajshakaran and Sounarapandian (1989) reported that a stable anterior graft provided structural support in only 41% of patients and that graft failure with residual kyphosis occurred in 59%. Thus we concluded that it was unwise to rely solely on the anterior strut graft to prevent vertebral collapse.^[37] In light of these facts we sought a method of treatment that could prevent such a major increase in the spinal deformity.

In the current series of 50 patients posterior instrumentation performed to decrease and stabilize the kyphotic unstable seg-

ment. There was a patients with significant increase in dorsal kyphosis due to anterior column destruction because of ineffectiveness of AKT and patient compliance, anterior reconstruction with cage and graft has to be done and so excluded from the study as a failure. There was two patients having delayed infection with sinus formation which was treated with daily dressing and antibiotics. Through out the study there was two patients with implant loosening in which visible bony fusion has occurred and so implant has been safely removed.

Among all patients, maximum increase in kyphosis angle was seen at dorsal region (average 33.1degrees) as compared to lumbar region(average 28.4 degree). Reason for that may be attributed to inherent kyphotic alignment of dorsal spine, so kyphosis development is high in dorsal region. significant deformity does not develop in lumbar region due to inherent lordosis of lumbar spine.

In our study posterior stabilization and reconstruction of spine by posterior and posterolateral fusion by bony approximation and in some cases fusion with cage helps in preventing progression of deformity. There was significant correction in angle of kyphosis(average 18.9 degrees) immediate after posterior fixation. There was mild degree of kyphosis recorded in 48% of patients In the final follow up which was in acceptable range and does not alter the final functional outcome of the study.

Among neurologically compromised patients, posterior fixation with posterior decompression had significantly increase recovery. Removal of the causative factor of neurological compromise by surgical means leading to decompression of neural elements leads to faster and better neurological recovery.

Regarding fusion, posterior fixation in lumbar region accompanied by cage filled with graft in some cases had increase the chances of fusion. Operative procedures provide adequate and fast removal of the disease process, added stability to the diseased part of the spine, with additional reconstructive procedure provide an ideal environment for healing and fusion to take place rapidly and abundantly and additionally reduces the further chances of neurological compromise.

In our study, all patients were operated by posterior instrumentation over anterior instrumentation due to following reasons-

Since there is infection and inflammation on anterior side, the hold of anterior implant in tuberculosis is precarious.

The hold of the pedicle screw and sublaminar wire on healthy lamina on posterior aspect is much much stronger than any other implant placed anteriorly on the body.

Thus, in this study the posterior spinal fixation together with decompression resulted into controlled correction of spinal column and maintenance over the period of time. patients managed by posterior decompression and fixation in dorsal and lumbar level had significantly better pain relief and significantly better return to previous work. It could be attributed to quicker healing of disease process, better stability and better fusion.

Functional outcome was significantly better in posteriorly fixed group of patients with average score being **14.66 (good)** according to **Seybold and Bayley** score. Better targeting of the disease focus with removal of disease focus, possible posterior reconstruction, rapid healing, added stability and better fusion, which all fulfilled by the posterior fixation and decompression and has the better functional outcome.

CONCLUSION

- dorsal and lumbar level prone to instability and deformity which affects the functional performance in future life.
- functional outcome is better according to *SEYBOLD AND BAYLEY SCALE*, in form of pain relief, work performance, fusion and neurological outcome after posterior decompression and fixation.
- Negligible loss of correction of deformity.
- Posterior fixation is safe and helps in early mobilization and rehabilitation.
- No Complication related to anterior approach.

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