

# Single stage posterior instrumentation and anterior interbody fusion for tuberculosis of dorsal and lumbar spines

PANDEY BK<sup>1</sup>, SANGONDIMATH GM<sup>2</sup>, CHHABRA HS<sup>2</sup>

<sup>1</sup>Department of Orthopaedics, Kathmandu Medical College Teaching Hospital, Sinamangal, Kathmandu, Nepal

<sup>2</sup>Indian Spinal Injuries Centre, New Delhi, India.

## ABSTRACT

**BACKGROUND:** Spine is the most common site for osseous involvement of tuberculosis, accounting around 50% cases of musculoskeletal tuberculosis. The most frequent sites of the involvement are the thoracic and lumbar spine. The anterior column is primarily affected resulting in progressive or residual kyphotic deformity even after the eradication of the disease by chemotherapy. Various surgical techniques like anterior fusion, posterior or combined fusion have been described. In this study we evaluated the clinical outcome and radiological results of single stage posterior instrumentation and anterior interbody fusion for tuberculosis of dorsal and lumbar spine.

**METHODS:** Details of the patients of tuberculosis of dorsal and lumbar spine operated with single stage posterior instrumentation and anterior interbody fusion from December 2004 to June 2008 were retrieved from the hospital database. There were 55 cases operated with this technique. Thirty patients, whose final details were available, were involved in this study. Pre-operative, post-operative and final follow up clinical and radiological assessments were performed. The follow up ranged from 18 to 60 months.

**RESULTS:** Average operation time was 5 hours 45 minutes and blood loss was 1100 ml. Anterior body fusion was achieved in all the patients. 93.3% of the patients had neurological improvement. Satisfactory post-operative kyphotic angle correction was achieved. There was minimal final loss of kyphotic correction. One patient had post-operative wound infection. Post operative paralytic ileus, chest infection, urinary tract infection, jaundice were the complications found in the patients. No graft related complication was seen. There was no recurrence of the disease in any of the cases.

**CONCLUSION:** Single stage anterior debridement and interbody fusion with posterior instrumentation can be performed safely to achieve satisfactory clinical and radiographic outcomes in patients of thoracic and lumbar tuberculosis.

**KEY WORDS:** *Pott's spine, interbody fusion, posterior instrumentation, single stage*

---

## INTRODUCTION

Tuberculosis (TB) remains the most common cause of death from infectious disease world-wide.<sup>1</sup> Percival Pott described tuberculosis of the vertebral column in 1877 as a kyphotic deformity of the spine associated with paraplegia.<sup>2</sup> Spine is the most common site for osseous involvement, accounting around 50% cases of musculoskeletal tuberculosis.<sup>2,3,4</sup> The most frequent sites of the involvement are the thoracic and lumbar spine.<sup>5,6,7</sup> With the advent of effective combination of chemotherapy in early 1950's, the mortality rate among patients with spinal tuberculosis

decreased from approximately 10 per cent to 3 per cent. However the rate of paraparesis remained constant at approximately 20 per cent of all patients with spinal tuberculosis.<sup>8</sup> The anterior column is primarily affected resulting progressive or residual kyphotic deformity even after the eradication of the disease by chemotherapy.<sup>9,10</sup> In 1960 Hodgson et. al.<sup>5</sup> reported anterior decompression and strut graft for reconstruction of anterior column. Graft slippage, resorption, subsidence leading to increased kyphosis is commonly anticipated in anterior debridement

without instrumentation.<sup>11,12</sup> This has led to the concept of anterior or posterior instrumentation to increase the success rate of correction and fusion procedures.<sup>2,9,10,13</sup>

Anterior fusion with anterior instrumentation through anterior approach, sequential or staged anterior fusion with posterior instrumentation through anterior and posterior approaches, and posterolateral or transpedicular anterior fusion and posterior instrumentation through posterior approach are the surgical treatment modalities. But when and how the surgery should be performed has remained controversial.<sup>14</sup> Indications for surgical treatment includes neurological involvement, progressive kyphotic deformity, evidence of radiological instability, back pain unrelieved by conservative treatment, presence of large abscess or sequestered bone.<sup>2,14</sup>

Active tuberculosis is not a contraindication for instrumentation. Oga et. al.<sup>15</sup> evaluated the adherence capacity of mycobacterium tuberculosis to stainless steel and demonstrated that adherence was negligible, and the use of implants in region with active tuberculosis infection may be safe.

In this study we evaluated the clinical outcome and radiological results of single stage posterior instrumentation and anterior interbody fusion for tuberculosis of dorsal and lumbar spine.

## MATERIALS AND METHODS

This is a retrospective study carried out at Indian Spinal Injuries Centre, from October 2009 to January 2010. We have included all the patients of tuberculosis of dorsal and lumbar spine operated with single stage posterior instrumentation and anterior interbody fusion from December 2004 to November 2008. Patients with old healed lesion with residual kyphotic deformity, children below the age of 15 years and tuberculosis of cervical spine, sacrum were excluded from the study.

Hospital records were reviewed for all available demographic data, level of involvement, neurological status, presence of associated medical illness, type of surgical approach and any perioperative complications.

Cases reviewed in this study had active spinal tuberculosis of dorsal, dorsolumbar, and lumbar spine. All were

clinically symptomatic and all had either neurological deterioration or increased pain or radiological deterioration. All the patients had increased blood ESR. Preoperative neurological assessment was performed using ASIA (American Spinal Injury Association) impairment score.<sup>16</sup>



Fig. 1 Pre-operative X-ray showing lesion of L2

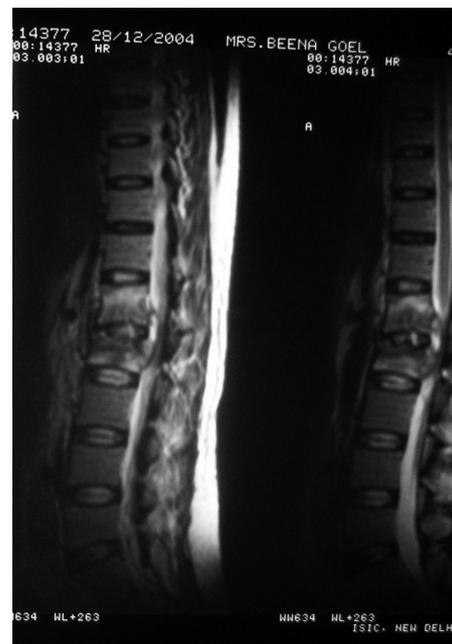
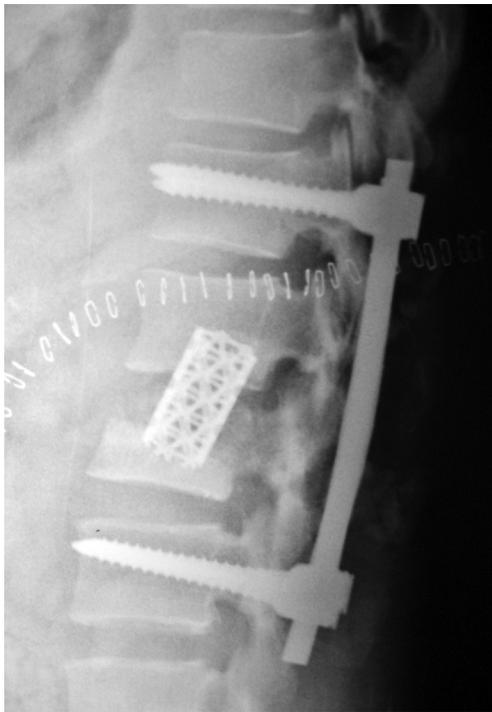


Fig. 2 MRI showing lesion of L1 and L2

All patients were first positioned in prone and through midline incision exposure to the entry point for pedicle screw insertion was done. After posterior instrumentation with pedicle screws and rods wound was closed superficially. Patients were then positioned right laterally for anterior approach. Thoracotomy was done for dorsal spine. Transdiaphragmatic approach was done for dorsolumbar junction tuberculosis. Lumbar vertebrae were approached by retroperitoneal approach. After anterior debridement and refreshing upper and lower end plates either cage with bone graft or iliac crest tricortical bone graft was placed to reconstruct the anterior column. Graft was compressed by posterior instrumentation.

Postoperative neurological and radiological assessments were performed. All the patients received antitubercular chemotherapy for 12 to 18 months.



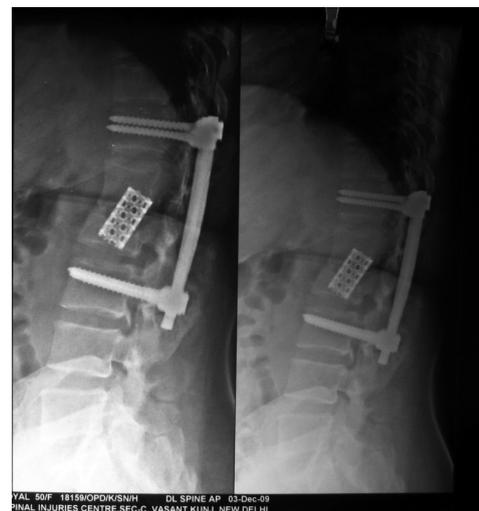
**Figure 3. Post-operative X-ray**

Postoperative and final clinical outcomes were evaluated with ASIA score for neurological and VAS (Visual analogue scale) score for pain assessment. Radiological results were evaluated by measuring kyphotic angle, bony fusion rate and graft with instrument related complications with follow up period ranging from 18 to 60 months.

## RESULTS

Out of 55 cases operated with this method, 30 cases were available for follow up. There were 17 male and 13 female with the mean age being 48 years (minimum of 18 years and maximum of 69 years). Indications for operation were neurological deterioration in 25 patients, intractable pain during a course of conservative treatment in 2 patients and increasing kyphotic deformity in 3 patients. Those patients who developed neurological deterioration had their symptoms in an average of 31 days before admission in the hospital. 11 patients had antitubercular chemotherapy more than 6 weeks before they developed neurological symptoms. 11 patients were having antitubercular chemotherapy for less than 6 weeks. 8 patients received antitubercular perioperatively. Twenty patients had dorsal lesion, 7 had lumbar lesion and 3 had dorsolumbar lesion. In single stage anterior debridement and posterior instrumentation average time taken for surgery was 5 hour 45 minutes. Average intraoperative blood loss was 1100 ml. Cage was used anteriorly in 21 patients; iliac crest graft was used in 6 patients and rib graft in 3.

Preoperative mean kyphotic deformity was 22.9°. Maximum kyphotic deformity was 46° and minimum was -3°. Post-operative average deformity was 12.5° with maximum of 25° and minimum of 3°. Final average deformity was 15.4° with maximum of 28° and minimum of 3°.



**Figure 4. X-ray of 5 years follow up**

Average post-operative correction was of 10.4° and average loss of correction in final follow up is 3°. Severity of pain was assessed with VAS (visual analogue scale) 0 being no pain and 10 being the maximum amount of pain. Average pre-operative VAS score was 8 (max – 9, min – 6). Average final score was 2 with maximum of 5 and minimum of 1.

Two patients with ASIA score A didn't improve from the surgery. Patients with ASIA score B, C and D improved their neurological status. Pre-operatively there were 5 patients with AISA score E, and at final follow up there were 24 patients with ASIA E score. There was neurological improvement with 93% of the patients.

Table 1. Location and number of vertebrae involved

Level	Number	Number of vertebra involved			
		Single	Two	Three	Skip lesion
Dorsal	20	4	15	3	
Dorsolumbar	3	0	1	0	
Lumbar	7	0	7	0	
Total	30	4	23	3	1

Table 2. Neurological Evaluation

ASIA impairment score	No of patients Pre-op	No of patients Post-op
A	2	2
B	3	0
C	9	0
D	11	4
E	5	24

There were two cases of superficial wound infection that was treated with dressing and oral antibiotics. Two patients developed post-operative paralytic ileus and were treated with continuous nasogastric tube insertion and one patient developed chest infection. One patient developed occipital infarct in PCA territory with bilateral loss of vision and hemothorax. Patient was treated conservatively and gradually patient regained vision. One patient developed post-operative jaundice which recovered conservatively. No recurrence of the disease was observed.

## DISCUSSION

There is a still high incidence of tuberculosis, especially in developing countries, where the spine is involved more often than other skeletal site.

Regular antitubercular chemotherapy has been the key point for spine tuberculosis management, with surgical treatment when needed<sup>14</sup>. Anterior debridement, interbody fusion with grafts combining chemotherapy is an efficient method to cure spinal tuberculosis and to prevent the progression of kyphotic deformity. Without instrumentation the grafted bone may displace, be absorbed and a long period of external fixation may be required.<sup>11,12,14</sup> Rajasekaran<sup>12</sup> in his study observed graft slippage, fracture, absorption or subsidence in 59% of cases with anterior body fusion without instrumentation. Benli et.al.<sup>2</sup> had correction loss of 23° without instrumentation.

Previous studies<sup>2,14</sup> stated that indications for surgical treatment includes neurological involvement, progressive kyphotic deformity, evidence of radiological instability, back pain unrelieved by conservative treatment, presence of large abscess or sequestered bone. In our study indications for operation were neurological deterioration in 24 patients, intractable pain during a course of conservative treatment in 2 patients and increasing kyphotic deformity in 2 patients.

As mentioned by Tuli<sup>3</sup>, Sundararaj et.al.<sup>17</sup>, tubercular lesion is more common in dorsal spine than in lumbar and dorsolumbar spine. In our study 67% of patients had dorsal lesion, followed by lumbar in 23% and then in dorsolumbar in 10%.

Oga et.al.<sup>15</sup> concluded that active tuberculosis is not a contraindication for instrumentation. Hence the concept of instrumentation in Pott's spine was accepted and many studies have had good surgical outcome.

Among the different methods of instrumentation anterior debridement, grafting with anterior instrumentation is one of the effective treatment methods. Zhao et.al.<sup>14</sup> stated that cord decompression can be achieved directly and completely from anterior approach. Yadav and Prabhakar<sup>18</sup> stated that single column fixation in kyphotic body might result in kyphosis. However, other studies<sup>2,10,14</sup>

found 64%-78% kyphotic correction with less than 3° of correction loss and 92% neurological improvement in this method of instrumentation.

Anterior debridement, grafting and posterior instrumentation can also be done only from posterior incision. It might be posterolateral or transpedicular. Laheri et.al.<sup>19</sup> had 62% kyphotic correction and 3.2% correction loss with this method. There was 3.5% graft slippage requiring repositioning, 4.3% neurological deterioration, 7.1% dural tear.

Anterior debridement, grafting and posterior instrumentation through separate approaches has an advantage of direct and complete cord decompression and rigid three column stabilization. In staged surgery, if anterior decompression and grafting is first done followed by secondary posterior instrumentation there is a chance of graft related complications<sup>17,13</sup>. In other way posterior instrumentation can be done first followed by anterior decompression and grafting in later stage. Main aim of the surgical treatment in spinal tuberculosis is neural decompression and then stabilization. In this method neural decompression is delayed, which might be the cause of less neurological recovery. In performing anterior debridement, grafting and posterior instrumentation in single stage direct visualization of graft can be done while compressing the graft from posterior instrument. This prevents graft related complications<sup>17,13,18</sup>. Many studies have shown good results with 54%-64% kyphotic correction and 2°-3° correction loss and 92% neurological recovery.<sup>9,13,17,18</sup>

In our study we had 54% kyphotic correction, 3° correction loss in final follow up with 93% neurological recovery with no recurrence of disease.

## CONCLUSION

Single stage anterior debridement and interbody fusion the posterior instrumentation can be performed safely to achieve satisfactory clinical and radiographic outcomes in patients of thoracic and lumbar tuberculosis.

## REFERENCES

1. World Health Organization. Stop TB annual report 2001. Geneva: WHO, 2002

2. <[http://www.emro.who.int/stb/technicalpapers/morocco03/Final\\_report2001.pdf](http://www.emro.who.int/stb/technicalpapers/morocco03/Final_report2001.pdf)>.
3. Benli IT, Acaroglu E, Akalin S, Kis M, Duman E, Un A. Anterior radical debridement and anterior instrumentation in tuberculosis spondylitis. *Eur Spine J* 2003;12(2):224-34.
4. Tuli SM. Tuberculosis of the skeletal system (Bone, Joints, Spine and Bursal Sheaths, 4th edn. New Delhi; Jaypee Brothers;2010.p.193-353.
5. Talbot JC, Bismil Q, Saralaya D, Newton DAG, Frizzel RM, Shaw DL. Musculoskeletal tuberculosis in Bradford – a 6-year review. *Ann R Coll Surg Engl* 2007;89:405-9.
6. Hodgson AR, Stock FE, Frog HSY, Ong GB. Anterior spinal fusion: The operative approach and pathological findings in 412 patients with Pott's disease of the spine. *Br J Surg* 1960;48:172-178.
7. Mehta JS, Bhojray SY. Tuberculosis of thoracic spine. *J Bone Joint Surg* 2001;83-B:859-63.
8. Guirguis AR. Pott's paraplegia. *J Bone Joint Surg* 1967;49-B:658-67.
9. Lifeso RM, Weaver P, Harder EH. Tuberculosis spondylitis in adults. *J Bone Joint Surg* 1985;67-A:1405-13.
10. Moon MS, Woo YK, Lee KS, Ha KY, Kim SS, Sun DH. Posterior instrumentation and anterior interbody fusion for tuberculous kyphosis of dorsal and lumbar spine. *Spine* 1995;20(17):1910-16.
11. Yilmaz C, Selek HY, Gurkan I, Erdemli B, Korkusuz Z. Anterior instrumentation for the treatment of spinal tuberculosis. *J Bone Joint Surg* 1999;81-A:1261-67.
12. Tulu U, Gogus A, Ozturk C, Hamzaoglu A, Domanic U. The role of posterior instrumentation and fusion after anterior radical debridement and fusion in the surgical treatment of spinal tuberculosis: experience of 127 cases. *J Spinal Disord Tech* 2006;19(8):554-59.
13. Rajasekaran S, Soundarapandian S. Progression of kyphosis in tuberculosis of the spine treated by anterior arthrodesis. *J Bone Joint Surg* 1989;71-A:1314-23.
14. Mukhtar AM, Farghaly MM, Ahmed SH. Surgical treatment of thoracic and lumbar tuberculosis by anterior interbody fusion and posterior instrumentation. *Med Princ Pract* 2003;12:92-96.
15. Zhao J, Lian XF, Hou TS, Ma H, Chen ZM. Anterior debridement and bone grafting of spinal tuberculosis with one stage instrumentation anteriorly or posteriorly. *Int Orthop* 2007;31:859-63.

16. Oga M, Arizono T, Takasita M, Sugioka Y. Evaluation of the risk of instrumentation as a foreign body in spinal tuberculosis. Clinical and biologic study. *Spine* 1993;18(13):1890-94.
17. Maynard FM, Bracken MB, Greasey G, Ditunno JF, Donovan WH, Ducker TB, Garber SL, Marino RJ, Stover SL, Tator CH, Waters RC, Wilberger JE, Young W. Spinal Cord 1997;35:266-74.
18. Sundararaj GD, Behera S, Ravi V, Venkatesh K, Cherian VM, Lee V. Role of posterior stabilization in the management of tuberculosis of the dorsal and lumbar spine. *J Bone Joint Surg* 2003;85-B:100-06.
19. Jadav B, Prabhakar MM. Primary posterior fixation for tuberculosis spine. *Int J Orthop Surg* 2008;10(1):36-40.
20. Laheri VJ, Badhe NP, Dewnany GT. Single stage decompression, anterior interbody fusion and posterior instrumentation for tuberculous kyphosis of the dorsal-lumbar spine. *Spinal Cord* 2001;31:429-36.



**CORRESPONDENCE:**

Dr. Bimal kumar Pandey  
Department of Orthopaedics  
Kathmandu Medical College Teaching Hospital  
Sinamangal, Kathmandu, Nepal  
E-mail address: bimalpandey@hotmail.com