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RADIOLOGICAL AND FUNCTIONAL OUTCOMES OF DISPLACED MID-SHAFT CLAVICLE FRACTURES MANAGED WITH LOCKING COMPRESSION PLATE FIXATION

Orthopaedics

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ABSTRACT

Mid-shaft clavicle fractures constitute approximately 80% of all clavicular fractures and are commonly encountered in orthopaedic practice. Traditionally managed conservatively, displaced fractures have been associated with higher rates of non-union, malunion, cosmetic deformity, and functional impairment. Recent advances in fixation techniques, particularly locking compression plates (LCP), have shifted the paradigm toward surgical management for improved outcomes. This prospective longitudinal study was conducted at the Department of Orthopaedics, Sri Siddhartha Medical College and District Hospital, Tumkur, between February 2024 and February 2026. A total of 53 patients aged 18–60 years with isolated, closed, displaced mid-shaft clavicle fractures were included. All patients underwent open reduction and internal fixation (ORIF) using locking compression plates. Functional outcomes were assessed using the Disabilities of the Arm, Shoulder and Hand (DASH) score at 4, 12, and 24 weeks postoperatively, along with evaluation of radiological union, complications, and return to daily activities. The mean age of patients was 34.2 years, with a male predominance (77.35%). Road traffic accidents were the most common mode of injury (73.58%), and the right side was more frequently involved (60.37%). Radiological union was achieved within 12 weeks in 73.59% of patients, with a mean union time of 12.6 weeks. The mean DASH scores improved significantly from 40.8 at 4 weeks to 15.6 at 12 weeks and 6.4 at 24 weeks ($p < 0.001$). At final follow-up, functional outcomes were excellent in 84.9% of patients, good in 11.32%, and fair in 3.77%, with no poor outcomes. Complications were minimal and included superficial infection (3.77%), implant prominence (5.66%), and delayed union (3.77%), with no cases of non-union or implant failure. Open reduction and internal fixation using locking compression plates for displaced mid-shaft clavicle fractures yields excellent functional outcomes, facilitates early mobilization, and is associated with a low complication rate, making it a safe and reliable treatment modality for active adults.

KEYWORDS

Mid-shaft clavicle fracture; Locking compression plate; ORIF; DASH score; Functional outcome; Fracture union

INTRODUCTION

Fractures of the clavicle are among the most common skeletal injuries encountered in orthopaedic practice, accounting for approximately 3–5% of all adult fractures and nearly 35–45% of injuries involving the shoulder girdle.[1–3] The clavicle plays a crucial role in upper limb biomechanics by acting as a strut between the sternum and scapula. The mid-shaft region is particularly vulnerable due to its anatomical characteristics and accounts for nearly 80% of all clavicle fractures.[9]

Traditionally, these fractures were treated conservatively with slings or figure-of-eight bandages, based on earlier reports suggesting low non-union rates.[2] However, more recent evidence has shown that displaced fractures are associated with higher rates of non-union, malunion, and functional deficits.[8] These complications can lead to chronic pain, weakness, and cosmetic deformity, significantly affecting quality of life.

With increasing patient expectations and advances in fixation techniques, surgical management has gained popularity. Open reduction and internal fixation (ORIF) with locking compression plates provides superior biomechanical stability and allows early mobilization.[4–6] Randomized trials have demonstrated improved outcomes with operative management compared to conservative treatment[4]

The present study aims to evaluate the functional and radiological outcomes of displaced mid-shaft clavicle fractures treated with locking compression plates, using the DASH score as the primary functional assessment tool.[15–17]

MATERIALS AND METHODS

This prospective longitudinal study was conducted in the Department of Orthopaedics at Sri Siddhartha Medical College and District Hospital, Tumkur, between February 2024 and February 2026. A total of 53 patients aged between 18 and 60 years with isolated, closed, displaced mid-shaft clavicle fractures were included. Patients with open fractures, pathological fractures, polytrauma, or neurovascular injuries were excluded. Ethical clearance was obtained, and informed consent was taken from all participants.

All patients underwent ORIF using precontoured locking compression plates. Surgery was performed under appropriate anesthesia with patients in a supine position. A superior approach to the clavicle was used, and fracture fragments were anatomically reduced and fixed with locking screws.

Postoperatively, early mobilization was initiated. Functional outcomes were assessed using the DASH score at 4, 12, and 24 weeks. Radiological union was evaluated using serial X-rays. Statistical analysis was performed using appropriate tests, with $p < 0.05$ considered significant.

RESULTS

The mean age of patients was 34.2 ± 10.6 years, with a male predominance (77.35%). Road traffic accidents were the most common mechanism of injury (73.58%).

Radiological union was achieved within 12 weeks in 73.59% of patients, with a mean union time of 12.6 weeks. No cases of non-union were observed.

Functional outcomes showed significant improvement over time. The mean DASH score decreased from 40.8 at 4 weeks to 15.6 at 12 weeks and 6.4 at 24 weeks ($p < 0.001$), indicating substantial functional recovery.

At final follow-up, 84.9% of patients had excellent outcomes, while 11.32% had good outcomes and 3.77% had fair outcomes. Complications were minimal, including implant prominence (5.66%) and superficial infection (3.77%).Subgroup analysis revealed no significant association between age or gender and functional outcomes ($p > 0.05$). However, fracture pattern significantly influenced union rates ($p < 0.05$).

Table 1: Demographic Characteristics

Variable	Value
Total patients	53
Mean age (years)	34.2 ± 10.6
Age range	18–60
Male	41 (77.35%)
Female	12 (22.65%)

Table 2: Radiological Union

Outcome	Number (n)	Percentage (%)
Union ≤12 weeks	39	73.59
Delayed union	2	3.77
Non-union	0	0

Table 3: DASH Score Over Time

Follow-up	Mean DASH Score (Mean ± SD)
4 weeks	40.8 ± 8.2
12 weeks	15.6 ± 5.4
24 weeks	6.4 ± 3.1

Table 4: Functional Outcome

Outcome	Number (n)	Percentage (%)
Excellent	45	84.9
Good	6	11.32
Fair	2	3.77
Poor	0	0

DISCUSSION

The present study demonstrates that locking compression plate fixation provides excellent functional and radiological outcomes in displaced mid-shaft clavicle fractures. The demographic profile observed in this study is consistent with previous literature, where young males are predominantly affected.[1–3]

The mean union time of 12.6 weeks aligns with earlier studies reporting union within [10,16] weeks.[4,6] The absence of non-union in this study highlights the effectiveness of stable fixation. Functional outcomes assessed using the DASH score showed significant improvement, consistent with previous reports demonstrating superior outcomes with operative management.[4,7]

The complication rate was low and comparable to existing literature. Implant prominence remains a known issue but rarely requires intervention.[4,6]

Overall, the findings of this study support the growing evidence favoring surgical fixation for displaced clavicle fractures.

CONCLUSIONS

Open reduction and internal fixation using locking compression plates for displaced mid-shaft clavicle fractures provides excellent functional outcomes, reliable union, and low complication rates. It is a safe and effective treatment modality, particularly in young and active individuals.

LIMITATIONS

The study is limited by a relatively small sample size and lack of a control group. The follow-up duration was limited to 24 weeks, which may not reflect long-term outcomes

CLINICAL PHOTOGRAPHS

Figure 1: Steps of Surgical procedure

Figure 2: Post operative Xrays and Full ROM of Patient No 1 and Patient No 2

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