



## Orthopaedics

# STUDY OF COMPARISON OF FUNCTIONAL OUTCOME OF ACROMIOCLAVICULAR JOINT DISLOCATION TREATED WITH K-WIRE FIXATION VERSUS CLAVICULAR HOOK PLATE FIXATION ALONG WITH CORACOCALVICULAR LIGAMENT RECONSTRUCTION.

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**ABSTRACT**

**Introduction:** Acromioclavicular joint injuries are classified most commonly using the 6-grade system. It takes into account not only the AC joint itself, but also the coracoclavicular ligament, the deltoid and trapezius muscles and the direction of the dislocation of the clavicle with respect to the acromion. Types IV, V, and VI are unstable and therefore, mandate early surgical reduction and fixation. Conservative management of these injuries can lead to deleterious consequences such as joint arthritis. **Aim and objectives:** To evaluate functional outcome of acromioclavicular joint dislocation treated with K-wire versus clavicular hook plate fixation along with coracoclavicular ligament reconstruction. **Material and methods:** This is a Prospective study conducted during September 2020 - August 2022 in Department of Orthopaedics, tertiary care hospital. Patients with ACJ dislocation operated with hook plate or K-wire with CC ligament reconstruction with minimum follow up of 6 months. The injuries were classified as per the inclusion criteria. Postoperative protocol was followed for all patients. Outcome was measured based on DASH questionnaire and Constant score at intervals of 6, 12, 24 and 48 weeks by one single examiner. **Results:** The mean DASH score in hook plate group was  $70.52 \pm 8.56$  whereas in k-wire group was  $77.78 \pm 5.07$ , with statistically significant difference having p value 0.025, at 3 month of follow up the DASH score was  $75.29 \pm 8.47$  in hook plate group and  $83.33 \pm 5.0$  in k-wire group. And at 6 month followup it was  $80.57 \pm 8.55$  and  $88.67 \pm 4.85$  in both the group, at both the interval the difference between two groups was significant with p value  $<0.05$ . **Conclusions:** On the basis of present study we use hook plate and k-wire for management of acromio-clavicular joint dislocation, both were effective in management however outcome as indicated by DASH score is better in k-wire group at each time interval, more no. of complication was present in k wire group however without any statistically significant difference.

**KEYWORDS :** DASH score, K wire, hook plate, acromioclavicular joint**INTRODUCTION**

The AC ligament complex spans between the acromion and the distal clavicle and has been described by multiple authors as having anterior, posterior, superior, and inferior components;(1) however, numerous cadaveric studies have failed to identify the inferior ligament up to 50% of the time.(2) Biomechanically, the AC ligament is primarily responsible for resisting anterior-posterior AC joint translation,(3) while providing additional restraint against posterior axial rotation of the clavicle(4). Additionally, they also provide rotational stability and stability with protraction and retraction of the scapula. The conoid ligament originates on the superomedial coracoid base and courses superolateral to insert broadly on the clavicular conoid tubercle. Similarly, the trapezoid originates on the superomedial surface of the coracoid, anterior to the conoid, and travels superolateral to insert narrowly on the clavicular trapezoid line, anterior to the conoid tubercle.(5) The diverging course and distinct attachments of both ligaments argues individual function that must be considered during surgical reconstruction. Rios et al determined that reliable CC ligament clavicular insertions could be calculated as percentages of total clavicular length—the trapezoid and conoid attaching 17% and 31% of the total clavicular length from the distal end, respectively. Chahla et al.(5) quantitatively found that the CC ligament clavicular insertion is on average 15.7 mm from the lateral joint line and the footprint spans an average length of 25.6 mm on the clavicle. Additionally, mean distances from the coracoid apex to the center of the trapezoid and conoid ligaments are  $27.0 \pm 3.3$  mm and  $33.9 \pm 3.3$  mm, respectively.

The original classification by Neer in the 1960s described two types of distal clavicular fractures: Type I in which the coracoclavicular ligaments remain intact, and type II in which the coracoclavicular ligaments are torn from the medial fragment (only the trapezoid ligament remains attached to the lateral fragment).(6) This classification was later revised to include type III fractures which involved extension into the AC joint; type IV fractures which are seen in children and involve a disruption of the periosteal sleeve and type V,

which involve an avulsion of the ligaments with a small inferior cortical fragment Acromioclavicular joint injuries are classified most commonly using the 6-grade system described by Rockwood et al.(1) (a modification to the earlier 3-type classification system described by Allman(7) and Tossy et al.(8). It takes into account not only the AC joint itself, but also the coracoclavicular ligament, the deltoid and trapezius muscles and the direction of the dislocation of the clavicle with respect to the acromion. Types IV, V, and VI are unstable and therefore, mandate early surgical reduction and fixation. Conservative management of these injuries can lead to deleterious consequences such as joint arthritis. The debate on the most appropriate method of management of these injuries ranges with the recommendation of open reduction and internal fixation as a first choice of treatment by some, while others are strong in their advocacy of conservative treatment. Here, we report our experience of using the hook-plate in the treatment of unstable distal clavicular fractures.

**AIM AND OBJECTIVES**

To evaluate functional outcome of acromioclavicular joint dislocation treated with K-wire versus clavicular hook plate fixation along with coracoclavicular ligament reconstruction.

**MATERIAL AND METHODS**

This is a Prospective study conducted during September 2020 - August 2022 in Department of Orthopaedics, tertiary care hospital. Patients with ACJ dislocation operated with hook plate or K-wire with CC ligament reconstruction with minimum follow up of 6 months with

**Inclusion Criteria**

1. Aged between 18 -60 years.
2. Patients with acromioclavicular joint dislocation (Rockwood type 3 to type 5)
3. Closed injuries.

**Exclusion Criteria**

1. Chronic injuries.
2. Elderly patients.
3. Compound injuries.
4. Associated with coracoid fracture.
5. Associated with neurovascular injuries.

Minimum 30 subjects were decided to be included in the study by universal sampling. We included a total of 30 cases with ACJ dislocation in our study.

#### Data collection:

All operations were done at tertiary care center. All patients were either from the Out-patient department or from Emergency Preoperative X-ray of shoulder in AP and Axillary view were taken. The injuries were classified as per the inclusion criteria. Postoperative protocol was followed for all patients. Outcome was measured based on DASH questionnaire and Constant score at intervals of 6, 12, 24 and 48 weeks by one single examiner. Radiological assessment was done at 6, 12, 24 and 48 serial intervals. Implant removal was done at a minimum period of 6 weeks for patients operated with K-wire and 6 months for patients operated with hook plate postoperatively. Stress Zanca view of both shoulders was taken after implant removal to assess the stability of the AC joint and CC ligament. Wound sepsis, time taken to bony union and reaching pre-fall injury status were also noted

#### RESULT

In the present study 71.4% and 77.8% patient come under 25-50 year age group in HOOK PLATE and K-WIRE respectively. And there is an insignificant association between age and operated group (P value > 0.05). 81.0% and 100% patient was male in HOOK PLATE and K-WIRE respectively. And there is an insignificant association between sex and operated group (P value > 0.05).

**Table 1: Distribution of Study Population as per MODE OF INJURY**

MODE OF INJURY	HOOK PLATE		K-WIRE	
	Frequency	Percent	Frequency	Percent
FALL	3	14.3	8	88.9
RTA	18	85.7	1	11.1
Total	21	100.0	9	100.0

Chi square Statistics (P value) = 12.05 (0.001)

Table 1 shows Distribution of mode of injury of Study Population, studied that 14.3% and 88.9% patient had fall of mode of injury HOOK PLATE and K-WIRE respectively. And there is a significant association between mode of injury and operated group (P value < 0.05).

**Table 2: Below figure showing the percentage of SIDE**

SIDE	HOOK PLATE		K-WIRE	
	Frequency	Percent	Frequency	Percent
LEFT	13	61.9	5	55.6
RIGHT	8	38.1	4	44.4
Total	21	100.0	9	100.0

Chi square Statistics (P value) = 0.00 (1.00)

In the present study 61.9% and 55.6% patient had left side in HOOK PLATE and K-WIRE respectively. And there is an insignificant association between side and operated group (P value > 0.05).

**Table 3: Comparison between DASH SCORE at different time interval and operated group**

	HOOK PLATE Mean $\pm$ SD	K-WIRE Mean $\pm$ SD	p - value
DASH SCORE 6 wk	70.52 $\pm$ 8.56	77.78 $\pm$ 5.07	0.025
DASH SCORE 3 month	75.29 $\pm$ 8.47	83.33 $\pm$ 5.0	0.01
DASH SCORE 6 month	80.57 $\pm$ 8.55	88.67 $\pm$ 4.85	0.01

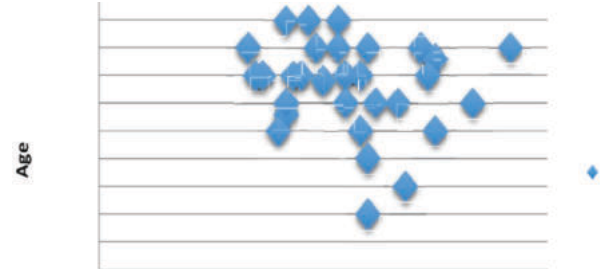
Table 3 shows Comparison between DASH SCORE at different time interval and operated group, at 6 wk, the mean DASH score in hook plate group was 70.52  $\pm$  8.56 whereas in k-wire group was 77.78  $\pm$  5.07, with statistically significant difference having p value 0.025, at 3 month of follow up the DASH score was 75.29  $\pm$  8.47 in hook plate group and 83.33  $\pm$  5.0 in k-wire group. And at 6 month followup it was 80.57  $\pm$  8.55 and 88.67  $\pm$  4.85 in both the group, at both the interval the

difference between two groups was significant with p value < 0.05.

**Table 4: Correlation between DASH SCORE and age**

	DASH SCORE	
	Correlation Statistics	P value
Age	-0.161	0.394

There is a no correlation between age and DASH Score p value > 0.05.



**Fig 1 : Correlation between DASH SCORE and age**

#### DISCUSSION

Acromioclavicular (AC) joint dislocation is a relatively common injury that accounts for 50% of all sports-related shoulder injuries and occurs five times more frequently in men. Various surgical options have been developed for AC joint dislocation, including fixation across the AC joint, coracoacromial ligament transfer (Weaver- Dunn procedure), coracoclavicular (CC) fixation, and AC or CC reconstruction. However, the clinical superiority of these procedures remains debatable, and various complications have been reported. Currently, two modern techniques-hook plate fixation and CC ligament reconstruction using a synthetic ligaments are widely used due to their good reported clinical outcomes. Hook plates have been developed as an alternative fixation method for fractures of the distal clavicle and dislocations of the AC joint and are used to promote natural healing of the ligaments.

#### Age

In our study majority of 22 of cases were in age group of 25-50 years followed by 7 cases in age group of <25 years of age and only 1 was >50 years of age. In the present study, age of the study population, studied that 71.4% and 77.8% patient come under 25-50 year age group in HOOK PLATE and K-WIRE respectively. And there is an insignificant association between age and operated group. **Yoon et al.(9)** study shows forty-two patients were included in the study with an average age of 40.5  $\pm$  13.4 years. **Sivanandan et al.(10)** study shows seven patients is under 30 years of age, 12 patients in a range of 30-50 years and most of the remaining patients, i.e., 14 patients were >50 years. The use of hook plate in the treatment of AC joint disruptions and fractures of the lateral end of the clavicle is shown to be a good and acceptable treatment option.

#### Sex

In our study 26 were male and 4 were female from total 30 selected patients. In the present study, studied that 81.0% and 100% patient was male in HOOK PLATE and K-WIRE respectively and there is an insignificant association between sex and operated group (P value > 0.05). **Yoon et al. (9)** study shows forty-two patients were included in the study. **Sivanandan et al. (10)** study shows there were 33 men and nine women. a total of 33 patients with AC joint disruptions were included. There were 26 males (78.8%) and 7 females (21.2%) with a mean age of 44.7 years. **Tuxun A et al.(11)** study shows there were 18 males and seven females with an average age of 43.5  $\pm$  2.4 years (ranging from 28 to 51 years).

#### Mode of injury

In our present study 11 out of 30 had history of fall while 19 out of 30 had history of RTA. In the present study, mode of injury of Study Population, studied that 14.3% and 89% patient had fall of mode of injury HOOK PLATE and K-WIRE respectively. And there is a significant association between mode of injury and operated group (P value < 0.05). **Sivanandan et al. (10)** study shows Road traffic accident was the main etiology followed by self-fall. **Tuxun A et al. (11)** study shows the fall injuries were involved in 13 (52%) patients. Five (20%) patients were mauled by others and seven (28%) were drifting-down injuries. **Cai L et al. (12)** Study shows the reason for injury was a sport or traffic accident in 53 cases (77%).

## Side

In our study 18 out of 30 had history of left side injury and 12 had history on right side. so left side more common as compare to right one. In the present study, side of Study Population; studied that 61.9% and 55.6% patient had left side in HOOK PLATE and K-WIRE respectively. And there is an insignificant association between side and operated group (P value > 0.05). **Sivanandan et al. (10)** study shows nineteen patients had right-sided acromioclavicular joint disruptions and 14 patients had left-sided injury. **Cai L et al. (12)** Study shows In Group A, the dislocation was on the right in 13 patients and the left in 17. In Group B, the dislocation was on the right in 16 patients and the left in 23. **Das M et al. (13)** study shows Left sided fractures were 19 (hook plate 8 and precontoured anatomical locking plate 11) and right sided were 13 (hook plate 6; precontoured anatomical locking plate 7). In the present study, complications of Study Population, studied that 100.0% and 88.9% patient had nothing complications in HOOK PLATE and K-WIRE respectively. And there is an insignificant association between complications and operated group (P value > 0.05). **Tuxun A et al. (11)** study says three months after surgery, some of the patients had mild acromioclavicular joint discomfort and partially limited abduction of shoulder joint or upper body, and obtained remarkable remission after they were treated with nonsteroidal anti-inflammatory drugs for 2-4 weeks and underwent professional rehabilitation training simultaneously. Ability of life and work of all the patients we followed up recovered as before. **Cai L et al. (12)** Study shows On the 1 year follow-up, all patients in Group A maintained complete reduction in the anteroposterior X-ray, except 3 (10%) who experienced complete loss of reduction. In spite of a total loss of reduction, these three patients showed satisfactory clinical outcome at the final follow-up evaluation and treated non-operatively. None of the been found in Group A. Postoperative complications occurred in five patients in Group B, including 3 superficial wound infection, 1 nerve palsy and 1 plate breakage. The superficial wound infection resolved with oral antibiotics and daily dressing. The superficial radial nerve palsy resolved spontaneously without treatment. **Das M et al. (13)** study shows study shows one patient had superficial infection in the precontoured anatomical locking plate group who was treated with antibiotics, and the infection resolved uneventfully.

## Dash score

In the present study, there is an insignificant difference between mean of Dash Score and operated group (P value > 0.05). **Das M et al. (13)** also shows the results in correlation with present study. The surgical and functional outcomes after AC joint stabilization with or without lateral end clavicle fractures using hook plate fixation yield satisfactory results. The hook plate also provides good horizontal, rotational, and vertical stability. Furthermore, the maintenance of reduction by the hook plate was significantly superior compared to the other modes of treatment. The hook plate also facilitates early mobilization and prevents stiffness of the shoulder joint.

## CONCLUSION

On the basis of present study we use hook plate and k-wire for management of acromio-clavicular joint dislocation, both were effective in management however outcome as indicated by DASH score is better in k-wire group at each time interval, more no. of complication was present in k wire group however without any statistically significant difference.

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