

Functional Outcome of Transpedicular Screw Fixation in Burst Fractures of Thoracolumbar Spine

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ABSTRACT

Background: Transpedicular Screw Fixation is one of the modalities used in surgical management of burst fracture of dorsolumbar spine for prevention of instability & for early rehabilitation of the patient.

Aim: To determine the efficacy of this modality and present the clinical results of the patients treated with the help of this protocol.

Methods: 45 patients (24 females, 21 males) with a mean age of 32 years were operated upon in department of Orthopedic Surgery, Mayo Hospital, Lahore from 2008 to 2011. 41 patients completed the 2 year follow-up. Burst fracture of dorso-lumbar vertebra was stabilized with posterior instrumentation by transpedicular screws in the healthy vertebra above and below. Posterior decompression was done in cases where canal encroachment was present or neurological deficit was there. Oswestery Disability Index (ODI) was calculated for individual patient after 24 months.

Results: Out of 41 patients included in the study, 8 patients had fracture of Dorsal spine, 20 had fracture in dorsolumbar junction and 13 in lumbar area. All the patients were managed surgically with transpedicular screw fixation. After 2 years of follow up according to Oswestry Disability index 34%, 63%, 2.4% had minimal, moderate and severe disability respectively.

Conclusion: Transpedicular Screw Fixation is an efficient mode of treatment in burst fracture of lumbar spine in long terms of prevention of disability and in improvement in the neurological deficit caused by instability of the affected vertebra.

Keywords: Transpedicular screw fixation, burst fracture, thoracolumbar spine

INTRODUCTION

The sagittal profile of the spine has been beautifully described by Denis¹ in 1983 who classified it into anterior, middle and posterior column. The middle column lies in the neutral axis of the spine and therefore is believed to provide greatest mechanical stability. This concept allows differentiation between compression fracture and burst fracture as in the former only the anterior column is involved and in the latter both the anterior and the middle columns are involved.

Burst fracture of thoracolumbar spine takes place when the spine is subjected to abnormal increased axial loading which bring both the anterior and middle column to failure.² However, despite of both column involvements in the injury, burst fracture may remain stable sometimes. The sequel of burst fracture may range from no to complete neurological involvement and from maintained spinal axis to severe kyphotic deformity. Therefore, the optimal treatment also varies from case to case.³

Even though no significant difference has been found in operative versus conservative management

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in stable burst fractures of thoracolumbar spine, unstable injuries with neurological deficit are more likely to be benefited from surgical intervention.^{3,4} Surgical intervention may be done through anterior, posterior or combined approaches. Advocacy of each approach has made the ideal approach to be controversial. However, posterior approach has been shown to produce very good results by different authors⁵.

Transpedicular screw fixation is one of the modalities used in the management of burst fracture through posterior approach. It has been shown to be technically easy and effective technique in a study by Khan⁶. Even though fractures in his study showed successful healing without complications, the study had limitations of its short follow up period i.e. 6 months. The present study was carried out to evaluate the functional outcome of the same technique after two years of the surgical intervention.

MATERIAL AND METHODS

A retrospective cross sectional analysis was done in the department of Orthopaedic Surgery Unit II of King Edward Medical University/ Mayo Hospital, Lahore. From January 2008 to January 2011, 45 patients (26 females, 21 males) with a mean age of 32 years

presenting in Accident and Emergency department with burst fracture of thoracolumbar spine were admitted and operated. 41 patients completed the 2 year follow-up and were included in the study.

After resuscitation, patient's neurological status was thoroughly evaluated and documented. Frankel Grading⁷ was done in each case. Haematological and radiological investigations were carried out including CT scan and MRI to establish the diagnosis. Patients with stable or unstable burst fractures of thoracolumbar spine were included in the study. Patients presenting late i.e. more than 7 days of injury, osteoporotic or pathologic fractures were excluded.

All patients were operated upon within 7 days by a single operating team including the author in every single case. Through posterior midline approach, paraspinal muscle muscles were retracted and with C arm guidance the level of injury identified. Fractured vertebra was stabilized with posterior instrumentation by pplyaxial transpedicular screws in the healthy vertebra above and below. Posterior decompression was done in cases where canal encroachment was present or neurological deficit was there. Contouring of the rods and distraction of the screws were achieved according to the presenting situation. Monoaxial screws were preferred in such cases.

Postoperatively, all patients went through standard rehabilitation program with early mobilization and protection with orthosis for at least three months. 1All the patients were telephonically approached through the contact numbers given at the time of their admission and patients were called to the hospital for evaluation. Some of the patients could not come to the hospital due to lack of logistics or finances and therefore the evaluation was done telephonically.

Oswestery Disability Index (ODI)⁸ was calculated for individual patient after 24 months. It is a time-tested outcome assessment tool that is used to measure a patient's impairment and quality of life. It is scored by the 'best answer' given by patient that describes his/her 'typical' pain and/or limitations. The questions are based on various daily activities as pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex life (if applicable), social life and travelling. Percentage of disability is calculated with the following formula:

Patient's Score X 100 = % disability

No. of sections completed x 5

Based on the score and the percentage, the disability of the patient is categorized as follows:

- Minimal 0-20%
- Moderate 20-40%
- Severe 40-60%
- Crippled 60-80%

Complete 80-100%

RESULTS

Out of 45 patients operated between 2008 and 2011, 41 patients (n=41) were included in the study as some patients were either lost in the follow up or their contact numbers had changed. 1 patient had expired after being discharged from hospital. The regional distribution of the burst fracture was as follows (Table 1).

Table 1: regional distribution

| Region | No. of fractures |
|------------------------|------------------|
| Dorsal spine | 8 |
| Thoracolumbar junction | 20 |
| Lumbar spine | 13 |

The number and percentage of the patients in different levels as categorized in the Oswestry Disability Index was as follows:

- 14 patients: (34%) minimal disability
- 26 patients: (63%) moderate disability
- 1 patient: (2.4%) severe disability
- 0 patient: (0%) complete disability



DISCUSSION

Posterior instrumentation with transpedicular screws provides three-column fixation in the surgical management of spinal injuries. It can restore stability with fewer anchoring points which can spare motion segments. With its screw-rod construct distraction and ligamentotaxis can be achieved. Ligamentotaxis can reduce the cord compression by up to 50%^{9,10}

Figure above are the preoperative and postoperative images of a young patient from the present study in which more than 50% of canal encroachment is seen. Post operative images show that height of the injured vertebra has been restored. Improvement in Frankel grade was expected and two year follow up reveals minimal disability in this particular case.

With the unstable burst fracture of spine, despite of the best management strategy, some degree of disability is always anticipated. To quantify a patient's level of disability in his daily activities, the Oswestry Disability Index is an outcome assessment tool that has been used efficiently¹¹. Hanif¹², in his study of instrumentation in caries spine, calculated the level of disability as an outcome modality by the help of this assessment tool.

In the present study 34% of patients can cope with most living activities after two year. No further treatment is indicated apart from advice on lifting sitting and exercise.

Majority of the patients (63%) experiences more pain and difficulty with lifting and standing. Travel and social life is affected but patients can cope up in moderation. Personal care sexual activity and sleeping are not grossly affected and the patient can usually be managed by conservative means. The areas which showed decreased score were mainly lifting, walking and standing. Probably, with the non availability of occupational therapy in our society and poor economic conditions these areas have been highlighted.

Only 1 patient has severe disability. Frankel grade was B preoperatively which remained unchanged after the surgery and throughout the follow up period. Rehabilitation of upper limbs is good enough for him to manage personal care, light weight lifting, sitting and sleeping. However, other aspects mentioned in ODI are severely affected to make the score very low. Pain is the main problem and activities of daily living are affected. This patient required a detailed investigation. No patient in our study group has back pain which interferes on all aspects of the patient's life making him/her unable to come to hospital.

This technique has been shown to be relatively safe but there are some weak points related to it as well. 1% of the cases have been reported to have iatrogenic neural injury which maybe caused by direct injury to the neural tissue by screw penetration or indirectly because of distraction. As posterior elements of the vertebra are exposed, there remains a potential danger of injury to the great vessels in front of the anterior elements of vertebra. Pseudarthrosis at anterior column secondary to over-distraction may lead to implant failure. Over

distraction of anterior column may occur because of over enthusiastic attempt to achieve ligamentotaxis.¹³

CONCLUSION

In properly selected patients with burst fracture of dorso-lumbar spine, spinal instrumentation with transpedicular screw fixation is justified because of its safety and efficacy and having good long term functional outcome.

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