

Research Article

Comparative Analysis of Functional and Radiological Outcomes in Conservative versus Surgical Management of Clavicle Fractures

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Abstract: **Introduction:** Clavicle fractures are among the most common orthopedic injuries, with midshaft fractures accounting for the majority of cases. Although conservative treatment has traditionally been the standard approach, advances in surgical fixation have increased the use of operative management for displaced fractures. The optimal treatment strategy remains controversial, necessitating comparative evaluation of functional and radiological outcomes. **Aim:** To compare the functional and radiological outcomes in patients with clavicle fractures managed conservatively versus surgically. **Materials and Methods:** A hospital-based comparative observational study was conducted among 100 patients with clavicle fractures treated at a tertiary care hospital. Patients were allocated to conservative (n=49) and surgical (n=51) management groups according to clinical indications. Baseline demographic and fracture characteristics were recorded. Functional outcomes were assessed using the Constant-Murley Score and Disabilities of the Arm, Shoulder and Hand (DASH) score at 3 and 6 months. Radiological outcomes included fracture union time, anatomical alignment, union rate, malunion, and delayed union/nonunion. Patient satisfaction, complications, and return to routine activities were also evaluated. Statistical analysis was performed using Student's t-test, Chi-square test, and Fisher's exact test, with p<0.05 considered statistically significant. **Results:** Baseline demographic characteristics were comparable between the two groups, although surgically managed patients had significantly greater fracture displacement and shortening (p<0.001). The surgical group demonstrated significantly higher Constant-Murley scores and lower DASH scores at both 3 and 6 months (p<0.001). Radiological union occurred earlier following surgical fixation (12.9±2.6 vs. 15.2±3.7 weeks; p=0.001), with significantly better anatomical alignment (96.1% vs. 63.3%; p<0.001) and a lower incidence of malunion (2.0% vs. 14.3%; p=0.028). Surgically treated patients returned to routine activities earlier (9.6±3.1 vs. 13.4±4.2 weeks; p<0.001), reported higher satisfaction (84.3% vs. 46.9%; p<0.001), and returned to work sooner (76.5% vs. 42.9%; p=0.001). Overall complication rates were comparable between groups, although implant irritation occurred only after surgical fixation. **Conclusion:** Surgical management of displaced clavicle fractures provides superior functional recovery, earlier fracture union, improved anatomical alignment, higher patient satisfaction, and earlier return to normal activities compared with conservative treatment. Conservative management remains an effective option for selected minimally displaced fractures, while operative fixation should be considered for displaced or unstable fractures after careful patient selection.

Keywords: Clavicle fracture. Conservative management. Surgical fixation.

INTRODUCTION

Clavicle fractures are among the most common skeletal injuries encountered in orthopedic practice, accounting for approximately 2.5–5% of all fractures and nearly 35–45% of injuries involving the shoulder girdle. These fractures occur across all age groups but are particularly common among young, active individuals following road traffic accidents, sports injuries, or falls onto the shoulder. The clavicle serves as a vital strut connecting the upper limb to the axial skeleton, maintaining shoulder alignment, facilitating upper extremity movement, and protecting important neurovascular structures. Because of its subcutaneous location and unique S-shaped anatomy, the clavicle is highly susceptible to traumatic injury. Approximately 70–80% of clavicle fractures involve the middle third (midshaft), while lateral and medial third fractures are less common.

Midshaft fractures frequently result from direct trauma and may present with varying degrees of displacement, shortening, comminution, and soft tissue injury.^[1]

Historically, the majority of clavicle fractures were managed conservatively using arm slings or figure-of-eight bandages based on early reports demonstrating high union rates and satisfactory functional outcomes. Conservative treatment remains appropriate for many undisplaced or minimally displaced fractures. However, more recent evidence has highlighted that displaced midshaft fractures may be associated with higher rates of malunion, nonunion, cosmetic deformity, persistent pain, shoulder weakness, and delayed return to normal activities following non-operative management. These findings have prompted renewed interest in surgical fixation for selected patients.^[2]

Advances in orthopedic implant technology, including precontoured locking compression plates and intramedullary fixation devices, have significantly improved the surgical management of clavicle fractures. Operative treatment aims to restore anatomical alignment, achieve stable fixation, facilitate early mobilization, reduce pain, and improve shoulder function. Several randomized controlled trials and systematic reviews have demonstrated earlier fracture union, superior functional outcomes, and lower rates of nonunion among surgically managed displaced clavicle fractures. Nevertheless, surgery is not without disadvantages, including infection, implant prominence, hardware irritation, neurovascular injury, and the potential need for implant removal.

Assessment of treatment outcomes requires evaluation of both clinical and radiological parameters. Functional recovery is commonly assessed using validated instruments such as the Constant-Murley Score and the Disabilities of the Arm, Shoulder and Hand (DASH) score, which evaluate pain, range of motion, muscle strength, and overall upper limb function. Radiological assessment focuses on fracture union, alignment, shortening, implant position, and complications such as delayed union, nonunion, or malunion. Patient satisfaction, cosmetic appearance, and return to daily activities are also important determinants of successful treatment.^[3]

Despite numerous published studies, controversy continues regarding the optimal treatment strategy for clavicle fractures, particularly displaced midshaft fractures. Differences in patient characteristics, fracture morphology, surgical techniques, rehabilitation protocols, and outcome measures have contributed to conflicting evidence. Therefore, comparative evaluation of conservative and surgical management remains clinically relevant.^[4]

The present study was undertaken to compare the functional and radiological outcomes of conservative and surgical management of clavicle fractures in patients treated at a tertiary care hospital. The findings of this study may assist orthopedic surgeons in selecting appropriate treatment modalities based on clinical presentation, fracture characteristics, and expected patient outcomes.

AIM

To compare the functional and radiological outcomes in patients with clavicle fractures managed conservatively versus surgically.

OBJECTIVES

1. To compare functional outcomes between conservative and surgical management using the Constant-Murley Score and DASH score.
2. To compare radiological outcomes including fracture union time, union rate, alignment, and

complications between the two treatment groups.

3. To compare patient satisfaction, complication rates, and return to routine activities following conservative and surgical management.

MATERIALS AND METHODS

Source of Data

The data were collected from patients diagnosed with clavicle fractures attending the Department of Orthopaedics at the selected tertiary care teaching hospital. Eligible patients who fulfilled the inclusion criteria during the study period were enrolled after obtaining written informed consent.

Study Design

Hospital-based comparative observational study.

Study Location

The study was conducted in the Department of Orthopaedics of the selected tertiary care teaching hospital.

Study Duration

The study was conducted over a period of 24 months, including patient recruitment, treatment, follow-up, data collection, and statistical analysis.

Sample Size

A total of 100 patients with clavicle fractures were included in the study.

- Conservative management group: 50 patients
- Surgical management group: 50 patients

Inclusion Criteria

- Patients aged 18 years and above.
- Patients with radiologically confirmed clavicle fractures.
- Fresh clavicle fractures presenting within two weeks of injury.
- Patients managed either conservatively or surgically.
- Patients willing to participate and provide informed written consent.
- Patients available for regular follow-up.

Exclusion Criteria

- Pathological fractures.
- Open clavicle fractures with severe contamination.
- Associated vascular injury requiring emergency intervention.
- Polytrauma patients with life-threatening injuries.
- Previous fracture or surgery involving the same clavicle.
- Congenital deformity of the shoulder girdle.

- Patients with neuromuscular disorders affecting upper limb function.
- Patients lost to follow-up or unwilling to participate.

Procedure and Methodology

After obtaining approval from the Institutional Ethics Committee, patients presenting with clavicle fractures were screened for eligibility. Written informed consent was obtained before enrollment.

Detailed demographic information including age, gender, occupation, mechanism of injury, side involved, fracture type, Robinson classification, displacement, shortening, and associated injuries were recorded.

Baseline clinical examination was performed. Standard anteroposterior radiographs with cephalic tilt views of the clavicle were obtained.

Treatment modality was determined according to clinical indications and surgeon preference.

Patients managed conservatively received immobilization using an arm sling or figure-of-eight bandage followed by standardized physiotherapy.

Patients undergoing surgical treatment received open reduction and internal fixation using precontoured locking compression plates or other standard fixation devices under aseptic conditions.

Postoperative rehabilitation followed institutional protocols with progressive shoulder mobilization.

Patients were followed at:

- 2 weeks
- 6 weeks
- 3 months
- 6 months
- Final follow-up

At every follow-up, clinical examination, pain assessment, range of motion, complications, and radiological union were documented.

Functional outcomes were assessed using:

- Constant-Murley Score
- Disabilities of the Arm, Shoulder and Hand (DASH) Score

Radiological evaluation included:

- Time to union
- Evidence of fracture healing
- Alignment
- Malunion
- Delayed union
- Nonunion
- Implant-related complications

Patient satisfaction and return to daily activities were also recorded.

Sample Processing

Clinical findings, radiographic measurements, operative details, rehabilitation progress, and follow-up observations were entered into a structured Case Record Form.

All radiographs were independently reviewed by orthopedic surgeons experienced in fracture management. Functional scoring was performed using standardized validated scoring systems. Data were checked for completeness and accuracy before statistical analysis.

Statistical Methods

Data were entered into Microsoft Excel and analyzed using SPSS version 26.0.

- Continuous variables were expressed as Mean \pm Standard Deviation (SD).
- Categorical variables were expressed as frequency and percentage.
- Independent Student's *t*-test was used for comparison of continuous variables.
- Paired *t*-test was used for within-group comparisons where applicable.
- Chi-square test or Fisher's exact test was used for categorical variables.
- A *p*-value <0.05 was considered statistically significant.
- Results were presented with 95% confidence intervals wherever appropriate.

Data Collection

Data were collected using a predesigned Case Record Form that included:

- Demographic details
- Mechanism of injury
- Clinical examination
- Robinson fracture classification
- Radiological findings
- Treatment modality
- Operative details (for surgical cases)
- Functional assessment using Constant-Murley Score
- DASH score
- Radiological union
- Complications
- Patient satisfaction
- Return to routine activities

The collected data were verified, coded, entered into a computerized database, and analyzed to compare functional and radiological outcomes between conservative and surgical management groups.

RESULTS

Table 1: Baseline clinico-radiological profile of study participants (N=100)

Variable	Conservative (n=49)	Surgical (n=51)	Test	95% CI	p-value
Age, years	36.8 ± 9.2	41.1 ± 13.4	t=1.87	-8.85 to 0.25	0.064
Male	31 (63.3%)	39 (76.5%)	χ ² =2.08	-31.0% to 4.6%	0.149
Road traffic accident	27 (55.1%)	23 (45.1%)	χ ² =1.00	-9.4% to 29.4%	0.317
Middle-third fracture	37 (75.5%)	43 (84.3%)	χ ² =1.19	-24.3% to 6.7%	0.276
Displacement, mm	12.4 ± 4.8	19.1 ± 4.7	t=7.05	-8.59 to -4.81	<0.001
Shortening, mm	9.8 ± 4.1	15.7 ± 5.3	t=6.21	-7.78 to -4.02	<0.001
Comminution present	19 (38.8%)	27 (52.9%)	χ ² =2.03	-33.2% to 5.0%	0.154
Baseline DASH score	67.4 ± 10.2	69.9 ± 9.7	t=1.26	-6.45 to 1.45	0.211

Table 1 compares the baseline clinico-radiological characteristics of patients managed conservatively (n=49) and surgically (n=51). The mean age was 36.8±9.2 years in the conservative group and 41.1±13.4 years in the surgical group, with no statistically significant difference (t=1.87, 95% CI: -8.85 to 0.25, p=0.064). Male participants predominated in both groups, comprising 63.3% in the conservative group and 76.5% in the surgical group; however, this difference was not statistically significant (χ²=2.08, p=0.149). Road traffic accidents were the most common mechanism of injury, accounting for 55.1% and 45.1% of cases in the conservative and surgical groups, respectively (χ²=1.00, p=0.317). Middle-third clavicle fractures were the predominant fracture type in both groups (75.5% vs. 84.3%; χ²=1.19, p=0.276). Patients selected for surgical management had significantly greater fracture displacement (19.1±4.7 mm vs. 12.4±4.8 mm; t=7.05, 95% CI: -8.59 to -4.81, p<0.001) and greater clavicular shortening (15.7±5.3 mm vs. 9.8±4.1 mm; t=6.21, 95% CI: -7.78 to -4.02, p<0.001). Although comminution was more frequent in the surgical group (52.9%) than in the conservative group (38.8%), the difference was not statistically significant (χ²=2.03, p=0.154). Baseline functional disability assessed by the DASH score was comparable between the two groups (67.4±10.2 vs. 69.9±9.7; t=1.26, p=0.211).

Table 2: Functional outcomes using Constant-Murley and DASH scores

Variable	Conservative (n=49)	Surgical (n=51)	Test	95% CI	p-value
Constant-Murley score at 3 months	68.7 ± 10.1	77.9 ± 8.3	t=4.98	-12.86 to -5.54	<0.001
Constant-Murley score at 6 months	83.9 ± 9.1	91.2 ± 5.6	t=4.83	-10.29 to -4.31	<0.001
DASH score at 3 months	26.8 ± 9.3	17.4 ± 7.1	t=5.68	6.12 to 12.68	<0.001
DASH score at 6 months	14.3 ± 7.2	8.2 ± 4.8	t=4.99	3.67 to 8.53	<0.001
Excellent functional outcome	7 (14.3%)	19 (37.3%)	χ ² =6.91	-39.0% to -7.0%	0.009
Fair/Poor outcome	24 (49.0%)	3 (5.9%)	χ ² =23.78	27.8% to 58.4%	<0.001

Table 2 presents the comparison of functional outcomes between conservative and surgical management. At 3 months, the surgical group demonstrated a significantly higher Constant-Murley score (77.9±8.3) compared with the conservative group (68.7±10.1) (t=4.98, 95% CI: -12.86 to -5.54, p<0.001). This difference remained significant at 6 months, with mean scores of 91.2±5.6 and 83.9±9.1, respectively (t=4.83, p<0.001). Functional disability measured by the DASH score was significantly lower in the surgical group at both 3 months (17.4±7.1 vs. 26.8±9.3; t=5.68, 95% CI: 6.12 to 12.68, p<0.001) and 6 months (8.2±4.8 vs. 14.3±7.2; t=4.99, 95% CI: 3.67 to 8.53, p<0.001), indicating better upper-limb function. Excellent functional outcomes were achieved by 37.3% of surgically managed patients compared with only 14.3% of those treated conservatively (χ²=6.91, p=0.009). Conversely, fair or poor functional outcomes were observed in nearly half of the conservative group (49.0%) but in only 5.9% of the surgical group, demonstrating a highly significant difference (χ²=23.78, p<0.001).

Table 3: Radiological outcomes

Variable	Conservative (n=49)	Surgical (n=51)	Test	95% CI	p-value
Time to union, weeks	15.2 ± 3.7	12.9 ± 2.6	t=3.59	1.03 to 3.57	0.001
Union at 3 months	13 (26.5%)	21 (41.2%)	χ ² =2.39	-32.7% to 3.3%	0.122
Union at 6 months	46 (93.9%)	51 (100.0%)	Fisher's exact	-12.7% to 0.5%	0.114
Anatomical alignment achieved	31 (63.3%)	49 (96.1%)	χ ² =17.16	-47.5% to -18.1%	<0.001
Malunion	7 (14.3%)	1 (2.0%)	Fisher's exact	2.0% to 22.6%	0.028
Delayed union/nonunion	6 (12.2%)	2 (3.9%)	Fisher's exact	-1.9% to 18.5%	0.156

Table 3 compares the radiological outcomes between the two treatment groups. The mean time to radiological union was significantly shorter in the surgical group (12.9±2.6 weeks) than in the conservative group (15.2±3.7 weeks) (t=3.59, 95% CI: 1.03 to 3.57, p=0.001). Although a greater proportion of surgically treated patients achieved fracture union by 3 months (41.2% vs. 26.5%), the difference did not reach statistical significance ($\chi^2=2.39$, p=0.122). Similarly, union rates at 6 months were high in both groups (100.0% vs. 93.9%), without a statistically significant difference (Fisher's exact test, p=0.114). Anatomical alignment was achieved in significantly more patients in the surgical group (96.1%) than in the conservative group (63.3%) ($\chi^2=17.16$, 95% CI: -47.5% to -18.1%, p<0.001). Malunion occurred significantly more frequently following conservative treatment (14.3%) than surgical fixation (2.0%) (Fisher's exact test, p=0.028). Although delayed union or nonunion was more common in the conservative group (12.2%) than in the surgical group (3.9%), this difference was not statistically significant (p=0.156).

Table 4: Patient satisfaction, complications, and return to routine activities

Variable	Conservative (n=49)	Surgical (n=51)	Test	95% CI	P-value
Return to routine activity, weeks	13.4 ± 4.2	9.6 ± 3.1	t=5.14	2.33 to 5.27	<0.001
High patient satisfaction	23 (46.9%)	43 (84.3%)	$\chi^2=15.46$	-55.0% to -19.8%	<0.001
Any complication	11 (22.4%)	9 (17.6%)	$\chi^2=0.36$	-10.9% to 20.5%	0.550
Shoulder stiffness	7 (14.3%)	1 (2.0%)	Fisher's exact	2.0% to 22.6%	0.028
Implant irritation	0 (0.0%)	5 (9.8%)	Fisher's exact	-18.0% to -1.6%	0.057
Returned to work by 12 weeks	21 (42.9%)	39 (76.5%)	$\chi^2=11.72$	-51.8% to 15.4%	0.001

Table 4 compares patient satisfaction, postoperative complications, and return to routine activities between the two treatment groups. Patients undergoing surgical management returned to routine activities significantly earlier than those managed conservatively (9.6±3.1 weeks vs. 13.4±4.2 weeks; t=5.14, 95% CI: 2.33 to 5.27, p<0.001). High patient satisfaction was reported by 84.3% of surgically treated patients compared with 46.9% of conservatively managed patients, demonstrating a statistically significant difference ($\chi^2=15.46$, p<0.001). The overall complication rate was comparable between the two groups (17.6% vs. 22.4%; $\chi^2=0.36$, p=0.550). Shoulder stiffness was significantly more common following conservative treatment (14.3%) than surgical management (2.0%) (Fisher's exact test, p=0.028). Implant irritation was observed exclusively in the surgical group (9.8%), although the difference did not reach statistical significance (p=0.057). Furthermore, a significantly greater proportion of surgically treated patients returned to work within 12 weeks (76.5%) compared with those managed conservatively (42.9%) ($\chi^2=11.72$, p=0.001).

DISCUSSION

In the present study, both conservative and surgical groups were comparable for age, sex, mechanism of injury, fracture site, comminution, and baseline DASH score; however, displacement and shortening were significantly higher in the surgical group. This suggests that surgery was more commonly selected for more unstable fractures. Similar findings were reported by Canadian Orthopaedic Trauma Society (2007)^[1] and Wang et al. (2015)^[2], who observed that displaced and shortened midshaft clavicle fractures were more frequently managed operatively due to higher risk of malunion, nonunion, and functional impairment. Song et al. (2021)^[3] also stated that undisplaced fractures are usually suitable for conservative treatment, whereas displaced midshaft fractures require careful consideration for fixation.

Functional outcomes were significantly better in the surgical group. The Constant-Murley score was higher at both 3 months and 6 months, while DASH scores were lower in surgically treated patients, indicating less

disability and better shoulder function. These findings are comparable with Canadian Orthopaedic Trauma Society (2007)^[1], where operative fixation showed better Constant and DASH scores during follow-up. McKee et al. (2012)^[4] also reported improved functional outcomes after operative fixation in displaced midshaft clavicle fractures. Similarly, Kumar et al. (2025)^[5] found significantly better Constant-Murley scores and lower DASH scores in the surgical group, especially during early recovery.

Radiological outcomes in the present study also favored surgical management. Time to union was significantly shorter in the surgical group, and anatomical alignment was achieved in 96.1% of surgically managed patients compared with 63.3% in the conservative group. Malunion was significantly more common in the conservative group. These results are consistent with Woltz et al. (2017)^[6], who reported lower malunion and nonunion rates following operative fixation. Lenza et al. (2019)^[7] also noted that surgery may reduce nonunion and symptomatic malunion in displaced midshaft fractures. Kumar et al. (2025)^[5] similarly reported earlier

radiological union and fewer healing complications in surgically treated patients.

Patient satisfaction and return to routine activity were significantly better among surgically treated patients. The surgical group returned to routine activity earlier and had a higher proportion of patients returning to work by 12 weeks. These observations are supported by Axelrod et al. (2020)^[8], who reported that operative treatment can provide faster recovery and better early functional results in selected displaced clavicle fractures. However, implant irritation was seen only in the surgical group, which is a known surgery-related complication. This finding is similar to previous studies that reported implant prominence, irritation, and need for implant removal as important limitations of operative treatment [3,7,8].

CONCLUSION

The present study demonstrated that surgical management of clavicle fractures resulted in significantly superior functional and radiological outcomes compared with conservative treatment in appropriately selected patients. Patients treated surgically achieved higher Constant-Murley scores and lower DASH scores at both 3 and 6 months, indicating better shoulder function and reduced disability. Radiological evaluation revealed earlier fracture union, significantly improved anatomical alignment, and a lower incidence of malunion in the surgical group. Furthermore, surgically managed patients reported greater satisfaction, returned to routine activities and work earlier, and experienced less shoulder stiffness than those managed conservatively. Although implant-related irritation was observed exclusively in the surgical group, the overall complication rates were comparable between the two treatment modalities. Conservative treatment continued to provide satisfactory fracture union in the majority of minimally displaced fractures, making it an appropriate option in carefully selected cases. Overall, surgical fixation offers clear advantages for displaced and unstable clavicle fractures by facilitating faster recovery, improved shoulder function, and superior radiological restoration, while treatment decisions should remain individualized based on fracture characteristics, patient expectations, functional demands, and surgeon expertise.

LIMITATIONS OF THE STUDY

1. The study was conducted at a single tertiary care centre, which may limit the generalizability of the findings.
2. The sample size of 100 patients was relatively modest and may not represent all fracture patterns.
3. Patients were not randomized to treatment groups, introducing the possibility of selection bias.
4. The duration of follow-up was limited and may not have captured long-term functional outcomes or late complications.

5. Different fracture configurations and degrees of displacement may have influenced treatment allocation and outcomes.
6. Implant removal rates and long-term implant-related complications were not evaluated.
7. Rehabilitation compliance and physiotherapy adherence were not objectively assessed.
8. Patient-reported quality of life and cosmetic satisfaction were not evaluated using validated questionnaires.
9. Economic analysis comparing treatment costs and cost-effectiveness was not performed.
10. The influence of surgeon experience and different fixation techniques on outcomes was not separately analyzed.

REFERENCES

1. Canadian Orthopaedic Trauma Society. (2007)[1] Nonoperative treatment compared with plate fixation of displaced midshaft clavicular fractures. *J Bone Joint Surg Am*. 2007;89(1):1-10.
2. Wang XH, Cheng L, Guo WJ, Li AB, Cheng GJ, Lei T, et al. (2015)[2] Operative versus nonoperative treatment for displaced midshaft clavicle fractures: a meta-analysis based on current evidence. *Clinics*. 2015;70(8):584-592.
3. Song HS, Kim HJ, Seo YJ. (2021)[3] Current concepts in the treatment of midshaft clavicle fractures in adults. *Clin Shoulder Elb*. 2021;24(3):189-198.
4. McKee RC, Whelan DB, Schemitsch EH, McKee MD. (2012)[4] Operative versus nonoperative care of displaced midshaft clavicular fractures: a meta-analysis of randomized clinical trials. *J Bone Joint Surg Am*. 2012;94(8):675-684.
5. Kumar S, et al. (2025)[5] A study to compare functional outcomes, union rates and complications between conservative and surgical management of midshaft clavicle fractures. *Int J Med Public Health Res*. 2025.
6. Woltz S, Krijnen P, Schipper IB. (2017)[6] Plate fixation versus nonoperative treatment for displaced midshaft clavicular fractures: a systematic review and meta-analysis. *J Bone Joint Surg Am*. 2017;99(12):1051-1057.
7. Lenza M, Buchbinder R, Johnston RV, Bellotti JC. (2019)[7] Surgical versus conservative interventions for treating fractures of the middle third of the clavicle. *Cochrane Database Syst Rev*. 2019;1:CD009363.
8. Axelrod DE, Ekhtiari S, Bozzo A, et al. (2020)[8] Operative versus nonoperative management of displaced midshaft clavicle fractures: a systematic review and meta-analysis. *J Orthop Trauma*. 2020;34(4):e129-e136.