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ORIGINAL ARTICLE

Functional Outcome of Posterior Transpedicular Screw Fixation among Patients Presenting with Spinal Tuberculosis

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ABSTRACT

Material and Methods; A series of descriptive case was completed at Neurosurgery Department Nishtar Hospital Multan. The time period for this study was from November 2014- September 2016. After registering the patients, under the supervision of an expert neurosurgeon results of all the clinical examinations, and medical history were recorded. The medical record reported forty-one consecutive patients were treated with one-stage posterior debridement, transpedicular fixation suffering from monosegmental lumbar spinal tuberculosis, between December 2014-August 2016, were prospectively analyzed.

Results; Forty one patients were observed for this procedure 25 (61%) were male patients and 16 (39%) of the patients were female with their mean age was 29.58 years ±2 years. The average time between follow-ups was 13.6 ±2.7 months. The average pain score preoperatively was 9.2 ± 2.13 on the VAS scale and postoperatively was 2.5 ± 1.32. This decrease in back pain was statistically significant (0.05142, P > 0.05) and Complication rate was 7.31 % in these patients

Conclusion; Our results support one stage posterior fixation procedure with pedicle screw in adults with lumbar spinal tuberculosis as it is safe, effective and yields desired functional outcome.

Keywords; Spinal Tuberculosis, Transpedicular screw fixation, posterior debridement.

INTRODUCTION

The reception of the evidences for the tuberculosis is at the rising trend throughout the world, especially in developing countries. Spinal tuberculosis (ST) is severe kind of skeletal tuberculosis which occurs very frequently in adults[1,2]. The most commonly affected spine is thoracolumbar spine, involving less frequent of the sacral and spinal cervical[3,4]. Involvement of the posterior vertebral body causes cavitations and an extradural mass. The disc space is eventually destroyed, but at a slower rate than pyogenic infection[5]. In the 2nd, 3rd, or 4th decade of life, Tuberculous spondylitis is diagnosed, having male-to-female ratio as1.3 : 1 to 1.7 : 1[2,4,6–8]. Neurologic deficits including kyphotic malformations are common complication of the condition[9].

Advancement of computed tomography (CT) scanning and MRI has enabled early diagnosis of spinal tuberculosis [10–16].Moreover; such effective chemotherapy regimes for anti tuberculosis are available which are very effective. So for this disease the strategies of treatment have been revised[17,18] and in recent years, has become more conservative[12,17–21]. Now, the standard medical treatment is rifampin and isoniazid set for a time period of nine months (for resistant strains, streptomycin is additional, for the first 3 months)[4].

Surgical treatment is recommended for failure to respond to antibiotics after 3–6 months, no improvement, or deterioration, in neurological function after a trial of antibiotics, posterior spinal involvement, spinal instability, recurrent disease, or recurrent neurological deficit[22]. The advantages of radical excision and fusion include a shortened recovery time and a smaller degree of deformity, including improved vertebral body height[2,6,22].

Latest instrumentation for transpedicular proves that it can provide effective stabilization to the lumbar spine and thoracolumbar[23–28]. Despite the fact that the majority of published papers favor the anterior method along with anterior fusion and radical debridement as it was observed that this infection usually placed in the anterior column, so the posterior approach reported by other authors has in recent times gained popularity with remarkable clinical success[13–16].

But, anterior debridement can cause reduction in the spinal biomechanical stability and residual kyphosis is found at the end of treatment[6]. But, past studies has proved that these combined procedures took longer surgery time, moreloss of blood, greater postoperative complications, and hospital stay for longer period of time[11,12].

MATERIAL AND METHODS

Neurosurgery department Nishtar Hospital Multan was chosen for this descriptive case series study.The time period for this study was fromNovember 2014-September 2016. After registering the patients, under the supervision of an expert neurosurgeon results of all the clinical examinations,andmedical historywere recorded. The medical record reported forty-one consecutive patients were treated with one-stage posterior debridement, transpedicular fixation suffering from monosegmental lumbar spinal tuberculosis, between December 2014-August 2016, were analyzed. It was decided that those patients would be consider who exhibit following indications: (1) unresponsive to chemotherapy and persistent back pain for last two months (2) Appearance of gradual angular deformity (≥30°) or instability and neurological deficit appeared. (3)Involvement of multilevel vertebrae where only single center was debrided and short bone fusion less than two levels had performed. (4) Patients with poor health conditionswho couldn't bearso much trauma(5) patients whose anterior procedure surgery had performed and theiranatomical structure was not clear. Those patients were excluded who exhibited the following conditions. (1) absence of neurological deficits; (2) multi focus centersor in which anterior long-segment bone fusion is requiredand which cause deep muscle abscesses 3) patients having severe kyphosis deformity which requires combined posterior and anterior surgery.

CT scanand, MRI examinations before surgery revealedthe presence of smaller intervertebral space, monosegment vertebral bone destruction, uneven bone signals, paravertebral abscess, and Para spinal abscess formation. Patients were placed in prone position after administration of general anesthesia. Back skin incision from midline linear was performed. For stabilization and correction of kyphosis pedicle screw system was installed in every patient, at least two levels above and below the decompression level. Antituberculous chemotherapy regimen treatment was done to patients for 9-12 months. Patients were called for follow up every two weeks for three months and then after 6 months each. All required investigations like ESR and CRP levels were assessed along with plain radiograph to assess functional outcome of the procedure. The nerve function was evaluated using Frankel Scale

while back pain was evaluated using pre-validated visual analogue scale (VAS). The patients who satisfied the subsequent standards were labeled as Cured; "(1) disappearance of clinical symptoms with the ability to return to normal activities; (2) improvement in kyphotic correction (3) ESR and CRP decrease to normal levels; and (4) no recurrence of spinal tuberculosis appearing one year after surgery".

All of the study was done by the utilization of SPSS Version 20.0. The statistical analysis was performed by applying Chi-square test and results were recorded. P value less than 0.05 was considered as baseline.

RESULTS

Forty one patients were observed for this procedure 25 were male patients and 16 were female patients. The average age was figured outabout 29.58 years ±2 years as shown in table 1. The recorded average operative time was 193.24 ± 26 min (range 149–255 min) and average loss of blood was 779.26 ± 394mL (range 400–1800 mL). The average postoperative recumbence period was 2.9±1.6 days. The average preoperative CRP values and ESR were 45 ± 15 mm/h (range 25–115 mm/h) and 29 ± 15mg/L (15–145mg/L), respectively. In these patients operated through the posterior approach, the kyphotic angle preoperatively ranged between 11.95°-26.4° with an average of 15.7°±2.5°and improved in the immediate postoperative period to 9.54 ± 2.84°. It is noteworthy that after 6 months from surgery little loss of correction angle was observed at the final follow-up (7.5° ±3.84°). The rate of hardware failure was 4.87 % as it was observed in just two cases.

Table 1: Cross tabulation of age with respect to gender

Age groups (In Years)	Gender		P value
	Male (n = 25)	Female (n = 16)	
22 – 30	09	07	0.002
31 – 40	07	05	
41 – 50	05	03	
51 – 70	04	01	
Total	41		

Table 2: Cross tabulation of hardware failure with respect to gender

Hardware failure	Gender		P value
	Male (n = 25)	Female (n = 16)	
Yes	01	01	0.74
No	24	15	
Total	41		

Table 3: Cross tabulation of infection with respect to gender

Infection	Gender		P value
	Male (n = 25)	Female (n = 16)	
Yes	02	01	0.478
No	23	15	
Total	41		

Table 4: Frankel scale evaluated neurological outcomes. Frankel scale was calibrated in grades as A to E whichis defined as follows.

Frankel Grade	Description
Frankel A	Complete power and sensation loss
Frankel B	Only sensation present
Frankel C	Some power but cannot walk
Frankel D	Decrease pain but can walk
Frankel E	Normal movement

Table 5: The preoperative and postoperative follow up of neurological function was evaluated by Frankel scale.

Frankel Grade	A	B	C	D	E
Preoperative	0	4	4	24	9
Postoperative	0	2	3	19	17
X^2 value	29.2				
P value	0.000				

The rate of infection was observed in 03 cases thus making the rate as 7.31 %. Clear improvement in the clinical neurological status was observed postoperatively as-compared to preoperative status. Table 5 shows the improvement in preoperative clinical status compared with the postoperative clinical status according to the Frankel scale. Back pain was present in 41 cases preoperatively. The average pain score preoperatively was 9.2 ± 2.13 on the VAS scale and postoperatively was 2.5 ± 1.32. The cases operated upon by means of the anterior approach evidenced more reduction in the VAS scale compared with those operated upon by the posterior approach, but the difference was statistically insignificant.

DISCUSSION

Spinal TB still remains to be point of concern which exists predominantly in underdeveloped countries. The ultimate aim of surgical management is local cure of TB, decompression of neuronal tissues and restoration of the normal spinal anatomy. Anterior approach was introduced by Ito et al, for the first time, for Spinal tuberculosis by performing anterior debridement coupled with posterior fusion that was quite commonly used for the treatment of this disease[13]. The surgical therapy of spinal tuberculosis in recent years has adapted same protocols using only one approach undergoing surgeries [14]and hencehave become an alternative management procedure for the treatment of Spinal Tuberculosis.

It was reported by Zhang et al.[15] that single-stage posterior technique may provide more acceptable outcomes than posterior approach.

In current study, authors have performed the surgical procedure comprising"one-stage posterior debridement, fixation with pedicle screw" in patients having lumbar spinal TB and monosegmental thoracic. The average time of the surgical procedure was 196.53 ± 28.34minutes showing average blood loss of 770.58 ± 23.52 ml. Pu et al [16] reported that the mean duration of procedure as well as mean levels of loss of blood were lowerthan.

It was reported by Ma et al.[17] that single-stage posterior debridement and internal fixation in patients resulted in a satisfactory neurological outcome that was similar to that of the result obtained by anterior decompression. For the correction of deformity most of the studies has declare posterior approach as a superior one than the anterior procedure.The Frankel scores were higher, significantly, at the final follow-up visit than those before surgery, in the current research.(P< 0.05). The outcomes matched those of Zhang et al.'s investigation[18]. The Visual Analogue Scale score of the patients was reduced to 2.5 atfinal follow-up visit while it was at 9.2 before the surgery. Within three months after surgery, the Erythrocyte Sedimentation Rate and C-Reactive Protein levels had dramatically dropped. In the current research, the average kyphotic Cobb's angle before and after surgery were15.7°± 2.5°and 7.5 ± 3.84° , with the significant difference (P< 0.05). At the final follow-up (P =0.542) there was no significant loss of deformity correction was seen. The outcomes matched those of Zhang et al.'s investigation[19].

CONCLUSION

The technique of transpedicular screw fixation, one-stage posterior debridement is safe and effective process to treat the monosegmental lumbar spinal Tuberculosis, surgically in adults. Though outcomes of this research exhibited thecorrection and maintenance of kyphosis at the final follow-up, but it was the case of short-term follow up only. There is much room for further study considering the sample of large number of patients with longer follow-up.

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