



Original Research Article

Observational retrospective study of subaxial cervical spine trauma at tertiary care centre

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ABSTRACT

Background: The aim of this study is to compare between various treatment modalities available for treatment of subaxial cervical spine injuries due to trauma**Materials and Methods:** A total of 172 patients of subaxial cervical spine injuries were assessed retrospectively about their mode of injury, clinical course, definitive treatment given and its outcome. As the study was Descriptive and retrospective in nature involving only patient case files, statistical test is not applied to the study.**Result:** In our study 44 patients suffered from vertebral body fracture while 108 patients had spinal canal compromise due to other injuries. 16 patients had quadriplegia, 24 patients had grade 4 power in upper and lower extremities, and roots were involved in 46 patients. In 44 patients complete corpectomy was performed with placement of tricorticate graft taken from fibula, this graft was fixed in place with titanium plate and four screws.**Conclusion:** From this study it can be concluded that Patients treated with anterior approach had better outcome in relation to the fixation and fusion of the spine, reconstruction is more better in anterior approach.This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.For reprints contact: reprint@ipinnovative.com

1. Introduction

There is difference of opinions among Neurosurgeons about treating traumatic subaxial cervical spine injuries by anterior and posterior approaches^{1,2} and also about using autologous and synthetic bone grafts for fixation.^{3,4}

Our study consist of study of last three years cases of subaxial cervical spine injuries at our centre. The goal of this study is to analyse various methods used to treat these patients and their outcome in relation to clinical improvement of patient, fusion and stability of the graft and overall benefit achieved by patients.

Subaxial cervical spine injuries involve either anterior column injuries i.e body fractures, middle column injuries

i.e facets injuries or posterior column injuries like laminar injuries and posterior osteoligamentous injuries

1.1. Anterior column injuries

Anterior column injuries mainly include compression and comminuted fracture injuries of vertebral body⁵ Surgical indications for anterior column injuries include:

1. If there is any compression of the spinal canal due to fractured segment breaching into spinal canal
2. Correction of kyphotic deformity occurred due to wedge fracture

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1.2. Middle coloum injuries

These injuries include fractures of facet joint and disruption Of joint capsule. Treatment mainly include stabilization of facet joint either by immobilization or fixation of levels above and below the level of fracture.

1.3. Posterior coloumn injuries

Posterior coloumn injuries include, injuries of lamina and injuries of various ligaments and are less severe unless compromising on spinal canal. Treatment mainly include laminectomy with or without fixation.⁶

2. Materials and Methods

This study is Descriptive and retrospective study of patient case files only. Patients were managed first in casualty with primary resuscitation with trauma protocol and spine immobilization. Upon stabilization they were investigated with clinical and radiological investigations. Patients having minimal bony injuries or no bony injuries with or without spinal cord contusion on MRI were given conservative course of management.

While those having moderate to severe bony injuries with compression of spinal cord were treated for decompression and fixation. Majority of patients were treated for anterior fixation i.e., corpectomy with either autologous bone graft or with titanium cage and plate fixation. Those patients having posterior coloumn injuries were treated by laminectomy and lateral mass screws fixation.

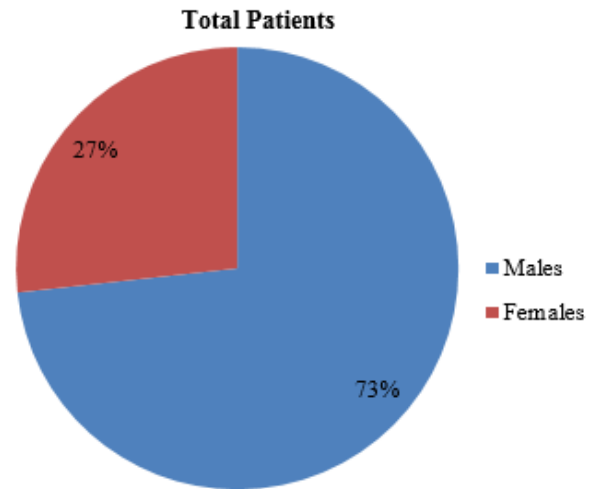
3. Results

Total 172 case records were analysed who were treated at Dept. Of Neurosurgery, At Tertiary care Institute. Of these 126 were male and 46 were females. Cause of injury were road traffic accidents in 106 patients, sports injuries occurred in 3, injuries at workplace like construction labor, porters, industrial workers were there in 52 patients, other causes like assaults was there in 3 patients.

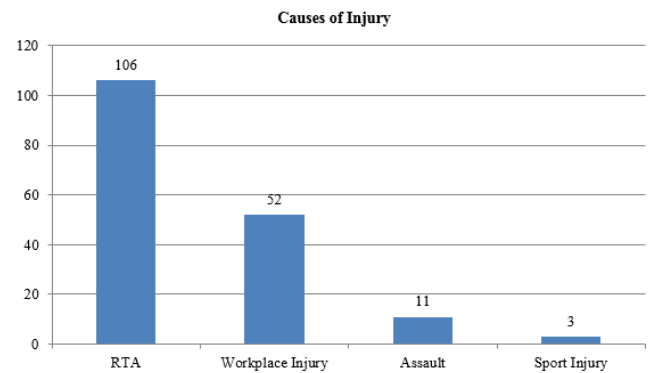
In our study 44 patients were of body fracture of cervical vertebrae. While 108 patients had other injuries like disk disruption, injury to posterior longitudinal ligament and other ligaments, fracture and dislocation of facet joint, locking of facet joint, fracture of posterior elements.

Of the body fractures included c3 in 2 patients, c4 in 4, c5 in 20, c6 in 8, c7 in 10 patients.

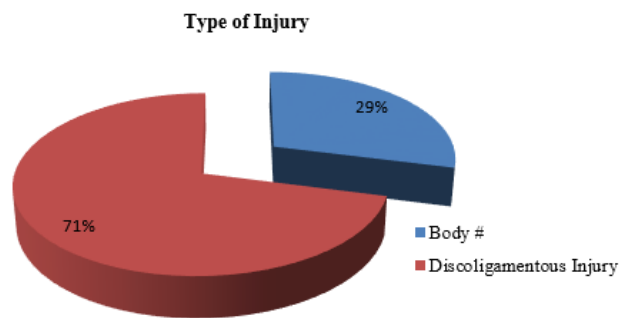
In fourteen cases more the one segment was affected. Of these 16 patients had quadriplegia, 24 patients had grade 4 power in upper and lower extremities, and roots were involved in 46 patients. Remaining patients had less of neurological deficit. Body fractures were mainly associated with cord compression and associated quadriplegia. Root involvement presented differently in different patients with sensory, motor or mixed involvement



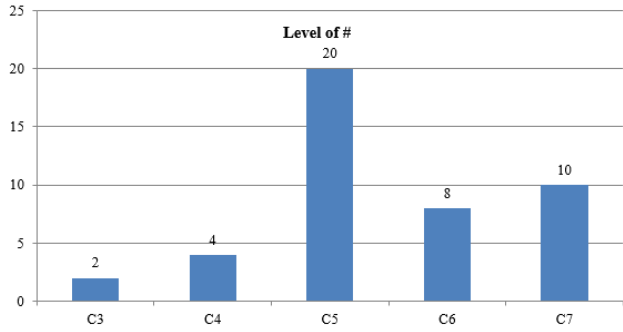
Graph 1: Incidence of C-Spine injury among males and females



Graph 2: Causes of Injury



Graph 3: Type of Injury



Graph 4: Level of C-Spine fracture



Fig. 1: CT scan showing dislocation of C6-C7



Fig. 2: Post op image showing corpectomy and fixation with titanium cage and screws

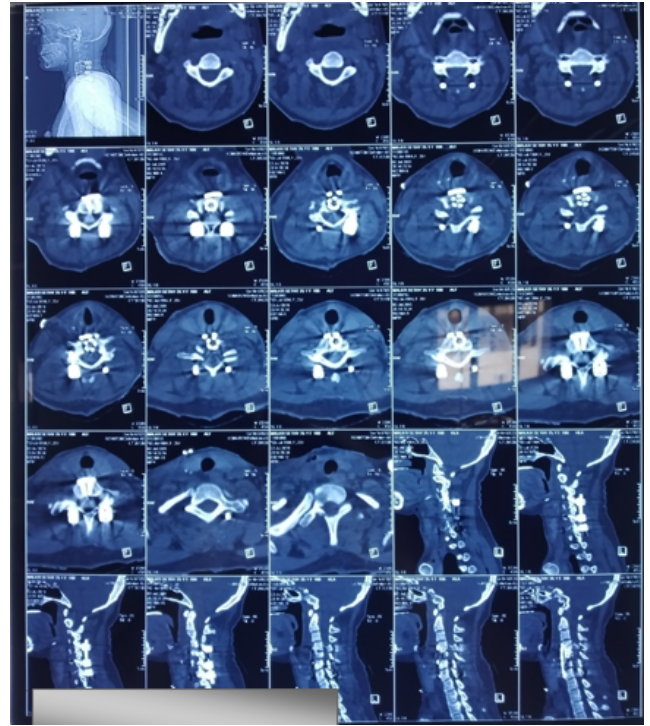


Fig. 3: Post op CT showing 360 degree fixation with both anterior and posterior approaches

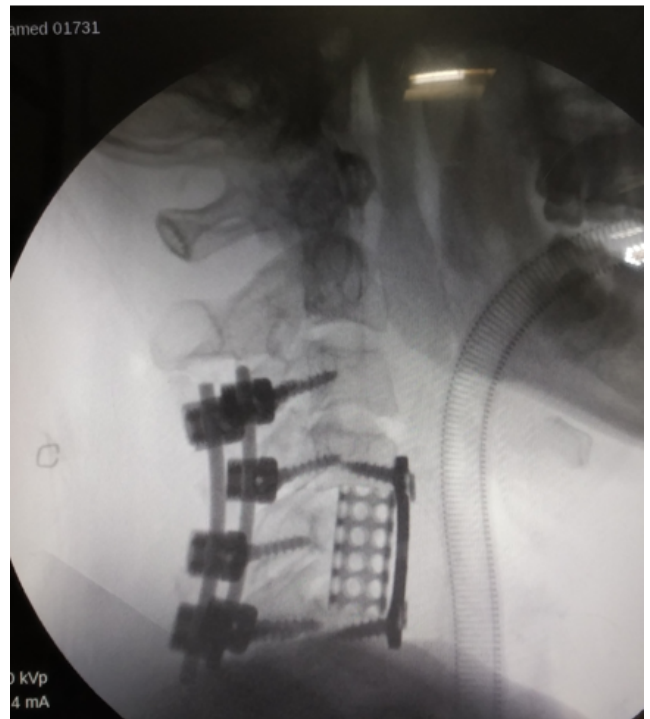


Fig. 4: Post of X-ray in 360 degree fixation

In 44 patients complete corpectomy was performed with placement of tricorticate graft taken from fibula, this graft was fixed in place with titanium plate and four screws. In other 78 patients complete corpectomy with fixation with titanium cage and plate/screws done. The cage was filled with autologous bone chips collected while doing corpectomy for fusion purpose in 66 patients while with G-bone in 12 patients. In fourteen patients operation done for more than one segment. While 30 patients were treated for laminectomy and lateral mass screw fixation

Intra-op complications were nil in our study. Most of the patients needed 10 days hospitalization. Patients with incomplete quadriplegia recovered the most. Proper rehabilitation, nursing care, family members participation and utmost physiotherapy played crucial role in gaining the power back to its maximum and improving overall health of the patients. It also helped increase morale of the patient

Both the groups showed utmost fusion with less of post op complications. Two patients in fibular graft group developed screw pullout and dislocation of fibular graft on fourth post op day, which needed reoperation and one patient in titanium cage group developed infection of the operative site with discharge of pus through incision site which needed removal of graft and was treated further.

Most patients showed improvement of power after removal of compressing segment but those with complete quadriplegia showed very minimal improvement. Deformity occurred due to trauma was corrected in most after surgery with very less of deformity remaining in a few.

4. Discussion

The aim of surgery is improve weakness and to correct other neurological deficits, correct deformity, fix the unstable spine and to enhance the patients health back to its maximum.^{7,8}

There are controversies and nuances around the management of spine injury patients. It is a general consensus that the anterior column injuries should be treated by anterior approach while middle and posterior column injuries should be treated by posterior approach.^{9–11}

However, some authors differ on this, that the posterior approach should be the first option whenever possible, and if anterior approach be necessary, it should be followed by a second-stage posterior surgery because of the morbidity associated with the anterior approach alone. Although some studies show the efficiency of the anterior approach for cervical spine fusion, Stauffer and Kelly et al noted in > thirty percent cases there was graft dislocation and recurrence of deformity. It can be concluded from their study that anterior approach can be adopted only when there is vertebral body fracture and compression of the cord, in this scenario only the anterior approach is beneficial according to stauffer and Kelly.¹²

Anterior approach may be beneficial in following ways

1. In a severely injured patient immediately after emergency resuscitation patient can be taken to operating table without turning the patient and thus minimising the chance of further trauma to the patient that may occur while turning the patient.
2. There is very less trauma to the patient in anterior approach, as there is very less dissection of the intervening muscle, after minimal separation of muscles surgeon directly lands on the anterior aspect of subaxial cervical spine.^{13,14}
3. Fixation achieved by both methods i.e either by autologous iliac/ fibular tricorticate graft or with titanium cage and plate fixation yields results and with both these methods deformity correction can be achieved.
4. Decompression can be better achieved by anterior approach compared to the posterior approach.⁶

Ulrich et al¹⁵ and Coe et al tested several implants in cadaver and bovine spines, and they concluded that posterior approach is far better than the anterior one especially in associated ligamentous injuries Ulrich et al said an additional external immobilization should be combined with anterior fixation, whereas Coe et al recommended posterior wiring techniques.

To summarise, above studies noted that posterior fixation were more better and more stable than anterior fixation, but the spine fixed with anterior implants achieve near normal anatomic contour. Also the weight bearing capacity is more of anterior implant than the posterior one. However in complete disruption, combined fixation from both anterior and posterior side achieves more stable construct and there is maximum deformity correction, although restricting movement of spine, but gives good stability to the spine.

Because of all these benefits, anterior approach was used more in our study while patients needing posterior fixation due to middle column or posterior column involvement or due to ligamentous injuries were treated with posterior fixation, while in some both approaches were used

In our study there were few complications in some cases like infection, hematoma formation some patients showed no neurologic improvement but there was no neurologic deterioration in any patient in our study, and there was graft dislocation in some cases on follow up which were reoperated

Posterior approach suggested by Roy-Camille¹⁶ and others is risky because of chances to dislocate loose disc fragments onto the cord intraoperatively and may lead to neurologic deterioration

In such scenario full radiological evaluation of patients with MRI and assessing at risk patient and modification of approach should be done.

Bombard et.al have compared both the approaches and concluded that among these anterior approach is more better

due to less complication rate and more improvement in disability of the patient.

Perforation of esophagus as mentioned by some authors is not seen in our study.

Bombard et al showed posterior approach has more complications compared to the anterior one. Neurological deficits were more frequently associated with posterior approach than the anterior one. Though they concluded reduction and reconstruction is more feasible with posterior approach. But for fusion of the graft anterior approach is far more better than the posterior approach

Stability of the spine can only be achieved by proper reduction either closed or open reduction. Closed reduction is the preferred choice. According to Cloward, open reduction can only be done in completely quadriplegic patients but not in other patients. Cases of locked facet are first reduced by operating from posterior side and then anterior fixation can be done if needed. Before opting this canal compression must be ruled out.

Patients who need traction to align the spine should be given traction. Sometimes this may avoid the need for open reduction.

5. Conclusion

From this study it can be concluded that Patients treated with anterior approach had better outcome in relation to the fixation and fusion of the spine, reconstruction is more better in anterior approach. Also decompression and neurologic improvement is better with anterior approach. Anterior surgical approach yields better outcome at the hands of well-trained Neurosurgeon.

6. Conflict of Interest

The author declares no potential conflicts of interest with respect to research, authorship, and/or publication of this article.

7. Source of Funding

None.

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