

# Outcome in Lower Cervical Spine Injuries (Treated Surgically)

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Fracture dislocation of the cervical spine is amongst the most serious injuries that can result from fall, industrial accident, automobile accidents and athletic activities. They cause a broad spectrum of disabling conditions ranging from minor pains to quadriplegia and even death. Cervical spine injuries are usually treated by skeletal traction for 3-6 weeks. By this method proper decompression, bony fusion and stabilization of the injured cervical spine is not possible. It also results in many complications i.e. bed sores, infection etc. Surgical management of the cervical spine injuries provides proper decompression, and enhances bony fusion & stabilization of the spine thus allowing early mobilization of the patient. With early mobilization the complications are tremendously reduced. It also reduces the hospital stay of the patient and offers ideal circumstances for recovering the neurological deficit. A study was conducted in the department of Neurosurgery Lahore General Hospital, Lahore comprising of 20 consecutive patients of lower cervical spine injuries which were treated surgically. Excluding the three patients who were in Grade E (Frankel grading), 75% of patients improved as regard of their grading. At the end of follow up of 6 months, only 20% of patients were in the non useful grades i.e. A, B & C. There were no complications like bed sore, thromboembolic phenomena, UTI and non union of the spine producing chronic instability. It was concluded that patients of lower cervical spine injuries treated surgically with early mobilization results in dramatic improvement in outcome with negligible rate of complications.

**Key words:** Spinal Injury, Spinal Fixation.

Serious injuries to the cervical spine is a major health problem every where. The sufferers are usually young and energetic group so consequences are of great concern to many individuals, not only to the medical profession responsible for their treatment but also the patient's family and the employer, public insurer and lawyers. Society at large has to share the financial burdens of disability, legal liabilities and unemployment. Probably no accident or illness is more devastating than quadriplegia from cervical spine injury. A strong healthy person in the vigor of youth is injured in a diving accident and suddenly finds himself totally paralyzed and helpless for the rest of his life, completely dependent on the others for all of his bodily needs, yet still retaining a keen and alert mind. The psychological and emotional impact of such a catastrophe is tremendous. The usual and conventional treatment of cervical injuries has been immobilization of cervical spine for a period of 6 weeks. The results and outcome has been very discouraging since the days of Cushing and Frazier. Surgical treatment has been in constant evolution since that time. The optimal surgical treatment which decompresses the neural elements and stabilizes the spine with the aim of bony union resulting in short and long term neural protection and hence axonal regeneration solves the puzzle of the physician and trouble of the patient.

## Material and Methods

This study has been carried out at the Department of Neurosurgery, Unit II, King Edward Medical College, situated at Lahore General Hospital, Lahore. This department is also affiliated with Post Graduate Medical Institute, Punjab.

We studied 20 consecutive cases in and around the city of Lahore presenting to department of neurosurgery from March 1996 to Oct 1997 with cervical spine injuries from C 3-7 level. The excluding criteria for the patients were, patients coming from other cities far from the Lahore, patients having multiple fractures of the long bones, patients having chest injuries and patients having associated medical diseases.

Antero-posterior and lateral plain radiographs of cervical spine were obtained to assess the bony injury. CT/MRI were done where indicated. Crutchfield cervical traction was applied as an initial procedure to achieve reduction. Anterior cervical spine fixation with Dynamic Compression plate and cancellous screws of appropriate lengths was performed after sufficient reduction has been achieved. Corpectomy and replacement with autologous bone grafting (from iliac crest) was done where indicated. Patients were mobilized gradually in a hard cervical collar over a period of 6 weeks. Patients were followed up after 3 months interval for a period of 6 months. At the time of follow up, antero-posterior and lateral radiographs of the spine were obtained to assess the bony spinal fusion. During this period of study ( March 1996 to Oct.1997) 32 cases of the cervical spine injury were received in the dept. of neurosurgery, unit II at Lahore general hospital, Lahore. Only those cases were included in this study which belonged to the areas near Lahore to facilitate follow up.

## Results

This was a prospective study which comprised of 20 consecutive patients presenting with injury to the cervical spine. Majority of patients (75%) were in younger age

group i.e., their ages ranged from 15-30 years. Only 15% of patients were younger than 20 years and the 10% were above 50 years. A male predominance was clearly noted, 80% as compared to females who were 20%. This is probably due to more exposure of the males to unsafe working conditions. Most of the patients presented early after the injury, however, mean delay of 17 hours was noted. The patients who presented early were those who presented directly to the casualty department of the hospital, while other patients who presented late were usually referred from other hospitals. The mean stay in the hospital was 16.85 days. This included all the delay before undergoing surgery which was mainly due to patient's problems e.g. fever, paralytic ileus etc. Philadelphia collar was applied soon after the fixation. Patients were gradually mobilised from their bed and were discharged on 6th-7th day after removing the stitches. The operative time ranged from 02 hours to maximum of 3 hours and thirty minutes, with an average of 02 hours and 30 minutes. Cases who took longer time included the cases in which severe damage had occurred to the cord and required careful decompression.

Fall from height was found to be the most common mode of injury, which occurred in 30% of patients. These include fall from roof, electric pole, tree and stairs in equal proportion. Next comes fall from moving vehicles 20%, road side accidents 15% and fall of weight on the back 15%.

The most frequent site of cervical body compression fracture was C5 (20%) and fracture dislocation occurred mostly (45%) at C5-C6 inter space.

Nearly all the patients (95%) had quadriplegia at the time of admission to the hospital. Only one patient had no neurological deficit. This patient had gross fracture dislocation at C5-6. More than half of the patients (56%) showed improvement in their grades of power of lower limbs. This showed the presence of spinal shock at the time of presentation as a possible factor. Taking Frankel grades into consideration, it is observed that majority of patients improved their functional grades. Excluding the three patients who were in Grade E, 75% of patients improved their grading to more useful grades. Thus by the end of follow up of 6 months only 20% of patients are in the non useful grades i.e. A, B & C.

Comparison of frankel grades

Frankel Grades	No. of patients			
	Pre-Op	Post-Op	At 3 months	At 6 months
A	1	1	0	0
B	3	3	1	0
C	10	10	9	4
D	3	3	5	7
E	3	3	5	

Five patients (25%) had no sensory deficit at the time of presentation. Sensory recovery observed in 80% of patients (12 out of 15). Out of these 50%

(07 out of 12) had complete recovery and 42% (05 out of 12) had partial improvement.

Two patients had complete control on their sphincters pre-operatively. 11 out of remaining 18 (61.11%) patients had complete loss of control on sphincters and 07(39%) had partial control. At the end of follow up, only 04 (22.22%) patients had no control on their sphincter. Nine (50%) out of 18 patients regained complete control on the sphincters along with 02 patients who were having no loss of control on sphincters. Five (28%) out of 18 patients showed partial recovery.

**Discussion**

Injuries of the cervical spine are amongst the most serious injuries that cause a broad spectrum of disabling conditions. Previously injuries of the cervical spine were managed conservatively by applying only cervical traction but the results were disheartening. Later, the technique of cervical spine fusion was adopted but rigid stabilisation was not possible with this procedure. The technique of anterior cervical spine fixation by a DC plate allows proper decompression of the cord along with rigid stabilisation that leads to solid bony fusion. The goal of treatment is to decompress a compromised spinal canal. The aim of the surgical treatment of cervical spine injuries is indicated to improve neurologic deficit, to restore spinal mechanics through correction of a deformity to stabilise unstable lesions, and to facilitate the patient's comfort and nursing.

This decompression is particularly important in those cases associated with neurologic deficit. Although some authors have shown no relationship between spinal canal narrowing and neurologic deficit<sup>1,2</sup>. In literature it has shown that there is an increasing amount of literature that suggests otherwise. Hashimoto et al (1988) have shown that although there is no direct correlation between spinal canal compromise and neurologic status, there is a degree of compromise at which neurologic injury becomes probable<sup>3</sup>. They have shown that there is a very significant relationship between neurologic injury and the presence of laminar fracture. Trafton and Boyd (1984) have also shown a relationship between the degree of spinal canal encroachment and neurologic injury<sup>4</sup>. Clinically, McEvoy and Bradford (1985) have shown that patients presenting with neurologic deficit have a better chance of improvement when treated surgically as compared with non operative treatment. In the present study, 1(5%) patient had no neurological deficit, 19(95%) patients were having weakness of limbs of various grade, out of these 19 patients, 5(26.32%) patients showed marked recovery (2 attained grade V power in all four limbs and 3 attained grade IV in all four limbs). These five patients were having no cord injury and all belonged to group I. The patients in group I (Dislocations) showed excellent improvement in their power of limbs post-operatively as compared to the patients in groups II & III (compression # & fracture dislocation). Ten patients improved their power

to some extent and were able to manage their activities and were able to look after them. Three patients did not improve and remained dependent on others for all of their bodily needs. In general, power in upper limbs improved better as compared to improvement in lower limbs. Taking Frankel Grading into consideration, only 06 (30%) patients were able to do useful work pre-operatively and at the end of follow up at 6 months, 16(80%) patients were having normal and useful motor activity.

Philadelphia collar was applied soon after stabilisation by anterior plate as also indicated by Paul SUH and Bohler (1990)<sup>5</sup>, Cabanella (1988), De Oliveria (1987) and Goodman (1983), and patients were mobilised from their bed in 1st post operative week. So all the complication of bed ridden patients are abated.

Anterior fusion of the lower cervical spine by the use of bone grafts was well accepted since the reports of Baily and Badgley (1960) & Cloward and Verbiest<sup>6,7</sup> (1962) (as cited by Cloward 1980). However inspite of the many advantages, it had been criticised because it does not provide sufficient stability. Secondary angular deformity and protrusion of the graft can occur.

As a solution to this problem, many authors have proposed the application of instrumentation after grafting to obtain immediate stabilisation. Different authors used different types of implants. Bohler was the first who used a heavy plate with large screws in 1964. After Bohler, Orozco (1970) Tschern (1971, Seneges (1971) and Gassman & Seligson (1983) used different types of plates, belonging to A O( anterior Orthosis) system ( as cited by Oliveria DC 1987). De Oliveria (1987) used special H-shaped plate with two screws for each vertebra. Caspar<sup>8</sup> (1986) used trapezial osteosyntatic plate which is non constrained type of system i.e. screws are not locked into the plate (Paramore 1996)<sup>9</sup>. Morscher (1990) introduced titanium hollow screw plate system. Clausen (1996) stated that there exist two markedly different instrumentation systems for the anterior cervical spine: The cervical spine locking plate system (CSLP) which uses unicortical screws with locking hub mechanism for attachment, and the Caspar trapezial plate system which is secured with unlocked bicortical screws.

The dynamic compression plates used in this study are locally made. This is an unconventional system who has a semirigid screw-plate junction that loads the screws less in pure tension than the constrained systems. Also stresses at the screw root of this semirigid system are less than in constrained systems, since the screws can pivot. This is demonstrated by the observation that during the critical "fusion" time, which lasted an average of 3 months in this study, there was not a single case of screw breakage. This is because as the screws can pivot slightly, the tension forces are dissipated. The second advantage of this micromotion is that it promotes remodelling. The third advantage of this system is that it utilises cancellous screws and thus a bicortical purchase is not necessary.

In a developing country like ours, a very important consideration is the cost of the instrumentation system used. The relative costs show that the dynamic compression plates and cancellous screw system is markedly cheaper than other instrumentation systems. The total cost of D.C plate and screws is 40-50 \$ which is much less than the cost of other systems. Locally made DC plate systems have further reduced the cost very much.

### Conclusion

The surgical treatment of the lower cervical spine trauma is a desirable treatment to improve the outcome and give hope to the patient. It saves the patient from a prolonged imprisonment in the bed and helps to early return to the society so decreasing the burdon of disabled in the society. The anterior approach is useful in its ability to allow for simultaneous decompression, bone grafting, and stabilisation permitting the use of a lighter weight, less restrictive form of postoperative immobilisation. It carries with it a nearly uniformly successful means of achieving arthrodesis of the spine while affording acceptably low rates of complications.

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