

## Only Anterior Surgery in Subaxial Cervical Fracture Dislocation-Our Experience

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## 1. Introduction

Cervical spine injuries are one of the most disabling injuries of the spine which in majority of the cases leads to permanent disability. majority of these injuries occur due to road traffic accident and fall from height [1]. cervical spine injuries are encountered in 2 to 3% of blunt trauma victims, while it constitute around 19 to 51% of all spinal trauma [2]. neurological injury is directly proportional to the severity of bony injury and majority of cervical fracture dislocation patients present with significant neurological injury [3].

Cervical fracture dislocation represents sever type of cervical spine trauma with both anterior and posterior column injury. In majority of the ceases these patients presents with neurological injury or at risk of developing one. Although there are reports of conservative treatment earlier but now majorities of these injuries are treated surgically [4]. These injuries are reduced close or open and stabilized and decompressed form anterior posterior or combine approach. Majority of cervical fracture dislocation cases need circumferential stabilization [5].

In our setup circumferential stabilization is usually not possible due to financial constraint. So we at our institution try to do gradual reduction of the dislocation and then only anterior stabilization in case of successful reduction. In this study we present the results of only anterior stabilization in cervical fracture dislocation in term of clinical outcome and radiological outcome.

## 2. Material and Methods

This retrospective study was conducted at Spine Unit Hayatabad Medical Complex and Aman hospital Peshawar from Jan 2015 to June 2019. All patients with cervical fracture dislocation who underwent only anterior cervical fusion were included in this study. Patients who had completed at least one year follow up were in-

cluded. Patients in whom combined anterior and posterior stabilization were excluded. Similarly, patients with posterior reduction and stabilization or posterior open reduction with anterior stabilization were also excluded.

All patients were initially stabilized according to ATLS protocol. Plane x-rays of the cervical spine were obtained in all cases. CT scan, MRI or 3D CT scan was obtained in selected cases. Initial stabilization of the spine was achieved with hard cervical collar. After stabilization of the patient, detailed history was obtained and complete examination was done. Patients' preoperative neurological statuses were graded according to ASIA scale [6]. All these cases were type C according to AO comprehensive sub axial cervical fracture classification [7].

Then patients were taken to the Operation Theater and axial Skull traction applied under local anesthesia. Initially 10 to 15 kg weight was applied and then it was gradually increased by 2.5 kg increments every 6 to 8 hours till reduction was achieved. Maximum weight was calculated on the basis of 5kg for skull and 2.5 kg for each level. We did not delay traction for MRI to assess disc rather we gradually apply traction and closely monitor neurology for any deterioration. Serial x-rays were obtained in traction and neurology was monitored carefully. If dislocation reduced, patients were operated on next list using anterior approach.

Postoperative patients were kept in Philadelphia cervical collar for 6 weeks. patients were mobilized in bed or out of bed on next day depending on their neurological status and presence of other fractures. Follow up was done after two weeks, every month for three months, every three months for the first year and then yearly for 3 years. History and examination were done and VAS, neck disability index (NDI) [8] and neurology according to ASIA grad-

ing was recorded at each follow up. Similarly, x ray cervical spine Anterio-posterior and lateral views were performed at each follow up for implant and union assessment.

**3. Results**

Total of 38 patients were included in the study. Out of 38 majority 29(76.3%) were male patients and 9(23.7%) were female (Table 1). Mean age of the group was 29.6 years (SD± 7.4) with minimum 18 years while maximum was 50 years (Table 2).

The main cause of trauma was road traffic accident. Out of 38 patients, 24(63.2%) had RTA, while 10(26.3%) patients had history of fall and 4(10.5%) patients had diving injury (Table 3). The most common level of injury was C5-6 (47.4%) followed by C4-5 (26.3%) (Table 4). In 23(60.5%) patients the dislocation was bi facetal while in 15(39.5%) it was uni facetal (Table 5). Mean duration of preoperative traction was 3.5 (SD± 0.9) days with minimum 2 days and maximum 7 days. This is duration of preoperative traction and does not show the duration in which reduction was achieved. As retrospectively we can only assess the duration of preoperative traction (Table 6).

Preoperative neurological injury was documented according to ASIA scale and was as follow: ASIA A 9(23.7%) ASIA B 3(7.9%) ASIA C 6(15.8%) ASIA D 7(18.4%) and ASIA E 13(34.2%) (Table 7). While using tongs for pre operative traction the tongs were revised only in three patients.

Tricortical autologous bone from the iliac crest was taken for fusion in 29(76.3%) patients while in 9 (23.7%) patients cage filled with autologous cancellous bone from iliac crest was used (Table 8). Mean postoperative follow up was 30.3 months (SD± 9.6) with

minimum 14 and maximum 46 months (Table 9). Neck disability index was calculated for 31 patients all patients showed minimal disability with mean NDI score of 11 (SD± 5.3) with minimum of 4 and maximum of 23. seven patients were unable to complete the score due to their neurological condition (Table 10). Mean visual analog score (VAS) was 2.5 (1.2%) with minimum of 1 and maximum 5 (Table 11).

Out of 38 patients 25(65.8%) had neurological injury and 5(20%) of them showed improvement in neurology on traction preoperatively.

Post op neurological improvement occurred in 19 (76%) out of 25 patients with neurological injury. Improvement of neurology was compared with preoperative neurological status on ASIA grading. If a patients improved on ASIA scale from B to C it was considered one grade improvement and from B to D was considered two grades and so on. Out of 25 patients 6(24%) patients did not improve at all, 7 (28%) patient improved by one grade on ASIA grading, 9 (36%) improved by two and 3(12%) patients improved by three grades. On comparing neurological improvement to preoperative neurological status out of 9 patients with ASIA A 5 did not improve. Three improved by two grades to ASIA C while 1 improved by three grades to ASIA D (Table 12 and 13).

At last, follow up none of our patients reported any complication although in the early-stage majority reported dysphagia and few had hoarseness. three patients had tong revision none of the patient's had revision surgery and all were without external support. On the last follow up x ray all patients were without any adjacent segment disease or implant related problems and showed sign of union with no change of implant orientation or kyphotic angle.

**Table 1:** Sex of the Patients

Sex	Frequency	Percent	Valid Percent	Cumulative Percent
Female	9	23.7	23.7	23.7
Male	29	76.3	76.3	100
Total	38	100	100	

**Table 2:** Age of the Patients

	AGE OF THE PATIENTS	SEX OF THE PATIENTS
	38	38
Missing	0	0
Mean	29.61	
Std. Deviation	7.369	
Minimum	18	
Maximum	50	

**Table 3:** Cause of Trauma

Cause	Frequency	Percent	Valid Percent	Cumulative Percent
RTA	24	63.2	63.2	63.2
Fall	10	26.3	26.3	89.5
Diving	4	10.5	10.5	100
Total	38	100	100	

**Table 4:** Level of Injury

Level	Frequency	Percent	Valid Percent	Cumulative Percent
c4-5	10	26.3	26.3	26.3
c5-6	18	47.4	47.4	73.7
c6-7	8	21.1	21.1	94.7
c7-t1	2	5.3	5.3	100
Total	38	100	100	

**Table 5:** Type of Dislocation

Type	Frequency	Percent	Valid Percent	Cumulative Percent
Unifacet	15	39.5	39.5	39.5
Bifacet	23	60.5	60.5	100
Total	38	100	100	

**Table 6:** Traction Duration in Days

	38
	0
Mean	3.53
Std. Deviation	0.951
Minimum	2
Maximum	7

**Table 7:** Preop Neurology

Neurology (ASIA Grads)	Frequency	Percent	Valid Percent	Cumulative Percent
A	9	23.7	23.7	23.7
B	3	7.9	7.9	31.6
C	6	15.8	15.8	47.4
D	7	18.4	18.4	65.8
E	13	34.2	34.2	100
Total	38	100	100	

**Table 8:** Material Used for Fusion

Material	Frequency	Percent	Valid Percent	Cumulative Percent
TRICORTICAL AUTOLOGUS BONE	29	76.3	76.3	76.3
CAGE WITH AUTOLOGUS BONE	9	23.7	23.7	100
Total	38	100	100	

**Table 9:** Follow Up in Months

N Valid	38
Missing	0
Mean	30.3
Std. Deviation	9.65
Minimum	14
Maximum	46

**Table 10:** Neck Disability Index

N Valid	31
Missing	7
Mean	11.0645
Std. Deviation	5.34126
Minimum	4
Maximum	23

**Table 11:** Visual Analogue Score

N Valid	38
Missing	0
Mean	2.5526
Std. Deviation	1.20129
Minimum	1
Maximum	5

**Table 12:** Neurology Improvement

Neurological Improvement	Frequency	Percent	Valid Percent	Cumulative Percent
No Improvement	6	15.8	24	24
Improvement by one grade	7	18.4	28	52
Improvement by two grades	9	23.7	36	88
Improvement by three grades	3	7.9	12	100
Total	25	65.8	100	
	13	34.2		
	38	100		

**Table 13:** Preop Neurology \* Neurology Improvement Cross Tabulation

Neurology	NEUROLOGY IMPROVEMENT				Total
	No Improvement	Improvement by one grade	Improvement by two grades	Improvement by three grades	
PREOP A	5	0	3	1	9
NEUROLOGY B	0	0	1	2	3
C	0	1	5	0	6
D	1	6	0	0	7
Total	6	7	9	3	25

**4. Discussion**

The approach to cervical spine for management of different cervical spine pathology remains point of debate for the last few decades. There are advocates of both anterior and posterior approach. At the end it comes to proper patient selection, location of the pathology and surgeon training and preference. Cervical fracture dislocations are mostly managed surgically but the approach vary a lot. It can be reduced close preoperatively and then stabilized anterior alone or circumferential [9]. In case of irreducible dislocation majority will prefer posterior open reduction and posterior fusion alone or circumferential in case of critical disc herniation which in some studies reported up to 42% then anterior discectomy posterior reduction and anterior fusion is recommended [10]. For these reasons many recommend to do preoperative MRI routinely to exclude critical disc herniation [11]. We are not doing preoperative MRI routinely at our institution but will apply halo traction and try to start gradual reduction of the dislocation as soon as possible. Obtaining MRI may delay management even for a day here. But trends are now changing and recently we receive more and more patients with MRI already in hand. The patient remains awake and any slight change in neurology can be observed. We think that early reduction and realignment prevent further spinal cord injury. In case of irreducible dislocation, we will do MRI prior to surgery. in our part of the world where universal insurance is not available

and patient has to bear the cost for surgery and implants. Majority of our patients are poor and it is difficult for them to arrange for two surgeries. So, we rarely do circumferential fusion in cervical fracture dislocation. we try to achieve close reduction by gradual traction under careful monitoring of neurology and will only stabilize anteriorly. In cases where posterior tension band is injured badly, we will try to do circumferential stabilization only in those cases.

In our study 25(65.8) % patients presented with neurological injury out of these 19 patients showed improvement postoperatively. Improvement of neurological injury was more obvious in patients with partial neurology. Patients presented with complete neurology 5 did not improved and 4 showed some improvement. But 3 improved to ASIA C and one to ASIA D so practically only one patient had meaningful improvement. Similar to our observation Srivastava SK et al reported one grade improvement from ASIA A to ASIA b in 5 patients out of 17 with ASIA A. so practically no meaningful improvement [12]. On the other hand, all patients with partial injury showed improvement except one patient, who remind throughout in ASIA D. At the end all patient with partial neurological injury achieved independent ambulatory status. This fact of marked improvement in patient with partial neurology after sub axial spine trauma has been reported by Gao W et al in their study [13].

Clinically majority of the patient's showed good improvement in pain and overall, according to neck disability index. Most of the patient's reported minimal or no pain while patient's who had permanent neurological injury reported some pain that in our opinion is mostly due to immobility and psychological element. Like other studies our patients showed no or minimal disability with mean NDI of 11 ( $SD \pm 5.3$ ). Again, patients with complete neurological injuries either could not complete the score or showed poor results according to NDI.

Majority of our patients had good relief and none of our patients showed any sign of loosening or adjacent segment degeneration (ASD). In 29 patients where graft was used Union was very clearly visible, while in 9 patients with cage it was very difficult to assess bridging of bone in some cases on plain X-RAY. But since there was no change in the geometry of implant and alignment of the spine, we think all patients had a union. We did not subject doubtful cases to detail CT scan evaluation as there were no symptoms extra radiation and patient had to bear extra cost. We think that as our follow up is short so it is still very early to draw firm conclusion about ASD and implant loosening or breakage. Similar to our study Abdulgaswad et al reported good result with anterior approach in term of VAS and NDI [14]. But they had worsening of neurology transient in two patients (9.5%) and loosening of implant in one patient out of 21 patients. They reduced fracture directly from anterior approach and not like us with preop close reduction. The most common complication in their study was dysphagia (14.3%).

Dhillon CS et al treating cervical fracture dislocation by anterior-posterior approach and doing 360-degree fusion reported similar result in term of neck pain and disability [15]. They had one posterior wound dehiscence out of 24 patients which healed by secondary intention.

Comparing anterior approach with posterior approach for treatment of cervical fracture dislocation Ren C et al reported similar outcome in term of pain and disability but posterior approach had more blood loss, longer operation time, longer hospital stays and loss of alignment. So they prefer anterior approach over posterior [16].

## 5. Conclusions

The results of this review demonstrated the varying benefits of anterior fusion relative to posterior and 360° fusions in treatment of subaxial cervical fractures. Also demonstrated fewer traumas and have less complication rates compared to posterior and 360° fusions.

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