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THORACOLUMBER VERTEBRAL FRACTURES; OUTCOME OF SHORT SEGMENT TRANSPEDICULAR FIXATION

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ABSTRACT… For spinal injuries, thoracolumbar junction is common site in our population. Surgical management of unstable fractures and fracture dislocations of thoracolumbar spine is still controversial. This study was conducted to document efficacy of short segment fixation of thoracolumbar verterbral fractures. **Objectives:** To determine the outcome of short segment transpedicular fixation of thoracolumbar fractures. **Study design:** Descriptive cross-sectional study. **Sampling technique:** Non-probability purposive sampling. **Material and Methods:** A total of 103 study cases with thoracolumbar vertebral fractures were taken in this descriptive case series study which was conducted at department of Neurosurgery, Nishtar Hospital Multan from February 2014 to June 2015. Informed verbal consent was taken from each patient before participation in this study ensuring them confidentiality of the information and explaining them objectives and procedure of our study. Once registered, detailed history and clinical examination was done by a Neurosurgeon, investigations like X-ray dorsolumbar spine, CT scan and Magnetic resonance imaging (MRI) dorsolumbar spine were also done. Short segment transpedicular fixation was done and outcome of surgical management was assessed in terms of improvement in power, hardware failure and infection by consultant neurosurgeon. All the study cases were called for follow up visits after every month till 6 months to record final outcome of management. All the information were recorded in the study proforma. Data were entered and analyzed by SPSS version 22. **Results:** Out of these 103 study cases, 66 (64.1 %) were male patients and 37 (35.9 %) were female patients and male to female ratio was 1.85:1. Mean age of our study cases 33.92 ± 9.72 years ranging from 20 years to 54 years. Mean ages of male patients was 36.68 ± 10.37 years while in female patients it was 29.00 ± 5.89 years (p=0.000).Post-surgical management improvement in power was seen in 55 (53.4%) of our study cases, hardware failure in 11 (10.7%) and infection was observed in 20 (19.4%). **Conclusion:** According to our study short segment transpedicular fixation is safe & effective procedure providing efficient spinal stability. Short segment fixation is associated with minimum blood loss and trauma and leads to early mobilization of the patient and ease in physiotherapy. Transpedicular screw fixation is a useful choice for achieving better neurological recovery and good pain control in post-traumatic thoracolumbar fractures.

Key words: Transpedicular fixation, Thoracolumbar vertebral fracture, infection.

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INTRODUCTION

For spinal injuries, thoracolumbar junction is common site. Surgical management of unstable fractures and fracture dislocations of thoracolumbar spine is still controversial.[1,2] In most of the cases, victims of these injuries are young male persons as a result of roadside accidents, so it has significant social, psychological and financial impacts on the suffering families. The thoracolumbar spine acts as a transitional site from immobile thoracic spine leading to the mobile lumbar spine. Majority of the spinal fractures which occur in this area are caused by falls from heights, roadside traffic accidents/motor vehicle accidents (MVA) or direct trauma.[3,4] Regarding the treatment of thoracolumbar fractures, there is controversy in the nonoperative and operative management.[5,6] In some reports, good results have been achieved in many patients using non-operative mode of treatment.[7] Majority of the authors have reported that surgery should be option of the treatment in those cases having unstable burst fractures having neurological indications, to attain maximum advantages including early

mobilization, associated with decreased number of neurological deterioration as well as increased kyphosis improvement.[8] In our general clinical practice, with the advent of transpedicular screw fixation modalities and instrumentation technique shave lead to short-segment instrumentation "fixation of one normal vertebra above and below an injured segment".[9,10]

Either anterior or posterior or both approaches can be employed to achieve fusion but surgical outcome remains the same with either technique being used.[11] However majority of the spine surgeons prefer posterior approach and report it as a treatment of choice in thoracolumbar vertebral fractures and due to the fact that posterior approach is less extensive. Short segment screw fixation remains safe and reliable procedure which attains reduction and stability and it can achieve early relief in pain and mobility.[10,12]

In thoracolumbar fractures, the core objective of treatment is the restoration of stability of the vertebral column stability and to obtain the decompression of spinal canal which ultimately leads to early mobilization of the patient. This improves the quality of life of the patient and is cost effective for the suffering families which helps to reduce burdens on hospital authorities as well. This study was planned to be conducted at Nishtar Hospital Multan, which is a major tertiary care hospital providing healthcare facilities to the people of the southern Punjab, to document efficacy of the short segment transpedicular fixation of thoracolumbar fractures in our population subset.

OBJECTIVE

- To determine the outcome of short segment transpedicular fixation of thoracolumbar fractures.

MATERIAL AND METHODS

This descriptive case series study was conducted at department of Neurosurgery, Nishtar Hospital Multan from February 2014 to June 2015 using non-probability purposive sampling technique. Informed verbal consent was taken from each patient before participation in this study ensuring them confidentiality of the information and explaining them objectives and procedure of our study. Once registered, detailed history and clinical examination was done by a Neurosurgeon, investigations like X-ray dorsolumbar spine, CT scan and Magnetic resonance imaging (MRI) dorsolumbar spine were also done.

Preoperative neurological status was assessed as per Frankel grading system:

Grade 1: "Complete (No sensory or motor function is preserved)"

Grade 2: "Incomplete (Sensory, but no motor function is preserved below the neurological)"

Grade 3; "Incomplete (Motor function is preserved below the neurological level, and the majority of key muscles below the neurological level have a muscle power grade of <3)".

Grade 4: "Incomplete (Motor function is preserved below the neurological level, and the majority of key muscles below the neurological level have a muscle power grade of >3)".

Grade 5: "Normal (sensory & motor function is normal)".

Socio-economic status and occupation of these study cases was also inquired to see any impact of confounders. Socio-economic status was defined as per classification given in economic survey of Pakistan.

Poor
Monthly family income less than Rs. 12000/--

Middle income
Monthly family income ranging from Rs. 12001 – 35000/--.

Rich
Monthly family income more than Rs. 35000/--

Patients with post traumatic thoracolumbar verterbral fractures D_{12} or L_1 having compression over thecal sac with neurological deficit and kyphotic deformity were included in this study while patients with surgical site infection, injuries older than 3 months, those unfit for anesthesia, need of long fixation and pathological fractures were excluded.

All the patients were treated with transpedicular fixation with titanium DCP and titanium screws. Short segment transpedicular fixation was applied and outcome of surgical management was assessed in terms of improvement in power, hardware failure and infection by a consultant Neurosurgeon. All the study cases were called for follow up visits after every month till 6 months to record final outcome of management on X-ray dorsolumbar spine. All the information were recorded in the study proforma. Data were entered and analyzed by SPSS version 22. Mean and standard deviation were calculated for age of patients, while frequencies and percentages were tabulated for categorical study variables.

RESULTS

Short segment fixation was performed in 103 patients with thoracolumbar verterbral fractures. Out of these 103 study cases, 66 (64.1 %) were male patients and 37 (35.9 %) were female patients and male to female ratio was 1.85:1. Mean age of our study cases 33.92 ± 9.72 years ranging from 20 years to 54 years. Mean ages of male patients was 36.68 ± 10.37 years while in female patients it was 29.00 ± 5.89 years (p=0.000). Age wise distribution of gender has been shown in Table-I.

Age groups (In years)	Gender		P-value
	Male (n=66)	Female (n=37)	
21 – 30	22	22	0.027
31 - 40	19	10	
41 – 50	21	05	
51 – 60	4	00	
Total	**103**		

Table-I. Age wise distribution of gender. (n=103)

Of our study cases, 23 (22.3%) were office workers, 18.4% were farmers, 18.4% were shopkeepers, 5 (4.9%) were labourers and 32 (31.1%) females were housewives. Sixteen (15.5%) patients were poor, 82 (79.6%) were middle income and 5 (4.9%) were rich. Fifteen (14.6%) were diabetics and 19 (18.4%) our study cases were hypertensives. Pre-operative nervous system was also assessed,20 (19.4%) with grade 1, 30 (29.1%) with grade 2, thirty one (30.1%) with grade 3, sixteen (15.5%) with grade 4 and 6 (5.8%) with grade 5.

Post-surgical management improvement in power was seen in 55 (53.4%) of our study cases, hardware failure in 11 (10.7%) and infection was observed in 20 (19.4%).

Hardware failure	Gender		P-value
	Male (n=66)	Female (n=37)	
Yes	05	06	0.196
No	61	31	
Total	**103**		

Table-II. Cross-tabulation of Hardware failure with regards to gender. (n=103)

Improvement in power	Gender		P-value
	Male (n=66)	Female (n=37)	
Yes	45	10	0.000
No	21	27	
Total	**103**		

Table-III. Cross-tabulation of improvement in power with regards to gender. (n=103)

Infection	Gender		P-value
	Male (n=66)	Female (n=37)	
Yes	15	05	0.308
No	51	32	
Total	**103**		

Table-IV. Cross-tabulation of infection with regards to gender. (n=103)

Efficacy of surgical management (improvement in power) was not related with diabetes and hypertension (p=0.780 and p= 1.00 respectively). None of the patient reported with severe pain

Figure-1. Pre-operative MRI image of dorsolumber junction showing compression fracture of L_1 vertebral body causing thecal compression.

Figure-2. Postoperative X-ray dorsolumber junction showing transpedicular fixation of D_{12} and L_2 with 4 hole titanium DCP and titanium screws.

after 6 months while only a few had complaint of mild occasional pain which did not need any medication.

DISCUSSION

Different procedures of posterior fixation of thoracolumbar spine fractures e.g. hooks and Harrington rods have undergone tremendous improvement over the last couple of decades. Moreover, pedicle screw fixation has revolutionized spinal surgeries all over the world.[13] Treatment of thoracolumbar spinal fractures is still controversial because some reports have suggested non-operative management being effective in some good outcomes and avoiding surgical complications.[14] However majority of authors have reported that the patients suffering from neurological impairments require operative stabilization owing to the advantages associated with instrumentation.[8] Short segment fixation has the advantages of utilizing less motion segments and biomechanical reports have indicated that the transpedicular screws being more rigid than those of posterior distraction instruments like Harrington rods.[15] Different studies have reported these fractures being more common in male gender. Our study results have also reported similar trend as, 66 (64.1%) were male patients

and 37 (35.9 %) were female patients and male to female ratio was 1.85:1. Khan et al[10] reported thoracolumbar vertebral fractures in 62% male patients while Rahman et al[15] reported 68.75 % such fractures occurred in males. The findings of Khan et al[10] and Rahman et al[15] are similar to findings of our study. Mean age of our study cases 33.92 ± 9.72 years ranging from 20 years to 54 years. These fractures are commonly seen in young persons due to motor vehicle accidents and fall from heights, our study results have reported similar findings. Rahman et al[15] reported 35 ± 6.75 years mean age of these patients which is close to that of our study results. Khan et al[10] reported 40 ± 13.75 years mean age of the patients with these fractures, which again shows these fractures being more prevalent in young persons. Post-surgical management improvement in power was seen in 55 (53.4%) of our study cases, hardware failure in 11 (10.7%), khan et al[10] reported hardware failure to be 9.52% which is similar to our study results, infection was observed in 20 (19.4%) while Khan et al[10] reported infection in 10% patients. Good pain control and significant improvement in neurological status was seen which is consistent to the findings of other studies.[10,15]

CONCLUSION

According to our study short segment transpedicular fixation is safe & effective procedure providing efficient spinal stability and hence can be employed as a substitute of long segment fixation. Short segment fixation is associated with minimum blood loss and trauma and leads to early mobilization of the patient and ease in physiotherapy. Transpedicular screw fixation is a useful choice for achieving better neurological recovery and good pain control in post-traumatic thoracolumbar fractures. Short segment fixation can also be safely employed in patients with diabetes and hypertension. Motor vehicle accident remains major cause of these injuries particularly in motor bike travelers, most of which are young people.

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"If you cannot do great things,
do small things in a great way."

Napoleon Hill

AUTHORSHIP AND CONTRIBUTION DECLARATION

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3	Dr. Muhammad Ali	Data collection, literature review and data entry	
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