

Original Research Article

Comparison of functional outcomes and complications of conservative management verses surgical fixation with a locking compression plate in the treatment of displaced middle third clavicular fracture

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Received: 08 August 2022

Revised: 08 September 2022

Accepted: 09 September 2022

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ABSTRACT

Background: About 3 to 5 percent of all fractures are clavicle fractures, which account for 45 percent of fractures at the shoulder. While fractures of the lateral and medial thirds of the clavicle account for 15% and 5% of all clavicle fractures, respectively, middle third fractures account for 80% of all clavicle fractures.

Methods: patients were divided into two groups at random. Patients selected for conservative treatment with figure of eight Clavicle Brace and arm sling/pouch were treated with the brace immediately and for surgical intervention with locking plating. Constant and Murley's scoring system was used to check for signs of healing and functional improvement

Results: The 40 patients in the current study include 20 with a new fracture of the mid-third clavicle who underwent surgical treatment with clavicular locking compression plate and screws and 20 who underwent conservative treatment with a figure-eight clavicle brace and arm pouch/sling. There was a statistically significant difference in the Constant and Murley score between the surgical group and the conservative group.

Conclusions: According to the present study, patients with a displaced mid-third clavicle fracture may benefit more from surgery than from conservative treatment.

Keywords: Displaced middle third clavicular fracture, Locking compression plate, Clavicle brace, Constant and Murley score

INTRODUCTION

About 3 to 5 percent of all fractures are clavicle fractures, which account for 45 percent of fractures at the shoulder. While fractures of the lateral and medial thirds of the clavicle account for 15% and 5% of all clavicle fractures, respectively, middle third fractures account for 80% of all clavicle fractures. With certain types of immobilisations, the majority of minimally displaced clavicle fractures can be successfully managed without surgery. The mid-clavicular region of the clavicle has a weak point, which accounts for the majority of fractures in this area. The

clavicle is subject to a variety of muscular and ligamentous stresses, and knowledge of these forces is important to comprehend the nature of clavicle fracture displacement and to draw the conclusion that certain fracture patterns are problematic if not reduced and surgically secured.¹ The rate of midclavicular fracture nonunion is typically stated to range from 0.1 to 0.8 percent, and traditionally, non-operative treatment has been chosen. Due to relatively frequent and severe sequelae, surgical treatment of acute middle third clavicle fractures was not advocated. However, the studies upon which these results are based failed to properly classify

clavicle fractures in terms of patient age and fracture displacement. More recent data suggest that the frequency of non-union in displaced comminuted midshaft clavicular fractures in adults is between 10 and 15% based on comprehensive classification of fractures.² The amount of pain and disability experienced by patients who get conservative treatment ranges during the first three to six weeks, and this aspect has gained insufficient consideration.

Widely displaced fractures of the middle part of the clavicle treated without surgery have a 15% nonunion risk, and all fractures with an initial shortening of more than 2 cm ended in nonunion.³ As nonoperative results are now perceived to be inferior both clinically and functionally, more and more surgeons are preferring to perform surgery. For totally displaced mid-shaft clavicular fractures, primary open reduction and internal fixation has been shown to be safe and effective in several trials, which also found a high union rate and minimal complication rate.⁴ A locking compression plate can be used in numerous complex clavicles fractures to provide a good result with a low complication rate.⁵ Mid-shaft clavicular fractures that are displaced and comminuted respond reliably and quickly to primary internal fixation.⁶ Surgery is the best treatment option for clavicle fractures, but it is not without risks. Scar hypertrophy, superficial and deep infection, non-union, delayed union, implant loosening and breakage, iatrogenic brachial plexus injury, and severe vascular damage are only a few possible complications. The most popular implants include clavicle locking compression plate (LCP), which is precontoured to a S shape in accordance with the curvature of the clavicle are the most preferred. In the conservative approach, different braces are used to immobilise the mid-third clavicle, although the commercial figure-eight brace is the most frequently utilised. The purpose of this study is to analyse the functional outcome following each treatment and to gain a deeper understanding of the outcomes and issues related to both conservative and surgical procedures (ORIF with clavicular LCP) for treating fractures of the mid-third clavicle.

Objectives

Objective of current study was to compare the functional results of conservative management with a figure-of-eight clavicle brace and open reduction and internal fixation with a locking compression plate in the treatment of displaced middle third clavicular fracture.

METHODS

Study design, location and duration

Current study is a prospective interventional study carried out at a Government medical college, tertiary care centre, Nagpur. Patients who presented to the institution with injury/trauma to midshaft clavicle were evaluated in

detail, clinically and radiographically. This study was carried out over a period 12 months from February 2021 to February 2022.

Inclusion criteria

Inclusion criteria for current study were; adult male and female patients with aged 18 to 60, who presented at our hospital with a displaced middle third clavicle fracture (Robinson type 2B1).

Exclusion criteria

Exclusion criteria for current study were; age >60 and <18, open injuries, medial or lateral third of the clavicle fracture, fractures that are undisplaced, patient with polytrauma, confirmed non-union resulting from a previous fracture, any medical condition that might prevent you from undergoing surgery or receiving general anaesthesia (heart diseases, renal failure or active chemotherapy).

Antero-posterior view of the clavicle was taken to determine the fracture type (displacement and comminution) and its location. Robinson's classification was used to classify the fractures. Then, patients were divided into two groups at random. Patients selected for conservative treatment with figure of eight clavicle brace and arm sling/pouch were treated with the brace immediately. As soon as the general health of the patients was stabilised and the patients were considered fit for surgery by the physician, surgery was performed on the patients who were chosen for it.

Surgical procedure

Patient was kept in supine with beach chair position after administration of general anaesthesia. Part prepared and draped. Local infiltration administered at incision site to minimise blood loss. Anteroinferior incision of size 10 cm taken. Dissection was carried out to reach fracture site. Fracture reduction were done and final fixation done with the help of locking compression plating. Wound closure done in layers. Following treatment, all patients were evaluated on every week for two weeks, then at sixth week, third month, sixth month, and at a year. Radiographs are taken immediately following treatment, at six weeks, three months, six months, and one year. Constant and Murley's scoring system was used to check for signs of healing and functional improvement at the time of the injury, at six weeks, three months, six months, and one year afterward. Additionally, evidence of implant rupture, non-union, and infection were also checked for. Statistical analysis- Statistical software STATA version 14.0 was used for statistical analysis. Case 1: 34 year male patient with History of road traffic accident from bike with trauma to right shoulder leads to midshaft clavicle fracture, presented to our institute after one and half month of trauma. Patient took conservative management with clavicular brace. No union was seen

hence managed with open reduction internal fixation with locking plating. Case 2: midshaft clavicle managed with open reduction internal fixation with plating.

RESULTS

The 40 patients in the current study include 20 with a new fracture of the mid-third clavicle who underwent surgical treatment with clavicular locking compression plate and screws and 20 who underwent conservative treatment with a figure-eight clavicle brace and arm pouch/sling. A total of 35 patients were accessible for follow-up, and they had regular 12-month evaluations. Both clinical and radiographic analyses of the results were performed.



Figure 1: Pre-operative X-rays.

Comparison of constant and Murley score between surgical and conservative group

Constant and Murley score in the surgical group was considerably higher than in the conservative group at 6

weeks, 3 months, 6 months, and 12 months. At 6 weeks, 3 months, 6 months, and 12 months, there was a statistically significant difference in the Constant and Murley score between the surgical group and the conservative group.



Figure 2: Intra-operative images.



Figure 3: Post-operative X-rays.

Table 1: Age distribution

Age groups (years)	N		%	
	Operative	Conservative	Operative	Conservative
20-29	8	6	40	30
30-39	7	9	35	45
40-49	2	3	10	15
50-60	3	2	15	10
Total	20	20	100	100

Table 2: Sex distribution.

Sex	N		%	
	Operative	Conservative	Operative	Conservative
Male	14	12	70	60
Female	6	8	30	40
Total	20	20	100	100

DISCUSSION

One of the most frequent fractures in the body is a middle third clavicle fracture; clavicle fractures make up about 4% of all fractures. If not treated properly, it frequently

causes discomfort and temporary dysfunction before resulting in longer-term deformity and disability.⁷ The majority of these fractures have often been managed with figure-of-eight harnesses, slings, or neglected without

treatment. Historically, it was believed that non-operative treatment was successful in treating all clavicle fractures.

Comparing the findings of the current study of patients with middle third clavicle fractures to those of the standard literature.

Table 3: Side of injury.

Side	N		%	
	Operative	Conservative	Operative	Conservative
Right	11	13	55	65
Left	9	7	45	35
Total	20	20	100	100

Table 4: Mode of injury.

Mode of injury	N		%	
	Operative	Conservative	Operative	Conservative
RTA	16	15	80	75
Fall	4	5	20	25
Total	20	20	100	100

Table 5: Distribution of mean Constant and Murley score in both groups.

Constant and Murley score	Surgical group		Conservative group	
	Mean	SD	Mean	SD
At time of injury	27.04	2.621	26.32	1.610
At 6 weeks	54.45	4.956	42.12	3.926
At 3 months	69.12	4.922	64.34	3.621
At 6 months	78.22	7.546	71.34	4.45

Table 6: Complications in both groups after treatment.

Complication	Surgical group	Conservative group
No complications	14	9
Implant failure	2	0
Infection	3	0
Shoulder stiffness	1	5
Delayed union	0	1
Non union	0	5

The Bostman et al study, which treated 103 patients with just middle third clavicle fractures using early open reduction and internal fixation with plate and screws, is one of the studies that is frequently compared.⁸ The findings from the Cesare Faldini et al trial, in which 100 patients with a clavicle midshaft fracture received treatment with a figure-of-eight clavicle brace, were also compared.⁹ Recent research indicates that displaced mid-third clavicular fractures in adults have a poor prognosis for nonoperative management, have a higher rate of nonunion, and, even when they do unite, frequently cause an ugly cosmetic bump in the middle of the clavicle, shoulder discomfort, and patient dissatisfaction.^{10,11} Poor outcomes were identified after conservative treatment for a displaced middle third clavicle fracture in research by Hill et al in 1997, Nordqvist et al, Robinson et al.¹²⁻¹⁴ Previously, it was believed that mal-union of the clavicle, which is common with displaced fractures, was just of radiological interest and did not need to be treated.

Patients today anticipate a quick recovery after a fracture and a return to pain-free function. In our study, we compared the effectiveness of two commonly used treatment approaches for fractures of the middle third of the clavicle: open reduction and plating with locking compression plate and conservative treatment with a figure-eight clavicle brace. At the time of the injury, at 6 weeks, at 3 months, at 6 months, and at 12 months, the functional result was assessed using the Constant and Murley scores. At 6 weeks, 3 months, 6 months, and 12 months, the Constant and Murley scores in the surgery group were considerably higher than those in the conservative group. A randomised control study conducted by the Canadian Orthopaedic Trauma Society indicated that the surgical group's Constant Score and DASH Scores were considerably higher at 6 weeks, 12 weeks, and 24 weeks than those of the conservative group.¹⁵ When compared to non-surgical options, surgery for a mid-third fractured clavicle with a plate offers rapid

pain relief, early shoulder movement, a lower risk of non-union, and a quicker return to work.

Limitations

Limitations of current study were; a smaller sample size and a shorter follow-up period were taken into consideration. Even although preliminary findings are encouraging, further research, larger population studies, and meta-analyses are needed to verify the data presented.

CONCLUSION

This study compared two commonly used treatment approaches for mid-third clavicle fractures: open reduction and internal fixation with clavicular locking compression plate and conservative treatment with application of a figure-of-eight clavicle brace and sling. The goal was to determine which approach provides a better functional outcome. Constant and Murley scoring systems were used to evaluate the patients' functional outcomes, and it was observed that patients who underwent surgery had considerably better functional outcomes than the conservative group at 6 weeks, 3 months, 6 months, and 12 months, respectively. The issues we encountered in the surgical group included 3 cases of infection, 2 cases of implant failure, and 5 cases of non-union in the conservative group, all of which were comparable to the non-union rates in widely-read literature. There was also two case of superficial skin infection in surgical group. When compared to the conservative group, it was found that patients who underwent surgical therapy had better functional outcomes in terms of early ROM and returned to work sooner. According to the present study, patients with a displaced mid-third clavicle fracture may benefit more from surgery than from conservative treatment.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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Cite this article as: Sakharkar NS, Atram VA, Arora CA, Bhurre RK, Atilkar AJ, Sakhare K. Comparison of functional outcomes and complications of conservative management verses surgical fixation with a locking compression plate in the treatment of displaced middle third clavicular fracture. Int J Res Orthop 2022;8:623-7.