



CONSERVATIVE VS SURGICAL MANAGEMENT OF CLAVICLE FRACTURES: A COMPARATIVE STUDY OF FUNCTIONAL OUTCOMES

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ABSTRACT

Background: Clavicle fractures are among the most common orthopaedic injuries, accounting for a significant proportion of shoulder girdle trauma. The majority occur in the midshaft region due to its anatomical and biomechanical vulnerability. Traditionally, conservative management has been the standard approach, offering satisfactory union rates and acceptable functional outcomes. However, recent evidence suggests that surgical intervention may provide superior results in selected cases, particularly in displaced fractures. The optimal management strategy remains controversial, with ongoing debate regarding functional outcomes, complication rates, and patient satisfaction.

Materials and Methods: This prospective comparative study was conducted at Government Dindigul Medical College Hospital over a period of two years, from January 2024 to January 2026. A total of 120 patients with clavicle fractures were included after applying inclusion and exclusion criteria. Patients were divided into two groups: conservative management (n=60) and surgical management (n=60). Conservative treatment involved immobilization with an arm sling, while surgical management consisted of open reduction and internal fixation using plate fixation. Functional outcomes were assessed using the Constant-Murley Score and DASH score at regular follow-up intervals of 6 weeks, 3 months, and 6 months. Time to union and complications were also recorded and analyzed statistically.

Results: The surgical group demonstrated significantly better functional outcomes, with higher mean Constant-Murley scores and lower DASH scores compared to the conservative group. Time to fracture union was shorter in surgically treated patients. The conservative group showed higher rates of nonunion and malunion, whereas the surgical group had implant-related complications such as infection and hardware irritation.

Conclusion: Surgical management of displaced clavicle fractures provides superior functional outcomes and faster recovery compared to conservative treatment. However, conservative management remains effective for minimally displaced fractures. Treatment decisions should be individualized based on fracture characteristics and patient-specific factors. Further large-scale studies are required to validate these findings.

INTRODUCTION

Approximately 2.6–5% of all fractures and nearly 35–45% of shoulder girdle injuries are clavicle fractures, making them one of the most common

injuries in orthopaedic practice. The midshaft region, which is the thinnest and most biomechanically fragile part of the clavicle, is where the majority of these fractures occur. These injuries commonly occur due to direct trauma, road traffic accidents, or sports.^{1,2}

By serving as a strut between the sternum and scapula, the clavicle is essential for preserving shoulder stability and enabling upper limb movement. In order to recover normal function and



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avoid long-term problems, clavicle fractures must be managed optimally.³

Clavicle fractures have historically been treated conservatively using techniques such as figure-of-eight bandaging or arm sling immobilization. This approach has gained widespread acceptance due to historically high union rates and satisfactory functional outcomes. Conservative management is particularly preferred in minimally displaced fractures, as the risk of complications is lower. However, recent studies have challenged this traditional approach, particularly in cases of displaced midshaft fractures.⁴

Current research shows that nonoperative treatment of displaced clavicle fractures is linked to increased rates of nonunion, malunion, and lasting functional impairments. Malunion can change shoulder mechanics and cause chronic pain, cosmetic deformity, and decreased endurance. It frequently results in clavicular shortening. Due to these concerns, surgical intervention is becoming more popular as a way to achieve anatomical reduction and improve outcomes.⁵

The safety and effectiveness of operative management have greatly increased thanks to advancements in surgical procedures, such as open reduction and internal fixation using plates and intramedullary implants. Accurate clavicular length and alignment restoration, early mobilization, and a quicker return to daily activities and employment are all made possible by surgical fixation. But there are dangers associated with surgery, including infection, hardware irritation, neurovascular damage, and the possibility of implant removal.^{6,7}

Given these considerations, there is a need for comparative evaluation of conservative and surgical management strategies, particularly with respect to functional outcomes and complication profiles. The present study aims to compare functional outcomes, time to union, and complications between conservative and surgical management of clavicle fractures.⁸

MATERIALS AND METHODS

Study Design and Setting

This prospective comparative study was conducted in the Department of Orthopaedics at Government Dindigul Medical College Hospital over a period of two years, from January 2024 to January 2026. The study was designed to evaluate and compare the functional outcomes of conservative versus surgical management in patients presenting with clavicle fractures. Institutional ethical committee approval was obtained prior to the commencement of the study, and all procedures were conducted in accordance with standard ethical guidelines.

Study Population

A total of 130 patients presenting with clavicle fractures during the study period were initially assessed for eligibility. Consecutive sampling was

used to include eligible patients. After applying predefined inclusion and exclusion criteria, 10 patients were excluded due to incomplete clinical data, associated severe injuries, or loss to follow-up. The remaining 120 patients were included in the final analysis.

Patients were divided into two groups based on the modality of treatment:

- Conservative management group (n = 60)
- Surgical management group (n = 60)

The allocation to treatment groups was based on fracture characteristics, degree of displacement, patient preference, and surgeon's clinical judgment.

Sample Size

The final sample size of 120 patients was considered adequate to assess differences in functional outcomes between the two groups. Equal distribution between conservative and surgical groups ensured comparability and improved statistical reliability.

Inclusion Criteria

- Patients aged between 18 and 60 years
- Acute clavicle fractures (predominantly midshaft fractures)
- Both displaced and non-displaced fractures
- Patients presenting within one week of injury
- Patients willing to participate and provide written informed consent

Exclusion Criteria

- Open clavicle fractures
- Pathological fractures
- Associated neurovascular injury
- Polytrauma patients requiring intensive management
- Previous clavicle fracture or surgery on the same side
- Patients with incomplete records or those lost to follow-up

Clinical Assessment and Classification

All patients underwent detailed clinical evaluation at presentation, including history of injury, mechanism of trauma, and physical examination. Radiological assessment was performed using standard anteroposterior radiographs of the clavicle. Fractures were classified based on anatomical location and degree of displacement, with particular emphasis on midshaft fractures.

Treatment Protocol

Conservative Management

Patients in the conservative group were treated with arm sling immobilization. Analgesics were prescribed for pain management. Patients were advised to restrict shoulder movements initially, followed by gradual mobilization after 2–3 weeks depending on pain tolerance. Physiotherapy was initiated in a phased manner to restore range of motion and strength.

Surgical Management

Patients in the surgical group underwent open reduction and internal fixation using plate fixation under appropriate anaesthesia. Standard surgical techniques were followed to achieve anatomical reduction and stable fixation. Postoperative care included immobilization for a short duration followed by early mobilization and supervised physiotherapy.

Data Collection

Data were collected prospectively using a structured proforma. Variables recorded included demographic details (age, gender), mechanism of injury, fracture characteristics, treatment modality, and duration of hospital stay. Intraoperative details and postoperative complications were documented in the surgical group.

Outcome Measures

Functional outcomes were assessed using validated scoring systems:

- **Constant-Murley Score** for shoulder function
- **DASH (Disabilities of Arm, Shoulder, and Hand) Score** for disability assessment

Radiological union was assessed using follow-up radiographs, and time to union was recorded. Complications such as nonunion, malunion, infection, and implant-related issues were also noted.

Follow-up and Outcome Assessment

All patients were followed up at regular intervals of:

- 6 weeks
- 3 months
- 6 months

During each follow-up visit, clinical and functional assessments were performed. Range of motion, pain levels, and return to daily activities were evaluated.

Radiological evaluation was carried out to assess fracture healing.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee of Government Dindigul Medical College Hospital prior to the commencement of the study. All procedures were conducted in accordance with standard ethical guidelines, and written informed consent was obtained from all participants.

Statistical Analysis

Data were analyzed using standard statistical methods. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. The independent t-test was used to compare functional scores between the two groups, and the chi-square test was used to assess associations between categorical variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 130 patients with clavicle fractures were initially assessed during the study period. After exclusion of 10 patients due to incomplete data and loss to follow-up, 120 patients were included in the final analysis. The study population was equally divided into conservative and surgical management groups, with 60 patients in each group. There was no significant difference in baseline characteristics between the two groups, ensuring comparability.

The majority of patients were young adults, with a higher incidence observed in males, reflecting the increased exposure to trauma such as road traffic accidents and sports injuries. Midshaft fractures constituted the predominant type in both groups.

Table 1. Distribution of Study Population

Parameter	Value
Total patients assessed	130
Excluded patients	10
Final sample size	120
Conservative group	60
Surgical group	60

Table Note: Data are presented as total number of patients. The final study population was obtained after applying inclusion and exclusion criteria.

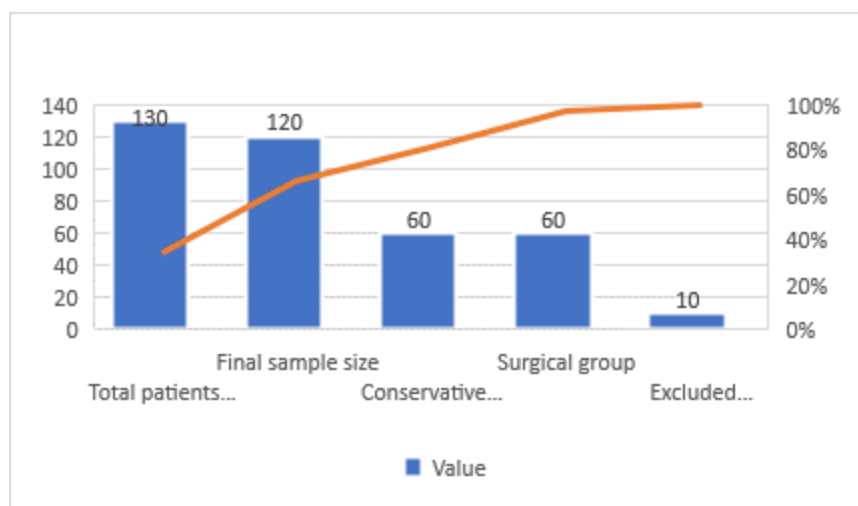


Figure 1: Distribution of Study Population

Figure Note: This figure illustrates the total number of patients assessed, excluded, and included in the final analysis. Equal distribution was maintained between conservative and surgical groups.

Table 2. Age-wise Distribution of Patients

Age Group (years)	Total (n)	Percentage (%)
18–25	28	23.30%
26–35	46	38.30%
36–45	30	25%
46–60	16	13.30%

Table Note: Data are expressed as frequency (n) and percentage (%). The majority of patients were in the 26–35 years age group.

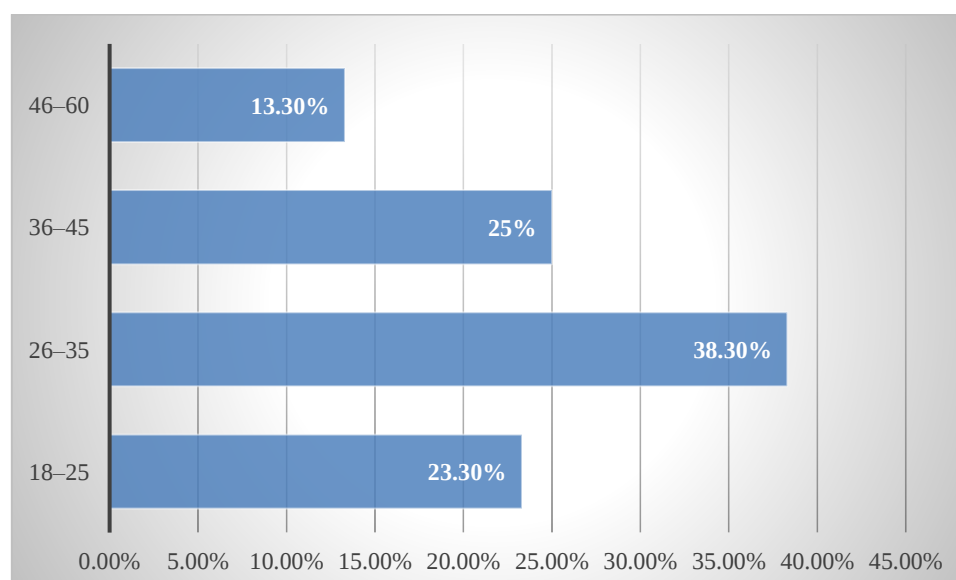


Figure 2: Age-wise Distribution of Patients

Figure Note: This figure demonstrates the age distribution of patients, with a higher proportion observed among young and middle-aged adults.

Table 3: Gender Distribution

Gender	Number (n)	Percentage (%)
Male	78	65%
Female	42	35%

Table Note: Male predominance was observed, reflecting increased exposure to trauma.
A higher incidence of clavicle fractures was observed among males compared to females.

Table 4: Fracture Characteristics

Type	Number (n)	Percentage (%)
Displaced	72	60%
Non-displaced	48	40%

Table Note: Displaced fractures constituted the majority of cases.
The majority of fractures were displaced midshaft fractures.

Table 5. Mechanism of Injury

Mechanism	Total (n)	Percentage (%)
Road Traffic Accidents	62	51.70%
Fall from height	34	28.30%
Sports injury	18	15%
Others	6	5%

Table Note: Road traffic accidents were the most common cause of clavicle fractures in the study population.

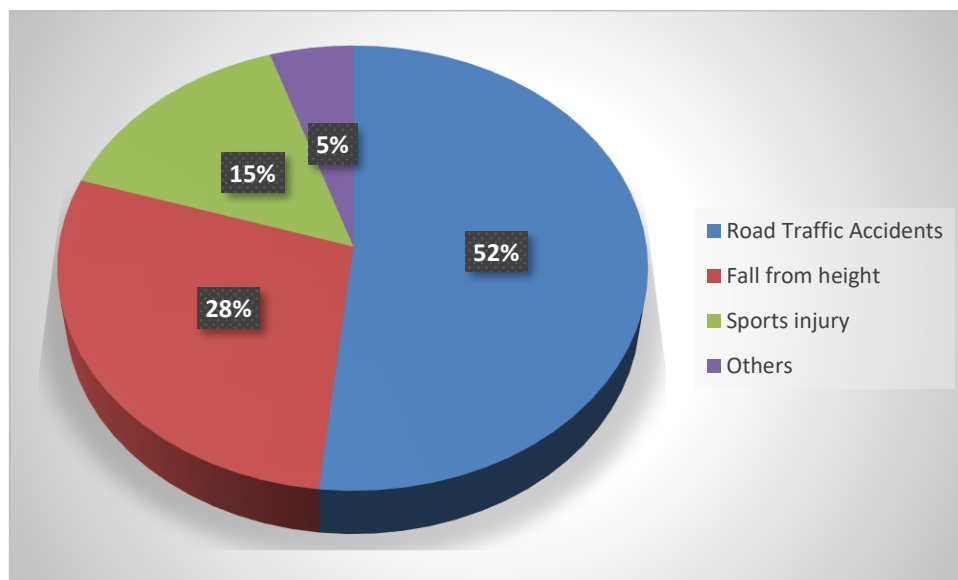


Figure 3: Mechanism of Injury Distribution

Figure Note: This figure shows the distribution of mechanisms of injury, with road traffic accidents being the predominant cause.

Table 6. Functional Outcome Comparison

Parameter	Conservative	Surgical
Constant-Murley Score	84.1 ± 6.2	92.4 ± 4.8
DASH Score	18.5 ± 5.1	9.2 ± 3.6

Table Note: Data are presented as mean ± standard deviation. The surgical group demonstrated significantly better functional outcomes compared to the conservative group ($p < 0.05$).

Table 7. Time to Fracture Union

Group	Mean Time to Union (weeks)
Conservative	12.5
Surgical	9.0

Table Note: The surgical group showed faster fracture union compared to the conservative group.
Patients treated surgically returned to normal daily activities earlier compared to the conservative group

Table 8. Complications

Complication	Conservative (n)	Surgical (n)
Nonunion	6	1
Malunion	8	0
Infection	0	3
Implant irritation	0	5

Table Note: Nonunion and malunion were more common in the conservative group, while implant-related complications were observed in the surgical group.

The risk of nonunion was significantly higher in the conservative group compared to the surgical group (RR = 6.0, $p < 0.05$).

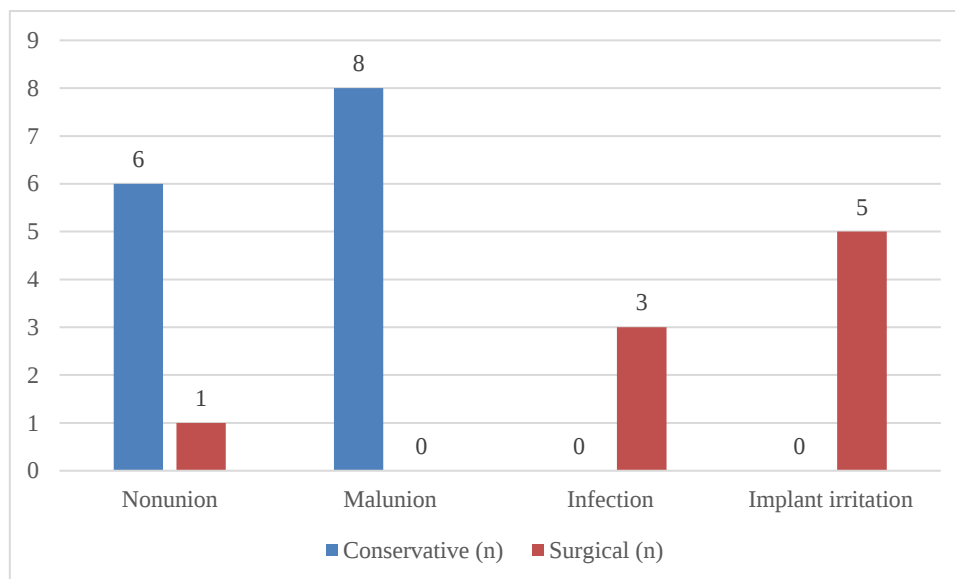


Figure 4: Distribution of Complications

Figure Note: This figure highlights the variation in complication patterns between the two groups, with

higher nonunion rates in conservative treatment and implant-related issues in surgical management.

Statistical Analysis

Parameter	Value
Mean difference in Constant Score	8.3
Mean difference in DASH Score	9.3
P-value	<0.05

Table Note: Statistical analysis demonstrated a significant difference in functional outcomes between the two groups, favouring surgical management ($p < 0.05$).

DISCUSSION

The present study compares the functional outcomes of conservative versus surgical management of clavicle fractures and demonstrates a clear advantage of surgical intervention in selected cases, particularly displaced fractures. The findings of this study reveal that patients treated surgically achieved significantly better functional outcomes, earlier fracture union, and lower rates of nonunion and malunion compared to those managed conservatively.⁹

These findings are consistent with Zhao et al., who reported improved functional outcomes and lower

complication rates with surgical fixation in displaced clavicle fractures.

In this study, the surgical group showed higher Constant-Murley scores and lower DASH scores, indicating improved shoulder function and reduced disability. These findings are consistent with recent literature, which suggests that anatomical reduction and stable fixation provided by surgical management contribute to better restoration of shoulder biomechanics. The improved functional recovery observed in surgically treated patients may be attributed to early mobilization and restoration of clavicular length, which plays a crucial role in maintaining normal shoulder mechanics.¹⁰

Nonunion and malunion were more frequently observed in the conservative group. This is likely due to inadequate alignment and shortening of the clavicle during the healing process. Malunion, particularly with significant shortening, has been associated with persistent pain, cosmetic deformity, and decreased shoulder endurance. The higher incidence of these complications in the conservative group supports the growing body of evidence favouring surgical management in displaced fractures.¹¹

However, surgical treatment is not without its limitations. In the present study, complications such as implant irritation and surgical site infection were observed in the surgical group. These findings highlight the importance of careful patient selection and adherence to surgical principles. Implant-related complications may require implant removal, increasing treatment burden.¹²

Patients in the conservative group achieved satisfactory functional outcomes in cases where fracture alignment was preserved. The avoidance of surgical risks and lower treatment costs make conservative management a viable option in appropriately selected patients.¹³

The results of the present study are in agreement with several randomized controlled trials and meta-analyses that support surgical fixation for displaced midshaft clavicle fractures. However, the decision between conservative and surgical management should be individualized, taking into account patient-specific factors such as age, activity level, fracture pattern, and comorbidities.¹⁴

Overall, this study reinforces the importance of tailored treatment strategies in the management of clavicle fractures. While surgical intervention offers clear benefits in selected cases, conservative management continues to play a significant role in the treatment of less severe injuries.¹⁵

Cost-Effectiveness

Conservative management is more cost-effective due to the absence of surgical expenses and implant costs. However, delayed union or nonunion may increase long-term costs. Surgical management, though initially expensive, may reduce indirect costs by enabling early return to work and better functional recovery. This is particularly relevant in resource-limited settings where cost plays a significant role in treatment decisions.

Limitations

This study has certain limitations that should be considered while interpreting the results. It was conducted as a single-center study, which may limit the generalizability of the findings to other populations. The absence of randomization in treatment allocation limits direct comparison between groups. The sample size, although adequate, was relatively moderate, and larger multicentric studies are required to validate these results. Additionally, long-term functional outcomes

were not assessed, which could provide further insights into recovery and prognosis.

CONCLUSION

Surgical management of clavicle fractures is an effective and reliable treatment modality, particularly in displaced fractures, providing better functional outcomes and faster recovery. The lower incidence of nonunion and malunion further highlights its advantage in selected cases.

Conservative management remains a practical and effective option for minimally displaced fractures. Careful patient selection and individualized treatment planning are essential to achieve optimal functional outcomes and reduce complications. Incorporation of evidence-based treatment strategies can improve overall patient outcomes.

REFERENCE

1. Sayed M, Sutar S, Kamel F, Faleel A, Dwyer AJ. Temporal Trends in the Management of Midshaft Clavicle Fractures: A Systematic Review. *Cureus*. 2025 Nov 10;17(11).
2. Hassan MA, Safy MA, Mohammed Khalil OK. Clinical Outcomes of Surgical Fixation of Displaced Midshaft Clavicle Fractures in Adults by Plating versus Elastic Stable Intramedullary Nailing. *International Journal of Medical Arts*. 2026 Feb 10;6508-14.
3. Hyland S, Charlick M, Varacallo M. Anatomy, shoulder and upper limb, clavicle.
4. Lenza M, Taniguchi LF, Ferretti M. Figure-of-eight bandage versus arm sling for treating middle-third clavicle fractures in adults: study protocol for a randomised controlled trial. *Trials*. 2016 May 4;17(1):229.
5. Rao BS. Clinical Study-Functional Outcome of Clavicle Fractures Treated Conservatively and Operatively in Semi-Urban Population.. *Journal of Contemporary Clinical Practice*. 2025 Oct;11(10):844-853.
6. Song HS, Kim H. Current concepts in the treatment of midshaft clavicle fractures in adults. *Clinics in shoulder and elbow*. 2021 Aug 30;24(3):189.
7. Drouaud AP, Stocchi C, Schroen C, Drouaud KT, Szatkowski J, Moore D. Global trends influencing orthopedic surgeons' midshaft clavicle fracture management: a Bullet Health Analysis. *Journal of Trauma and Injury*. 2026 Mar 3;39(1):34.
8. Dr. Saurabh Kumar DSK, Dr. Ratan Kumar Gupta DRKG, Dr. Mahesh Prasad DMP. A Study to Compare Functional Outcomes, Union Rates, And Complications Between Conservative and Surgical Management. *International Journal of Medical and Pharmaceutical Research*. 2025 Sep;6(5):2168-2175.

9. Ayik G, Kolac UC, Aksoy T, Ibik S, Kaymakoglu M, Kara D, Duzgun I, Huri G. Comparing the effects of surgical and conservative treatment on scapular dyskinesis in minimally displaced midshaft clavicle fractures. *Archives of Orthopaedic and Trauma Surgery*. 2026 Feb 25;146(1):82.
10. Maheshwari P, Peshin Sr C, Agarwal D. Functional outcomes in surgically treated clavicle fractures: a longitudinal observational study. *Cureus*. 2023 Oct 31;15(10).
11. Jeray KJ. Acute midshaft clavicular fracture. *JAAOS-Journal of the American Academy of Orthopaedic Surgeons*. 2007 Apr 1;15(4):239-48.
12. Rezaei AR, Zienkiewicz D, Rezaei AR. Surgical site infections: a comprehensive review. *Journal of Trauma and Injury*. 2025 Jun 27;38(2):71.
13. Vannela VA. Evaluation of Functional Outcome and Complications in Distal Radius Fractures Managed Conservatively: An Observational Study. *Journal of Contemporary Clinical Practice*. 2020 ;6(2):152-156.
14. Zhao JG, Wang J, Long L. Surgical versus conservative treatments for displaced midshaft clavicular fractures: a systematic review of overlapping meta-analyses. *Medicine*. 2015 Jul 1;94(26):e1057.
15. Ganesh MT, Pandian H, Palasseril AS. Outcome of clavicle fractures treated by various modalities. *Journal of Orthopaedic Case Reports*. 2025 Jun;15(6):250.

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