

Evaluation of the Outcome of Operative Treatment of Thoracolumbar Spinal Injury

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Abstract:

Fracture and dislocation of the spine are serious injuries that most commonly occur in young people. Disability and complications are great burden for the family and as well as country in this incidence. The current trend to treat this patient either conservatively or operatively. Conservative treatment takes long time to rehabilitate the patient, produces so many complications and sometimes it is not possible to solve the problem at all. If operative treatment is proved to be an effective option in case of post traumatic incomplete spinal cord injury in our population it could be possible to bring health benefit for our country spinal injury patients with save of national currency. With this background present study have been designed to evaluate the outcome of operative management of traumatic thoraco-lumbar spinal injury with incomplete neurological lesion. This Quasi experimental study was carried out in National Institute of Traumatology and Orthopaedic Rehabilitation (Nitor), Dhaka, during the period from January 2011 to February 2012. A total number of 24 patients with thoracolumbar spinal injury with incomplete neurological lesion were selected radiologically. Of the total 28 patients majority (42.9%) were in the age group 30-39 years. Occupation of the subjects demonstrated that farmer (32.14%), Construction Worker (14.29%), Labourer (10.71%) comprised the main bulk. Other occupants were housewife (7.14%) & mason (10.71%), Students & saw mill worker (7.14%), electrician, shop-keeper & teacher (3.57%). The causes of injuries were- fall from height (71%), road traffic accident (21%), fall of heavy object (4%) then hit by heavy object 2(4%) cases. Among the total patients 68.4% had pre-operative Frankle grade "C" & post-operative Frankle grade "D" (57.6%) and (39.6%) patients became completely normal that is Frankle grade "E". In this study, shift of Frankle grade 1 was the highest (50.7%), grade 2 was (7.1%), grade 3 was (21.4%), and no shifting was in (10.7%) patients.

Key words: spinal cord injury, spinal decompression and stabilization, interbody fusion, paraplegia, paraparesis

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Introduction:

A spinal cord injury (SCI) refers to any injury to the spinal cord that is caused by trauma instead of diseases¹. Each year more than -5000 new cases of spinal injuries are occurring in our country, of which majority involves the thoracolumbar region². Spinal cord injury occurs most frequently in teenagers and young adults. The most common age at injury is 19 yrs, with 52.8 percent of all injuries occurring

between the ages of 17 and 23yrs. Almost 80 percent of injuries occur between the ages of 16 to 45 yrs³

The thoracolumbar junction is the most common area of injury to the axial skeleton. Forces along the long stiff kyphotic thoracic spine switch abruptly into the mobile lordotic lumbar spine at the thoracolumbar junction. Biomechanically, this transition zone is susceptible to injury and is the most commonly injured portion of the spine. Primary goals in thoracolumbar trauma patients are prompt recognition and treatment of associated injuries and expeditious stabilization of the spine and protection of the neural elements.⁴. Successive development of imaging facilities and understanding of pathophysiology of the vertebral injuries allowed clinicians to visualize the lesion and results of

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treatment over time. This paves the way to advance in both conservative and surgical management of the patient with spinal injuries^{5,6}. Surgical decompression of the spinal canal is presently accepted worldwide as the method of treatment for thoracolumbar spinal injury with neurological deficit in the belief that neurological recovery may be produced or enhanced.⁷ The advantages of surgical treatment for thoracolumbar spinal injury with neurological deficit include better correction of kyphotic deformity, greater initial stability, and an opportunity to perform direct decompression. The question as to how this fracture should be approached and stabilized (anteriorly, posteriorly or combined anteroposteriorly) is controversial^{8,9}. The posterior procedure is well established. The advantages include safe exploration of the surgical site without violating the pulmonary, visceral and vascular structures. It also has the advantages of alignment correction. Pedicle screw – rod systems provide rigid segmental fixation along all three columns of the spine and allow a combination of forces (distraction, compression or rotation) to be selectively applied to the spinal segment. Thus, pedicle screw fixation improves the ability to correct a spinal deformity. The great advantage of the posterior approach is that it gives a clear view of the neural structures; this allows the removal of possibly dangerous structures around the neural structure. Using the posterior approach, all processes, such as decompression, correction of alignment with instrumentation, and posterior stabilization are performed safely under direct view. Furthermore, dural tear occur frequently in thoracolumbar spinal injury with neurological deficit with posterior element fractures¹⁰ Goal of any form of treatment are to obtain a painless, balanced static spine with optimum neurological function and maximum spine mobility¹¹. The treatment of spine fracture and dislocation has also several goals including reduction of deformity and stabilization, minimizing neurological injury and early rehabilitation.

Methods and Materials:

This is a Quasi experimental study. The study was conducted in National Institute of Traumatology and Orthopaedic Rehabilitation

(Nitor), Dhaka, total study period was from January 2011 to February 2012. 28 patient of traumatic thoracolumbar spinal injury with incomplete neurological lesion are selected strictly following inclusion and exclusion criteria.

Inclusion Criteria: Thoracolumbar spinal injury due to acute traumatic event with radio logically documented cord compression within 6 weeks.

Exclusion criteria: Patient with Complete neurological lesion, Patients with co-morbid diseases. Patient Associated with injury-cervical spine.

Purposive sampling technique was adopted. A pre designed data sheet containing history and examination findings of the patient, operative procedure and follow up were used to collect the data. A detailed history of the selected patient was taken with mode of injury, time of injury, other history, then thorough general, local, neurological examination for proper assessment was made. Plain X ray both AP & lateral view and MRI of thoracolumbar or lumbar region for all cases were taken to see the retropulsion of respective fractured vertebra. After proper preoperative preparation, surgery was done. After surgery the patients started using wheel chair and walking aid or without support according to their clinical status and degree of fracture and transposition. After discharge each patient was followed up at OPD initially monthly then three monthly for one year. On each visit the wound status, motion, presence of any infection, pain at the fracture site, work status or other complications of any was assessed. Radiographs were taken at each visit to follow the fracture healing, position screw & status of posterolateral fusion. Neurological status was assessed by Frankle's grading system.

Results and observations

A total number of 28 patients of thoracolumbar spinal injury with incomplete neurological deficit were selected. All patients were treated by surgical intervention in the form of decompression, stabilization by pedicular screw & rods, fusion through posterior approach.

Table-I

Distribution of patients according to age (N=28)

Age group (Years)	Frequency	%
11-20	4	14.3
21-30	12	42.9
31-40	7	25.0
41-50	4	14.3
51-60	0	00
61-70	1	3.6
Total	28	100.0

Table 1 shows the age distribution of the study patient. In this study the age ranged from 15 to 65 years. Maximum patients were found in 21 to 30 years age group 12 (42.9%). Mean age: (29.8±10.63) Years.



Fig.-1: Distribution of patient according to occupation.

Occupation of the subjects demonstrated that farmer 09 (32.14%), Construction Worker 04(14.29%), Laborer 03 (10.71%) comprised the main bulk. Other occupants were housewife 02 (7.14%) & mason 03 (10.71%), Students & saw mill worker 02 (7.14%), electrician, shop-keeper & teacher 01 (3.57%).

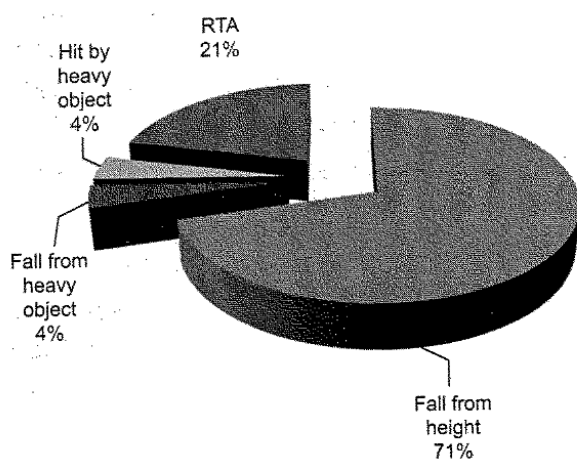


Fig.-2: The causes of injury.

The Causes of injuries were- fall from height 19 (71%), road traffic accident 05 (21%), fall of heavy object 02 (4%) then hit by heavy object 02(4%) cases.

Table-II

Distribution of patients according to level of injury (N=28)

Level of spine	Frequency	%
L1	14	50.0
L2	01	3.6
L3	05	17.9
L2,L3	01	3.6
D12	07	25.0
Total	28	100

Table II shows the distribution of patients according to level of injury. In this study, 14 cases (50%) had fracture L1, 01 case (3.6%) had L2 fracture, 05 cases (17.9%) fracture L3, 01 case (3.6%) had fracture L2, L3, 07 cases (25%) had fracture D12.

Table-III

Distribution of patients according to pre-operative & post operative Frankle grade. (N=28)

Frankle's Grade	Pre-operative patients	%	Post-operative patient	%
A	00	00	00	00
B	02	7.2	00	00
C	19	68.4	01	3.6
D	07	25.2	16	57.6
E	00	00	11	39.6
Total	28	100%	28	100%

Table III shows the Distribution of patients according to pre-operative & post operative Frankle grade. Out of total 28 patient, 19 (68.4%) had pre-operative Frankle grade "C" & post-operative Frankle grade "D" 16 (57.6%) and 11 (39.6%) patients became completely normal that is Frankle grade "E".

Table-IV

Distribution of patients according to shift of Frankle grade (N=28)

Shift of Frankle grade	Frequency	%
0	3	10.7
1	17	60.7
2	2	7.1
3	6	21.4
Total	28	100

Table IV shows the Distribution of patients according to shift of Frankle grade. In this study, shift of Frankle grade 1 was the highest 17(50.7%), grade 2 was 2 (7.1%), grade 3 was 6 (21.4%), and no shifting was in 3 (10.7%) patients.

Table-V

Distribution of patients according to work scale (N=28)

Grade	Frequency	%
1	14	50.0
2	13	46.4
3	1	3.6
Total	28	100

Table V shows Distribution of patients according to work scale. Among the total 28 patients, according to Denis et al. work scale 14 (50%) patients became completely normal that is grade-1, 13 (46.4%) grade-2 and grade-3, 1 (3.6%). No patient was in grade-4 and 5.

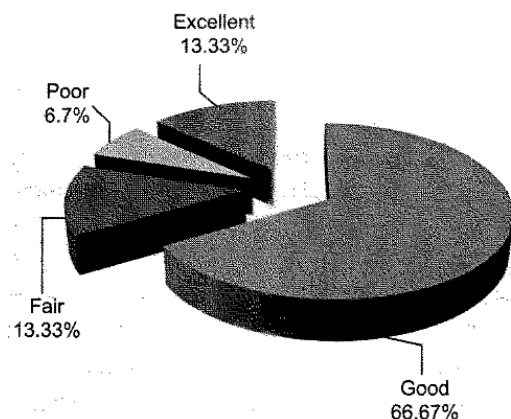


Fig.-3: Final outcome

Overall results were classified as excellent, good, fair & poor. 04 (13.33%) cases were in excellent group, 18 (66.67%) cases were in good, 4 (13.33%) cases were in fair & 02 (6.67%) cases were poor.

Discussion:

A prospective study was carried out from January 2011 to February 2012 at NITOR to evaluate the results of surgical outcome of thoracolumbar vertebral fracture through posterior approach. A total 28 patients satisfying the inclusion and exclusion criteria were selected for this study. In this study the age ranged from 15 to 65 years. Maximum patients were found in 21 to 30 years age group 12 (42.9%). Mean age: (29.8±10.63) Years, the study conducted by Yue et al. selected mean was age 41.3 years (range 21 76 years). Aebi et al. 1987 stated mean age was 33.8 years (range 18 61 years). McNamara et al. 1992 found mean age 28.6 years (range 16 50 years). High incidence of young adult in the present series is due to working group people¹². In our study occupation of the subjects demonstrated that farmer 09 (32.14%), Construction Worker 04(14.29%), Laborer 03 (10.71%) comprised the main bulk. Other occupants were housewife 02 (7.14%) & mason 03 (10.71%), Students & saw mill worker 02 (7.14%), electrician, shop-keeper & teacher 01 (3.57%). Most of the occurrence occurred in village area & laborers were engaged in their daily activities such as climbing a tree. In this study Causes of injuries were- fall from height 19 (71%), road traffic accident 05 (21%), fall of heavy object 02 (4%) then hit by heavy object 02(4%) cases. In this series; fall from height was the commonest cause of injury. Study conducted by Aebi et al. showed that the common cause of injury is RTA (33.33%). Yue et al. also found that common cause of injury was high energy trauma such as motor vehicle accidents. Study in our country showed that most common cause of injury due to fall from height especially fall from tree. But study in western countries showed that common cause of injury is RTA. Difference between these two studies due to socio-economic status of the patient. But Moon et al (2003) study done in Korea showed that most common cause of injury was fall from height (66.66%). In our study, 14

cases (50%) had fracture L1, 01 case (3.6%) had L2 fracture, 05 cases (17.9%) fracture L3, 01 case (3.6%) had fracture L2, L3, 07 cases (25%) had fracture D12. Aebi et al (1986) showed most common level was L1 (43.3%) & Celebi et al. (2007) also found most common involved level was L1 (37.5%). So in all series L1 was the most common involved spine level. In this study 19 (68.4%) had pre-operative Frankle grade "C" & post-operative Frankle grade "D" 16 (57.6%) and 11 (39.6%) patients became completely normal that is Frankle grade "E". No patient with an incomplete lesion was neurologically worse at the time of follow up. In this study, shift of Frankle grade 1 was the highest 17 (50.7%), grade 2 was 2 (7.1%), grade 3 was 6 (21.4%), and no shifting was in 3 (10.7%) patients. Aebi et al (1986) found that 12 out of 14 patients with partial neurologic deficit (Frankel grades C and D) improved at least one Frankel grade. Hardeker et al (1990) showed that improvement in one or more grades was noted in 34 (85%) out of the 40 patients presenting with incomplete neurologic deficit. In this study, according to Denis et al. work scale 14 (50%) patients became completely normal that is grade-1, 13 (46.4%) grade-2 and grade-3, 1 (3.6%). No patient was in grade-4 and 5. In the Shin et al (2007) series showed that 10 (52.6%) patients were in grade-I, 4 (20.5%) were in grade 2, 2 (10.5%) were in grade 3, 1 (5.3%) was grade 4 and 5 (10.5%) were in grade 5. In this study, Overall results were classified as excellent, good, fair & poor. 04 (13.33%) cases were in excellent group, 18 (66.67%) cases were in good, 4 (13.33%) cases were in fair & 02 (6.67%) cases were poor. In Celebi et al (2007) reported that 16 (33.3%) patients had excellent results, 23 (47.9%) had good, 7 (14.58%) had fair & 2 (4.16%) patients had poor results.

Conclusion:

In the operative treatment of thoracolumbar vertebral fractures with decompression, correction of deformity, stabilization by pedicular screws-rods and posterolateral fusion through posterior approach is a safe surgical treatment for the neural structures. The advantages of this operative procedure is safe for the neural structures and complete spinal canal decompression and kyphosis correction.

On the basis of the results of the present study, integrated with the understanding from the available literatures, it may be recommended that early surgical intervention is essential for unstable spinal injury with incomplete neurological deficit. A regular, well supervised follow up program should be ensured to know the final outcome of the treatment and patient's motivation must be established.

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