



Original Article (SPINE)

Epidemiology and Surgical Outcome of Traumatic Sub Axial Cervical Spine Injuries in a Tertiary Care Hospital of KPK, Pakistan

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ABSTRACT:

Objective: The purpose of this study was to characterize the epidemiologic characteristics, a pattern of traumatic subaxial cervical spine injuries, and their surgical outcomes in a tertiary care hospital in Khyber Pakhtunkhwa, Pakistan.

Materials and Methods: This retrospective descriptive study was conducted at the Department of Neurosurgery at Lady Reading Hospital Peshawar. The records of 40 patients between the ages of 15 and 60 who had cervical spine injuries were evaluated to characterize the injuries and surgical outcomes. We employed the anterior route for surgery regularly and the posterior method only when the reduction failed or substantial instability. We used a tricortical bone graft or titanium cages with autologous bone and secured them through titanium plates to achieve fusion.

Results: 80% of patients presented with sub axial cervical injury. Regarding the etiology of injury, 37.5 % had motor vehicle accidents, 28.12% had a history of height falls, and the remaining had sustained injuries due to other causes. The majority of the patients, 68.75% (n = 22), had isolated subluxation injury. 87.5% (n = 28) underwent surgical intervention; surgical outcomes such as pain relief were measured using the VAS, which was 6.09 ± 1.42 preoperatively while 4.5 ± 1.29 postoperatively with a difference of means of 1.59. There was a significant improvement in neurological functions as measured through the ASIA impairment scale.

Conclusion: Most cervical spine injuries occurred in young male patients, motor vehicle accidents were the most prevalent cause, and isolated subluxation was the most frequent injury pattern. The anterior approach was a successful surgical procedure, as evidenced by good neurological and functional outcomes.

Keywords: Subaxial Cervical Spine Fractures, Cervical Discectomy, Anterior Cervical Corpectomy, Fusion.

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INTRODUCTION

Traumatic spinal fractures are a significant cause of death and disability in every population worldwide.¹² Collecting and analyzing information to characterize the issue and recognize potential risk factors in distinct population groups is one of the first stages in preventing injury.³⁴

TCSCI (traumatic cervical spinal cord injuries) is one of the most serious and debilitating traumatic disorders that may cause loss of motor and sensory functions as well as multiple organ dysfunction, posing a significant financial and social burden on involved persons, their relatives, and their society due to high cost of healthcare treatment, recuperation, and loss of function.⁵⁶ As a result, a quick and precise diagnosis of these illnesses is critical to commence suitable treatment options that will hopefully improve patient outcomes.

With the recent advancements in instrumentation and surgical techniques, individuals with cervical spine fractures are frequently urged to undergo surgery. Conservative therapy can result in post-traumatic instability and persistent discomfort; both of which can lead to ongoing incapacity.⁷ The objectives of surgical therapies are to restore functional capacity, reduce discomfort, improve neurology, and avoid forth coming incapability. Anatomical restoration, direct decompression of neural components, early mobilization, and fewer nursing care issues are all advantages of surgery. The anterior technique has gained prominence in recent years. An anterior approach is used to treat the majority of cervical spine fractures. It is less painful and can decompress the cord directly, resulting in improved fusion rates and eliminating the need for adjacent segment fusion, which is required with the posterior technique.⁸ In 1952, an anterior technique to subaxial cervical surgery was first developed. Intervertebral fusion was later achieved by using an iliac crest bone graft technique. Fixation was initially done using ordinary AO plates, and then H-type locking

plates were adopted. The cord compression in cervical spine injuries is caused by instability, fragmentation, or dislocation, addressed from the anterior.⁹ The posterior technique is nowadays rarely performed. It can be used when the locking of facets cannot be reduced preoperatively by employing traction, such as in old fractured is locations.

Conversely, specific experts now advocate for an anterior approach for open reduction.¹⁰ Although surgical procedures for cervical injuries are gradually snowballing in our nation, surgical treatments for cervical spine fractures are only conducted at limited centers due to insufficient amenities and technical expertise. As a result, local literature is scarce on those subjects.

The present study conducts a detailed evaluation of each individual's medical records with traumatic cervical spine injuries for one year to determine the frequency and forms of various subaxial cervical spine injuries. We also wanted to see how their occurrences differed depending on the severity of the cervical spinal fractures and our surgical experience with various subaxial cervical spine fractures regarding pain reduction and neurological outcomes.

MATERIALS AND METHODS

Study Design and Place

The records of patients presented and admitted to the Department of Neurosurgery, Lady Reading Hospital Peshawar, KPK from June 2020 to June 2021 were analyzed in this descriptive retrospective study, which represented 80 percent of all cervical spine injuries admitted during this period with on average follow-up of 6 months. This study confirms to the ethical review board requirements of PGMI lady reading hospital Peshawar KPK.

Inclusion Criteria

This study included patients of both genders

between the ages of 15 and 60 years. An inclusion criterion for surgical intervention was an anterior vertebral body fracture of the subaxial cervical spine region, traumatic subluxations, or a traumatic disc causing compression.

Exclusion Criteria

C1-C2 injuries, injury to posterior column only, patients with contused cord without any ligamentous and bony injury, patients having serious respiratory compromise, severe associated injuries such as severe head injury, and associated malignant disease were all exclusion criteria for surgical intervention.

Clinical Management of Patients

All of the patients were stabilized using the ATLS technique, and rapid resuscitation was performed. Initially, patients were screened, and management prioritized their pattern of injuries and vital signs during the initial inspection after being fitted with a rigid cervical collar. A secondary survey, consisting of a complete head-to-toe examination and a thorough neurological examination, was performed at the ward's bedside, and records were kept. In all instances, anteroposterior and lateral X-rays of the cervical spine from C1 to the cardiothoracic junction were taken. Selected instances received a CT (computed tomography) scan, MRI (magnetic resonance imaging) scan, or a 3D CT scan of the cervical spine. Patients' neurological and functional statuses were rated preoperatively using the ASIA (American Spinal Injury Association) impairment scale and VAS (visual analog scale).

Surgical Management

Patients underwent surgery on the following available list after meticulous preoperative preparation. Axial traction was used on patients with fracture-dislocation. Weights of 10 kg to

15 kg were utilized at first, and then 2.5 – kilogram augmentations were added after 6 to 8 hours until reduction was attained. We hadn't waited for an MRI scan to check for the disc before starting traction; instead, we started slowly and monitored neurology carefully for any signs of worsening. In traction, serial X-rays were taken, and neurology was closely followed. Patients were operated on the following available list if traction reduced dislocation, which usually happened in most cases. All patients signed an informed consent form.

We employed the anterior route for surgery regularly and the posterior method only when the reduction was failed or substantial instability. We used a tricortical bone graft or titanium cages with autologous bone and secured them through titanium plates to achieve fusion. We employed a stiff cervical collar and intravenous (IV) antibiotics for the first five days after surgery. For the first two to three days, IV analgesia was given.

Patients were mobilized as soon as their condition permitted the following surgery. Patients were subsequently followed twice a month in the outpatient department (OPD) for the first month, then once a month for the next five months. VAS and ASIA (American Spinal Injury Association) grading were completed at each follow-up. Implant fixation and fusion were assessed using X-rays.

Data Collection and Analysis

All information was gathered using a predesigned proforma and analyzed with SPSS 26.0. percentages and frequencies were calculated for nominal and categorical variables, while Mean and standard deviation were used for numerical variables. A surgical outcome in terms of improvement in function such as pain relief was measured using the visual analog scale before and after surgical intervention, and the difference between the means of the two groups was compared using paired sample t-test, taking p-value < 0.05 as significant.

RESULTS

Age-wise Distribution

In our study, 40 patients were admitted with cervical spine injuries, out of which eight patients (20%) had sustained C1-C2 injuries. In contrast, the remaining 32 (80%) patients were presented with traumatic subaxial cervical spine injuries from C3 to T1. Nearly 13 (40.62%) patients received directly through accident and emergency from trauma site to Neurotrauma unit, while 19 (59.37 %) were referred from peripheries hospital. The age of the patients ranged from 15 to 60 years with a mean age of 32.40 ± 12.6 years, as shown in. In our study, most of the patients were in the third decade of life.

Gender-wise Distribution

Many of the patients were male, comprising 24 (75%), whereas only 8 (25%) were female. The male to female ratio was 3:1.

Mechanism of Cervical; Injuries and Associated Injuries

Most of the patients (37.5%) had MVA (motor vehicle accident) leading to cervical spinal injury, while 28.12% were victims of more than two meters of falls from heights. A detail about the mechanism of injury is briefed in Table 2.13 (40.62%) patients had associated injuries. Among these, 9 (28.12%) patients had sustained head trauma, 2 patients had sustained chest trauma, and 2 patients presented with associated fractures of the long bones, as shown in Table 2.

The Pattern of Injuries Based on Radiology

Radiological studies showed that the majority of the patients, 68.75% (n = 22), had isolated subluxation injury, 18.75% (n = 6) had subluxation with vertebral body fractures, 6.25% (n = 2) had vertebral body fracture only, and 6.25% (n = 2)

had spinal cord injury without any ligamentous or bony abnormality. Of the patients who had sustained isolated subluxation only, 12 patients had C5 – C6 subluxation, and five patients had C6 – C7 subluxation, three patients had C4 – C5 subluxation, two patients had C3-C4 subluxation, as shown in Table 4.

Pre and Postoperative Surgical Outcomes

A total of 87.5% (n = 28) underwent surgical intervention. Anterior approach — either anterior cervical corpectomy & fusion or anterior cervical discectomy & fusion was performed in 24 patients whose dislocation was successfully reduced by applying axial traction. Posterior spinal fusion (PSF) was done in two patients using autogenous bone graft and lateral mass screws. Combined surgery was also performed on two patients. Surgical outcomes such as pain relief were measured using the visual analog scale (Functional outcome), which was 6.09 ± 1.42 (Mean \pm SD) preoperatively while 4.5 ± 1.29 (Mean \pm SD) after surgical procedure, a difference of means 1.59 (p-value < 0.001) as shown in Table 5. There was a significant improvement in neurological functions as measured through the ASIA impairment scale, as shown in Table 6.

Table 1: Age ranges of the patients.

Age Range	n (%)
15 – 20 years	6 (18.75%)
21 – 30 years	11 (34.37%)
31 – 40 years	6 (18.75%)
41 – 50 years	5 (15.62%)
51 – 60 years	4 (12.5%)

Table 2: Mechanism of Injuries.

Mechanism of Injury	Number of Patients	Percentage of Patients
Motor vehicle accidents	12	37.5%
Fall from height	9	28.12%
Diving	3	9.37%
Fall of a heavy object overhead and neck	4	12.5%

Suicidal hanging	1	3.12%
Physical Assault	2	6.25%
Sports-related	1	3.12%
Total	32	100%

Table 3: Associated Injuries

Associated Injuries	No of Patients
Associated head trauma	9
Associated chest trauma	2
Associated long bone fractures	2
Total	13

Table 4: Pattern of injuries based on radiological studies.

Pattern Involved	No of Patients	Percentage of Patients
Isolated Subluxation Only	22	68.75%
C5 – C6 subluxation	12	54.54%
C6 – C7 subluxation	5	22.72%
C4 – C5 subluxation	3	13.63%
C3 – C4 subluxation	2	9.09%
Subluxation with vertebral body fracture	6	18.75%
Vertebral body fracture only	2	6.25%
SCIWORA	2	6.25%
Total	32	100%

Table 5: Pre and Postoperative functional outcome using the Visual Analogue Scale.

Preop Mean VAS	Postop Mean VAS	Difference
6.09 ± 1.42 (Mean ± SD)	4.5 ± 1.29 (Mean ± SD)	1.59 (p value < 0.001)

Table 6: Preop & postop Neurology based on the ASIA scale.

ASIA Scale		Pre-op		Post-op	
	No, of Patients	Percentage	No, of Patients	Percentage	
A	8	28.57%	6	21.42%	
B	2	7.14%	4	14.28%	
C	4	14.28%	2	7.14%	
D	4	14.28%	3	10.71%	
E	10	35.71%	13	46.42%	

DISCUSSION

The cervical spine is the most vulnerable region prone to injuries; variances in occurrences, frequencies, kind, and location are due to various causes. In our study, 80% of patients had sub axial cervical spine damage, although other studies show it occurs in roughly 60% of individuals¹¹. Out of 40 patients who presented with cervical spine injuries, 20% suffered from upper cervical injuries (C1 – C2), and the remaining 32 (80%) suffered from subaxial cervical spine injuries (C3 to T1), which is consistent with earlier studies.¹² In our study age range of patients was 15 to 60 years with a mean age of 32.40 ± 12.6 years. The majority of the patients were male and in their third decade of life, indicating that young adult males are more susceptible to sub axial cervical spine injuries. According to this study, a primary cause of cervical trauma is an MVA (motor vehicle accident), followed by a fall from heights greater than 2 meters. These findings are comparable to those of other studies.¹³⁻¹⁷ A growing trend can explain this for rarely observed safety elements such as safety belts and helmets both at work and when driving and a tendency toward excessive speeds among young individuals. As a result, public programs focused on reducing injuries should have a greater emphasis on causes such as roadside motor vehicle accidents and falls from height, with a particular focus on young males.

Traumatic Cervical injuries may occur in concurrence with acute and life-threatening associated injuries to other anatomical areas, which should be adequately diagnosed and handled to achieve the best possible patient outcomes. Thirteen patients (40.62 percent) of all patients with severe subaxial cervical spine injuries also had related injuries. In this study, trauma to the head was the most common category of related injury, with 28.12 percent of all patients reporting it. These injuries are particularly concerning since they have been linked to neurologic impairment, long-term disability, and even death in some people.¹⁷ As a

result, it appears that treating physicians should keep in mind a high index of the doubt for contemporary head and neck injuries, associated long bone fractures, and chest trauma.

Furthermore, radiological studies revealed that the majority of the patients, 68.75 percent (n = 22), had isolated subluxation injury, 18.75 percent (n = 6) had subluxation with vertebral body fractures, 6.25 percent (n = 2) had vertebral body fracture only, and 6.25 percent (n = 2) had spinal cord injury without any ligamentous or bony injury, which is consistent with other studies.¹²¹⁵¹⁸ The leading communal subluxation site was C5 – C6, next C6 – C7, according to the statistics. These findings are consistent with earlier research that has linked hypermobility of the lower parts of the subaxial cervical spine to problems.¹⁹²⁰

Cervical fracture treatment outcomes are rarely evaluated on a functional basis in many studies. Many research focuses on neurology, fusion, and complications. Using a visual analog scale, we attempted to improve functional outcomes such as pain alleviation and had positive results. In the last follow-up, the mean VAS score had improved to 1.59. ACDF was reported to have an excellent functional outcome in patients with traumatic cervical instability in one study.²¹

Despite biomechanical studies suggesting that posterior fixation is more effective, clinical results of anterior interbody fusion and fixation using plates had been excellent. Our research discovered that an anterior approach was simple to implement with early stabilization and early improvement in neurology. Others have reported similar findings, defining anterior plate fixation as a beneficial approach in most patients with cervical injuries.²²

CONCLUSION

Most cervical spine injuries occur in male patients younger in age, and the most common cause is a

motor vehicle accident. The most common type of injury was an isolated subluxation. As evidenced by the positive neurological and functional outcomes, the anterior approach was a successful surgical procedure.

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Additional Information

Disclosures: Authors report no conflict of interest.

Ethical Review Board Approval: The study was conformed to the ethical review board requirements.

Human Subjects: Consent was obtained by all patients/participants in this study.

Conflicts of Interest:

In compliance with the ICMJE uniform disclosure form, all authors declare the following:

Financial Relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

Other Relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

AUTHORS CONTRIBUTIONS

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
1.	Hamayun Tahir	1. Study design and methodology.
2.	Hina Arooj	2. Data calculations.
3.	Samina Feroz	3. Data collection and calculations.
4.	Afzal Raza	4. Interpretation of results.
5.	Farooq Azam	5. Literature review and referencing.
6.	Naseer Hassan	6. Analysis of data.