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## A Study On Functional Outcome Following Surgical Fixation For Subaxial Cervical Spine Injuries.

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### ABSTRACT

Lower Subaxial Cervical Spine Injuries are one of the common causes of serious morbidity mortality following trauma. 6% of trauma patients have spine injuries of which >50% is contributed by a cervical spine injury. The aim of the study was to determine the functional outcome following surgical fixation for sub-axial cervical spine. This prospective study involving 17 patients who were all admitted with sub-axial cervical spine injuries and amenable to intervention in our department of orthopedics and traumatology, Government Medical College, and Hospital, Madurai, Tamil Nadu, India in the year 2023-2024. Duration of 6 months from December 2023 to May 2024. Most of the injuries presented within 24 hours of injury. Most of the patients presented with an incomplete neurological deficit. C5-C6 subluxation with disc bulge was the most common spinal injury. 5 patients were operated on more than 2 levels. The rest of the patients were operated on at 2 levels. We consider that the anterior decompression and fusion with a locking compression plate is a viable procedure in sub-axial cervical spine injuries.

**Keywords:** ASIA, Cervical spine, Decompression, MRI, Outcome, Spinal cord injury

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## INTRODUCTION

A spinal cord injury (SCI) is an injury to the spinal cord that affects temporary or permanent alterations in its function. Symptoms may include loss of muscle function, sensation, or autonomic function in the parts of the body served by the spinal cord below the level of the damage [1]. Injury can occur at any level of the spinal cord and can be a full injury, with a complete loss of sensation and muscle function, or incomplete, meaning some nervous signals can travel past the damaged area of the cord. Early recognition, immobilization, preservation of spinal cord function, and stabilization are the initial management of patients with cervical spine injuries [2]. Cervical instability due to trauma is usually from the level of C3 to C7 (i.e.; sub-axial). Neurological deficits are common i.e.; root compression and cord compression with subluxation and dislocation [3]. Unstable cervical spine injuries with or without neurological deficit require open reduction stabilization is done by using various implants and bone grafting. Implants provide immediate stability, whereas bone grafts provide long term stability by achieving intervertebral fusion [4]. Distraction, forcible stretching of the spinal column in the axial plane, provides a third mechanism and becomes apparent when distraction forces resulting from flexion, extension, rotation, or dislocation produce shearing or stretching of the spinal cord and/or its blood supply [5]. Hence to relieve from the primary impact, persistent compression, and alignment of stable anatomy of the cervical spine, early surgical intervention is necessary to relieve persistent compression and stabilization of sub-axial cervical spine injuries. We have done the procedure of decompression and fusion with cervical H plate for the sub-axial cervical spine injuries [6].

## METHODS

This prospective study involving 17 patients who were all admitted with sub-axial cervical spine injuries and amenable to intervention in our department of orthopedics and traumatology, Government Medical College, and Hospital, Madurai, Tamil Nadu, India in the year 2023-2024.

### Inclusion criteria

18-65 years of both sex, cervical spine injury with instability involving C3 cervical level to C7 cervical, spinal level (lower cervical spine). Traumatic disc prolapses impinging the cord involving C3 cervical level to C7 cervical spinal level (lower cervical spine). Patients with cord damage whether complete or incomplete quadriplegia.

### Exclusion criteria

Medical comorbidities e.g. malignancy, severe liver disease, organic brain disease. Multiple injuries that influence the function. Thoracolumbar spinal injuries. Previous cervical spine injuries. A thin needle bent at 90 degrees was placed in the appropriate disc space and a lateral radiograph was taken to verify the exact level. Anterior longitudinal ligament and annulus over disc were incised and disc taken out end plates of adjacent bodies and space for graft were prepared. Spaces were packed with gel foam and the wound was covered with a clean sponge. For corpectomy, the body of vertebra excluding lateral cortices was removed. A tricortical graft harvested from the iliac crest equal to measured dimensions and was fashioned into a wedge to maintain cervical lordosis. Then the graft was placed either corpectomy or discectomy space. A lateral radiograph was taken to check the position of the graft. The anterior cortex was drilled by 2.5 mm bit and appropriate size locking plate was placed and screws of 14-18 mm were used and directed towards the midline. The position of the screw was checked with C-arm and then diagonally, the opposite locking screw was then placed. The position of screws and plate was again checked with C-arm. After ensuring proper hemostasis, platysma, subcutaneous tissue and skin were closed in layers without drain and a Philadelphia collar was applied and the patient was extubated.

## RESULTS

In Table 1, age of the patients ranged from 19 to 62 years. The mean age was 43.8 years. There was male predominance in this case. In Table 2, road traffic accident is the most common mode of injury followed by fall from height. In Table 3, about 36% of the patients had fractures at more than one cervical level. 2 patients had high cervical and sub-axial fractures among the 36 patients. The median age of the patients with sub-axial fracture were 48 years and 98% were males.

Table 1: Age incidence.

Age (years)	No. of patients	Percentage(%)
11-20	1	5.8
21-30	2	12
31-40	3	17.6
41-50	7	41
51-60	3	17.6
61-70	1	5.8

Table 2: Mode of injury.

Mode of injury	No. of patients	Percentage(%)
Road traffic accident	7	41
Fall from height	7	41
Fall with weight on the back	2	12
Slip and fall on the ground level	1	6

Most of the injuries presented within 24 hours of injury. Most of the patients presented with incomplete neurological deficit. C5-C6 subluxation with disc bulge was the most common spinal injury.

Table 3: Types of fractures.

Type of injury	No. of patients
C4-C5 fracture-dislocation	1
C5-C6 fracture-dislocation	6
C6-C7 fracture-dislocation	6
C4-C5/C5-C6 traumatic disc prolapse	1
C5-C6 subluxation with disc prolapse	1

Table 4: Neurological deficit.

Neurological deficit	No. of patients
Complete	6
Incomplete	11

In Table 4, most of the patients presented with incomplete neurological deficits. Some patients with suspected spine trauma were fortunate to escape neurological injury and have a normal neurological examination. Attempts had been made to develop reliable guidelines to identify these patients to spare them the expense and radiation exposure of imaging. The National emergency X-radiography utilization study proposed guidelines based on the clinical history and physical examination to identify patients who may be safe to observe without radiography. In Table 5, complete was no feeling or movement of the areas of your body that are controlled by your lowest sacral nerves. This meant that the patient did not have feeling around the anus or control of the muscle that closes the anus. People with complete SCI did not have control of bowel and bladder function. Incomplete neurological deficit had feelings but no movement below the level of injury, including sacral segments that control bowel and bladder function. In incomplete there was feeling and movement below the level of injury. More than half of key muscles can move, but not against gravity. Moving against gravity means moving up, for example, raising your hand to your mouth when you are sitting up. Incomplete feeling and movement below the level of injury. More than half of key muscles can move against gravity. Feeling and movement were normal.

Table 5: Frankel's grade.

Pre-op Frankel's grade	No. of patients
A	6
B	5
C	5
D	1
E	0

**Table 6: Level of fusion.**

Level of fusion	No. of patients
C4-C5	1
C5-C6	7
C6-C7	6
C6-C7-T1	2
C4-C5/C5-C6	1

In Table 6, 3 cases were expired. Two cases were due to acute respiratory distress syndrome. One case died due to aspiration pneumonitis. Four patients developed bed sores in which one case developed bedsores pre-operatively and others post-operatively. One patient developed a tracheoesophageal fistula and it was managed conservatively. Cervical spine injury in OPLL patient with cord contusion, C3-C4 fracture-dislocation with cord contusion, C4 corpectomy and cage/plate fixation, C3-C5disc ligamentous injury, posterior decompression, and lateral mass fixation.

### DISCUSSION

The principal goals in the surgical treatment of cervical spine injuries are stabilization of the spine, decompression of the neurological elements, and facilitation of rehabilitation. The most effective method for decompression, reconstruction, and stabilization of patients with cervical spine injuries remains controversial [7]. Mihara et al has mentioned excellent clinical results have been reported in the literature. Since, then this technique has gained popularity. Originally non-locked plates were used, with either static or dynamic screw fixation. Since, then the locked plate system has been introduced. In recent years, anterior plating with locked fixation screws has been shown to provide better stability than conventional anterior plating without locked screw fixation [8]. Roy-Camille et al, also showed that locking plate constructs had higher pull-out strengths than non-locked systems. Several investigators have conducted biomechanical studies of the surgical construct stability provided by various anterior and posterior instrumentations of the cervical spine. Broadly speaking the options are anterior alone, posterior, or a combined stabilization approach. It has been concluded by many of these studies that combined anterior and posterior fixation, and posterior alone fixation, are both biomechanically more stable than an anterior alone fixation [9]. In our institute, for sub axial cervical spine injuries the locking cervical plate show good results radiologically as well as neurologically as compared to the nonlocking plate. The complications related to nonlocking plate-like screw pull-out, plate failure is less likely to occur in locking plates. The normal lordotic curve of the cervical spine is maintained well in these cases compared to the patients treated with nonlocking plate [10]. In our study, it has been 2.0 hours. The theory behind this is that the increased stability afforded by locked plates, combined with immobilization in a rigid cervical collar, obviates the need for posterior stabilization [11]. Combined anterior and posterior approach is associated with increased complications and prolonged operative time. If an anterior alone approach shows acceptable results, then it would be an attractive option due to the shorter theatre time required, reduced cost, and patient morbidity. There is a paucity of literature showing results using this technique [12]. Orozco et al performed in vitro testing simulating burst fractures with the posterior distraction of the sub-axial cervical spine. They then stabilized this with an anterior locked plate with graft and showed that this technique is capable of returning the stability of this cadaveric spine to well within its pre- injury level [13]. Kocis et al also investigated this using an injury model with anterior and posterior disruption. They demonstrated that the stability of the normal spine was comparable to that of an injured spine stabilized by an anterior locking plate with uni cortical screws, or by a non- locking plate with bi-cortical screws [14, 15].

### Limitations

The present study had the inherent limitations of a retrospective, single-center investigation. There were only a few papers in the literature that have studied the relationship between IMLL and neurological outcomes. The complex relationship between morphology, the extent of decompression, surgical technique, the timing of decompression, and IMLL has not

been fully explored before. The findings reported here will require verification in a prospective, multi-

center trial.

## CONCLUSION

The use of anterior cervical plating after anterior corpectomy and fusion with autologous bone graft greatly enhances arthrodesis. Locking cervical plate provides rigid stabilization. Therefore, we consider that the anterior decompression and fusion with locking compression plate as a viable procedure in sub-axial cervical spine injuries.

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