

Anterior Approach to the Thoracic and Thoracolumbar Spine: A Prospective Study in Our Hospital

Sarang Gotecha, MD., Prashant Punia, MD., Deepak Ranade, MD., Anil Patil, MD., Ashish Chugh, MD., Megha Kotecha, MD.

Department of Neurosurgery, D. Y. Patil Medical College and Hospital, Pimpri, Pune, India.

ABSTRACT

Background Data: Anterior approaches to the thoracic and thoracolumbar spine have several advantages including direct access to the lesion, less surgical bleeding, low risk of infection, and shorter segment fixation devices. It provides excellent visualization and access to the anterior thoracic spine, vertebral bodies, intervertebral disks, spinal canal, and nerve roots and may improve neurological outcome.

Purpose: To evaluate various outcome parameters of the anterior approach to the thoracolumbar spine of various pathologies.

Study Design: Prospective clinical case study.

Patients and Methods: Thirty patients were included in this study. Patients with infections, malignancy, and trauma were included, while patients with medical comorbidities, extensive several spinal levels disease, posterior tension band injury and translational or rotational injury, and severe osteopenia or osteoporosis were excluded. The evaluation included the demographic data, clinical features, level of injury, and neurological status of these patients. All patients underwent operation through the anterior thoracolumbar approach. Outcome parameters included preoperative and perioperative data and postoperative ASIA, VAS, SCIM, and ODI.

Results: The age of patients was 46.06 ± 12.2 (range, 20–70) years. Twenty patients were males and 10 were females. Most patients were 41–50 and >50 years. Thirteen patients (43%) suffered from traumatic fractures (M:F 3.3:1), 14 (47%) tuberculous spondylodiscitis (M:F 1.8:1), and 3 (10%) metastatic compression fracture. Surgical time was 213.12 and 201.43 minutes in Rt and Lt side approach, respectively, while blood loss was 609.4 and 650 ml in Rt and Lt side approach, respectively. In the whole group, pre- and postoperative sensory ASIA score was 91.53 and 105.8; motor ASIA score was 66.2 and 77.13; VAS was 5.13 and 0.63; SCIM was 30.93 and 76.13; ODI was 74 and 16.53, respectively. Complications included wound infection (N=3), kyphosis (N=3), intraoperative vascular injury (N=2), new neurological deficit (N=2), and myocardial infarction (N=1).

Address correspondence and reprint requests: Prashant Punia, MD.

Department of Neurosurgery, D. Y. Patil Medical College and Hospital, Pimpri, Pune, India.

Email: getdrprashant@gmail.com

Submitted: February 28th, 2020.

Accepted: March 28th, 2020.

Published: April, 2020.

The article does not contain information about medical device(s)/drug(s).

No funds were received in support of this work.

The authors report no conflict of interest.

Conclusion: Anterolateral approach in thoracic and thoracolumbar pathologies achieves adequate decompression, pathological evaluation for tissue, the possibility for instrumentation, and favorable neurological outcome. The familiarity and experience of the surgeon with the approach will always remain a cornerstone for the success of the procedure. (2020ESJ204)

Keywords: Anterior approach; Thoracic; Thoracolumbar; Trauma; Infection.

INTRODUCTION

Surgical approaches to the spine might be simply classified into anterior, posterior, or a combined approach. Each has its role and the choice of the best approach depends on several factors, such as the level of the disease in the spine, the extent of the lesion, and the need of spinal reconstruction or stabilization.⁸

Anterior spine exposure may be used alone or in combination with a posterior midline approach in a staged or sequential fashion. The anterior approach presents several advantages including direct access to the lesion, less surgical bleeding, low risk of infection, and the use of shorter segment fixation devices.¹² Thoracotomy provides the spine surgeon with excellent visualization and access to the anterior thoracic spine, the vertebral bodies, intervertebral disks, spinal canal, and nerve roots. Only the contralateral pedicle and posterior elements are inaccessible through this approach.¹³ The approach is currently used in the surgical treatment of thoracic disk disease, vertebral osteomyelitis or discitis, fractures of the spinal column, and tumours of the vertebral bodies, allowing for proper decompression of neural elements and spine stabilization.^{20,21}

The posterior approach poses some technical inadequacy, with recurrence rates higher than the anterior approach. In fractures causing angular deformity, the anterior approach has been proposed as the appropriate method. In fragmented fractures of the thoracolumbar spine, corpectomy with anterior approach and grafting is an effective treatment modality.¹³ Anterior approach not only provides a very good exposure to allow for decompression of the spinal canal but also helps in improving the neurological status

in patients with neurological deficits. However, morbidity, which is mostly respiratory (atelectasis, respiratory failure, etc.), is more frequent with the anterior approach.¹⁹

The purpose of this prospective study was to evaluate the efficacy and to assess the complications associated with the anterior approach to the thoracic and thoracolumbar spine.

PATIENTS AND METHODS

This prospective study was carried out at Patil Hospital, Pune, from November 2013 to January 2016 on 30 patients. Patients included in this study suffered from tuberculosis spondylodiscitis, vertebral metastatic disease, and unstable traumatic vertebral fracture. Patients excluded from the study had medical comorbidities such as severe pulmonary or cardiac disease, an extensive disease involving several spinal levels, posterior tension band injury and translational or rotational injury, and severe osteopenia or osteoporosis.

After full physical and neurological assessment and radiologic confirmation, all eligible patients meeting the inclusion criteria were subjected to the procedure. Written and informed consent was taken from all patients for the procedure. Preoperative assessments included pulmonary function tests and blood gas analyses for preoperative and postoperative care and evaluation of the cardiac status. For preoperative evaluation, the demographic data, clinical features, level of injury, and neurological status of these patients using American Spine Injury Association (ASIA) impairment scale and evaluation of pain using the Visual Analog Scale (VAS) were noted. Functional status using the Oswestry Disability Index (ODI) and the Spinal Cord Independence

Measure (SCIM) was also recorded. Preoperative and postoperative radiological assessment included X-rays (AP and lateral views) and MRI of the clinically suspected level of pathology. Intraoperative evaluation was comprised of the evaluation of blood loss and operative time.

Postoperative evaluation of neurological status of these patients was carried out using ASIA impairment scale, evaluation of pain using VAS, functional status using ODI, and the SCIM on 3-month intervals. Postoperative complications were also reported. Patients were scheduled for routine outpatient clinical follow-up where postoperative clinical assessment and plain radiographs were done at 3 months. MRI scans were ordered for all patients 3 months after the procedure.

Surgical Technique (Figures 1–3)

Position. Patient was placed in a direct lateral position with shoulders and hips perpendicular to the floor, to assist with accurate screw placement. The kidney rest is at the apex of the thoracolumbar deformity and is elevated to prevent the spine sagging between the chest and the pelvis when in the lateral position. Operating from either the standard left side of the patient or right side was based on the comfort and confidence of the operating surgeon.

Incision Level. Generally, the rib resected in the thoracotomy and thoracoabdominal incision should be two levels above the lesion. Lesions of T11 and above require thoracotomy and only lesions of T12 to L2 require a thoracoabdominal approach, while lesions of L3 can be managed through a 12th-rib incision that does not require opening of the chest.

Vertebral Column Dissection. Segmental vessels should be ligated over the three levels (the affected one and proximal and distal vertebrae for instrumentation). The segmental vessel should be ligated at the mid-lateral level of the vertebral body. The surgical exposure should demonstrate the anterior and lateral side of the body from where the approach is being made. In the lumbar spine, the psoas needs to be mobilized. In the

chest, the rib head of the relevant vertebral bodies should be respected, to allow identification of the pedicle and the foramen and to assist with anatomical landmark identification. Anteriorly, the vertebral body should be displayed beyond the midline. Dissection is best achieved at the level of the disc where there is minimal vascularity.

Vertebrectomy. The disc above and below the vertebra is resected back to the posterior portion of the disc. The vertebral body is then removed at the front and the left side back to the canal. Dissection into the canal starts inferiorly and should be carried across the opposite side so that the neural elements do not bulge out and obscure the view. The maximum compression of the neural elements is normally at the proximal level of the involved vertebral body. Dissection proceeds proximally to resect the fragment that is wedged between the two pedicles. The rest of the discs above and below the lesion are resected to demonstrate posterior longitudinal ligament or dura. The pedicles on each side must be identified to demarcate the lateral extent of the decompression. The canal above and below the relevant disc should be probed to confirm decompression. Dissection must be far enough across the vertebral body to allow central seating of a cage or reconstruction device.

Reconstruction. The screws of the stabilization device must be placed above and below the vertebra resected. They should be placed parallel to the relevant endplates. The corpectomy site should be distracted with vertebral body spreaders. The screws can be used to stabilize the distraction when the reconstruction device is placed. Cages filled with bone obtained from the vertebral body resection or augmented with rib graft are used to fill the corpectomy space.

Closure. Chest tube drains (two) were required if thoracotomy has been performed. Strong nonabsorbable circum-costal sutures can be useful to reapproximate the ribs and this is assisted by lowering the kidney rest.

Postoperative Management. The patient should be nursed supine and log-rolled for comfort. The chest drains are removed when X-rays show that

the lung is expanded and the drainage reduced. A TLSO (thoracolumbosacral orthosis) is then applied and maintained for three months after surgery.

Postoperative Complications. Any abnormal postoperative event including either minor or major complications was reported and if none was noticed, patient was discharged from the hospital and scheduled for outpatient follow-up.

Statistical Analysis

All the data were analysed using SPSS (Statistical Package for Social Science) version 17. Chi-squared test was used to find the significance of association of various parameters. *P*-value of <0.05 was statistically significant.

RESULTS

In our study, the mean age was 46.06 ± 12.2 (range, 20–70) years. Twenty patients were males and 10 were females with a clear male preponderance. Most patients belonged to the age group 41–50 years (26.67%) and >50 years (26.67%) (Table 1). The most common complaint was pain which was present in all the patients (100%), followed by loss of function (93.33%), motor deficit (90%), sensory deficit (66.67%), bladder involvement (60%), and bowel involvement (33.33%).

Pott's spine (47%) was the most common aetiology, followed by a traumatic fracture (43%), and the metastatic compression fracture (10%) was the least (Table 2). Sixteen (53%) patients underwent operation on the right side, while 14 (47%) patients had the surgery on the left side. The most common level of the involved pathology was L1 (Table 3). Out of the 13 traumatic fracture cases, 9 patients (69.2%) had injuries in the thoracolumbar region. In our study, the levels affected by tuberculous spondylodiscitis were as follows: D12-L1 in 4 patients; D11-D12 and L3-L4 in 3 patients; and D6-D7, D10-D11, and L4-L5 in one patient each. Mean time of surgery on the right-side approach was 213.13 ± 20.24 minutes, while the mean blood loss was 609.4 ± 133.2 ml. Mean time of surgery on

the left side was 201.43 ± 31.40 minutes, while the mean blood loss was 650 ± 154.4 ml.

The mean preoperative sensory ASIA score was 91.53 ± 15.38 , while the mean postoperative sensory ASIA score was 105.80 ± 5.93 , suggesting significant postoperative improvement in sensory symptoms (Wilcoxon *Z* value: 3.99; *P*-value <0.0001). The mean preoperative motor ASIA score was 66.20 ± 9.46 , while the mean postoperative motor ASIA score was 77.13 ± 7.48 , showing significant postoperative improvement in motor symptoms (Wilcoxon *Z* value: 4.65; *P*-value <0.0001).

The mean preoperative VAS score was 5.13 ± 1.01 , while the mean postoperative VAS score was 0.63 ± 0.61 , which suggests significant postoperative improvement in pain symptoms (Wilcoxon *Z* value: 4.82; *P*-value <0.0001). The mean preoperative SCIM score was 30.93 ± 4.18 , while the mean postoperative SCIM score was 76.13 ± 3.48 which is statistically significant (Wilcoxon *Z* value: 4.79; *P*-value <0.0001). The mean preoperative ODI score was 74 ± 5.09 , while the mean postoperative ODI score was 16.53 ± 2.67 (Wilcoxon *Z* value: 4.80; *P*-value <0.0001).

Reported complications in this study included wound infection (N=3), kyphosis (N=3), intraoperative vascular injury (N=2), new neurological deficit (N=2), and myocardial infarction (N=1) (Table 4). Wound infection was superficial and healed well with proper wound care with daily dressings and 2 weeks course of parenteral cephalosporins. Two of the patients who suffered from residual kyphosis with mild back pain refused further surgery and continued conservative therapy, while the 3rd patient had posterior surgical correction with good recovery. Intraoperative vascular injury was reported in two patients: one patient underwent operation from right side and the other from the left side. Both patients had common iliac vein injury intraoperatively and were managed by direct repair by an attendant vascular surgeon. New neurological deficit was reported in 2 patients: one patient underwent operation from right side

and the other from the left side. Both patients deteriorated from ASIA grade C preoperatively to ASIA grade B immediately postoperatively; subsequently, both were managed conservatively as their postoperative imaging did not show any significant compression on the spinal cord. Both patients showed partial improvement to ASIA grade D power at a 6-month postoperative

follow-up. A case of myocardial infarction was reported on the 10th postoperative day in a patient operated on from the right side, wherein, after the initial resuscitation, patient was transferred to the cardiology unit for further management. Comparing the reported complications in patients operated on from the right side and the left side showed no statistically significant differences.

Table 1. Age and sex distribution of cases in study group.

Age (Years)	Male (%)	Female (%)	Total (%)
20–30	5 (16.67)	2 (6.67)	7 (23.33)
31–40	5 (16.67)	2 (6.67)	7 (23.33)
41–50	6 (20)	2 (6.67)	8 (26.67)
>50	4 (13.33)	4 (13.33)	8 (26.67)
Total	20 (66.67)	10 (33.33)	30 (100)

Table 2. Aetiology and sex distribution of cases in study group.

Aetiology	Male	Female	Total
Metastatic compression fracture	1	2	3
Unstable traumatic fracture	10	3	13
Tuberculous spondylodiscitis	9	5	14
Total	20	10	30

Table 3. Level of pathology distribution of cases in study group.

Level	No. of cases	%
D6	1	3.33
D6-D7	1	3.33
D8-D9	1	3.33
D9	1	3.33
D10	4	13.33
D10-D11	1	3.33
D11-D12	3	10
D12	1	3.33
D12, L1	5	16.67
L1	6	20
L2	2	6.67
L3-L4	3	10
L4-L5	1	3.33
Total	30	100

Table 4. Side of surgery and complication distribution in study patients.

Complication	Side of surgery		Z Value	P-value
	Right (N=16)	Left (N=14)		
Wound infection	2 (12.50%)	1 (7.14%)	0.49	>0.05
Kyphosis	2 (12.50%)	1(7.14%)	0.49	>0.05
Intraoperative Vascular injury	1 (6.15%)	1 (7.14%)	0.10	>0.05
New deficit	1 (6.15%)	1 (7.14%)	0.10	>0.05
Myocardial infarction	1 (6.15%)	0	1.03	>0.05

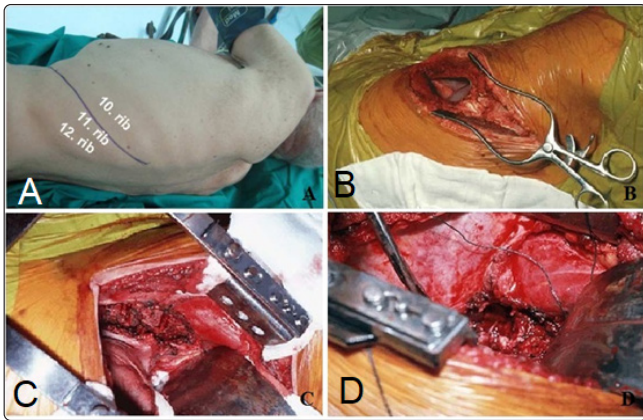


Figure 1. (A) Operative photo showing patient placed in the lateral decubitus position in 10°–15° oblique chest position rotated posteriorly with the left side up. (B) Skin and subcutaneous tissue are opened from the lateral border of the paraspinal musculature to costal cartilage junction over the rib to be resected. (C) Thoracoabdominal approach via a lower rib thoracotomy, lung and diaphragm being visible, and the costal cartilage divided representing a useful landmark for later wound closure. (D) Thoracolumbar spine displayed with mobilization of psoas, discectomy performed at the levels above and below the fracture, and corpectomy with display of the dural tube partially covered with gel foam.

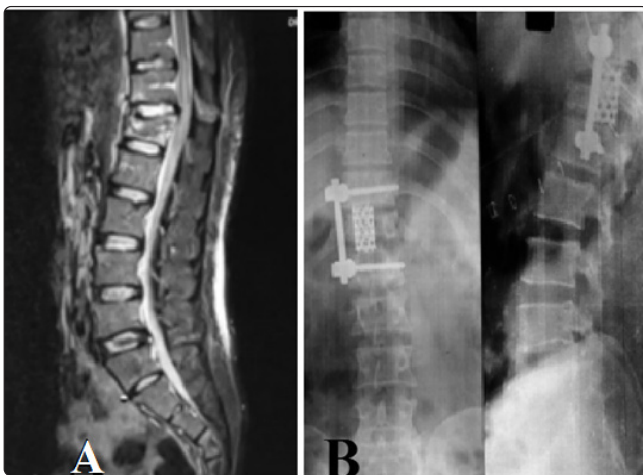


Figure 3. (A) Preoperative T2 sagittal MRI showing T12 compression fracture with retropulsion of the fractured segment causing neural compromise. (B) Postoperative anteroposterior and lateral views plain radiographs showing anterolateral decompression, reconstruction, fusion, and fixation.

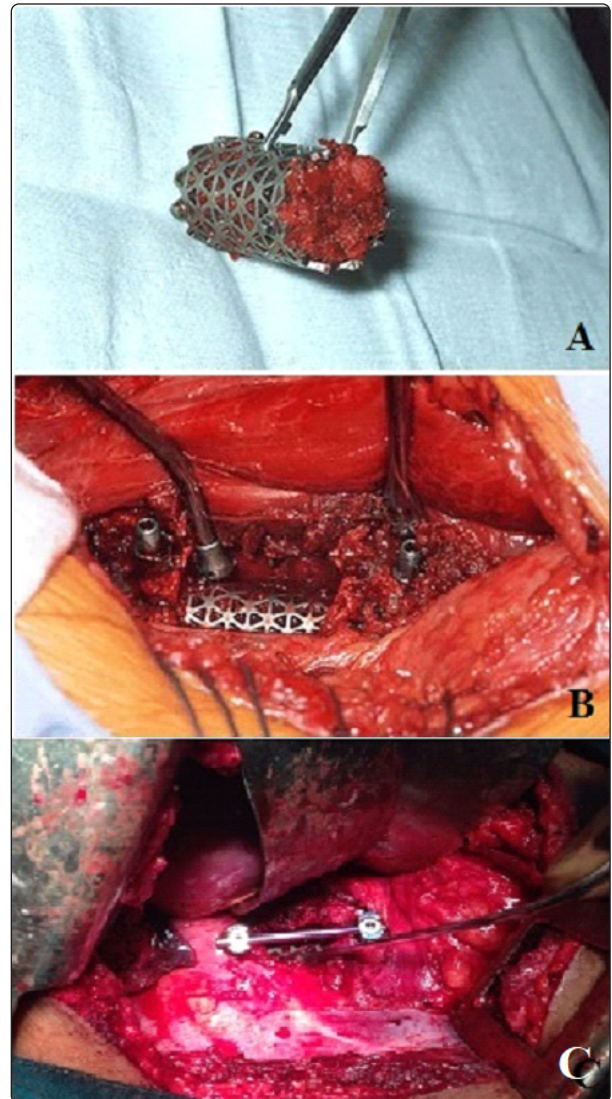


Figure 2. (A) Operative photo showing titanium mesh cage packed with autogenous cancellous bone resected from the fracture site. (B) Cage placed at the corpectomy site and bolts for the lateral stabilizing plate are in situ at the vertebra above and below; the canal and dural tube are obscured by gel foam. (C) The cage, screws, and rod placement after full anterior column reconstruction.

DISCUSSION

In our study, there were 10 males and 3 females in the posttraumatic fracture group (M:F = 3.33:1). Men are more likely to have injuries due to their professions or recreational activities. The risk-taking behaviour of men is well documented. Male gender, as a risk factor for traumatic spine fractures, has been reported in National Longitudinal Data of Thoracolumbar Fractures in Sweden by Jansson et al.¹⁵ Similar results were also shown by Roche et al.²⁶ In developing countries, Fairbank et al.⁹ reported a ratio of 2.77:1.

A slight preponderance to male sex was observed where there were 30 patients, out of which 20 were males and 10 were females with male to female ratio being 2:1, whereas Anderson et al.¹ reported an almost equal incidence in both sexes (0.9:1). On the other hand, Hsu et al.¹⁴ reported a female preponderance with male : female ratio being 0.4:1. In our study, there were 14 patients of Pott's spine of which 9 patients were males and 5 were females (M:F ratio, 1.8:1) compared to studies by Ramirez et al.²⁴ and Kashani et al.²³, which were 1.6:1 and 1.3:1, respectively. Garg et al.¹⁰ reported a higher incidence of in males with the male to female ratio being 2.9:1. Higher incidence of females was observed in the Pott's spine group by Riemer et al.²⁵ with 0.3:1 as the M:F.

Moreover, in our study, there were 3 cases of metastatic compression fracture of which 2 were female patients and 1 was male patient but was not compared to our studies because of the very small sample size.

In the current study, the patients' age ranged from 20 to 70 years with a mean age of 46.06 years. In a similar study conducted by De Giacomo et al.⁸, the mean age of the patients was 49.6 years which was comparable to our study. Traumatic spine injuries require high-energy trauma for their occurrence. Such accidents are known to be more common in younger age groups. In our study,

the most common age group of traumatic spine injury was 20 to 45 years (11/13 patients—84.6 patients) with a mean age of 38.3 years. Chabok et al.⁶ reported the most common age group age as 25–44 years with mean age of 38.2 years which is comparable to our study. A mean age of 41.35 years and 41.74 years was reported in Li et al.¹⁸ and Bajracharya et al.³, respectively. Moreover, the incidence of metastatic spinal fractures was seen in the elderly age group (mean age of 69.3years) which is also consistent with literature.

Pain was the most common mode of presentation in patients with spinal fractures followed by motor deficit, sensory deficit, bladder involvement, and bowel involvement. In a study conducted by Sawan et al.²⁷, the patients in the study had a similar clinical profile.

The most common aetiology in our study was Pott's spine followed by posttraumatic fracture and metastatic compression fracture. In a study conducted by Anderson et al.¹, the various indications of surgery in their study were herniated nucleus pulposus (N=11), metastatic disease to the spine, osteomyelitis (N=10), spinal deformities (N=6), vertebral fractures (N=4), spinal abscess (N=2), Pott's disease (N=1), and liposarcoma (N=1). In a study by De Giacomo et al.⁸, the indications of surgery were traumatic fracture (N=20), malignancy (N=35), degenerative diseases (N=29), and correction of scoliosis (N=58). The higher incidence of Pott's spine in our country is due to the higher prevalence of tuberculosis in our country.

In our study, 16 cases (53.3%) were operated on from the right side and 14 cases (46.67%) from the left side. The mean time of surgery from the right side was 213.33 minutes with a standard deviation of 20.24 minutes and from the left side was 201.43 minutes with a standard deviation of 31.40 minutes. The duration of surgery from the right side or left side was statistically insignificant. The mean blood loss in operation from the right side was 609.4 ml with a standard deviation of 133.2 ml and from the left side was 650 ml with

a standard deviation of 154.4 ml which was also statistically not significant. The complications of surgery were wound infection and kyphosis which was seen in 2 patients operated on from the right side and one patient from the left side. Intraoperative vascular injury and new deficit were seen in one patient each operated on from the right and left side and myocardial infarction was seen in one patient operated on from the right side. Thus, the comparison of complications in patients operated on from the right side and left side was statistically insignificant. In this study, the side of surgical approach was decided according to the comfort and confidence of the operating surgeon and showed no significant difference between the right and left sides. Komanapalli et al.¹⁷ have suggested in their study that, in the absence of lateralising pathology, either a left- or a right-sided thoracotomy can be used safely. Additionally, Gavriiliu et al.¹¹, in their study in 2015, stated that the choice of anterior approach of the spine relies on a series of factors including surgeon's preference and he further illustrated his technique of anterior approach through the right side. This assertion is further strengthened in the study by Balasubhramaniam et al.⁴ where the authors operated on all cases from the right side. Furthermore, in the discussion (commentary) following the study by Anderson et al.¹ on thoracic approaches, the reviewer clearly points out that it does not make a great deal of difference whether inferior vena cava or the aorta is mobilised and thus either a left- or right-sided approach will get the surgeon where he wants and asserts that all can be done without any real difficulty.

Out of the 13 traumatic fracture cases, 9 patients (69.2%) had injuries in the thoracolumbar region. This is explained by the fact that the thoracolumbar junction is a mechanical transition zone between the stiff thoracic spine and the mobile lumbar spine. Numerous studies have reported similar results. Roche et al.²⁶ reported 53% of traumatic spine fractures at the thoracolumbar region. This was much lower compared to our study since their study series was inclusive of injuries to the

cervical spine. Similar results were reported by Chabok et al.⁶

In our study, the levels operated on for tuberculous spondylodiscitis were as follows: D12-L1 in 4 patients; D11-D12 and L3-L4 in 3 patients each; and D6-D7, D10-D11 and L4-L5 in one patient each. In a study conducted by Ramirez et al.²⁴ on the anterior approach to the thoracolumbar spine, the levels affected were as follows: T8-T9 in one case; T12 in 3 cases; L1 in one case; T12-L1 in 2 cases; L3 in one case. This was comparable to our study.

Increased blood loss and long duration of surgery have often been cited as a disadvantage of anterior approach. It increases the postoperative morbidity and often leads to multiple units of blood and blood products transfusion with its associated risks and morbidity. In our study, the mean blood loss and duration of surgery were 628.33 ± 146.9 ml and 207.67 ± 24.5 minutes, respectively. We had considered the duration of surgery from time of skin incision to end of skin closure.

Of the literature reviewed, the blood loss ranges from 390 ml²⁴ to 1878 ml.⁷ Similarly, mean duration of surgery ranges from 172.5 minutes¹⁹ to 324 minutes.²² In both, blood loss and duration of surgery, the range reported is wide. The older studies recorded higher values and later studies lower values, although, in a recent study on comparison between posterior and anterior management of thoracolumbar fractures, Aziz et al.² reported a mean operative time of 300 minutes for anterior approach. At our institute, we have improved the speed and skill of anterior approach over time. Thus, as we become more familiar with the technique of anterior approach, blood loss and duration of surgery can be reduced to less than half. With minimally invasive surgery, voluminous blood loss and duration of surgery may become historic.

The mean ASIA motor scores before surgery and at follow-up were 66.20 and 77.13, respectively. This improvement was statistically significant ($P < 0.0001$). Similarly, the improvement in mean

ASIA sensory scores from 91.53 to 105.80 was statistically significant ($P < 0.0001$).

In our study, the mean VAS scores preoperatively and at follow-up were 5.13 and 0.61, respectively. The mean SCIM score preoperatively and at follow-up were 30.93 and 76.13, respectively. The mean ODI score improved preoperatively from 74 to 16.53 at follow-up. The improvements in VAS, SCIM, and ODI score were statistically significant ($P = 0 < 0.0001$). Thus, in our study, anterior surgery has shown predictable outcomes as stated in literature.

Kaneda et al.¹⁶ have reported the largest series (N=150) of patients treated with anterior surgery. Ten patients with pseudoarthrosis, 9 patients with failure of device, and one patient intraoperative laceration of vena cava in one and deep infection were recorded. Superficial infection (N=3), postoperative urinary tract infection (N=3), atelectasis (N=10), transient dysesthesia (N=5), and sympathectomy effect on ipsilateral lower limb (N=15) have also been reported. On the other hand, McDonough et al.²⁰ reported only one patient with prolonged chest tube output (5 days). Recently Xu et al.²⁸ also demonstrated only 3 cases of prolonged chest tube removal with no other complications.

Kashani et al.²³ in their study of 23 patients experienced complications in 2 patients with superficial wound infections and one case of ureteral tearing. De Giacomo et al.⁸ in their study of 142 patients recorded the following complications in 21.8% of patients: pleural effusion in 7, bleeding requiring reoperation in 3, pulmonary atelectasis in 5, pneumonia in 3, wound infection in 6, atrial fibrillation in 4, chylothorax in 1, and cerebrospinal fluid leakage in 2.

Campbell et al.⁵ in their study of 128 patients studied early complications related to the thoracic and lumbar spine surgery. Deep wound infection was the commonest major complication and the most common minor complication was urinary tract infection. Other complications were graft malposition, myocardial infarction pulmonary

embolism, durotomy, new weakness, sepsis, and splenic rupture. In our study, we recorded 3 patients with wound infection, 3 patients with kyphosis, 2 patients each with complaints of intraoperative vascular injury and development of a new deficit, and one patient with myocardial infarction.

This study has some limitations which may affect the generalization of the results and mandate further future studies. The study group was not representative of the population of any particular region. The study did not have a control group of patients managed conservatively and its inclusion would have made the comparison more robust. Assessment of fusion status, assessment of vertebral canal compromise, and kyphosis measurement were not included in the study.

CONCLUSION

Anterolateral approach in thoracic and thoracolumbar pathologies achieves adequate decompression, pathological evaluation for tissue, possibility for instrumentation, and favourable neurological outcome. The familiarity and experience of the surgeon with the approach will always remain a cornerstone for the success of the procedure.

REFERENCES

1. Anderson TM, Mansour KA, Miller JJ: Thoracic approaches to anterior spinal operations: anterior thoracic approaches. *Ann Thorac Surg* 55:1447-1452, 1993
2. Aziz MM, Kotb A, Anwar H, Kattab M: Thoracolumbar fractures, posterior versus anterior management: A case series and literature review. *Egy Spine J* 30:12-22, 2019
3. Bajracharya S, Singh M, Singh GK, Shrestha BP: Epidemiology of spinal injuries in Nepal. *Indian J Orthop.* 41(4):286-289, 2007

4. Balasubramaniam S, Tyagi D, Zafar S, Savant H: Transthoracic approach for lesions involving the anterior dorsal spine: a multidisciplinary approach with good outcomes. *J Craniovertebr Junction Spine* 7(4):236–242, 2016
5. Campbell PG, Malone J, Sanjay Y, Maltenfort MG, Harrop JS, Sharan AD, et al: Early complications related to approach in thoracic and lumbar spine surgery: a single center prospective study. *World Neurosurgery* 73(4):395–401, 2010
6. Chabok SY, Safee M, Alizadeh A, Dafcachi MA, Taghinnejadi O, Koochakinejad L: Epidemiology of traumatic spinal injury: a descriptive study. *Acta Medica Iranica* 48(3): 308-311, 2010
7. Danisa OA, Shaffrey CI, Jane JA, Whitehill R, Wang GJ, Szabo TA, et al: Surgical approaches for the correction of unstable thoracolumbar burst fractures: a retrospective analysis of treatment outcomes. *J Neurosurg.* 83(6):977–983, 1995
8. De Giacomo TD, Francioni F, Diso D, Tarantino R, Anile M, Venuta F, et al: Anterior approach to the thoracic spine. *Interactive Cardio Vascular and Thoracic Surgery* 12(5):692–695, 2011
9. Fairbank JCT, Pynsent PB: The Oswestry disability index. *Spine* 25(22):2940–2953, 2000
10. Garg B, Kandwal P, Nagaraja UB, Goswami A, Jayaswal A: Anterior versus posterior procedure for surgical treatment of thoracolumbar tuberculosis: a retrospective analysis. *Indian J Orthop* 46(2): 165–170, 2012
11. Gavrilu TS, Japie EM, Ghita RA, Hamei S, Dughila C, Tiripa IL, et al: Burnei's anterior transthoracic retropleural approach of the thoracic spine: a new operative technique in the treatment of spinal disorders. *J Med Life* 8(2):160–165, 2015
12. Gokaslan ZL, York JE, Walsh GL, McCutcheon IE, Lang FF, Putnam JB Jr, et al: Transthoracic vertebrectomy for metastatic spinal tumors. *J Neurosurg* 89:599–609, 1998
13. Hitchon PW, Tomer J, Eichholz KM, Beeler SM: Comparison of anterolateral and posterior approaches in the management of thoracolumbar burst fractures. *J Neurosurg Spine* 5:117–125, 2006
14. Hsu HT, Teng MS, Yang SS, Huang KF, Wen CS, Li TC, et al: Anterior approach for surgery of thoracolumbar spine: surgical outcomes of series of one self-trained neurosurgeon. *Formosan Journal of Surgery* 46(5):157–165, 2013
15. Jansson KA, Blomqvist P, Svedmark P, Granath F, Buskens E, Larsson M, et al: Thoracolumbar vertebral fractures in Sweden: an analysis of 13, 496 patients admitted to hospital. *Eur J Epidemiol* 25:431–437, 2010
16. Kaneda K: Anterior decompression and stabilization with the Kaneda device for thoracolumbar burst fractures associated with neurological deficits. *J Bone Joint Surg [Am]* 79:69–83, 1997
17. Komanapalli CB, Eller JL, Sukumar MS: Thoracotomy for exposure of spine. Published on CTS Net (<https://www.ctsnet.org>), 2008
18. Li J, Liu G, Zheng Y, Hao C, Zhang Y, Wei B, et al: The epidemiological survey of acute traumatic spinal cord injury of 2002 in Beijing municipality. *Spinal Cord* 49(7):777–782, 2011
19. Lin B, Chen ZW, Guo ZM, Liu H, Yi ZK: Anterior approach versus posterior approach with subtotal corpectomy, decompression, and reconstruction of spine in the treatment of thoracolumbar burst fractures: a prospective randomized controlled study. *J Spinal Disord Tech* 25(6):309–317, 2011

20. McDonough PW, Davis R, Tribus C, Zdeblick TA: The management of acute thoracolumbar burst fractures with anterior corpectomy and Z-Plate fixation. *Spine* 29 (17), 1901–1909, 2004
21. Nadir A, Sahin E, Ozum U, Karadag O, Tezeren G, Kaptanoglu M: Thoracotomy in spine surgery. *ICTS* 56:482–484, 2008
22. Okuyama K, Abe E, Chiba M, Ishikawa N, Sato K: Outcome of anterior decompression and stabilization for thoracolumbar unstable burst fractures in the absence of neurologic deficits. *Spine (Phila Pa 1976)* 21(5):620–625, 1996
23. Omid-Kashani F, Hasankhani EG, Ebrahimzadeh MH: Anterior spinal surgery alone in the surgical treatment of thoracolumbar spinal tuberculosis: a prospective study. *MJIRI* 25(4):209–215, 2011
24. Ramírez E, Ochoa M, Ordoñez F: Surgical treatment of spinal tuberculosis by anterior approach. *Columna* 12(4):308–311, 2013
25. Riemer B: Anterior-only transthoracic surgery for adult spinal tuberculosis. *SA Orthopaedic Journal Spring* 10(3):43, 2011
26. Roche SJ, Sloane PA, McCabe JP: Epidemiology of spine trauma in an Irish regional trauma unit: a 4-year study. *Injury* 39(4):436–442, 2008
27. Sawan M, Moharram A: Surgical outcome of anterior versus posterior surgical approach for thoracic and lumbar Pott's disease. *Egyptian Orthopedic Journal* 49:120–127, 2014
28. Xu JG, Zeng BF, Zhou W, Kong WQ, Fu YS, Zhao BZ, et al: Anterior Z-plate and titanic mesh fixation for acute burst thoracolumbar fracture. *Spine (Phila Pa 1976)* 36(7):E498-504, 2011

الملخص العربي

التدخل الأمامي للعمود الفقري الصدري والقطني. دراسة مستقبلية في المستشفى

البيانات الخلفية: يعتبر التدخل الأمامي للفقرات الصدرية والقطنية من الطرق الجراحية التي لديها مميزات عديدة مثل التعامل المباشر مع الأورام، ويسمح بنزيف أقل عن الطرق الجراحية الأخرى، ويعطى نتائج بها نسبة عدوى أقل، كما يحتاج الى نظم تثبيت أقل طولاً. كما يوفر هذا التدخل رؤية ممتازة للجزء الأمامي من الفقرات الصدرية وللغضاريف وللقناة العصبية وجذور الأعصاب. كما يساعد على تحسين الوظيفة العصبية.

تصميم الدراسة: دراسة مستقبلية في المستشفى.

الغرض: تهدف الدراسة الى تقييم التدخل الأمامي للعمود الفقري الصدري والقطني.

المرضى والطرق: تم تضمين ثلاثين مريضاً في هذه الدراسة. تم تضمين المرضى الذين يعانون من الالتهابات، والأورام الخبيثة، والصددمات، في حين تم استبعاد المرضى الذين يعانون من أمراض مصاحبة طبية، وأمراض عديدة في مستويات العمود الفقري، وإصابة حزام التوتر الخلفي وإصابة متعددة أو دورانية، وهشاشة العظام الشديدة. تضمن التقييم البيانات الديموغرافية والسمات السريرية ومستوى الإصابة والحالة العصبية لهؤلاء المرضى. خضع جميع المرضى لعملية جراحية من خلال نهج الصدري القطني الأمامي. تضمنت معلمات النتائج بيانات ما قبل الجراحة وفترة ما بعد الجراحة و ASIA و VAS و SCIM و ODI بعد الجراحة.

النتائج: كان عمر المرضى 46.06 ± 12.2 (المدى، 20-70) سنة. كان عشرون مريضاً من الذكور و 10 من الإناث. كان معظم المرضى من 41 إلى 50 سنة وأكثر من 50 سنة. عانى 13 مريضاً (43%) من كسور انضغاطية رضحية (47%)، 14 (M: F 3.3: 1) التهاب الفقار السلي (M: F 1.8: 1)، و 3 (10%) كسر انضغاطي ورمي. كان وقت الجراحة 213.12 و 201.43 دقيقة في النهج الجانبي اليمين واليسر على التوالي، بينما كان فقدان الدم 609.4 و 650 مل في النهج الجانبي اليمين واليسر على التوالي. في المجموعة بأكملها، كانت درجات ASIA الحسية 91.53 و 105.8؛ كانت درجات ASIA الحركية 66.2 و 77.13. كان VAS 5.13 و 0.63. كان SCIM 30.93 و 76.13؛ كان ODI 74 و 16.53 قبل وبعد الجراحة على التوالي. تضمنت المضاعفات عدوي الجرح (N = 3)، وحداب (N = 3)، وإصابة الأوعية الدموية أثناء العملية (N = 2)، والعجز العصبي الجديد (N = 2)، واحتشاء عضلة القلب (N = 1).

الاستنتاج: خلصت الدراسة الى التدخل الجراحي الأمامي للفقرات الصدرية والقطنية يحقق تخفيف ضغط كافي على الأنسجة العصبية، كما يوفر نسيج للباثولوجي، كما يعطي نتائج إيجابية وتحسين في الوظيفة العصبية. وتعتبر خبرة وراحة الجراح تجاه هذا التدخل الجراحي هو حجر الأساس في نجاحه.