



FUNCTIONAL OUTCOME OF CONSERVATIVE VERSUS OPERATIVE MANAGEMENT IN MID-SHAFT CLAVICLE FRACTURES: A COMPARATIVE STUDY

Orthopaedics

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ABSTRACT

Purpose: To evaluate the functional outcome of open reduction and internal fixation with locking compression plate and conservative management with figure of eight clavicle brace in treating displaced middle third clavicular fracture as measured by Constant & Murley score **Materials and Methods:** 40 Patients were allotted randomly into two groups. Patients selected in the conservative group were immediately managed with figure of eight Clavicle Brace. Patients selected for surgery were operated as early as possible once the general condition of the patients were stable and the patients were fit for surgery as assessed by the anesthesia team. All patients were followed up every week for 2 weeks post treatment and thereafter every 6th week, 3rd month, 6th month and at 1 year. Serial radiographs were obtained immediately after surgery and then at 6 weeks, 3 months, 6 months and one year. Features of healing and functional outcome were looked for using the Constant and Murley scoring system at the time of injury, 6 weeks, 3 months, 6 months and one year. Also, evidence of implant breakage, non-union, infection or any other complication was looked for. **Result:** The functional outcome scores were measured using Constant and Murley system and it was found that patients treated surgically had significantly better results at 6 weeks, 3 months, 6 months and 12 months respectively when compared to conservative group. The complications observed were one case each of infection and implant failure in the surgical group and one case each of nonunion and shoulder stiffness in the conservative group. **Conclusion:** It was observed that patients who underwent surgical treatment had better functional outcome in terms of early ROM and so return to work was earlier compared to conservative group.

KEYWORDS

INTRODUCTION

Roughly 2.6% of all fractures and 44% to 66% of fractures involving the shoulder are clavicle fractures.^[1,2] Middle third fractures account for 80% of all clavicle fractures, whereas fractures of the lateral and medial third of the clavicle account for 15% and 5% respectively. Most minimally displaced clavicle fractures can be successfully treated non-operatively with some forms of immobilization.^[3,4,5]

Between the sternum and the glenohumeral joint, the S-shaped clavicle serves as a strut. It facilitates upper limb mobility and acts as a link between the axial and appendicular skeletons, offering structural support.^[6,7] There has been an ongoing debate regarding the treatment of mid-shaft clavicle fractures, with proponents of both conservative and surgical methods.^[8,9]

This study compares, using the Constant & Murley score, the functional outcomes of conservative versus surgical therapy of mid-shaft clavicle fractures.^[10] The study also intends to assess the frequency of post-treatment complications and ascertain the incidence of displaced mid-shaft clavicle fractures with respect to age and sex.^[11,12]

Aims and Objectives

- To evaluate the functional outcome of "open reduction and internal fixation with locking compression plate" and "conservative management with figure of eight clavicle brace" in treating displaced middle third clavicular fracture as measured by Constant & Murley score.
- To find out the incidence of displaced fracture clavicle-middle third in our hospital in terms of age and sex.
- To study the incidence of post-treatment complications like nonunion, infection, shoulder stiffness as per Constant and Murley score, on treatment with "open reduction and internal fixation with locking compression plate" and "conservative management with figure of eight clavicle brace" and arm pouch/sling application.

Materials and Methods

Study Design

This study was a prospective, randomized controlled trial conducted at K.D Medical college hospital and research Centre Mathura from January 2023 to June 2024. The study was approved by the

institutional ethics committee, and informed consent was obtained from all participants.

Participants

Patients with displaced mid-shaft clavicle fractures were included in the study.

Inclusion Criteria Were

- Age between 18 and 60 years
- Displaced mid-shaft clavicle fracture confirmed by radiography
- No previous shoulder pathology

Exclusion Criteria Were

- Open fractures
- Pathological fractures
- Patients with neurovascular injury

Interventions

Participants were randomly assigned to one of two treatment groups:

- Surgical Group: Open reduction and internal fixation with a locking compression plate.
- Conservative Group: Conservative management with a figure-of-eight clavicle brace and arm pouch/sling application.

Statistical Analysis

Data were analyzed using [Statistical Software]. Continuous variables were expressed as mean $\pm$ standard deviation, and categorical variables were expressed as frequencies and percentages. The Student's t-test was used to compare continuous variables, and the chi-square test was used to compare categorical variables. A p-value of <0.05 was considered statistically significant.

RESULTS

The present study consists of 40 patients, among which 20 patients of fracture of the mid-third clavicle were treated surgically with clavicular locking compression plate & screws and 20 patients were treated conservatively with figure of eight clavicle brace and arm pouch/sling between January 2023 to June 2024. 36 patients were available for follow-up and they were followed up for minimum 12 months at regular intervals. Results were analyzed both clinically and radiologically.

Mode of Injury

Out of the 40 patients that were included in the study, 28 patients (70%) sustained fracture as a part of a road traffic accident while 12 patients sustained fracture due to direct fall from height (30%).

Age

The distribution of age in the surgical group ranges from 25 to 59 years. The mean age in the surgical group was 45.11 years with a standard deviation (SD) of 8.123 years. The distribution of age in the conservative group ranges from 18 to 64 years. The mean age in the conservative group was 45.33 years with a SD of 13.578 years.

Gender

Out of 40 patients, 18 were male (45%) and 22 were female (55%). The number of male patients in the surgical group was 8 while in the conservative group it was 10. The number of female patients were 12 and 10 in the surgical and conservative groups respectively.

Gender	Surgical group		Conservative group	
	Frequency	Percentage	Frequency	Percentage
Male	8	40	10	50
Female	12	60	10	50
Total	20	100	20	100

Side

In the surgical group, 11 patients had fractures on the right side and 9 patients had fractures on the left side. In the conservative group, 10 patients had fractures on the right side and 10 patients had fractures on the left side.

Side	Surgical group		Conservative group	
	Frequency	Percentage	Frequency	Percentage
Left	9	45	10	50
Right	11	55	10	50
Total	20	100	18	100

Treatment

Nonoperative Care - Patients randomized to nonoperative care received a standard shoulder sling for comfort, followed by pendulum or gentle range of motion shoulder exercises, approximately 2 weeks after injury. Strengthening exercises were implemented at approximately 6 weeks after injury.

Operative - Prophylactic antibiotics were administered. A general or regional anesthetic was administered. The patient was placed in either the beach chair or the semi-sitting position and the involved shoulder was prepared and draped. An incision of around 7 to 9 cm was made in the anterior aspect of clavicle, centering over the fracture site. The incision is deepened and skin, subcutaneous tissue and platysma were divided. The overlying fascia and periosteum were next divided. The fractured ends are made free from surrounding tissue. Minimal soft tissue and periosteum dissection was done. Fracture was then reduced and plate was placed over the superior aspect of the clavicle. At the junction of the medial and middle third of the clavicle, the inferior surface of clavicle is exposed in order to keep a protective instrument, while drilling to prevent injury to neurovascular structure underneath it. The locking compression plate was fixed to the medial and lateral fragment with locking screws/cortical screws after putting inter fragmentary screw and at least three screws in medial and lateral fragment were applied. After achieving adequate hemostasis, wound was then closed in layers and sterile dressing was done.

Comparison of Constant & Murley Score Between Surgical and Conservative Group

Constant & Murley scores at 6 weeks, 3 months, 6 months, and 12 months were significantly higher in the surgical group than in the conservative group. There was a statistically significant difference in Constant & Murley scores at these intervals between the surgical and conservative groups.

The distribution of Mean Constant & Murley Scores in the Surgical Group is Shown in Table

Constant & Murley score	Surgical group		Conservative group		t value	p value
	Mean	SD	Mean	SD		
At time of Injury	29.70	2.620	28.80	1.798	1.505	0.120
At 6 weeks	55.48	5.427	44.49	4.188	7.187	0.002
At 3 months	70.85	5.740	65.50	3.620	2.125	0.032*
At 6 months	79.85	7.414	73.21	4.527	3.325	0.002**
At 12 months	83.50	6.392	77.45	3.603	3.683	0.004*

Complications

The complications faced in the surgical group included one case of superficial infection and one case of implant failure. In the conservative group, there was one case of non-union and one case of shoulder stiffness at 12 months.

DISCUSSION

In our study we compared two accepted treatment modalities of fracture mid-third clavicle viz open reduction and plating with locking compression plate and conservative treatment with figure of eight clavicle brace in terms of outcome. The results of present study of patients with middle third clavicle fractures are compared with the results of standard literature. Fractures occur most commonly in the middle third of the bone (76-82%) and less often in the distal (12-21%) and medial (3-6%) thirds^{13,14}. Traditionally, most of these fractures have been treated with benign neglect, slings, or figure-of-eight braces. Historically, it was considered that all clavicle fractures do well with non-operative treatment, such treatment was usually successful and till recently most of the available literature showed that more than 95% of clavicle fractures achieve union with acceptable cosmetic and functional results. Recent studies show that displaced mid-third clavicular fractures in adults do poorly when treated non-operatively¹⁴, have higher rate of nonunion and, even when they unite, often result in an unsightly cosmetic bump in the center of clavicle, shoulder discomfort, and patient dissatisfaction. Hill et al¹⁵, Nordqvist et al¹⁰ and Robinson et al¹⁶ found poor results following conservative treatment of displaced middle third clavicle fracture. Previously, mal-union of the clavicle, which is typical with displaced fractures, was thought to be of radiographic interest only and required no treatment.

But now, clavicular mal-union is regarded as a distinct clinical entity with radiographic, orthopedic, neurologic, and cosmetic features. Nowak et al. examined the late sequelae in 208 adult patients with clavicular fractures and found that, at ten years after the injury, ninety-six patients (46%) still had symptoms despite the fact that only fifteen (7%) had a nonunion¹⁷.

When it involves a young patient any compromise in shoulder function due to mal-union/nonunion of clavicular fracture severely hampers his employability. Patients today expect a rapid return to pain free function following a fracture. Many recent published articles document the success of open reduction and internal fixation for nonunion of displaced clavicle fractures with low complication rates. Most of these authors used plate fixation to treat these patients¹⁹.

CONCLUSION

It was observed that patients who underwent surgical treatment had better functional outcome in terms of early ROM and so return to work was earlier compared to conservative group. According to present study, surgery can be recommended over conservative treatment in patients with displaced mid-third fracture clavicle

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