

Functional outcome in patients with bilateral post traumatic facet jump dislocation after close reduction and skull traction

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Abstract

Objective: The objective of this study was to assess the outcome of skull traction in patients of acute post-traumatic bilateral facet dislocation.

Study design: Descriptive case series

Setting: Department of Orthopedics and Spine Surgery, Ghurki Trust Teaching Hospital, Lahore

Duration of study: December 15, 2015 till June 14, 2016

Sample Size: Sample size of 100 patients is calculated with 95% confidence level, 10% of margins of error and expected percentage of neurological improvement i.e. category E according to ASIA classification i.e 46.7%(7) after skull traction in closed reduction of acute post traumatic bilateral facet dislocation.

Material and methods: After taking approval from hospital ethical committee, 100 patients fulfilling selection criteria were included in this study. Pre-op ASIA scale was applied and neurological grade were noted. Position of patient was in supine with reverse trendelenburg in emergency operating room. Patients were awake and conscious and skull traction was applied with garden well skull tongs about 01cm above both pinna in line with external auditory meatus below the equator of skull without risk of superficial temporal vessels injury in local anesthesia. After tightening of pins initial weight of 10lbs for skull and 05lbs for each vertebrae level were added. After 12 hrs of series of interval 05lbs weight were added and clinical neurological examination done neurology graded according to ASIA scale. Neurological improvement was labeled as per operational definitions. Data analysis was done by using computer software SPSS version 17.

Results: The mean age of patients in this study was 36.88 ± 9.73 years and there were 69% males and 31% females. The neurological improvement was seen in 84.00% patients whilst in 16.00% patients, there was no neurological improvement. The reduction was achieved in 77.00% patients and could not be achieved in 23.00% patients.

Conclusion: Skull traction is an effective treatment method of closed reduction in bilateral facet dislocations. It improves the ASIA score significantly, improves neurological function and has successful reduction in majority of patients. The neurological improvement has significant association with non-obese and ASIA score however, reduction is only significantly associated with obesity.

Keywords: Traumatic injury, bilateral facet dislocation, skull traction, ASIA score, neurological improvement

Introduction:

Cervical spine facet dislocations account more than 50% of all cervical injuries in which narrowing of spinal canal caused by displacement

of fracture fragments or subluxation of one vertebrae over another frequently produces spinal cord injury.¹ Bilateral facet dislocations are part of a spectrum of cervical spine flexion distrac-

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tion injuries which is disruption of both facet joints in which inferior articular process of upper vertebra have translated antero-superiorly over the superior articular process of lower vertebra.² According to the subaxial cervical injury description system (SCIDS), bilateral facet dislocation is defined as a disruption of both facet joints in which the inferior articular processes of the cranial vertebra have translated antero-superiorly over the superior articular processes of the caudal vertebra.³ The vertebral body at the dislocated level is anteriorly displaced, and may reside upwards of 50% beyond the antero-posterior vertebral body dimension in complete bilateral facet dislocation. Because of the forces involved and degree of distraction, bilateral facet dislocation also results in extensive soft tissue injury, causing an unstable cervical spine. Complete disruption of the posterior column ligament complex, the posterior longitudinal ligament, the intervertebral disc, and the anterior longitudinal ligament have all been described.⁴ Complete spinal cord injuries and quadriplegia occur in 50%-84% of patients with bilateral facet dislocations.⁵ Treatment options are multiple and depend on the type of injury, the delay in presentation, the type of signs and symptoms present, as well as the associated injuries. Priority is given to the decompression of neurological structures and reperfusion of the tissue first, followed by the restoration of mechanical integrity.⁴ This can be performed with axial traction and/or manipulation or during surgery.² Skull traction is a longitudinal pull that reduces deformity, restores normal anatomical alignment and provides stabilization when used along cervical spine as it is safe and effective initial treatment for bilateral facet dislocations which reduces the need for extensive surgery.⁶ It is used for locked facet release and stabilization of unstable fracture or fracture dislocation. In fracture dislocation, it draws the fragments of spine apart, restores the diameter of cervical canal and reduces the danger of pressure on cord.⁷

Skull traction is indicated for a) Temporary stabilization to preserve neurological function in trauma patients. b) Pre-operative reduction in patients with deformity or displaced fractures.

c) Intraoperative stabilization and interspace distraction for anterior grafting. d) Pain relief for patients with radiculopathy or muscle spasm.⁷ Closed reduction with skull traction should only be performed in the awake, cooperative patient whose periodic neurological examination and radiographic imaging should be performed during skull traction to avoid over distraction.⁸

Different studies have given different successful rates after skull traction in bilateral facet dislocation. A study published in 2014 shows overall neurological improvement is 46.7% and complete radiological alignment i.e. successful reduction was achieved in 56.7% patients with skull traction with cervical spine injuries.⁷

The rationale of the study was to generate national data on success rate of skull traction for bilateral facet dislocations in terms of immediate improvement in neurology and reduction because there is limited national data. The protocol use in Pakistan spine center for increasing weight in skull traction is still unpublished. This study could add this protocol to international literature for further evaluation. The findings of the study can help to improve quality of life in patients with bilateral cervical facet dislocations injuries, if it is proved to be effective.

Materials and Methods:

This Descriptive case series was done at Department of Orthopedics and Spine Surgery, Ghurki Trust teaching hospital Lahore from December 15, 2015 till June 14, 2016. 100 patients was selected using 95% confidence level, 10% of margins of error and expected percentage of neurological improvement i.e. category E according to ASIA classification i.e 46.7%⁷ after skull traction in closed reduction of acute post traumatic bilateral facet dislocation. The patients were selected using Non-Probability: Consecutive sampling technique after approval from Hospital Ethical Committee approval and consent from the patients. All patients of aged 20 to 50 years of either gender presented with history of trauma, intact neurology and partial neurology, Interval between injury and intervention less than 03 weeks and Patients with lower cervical spine

Table-1: Frequency distribution of ASIA score before and after treatment

		Pre		Post	
		Frequency	Percent	Frequency	Percent
ASIA score	B	27	27.0	0	0.0
	C	37	37.0	20	20.0
	D	36	36.0	46	46.0
	E	0	0.0	34	34.0
	Total	100	100.0	100	100.0

Table-2: Frequency distribution of ASIA score before and after treatment

		Neurology Improvement		Total
		Yes	No	
Age groups	20-30	24	6	30
		28.6%	37.5%	30.0%
	31-50	60	10	70
		71.4%	62.5%	70.0%
Total	84	16	100	
	100.0%	100.0%	100.0%	

Table-3: Comparison of Neurology improvement when stratified for gender

		Neurology Improvement		Total
		Yes	No	
Gender	Male	57	12	69
		67.9%	75.0%	69.0%
	Female	27	4	31
		32.1%	25.0%	31.0%
Total	84	16	100	
	100.0%	100.0%	100.0%	

Chi square 0.321, p-value 0.571

Table-4: Comparison of Neurology improvement when stratified for Obesity

		Neurology Improvement		Total
		Yes	No	
Obesity	Yes	24	0	24
		28.6%	.0%	24.0%
	No	60	16	76
		71.4%	100.0%	76.0%
Total	84	16	100	
	100.0%	100.0%	100.0%	

Chi square 6.01 p-value 0.014

bilateral facet dislocation diagnosed on x-ray cervical spine were included in study while Patients with associated fracture of spine, Not willing to participate in the study, ASIA scoring A and polytrauma patients were excluded from the study. The demographic information (name, age, sex, contact) were taken. Patients were admitted in ward and were shifted to emergency operation theatre. Pre-op ASIA scale was applied and

neurological grade were noted. Position of patient was in supine with reverse trendelenburg in emergency operating room. Patients were awake and conscious and skull traction was applied with garden well skull tongs about 01cm above both pinna in line with external auditory meatus below the equator of skull without risk of superficial temporal vessels injury in local anesthesia. After tightening of pins initial weight of 10 Ibs for skull and 05Ibs for each vertebrae level were added. After 12 hrs of series of interval 05 Ibs weight were added and clinical neurological examination done neurology graded according to ASIA scale. Radiological examination was also done with lateral view cervical spine, when both facet joints were aligned and no listhesis present on radiographs, it was considered as success of reduction. Neurological improvement was labeled and to remove bias, each time this procedure was performed by researcher himself under supervision of his supervisor. Data analysis was done by using computer software SPSS version 17. Quantitative variables like age were presented in the form of mean \pm standard deviation. Qualitative variables like gender, neurological improvement and successful reduction were presented as frequency and percentage; Data were stratified for age, gender and BMI (obesity) baseline ASIA grade to address effect modifiers. Post stratification Chi-square test was applied to check the significance with P value \leq 0.05 as significant.

Results:

The mean age of patients in this study was 36.88 ± 9.73 years with minimum age of 20 years and maximum ages of 50 years respectively. There were 70% patients in 31-50 years age category and 30% in 20-30 years age category. There were 69% males and 31% females in this study. The mean BMI was recorded as 24.82 ± 5.357 with minimum BMI of 18.70 and maximum of 40.00. Out of total 100, 24% patients were obese and rest of 76% were non-obese. The neurological improvement was seen in 84.00% patients whilst in 16.00% patients, there was no neurological improvement. The reduction was achieved in 77.00% patients and could not be

achieved in 23.00% patients.

The ASIA score was recorded in 27 patients before the treatment and 0 after the treatment in B-group, 37 before the treatment and 20 after the treatment in C-group, 36 before the treatment and 46 after the treatment in D-group and 0 before the treatment and 34 after the treatment in E-group. (table-1)

There was no association of neurological improvement with age (p-value=0.475) and gender (p-value=0.571) but highly significant association with obesity (p-value=0.014) (table 2-4)

Discussion:

The cervical spine is the most vulnerable spinal segment and the most frequently injured portion of the spinal column after high-velocity trauma. Cervical facet dislocations account for 6-15% of cervical spine injuries. Bilateral facet dislocation is associated with neurological deficit in the region of 90%.⁹ Cervical injuries, such as bilateral facet dislocation, are part of a spectrum of cervical spine flexion/distraction-type injuries. Many definitions exist for these injuries and efforts have been made recently to standardize the nomenclature to avoid confusion during inter professional communications, as well as to facilitate documentation and research. According to the Subaxial Cervical Injury Description System (SCIDS), bilateral facet dislocation is defined as a disruption of both facet joints in which the inferior articular processes of the cranial vertebra have translated antero superiorly over the superior articular processes of the caudal vertebra.¹⁰

The management of cervical spine facet dislocations continues to generate considerable controversy with arguments made for non-operative management, anterior, posterior, and combined surgical reduction and fixation devices.⁹ Traditionally, these injuries have been treated with closed reduction techniques and either external orthotic immobilization or dorsal arthrodesis. Techniques for closed reduction include manual traction and manipulation, skeletal traction in

which incremental increases in traction weight are applied, manipulation using sedation and muscle relaxants, and skeletal traction and manipulation after induction of general anesthesia. The efficacy of these techniques has been confirmed by years of clinical experience. However, even now this procedure contains some failures and risks. Neurological deterioration can occur during or after attempted closed reduction procedures. Open reduction techniques, therefore, have also gained in popularity.¹¹ Both procedures have their own pre-requisites as well as advantages however, a therapy which provides an effective means of safely decompressing and reducing cervical facet dislocations should be used. The important thing is to execute the treatment plan in time. Studies show that early management is essential, although not common, delayed management makes treatment of this entity even more challenging.¹²

In acute cervical spine trauma, skull traction is used to reduce a dislocation or fracture dislocation, to immobilize an unstable lesion until definitive treatment (operative or conservative) is possible or, more rarely, as a definitive treatment until healing occurs. Where this method is considered quite helpful in neurological improvement in patients, some studies report complications as well.¹³ In Pakistan, there is lack of sufficient data in this regard and that is why we aimed to generate national data on success rate of skull traction for bilateral facet dislocations in terms of immediate improvement in neurology and reduction.

In our study, the mean age of patients was 36.88 ± 9.73 years with minimum and maximum ages of 20 years and 50 years respectively. There were 70% patients in 31-50 years age category and 30% in 20-30 years age category. There were 69% males and 31% females in this study. The mean BMI was recorded as 24.82 ± 5.357 with minimum BMI of 18.70 and maximum of 40.00. Out of total 100, 24% patients were obese and rest of 76% was non-obese.

One retrospective study aimed to evaluate single-level anterior cervical discectomy and stabi-

lization for bilateral facet fracture dislocations using bone graft and anterior titanium plates with unicortical screw fixation in the clinical setting. This consecutive study over 6 years period of patients undergoing the defined protocol of study. They included 22 patients out of whom 16 were males and 6 were females. The mean age in this study was recorded as 47.7 years. Similar to our study, majority of patients with bilateral facet fracture dislocations were middle aged and males.¹⁴

Another study that aimed to see the management and outcomes of bilateral facet fracture dislocations reported that patient population consisted of 27 males and 9 females with an average age of 33.3 years (19-74). 26 patients were involved in motor vehicle accidents (72%), 5 were injured in falls (13.88%), 4 in sport or diving accidents (11%) and 1 was due to assault.⁹

Furthermore, in their study 27 patients (75%) presented with complete spinal cord injuries (ASIA A), 6 had incomplete spinal cord injuries (ASIA B,C,D) and 3 had only upper limb radicular deficits. The average ASIA motor score improved from 28.4 (0-100) to 36.6 (0-100). In 23 patients the ASIA score was unchanged, in 8 patients the ASIA grade improved one level and in 1 patient the ASIA score improved by two grades. Also, satisfactory closed reduction of deformity was achieved in 2 out of 6 patients attempted by the peripheral hospitals. A further 11 out of 15 patients attempted closed reductions were reduced in the ASCI unit.⁹

We also quantified the ASIA score in all A-E ranges as well as the neurological improvement and reduction in our study. The ASIA score was recorded as 27 before the treatment and 0.00 after the treatment in B-group, 37 before the treatment and 20 after the treatment in C-group, 36 before the treatment and 46 after the treatment in D-group and 0.00 before the treatment and 34 after the treatment in E group. The neurological improvement was seen in 84% patients whilst in 16% patients, there was no neurological improvement. The reduction was achieved in 77% patients and could not be achieved in 23%

patients.

One study aimed to investigate a suitable management specific to patients with different types of cervical locked facets. In this study, a total of 38 patients with cervical dislocation with locked facet due to cervical injury treated by rapid skull traction and operation from 1988 to 2005 were reviewed. These 38 patients (27 men and 11 women) with unilateral or bilateral locked facets cervical dislocation were admitted to the hospital from 1988 to 2005. The patients aged from 20 to 67 years (average 42.7 years). Closed reduction was attempted in all the patients using skull traction. Traction weight was initiated at 5 kg and increased by 1 kg sequentially at a 15-minute interval until the reduction of the cervical facet was achieved.¹⁵

They also published that there were 25 patients with bilateral locked facet and 13 with unilateral locked facet. 88%(22/25) of the patients with bilateral locked facet and 15.4%(2/13) of the patients with unilateral locked facet were successfully treated by closed skull traction. Among the patients, 23 were followed up for 13-36 months (mean, 21.6 months). All of them achieved cervical spine alignment and bone fusion, and 10 got improved neuro function.¹⁵

Another study reviewed the treatment outcomes of 19 patients with delayed presentation of cervical facet dislocations. Records of 17 men and 2 women aged 21 to 63 (mean, 39) years who presented with unilateral 14 or bilateral 5 cervical facet dislocation after a delay of 7 to 21 (mean, 14) days were reviewed in this study. They attempted closed reduction using continuous skull traction for 2 days. They reported that all patients achieved pain relief and sufficient neck movement for normal activities and all 7 patients with nerve root injury improved completely.⁶

These studies, similar to our results advocate the effectiveness of skull traction in bone fusion, reduction, improvement in neurological functioning and overall patient satisfaction. More comparative studies are encouraged to explore

further opportunities and aspects of possible treatment options of facet dislocations.

Conclusion:

Skull traction is an effective treatment method of closed reduction in bilateral facet dislocations. It improves the ASIA score significantly, improves neurological function and has successful reduction in majority of patients. The neurological improvement has significant association with non-obese and ASIA score however, reduction is only significantly associated with obesity.

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Dr Shahzad Ahmad, did data collection

Dr Latif Khan, did data collection

Dr Ashfaq Ahmed, did data analysis

Dr Saeed Ahmad, did literature search

Dr Haseeb Hussain, did article writing

Dr Shehzad Javed, did article review

Dr Rizwan Akram critically review the article and made some changes

Dr Amer Aziz, did final approval

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