



Original article

Surgical approaches in advanced cervical trauma

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Article Info

Abstract

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Background: Bilateral cervical facet dislocations present with severe neurological deficit and an unstable spine. Cervical dislocations with locked facets account for more than 50% of all cervical injuries. The rapid reduction should give the patient the best chance for neurological recovery from compression of the spinal cord or nerve root, or at least prevent progressive secondary spinal cord injury, however, the proper method for reduction and operation is still controversial. **Purpose:** To evaluate the surgical outcome in cervical spine injury with bilateral facet dislocation. **Patients and Methods:** In this study, all the records of sixteen patients with cervical bilateral facet dislocations were reviewed. The SLIC scoring was used for surgical decisions. These cases were managed in our department by open reduction and internal fixation from Jan 2018 to March 2020. Clinically we used the Frankel scale to evaluate our patients. Of our 16 patients, nine cases were managed by the anterior approach; four cases were managed by the posterior approach. And three cases needed a combined approach. **Results:** Mean age was 38 years. A road traffic accident was the cause of 80%. One patient had no neurological deficit. C5/6 and C 6/7 were the commonest injured segments

(80%). Disc compression was present in 58% (eleven patients) of cases. The mean SLIC score was 8 and the mean hospital stay was 15 days. Restoring spinal alignment and reduction of facets was achieved in 87.5% (fourteen patients) of patients.

Conclusion: Bilateral facet dislocation is a serious sequel to cervical spine trauma. It can present with the entire spectrum of neurological deficits. Patients with incomplete spinal cord injury show improvement after early decompression and fixation.

1. Introduction:

Bilateral facet dislocation is the most severe form of cervical spine injury seen in about 5% of cases [1,2]. Facet dislocation is a hyperflexion-distraction injury with the involvement of both the anterior and posterior columns. Most authors [2,3] agree that rapid reduction should give the patient the best chance for neurological recovery from compression of the spinal cord or nerve root, or at least prevent progressive secondary spinal cord injury. The vertebral body translation is usually more than 50% of the vertebral body width [4].

The inferior facets of the superior vertebra move forward over the superior facets of the inferior vertebra due to hyperflexion. Fracture of facets, laminae, and spinous processes may coexist [5-7]. These injuries are inherently unstable [8,9]. Most of the patients present with severe neurological deficits with cord or root injury [10]. The closed reduction has several drawbacks including that closed

reduction fails in a substantial percentage of patients, and a traumatic disc herniation has been found in 50% to 80% of bilateral locked facets. Although it has not been statistically assessed, closed reduction of a bilateral facet dislocation associated with disc rupture has been reported to result in increased spinal cord compression and to worsen a neurological deficit. Finally, closed reduction exposes the trauma patient to supplementary immobilization and pain. [5,10,11]

2. Patients And Methods:

In this retrospective study, 16 cases of cervical spine injury with bilateral facet dislocation were reported. All were operated on at our hospital from Jan 2018 to March 2020. Patients with associated severe head injury or other types of cervical trauma were excluded from this study. All patients were classified according to the SLIC score with their morphology, disco ligamentous complex (DLC) injury, and neurological status. A full neuro-imaging study was made for all patients.

It included a cervical spine X-ray, CT scan with coronal and sagittal reconstruction, and MRI of the cervical spine. The image of each case was studied to decide the surgical management either by anterior approach or posterior approach. Postoperative cervical X-ray and multi-slide CT were done on all patients.

Clinically we used the Frankle grading system to evaluate our patients. Twelve patients had complete cord injury and were scored grade A, three patients had incomplete cord injury and two cases were grade C and one case scored D and only one patient was neurologically intact and scored E.

The total number of patients recruited for this study was 16. There were 13 males and three females with a mean age of 38 years (Ranged 11-60 years). The mode of trauma was motor car accidents was in 11 patients and falling from a height in five. Twelve patients had complete cord injury and were scored 2 according to the SLC scoring system, three patients had incomplete cord injury and were scored 3 and one patients was neurologically intact. C5-6 and C6-7 were the most common injured segments (81.25%) whereas C4-5 was

involved in 12.5% and C3-4 was involved in 6.25% of cases. Significant compression on the cord due to traumatic disc herniation was present in 58% (eleven patients) of cases. The mean SLIC score was 8 (Range from 6 to 9). Nine patients were managed by anterior approach, four by posterior approach, and three cases by combined approach. Patients were allocated for the anterior approach if they have vertebral body failure or significant disc herniation. If alignment was not restored so the combined approach was the solution. in the strategy of management we followed the recommendation made by Vacaro and his colleague in approaching these cases² the first factor to determine to start with the anterior approach is vertebral body failure or significant disc hernia ion if aliment was not restored so combined approach will be the solution in the combined cases two cases had disc herniation and we tried anterior approach and reduction was not succeeded so combined approach was done and the other case had teardrop fracture and subluxation so we went for combined approach from the start.

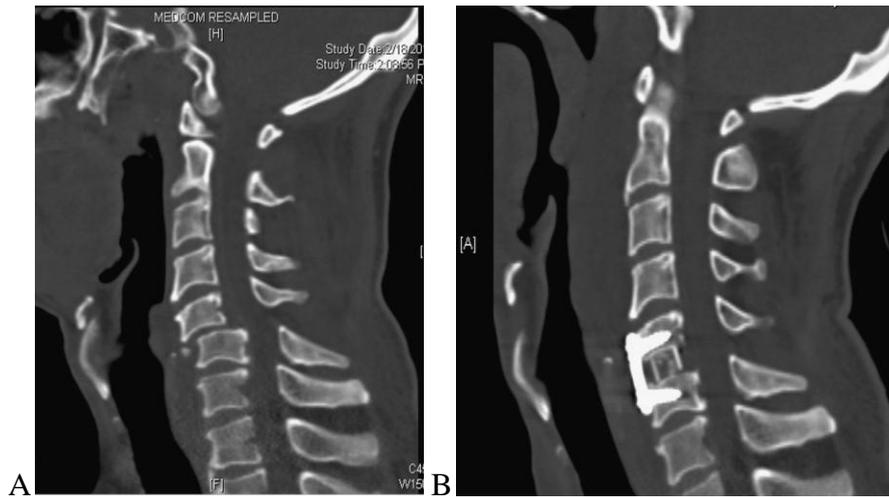


Figure 1. Preoperative imaging. (A) Sagittal CT scan images showing anterolisthesis of C5 over C6. Postoperative images. (B) Sagittal CT showing C5/C6 Discectomy with PEEK cage and plate with the restoration of ailment

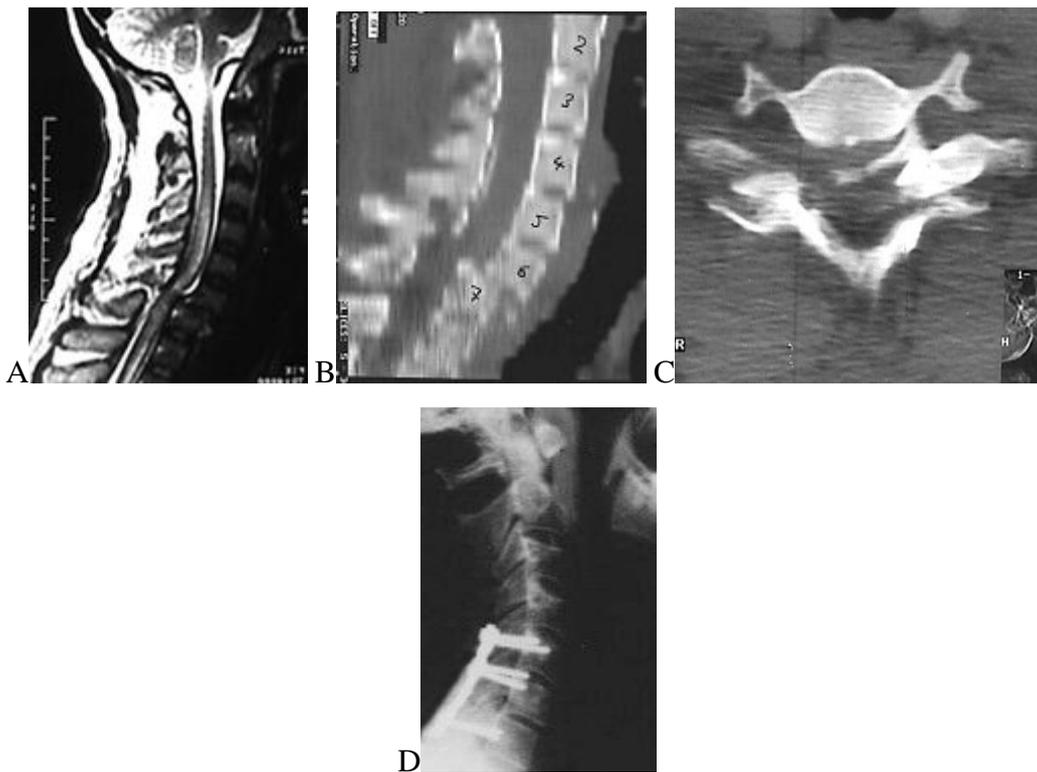


Figure 2. Pre-operative (A)MRI (B)CT cervical spine sagittal cuts (C)axial cut showing bilateral locked facet and C6 C7 dislocation (D) postoperative X-ray lateral view showing lateral mass fixation as there was no anterior compression

3. Results:

Restoring the alignment and reduction of facets was achieved in 87.5% (fourteen cases) of patients. According to the Frankel grading system, three patients with incomplete cord injury improved two cases become grade E, and one case became D. Mortality cases were 18.75% (three patients). One patient died from a chest infection and respiratory failure, the second died during the postoperative period due to pulmonary embolism and the last case died in a rehabilitation center. Considering neck pain 18.75% experienced persisting neck pain postoperatively.

That interfered with daily activities and required analgesics two of these cases had angulations on follow-up x-ray. In the immediate postoperative (87.5%) 16 had achieved perfect anatomic realignment. All showed evidence of bony fusion on x-ray and CT scan and no movement on flexion/extension films. The rest were stable but with a slight imperfection in alignment. Of these 2 patients, one had complete reductions and subsequently had slight angulations on follow-up radiographs and one never achieved perfect anatomic alignment.

Table (1) shows the summary of the case

case	Level affected	Disc herniation	SLC scoring	Alignment restoration	Approach used
1	C5-6	+	9	+	anterior
2	C5-6	+	9	+	anterior
3	C6-7	+	8	+	anterior
4	C5-6	+	9	-	combined
5	C6-7	+	7	+	anterior
6	C5-6	+	8	+	anterior
7	C6-7	+	7	+	anterior
8	C6-7	+	9	+	anterior
9	C6-7	+	9	+	combined
10	C6-7	+	7	-	anterior
11	C5-6	+	8	+	anterior
12	C6-7	-	6	+	posterior
13	C5-6	-	9	+	posterior
14	C3-4	-	8	+	posterior
15	C4-5	-	8	+	combined
16	C4-5	-	9	+	posterior

4. Discussion:

Bilateral facet dislocation is a hyperflexion-distraction injury associated with complete spinal cord injury in 65-87% cases, incomplete injury in 13-25% and less than 10% are intact [8] Anatomically the inferior articular processes of the upper vertebra move forward over the superior articular facets of the lower vertebra because of severe hyperflexion. Due to severe traumatic force adjacent fractures of the vertebral body, facet, lamina, pedicle, or transverse or spinous process have been found fractured in 38.5%-60% of patients. [1] In this study, the motor car accident was the cause of eleven patients then falling from height. In the published literature, falls from height were the cause in the majority of the patients contrary to motor vehicle accidents. [4] C5-6 and C6-7 are the most common involved segments in our study and it matches the results published in the literature. This was explained due to a combination of lower height, smaller anteroposterior diameter of the superior facet, and a more horizontally oriented superior facet at C6 and C7 levels [7-11]

In our study, pre-operative MRI was done in all cases. The need for MRI before reduction is debated since 1990. It is generally recommended that a pre-operative MRI is important to get all the information about the status of the spinal cord and any potentially offending soft tissue or bony structures compressing the spinal cord and for decision

making which approach to be used [3] Treatment choices for subaxial cervical dislocations are still controversial. The decision-making for these patients is mainly affected by patients' neurologic status, presentation, absence of disc herniation, or dislocation of the facet joints. For subaxial cervical dislocation patients with incomplete or without neurological deficit, the possibility of recovery is relatively higher [7-9] .In this case, protection of the remaining neurologic functions from further damage appears to be more important, which needs to be considered during the surgery for these patients. In addition, traumatic disc herniation often is accompanied by sub axial cervical dislocation.

In our study, we did not use the closed reduction and all patients were subjected to open reduction and fixation. Lee y, et al have reported the occurrence of permanent neurological complications after a closed reduction in wake patients [5]. A biomechanical study has shown that cervical facet dislocation leads to injury of the cervical disc and anterior longitudinal ligament or facet articular capsule and interspinous ligament which means cervical instability after reduction.

The most important factors that determine the outcome may be related to the affected segments of the cervical spine, the presence of traumatic disc herniation or not, the extent of neurological deficit (Frankel score), and

the presence of unilateral or bilateral facets dislocation in patients[7-11]. Therefore, patients with cervical dislocation with locked facet should be treated by instrumentation no matter if the reduction is performed or not²⁻⁹ in other studies such as. Yu Z-sheng et al reported a success rate of 88% in dislocation with the bilateral locked facet and 15.4% in unilateral locked facets by closed reduction¹² in our study Postoperative CT scans revealed achievement of reduction of facets bilaterally in 87.5% fourteen cases and closed reduction was not used, The SLIC score was used as a guiding principle all patients were surgical candidates with a minimum score of 6. The surgical approach is not standardized[11]. Combined anterior and posterior fixation is superior in terms of stability Stellerman recommends posterior facetectomy and reduction with fusion if reduction failed after an anterior discectomy and monitored distraction [10]. In our study nine cases out of the eleven cases with anterior disc compression were managed successfully by the anterior approach; four cases out of five cases without any affection in the anterior column could be managed by the posterior approach and the remaining three cases needed combined approach. in our experience the easiest level of management was C5-6 and the hardest was C6-7 but we did not find a correlation between the level affected and the surgical success in reviewing the literature, other studies tried to find a relation between

the age of patient being less 40y and the time of surgical management within 84 hours of trauma and the velocity causing the injury being low velocity like falling from a height but these factors were found to be statistically insignificant and the most important factor is the clinical stage preoperatively[11].

5. Conclusion:

Severe trauma to the cervical spine can cause bilateral locked facet whose management is debatable it may present with the entire spectrum of neurological deficits as well as no deficit The SLIC scoring system is accurate and reliable in evaluating these cases, open reduction and fixation is a safe procedure. Patients with incomplete spinal cord injury show improvement after early decompression of the cord and fixation to ensure stabilization.

6. References:

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