



CONSERVATIVE VS OPERATIVE MANAGEMENT OF DISPLACED MID-SHAFT CLAVICLE FRACTURE: A COMPARATIVE STUDY.

Orthopaedics

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ABSTRACT

Background: Clavicle fracture is one of the common fractures accounting for 2.6-12% of all fractures and 44-66% of shoulder fractures with midclavicle fracture accounting for 80% of clavicle fractures. Most of the clavicles were treated conservatively in past but recently there has been an increasing tendency for operative management of clavicle fractures. With studies done showing varying results it is not clear whether primary surgical management provides any better results than conservative management. So, this study was carried out to compare the radiological and functional outcome following conservative management to that of operative management with plating for displaced mid-shaft clavicle fractures.

Methods: In a single center, clinical study from December 2019 to Feb 2021, 30 patients with displaced midshaft fracture of the clavicle were randomized into either operative treatment with plate fixation or nonoperative treatment with clavicle brace and Arm sling. Outcome was analysed in terms of functional outcome and radiological union by standard follow-up, Constant and Murley shoulder score and plain radiographs. All 30 patients completed six month follow up and there was no difference between two groups with respect to patient demographics, mechanism of injury and fracture pattern.

Result: There was no significant difference in Constant-morley shoulder score between the two groups. The mean time of union was 13.06 weeks in operative group compared to 14.35 weeks in nonoperative group. There were two nonunion in nonoperative group compared to none in operative group. The complications in operative group were mainly hardware related. At six months after surgery patient were more likely to be satisfied with the results in operative group compared to nonoperative group ($p < 0.05$).

Conclusion: Six months after a displaced midshaft clavicular fracture, nonoperative treatment resulted in higher malunion and nonunion rate but similar functional outcome and union time compared to operative management. However, patients were more likely to be satisfied in operative group compared to nonoperative group.

KEYWORDS

INTRODUCTION

Clavicle acts as bony connection between thorax and shoulder girdle while contributing to movements around the shoulder. It is one of the common bones to fracture accounting for 4-12% of all fractures and 44-66% fractures around shoulder. Clavicle fractures represents 2.5-10% of all fractures in adults. The risk is higher in young male patients aged less than 30 years and patients aged over 70. The main causes are a direct blow to the shoulder or a fall onto an outstretched hand, especially during sport activities or road traffic accidents. Middle third fracture represents 69% to 82 % of all clavicle fractures and they often present some degree of displacement.^[1]

More than 200 methods of operative and nonoperative methods for management of clavicle fractures have been described. These methods can be roughly divided into operative and nonoperative methods.^[2]

Most commonly used nonoperative method is clavicle brace and an arm sling. It has advantage of being noninvasive and absence of exposure to anaesthesia. However, nonoperative methods are said to be associated with risk of non-union, residual deformity and patient dissatisfaction. Most clavicular fractures still are treated closed and heal uneventfully without serious consequences.^[3] Mandatory indications for surgical fixation of middle third clavicle fractures are open fractures, neurological or vascular compromise, skin tenting, widely displaced and comminuted fractures.^[4,5]

Displaced middle third clavicle fractures result in poor clinical outcomes, which include decreased strength and range of motion (ROM), ongoing pain, and patient dissatisfaction, especially in conservatively treated patients^[6]. Malunion of middle third clavicle fractures impairs shoulder biomechanics as well as, in some cases, causes neurovascular complications^[7,8]. The purpose of the present systematic review and meta-analysis is to compare the clinical outcomes of surgical and conservative treatment for middle third clavicle fractures in patients with a skeletal maturity, evaluating the incidence of complications such as patient's pain, aesthetic skin scarring, patient satisfaction, painful skin scarring and shoulder ROM.

MATERIALS AND METHODS

The study was done at Navodaya hospital, Raichur between December 2019 to Feb 2021 This is a prospective study that includes 30 patients with displaced midshaft fracture of the clavicle. These patients were either into operative treatment with plate fixation or nonoperative treatment with clavicle brace and Arm sling. Group A underwent conservative management (14 patient) and Group B underwent open reduction and internal fixation with a plate (16 patient).

Inclusion Criteria:

1. People older than 17 years old.
2. Evaluated at the Emergency Room.

Exclusion Criteria:

1. Comminuted fractures.
2. Multiple fragment or pathologic fractures.
3. Corrective osteotomies.
4. Pediatric patients.
5. Intramedullary pin fixation.

Patients with a median follow-up time of 6 months were evaluated clinically, with the Constant and Murley Scoring - Radiological evaluation was done with the help of X-Ray chest including both clavicles (Posterioranterior views) at subsequent follow-ups. The radiographic union was defined as complete cortical bridging between proximal and distal fragments on both radiographs.

RESULT

In this study, the youngest patient was 17 years, and oldest patient was 49 years with the average age being 31.167 years with a standard deviation of 9.606. The majority of patients (53.57% of total cases) were below 30 years of age. In our study the majority of cases 18 were male, and 12 were female. (p value=0.765).

In this study, 12 patients (40%) had right sided fracture, and 18 patients (60 %) had left sided clavicle fracture, and fracture distribution by the side on the two groups were similar with no statistical significance.

Most common mode of injury was road traffic accident (83.33%) followed by fall injury (16.67%).

		Conservative		Operative		Chisq	P
		No.	%	No.	%	uare	Value
Age	<30 years	8	57.14	8	50	0.268	0.875
	30 - 45 years	4	28.57	6	37.5		
	>45 years	2	14.29	2	12.5		
Gender	Male	8	57.14	10	62.5	0.089	0.765
	Female	6	42.86	6	37.5		
Union Time	< 12 weeks	6	42.86	10	62.5	1.272	0.529
	12 - 18 weeks	6	42.86	4	25		
	> 18 weeks	2	14.29	2	12.5		

The average union time in the conservative group was 14.35 weeks with a standard deviation of 4.217 and that in ORIF with plating group was 13. weeks with a standard deviation of 4.434 There was a reduction in the mean duration of the union when patient was managed operatively, but this reduction was not statistically significant.

	Group	N	Mean	Std. Deviation	"t" Test	P Value
Union Time	Conservative	14	14.35714	4.217311	0.816	0.421
	Operative	16	13.0625	4.434242		

There was a reduction in union time in operative group compared to the conservative group with 62.5% of fractures in an operative group united before 12 weeks whereas in conservative group 42.86% of fracture union occurred before 12 weeks (p value=0.529).

The average value of Constant and Murley score in the conservative group was 94.47 ± 7.514 and in operative group was 96 ± 7.909 . (p value=0.445)

There were 2 cases of nonunion in conservative group none of which had many limitations in range of motion with slight restriction in internal rotation and slight restriction of daily activities at six month follow up. On continued followup both the cases were asymptomatic with no functional restriction and no further intervention was required. There was a significantly high number of malunion in the conservative group compared to operative group. 8 (70%) cases in conservative group had malunion. Despite the high incidence of malunion in the conservative group, there was no significant functional restriction of the patient apart from the appearance of the region.

		No. of Cases	Percentage
Literality	Right	12	40
	Left	18	60
Pattern of Fracture	Oblique	13	43.33
	Transverse	13	43.33
	Segmental Fractures	4	13.33
Mode of Injury	RTA	25	83.33
	Fallen	5	16.67
Type of Plate	Anatomical Shape Plate	4	25
	Reconstructive Plate	8	50
	Semitubular Plate	4	25
Complication	Non Union Conservative	2	14.29
	Malunion Conservative	8	57.14

Patient satisfaction was found to be significantly higher in operative group compared to the conservative group at the end of six months. It was found that 93.75%(15) patients were satisfied with results in operative group compared to 71.42%(10) in conservative group (p value<0.05).

DISCUSSION

The aim of this study was analyzing whether patients with a displaced midshaft clavicular fracture are better managed with a plate fixation or a non-surgical treatment considering clinical results, functional outcomes and complication rate in patients treated at our department and comparing them to the literature.

Different conservative treatment methods are described of which arm sling and figure of 8 bandages are commonly used. None of the methods reduce fracture, but arm sling results better patient satisfaction with lesser side effect. Many earlier studies have shown excellent results with nonunion rate ranging from 0.3% to 6.2%. Recent studies have shown higher incidence of non-union with 4.5% to 9.5% in Robinson's series to as high as 15% in Hill's series.^(9,10)

More recent studies show the changes of the indications, evaluating the reduction of nonunion cases in surgically treated inpatients. In the literature, multiple studies report lower rates of nonunion after plate fixation than conservative treatment, reporting a relatively higher incidence of non unions following to conservative treatment, causing a shift toward surgical treatment. Plate fixation of the fracture also provides immediate stabilization, pain relief and early mobilisation and resumption of preinjury activities. Complications associated with plating of clavicle include infection, hardware failure, hypertrophic scar, delayed union or non-union and need of reoperation for implant removal.

In this study majority of the patients were young (< 30 years, mean age 31.16 years) with male preponderance (Male: 57.14% versus Female: 42.86%).

In this study majority of fracture was present on the left side (60%) compared to the right (40%). Similar to this study Judd et al., Postacchini et al. and Vaithilingam et al. have reported fracture clavicle to be more common in left side which was nondominant side in most of the cases^(9,11).

In this study, 83.33% of cases developed clavicle fractures following road traffic accident with direct impact on shoulder followed by fall injury in 16.67% of cases. Similar to this study Vaithilingam et al., Patel et al. and Judd et al. had reported road traffic accident as the most common mode of injury accounting for 53% to 70% of cases^(9,11,12).

In this study there was no significant reduction in time required for fracture union with the union in operative group occurring at the mean time of 13.062 weeks compared to 14.357 weeks in conservative group. Judd et al., Patel et al. and Vaithilingam et al. also reported reduction in union time in operative group compared to the conservative group^(9,11,12). This relative increase in union time in an operative group in this study could be attributed to a case which had implant failure resulting into repeated surgery and delayed union and longer duration between two follow-ups thereby increasing union time.

In this study, Physiotherapy was initiated in the conservative group only after six weeks of immobilization compared to early initiation of physiotherapy in other studies. This longer duration of immobilization could have resulted in the reduction in union time by reducing the motion at the fracture site.

In this study, there was no significant difference in the Functional outcome measured regarding Constant and Murley scoring between the two groups of patient. A study was done by Canadian Orthopaedic Trauma Society, Wang et al. and Vaithilingam et al. have shown better functional scoring with a patient undergoing operative management compared to conservative management^(9,13,14). However, in all the studies there was no restriction of motion at shoulder joint in either group of patients.⁽⁹⁾

Considering the clinical scores in the previous studies, the Constant and DASH scores showed better results in the surgically treated group, than in the conservative group although the differences were only respectively 4.4 and 5.1 points, largely less than the 10 to 15 points, generally defined as the minimal difference for the clinical relevance. It remains 2 controversial whether shortening of the clavicle after non-surgical treatment of a middle third fracture can affect shoulder ROM: in literature, there is no correlation between shortening and functional outcomes, even though the difference exceeds 2 cm.

Recent clinical trials comparing conservative and operative management of displaced clavicle fracture have shown varying results that ranged from similar outcome despite the treatment method to a better outcome with operative management^(11,13,15). Range of motion was preserved in all cases of fracture clavicle despite the method of management^(9,11,13,15). Robinson et al. performed secondary plate fixation in 81% of patients with non-union fracture after 6 months. In Schemistch series for Canadian Orthopaedic Trauma Society (COTS), all patients with a non-union after 1 year follow-up period, underwent plate fixation.⁽¹⁰⁾

In this study the incidence of delayed union was similar in both the groups. Conservative management of clavicle fracture results in higher rate of non-union and malunion compared to operative management whereas operative management results in higher rate of plate related

complications^[9,13,15,16].

This is similar to study done by Canadian Orthopaedic Society who found higher rate of nonunion in conservative group compared to operative group (7 of 49 in conservative versus 2 of 62 in operative). They also reported higher rate of symptomatic malunion in conservative group (9 of 49) compared to operative (none)⁽¹³⁾.

Similarly, Patel et al. and Vaithilingam et al had reported a higher incidence of malunion and nonunion in the conservative group compared to operative group and plate-related complications in operative group.^(9,12)

In this study patient satisfaction was higher in operative group compared to conservative group (93.75% in operative group compared to 71.42% in conservative group). This study has few limitations like the study was carried out in a single institution, and the sample size was less. The duration of follow up was only six months. Long-term result could have been assessed on longer follow up. Other methods of operative management were not considered.

CONCLUSIONS

Plate fixation of a displaced clavicular fracture does not result in improved clinical and functional outcome at 6 month follow-up period, but significantly reduces the risk of non-union. Therefore, we suggest an individualized patient-by-patient treatment, taking into consideration the functional demand, the general clinical diseases, the fracture characteristics and the non-union risk factors such as large displacement.

We suggest surgical treatment as gold standard in young patients, who demand a fast recovery and a good upper limb ROM and should non-union risk factors be present, where, as conservative treatment can be considered a good option for elderly or less active patients, especially in case of risk factors that can contraindicate surgery.

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