

Comparative Study of Functional Outcome Of Displaced Midshaft Clavicle Fracture, Managed by Conservative v/s Operative Procedures**Ramniwas Bhadu¹, B.L. Khajotia², Sanjay Tanwar³, Ajay Kumar Bokolia⁴, Mukesh Kumar Saini⁵**^{1,4,5}Resident Doctor, Department of Orthopaedics, and Physical and Medical Rehabilitation, Sardar Patel Medical College, Bikaner²Director Trauma Centre, Senior Professor and Hod, Department of Orthopaedics, and Physical and Medical Rehabilitation, Sardar Patel Medical College, Bikaner³Assistant Professor, Department of Orthopaedics, and Physical and Medical Rehabilitation, Sardar Patel Medical College, Bikaner

Received: 20-08-2025 / Revised: 19-09-2025 / Accepted: 20-10-2025

Corresponding Author: Ramniwas Bhadu

Conflict of interest: Nil

Abstract:**Background:** Midshaft clavicle fractures, accounting for a significant portion of shoulder girdle injuries, are common in young adults due to high-energy trauma. Traditionally managed non-operatively, recent evidence favors surgical intervention for displaced fractures. However, comparative data from low-resource settings like India remain limited.**Aim:** To compare the functional outcomes of displaced midshaft clavicle fractures managed by conservative and operative treatments using Constant Murley Score.**Materials and Methods:**

A hospital-based longitudinal, record-based comparative study was conducted at Sardar Patel Medical College, Bikaner, from March 2024 to February 2025. Sixty patients aged 18–60 years with displaced midshaft clavicle fractures were enrolled and randomized into two groups:

- **Group A (Conservative):** Treated with figure-of-eight bandage or arm sling.
- **Group B (Operative):** Treated with plating or intramedullary fixation (TENS). Functional assessment was done using the Constant Murley Score at 6 months. Radiological union, complications, and ability to return to work were also assessed.

Results: The mean age was 33.43 years (Group A) vs 32.30 years (Group B).

- Functional outcomes were significantly better in the operative group ($p = 0.035$):
 - Good-to-excellent outcomes: 83.33% (Group B) vs 50% (Group A)
- Radiological healing favored surgery (Stage 3 union in 66.67% of Group B vs 33.33% of Group A, $p = 0.036$).
- Complications:
 - Group A: Nonunion (6.67%), angulation (13.33%), shoulder stiffness (20%)
 - Group B: Infection (3.33%), reoperation (3.33%)
- Work return was comparable, though slightly delayed in Group B.

Conclusion: Operative management offers superior functional outcomes, faster union, and fewer complications in displaced midshaft clavicle fractures compared to conservative treatment. However, surgical risks and cost must be considered. Treatment should be individualized based on patient profile, activity level, and fracture characteristics.**Keywords:** Midshaft Clavicle Fracture, Conservative Treatment, Surgical Fixation, Constant Murley Score, Functional Outcome, Intramedullary Nailing, Plating.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

The clavicle, or collarbone, is among the most commonly fractured bones, accounting for 2.6–4% of all fractures and 35–45% of shoulder girdle injuries. Its unique S-shape, subcutaneous position, and narrow midshaft make it particularly susceptible to trauma, especially in the middle third, which is the

most frequent fracture site. [1-2] Functionally, it acts as a strut between the sternum and scapula, facilitating shoulder mobility and transmitting mechanical forces to the axial skeleton while protecting underlying neurovascular structures.[3]

Midshaft clavicle fractures have traditionally been managed non-operatively, using arm slings or figure-of-eight bandages. This approach is effective for undisplaced or minimally displaced fractures, offering high union rates (90–95%) and satisfactory outcomes. [4-5] However, displaced fractures treated conservatively present risks such as nonunion (10–15%), malunion, cosmetic deformities, chronic pain, and reduced shoulder function.[6]

In recent years, surgical intervention has gained favor for displaced fractures. Techniques like plate fixation (using dynamic compression or pre-contoured locking plates) and intramedullary devices (TENS, Rush or Knowles pins) aim to restore anatomical alignment and allow early mobilization. [7-8] Studies suggest that operative management results in lower rates of nonunion and symptomatic malunion, faster recovery, and improved early functional outcomes. Yet, surgical risks—including infection, neurovascular injury, and hardware failure—remain concerns.[9]

The choice between conservative and operative treatment remains debated. While surgery offers anatomical and functional benefits in displaced cases, it entails higher costs and risks. Conversely, non-operative treatment is cost-effective but may compromise long-term outcomes in certain patients. [10-12] Factors such as age, activity level, and cosmetic preference often guide treatment decisions.[13]

Need for the Study: Despite numerous global studies, data specific to low-resource settings like India is scarce. With limited local evidence and high-cost sensitivity, comparative studies evaluating both treatment modalities in the same population are needed to guide clinical decisions effectively.

Aim and Objectives: The aim of this study is to compare the functional outcomes of displaced midshaft clavicle fractures managed through conservative versus operative treatment approaches. The primary objective is to assess functional recovery using both clinical and radiological evaluations based on the Constant-Murley scoring system. Additionally, the study aims to evaluate and compare the range of motion in patients treated

conservatively and surgically, again using the Constant-Murley score as a standardized tool. A further objective is to identify and analyze the complications associated with each treatment modality, providing a comprehensive comparison of their respective risks and benefits.

Materials and Methods

This hospital-based longitudinal, record-based comparative study was conducted in the Department of Orthopedics, Sardar Patel Medical College, Bikaner, from March 2024 to February 2025. The study included 60 patients aged 18–60 years with simple, displaced midshaft clavicle fractures without neurovascular injury. Patients with pathological or compound fractures, hemiparesis, or those unwilling for surgery were excluded. Participants were randomly assigned to two groups: 30 received conservative management, and 30 underwent surgical treatment.

Surgical techniques included clavicle plating and titanium elastic nailing (TENS), performed under general anesthesia in a beach chair position. Clavicle plate fixation involved open reduction and internal fixation with anatomically contoured locking compression plates. In TENS, a small medial incision allowed insertion of a pre-bent titanium nail into the medullary canal, with closed or open reduction as needed under fluoroscopic guidance.

Conservative treatment used a figure-of-eight bandage worn for 6–9 weeks, with weekly tightening and monitoring. Functional outcomes were assessed using the Constant-Murley Score, which evaluates pain, daily activity, range of motion, and strength. Radiographic assessments included measurements of clavicle length and displacement, as well as fracture union status.

Follow-up assessments were performed at 15 days, 3 months, and 6 months. Statistical analysis involved descriptive measures, Student's t-test, and Chi-square test, with significance set at $p < 0.05$. Data analysis was conducted using Primer version 6. Final assessments focused on functional outcomes and complications such as non-union, nerve injury, or joint stiffness.

Observations and Results

Table 1: Demographic Profile of Patients

Category	Group A (Conservative)	Group B (Operative)	P-Value
Mean Age	33.43 ± 11.43	32.30 ± 9.61	0.680
Male (%)	90%	86.67%	1.000
Female (%)	10%	13.33%	-
Urban (%)	63.33%	56.67%	0.792
Rural (%)	36.67%	43.33%	-

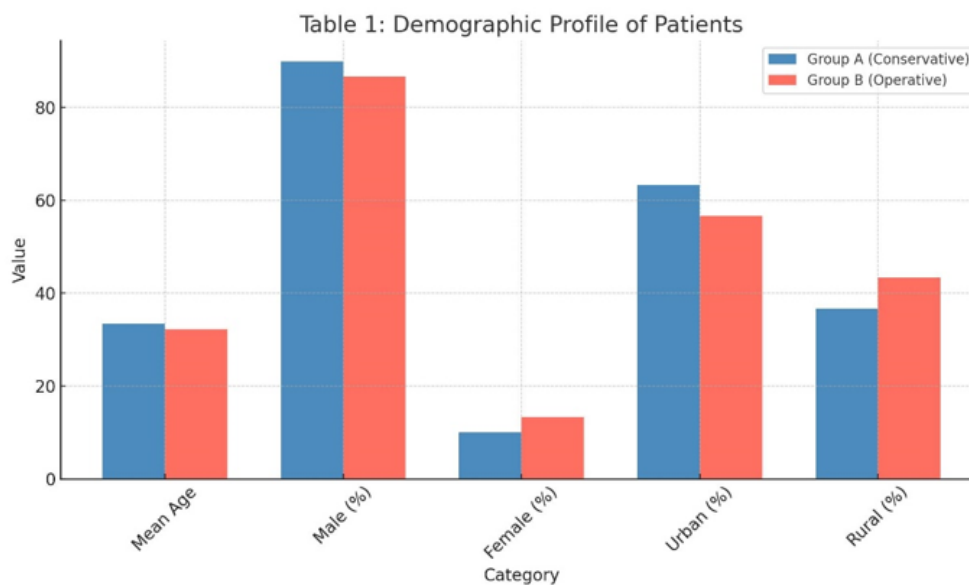


Table 2: Conservative Treatment Methods Used

Treatment Type	Group A (%)	Group B (%)	P-Value
Brace	90.00%	76.67%	0.299
Immobilization	10.00%	23.33%	-

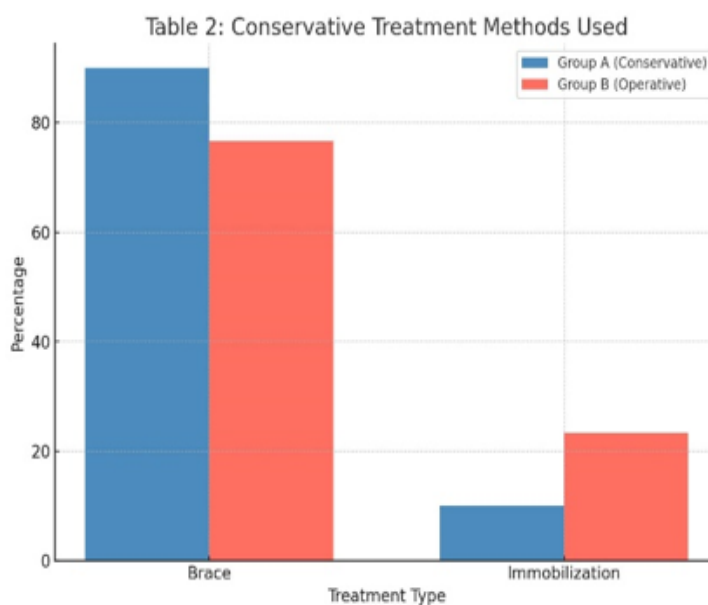
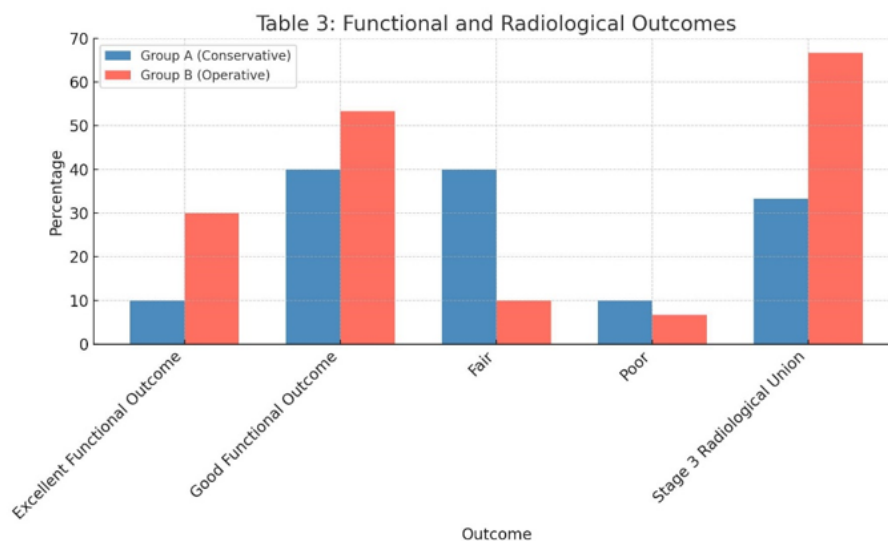
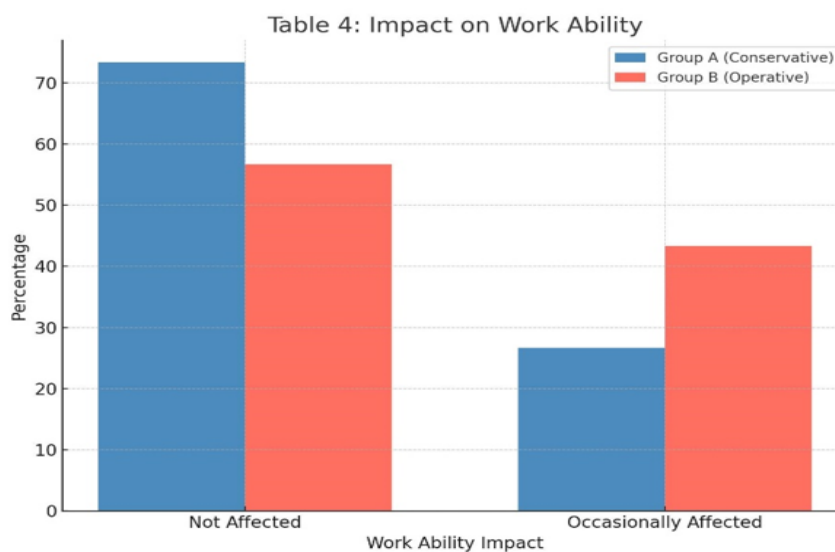


Table 3: Functional and Radiological Outcomes

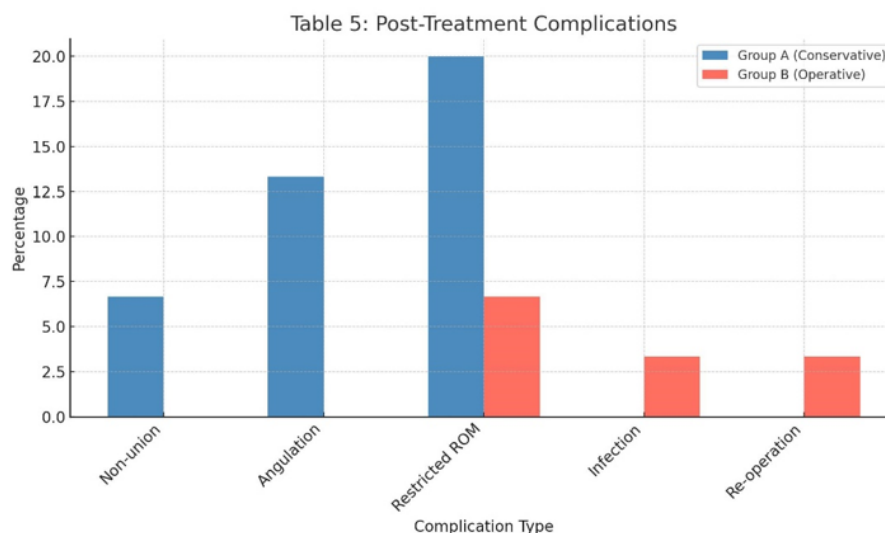
Outcome	Group A	Group B	P-Value
Excellent Functional Outcome	10.00%	30.00%	0.035
Good Functional Outcome	40.00%	53.33%	-
Fair	40.00%	10.00%	-
Poor	10.00%	6.67%	-
Stage 3 Radiological Union	33.33%	66.67%	0.036

**Table 4: Impact on Work Ability**

Work Ability	Group A (%)	Group B (%)	P-Value
Not Affected	73.33%	56.67%	0.279
Occasionally Affected	26.67%	43.33%	-

**Table 5: Post-Treatment Complications**

Complication	Group A (%)	Group B (%)
Non-union	6.67%	0.00%
Angulation	13.33%	0.00%
Restricted ROM	20.00%	6.67%
Infection	0.00%	3.33%
Re-operation	0.00%	3.33%



This comparative study included 60 patients with displaced midshaft clavicle fractures, divided equally into two groups: conservative (Group A) and operative (Group B). The mean age was similar between the groups—33.43 years in Group A and 32.30 years in Group B—with the majority aged 18–30 years. There was no statistically significant difference in age, gender (predominantly male), or urban–rural distribution between the groups.

Conservative treatment primarily involved brace use (90%), whereas in the operative group, 76.67% used braces postoperatively. No significant difference was observed in the type of immobilization used ($p = 0.299$).

In terms of return to work, 73.33% of conservative patients and 56.67% of operative patients reported no difficulty, but the difference was not statistically significant ($p = 0.279$). However, radiological outcomes showed a clear advantage for the operative group, with 66.67% achieving Stage 3 healing compared to only 33.33% in the conservative group ($p = 0.036$).

Functional outcome based on the Constant Murley Score was significantly better in the operative group ($p = 0.035$). In Group B, 83.33% had good to excellent outcomes, compared to 50% in Group A.

Complication rates were higher in the conservative group, including non-union (6.67%), angulation (13.33%), and restricted shoulder motion (20%). In contrast, the operative group experienced fewer complications, limited to minor infection (3.33%) and re-operation (3.33%). Notably, non-union and malalignment were absent in surgically managed patients.

Overall, the study found that operative treatment provided superior radiological healing, better functional outcomes, and fewer complications

compared to conservative management for displaced midshaft clavicle fractures.

Discussion

Clavicle fractures account for 2.6–4% of adult fractures, with nearly 75% involving the midshaft, commonly affecting young males through high-energy trauma. Females show a bimodal distribution. Most fractures heal through the standard bone healing process, with conservative treatment being effective in undisplaced cases. However, displaced fractures treated non-operatively show increased risks of nonunion, malunion, and functional limitations. In contrast, operative fixation with plates or intramedullary devices can restore alignment, promote faster recovery, and improve outcomes—though not without risks like infection or implant-related issues.

In our study, the majority of patients were young males, consistent with global trends. No significant differences were noted in age or gender between groups. Urban patients slightly outnumbered rural ones, reflecting better access to surgical care. Bracing was more commonly used than rigid immobilization, aligning with literature supporting patient comfort and early mobilization.

Although work return was marginally better in the conservative group, operative patients showed significantly faster and more complete radiological healing ($p = 0.036$) and superior functional outcomes (83.33% good-to-excellent vs. 50%, $p = 0.035$). These findings are consistent with previous studies that reported better Constant-Murley scores and earlier union in surgically treated patients.

Complications like nonunion and restricted motion were more frequent in the conservative group, while infections and implant-related issues were limited to the operative group. Overall, operative treatment

provided superior healing and function but required careful risk-benefit consideration, especially in resource-limited settings. Hence, individualized treatment based on patient needs, fracture pattern, and access to surgical care remains essential.

Conclusion:

This study demonstrates that while conservative treatment remains effective for undisplaced clavicle fractures, displaced midshaft fractures achieve better outcomes with surgical management. Operative fixation resulted in faster radiological union, higher rates of good-to-excellent functional recovery, and fewer complications such as nonunion and malunion. Conservative treatment, though simple and cost-effective, was associated with higher rates of angulation, nonunion, and shoulder stiffness.

Therefore, operative management with plating or intramedullary fixation is superior in displaced midshaft clavicle fractures, particularly in young, active individuals, as it restores alignment, ensures reliable union, and allows early return to function. Conservative treatment may still be suitable for minimally displaced fractures or in patients with contraindications for surgery. Ultimately, treatment decisions should be individualized, balancing fracture pattern, patient activity level, cosmetic concerns, and surgical risks.

Bibliography

1. Postacchini F, Gumina S, De Santis P, Albo F. Epidemiology of clavicle fractures. *J Shoulder Elbow Surg.* 2002;11(5):452–6.
2. Robinson CM. Fractures of the clavicle in the adult. Epidemiology and classification. *J Bone Joint Surg Br.* 1998;80(3):476–84.
3. Neer CS. Nonunion of the clavicle. *J Am Med Assoc.* 1960;172(10):1006–11.
4. Mosley HF. The clavicle: its anatomy and function. *Clin Orthop Relat Res.* 1968; 58:17–23.
5. Rowe CR. An atlas of anatomy and treatment of midclavicular fractures. *Clin Orthop Relat Res.* 1968; 58:29–42.
6. Zlowodzki M, Zelle BA, Cole PA, Jeray K, McKee MD. Treatment of acute midshaft clavicle fractures: systematic review of 2144 fractures. *J Orthop Trauma.* 2005;19(7):504–7.
7. Hill JM, McGuire MH, Crosby LA. Closed treatment of displaced middle-third fractures of the clavicle gives poor results. *J Bone Joint Surg Br.* 1997;79(4):537–9.
8. McKee RC, Whelan DB, Schemitsch EH, McKee MD. Operative versus nonoperative care of displaced midshaft clavicular fractures: a meta-analysis of randomized clinical trials. *J Bone Joint Surg Am.* 2012;94(8):675–84.
9. Canadian Orthopaedic Trauma Society. 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.
10. Robinson CM, Court-Brown CM, McQueen MM, Wakefield AE. Estimating the risk of nonunion following nonoperative treatment of a clavicular fracture. *J Bone Joint Surg Am.* 2004;86(7):1359–65.
11. Smekal V, Irenberger A, Struve P, Wambacher M, Krappinger D, Kralinger FS. Elastic stable intramedullary nailing versus nonoperative treatment of displaced midshaft clavicular fractures—a randomized, controlled, clinical trial. *J Orthop Trauma.* 2009;23(2):106–12.
12. Ferran NA, Hodgson P, Vannet N, Williams R, Evans RO. Locked intramedullary fixation vs plating for displaced and shortened mid-shaft clavicle fractures: a randomized clinical trial. *J Shoulder Elbow Surg.* 2010;19(6):783–9.
13. Altamimi SA, McKee MD; Canadian Orthopaedic Trauma Society. Nonoperative treatment compared with plate fixation of displaced midshaft clavicular fractures. Surgical technique. *J Bone Joint Surg Am.* 2008;90 Suppl 2 Pt 1:1–8.