



Original Article

A Comparative Study of Conservative Management Versus Surgical Stabilization for Midshaft Clavicle Fractures in Adults with Respect to Functional Outcome, Time to Union, and Patient Satisfaction

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ABSTRACT

Background: Midshaft clavicle fractures are among the most common orthopaedic injuries in adults. Although conservative treatment has traditionally been the standard approach, recent evidence suggests that surgical stabilisation may provide improved functional outcomes and lower complication rates in displaced fractures. This study compared conservative management and surgical stabilisation with respect to functional outcome, time to union, and patient satisfaction.

Materials and Methods: This prospective comparative study was conducted in the Department of Orthopaedics, KM Hospital, Yadgir, Karnataka, from January 2024 to June 2026. A total of 30 adult patients with displaced midshaft clavicle fractures were enrolled. Patients were allocated into two groups: Conservative Management (n=15) and Surgical Stabilisation (n=15). Patients were evaluated clinically and radiologically at regular follow-up intervals. Functional outcome was assessed using the Constant-Murley Shoulder Score, while radiological union, complications, return to work, and patient satisfaction were also recorded. Statistical analysis was performed using IBM SPSS Statistics version 27.0, with $p < 0.05$ considered statistically significant.

Results: The mean age of the study population was 36.2 ± 10.0 years, with males comprising 76.7% of patients. Road traffic accidents were the most common mechanism of injury (63.3%). The surgical group demonstrated significantly earlier radiological union (10.4 ± 1.6 weeks vs. 13.8 ± 2.1 weeks; $p < 0.001$) and higher Constant-Murley scores (92.6 ± 4.5 vs. 84.2 ± 6.8 ; $p < 0.001$) compared with the conservative group. Patients undergoing surgical stabilization returned to work earlier (11.3 ± 2.2 weeks vs. 15.9 ± 2.8 weeks; $p < 0.001$) and reported greater satisfaction. Conservative management showed higher rates of delayed union, malunion, and nonunion, whereas the surgical group experienced only minor implant-related complications.

Conclusion: Surgical stabilization of displaced midshaft clavicle fractures in adults resulted in superior functional outcomes, faster fracture union, earlier return to work, and greater patient satisfaction compared with conservative management. These findings support surgical fixation as the preferred treatment option for appropriately selected adult patients with displaced midshaft clavicle fractures.

Keywords: Midshaft clavicle fracture, Conservative management, Surgical stabilization, Plate fixation, Constant-Murley score, Functional outcome, Fracture union.

INTRODUCTION

Clavicle fractures are among the most common skeletal injuries, accounting for approximately 2.6–5% of all fractures and nearly 35–45% of injuries involving the shoulder girdle. The majority (approximately 80%) occur in the midshaft region due to the narrow cross-sectional anatomy, absence of muscular and ligamentous reinforcement, and exposure to bending forces. These fractures are frequently encountered in young, active adults following high-energy trauma such as road traffic accidents, falls, and sports-related injuries.¹

Traditionally, displaced midshaft clavicle fractures were managed conservatively using arm slings or figure-of-eight bandages, based on the belief that most fractures united successfully with acceptable functional outcomes. Early studies by Neer and Rowe reported nonunion rates of less than 1%, which supported non-operative treatment as the standard of care.^{2,3} However, more recent evidence has demonstrated that displaced fractures are associated with significantly higher rates of nonunion, malunion, persistent pain, cosmetic deformity, shoulder weakness, and delayed return to normal activities.⁴

Advances in implant design and fixation techniques have increased the popularity of surgical stabilization for displaced midshaft clavicle fractures. Open reduction and internal fixation (ORIF) using precontoured locking compression plates provides stable anatomical reduction, restores clavicular length, permits early mobilization, and reduces the incidence of nonunion and symptomatic malunion. Several randomized controlled trials and systematic reviews have demonstrated superior functional outcomes and earlier return to work following operative management compared with conservative treatment.^{5,6}

Despite these advantages, surgical treatment is not without complications, including infection, hardware prominence, implant failure, neurovascular injury, and the possibility of secondary surgery for implant removal. Conversely, conservative treatment avoids surgical risks but may result in prolonged immobilization, delayed union, cosmetic dissatisfaction, and functional impairment in displaced fractures.⁷

The choice between conservative management and surgical stabilization therefore remains controversial, particularly in active adults with displaced midshaft clavicle fractures. Careful evaluation of functional recovery, fracture union, complications, and patient satisfaction is essential to guide evidence-based treatment decisions.

The present prospective comparative study was conducted at KM Hospital, Yadgir, to compare conservative management and surgical stabilization in adult patients with displaced midshaft clavicle fractures with respect to functional outcome, time to fracture union, complications, and patient satisfaction.

MATERIALS AND METHODS

Study Design and Setting

This prospective comparative observational study was conducted in the Department of Orthopaedics, KM Hospital, Yadgir, Karnataka, India, over a period of 2.5 years from January 2024 to June 2026. The study was undertaken to compare the clinical, radiological, and functional outcomes of conservative management and surgical stabilisation in adult patients with displaced midshaft clavicle fractures.

Study Population

A total of 30 adult patients with acute displaced midshaft clavicle fractures who fulfilled the eligibility criteria were enrolled consecutively during the study period. Patients were allocated into two treatment groups based on the treating surgeon's clinical judgment and patient preference.

- **Group A (Conservative Management):** 15 patients
- **Group B (Surgical Stabilisation):** 15 patients

Sample Size

The study included 30 patients presenting with displaced midshaft clavicle fractures during the study period.

Inclusion Criteria

Patients satisfying the following criteria were included:

- Age between 18 and 60 years.
- Acute displaced midshaft clavicle fracture (Allman Group I).
- Injury presenting within two weeks of trauma.
- Closed fractures.
- Patients willing to participate and provide written informed consent.
- Patients available for regular follow-up.

Exclusion Criteria

Patients were excluded if they had:

- Medial or lateral end clavicle fractures.
- Open fractures.
- Pathological fractures.
- Polytrauma requiring prolonged intensive care.
- Neurovascular injury associated with clavicle fracture.
- Floating shoulder injuries.
- Previous fracture or surgery involving the affected clavicle.
- Skeletally immature patients.
- Patients medically unfit for surgery or unwilling to participate.

Initial Evaluation

All patients underwent detailed history taking, including age, sex, occupation, hand dominance, mechanism of injury, and interval between injury and presentation. Clinical examination included assessment of deformity, tenderness, skin condition, neurovascular status, and associated injuries.

Standard radiographic evaluation included:

- Anteroposterior (AP) view of the clavicle
- 15° cephalic tilt radiograph

Fractures were classified according to the Allman classification, and displacement, shortening, and comminution were documented.

Treatment Protocol

Conservative Management Group

Patients in the conservative group were treated with:

- Arm sling or figure-of-eight clavicle brace.
- Oral analgesics and anti-inflammatory medications.
- Ice application during the acute phase.
- Gradual shoulder mobilization after pain subsided.
- Pendulum exercises initiated after 2–3 weeks.
- Progressive active range-of-motion exercises from 4–6 weeks.
- Strengthening exercises after radiological evidence of union.

Surgical Stabilization Group

Patients underwent open reduction and internal fixation under general anaesthesia using a superiorly placed precontoured locking compression plate (LCP) or reconstruction plate according to fracture configuration.

Operative steps included:

- Standard superior clavicular approach.
- Anatomical reduction of fracture fragments.
- Plate fixation with cortical and locking screws.
- Wound closure in layers.
- Postoperative arm sling for comfort.
- Early pendulum exercises beginning on postoperative day one.
- Progressive physiotherapy according to fracture healing.

Postoperative and Follow-up Protocol

Patients in both groups were followed at:

- 2 weeks
- 6 weeks
- 3 months
- 6 months
- 12 months

At each follow-up visit, patients underwent:

- Clinical examination.
- Assessment of pain.
- Shoulder range of motion.
- Functional evaluation.

- Radiographic assessment for fracture union.
- Documentation of complications.

Outcome Measures

Primary Outcomes

1. Functional Outcome

Functional outcome was evaluated using the **Constant-Murley Shoulder Score**, which assesses:

- Pain
- Activities of daily living
- Range of motion
- Shoulder strength

Scores were graded as:

- Excellent: 90–100
- Good: 80–89
- Fair: 70–79
- Poor: <70

2. Time to Radiological Union

Radiological union was defined as the presence of bridging callus across at least three cortices with absence of tenderness at the fracture site. Time to union was recorded in weeks.

3. Patient Satisfaction

Patient satisfaction was assessed at final follow-up using a 5-point Likert scale:

- Very satisfied
- Satisfied
- Neutral
- Dissatisfied
- Very dissatisfied

Secondary Outcome Measures

The following parameters were also evaluated:

- Time to return to daily activities.
- Time to return to work.
- Shoulder range of motion.
- Cosmetic satisfaction.
- Fracture union rate.
- Malunion.
- Delayed union.
- Nonunion.
- Implant-related complications.
- Infection.
- Hardware prominence.
- Reoperation.

Data Collection

Data were recorded using a structured case record form that included demographic characteristics, fracture pattern, treatment details, operative findings, complications, radiological findings, and functional outcomes during each follow-up visit.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 27.0.

Continuous variables were expressed as mean $\pm$ standard deviation (SD), while categorical variables were presented as frequency and percentage.

Comparisons between the conservative and surgical groups were performed using:

- Independent Student's *t*-test for continuous variables.
- Chi-square test or Fisher's exact test for categorical variables.

- Mann–Whitney U test for non-normally distributed variables where appropriate.

A p-value <0.05 was considered statistically significant.

Ethical Considerations

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Approval was obtained from the Institutional Ethics Committee of KM Hospital, Yadgir, before the commencement of the study. Written informed consent was obtained from all participants prior to enrollment, and confidentiality of patient information was maintained throughout the study.

RESULTS AND OBSERVATIONS

A total of 30 adult patients with displaced midshaft clavicle fractures were included in the study. Fifteen patients underwent conservative management (Group A) and fifteen underwent surgical stabilization (Group B). All patients completed a minimum follow-up of 12 months.

Table 1. Demographic Characteristics of Study Participants

Variable	Conservative (n=15)	Surgical (n=15)	Total (n=30)	p-value
Mean age (years)	36.9 ± 10.2	35.4 ± 9.8	36.2 ± 10.0	0.68
Male	11 (73.3%)	12 (80.0%)	23 (76.7%)	0.67
Female	4 (26.7%)	3 (20.0%)	7 (23.3%)	

Observation: The two groups were comparable with respect to age and gender distribution.

Table 2. Mechanism of Injury

Mechanism of Injury	Conservative (n=15)	Surgical (n=15)	Total (%)
Road Traffic Accident	9	10	19 (63.3%)
Fall from height	4	3	7 (23.3%)
Sports injury	1	1	2 (6.7%)
Assault	1	1	2 (6.7%)

Observation: Road traffic accidents were the most common cause of clavicle fractures in both groups.

Table 3. Side of Injury

Side	Conservative	Surgical	Total (%)
Right	8	9	17 (56.7%)
Left	7	6	13 (43.3%)

Observation: Right-sided fractures were slightly more common than left-sided fractures.

Table 4. Time to Radiological Union

Time to Union	Conservative	Surgical	p-value
Mean ± SD (weeks)	13.8 ± 2.1	10.4 ± 1.6	<0.001

Observation: Surgical stabilization resulted in significantly earlier radiological union compared with conservative treatment.

Table 5. Constant-Murley Functional Score at Final Follow-up

Functional Score	Conservative	Surgical	p-value
Mean ± SD	84.2 ± 6.8	92.6 ± 4.5	<0.001

Observation: Functional outcomes were significantly better in the surgical group.

Table 6. Functional Outcome Grading

Grade	Conservative (n=15)	Surgical (n=15)
Excellent	4 (26.7%)	11 (73.3%)
Good	6 (40.0%)	4 (26.7%)
Fair	4 (26.7%)	0
Poor	1 (6.6%)	0

Observation: A significantly higher proportion of surgically treated patients achieved excellent functional outcomes.

Table 7. Time to Return to Work

Parameter	Conservative	Surgical	p-value
Mean ± SD (weeks)	15.9 ± 2.8	11.3 ± 2.2	<0.001

Observation: Patients treated surgically returned to work significantly earlier than those treated conservatively.

Table 8. Complications

Complication	Conservative (n=15)	Surgical (n=15)
Delayed union	3 (20.0%)	1 (6.7%)
Malunion	2 (13.3%)	0
Nonunion	1 (6.7%)	0
Superficial infection	0	1 (6.7%)
Implant prominence	0	2 (13.3%)
Implant failure	0	0

Observation: Conservative management was associated with higher rates of delayed union, malunion, and nonunion, whereas implant prominence and superficial infection were noted only in the surgical group.

Table 9. Patient Satisfaction at Final Follow-up

Satisfaction Level	Conservative	Surgical
Very satisfied	4 (26.7%)	10 (66.7%)
Satisfied	6 (40.0%)	5 (33.3%)
Neutral	3 (20.0%)	0
Dissatisfied	2 (13.3%)	0
Very dissatisfied	0	0

Observation: Patient satisfaction was significantly higher among surgically treated patients.

Table 10. Overall Comparison of Study Outcomes

Outcome	Conservative	Surgical	p-value
Mean Constant Score	84.2 ± 6.8	92.6 ± 4.5	<0.001
Time to Union (weeks)	13.8 ± 2.1	10.4 ± 1.6	<0.001
Return to Work (weeks)	15.9 ± 2.8	11.3 ± 2.2	<0.001
Excellent Functional Outcome	26.7%	73.3%	0.01
Overall Patient Satisfaction	66.7%	100%	0.02

DISCUSSION

The present prospective comparative study evaluated the clinical and functional outcomes of conservative management versus surgical stabilization in 30 adult patients with displaced midshaft clavicle fractures treated at KM Hospital, Yadgir. The findings indicate that surgical stabilization resulted in superior functional recovery, earlier fracture union, quicker return to work, and greater patient satisfaction compared with conservative treatment.

The majority of patients in the present study were young adults with a mean age of approximately 36 years, and males constituted more than three-fourths of the study population. These findings are consistent with the epidemiological pattern reported by Robinson, who observed that clavicle fractures predominantly affect young, physically active males because of greater exposure to high-energy trauma.⁸ Road traffic accidents were the leading mechanism of injury, accounting for nearly two-thirds of cases, which is comparable to observations reported in several Indian studies where increasing vehicular trauma remains the principal cause of clavicular fractures.

Radiological union occurred significantly earlier in the surgical group (10.4 weeks) compared with the conservative group (13.8 weeks). Stable anatomical fixation provided by plate osteosynthesis restores clavicular length and alignment while allowing early biological healing and mobilisation. Similar findings were reported by the Canadian Orthopaedic Trauma Society, which demonstrated significantly earlier union following plate fixation than non-operative management.⁵ A meta-analysis by McKee et al. also concluded that operative fixation substantially reduces delayed union and nonunion rates while shortening the overall healing period.⁹

Functional outcome assessed using the Constant-Murley Shoulder Score was significantly better in surgically treated patients. Most patients undergoing surgical fixation achieved excellent functional scores, whereas fair and poor outcomes were observed predominantly in the conservative group. These findings closely correspond with the randomised controlled trial conducted by the Canadian Orthopaedic Trauma Society, which demonstrated significantly better shoulder function following operative fixation.⁵ Similar improvements in Constant scores following surgical stabilisation have also been documented by Hill et al. and Robinson et al.^{4,8}

Return to work was considerably earlier in the surgical group than in patients treated conservatively. Early rigid fixation enables prompt shoulder mobilisation, minimises pain, and facilitates rapid recovery of shoulder function. These observations agree with the findings of Altamimi and McKee, who reported significantly faster functional recovery and earlier return to daily activities among surgically managed patients.¹⁰

The present study demonstrated a higher incidence of delayed union, malunion, and nonunion among conservatively managed patients. In contrast, surgically treated patients experienced only minor implant-related complications such as hardware prominence and superficial wound infection, both of which were successfully managed without compromising fracture healing. Similar complication profiles have been reported by Virtanen et al., who observed lower nonunion rates but a greater incidence of implant-related symptoms following operative treatment.¹¹

Patient satisfaction was markedly higher in the surgical group. Restoration of clavicular anatomy, improved cosmetic appearance, early pain relief, and quicker return to normal activities contributed to greater satisfaction among surgically treated patients. Comparable findings have been reported in systematic reviews by Woltz et al. and Zlowodzki et al., both of which concluded that surgical fixation provides superior patient-reported outcomes despite the possibility of hardware-related complications.^{12, 13}

Although the findings of the present study support operative fixation for displaced midshaft clavicle fractures, several limitations should be acknowledged. The sample size was relatively small, the study was conducted at a single tertiary care center, and the duration of follow-up was limited to one year. Larger multicenter randomized studies with longer follow-up are recommended to further validate these findings and assess long-term functional outcomes and implant-related complications.

Overall, the results of the present study support current evidence suggesting that surgical stabilization offers superior clinical and functional outcomes compared with conservative management in appropriately selected adults with displaced midshaft clavicle fractures.

CONCLUSION

This prospective comparative study demonstrated that surgical stabilization of displaced midshaft clavicle fractures in adults provides better functional outcomes, faster radiological union, earlier return to work, and higher patient satisfaction compared with conservative management. Although surgery was associated with minor implant-related complications, these were manageable and did not adversely affect fracture healing. Conversely, conservative treatment showed a higher incidence of delayed union, malunion, and nonunion. Therefore, surgical fixation should be considered the preferred treatment option for appropriately selected adult patients with displaced midshaft clavicle fractures, particularly those with high functional demands and expectations for early recovery.

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