



Original Article



Clavicular Hook Plate Removal: A Necessity or A Myth?

Uzair Rashid¹, Abdulah Wali¹, Saad Ilyas¹, Ijaz Ahmed¹, Humera Rafiq² and Arsala Rashid^{3*}

¹Department of Orthopedic, Ghurki Trust Teaching Hospital, Lahore, Pakistan

²Department of Pathology, Fatima Jinnah Medical University, Lahore, Pakistan

³Department of Hematology, Services Institute of Medical Sciences, Lahore, Pakistan

ARTICLE INFO

Keywords:

Clavicular Fracture, Acromioclavicular Joint Dislocation, Hook Plate Removal, Timely fixation

How to Cite:

Rashid, U., Wali, A., Ilyas, S., Ahmed, I., Rafiq, H., & Rashid, A. (2025). Clavicular Hook Plate Removal: A Necessity or A Myth? Clavicular Hook Plate Removal. Pakistan Journal of Health Sciences, 6(6), 295-299. <https://doi.org/10.54393/pjhs.v6i6.3381>

***Corresponding Author:**

Arsala Rashid

Department of Hematology, Services Institute of Medical Sciences, Lahore, Pakistan
arsala88@hotmail.com

Received Date: 8th May, 2025

Revised Date: 20th June, 2025

Acceptance Date: 26th June, 2025

Published Date: 30th June, 2025

ABSTRACT

Timely fixation of fractures of the clavicle or acromioclavicular joint dislocation is rising in popularity vs conservative management. This is primarily due to potential complications, such as impingement, which may result in chronic pain and limited shoulder mobility. **Objectives:** To find the cause and number of hardware removals among clavicular fractures. To assess whether clavicular plates caused any after effects when they were left in. **Methods:** A Total of 156 patients treated by hook plate for either fracture of distal clavicular fracture or treatment of acromioclavicular joint dislocation were enrolled from January 2024 to April 2024 in the Orthopedic Department of Gurki Trust Teaching Hospital. All patients were followed for 12 months postoperatively. Clinical results were gauged using different scores. **Results:** There were 107 male and 49 female. At follow up patients in group I were n=50 (64.5%), while group II had only n=15 (19.2%) patients who underwent hook plate removal. The pain VAS scale had a significant p-value of 0.0035 among both groups. The SST score was statistically significant with a p-value of 0.0026. On the last follow-up visit, the mean VAS, SST, and Constant-Murley scores had insignificant p-values, respectively, in both groups. **Conclusions:** Clavicular fracture or acromioclavicular joint dislocation fixation by using hook plates is a safe and reliable mode of treatment. Patients operated with hook plates for distal clavicular fractures are more comfortable, while those treated for acromioclavicular joint dislocation are keener for its removal.

INTRODUCTION

Clavicle fractures and dislocation of the acromioclavicular joint are relatively common shoulder girdle injuries. The incidence of clavicular fracture is not so common, with 50 fractures per 100,000/ year, with distal clavicle fracture accounting for 18% to 25% of all clavicular fractures [1]. However, sports acromioclavicular (AC) joint dislocation is a relatively common injury and constitutes about half of all the shoulder injuries [2]. Depending on the nature of the injury and the percentage of the soft tissue involved, clavicular fractures can be treated operatively or non-operatively [3]. The adverse events that are increasing in non-operative treatment include symptomatic nonunion or stiffness of the shoulders, but it remains the gold standard in non-displaced or minimally displaced fractures. The operative treatment is considered in the presence of

comorbid neurovascular injury, open fractures or fractures with high risk of displacement with skin perforation, or shoulder girdle fractures with significant crushing. Due to studies showing a greater number of complications, surgeons are supporting prompt and definitive fixation for fracture configurations as compared to the conservative approach, which has previously been quite promising. This operative treatment has substantially gained in popularity in the past decade [4]. Research shows that plate fixation with bone graft is one of the reliable and best methods for clavicular fractures. The internal fixation is so firm that early mobilization can be started [5]. Other methods that can be used are K-wire, coracoclavicular (CC) screw, and tight loop [6]. Other than them, AC joint fixation with pins, clavicular plate, tension band wire, and with the modified



Weaver-Dunn procedure, almost alone and occasionally with fixation using a washer and screw, are mostly adopted. Each alternative has merits and demerits. Similarly, a hook plate is preferred by many people, but there are also advantages and disadvantages of the same [7]. Hook plate denies this kind of rotational movement. Wider hook plates or the right size of hook plate treatment can lead to much better results. The commonest being that it may cause erosion by increasing the pressure of the hook under the body of the acromion [8, 9]. Although the hook plate design is such that it allows free movement at the AC joint, especially during elevation and rotation, it does not interfere with the biomechanics of the AC joint, but it can result in impingement and inflammation [10, 11]. Complications such as osteolysis, calcification have also been documented [12]. Limited data is available internationally on the management of the hook plate of AC joint dislocation and distal clavicle fractures. Moreover, literature shows very few studies have been done in Pakistan comparing acromioclavicular joint dislocation with distal clavicular fracture. This study will also help the attending orthopedic surgeon to redefine timelines for the removal of hook plates and explore more options, weighing the pros and cons. Lastly, the surgeons must educate patients regarding the standard protocols for its removal since they are lost to follow-up, and they feel it is unnecessary. Consequently, they might face complications thereafter [13]. The study was enlightening and eye-opening for patients as well as surgeons. Moreover, the demonstration of such sequels can help surgeons to become more amicable with such modalities of treatment, as they are considered relatively new methods, at least in our locality and regions.

Despite various operative techniques for clavicular fractures and acromioclavicular (AC) joint injuries, including hook plate fixation, there is limited local evidence comparing outcomes, complications, and the necessity of hardware removal, particularly in Pakistan where follow-up and standardized management protocols are often inconsistent. This lack of data creates uncertainty regarding optimal timing for implant removal and the long-term effects of retained hardware. This study aimed to find the cause and number of hardware removals among clavicular fractures. To assess whether clavicular plates caused any after effects when they were left in.

METHODS

A prospective cohort study on 156 patients (by consecutive sampling technique) treated by hook plate for either fracture of the distal clavicle or treatment of acromioclavicular joint dislocation in the Orthopedic Department of Ghurki Trust Teaching Hospital, Lahore. The patients were enrolled from January 2024 to April 2024

after taking formal consent and approval from the Institutional Review Board Committee (Ref No. 2024/01/R-46). Patients who had multiple fractures or complications during surgery were excluded. The sample size was calculated by using the following formula, keeping the incidence of acromioclavicular joint injury as 11 % of all shoulder injuries [14] with an error margin of 5%: $n = \frac{N \times x}{E^2 + x}$. The total number of patients was divided into 2 groups with an equal number of 78 patients in each. Group I had hook plate fixation for AC joint dislocation, whereas those who got it for distal clavicle fracture were referred to as group II. Statistical analysis was undertaken using SPSS Statistics version 24.0. Quantitative variables, including age of patients, scores from pain visual analogue, simple shoulder test, and Constant-Murley, were presented as mean \pm standard deviation. Qualitative variables, including gender, no of patients who underwent removal of the hook plate and its causes, were presented in the form of frequency and percentages using chi chi-square test. After finding out the normality of data using the Shapiro-Wilk test, the t-test was applied to determine the p-value, with a value less than 0.05 considered statistically significant. Results were drawn using the simple shoulder test, pain visual analogue scale (VAS) and Constant-Murley scores. The follow-up time of the patients was 12 months after the operation for the study, while the mean follow-up time was 8 months and 19 days.

RESULTS

Hook plate treatment was applied to a total number of 156 adult patients enrolled in the study (78 third-Neer type II-fractures of the distal clavicle and 78 type III acromioclavicular dislocations). Out of the 156 patients, 107 were male and 49 were female, giving the male-female ratio of 2.1:1.9 (Figure 1).

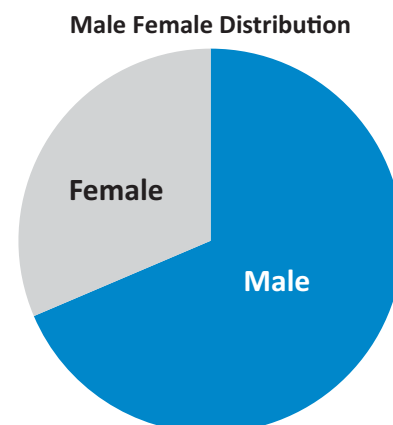


Figure 1: Male and Female Distribution

The mean age of the patients was 40.4 ± 3.45 years. About 67% of the injuries were right-sided, and 33% injuries were on the left side. Union of fractures was seen in 153 (98.56%) of the total patients. The patients were divided into groups,

with group I having hook plate fixation for AC joint dislocation, whereas those who got it for distal clavicle fracture were referred to as group II. Among those in group I, patients who got the hook plate removed were n=50 (64.1%). Whereas in group II, who were treated for third-Neer type II-fractures of the distal clavicle, only n=15 (19.2%) wanted the removal of the hook plate, while 80.8 % had no objection to retaining it. About 85% of the women in group I got plate removal vs 60% of the women in group II.

Table 1: Variables Showing Plate Removal in Group I and Group II

Variables	Group I	Group II
Mean Removal Time (Months)	4.5	7.6
Percentage of Women	85 %	60%
Plate Removal	64.1%	19.2%
3 Months	30.4%	15.1 %
6 Months	22.4%	2.6%
1 Year	11.2%	1.5%

The main causes for removal of the plate were the following: 15(30%) patients had restricted movement of the joint, and 28 (55 %) had pain because of impingement. Mechanical failure was observed in one of the patients (2.5%), and the plate was levered off the bone or eroded the acromion. About 06 patients (12.5%) wanted to get the plates removed due to hypertrophic scar tissue (Table 2).

Table 2: Distribution of Causes of Hook Plate Removal in Group I

Causes	n (%)
Restricted Movement of the Joint	15 (30%)
Pain Due to Impingement	28 (55%)
Mechanical Failure	1 (2.5%)
Hypertrophic Scar Tissue	06 (12.5%)
Total	50 (100%)

The reasons for the removal of the plate in group II were pain due to plate impingement. In 8 patients (33.33 %), and 5 of them (46%) had pain because of impingement. No plate was removed due to a mechanical failure in this group. Only 2 (13.33%) had to get the plates removed due to an increase in scar tissue (Table 3).

Table 3: Distribution of Causes of Hook Plate Removal in Group II

Causes	n (%)
Restricted Movement of A Joint	5 (33.33%)
Pain Due to Impingement	8 (46%)
Mechanical Failure	0 (0%)
Hypertrophic Scar Tissue	2 (13.33%)
Total	15 (100%)

However, on the last follow-up visit, the mean Visual Analogue Score between the two groups was (1.75 ± 1.99 vs. 1.89 ± 1.57), the simple shoulder test had (18.05 ± 1.16 vs. 15.72 ± 1.33), and the Constant-Murley scores were (89.50 ± 5.39 vs. 95.20 ± 5.57). The p-value was found to be insignificant (p=0.423, 0.340, and 0.118) respectively in both groups (Table 4).

Table 4: Last Follow-Up Visit Between Groups

Follow-Up List	Group I (Mean ± SD)	Group I (Mean ± SD)	p-value
Visual Analogue Score	1.75 ± 1.99	1.89 ± 1.57	0.423
Simple Shoulder Test	18.05 ± 1.16	15.72 ± 1.33	0.340
Constant-Murley Scores	89.50 ± 5.39	95.20 ± 5.57	0.118

DISCUSSION

Our study had a male-to-female ratio of 2:1, probably because male is often more vulnerable to fractures of the distal clavicle and acromioclavicular joint dislocation due to road traffic accidents and sports injuries. A similar finding was seen in a study by Maliwankul *et al.* who stated the prominent causes of upper shoulder girdle as traffic accidents and sports injury [15]. The analysis using the VAS, SST and constant Murley scores demonstrated that favourable results were found when the hook plate was used for AC joint disruption or distal clavicular fractures. Martetschläger *et al.* reported similar results [16]. Our study showed union of fractures in 98.56% of patients. Kashii *et al.* reported a good union rate with the hook plate for clavicular fracture [17]. Thangaraju *et al.* and Reska *et al.* also reported a good union rate of 95% and almost no complications with dislocated distal clavicular fractures (Neer type II) who had interventional surgery with a hook plate [18, 19]. Our study showed that 64.5% patients in group I were keen for removal of the hook plate as compared to group II, in which only 19.2% were interested in removal. Similar results were observed by Oh *et al.* who stated that patients treated for AC joint dislocation wanted the hardware to be removed [20]. Our study showed that mean VAS, simple shoulder and Constant-Murley scores were insignificant in both groups; however, the VAS and SST had slightly raised values in group I as compared to group II, whereas Constant-Murley scores were higher in group II. This implies that group I had complications like pain and restricted movements due to the hook plate, which eventually led to its removal. On the other hand, patients in group II had better Constant Murley scores, showing better shoulder function despite the hook plate. Similar results Louwerens *et al.* and Hendrickx *et al.* showed same results [21, 22]. Thus, patients from group I who underwent plate fixation for AC joint dislocation were more adversely affected as compared to Group II, leading to its higher rate of removal in that group.

This study was limited by its relatively small sample size and single-center design, which may limit the generalizability of the findings. Additionally, short- to mid-term follow-up restricted assessment of long-term functional outcomes and late complications related to hook plate fixation. In our suggestion, hook plates can be removed if they cause effects like impingement. Their use in the older age group should be carefully done as per the given tendency of the

plate to lever off the bone. In other words, it is important to enlighten patients about the importance of implant removal and educate them about its removal.

CONCLUSIONS

Clavicular fracture or acromioclavicular joint dislocation fixation by using hook plates is a safe and reliable mode of treatment. The added advantage of it has a very low secondary surgery for implant removal or revision. Patients operated on with hook plates for distal clavicular fractures are more comfortable with them. On the other hand, those treated with a hook plate for acromioclavicular joint dislocation are more prone to removal due to various medical reasons.

Authors' Contribution

Conceptualization: UR

Methodology: UR, HR

Formal analysis: IA

Writing and Drafting: AW, SI, IA, AR

Review and Editing: UR, AW, SI, IA, HR, AR

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

All the authors declare no conflict of interest.

Source of Funding

The author received no financial support for the research, authorship and/or publication of this article.

REFERENCES

- [1] Mayasari DA, Hawari I, Dwiyantri SA, Noviyadi NR, Andryani DS, Utomo MS *et al.* Convolutional Neural Network for Assisting Accuracy of Personalized Clavicle Bone Implant Designs. *International Journal of Electrical and Computer Engineering*. 2024 Jun; 14(3): 3208-19. doi: 10.11591/ijece.v14i3.pp3208-3219.
- [2] Minkus M, Wieners G, Maziak N, Plachel F, Scheibel M, Kraus N. The Ligamentous Injury Pattern in Acute Acromioclavicular Dislocations and Its Impact on Clinical and Radiographic Parameters. *Journal of Shoulder and Elbow Surgery*. 2021 Apr; 30(4): 795-805. doi: 10.1016/j.jse.2020.10.026.
- [3] Von Rden C, Rehme-Rhrl J, Augat P, Friederichs J, Hackl S, Stuby F *et al.* Evidence on Treatment of Clavicle Fractures. *Injury*. 2023 Oct; 54: 110818. doi: 10.1016/j.injury.2023.05.049.
- [4] Fitzgerald EM, Moore DM, Quinlan JF. A Review of Outcomes After Operative Fixation of Clavicular Fractures Over A 10-Year Period—A Single Tertiary Trauma Unit Experience. *Journal of Shoulder and Elbow Surgery International*. 2022 Mar; 6(2): 264-7. doi: 10.1016/j.jseint.2021.11.001.
- [5] Mast J, Van Beek N, Claes T. Fast Rehab After Midshaft Clavicle Fractures in Elite Cyclists and Motocross Riders. *Acta Orthop Belgica*. 2023 Sep; 89: 525-30. doi: 10.52628/89.3.11696.
- [6] Kumar MK and Mylarappa A. A Comparative Study on Fixation of Unstable Lateral End Clavicle Fractures with Tightrope and Endobutton by Transcoracoid and Subcoracoid Cerclage Techniques. *Journal of Orthopedics, Traumatology and Rehabilitation*. 2024 Jul; 16(2): 107-12. doi: 10.4103/jotr.jotr_6_24.
- [7] Patel R, Khan MM, Gibson W, Banerjee R, Pardiwala A. Comparison of Hook Plates Vs. Locking Plates for Neer Type IIB Fractures of Lateral End Clavicle: A Systematic Review. *Chinese Journal of Traumatology*. 2025 Feb. doi: 10.1016/j.cjte.2024.03.012.
- [8] Chen PH, Chen CY, Lin KC, Tarng YW. Fixing Cho Type IIC Distal Clavicle Fractures with Hook Plates Leads to a High Incidence of Subacromial Osteolysis: A Retrospective Study and Literature Review. *Clinics in Orthopedic Surgery*. 2024 Sep; 16(5): 694. doi: 10.4055/cios24009.
- [9] Testa EJ, Katz L, Zhang H, Chang K, Kutschke MJ, Dworkin M *et al.* Rotator Cuff Tears to Shoulder Instability: The Relationship Between Acromial Morphology and Shoulder Pathology. *Journal of Bone and Joint Surgery Reviews*. 2024 Jan; 12(1): e23. doi: 10.2106/JBJS.RVW.23.00188.
- [10] Saengsiravin P, Iamsirikulmit C, Piyapittayanun P, Phiphobmongkol V, Jongthanakamol T, Ratanalekha R. Optimizing Hook Implantation Angle of the Clavicular Hook Plate: A Cadaveric Study. *European Journal of Orthopedic Surgery and Traumatology*. 2024 Jul; 34(5): 2653-61. doi: 10.1007/s00590-024-03981-z.
- [11] Choi JH, Chun YM, Yoon TH. Effect of Cigarette Smoking on the Maintenance of Reduction After Treatment of Acute Acromioclavicular Joint Dislocation with Hook Plate Fixation. *Clinics in Shoulder and Elbow*. 2023 Nov; 26(4): 373. doi: 10.5397/cise.2023.00738.
- [12] Xu D, Luo P, Chen J, Ji L, Yin L, Wang W *et al.* Outcomes of Surgery for Acromioclavicular Joint Dislocation Using Different Angled Hook Plates: A Prospective Study. *International Orthopedics*. 2017 Dec; 41(12): 2605-11. doi: 10.1007/s00264-017-3611-2.
- [13] Javed H, Olanrewaju OA, Owusu FA, Saleem A, Pavani P, Tariq H, Ortiz BS, Ram R, Varrassi G. Challenges and Solutions in Postoperative Complications: A Narrative Review in General Surgery. *Cureus*. 2023 Dec; 15(12). doi: 10.7759/cureus.50942.

- [14] Shaty W. The Results of Hook Plate Fixation in Acute Acromioclavicular Joint Dislocation and Distal Clavicle Fractures. *Orthopedic Reviews*.2024Jun; 16: 120306. doi: 10.52965/001c.120306.
- [15] Maliwankul K, Kanyakool P, Klabklay P, Parinyakhup W, Boonriong T, Chuaychoosakoon C. Progressive Loss of Acromioclavicular Joint Reduction Correlated with Progressive Clavicular Tunnel Widening after Coracoclavicular Stabilization in Acute High-Grade Acromioclavicular Joint Injury. *Journal of Clinical Medicine*.2024Jul;13(15):4446. doi: 10.3390/jcm13154446.
- [16] Martetschläger F and Zampeli F. What to Do If It Goes Wrong? Solutions After Failure. In *ESSKA Instructional Course Lecture Book: Milan*. Berlin, Heidelberg: Springer Berlin Heidelberg 2021. 2020 Apr 25: 175-181. doi: 10.1007/978-3-662-61264-4_25.
- [17] Kashii M, Inui H, Yamamoto K. Surgical Treatment of Distal Clavicle Fractures Using the Clavicular Hook Plate. *Clinical Orthopedics and Related Research (1976-2007)*.2006Jun;447:158-64.doi:10.1097/01.blo.0000203469.66055.6a.
- [18] Thangaraju S, Tauber M, Habermeyer P, Martetschläger F. Clavicle and Coracoid Process Periprosthetic Fractures as Late Post-Operative Complications in Arthroscopically Assisted Acromioclavicular Joint Stabilization. *Knee Surgery, Sports Traumatology, Arthroscopy*. 2019 Dec; 27(12): 3797-802. doi: 10.1007/s00167-019-05482-7.
- [19] Reska M, Konečný J, Kašpar M, Kábelka M, Cierník J. Stabilization of the Dislocated Acromioclavicular Joint and Lateral Fractures of the Clavicle Using a Hook Plate. *Rozhledy v Chirurgii: Mesičník Československé Chirurgické Společnosti*.2013Mar; 92(3): 143-50.
- [20] Oh JH, Min S, Jung JW, Kim HJ, Kim JY, Chung SW *et al*. Clinical and Radiological Results of Hook Plate Fixation in Acute Acromioclavicular Joint Dislocations and Distal Clavicle Fractures. *Clinics in Shoulder and Elbow*.2018Jun;21(2):95.doi:10.5397/cise.2018.21.2.95.
- [21] Louwerens JK, van den Bekerom MP, van Royen BJ, Eygendaal D, van Noort A, Siersevelt IN. Quantifying the Minimal and Substantial Clinical Benefit of the Constant-Murley Score and the Disabilities of the Arm, Shoulder and Hand Score in Patients with Calcific Tendinitis of the Rotator Cuff. *Journal of Bone and Joint Surgery International*.2020Sep;4(3): 606-11. doi: 10.1016/j.jseint.2020.05.001.
- [22] Hendrickx E. Patient-Specific Implant to Treat Displaced Acromial Stress Fractures After Reverse Total Shoulder Arthroplasty (Doctoral dissertation, Ghent University). 2021.