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Research Article

Outcome analysis of surgically managed unstable burst fracture

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ABSTRACT

Background: Burst fractures are common injuries of dorsolumbar spine. In indicated cases, surgery is the treatment of choice. Significant controversy exists regarding surgical intervention for these fractures. Posterior decompression, anterior decompression and instrumentation, and combined anterior decompression and posterior instrumentation have been recommended in various studies. Here we are going to evaluate unstable burst fractures of thoracic and lumbar spine treated by isolated anterior decompression and instrumented fusion with TSM-Bone graft composite.
Methods: Prospective study of thirty-six cases of unstable fracture of thoracic and lumbar spine treated in Sri Ramachandra Medical centre from January 2011 to January 2014. The inclusion criteria were burst fractures of thoracic or lumbar spine complete or incomplete neurological deficit and burst fractures of thoracic or lumbar spine without neurological deficit but with mechanical instability. The exclusion criteria were pathological fractures, chance fracture, stable burst, wedge compression and osteoporotic compression fractures. The results were analyzed during the follow-up using the Pain – Visual analogue scale, Fusion status and radiographic parameter – K-angle .For pain score were given as 3,2,1 for absent, moderate and severe pain respectively. Regarding fusion status score of 3,2,1 were given when fusion was good, fair and no sign of fusion respectively.
Results: Mean pre-operative K-angle was 28o. Average loss of correction at final follow up was 3o.Mean correction of K-angle was 140.Moderate to severe loss of correction of K- angle was observed in 4 patients. Mild to moderate pain in 5 patients treated with analgesics. Average TSM subsidence was 3mm.
Conclusions: Bone graft composite provides stable biomechanical support to deficient anterior column in burst fractures and allows early rehabilitation and mobilization. Neural recovery may occur after anterior decompression, stabilization and fusion with TSM-Bone graft composite in dorsolumbar burst fractures with incomplete cord injury.

Keywords: Burst fracture, TSM-Bone graft, Anterior decompression, Neurological deficit

INTRODUCTION

The Dorsolumbar junction is the most common site for non-osteoporosis related spinal column fractures. Dorsolumbar segment of spine is an unstable zone between fixed dorsal and mobile lumbar spine. A wide variety of injury patterns and clinical presentations are encountered. Although Dorsolumbar junction has a higher risk for fracture, it has important anatomic characteristics that allow for a greater recovery from neurologic injury than more cephaloid cord injuries. The site has also been the most extensively studied, including development and treatment. In addition there is no universally accepted classification of spinal fractures that identify those who will require surgery to prevent late deformity or neurologic compromise. Burst fractures are common injuries of dorsolumbar spine. In indicated cases, surgery is the treatment of choice. Significant controversy exists regarding surgical intervention for these fractures. Among all surgeries anterior decompression is ideal not only because of compression anteriorly are relieved but also maintains the

biomechanics near normal by positioning the implants as per rules of IAR.[1,2] The choice of treatment for burst fractures of the thoracolumbar spine with neurological deficit is controversial. Posterior decompression, anterior decompression and instrumentation, and combined anterior decompression and posterior instrumentation have been recommended in various studies. Here we are going to evaluate unstable burst fractures of thoracic and lumbar spine treated by isolated anterior decompression and instrumented fusion with TSM-Bone graft composite.

METHODS

Prospective study of thirty-six cases of unstable fracture of thoracic and lumbar spine treated in Sri Ramachandra Medical centre from January 2011 to January 2014. The inclusion criteria were burst fractures of thoracic or lumbar spine complete or incomplete neurological deficit and burst fractures of thoracic or lumbar spine without neurological deficit but with mechanical instability. The exclusion criteria were pathological fractures, chance fracture, stable burst, wedge compression and osteoporotic compression fractures. The criteria for instability were Kyphosis angle more than 20 degrees, Loss of anterior vertebral body height by at least more than 30%, 2 or 3 column involvement (Denis Classification) Neurological deficit, MRI/Gaines score (7 or > 7).[3,5,7] Age of the patients ranged from 20 years to 46 years. We had twenty-four male and twelve female patients. Minimum follow-up in our study was one year. Sixteen patients had road traffic accidents, twelve had fall from height and eight had fall of heavy object as their mode of injury.

Twenty patients had L1 fracture; ten had D 12 fracture while L2, D9 and D7 fractures were seen in two patients each. Fourteen patients had complete neurological deficit while twenty-two had incomplete neurological deficit. All the patients were assessed by ASIA impairment scale. The pre op ASIA grading and timing of presentation were as per Table1 and 2 respectively. All the patients were evaluated with X-ray of D.L. spine– A/P and Lateral view, Trauma series X-ray and M.R.I. of the D. L. spine. All patients underwent surgery through the Thoracoabdominal (Transpleural) approach. For all cases anterior decompression by partial corpectomy and discectomy and fusion with interbody titanium surgical mesh (TSM) and bone graft composite stabilized with screw and rod construct was done. For stabilization, monoaxial screws of 5mm and rods of 5 mm diameter were used. Resected rib & corpectomy material was used as bone graft in titanium surgical mesh. ICD was removed according to the collection ranging from 3rd to 5th day following surgery. Sutures removed on 12th day. Post operatively patients were mobilized with TLSO corset. Post operatively passive exercises of both lower limbs started. Bladder training was given [CSIC]. All patients were reviewed neurologically and radiologically at 6weeks, 3 months, 6 months and 1 year. The results were analysed during the follow-up using the Pain-Visual analogue scale, Fusion status and radiographic parameter – K-angle.[6,7] For pain score were given as 3,2,1 for absent, moderate and severe pain respectively. Regarding fusion status score of 3, 2, and 1 were given when fusion was good, fair and no sign of fusion respectively. When loss of correction was mild, moderate and severe 3, 2, 1 scoring was done respectively. Results are graded as Excellent (7 to 9 score), Fair (4 to 6 score) and Poor (<4 score).

RESULTS

Table 1: Pre-op Asia grade.

Asia grade	No. of patients	Percentage
A	14	38.88 %
B	2	5.55 %
C	10	27.77 %
D	8	22.22 %
E	2	5.55 %

Table 2: Time of presentation.

Time of presentation	No. of patients
Day -1	12
1Day – 1 Week	14
1Week – 1 Month	6
1Month – 6 Month	4

Table 3: Results.

Results	No. of cases	Percentage
Excellent (case 1)	26	72.22 %
Fair (case 2)	8	22.22 %
Poor (case 3)	2	5.55 %

Table 4: Complications.

Complication	No. Of Patients
U.T.I	6
Loss of correction	4
Bed sore	2
D.V.T.	1

None of the patients had neurological deterioration in incomplete lesion after anterior decompression and instrumented fusion. Mean pre-operative K-angle was 28^{o}. Average loss of correction at final follow up was 3^{o}. Mean correction of K-angle was 14^{0}.Moderate to severe loss of correction of K- angle was observed in 4 patients. Mild to moderate pain in 5 patients treated with analgesics. Average TSM subsidence was 3mm .Results and complications were tabulated in Table 3 and Table 4 respectively.

DISCUSSION

Acute injuries of the dorsolumbar spine with neurological deficit were among the common causes of severe disability, yet treatment options of these injuries varies.[8,9] From our study it is seen that males in the age group of 20 to 30 years most commonly sustain this injury. The common modes of injury in our study were RTA followed by fall from height, fall of heavy object. This was similar to the western literature where most common mode of injury is RTA.[10] The goals of the treatment in dorsolumbar spinal fractures are to stabilize & protect against further injury, restore spinal alignment and biomechanical stability and to facilitate rehabilitation.[11,12] Post-traumatic residual kyphosis and cord compression leads to chronic backache and increased tension on the axonal tracts necessitates anterior decompression and stabilization.[13]

Table 5: Comparison to various studies.

Study	No. of Pt. [neuro-logical deficit]	Level of Injury	Type of Implant	Neurological Improvement [%]/ [K°]	Failure of implant [%]
Dunn [9]	48[40]	T5-L5	Dunn	100/18	6 %
Kostuik [10]	63[?]	T4-L5	Kostuik Harrington	16/10	--
Zielke [8]	29[10]	--	Zielke	90/14	24 %
Kaneda [11]	150 [150]	T6-L4	Kaneda	96/15	6 %
Our study	36[36]	T7-L2	TSM	65/14	6 %

The aim of surgery was to promote earlier and better rehabilitation. In general if the human body lies for an extended period of time in the unphysiological supine position, this can lead to long lasting cardio-pulmonary disturbance which often tends in multi organ failure. By doing surgery these patients were rehabilitated better and earlier, so prolonged recumbency was avoided.

Indication for the anterior decompression of the spinal column in patients who have thoracolumbar burst fracture was radiographic evidence of obstruction of the spinal canal with or without neurological deficit and presence or impending deformity or demonstrable instability.[14,15] Compressive tissue after burst fracture were invariably located in anterior portion of the spinal canal [16].Many investigators found that better results can be obtained with direct removal of retropulsed fragments & debris from spinal canal through anterior approach.[17] TSM-Bone graft composite provides stable biomechanical support to deficient anterior column in burst fractures and allows early rehabilitation. Anterior neurodecompression after a few days of patient's stabilization still remains the practice in many institutions, although experimental data had shown that early neurodecompression was crucial for regeneration of nerve tissue.[18]

Our results of isolated anterior decompression and instrumented fusion with TSM-Bone graft composite was comparable to results of Dunn et al, Kostuik et al, Kaneda et al, Zielke et al (Table 5).[8-11] Complication rates were minimal. Average loss of correction at final follow up was 3^{o} which was acceptable. The Mean correction of K-angle was 14^{0} and no case of progression of neurological deficit was comparable to these studies. Anterior surgery achieves more complete and reliable decompression with interbody strut graft fusion along the lines of axial loading which was so very important in the biomechanics of the spinal functioning in this region. Anterior surgery had better advantage of canal clearance than posterior pedicle screws and plates system. For early rehabilitation program aimed at shorter hospitalization and with intention to return the patient to full time work, it is necessary to have stiff anterior construct with TSM bone grafting and implants. Edelker et al showed that two motion segment stabilization with pedicle screws and VSP plates along with anterior bone grafting addresses effectively the anterior and middle columns.[19]

CONCLUSION

Goals of the surgery of unstable burst fracture of the dorsolumbar spine should be decompression of spinal canal, restoration of spinal alignment and stability and to speed the rehabilitation process. Decompression of the entire anterior aspect of thecal sac was achieved under direct vision. TSM-Bone graft composite provides stable biomechanical support to deficient anterior column in burst fractures and allows early rehabilitation AND mobilization. Neural recovery may occur after anterior decompression, stabilization and fusion with TSM-Bone graft composite in dorsolumbar burst fractures with incomplete cord injury.

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