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Original Research Article

RETROSPECTIVE AND PROSPECTIVE STUDY OF FUNCTIONAL OUTCOME OF CERVICAL SPINE INJURIES TREATED WITH POSTERIOR STABILIZATION

G. Kaliraj[1], A. Mohamed Zubair[2], M. N. Karthi[3], R.Vijayaraj[4]

[1]Associate Professor, Department of Orthopaedics, Kanyakumari Government Medical College Asaripallam, Tamilnadu, India.
[2]Assistant Professor, Department of Orthopaedics, Kanyakumari Government Medical College Asaripallam, Tamilnadu, India.
[3]Associate Professor, Department of Orthopaedics, Kanyakumari Government Medical College
[4]Asaripallam, Tamilnadu, India.
[5]Assistant Professor, Department of Orthopaedics, Government Medical College and Hospital, Tiruppur, Tamilnadu, India.

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Corresponding Author:
Dr. R.Vijayaraj
Email: drvijayarajtvmc@gmail.com

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Abstract

Background: The cervical spine is a highly mobile spine segment, liable to various diseases and trauma. In addition, it is a complex region where many vital structures lie close to a vertebra. Aim: The study aims to analyze the functional outcome of neurological improvement and stability of cervical spine patients with traumatic cervical spine injury treated with lateral mass fixation posterior cervical fusion with bone grafting. **Materials and Methods:** A Longitudinal study was conducted at the Institute of Orthopaedics and Traumatology, Rajiv Gandhi Government General Hospital, Chennai, for 1 year and 6 months. Twenty patients fulfilling the eligibility criteria presenting with cervical spine injuries treated with posterior stabilization during the study period were selected. **Result:** Among 21 patients, most patients were male, 18 (85.7%), and female were 3 (14.3%). In the age group, most patients were aged 41-50 years 5 (23.8%) and 51-60 years 5 (23.8%). The frequent injury was road traffic accidents in 11 (52.4%) patients, and among MRI, oedema in 13 (61.9%) patients. The most common level injury was C5-C6 fracture dislocation (50%). Three patients had sacral pressure sore; three patients were treated conservatively. One patient developed a wound infection, treated with appropriate antibiotics for culture-specific organisms and wound debridement was done. There is no significant difference between pre-op and post-op neurology. **Conclusion:** We conclude that posterior surgical stabilization of sub-axial cervical spine injuries had a good functional outcome.

INTRODUCTION

The cervical spine is a highly mobile spine segment, liable to various diseases and trauma. It is a complex region where many vital structures lie close to a vertebra. Cervical spine injuries from trauma with a neurological deficit like root or cord compression are not uncommon. The cervical injury affects males more frequently than females, and the age range of 15 to 30 years and those older than 65 years have the highest prevalence rates. Accidents involving motor vehicles falls, and injuries sustained from participation in sports are the most prevalent causes of death in children younger than 15 years old. Injuries often occur in the sections of the cervical spine located at C2, C5, C6, and C7.[1] When attempting to detect a cervical injury, the patient's medical history and a physical examination are essential parts of the process. Fractures and dislocations of the cervical spine might manifest themselves with pain or stiffness in the neck. Investigate the cause of the damage as well as the patient's current condition after it occurred. Unconscious patients have discomfort in the axial region of the neck and have neurological impairment symptoms, raising the possibility of a spinal cord injury. Be aware that the absence of neurologic signs does not rule out the potential of sustaining an injury to the spinal cord.[2] Fusion of the cervical spine is the only option for obtaining stability and pain relief in a traumatic spine. An unstable cervical spine injury with or without neurological deficit requires closed reduction or open reduction. Lateral mass screws have been advocated by many spinal surgeons for both traumatic and degenerative fixation of the cervical

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spine.[3] The major advantage of posterior stabilization with lateral mass fixation is its higher fusion rate and greater biomechanical stability than anterior plating or interspinous wiring techniques. Injury to nerve root associated with lateral mass screw insertion and screw fixation failure is the potential complication. The most feared direct complications of LMSF are injuries to the vertebral arteries and nerve roots. Screw pulls out, implant disengagement, or fracture at the instrumented or adjacent segments is a concern, but they generally do not result in an irreversible squeal.[4] Magerl described a more lateral (20°–30°) angulation and a slightly more medial and cephalad starting point with his technique. Additionally, a more superiorly angulated sagittal plane would maximize purchase, facilitate insertion, and further minimize the vertebral artery and nerve root risk.[5]

Aim

To analyze the functional outcome neurological improvement and stability of cervical spine patients with traumatic cervical spine injury treated with lateral mass fixation posterior cervical fusion with bone grafting.

MATERIALS AND METHODS

A Longitudinal study was conducted at the Institute of Orthopaedics and Traumatology, Rajiv Gandhi Government General Hospital, Chennai, for 1 year and 6 months. Twenty patients fulfilling the eligibility criteria presenting with cervical spine injuries treated with posterior stabilization during the study period were selected. Inclusion criteria: Patient diagnosed with traumatic cervical spine injuries with a neurological deficit per the ASIA scoring system. Patients with cervical spine instability by SLIC scale 5 or more, ALLEN and FERGUSON classification of sub axial spine, fractures C3 to C7, patients have proper medical records, motor score at the time of admission, MRI reports and images CT reports and images, and age of 18 years and above.

Exclusion Criteria

Those who are not willing the study, stable cervical spine injuries without neurological deficit, children aged less than 18 years, and cervical spine injuries associated with other pathology of the cervical spine, e.g., Tuberculosis, degenerative disease, tumour. Initial management is the management of Airway, Breathing, and Circulation (A, B, C), cervical collar immobilization, fluid and electrolyte management, assessment of neurological status by ASIA motor score, and methylprednisolone succinate if the injury is <8 hours old. Then, a dose of 30 mg/kg in the first 15 minutes, followed by 5.4mg/kg/hr I.V. infusion for the next 23 hours, skull tong traction with Gardner's skull tong, after the stabilisation of the patient, appropriate X-rays, CT scan, and MRIs was taken, cervical injuries were classified using a standard classification system, i.e., Allen Ferguson classification and patients were assessed, and surgical procedures were planned.

RESULTS

Table 1: Demographic data of the study

		Frequency	Percentage
Gender	Male	18	85.7%
	Female	3	14.3%
Age group	18-20	2	9.5%
	21-30	3	14.3%
	31-40	4	19%
	41-50	5	23.8%
	51-60	5	23.8%
	61-70	2	9.5%
Mode of injury	Road traffic accident	11	52.4%
	Fall from height	5	23.8%
	Slip and fall from steps	5	23.8%
MRI	Oedema	13	61.9%
	Haemorrhage	2	9.52%
	No signal change	6	28.57%
Neurology	B	9	40.9%
	C	10	45.5%
	D	2	9.1%
Post-op Neurology	C	5	23.8%
	D	6	28.6%
	E	10	47.6%

Among 21 patients, most patients were male, 18 (85.7%), and female were 3 (14.3%). In the age group, most patients were aged 41-50 years 5 (23.8%) and 51-60 years 5 (23.8%). The frequent injury was road traffic accidents in 11 (52.4%) patients, and among MRI, oedema in 13 (61.9%) patients. The most common level injury was C5-C6 fracture dislocation (50%). In addition, 59% of cases involve flexion distractive violence (Table 1). Most patients 4 (19%) were a procedure done C3C4C5.

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Table 2: Comparison of pre-op neurology with post-op neurology

Pre neurology	Post-op neurology			P-value
	C	D	E	
B	4	3	2	0.183
C	1	3	6	
D	0	0	2	
	C	D and E		
Group 1 (B and B)	4	5		0.055
Group 2 (C and D)	1	11		

Three patients had sacral pressure sore; three patients were treated conservatively. One patient developed a wound infection, treated with appropriate antibiotics for culture-specific organisms and wound debridement was done. In grade B, out of 9 patients, 4 patients improved to grade C-2, patients improved to grade D, 3 patients improved to grade E and in grade C, out of 10 patients, 3 patients improved to grade D and 6 patients improved to grade E. 2 patients in grade D improved to grade E after surgical intervention. There is no significant difference between pre-op and post-op neurology [Table 2].

DISCUSSION

Vaccaro et al. formulated a sub-axial cervical spine injury classification system (SLIC) in which a SLIC score of 5 or > 5 needs operative management.[6] Treating cervical spine fractures and dislocations has several goals, including reducing Deformity and stabilization, minimizing or decreasing neurologic injury, and early rehabilitation. The choice of treatment modality is based on the fracture's anatomy and the surgeon's experience. Lateral mass screw fixation and posterior stabilization are safe and can withstand alignment.[7] The role of timing of surgical intervention in spinal cord injury remains one of the most important topics. Using lateral mass screws for traumatic cervical spine injuries is associated with excellent alignment maintenance and minimal complications. The posterior approach is preferable since we can directly encounter the posteriorly locked facets and remove the excess fibrous tissues.[8] According to Lalwani et al.[9] a series of 341 cases stated that 73% of patients are between 25 to 64 years of age, comparable to 76% of patients in our study. A study by Shrestha et al.[10] showed 60% of cases are due to falls from height in a series of 149 patients with cervical spine injuries, 44 % of patients in our study, since fall from height and while carrying weight is due to occupational trend in our country like agricultural and labour work. But in our study, road traffic accident fall from bike contributes 55%. It was generally accepted that the most injured spinal level is at the 5th and 6th cervical vertebra, as this level has the greatest range of flexion or extension stress and, therefore most susceptible to trauma. Masood et al.[11] showed 31% of patients with cervical 105 spine injuries, the commonest level being C5-C6, in a series of 214 patients, similar to our study, shows 50%. In our study, the most common level injury was C5-C6 fracture dislocation (50%), followed by C6-C7 level, which was comparable to earlier studies. It was generally accepted that the most injured spinal level is at the 5th and 6th cervical vertebra as this level has the greatest range of flexion–extension stress and is, therefore, most susceptible to trauma. Flexion – distraction type of violence was more in the study. These injuries can result in facet sprains, dislocations jumped or perched facets. We observed that 59% of cases are involved with flexion distractive violence, comparable to previous studies showing 61%.[12,13] Pressure soreness is one of the known complications of cervical spine injuries. In our study, 3 patients had a sacral pressure sore. Three patients were treated conservatively. One patient developed a wound infection, treated with appropriate antibiotics for culture-specific organisms and wound debridement was done. However, our studies had no hardware-related complications like screw pull-out and implant failure, and cord oedema presented 59% cord haemorrhage in 9% of the patients.[14] The normal lordotic curve of the cervical spine is maintained in all cases. Patients were classified into five grades as per the ASIA impairment scale. In grade B, out of 9 patients, 4 patients improved to grade C-2, patients improved to grade D, 3 patients improved to grade E and in grade C, out of 10 patients, 3 patients improved to grade D and 6 patients improved to grade E. 2 patients in grade D improved to grade E after surgical intervention. We had no patients in grade E. In our study, patients improved to grade 2 more power after early surgical stabilization, and no patient underwent neurological deterioration.[15] In new cases, the reduction is achieved by soft tissue release and traction. In old cases, the reduction is not attempted. Posterior stabilization with lateral mass screw fixation bone grafting gives stabilization and fusion compared to ACDF. Improvement in neurological power after stabilization is because of the reestablishment of blood supply of the spinal cord in the affected segment due to regression of oedema and release of the compressive elements. Hence lateral mass screw fixation with posterior stabilization and bone grafting can also be considered a treatment for cervical spine injuries with neurological deficits

CONCLUSION

Our study achieved a good functional outcome in the form of stability and definitive neurological improvement in incomplete spinal cord injury cases

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following surgical intervention. Proper preoperative planning, precision in surgical techniques and early rehabilitation programs are needed to achieve good results and minimise complications. We conclude that posterior surgical stabilization of sub-axial cervical spine injuries had a good functional outcome.

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