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Management of Clavicle Midshaft Fractures: A Comparative Prospective Study in Jammu

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ABSTRACT

Background: Clavicle fracture, which is also commonly known as a broken collarbone, occurs mostly due to direct high impact energy over the bone due to a fall onto the lateral shoulder or on the outstretched hand. It has been seen that such types of fractures are prevalent among active and sports persons due to sporting activities. This study aimed to assess the pros and cons associated with conservative and surgical management of clavicle fractures. **Methods:** The present prospective comparative study was conducted at Government Medical College Kathua between February 2021 to January 2022. There was a total of 52 patients, with 26 patients in each group. Group A patients were given conservative management, while Group B patients were operated on for plate fixation. **Results:** The average fracture union time in group A was slightly higher compared to group B (15.9 vs. 13) weeks. And the difference was statistically significant with a p-value of 0.0483. We observed that there exists a significant difference between the two groups with respect to the total score at 24 weeks (6 months). Evidently, the average CMS score for the conservative group is smaller compared to the operated group (89.95 vs. 94.2) weeks. However, the majority of patients in group A had malunion complications (65.4%) compared to (3.8%) in group B, and the difference was statistically significant. **Conclusion:** Evidently, post six months of displaced midshaft clavicle fracture, the rate of complications was more prevalent in group A compared to group B.

1. Introduction

Clavicle fractures are the commonest form of fracture, accounting for about 5% to 10% of all types of fractures.¹ Clavicle fracture, which is also commonly known as a broken collarbone, occurs mostly due to direct high impact energy over the bone due to a fall onto the lateral shoulder or on the outstretched hand. It has been seen that such types of fractures are prevalent among active and sports persons due to sporting activities. Albeit, road traffic accidents, and non-traumatic factors also it's contributing factors.²⁻⁴ It is important to identify the location and type of fracture because treatment management is largely determined by a specific category. Clavicle fractures

are generally classified according to the famously known Allman and/ or Robinson classification. In the present paper, we will be specific to the most common clavicle fracture, known as a midshaft fracture, which constitutes about 80% of all clavicle fractures.⁵

Midshaft fractures are commonly evident among young adults, while as lateral and medial end clavicle fractures are commonly seen in elderly people.^{6,7} The treatment protocol for the management of clavicle fractures have been largely categorized as operative or conservative. The conservative management targets pain reduction by temporary immobilization with the help of a sling or collar cuff with an analgesic or

Kinesio tape combination. On the other hand, operative management consists of open reduction and internal fixation with the help of screws plates or intramedullary devices. Intramedullary fixation (IMF) can be explored with smooth or threaded K-wires, Steinman pins, Hagie pins, or cannulated screws. However, titanium elastic nail is the most exploited option.⁸⁻¹⁴ Even though non-operative management is noninvasive in nature, such methods always carry a plausible risk of non-union, residual deformity, and malunion complications. On the other hand, operative management has been reported to potentially leave distinct scars on the shoulder. Hypertrophic scarring is the most disturbing complication of postsurgical treatment with plate fixation.¹⁵ This study aimed to assess the pros and cons associated with conservative and surgical management of clavicle fractures.

2. Methods

The present prospective comparative study was conducted at Government Medical College, Kathua between February 2021 to January 2022. There was a total of 52 patients, with 26 patients in each group. The primary outcome measure of our study was the use of Constant and Murley scoring (CMS) at the end of six months for functional assessment, while the secondary outcome includes fracture union time, the incidence of complications, and patient satisfaction in two groups. Each participant's or their guardian's signed consent was obtained in accordance with legal requirements. This study has received approval from The Institute of Ethical Committee, GMC, Kathua.

The inclusion criteria for this study were patients with isolated closed displaced traumatic mid-clavicular fractures without neurovascular involvement between the age group 16-60 years were included in the study. Patients with risky comorbid conditions were excluded from the study. In group A, patients were managed conservatively by using a clavicle brace and sling in which the limb was

immobilized for six weeks. Range of motion will be started post six months. In group B, patients were managed operatively. A transverse incision was made along the superior border of the clavicle under general anesthesia. Fixation was performed following fracture reduction with minimal periosteal stripping. The plate was contoured to the shape of the clavicle. Autogenous iliac bone grafting was performed in severe comminution in the inferior surface to avoid non-union or fixation failure or metal breakage caused by tension. The postoperative patient was given iv antibiotics for a period of 3 days and then discharged. Patients received arm slings for two weeks. Post two weeks, suture removal was performed, and range of motion was initiated. The patients were followed up at two weeks, six weeks, twelve weeks, eighteen weeks, and twenty-four weeks. Assessment of cases was performed clinically at subsequent follow-up visits, and results were designated as Excellent, Good, Fair, and Poor based on Constant and Murley scoring at the end of 6 months.

3. Results

The average age of group A patients was less compared to group B (34.6 ± 3.91 years vs. 35.1 ± 4.23). However, the difference was statistically insignificant, with a p-value of 0.661. Pertinently group A received conservative treatment, and group B received operative management ORIF with Plating. The proportion of patients with respect to gender was also insignificant between the groups, with a p-value of 0.749. Laterality and pattern of fractures were also comparable between the groups, with a p-value of 0.781 and 0.926, respectively. The mode of injury was assessed among studied patients of both the groups, and found that there was an insignificant difference between the groups with a p-value of 0.532. The average fracture union time in group A was slightly higher compared to group B (15.9 vs. 13) weeks, and the difference was statistically significant with a p-value of 0.0483 (table 1).

Table 1. Fracture union time in two groups.

Fracture union time (weeks)	N	Mean	SD	P-value
Group A	24*	15.9	5.17	0.0483*
Group B	26	13	4.95	

*In two cases managed conservatively, the union was not seen, so they were excluded in order to calculate union time.

There was a significant difference between the two groups with respect to the total score at 24 weeks (6 months). Evidently, the average CMS score for the

conservative group is smaller compared to the operated group (89.95 vs. 94.2) weeks (table 2).

Table 2. Total CMS score at 24 weeks in two groups.

Total score	N	Mean	SD	P-value
Group A	26	89.95	5.89	0.0147*
Group B	26	94.2	6.51	

*significant difference (p<0.05).

The assessment of complications among patients of two groups was made, and it was found that both groups were comparable with respect to non-union complications, delayed union complications, and infection. However, the majority of patients in group A

had malunion complications (65.4%) compared to (3.8%) in group B, and the difference was statistically significant (table 3). Also, there was a significant difference between the groups (p-value<0.001*) with respect to functional results (table 4).

Table 3. Various complications between the two groups.

Complications	Group A	Group B	P-value
	Total (%)	Total (%)	
Nonunion	2 (7.7)	0	0.491
Delayed union	2 (7.7)	3 (11.5)	0.638
Malunion	17 (65.4)	1 (3.8)	<0.001*
Infection	0	1 (3.8)	1.000
Loosening of screw	-	3 (11.5)	-
Implant failure	-	2 (7.7)	-

*significant difference (p<0.05).

Table 4. The functional result at 24 weeks in two groups.

Functional result	Group A	Group B	P-value
	Total (%)	Total (%)	
Excellent	5 (19.2)	23 (88.5)	<0.001*
Good	2 (7.7)	1 (3.8)	
Fair	3 (11.5)	1 (3.8)	
Poor	16 (61.5)	1 (3.8)	
Total	26 (100)	26 (100)	

*statistically significant difference (p-value<0.05).

4. Discussion

In the present comparative study, it was found that age and sex distribution were comparable between the groups. The average age of group A patients was slightly less compared to group B patients (34.6±3.91 years vs. 35.1±4.23). However, the difference was statistically insignificant, with a p-value of 0.661. Similar to our study, the average age of such patients has been reported as 33.4 years, 31.5 years, 32.5 years, and 32.9 years by different studies.¹⁶⁻¹⁹ The male predominance among such patients has been reported by a good corpus of scholars.¹⁶⁻²⁰ The physical features like laterality and pattern of fracture, and mode of injury were also comparable between the groups. Laterality of clavicle fractures were present on the left side in the majority of the cases in both groups, which is comparable with some previous studies.¹⁹⁻²¹

In the present study, it was found that the presentation of most of the clavicle fractures were oblique in nature among both the groups (42.3% vs. 46.2%), followed by transverse accounting for (38.5%) in both the groups and comminuted pattern (19.2%) in group A and (15.4%) in group B. Previous study reported that comminuted fracture is a less prevalent form of clavicle fractures, accounting for only (24%) of all the clavicle fractures, they reported that two-part fractures are predominant clavicle fracture which is in consonance to our study.¹⁸

The mode of injury was assessed among patients of both groups and found that most of the clavicle fractures were due to road traffic accidents accounting

for 76.9% in group A and 69.2% in group B. Contemporary to the literature, a previous study reported that 76.67% clavicle fractures occur due to road traffic accidents which are similar to our finding.²² Some studies also highlighted road traffic accidents as the commonest cause of clavicle fractures.^{19,23} Pertinently in group B, (73.33%) patients were managed with a reconstruction plate, (16.66%) patients were managed with a clavicular plate, and in (10%) patients semi-tubular plate was used. A similar kind of plate exploitation for operative management was reported by Patel et al. and Bostman et al.^{16, 23}

Clavicle fractures in the middle of the shaft have historically been treated non-operatively since the non-union rate was thought to be quite low. The clavicle is the bony connector between the thorax and shoulder girdle.^{23,24} However, more recent research indicates that non-union rates can reach 15%, in addition to additional issues such as visual deformity, shoulder weakness, and altered shoulder biomechanics.^{25,26} As a result, several surgeons advocated for open reduction and fixation with a plate and screws.^{27,28} In this study, we contrasted surgical with non-surgical treatment of midshaft clavicle fractures in terms of functional outcomes and patient satisfaction ratings. Constant and Murley shoulder scores and radiographs were assessed among both groups. The use of Constant-Murley Scoring (CMS) for functional evaluation at the end of six months served our main objective. The conservative group's average

CMS at the 6-month follow-up was 89.95 compared to 94.2 in the operative group, and the difference was statistically significant with a p-value of 0.0147. This statistically significant result infers that patients who had operative management for midshaft clavicular fractures regain shoulder function quicker and, as a result, it aided early return to regular employment. Studies by Jha et al., Wang et al., and the Canadian Orthopaedic Trauma Society's multicenter RCT all reported improved CMS ratings in surgical patients; however, Virtanen et al. reported no change in CMS scores between the two groups.^{22,26,27,29}

Fracture union time, patient satisfaction at six months, and analysis of complications served our secondary outcomes in our study. Group A had a significantly higher average fracture union time compared to group B (15.9 vs. 13.0) weeks, with almost (54%) of patients having their fractures united before 12 weeks compared to 33.3% in group A. Contemporary to the literature, our results are comparable with numerous studies.³⁰⁻³² For instance, Naveen et al. reported that the average duration for union in the conservative group was 11.29 weeks, as compared to 9.27 weeks in the operative group. They also noted a substantial difference in the mean length of union time between the groups, which is consistent with our results.³⁰ However, contrary to this, Jha et al. reported an insignificant difference between the groups with a p-value of 0.191.²²

The assessment of complications among patients of two groups was made, and it was found that both groups were comparable with respect to non-union complications, delayed union complications, and infection. However, the majority of patients in group A had malunion complications (65.4%) compared to (3.8%) in group B, and the difference was statistically significant. In the same way, Vaithilingam et al., Jha et al., and Patel et al. have reported malunion as the commonest complication in the conservative group, followed by a non-union complication.^{19,22,23} But unlike our study, Judd et al. have reported that operative management leads to higher complications compared to conservative management. However, they

reported an identical rate of non-union complications in both groups.²¹

In the present study, there is a highly significant difference between the groups with respect to the functional result. Our results are consistent with the results obtained by Jha et al., who reported 93.3% patient satisfaction compared to 70% in the conservative group.²² In a likewise study conducted by the Canadian Orthopaedic Society, it was observed that (83%) of patients were satisfied with operative management compared to 53% with conservative management. In addition to this, they reported that operatively treated clavicle fractures with plate fixation had superior functional results, lower malunion, decreased non-union rates, and a shorter total time to the union, which is much similar to our study.²⁷

Our study had some drawbacks, which included small sample size and a limited catchment area because it was conducted at a single health care facility center. A patient's desire for surgery may have been discouraged by the expense of pre-contoured plates because they are more expensive than conservative therapy. Patients' responses to the same problem in the subjective evaluation of patient satisfaction at six months varied depending on whether they were optimistic or pessimistic, making it impossible to view the full picture.

5. Conclusion

The present study demonstrated that patient satisfaction with the functional outcome was significantly higher among those who were treated with operative management compared with conservative management. Evidently, post six months of displaced midshaft clavicle fracture, the rate of complications was more prevalent in group A compared to group B. Although the fixation of ORIF with plating reduces the plausibility of non-union significantly, we cannot make a general recommendation for operative management owing to patient's comorbid conditions and other non-union risk factors

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