



CLINICAL AND FUNCTIONAL OUTCOME OF CONSERVATIVELY MANAGED MID-SHAFT CLAVICLE FRACTURES: A PROSPECTIVE STUDY OF 100 CASES WITH MINIMUM 6-MONTH FOLLOW-UP

Orthopaedics

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ABSTRACT

Background: Mid-shaft clavicle fractures are common injuries traditionally treated non-operatively, although malunion, non-union, shortening and residual functional deficits remain concerns. This study evaluated the clinical and functional outcome of conservatively managed adult mid-shaft clavicle fractures. **Methods:** This prospective study included 100 patients aged ≥ 18 years with mid-shaft clavicle fractures managed conservatively at Guru Gobind Singh Government Hospital, Jamnagar, over 18 months. Patients were treated with analgesia and immobilization using a sling and/or figure-of-eight/figure-of-four bandage, followed by progressive mobilization and physiotherapy. Clinical outcome, complications, clavicular shortening, shoulder range of motion, muscle endurance and patient-reported disability using the QuickDASH were assessed. The minimum intended follow-up was 6 months. **Results:** The cohort was predominantly male (83%), and road traffic accidents accounted for 90% of injuries. Twenty-four percent had associated polytrauma. Immobilization most commonly lasted 1.5–2 months. Among the 65 patients available for six-month functional assessment, 62 (95.4%) had QuickDASH scores ≤ 20 ; 51 (78.5%) scored 0–10, 11 (16.9%) scored 10–20, two (3.1%) scored 20–30, and one (1.5%) scored 80–90. Full shoulder range of motion was regained by 62 assessed patients between 1.5 and 2.5 months. Malunion was recorded in 44% and non-union in 11% of the total cohort. Clavicular shortening of 1–2 cm was common. **Conclusion:** Conservative management produced generally good functional recovery in the assessed patients despite frequent radiographic deformity. Early mobilization and physiotherapy appear important for functional restoration. However, the substantial 35% loss to follow-up limits interpretation of complication and long-term outcome rates.

KEYWORDS

Clavicle Fracture; Mid-shaft Fracture; Conservative Management; Non-operative Treatment; Quickdash; Functional Outcome

INTRODUCTION

The clavicle is an important strut of the shoulder girdle, maintaining the upper limb away from the thorax and contributing to shoulder stability, motion and protection of underlying neurovascular structures. Clavicle fractures are common, accounting for approximately 2.6–4.0% of all fractures, and the middle third is the most frequent site. The subcutaneous position of the bone and the biomechanics of the shoulder expose it to direct and indirect trauma.

Historically, most mid-shaft clavicle fractures were treated non-operatively with a sling or figure-of-eight bandage, with an expectation of reliable union and satisfactory function. Subsequent studies, however, demonstrated that displaced fractures may be associated with malunion, shortening, nonunion, pain and residual weakness. Operative fixation can reduce non-union and symptomatic malunion in selected displaced fractures, but carries implant-related and surgical risks.

In resource-constrained settings, conservative treatment remains clinically relevant, particularly for patients without neurovascular compromise, open injury or other clear indications for surgery. The present study was undertaken to evaluate the clinical and functional outcome of conservatively managed adult mid-shaft clavicle fractures, with particular attention to range of motion, muscle endurance, clavicular shortening, complications, return to activity and patient-reported disability.

AIM AND OBJECTIVES

The study aimed to evaluate the effects and functional outcome of conservative treatment for acute mid-shaft clavicle fractures in adults.

- To assess functional improvement following conservative treatment.
- To evaluate complications and patient satisfaction.
- To assess shoulder range of motion and muscle endurance.
- To assess shortening of the fractured clavicle compared with the opposite side.
- To evaluate the time required for return to functional activity/work.
- To examine the influence of age, sex, comorbid illness and associated injuries on outcome.

MATERIALS AND METHODS

Study design and setting: This was a prospective study of 100 adult patients with mid-shaft clavicle fractures managed conservatively in the Department of Orthopaedics, Guru Gobind Singh Government Hospital and Shri M. P. Shah Government Medical College, Jamnagar. The study period was 18 months.

Participants: Patients aged 18 years or older, of either sex, with a mid-shaft clavicle fracture and a minimum follow-up of 6 months were eligible. Patients younger than 18 years and those with another disorder of the shoulder were excluded.

Clinical assessment: A detailed history of trauma and clinical examination were performed. Demographic variables, mode of injury, side of fracture, associated trauma, pre-existing illness, distal neurovascular status, immobilization method, duration of immobilization, onset of shoulder movements, time to full range of motion, complications, muscle wasting and shoulder muscle endurance were recorded using the study case-record form.

Imaging: Standard anteroposterior radiographs of the clavicle were obtained. Radiological findings included fracture healing, malunion/non-union and comparison of clavicular length with the opposite side.

Conservative treatment: Patients received analgesia and immobilization. The study records document use of a shortarm sling, figure-of-eight bandage and figure-of-four bandage, followed by progressive shoulder mobilization and physiotherapy.

Outcome assessment: Functional outcome was assessed using the QuickDASH disability score at six months in patients available for assessment. Range of motion was recorded by the time required to regain full movement. Shoulder muscle endurance was assessed by weight-lifting capacity, and muscle wasting was recorded clinically.

Follow-up and analysis: Although 100 patients were enrolled, 35 were lost to follow-up. Therefore, functional outcomes reported at six months are based on the 65 patients available for assessment.

RESULTS

A total of 100 patients were enrolled. The study population was predominantly young and middle-aged adults, with a marked male predominance. Road traffic accidents were the major mechanism of injury.

Table 1. Demographic and injury characteristics.

Variable	No. (n=100)	Percentage
Male	83	83.0
Female	17	17.0
Right-sided fracture	52	52.0
Left-sided fracture	48	48.0
Road traffic accident	90	90.0
Landing awkwardly after a jump	10	10.0
Polytrauma	24	24.0
No associated trauma	76	76.0

Table 2. Age distribution.

Age group (years)	No. (n=100)	%
11–20	5	5.0
21–30	27	27.0
31–40	23	23.0
41–50	15	15.0
51–60	23	23.0
61–70	3	3.0
71–80	3	3.0
81–90	1	1.0

No patients were recorded in the 0–10 or 91–100 year groups.

Table 3. Duration of immobilization

Duration of immobilization	No. (n=65)	%
1 month	9	9.0
1.5 months	30	30.0
2 months	23	23.0
2.5 months	2	2.0
3 months	1	1.0

The available tabulation did not account for all 100 records in this table; values are reproduced as recorded.

Table 4. Follow-up compliance.

Follow-up status	No.	% of total
6–9 months	26	26.0
9–12 months	9	9.0
12–15 months	23	23.0
15–18 months	2	2.0
18–21 months	1	1.0
21–24 months	4	4.0
Lost to follow-up	35	35.0

Table 5. Time to regain full shoulder range of motion among patients assessed at follow-up.

Full ROM achieved	No. (n=65)	%
Not achieved	3	3.0
1.5 months	5	5.0
2 months	17	17.0
2.5 months	36	36.0
3 months	2	2.0
3.5 months	1	1.0
4.5 months	1	1.0

Table 6. Shoulder muscle endurance assessed by weight-lifting capacity.

Shoulder muscle endurance	No. (n=65)	%
0 kg	1	1.5
2.5 kg	2	3.1
3 kg	1	1.5
5 kg	21	32.3
7 kg	1	1.5
7.5 kg	1	1.5
10 kg	36	55.4
15 kg	1	1.5
25 kg	1	1.5

Table 7. Muscle wasting at follow-up.

Muscle wasting	No. (n=65)	%
Absent	55	84.6
Present	10	15.4

Table 8. QuickDASH disability score at six months.

QuickDASH at 6 months	No. (n=65)	%
0–10	51	78.5
10–20	11	16.9
20–30	2	3.1
30–40	0	0
40–50	0	0
50–60	0	0
60–70	0	0
70–80	0	0
80–90	1	1.5
90–100	0	0

Overall, 62/65 (95.4%) had a QuickDASH score ≤ 20 .

Table 9. Complications

Recorded outcome / complication	No.	%
Malunion	44	44.0
Non-union	11	11.0
Hypertrophic non-union	7	7.0
Pain	3	3.0
Stiffness	2	2.0
No complication	3	3.0

Table 10. Clavicular shortening among patients assessed at follow-up

Shortening compared with opposite side	No. (n=65)	%
0 cm	2	3.1
0.5 cm	2	3.1
1 cm	15	23.1
1.5 cm	27	41.5
2 cm	16	24.6
2.5 cm	1	1.5
3 cm	1	1.5
3.5 cm	1	1.5

DISCUSSION

The present prospective study demonstrates that conservative treatment of adult mid-shaft clavicle fractures can be associated with satisfactory short- to mid-term functional recovery. The cohort was predominantly male and injuries were most commonly caused by road traffic accidents. These findings are consistent with the traumatic epidemiology of clavicle fractures reported in previous studies.

At six months, 62 of 65 patients available for functional assessment had QuickDASH scores ≤ 20 , while 51 patients had scores between 0 and 10. Thus, despite the radiographic abnormalities frequently documented after non-operative treatment, most assessed patients had little patient-reported disability. McKee et al. reported residual deficits in strength and endurance after non-operative treatment of displaced midshaft fractures, emphasizing that radiographic union alone may not reflect functional recovery.

Fuglesang et al. reported a fair-to-poor DASH result in approximately one quarter of patients treated conservatively for completely displaced mid-shaft fractures, and found that marked vertical displacement was associated with inferior clinical outcome. In the present study, detailed displacement measurements were not reported, limiting direct comparison.

Clavicular shortening was common, particularly in the 1–2 cm range. Previous literature has shown variable relationships between shortening and functional outcome. De Giorgi et al. found greater shortening among dissatisfied patients and proposed a percentage-shortening threshold, whereas other studies have reported that shortening alone does not necessarily predict poor functional outcome. The present data similarly suggest that moderate shortening did not uniformly translate into severe functional disability, although the study was not designed to establish a causal relationship.

Malunion and non-union were recorded relatively frequently. The 44% malunion rate reflects the propensity of displaced clavicle fractures to heal with residual deformity after conservative treatment. The 11% non-union rate is clinically important and reinforces the need for

surveillance of patients with persistent pain, fracture mobility or poor radiological progress. However, the complication table contains overlapping categories, including separate recording of hypertrophic non-union, so these figures require verification against the master chart before final publication.

Most patients regained full range of motion by 2.5 months. This supports the importance of structured rehabilitation and progressive mobilization after the period of immobilization. At follow-up, 84.6% of assessed patients had no muscle wasting, while 55.4% could lift 10 kg and 32.3% could lift 5 kg. These measures indicate generally preserved shoulder function in the majority of patients, although weight-lifting capacity is not a standardized shoulder strength instrument.

The principal limitation was loss to follow-up: 35% of the enrolled cohort did not contribute to the six-month functional assessment. Consequently, the QuickDASH, range-of-motion, muscle endurance and shortening results describe the 65 patients available for assessment rather than all 100 enrolled participants. The study was also observational and lacked a surgical comparison group.

CONCLUSION

Conservative management of adult mid-shaft clavicle fractures in this cohort was associated with good functional recovery in most patients available for six-month assessment. Road traffic accidents were the predominant mechanism, males formed the majority of patients, and most patients regained full shoulder motion within 2–3 months. At six months, 95.4% of assessed patients had a QuickDASH score ≤ 20 . Malunion and nonunion remained important radiological/clinical outcomes, while moderate clavicular shortening was common but was not uniformly associated with functional disability.

Conservative treatment therefore remains a reasonable option for appropriately selected adult mid-shaft clavicle fractures, particularly when accompanied by early functional rehabilitation and careful follow-up. Patients with persistent pain, fracture instability, progressive deformity, or evidence of non-union should be reassessed for possible operative management. Because of the substantial loss to follow-up and the absence of a comparative surgical group, larger prospective comparative studies with standardized functional and radiological measures are required.

LIMITATIONS

- Thirty-five percent of the enrolled cohort was lost to follow-up.
- There was no operative control group.
- The study did not report inferential statistical analysis or p-values.
- Shoulder muscle endurance was assessed by weight-lifting capacity rather than a standardized dynamometer-based test.
- The complication table contains overlapping/unclear categories and should be reconciled with the master chart before submission.
- The study was conducted at a single tertiary-care centre, which may limit generalizability.

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