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Original Article

Comparison of Functional Outcome of Conservative Management and Operative Treatment for Displaced Mid-Shaft Clavicle Fractures

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ABSTRACT

Objective: To compare functional outcomes of conservative management and operative treatment for Displaced Mid-shaft Clavicle fractures.

Study Design: Prospective comparative study.

Place and Duration of Study: Department of Orthopaedics Combined Military Hospital, Rawalpindi, Pakistan, from Dec 2020 to Sep 2021.

Methodology: In a cohort of 80 patients with displaced midshaft clavicle fractures, 40 patients were managed conservatively with an arm sling, and 40 were managed operatively with an anatomical clavicle plate. All these patients were followed up for three months. The functional efficacy of different treatment options in displaced midshaft clavicle fractures was assessed using a Disability of Arm, Shoulder and Hand (DASH) score.

Results: The DASH Score showed Functional outcomes were significantly better (p<0.01) in the Operative-Group at 4 weeks, 2 months and 3 months. At two-month follow-up, the Conservative Group had a DASH score of 21.2±2.1, whereas the Surgical Group had a DASH score of 11.7±1.8. The DASH score at three months follow-up was 5.5±1.3 and 12.5±1.9 for the Operative and Conservative Groups, respectively.

Conclusion: Plate fixation improves the functional results for individuals with a displaced mid-shaft clavicle fracture. This study showed that DASH scores are lower in the operative Group. When it comes to non-displaced mid-shaft clavicle fractures, conservative management has always been the best option.

Keywords: Clavicle, Displaced fracture, DASH score, Midshaft clavicle, Plate osteosynthesis.

How to Cite This Article: *Swati MAA, Amin MS, Niazi JI, Kakkar Z, Aslam Z, Habib A. Comparison of Functional Outcome of Conservative Management and Operative Treatment for Displaced Mid-shaft Clavicle Fractures. Pak Armed Forces Med J 2023; 73(5): 1317-1320. DOI: https://doi.org/10.51253/pafmj.v73i5.8018.*

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INTRODUCTION

A clavicle fracture is one of the most common injuries in trauma and orthopaedics clinics.[1] Clavicle fracture accounts for 2-5 per cent of all fractures in the body,[2] with an incidence of 59 out of 100,000 per year. Approximately 80% of all clavicle fractures occur in the middle third (or mid-shaft).[3,4]

The treatment of a displaced mid-shaft clavicle fracture has been contentious from the start.[5] Even if complete displacement was present, conservative treatment of a mid-shaft clavicle fracture was the gold standard since the classical Greek era.[6] When assessing the functional outcomes at the shoulder joint, studies have shown that initial objective and patient-reported scores in the surgical Group are significantly better than in the conservative Group. [7,8] However, after 12 months, the scores are identical in both groups.[9]

The main goal of clavicle fracture treatment is to achieve bony union to restore shoulder function and avoid cosmetic deformities. Several trials have looked at the functional outcome of clavicle fractures and the morbidity of nonunion and malunion. Restoring functional strength in the afflicted area is one of the most essential study was to compare the efficacy of open reduction and plate fixation versus nonoperative treatment (with arm sling) in patients with displaced mid-shaft clavicular fractures in terms of shoulder function.

METHODOLOGY

The prospective comparative study was carried out at Department of Orthopaedics Combined Military Hospital, Rawalpindi Pakistan, from Dec 2020 to Sep 2021 after approval from the Hospital Ethical Committee (198/9/21). The sample size was calculated by using the WHO sample size calculator with the reported mean DASH score of 11.1±1.4 in the Cons Group and the Surgical Group 7.3±1.1.[10]

Inclusion Criteria: Patients aged 18-60 years, of either gender with a one-shaft width displaced mid-shaft clavicle fracture (Robinson type 2B1 and type 2B2), presented within seven days of injury, and medically fit to undergo surgery were included.

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Received: 13 Jan 2022; revision received: 19 Apr 2022; accepted: 19 Apr 2022

Exclusion Criteria: Patients with pathological fractures, open fractures, fractures associated with neurovascular damage, ipsilateral upper extremity fractures, an accompanying head injury, previous shoulder surgery associated with reduced shoulder function, or who presented after seven days of injury were excluded from the study.

A probability consecutive sampling technique was used to gather the sample. Two groups of 40 each were formed in a randomized manner. Patients were allocated into these groups via a lottery method. Group-A was treated conservatively with an arm sling, while Group-B was managed surgically. Participants who agreed to participate in the study were given an informed consent form in their native language. Patients were included in the study after completing the paperwork. Patients in the operatively managed Group were scheduled for surgery on the next available operation list.

An orthopaedic surgeon operated on patients in Group-B. An incision was made from the sternal notch to the anterior margin of the acromion, centred over the fracture. After the division of lateral platysma, the supraclavicular nerve was identified, which runs down the front of the clavicle. The incision was made along the clavipectoral fascia's attachment to the clavicle, and the clavipectoral fascia was carefully elevated. A 3.5-mm anatomical titanium plate was used to fit along the superior aspect of the clavicle after reducing the fracture. Screws were inserted from the top to the bottom, taking care not to damage the neurovascular structures. 1 A lag screw was used in case of a wedge or oblique fracture pattern. AO principles of implant fixation were taken into consideration.

Patients in Group-A were given an arm sling for three weeks. Internal rotation of the arm was maintained. Patients were allowed to take the sling off for short periods to wash their faces, dress, etc.

A rehabilitation protocol was used for all patients. In the conservative Group, pendulum movements of the shoulder were started after two weeks, whereas, in the operative Group, these movements were started on the first post-op day. Both Groups were allowed a gentle, active range of motion of the shoulder after three weeks, with abduction up to 90'. Active range of motion in all planes was allowed after four weeks. Muscle strengthening activities were allowed when fracture union was visible (as defined by radiographic evidence of bridging callous formation with no pain on motion or manual stressing of fracture). At eight weeks, isometric and isotonic shoulder workouts were recommended. At three months, the patient was allowed to resume full activity including sports.

All patients were followed up at one month (four weeks), two months and three months. A standard DASH score proforma assessed the patient's functional outcome. Each appointment included a clinical evaluation as well as a radiological examination. Serial plain radiographs revealed fracture healing. Any problem necessitating extra medical care or another operational procedure was considered unfavourable.

Data were analysed using Statistical Package for the Social Sciences (SPSS) version 26.00 and MS Excel 2016 software. Mean±SD was calculated for continuous variables. Frequency and percentage were calculated for categorical variables. To see if there was a statistically significant difference in DASH scores between the conservative and operative Groups, independent sample t-tests were used. The *p*-value of ≤0.05 was considered significant.

RESULTS

A total number of 80 patients were enrolled, with 40 receiving operative treatment and the other 40 receiving non-operative treatment. The average age of the patients in Groups A and B was 32.5±0.6 years and 32.4±0.5 years, respectively. 76(95%) patients were males and 4(5%) patients were females. A 3.5-mm anatomical titanium clavicular plate was used on all operatively treated patients. Radiographs were taken for all patients on each follow-up. No patient was lost to follow-up.

At a four-week follow-up, the average DASH score in the Conservative Therapy Group was 31.5±2.6. At four-week follow-up, the DASH score in the Surgery Group was 16.9±2.0. At two-month follow-up, the Conservative Group had a DASH score of 21.2±2.1,

Table: Mean DASH score in Conservative and Operative Groups at One Month, Two months and Three months (n=80)

DASH Score	Conservative Group (Group-A) (n=40)	Operative Group (GroupB) (n=40)	*p*-value
DASH at 1-month (Mean±SD)	31.54±2.66	16.96±2.09	<0.01
DASH at 2-months (Mean±SD)	21.27±2.13	11.74±1.85	<0.01
DASH at 3-months (Mean±SD)	12.52±1.94	5.555±1.35	<0.01

whereas the Surgical Group had a DASH score of 11.7±1.8. At three-month follow-up, the Conservative and Surgical Groups had DASH scores of 12.5±1.9 and 5.5±1.3, respectively. The DASH scores of Operative Group were notably lower than the Non-operative Group at each follow-up (p<0.01) (Table).

DISCUSSION

In this study, the DASH score showed Functional outcomes were significantly better (p<0.01) in the Operative-Group at 4 weeks, 2 months and 3 months. Neer *et al*.[11] and Rowe *et al*.[12] conducted the first trials for this fracture treatment, and they indicated a low rate of nonunion in conservatively managed fractures. Following these trials, many surgeons began using arm slings as the treatment of choice for displaced mid-shaft fractures. After conservative management of this fracture, multiple studies have found an increased incidence of persistent pain, nonunion, malunion, shoulder weakness, decreased shoulder endurance, inferior patient and surgeon-oriented outcome scores and lower overall satisfaction.[13,14] According to the recently published literature, higher nonunion rates were seen in those patients who were managed conservatively compared to those who were managed surgically.[15,16]

In our study, participants were operated within seven days, which may have contributed to increased rates of bone union. Operative treatment has several advantages, including instant rigid stability and pain alleviation, as well as facilitating early mobilization. The rehabilitation protocol employed in both groups was described in full in the previous section. Early mobilisation in the Surgical Group helped them maintain shoulder strength and function. However, the conservative Group's shoulder was immobilised for two weeks, which could have resulted in muscle wasting and delayed shoulder function. As a result, at all follow-ups, the functional outcome defined by the DASH score (Disability of Arm, Shoulder and Hand) was better in operated-treated patients than in the non-surgical Group. Furthermore, as evident by our findings, earlier rehabilitation may have contributed to higher rates of bone union & early functional recovery. In mean DASH scores, there was a difference of 14.572 points in favour of the surgical Group at four weeks, 9.532 points at 8 weeks and 6.97 points at 12 weeks.

Several randomised controlled trials have found consistent outcomes regarding functional outcomes.[17,18] However, these studies show that the functional outcome difference diminishes once the fracture is united. The union of the fracture treated by any method leads to the same DASH scores. The results of the same DASH scores are usually seen in the ninth-month follow-up.[19,20]

This study, like all others, has a few strengths and a few limitations. Our study has a 100% follow-up rate, its most significant strength. On follow-ups, all of these subjects were evaluated by independent assessors. Furthermore, our respondents' baseline demographic traits were nearly identical, reducing the possibility of bias in our research.

LIMITATIONS OF STUDY

The major study limitations were the short follow-up time of only three months and the fact that the assessors were not blinded to the treatment Groups.

ACKNOWLEDGEMENT

We want to take this opportunity to express our immense gratitude to those who have given their invaluable support and assistance.

CONCLUSION

Plate fixation improves the functional results for individuals with a displaced mid-shaft clavicle fracture. This study showed that DASH scores are lower in the operative Group. When it comes to non-displaced mid-shaft clavicle fractures, conservative management has always been the best option.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

MAAS: & MSA: Data acquisition, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

JIN: & ZK: Study design, drafting the manuscript, data interpretation, approval of the final version to be published.

ZA: & AH: Concept, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Campbell DH, McKee MD. Operative Fixation of a Displaced Midshaft Clavicle Fracture. J Orthopaedic Trauma 2020; 34: S3-S4. https://doi.org/10.1097/bot.0000000000001834
2. Waldmann S, Benninger E, Meier C. Nonoperative treatment of midshaft clavicle fractures in adults. Open Orthop J 2018; 12: 1. https://doi.org/10.2174%2F1874325001812010001
3. Wiesel B, Nagda S, Mehta S, Churchill R. Management of midshaft clavicle fractures in adults. J Am Acad Orthop Surgeons 2018; 26(22): e468-e76. https://doi.org/10.5435/jaaos-d-17214-00442

4. Subramanyam KN, Mundargi AV, Gopakumar K, Bharath T, Prabhu MV, Khanchandani P, et al. Displaced midshaft clavicle fractures in adults–is non-operative management enough? Injury 2021; 52(3): 493-500. https://doi.org/10.1016/j.injury.2020.10.019
5. Society COT. Nonoperative treatment compared with plate fixation of displaced midshaft clavicular fractures. A multicenter, randomized clinical trial. J Bone Joint Surg Am 2007; 89(1): 1-10. https://doi.org/10.2106/jbjs.f.00020
6. Woltz S, Stegeman SA, Krijnen P, van Dijkman BA, van Thiel TP, Schep NW, et al. Plate fixation compared with nonoperative treatment for displaced midshaft clavicular fractures: a multicenter randomized controlled trial. J Bone Joint Surg Am 2017; 99(2): 106-112. https://doi.org/10.2106/jbjs.15.01394
7. Augat P, von Rüden C. Evolution of fracture treatment with bone plates. Injury. 2018; 49(1): S2-S7. https://doi.org/10.1016/s0020-1383(18)30294-8
8. Ahmed AF, Salameh M, AlKhatib N, Elmhiregh A, Ahmed GO. Open reduction and internal fixation versus nonsurgical treatment in displaced midshaft clavicle fractures: a meta-analysis. J Orthop Trauma 2018; 32(7): e276-e83. https://doi.org/10.1097/bot.0000000000001174
9. Frima H, van Heijl M, Michelitsch C, van Der Meijden O, Beeres FJ, Houwert RM, et al. Clavicle fractures in adults; current concepts. Eur J Trauma Emerg Surg 2020; 46(3): 519-529. https://doi.org/10.1007/s00068-019-01122-4
10. Daniilidis K, Raschke MJ, Vogt B, Herbort M, Schliemann B. Comparison between conservative and surgical treatment of midshaft clavicle fractures: outcome of 151 cases. Technol Health Care 2013; 21(2): 143-147. https://doi: 10.3233/THC-130714.
11. Neer CS. Nonunion of the clavicle. J Am Med Assoc 1960; 172(10): 1006-1011. https://doi.org/10.1001/jama.1960.03014003
12. Rowe CR. An Atlas of Anatomy and Treatment of Midclavicular Fractures. Clin Orthop Relat Res 1968; 58: 29-42.
13. Qin M, Zhao S, Guo W, Tang L, Li H, Wang X, et al. Open reduction and plate fixation compared with non-surgical treatment for displaced midshaft clavicle fracture: A meta-analysis of randomized clinical trials. Medicine 2019; 98(20). https://doi.org/10.1097/md.0000000000015638
14. Morgan C, Bennett-Brown K, Stebbings A, Li L, Dattani R. Clavicle fractures. Br J Hosp Med 2020; 81(7): 1-7.
15. Bhardwaj A, Sharma G, Patil A, Rahate V. Comparison of plate osteosynthesis versus non-operative management for mid-shaft clavicle fractures—A prospective study. Injury 2018; 49(6): 1104-1107. https://doi.org/10.1016/j.injury.2018.04.012
16. Hoogervorst P, van Schie P, van den Bekerom MP. Midshaft clavicle fractures: Current concepts. EFORT Open Rev 2018; 3(6): 374-380. https://doi.org/10.1302/2058-5241.3.170033
17. Axelrod DE, Ekhtiari S, Bozzo A, Bhandari M, Johal H. What is the best evidence for management of displaced midshaft clavicle fractures? A systematic review and network meta-analysis of 22 randomized controlled trials. Clin Orthop Relat Res 2020; 478(2): 392. https://doi.org/10.1097/corr.0000000000000986
18. Smeeing DP, van der Ven DJ, Hietbrink F, Timmers TK, van Heijl M. Surgical versus nonsurgical treatment for midshaft clavicle fractures in patients aged 16 years and older: a systematic review, meta-analysis, and comparison of randomized controlled trials and observational studies. Am J Sports Med 2017; 45(8): 1937-1945. https://doi.org/10.1177/ 0363546516673615
19. Federico A, Grassi M. Management of midclavicular fractures: Comparison between nonoprative treatment and open intramedullary fixation in 80 patients. J Trauma Injury Infect Crit Care 2001; 50(1): 1096-1100. https://doi.org/10.1097/00005373-200106000-00019
20. Huttunen TT, Launonen AP, Berg HE, Lepola V, Felländer-Tsai L, Mattila VM, et al. Trends in the incidence of clavicle fractures and surgical repair in Sweden: 2001-2012. J Bone Joint Surg Am 2016; 98(21): 1837-1842. https://doi.org/10.2106/jbjs.15.01284