

Outcome of Anterior Fixation in Lower Cervical Spine Injuries

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ABSTRACT

Introduction: The fractures of cervical spine are divided into upper cervical spine ($C_1 - C_2$) and lower cervical spine ($C_3 - C_7$) fractures, also called sub-axial cervical spine. Sub-axial cervical injuries range from minor ligamentous strain or spinous process fracture to complete fracture dislocation with bone and ligament disruption, resulting in severe spinal cord injury.

Objectives: The objective of this study was to determine the efficacy of anterior cervical spine fixation as regards the effective stabilization, immobilization and solid bony fusion in lower cervical spine injuries by the use of cervical spine locking plate (CSLP) attached with cancellous screws.

Study Design: Descriptive case series study.

Materials and Methods: This study was conducted from March 2013 to March 2014 in the department of Neurosurgery unit II, Lahore General Hospital Lahore. A total of 30 patients were included in this study of both gender and in the age range of 16 – 60 years.

Results: In our study, there were 23 (76.7%) male patients and 7 (23.3%) female patients. The majority of the patients 25 (83.3%) were in the age range of 21 – 50 years with mean age was 38.2 ± 11.7 years. On one month follow up, the mean Frankel grade was 3.5 ± 1.6 , 3.53 ± 1.6 on 3 months follow up and 3.6 ± 1.8 on 6 months follow-up. Similarly, 12 (40%) patients remained catheterized, 16 (53.3%) patients had normal control and 2 (6.7%) patients had partial recovery in 1 month time. After 3 months, 4 (13.3%) patients remained catheterized, 20 (66.7%) patients had normal control and 6 (20%) patients had partial recovery. After 6 months 3 (10%) patients remained catheterized, 25 (83.3%) patients had normal control and 2 (6.7%) had partial recovery. On follow up of one, three and six months, x-ray finding showed in 9 (30%) patients of good condition and 21 (70%) patients of satisfactory condition.

Conclusion: The use of anterior approach in treatment of the injured lower spine is safe and effective.

Key words: Cervical spine, anterior fixation, cervical spine locking plate, ligaments.

Abbreviations: CSLP = cervical spine locking plate.

INTRODUCTION

The fractures of cervical spine are divided into upper cervical spine ($C_1 - C_2$) and lower cervical spine ($C_3 - C_7$) also called sub-axial cervical spine.¹ Sub-axial cervical injuries are common, ranging in severity from minor ligamentous strain or spinous process fracture to complete fracture dislocation with bone and ligament disruption, resulting in severe spinal cord injury.² Motor vehicle accident, falls, gunshot wounds and contact or water sports are the main causes.³ They

cause a broad spectrum of disabling conditions ranging from minor pains to quadriplegia and even death. Patients with spinal cord injury are severely handicapped, dependent and prone to develop secondary and tertiary complications easily.⁴ The primary goals of treatment are to realign the spine, prevent loss of function of uninjured neurological tissue, improve neurological recovery, obtain and maintain spinal stability and obtain early functional recovery.⁵

The goals of any treatment of cervical spine inju-

ries are: return to maximum functional ability, minimum of residual pain, decrease of any neurological deficit, minimum of residual deformity and prevention of further disability. The advantages of surgical treatment are the ability to reach optimal reduction, immediate stability, direct decompression of the cord and the exiting roots, the need for only minimum external fixation, and the possibility for early mobilisation and clearly decreased nursing problems.

There are some reasons why these goals can be reached better by anterior surgery. Usually the bony compression of the cord and roots comes from the front therefore anterior decompression is usually the procedure of choice. Also, the anterior stabilisation with a plate is usually simpler than a posterior instrumentation. It needs to be stressed that closed reduction by traction can align the fractured spine and indirectly decompress the neural structures in about 70%.

The anterior cervical spine surgery approach at the level of the C₃ to T₁ has been introduced in 1952.⁶ The addition of autologous⁷ bone graft for an intervertebral fusion has been proposed by Smith and Robinson in 1955⁷ and modified by Cloward in 1961⁸ and Verbiest in 1969.⁹ The anterior plate fixation has been first described by Böhler in 1964¹⁰ and has been developed by Orozco in Spain¹¹ and Sénégas in France.¹² At the beginning, standard AO – plates have been used, later in 1970 small fragment plates and in 1975 the so – called H – plate has been introduced (AO Spine Manual).¹³

Anterior surgery may be contra-indicated in case of significant posterior lesions compromising the spinal cord or roots or in clinically relevant Dural leaks, in case of locked facet joints, which are unreducible by traction or even anterior open surgery, specifically, in case of delayed surgery. Furthermore, highly unstable injuries may need a combined anterior-posterior surgery or if an anterior stabilisation may appear insufficient intra-operatively. This may be the case in severely degenerated stiff C-spines creating a major lever arm on the traumatised segment.

MATERIAL AND METHODS

This descriptive study was conducted in the department of Neurosurgery unit II, Lahore General Hospital from March 2013 to March 2014 by performing anterior fixation in lower cervical spine injuries and follow up patients postoperatively both neurologically and radio logically at one, three and six months interval. A

total of 30 patients were included in this study of both gender and in the age range of 16 – 60 years.

RESULTS

In our study, there were 23 (76.7%) male patients and 7 (23.3%) female patients as shown in figure no 1. The majority of the patients 25 (83.3%) were in the age range of 21 – 50 years with mean age was 38.2 ± 11.7 years as shown in table 1. Anterior cervical fixation was done in all patients admitted with lower cervical spine injuries and followed postoperatively up to 6 months both neurologically and radio logically. On one month follow up, the mean Frankel grade was 3.5 ± 1.6, 3.53 ± 1.6 on 3 months follow-up and 3.6 ± 1.8 on 6 months follow up. Similarly, 12 (40%) patients remained catheterized, 16 (53.3%) patients had normal control and 2 (6.7%) patients had partial recovery in 1 month time. After 3 months, 4 (13.3%) patients remained catheterized, 20 (66.7%) patients had normal control and 6 (20%) patients had partial recovery. After 6 months 3 (10%) patients remained catheter rized,

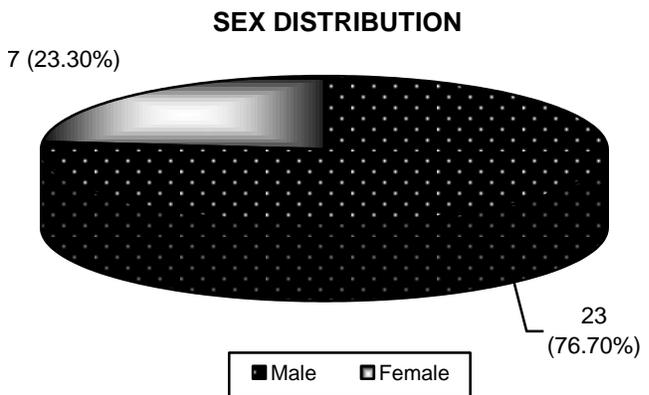


Figure 1: Distribution of Patient by Sex.

Table 1: Distribution of patients by Age.

Age (Years)	No.	Percentage
Up to 20	2	6.7
21 – 30	8	26.7
31 – 40	8	26.7
41 – 50	9	30.0
51 – 60	3	10.0
Mean SD	38.2 ± 11.7	

25 (83.3%) patients had normal control and 2 (6.7%) had partial recovery. On follow up of one, three and six months, x-ray finding showed in 9 (30%) patients of good condition and 21 (70%) patients of satisfactory condition.

DISCUSSION

Looking at the distribution of acute cervical spine trauma, 55% of the injuries is located at the level of C_{5/6} and C_{6/7} and approximately 20% are located at the level of the odontoid and the C_{1/2} level. The rest is more or less equally distributed over the whole cervical spine with a little preference for the level of C_{4/5}. The last 20 years have shown an ongoing discussion whether anterior or posterior surgery is the treatment of choice for most of the cervical spine injuries. Attempts have been made to give either biomechanical, morbidity, simplicity of procedure or type of injury as reasons for the choice of treatment. All these arguments are valid and all taken together favour finally the anterior surgery, however, a lot of the decision, whether anterior or posterior surgery is chosen in the context of a cervical spine trauma, has to do with the surgeon's preference.

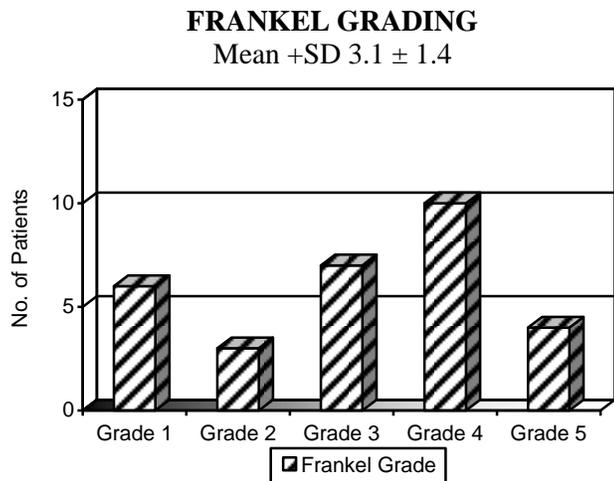


Figure 2: Power distribution in patients by Frankel grading.

In our study thirty patients having lower cervical spine injuries from C₃ to C₇ were selected from OPD and emergency department of Neurosurgery, Lahore General Hospital Lahore. The mean Frankel grading of the patients were 3.1 ± 1.4. There were 6 (20%) patients of Frankel grade – 1, 3 (10%) patients of Frankel

grade – 2, 7 (23.3%) patients of grade – 3, 10 (33.3%) patients of Frankel grade – 4 and 4 (13.3%) patients of Frankel grade – 5 as shown in Figure 2. There were 18 (60%) patients who loss bladder and bowels control, 10 (33.3%) patients of normal control, and 2 (6.7%) patients of urinary retention (Table 2). In the sensory level, there were 6 (20%) patients of sensory level of C₄, 14 (46.7%) patients of C₅, 7 (23.3%) patients of C₇ and 3 (10%) patients of C₇ sensory level (Table 3).

Table 2: Distribution of patients by bladder and bowel control.

Bladder and Bowel Control	No.	Percentage
Normal	10	33.3
Urinary retention	2	6.7
Loss control	18	60.0
Total	30	100.0

Table 3: Distribution of patients by sensory level.

Sensory Level	No.	Percentage
C4	6	20.0
C5	14	46.7
C6	7	23.3
C7	3	10.0
Total	30	100.0

On x-ray spine, there were 3 (10%) patients of C₄ – C₅ anterior dislocation, 2 (6.7%) patients of C₄ fracture with posterior dislocation, 1 (3.3%) patient of C₄ vertebral body fracture, 9 (30%) patients of C₅ – C₆ anterior dislocation, 6 (20%) patients of C₅ vertebral body fracture, 5 (16.7%) patients of C₆ – C₇ anterior dislocation, 1 (3.3%) patient of C₆ vertebral body fracture, 2 (6.7%) patients of C₇ vertebral body fracture and 1 (3.3%) patient of C₇ posterior dislocation (Table 4). The mean degree of retropulsion of the vertebral bodies and encroaches of the spinal canal was 4.0 ± 18.1.

All patients undergone anterior cervical fixation and followed up postoperatively at one, three and six months interval. The mean hospital stay of the patients was 28.4 ± 4.2 days. On follow up of one month, the mean Frankel grade of the patients was 3.5 ± 1.6, on

Table 4: Distribution of patients by C. spine injury.

Spine X-ray	No.	Percentage
C4 – C5 anterior dislocation	3	10.0
C4 fracture with posterior dislocation	2	6.7
C4 vertebral body fracture	1	3.3
C5 – C6 anterior dislocation	9	30.0
C5 vertebral body fracture	6	20.0
C6 – C7 anterior dislocation	5	16.7
C6 vertebral body fracture	1	3.3
C7 vertebral body fracture	2	6.7
C7 posterior dislocation	1	3.3
Total	30	100.0

three months follow up the mean Frankel grade was 3.53 ± 1.6 and on six months follow up the mean Frankel grade was 3.6 ± 1.8 (Table 5).

Table 5: Distribution of patients by follow-up of Frankel grading.

Frankel Grade	1 Month Follow-up No. (%)	3 Months Follow-up No. (%)	6 Months Follow-up No. (%)
1	6 (20.0)	6 (20.0)	6 (20.0)
2	3 (10.0)	3 (10.0)	2 (6.7)
3	3 (10.0)	2 (6.7)	3 (10.0)
4	6 (20.0)	7 (23.3)	3 (10.0)
5	12 (40.0)	12 (40.0)	16 (53.3)
Mean SD	3.50 ± 1.6	3.53 ± 1.6	3.6 ± 1.8

On follow up of one month, in the bladder and bowel control, there were 12 (40%) patients of catheterized, 16 (53.3%) patients of normal control and 2 (6.7%) patients of partial recovery. On follow up of three months, in the bladder and bowel control, there were 4 (13.3%) patients of catheterized, 20 (66.7%) patients of normal control and 6 (20%) patients of partial recovery. On follow-up of six months, in the bladder and bowel control, there were 3 (10%) patients of catheterized, 25 (83.3%) patients of normal control and 2 (6.7%) of partial recovery (Table 6).

Table 6: Distribution of patients by bladder and bowel control.

Bladder and Bowel Control	1 Month Follow-up No. (%)	3 Month Follow-up No. (%)	6 Month Follow-up No. (%)
Normal	16 (53.3)	20 (66.7)	25 (83.3)
Partial recovery	2 (6.7)	6 (20.0)	2 (6.7)
Catheterized	12 (40.0)	4 (13.3)	3 (10.0)
Total	30 (100.0)	30 (100.0)	30 (100.0)

On immediate postoperative x-ray, there were 9 (30%) patients of good condition, 17 (56.7%) patients of satisfactory condition and 4 (13.3%) patients of unsatisfactory condition. On postoperative x-ray at the time of discharge, there were 9 (30%) patients of good condition and 21 (70%) patients of satisfactory condition (Table 7). On follow up of one, three and six months, in the x-ray finding, there were 9 (30%) patients of good condition and 21 (70%) patients of satisfactory condition (Table 8).

Table 7: Distribution of patients by postoperative x-rays.

X-rays	Immediate No. (%)	At the Time of Discharge No. (%)
Good	9 (30.0)	9 (30.0)
Satisfactory	17 (56.7)	21 (70.0)
Unsatisfactory	4 (13.3)	0

Table 8: Distribution of patients by follow-up of x-rays condition.

X-ray Condition	1 Month Follow-up No. (%)	3 Month Follow-up No. (%)	6 Month Follow-up No. (%)
Good	9 (30%)	9 (30%)	9 (30%)
Satisfactory	21 (70%)	21 (70%)	21 (70%)
Total	30	30	30

CONCLUSION

It is concluded from this study that good results was

achieved by anterior cervical spine fixation and it is fully capable to stabilize the lower cervical spine after injury. The use of anterior approach in treatment of the injured lower spine is safe and effective.

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