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The study of the functional outcome between surgical & conservatively treated clavicular fractures

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Abstract

Background: One of the most frequently fractured bones in the body is the clavicle. Traditionally, midshaft clavicle fractures have been treated conservatively. There is a higher prevalence of patients with displaced midshaft clavicle fractures going in for non-union or mal-union after conservative treatment than in those treated with Open Reduction & Internal Fixation (ORIF). The primary treatment for displaced midshaft clavicular fractures is surgery. Improved functionality, a reduction in the time taken for a union, and early return to activity were observed in patients treated operatively as compared to those treated with a conservative approach.

Materials and methods: The Department of Orthopaedics, A.J. Institute of Medical Sciences and Research Centre, Mangalore, conducted a hospital-based retrospective and prospective study for two years. On meeting the inclusion and exclusion criteria after ethical clearance and consent, a total of 100 cases of midshaft clavicle fractures were treated by operative and non-operative methods. Physiotherapy was started for the patients after 3 weeks. Follow-ups were done at 6, 12, and 24 weeks and the patients were evaluated clinically based on the Constant-Murley Score.

Results: There was a significantly higher number of male subjects compared to females (83% against 17%). 54 patients (54%) had a history of RTA while the remaining 46 patients (46%) gave an account of a fall. The youngest patient's age was 19yrs, while the oldest was 72yrs old. The mean age was 36.93 years. Amongst the complications witnessed, 1 patient had plate breakage, 13 patients experienced non-union, and 18 patients had a limitation in range of motion. 63% of patients had a left-sided fracture, whereas 37% of patients had a right-sided fracture.

As per the Constant and Murley scoring system, the Conservative study 46% fell under the Good category, 36% had Fair functional outcome while 18% had a poor result. In the Operative study, 82% fell under the Good category, 16% had a Fair functional while 2% had a poor outcome.

Conclusion: Midshaft clavicular fractures treated operatively have clinically better union rates in comparison to those taking a conservative approach based treatment.

Keywords: clavicle fracture, operative, non-operative, radiological union, clavicle brace

Introduction

Fractures of the clavicle comprise ~2.6–5% of all the adult fractures [1, 2]. Commonly encountered in athletes following fall on the ipsilateral shoulder. 85% of these fractures occur in the midshaft as here, the conventional compressive forces subjected to the clavicle in addition to its narrow bony cross-section result in a fracture [3]. Open fractures of the clavicle are rare, amounting to only 0.1-1% of cases. Midclavicular fractures are twice as common in women. 10% of patients also have associated injuries, including vertebral fractures, rotator cuff injuries, or rib fractures [4]. Conventionally, conservative management has been the treatment of choice for clavicular fractures [5, 6]. However, recent studies show surgical intervention significantly reduces the incidence of non-union with improved functional outcomes while also being cosmetically superior, resulting in better patient satisfaction when compared with non-surgical treatment. Surgical fixation is assumed as the mainstay for displaced midshaft fractures of the clavicle. Surgical fixation leads to better function, faster union, and early resumption to activity when compared to conservative management.

The objective of the study was to assess the safety and effectiveness, the functional outcome, any non-union or malunion, and the complications of clavicular fractures treated by surgical

fixation when compared to conservative management.

Materials and methods

All patients presenting to A.J. Institute of Medical Sciences and Research Centre in the emergency and out-patient department, satisfying the inclusion and exclusion criteria during the study period, were included. The sample size consisted of 100 patients, with the conservative and operative groups having 50 patients each.

Only the patients who were above 18 years of age with closed

mid-clavicular fractures were included in the study, while many patients with associated AC joint dislocation, lateral or medial 1/3rd fractures were omitted from the study.

The patient's undergoing conservative treatment was done so with a clavicular brace (Figure 1) along with an arm pouch.

Patients subjected to surgical fixation underwent pre-operative assessment. Fitness for surgery was acquired. Post-operatively at 6, 12, and 24-week follow-ups, the patients were assessed clinically based on the Constant-Murley Score.



Fig 1: Xray of a Conservatively Treated Patient

Surgical technique

The patient is positioned supine with a large towel roll placed in the interscapular region. This position facilitated the injured shoulder to be positioned posteriorly restoring length and achieving optimum exposure of the clavicle. Incision extending from over the fracture site, starting from the sternal notch to the anterior edge of the acromion was made. The platysma is released on the lateral aspect, followed by the identification of the supraclavicular nerve, which is retracted. An incision is made over the Clavipectoral fascia along with its attachment. Fracture is reduced and held with bone clamps following soft tissue dissection. Provisional fixation was achieved using a lag screw in select cases as required. A 3.5 mm plate was contoured along the anteroinferior edge of the clavicle. The screws used for fixation of the plate are aimed posteriorly and superiorly^[9]. For optimum fixation, the plate is contoured along the superior edge of the clavicle (Figure 2). The screws are inserted superiorly and directed inferiority. Adequate measures were taken to avoid neurovascular injury^[9]. The surgical wound was approximated in layers. (Figure 3)



Fig 2: Application of clavicle plate

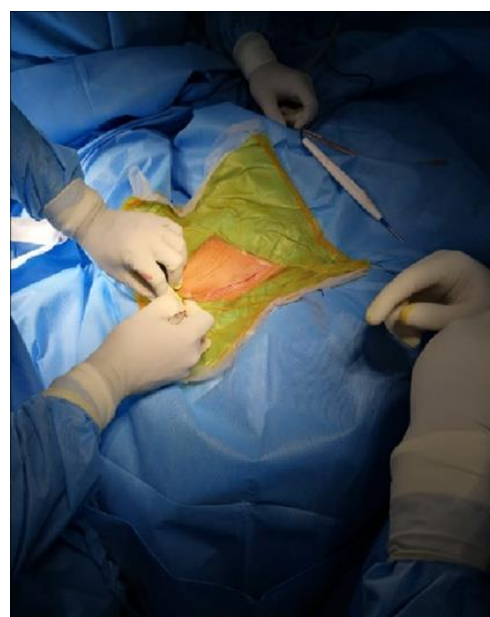


Fig 3: Wound closure

Rehabilitation

The shoulder is immobilized in adduction and internal rotation with a sling until postoperative day 12, followed by suture removal when gentle pendular movements are started. Gentle active range of motion of the shoulder is initiated at 6 weeks with abduction limited to 80°. Active to an active-assisted range of motion in all planes are allowed after 6-8 weeks

Isometric and isotonic exercises are introduced for shoulder girdle muscles after 8-12 weeks^[10].

Results

In our study, the mean age of our patients was 36.9 ± 11.78 years. Patient ages ranged from 19-80 years old. Among 21-

30 years old, there were 35% of the patients (Figure 6). The study had 83 male and 17 female patients, which was akin to a study done by Channappa *et al.* [17]. Our 54 patients sustained the fracture in a road traffic accident, and the other 46 with a history of fall. Our study also concluded that at 6, 12, and 24 weeks, functional outcomes were better in the operative group ($p > 0.01$) in comparison to the non-operative group. However, as expected, patients who treated operatively (82%) had a slightly more extended hospital stay of 4-6 days, with 4% of patients staying only for 1-3 days (Table 1).

Table 1: Duration of hospital stay

Duration of stay (in days) in hospital	Number of Patients	Mean	Standard Deviation
1-3	2 (4%)	5.3	1.89
4-6	41 (82%)		
7-10	7 (14%)		
Total	50 (100%)		

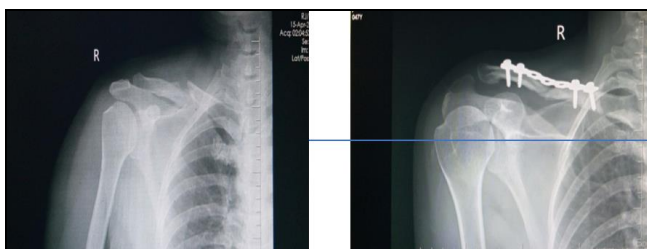


Fig 4: Xray of an operated patient

Complications (figure 8)

Only one patient in the study presented to us with an implant fracture. The Plate broke after attempting to lift a heavy object one month following surgery (Figure 5). The patient was subjected to revision surgery. Among the operated patients, none of them developed non-union. Non-union (13) and restriction of shoulder movements (14) were seen in 54% of the patients in the study, all belonging to the conservative group.



Fig 5: Plate Breakage Xray (Complication)

Discussion

Debate continues about the need for surgical fixation instead of Conservative management for Clavicular shaft fracture. An earlier school of thoughts favouring conservative treatment soon transitioned towards surgical fixation. Nischoll *et al.*, in his study, have mentioned, "It is known that all that is

necessary is to support the elbow and brace the shoulders" and that fracture clavicle cannot be effectively immobilized [11]. Very little importance was conventionally given to middle-third fractures of clavicle shaft because of the pain and disability that they produce, particularly during the first three weeks of treatment. Also, it is quite challenging to support a fracture of the middle third of the clavicle by external means with a clavicular brace in adults [12]. Another 10-year study involving fifteen adult patients with clavicular non-unions was evaluated. These patients were initially treated with a clavicular brace, but it did not prove advantageous in providing pain relief or adequate reduction of the fracture. Another study involved transcortical fixation by using locking Knowles pin for treating hypertrophic non-union as well as for irreducible acute fractures [13]. An alternate study concluded that although non-operative treatment of clavicular fractures provided good union with minimal physical deficits, surgeon-based methods of assessment may be insensitive to loss of muscle strength. They detected residual deficits in shoulder strength and endurance in their patient population, which may be related to the significant level of dysfunction detected by the patient-based outcome measures [7]. 15% of cases with displaced midshaft fractures treated conservatively had developed non-union, while 31% reported unsatisfactory results. Thus the need for open reduction and internal fixation of severely displaced fractures of the middle third of clavicle in adults was stressed.

A study on 868 patients with conservatively treated clavicular fractures showed a prevalence of 6.2% non-union, which was higher than reported previously. The following factors increased the risk of non union in diaphyseal clavicular fractures- lack of cortical apposition, comminution, age and female sex. These factors can be upheld while counseling the patients regarding the risk for development of non-union following injury [19].

Ramkumar Reddy *et al.* [14]. Through their study, had an average age group between 19-39 years (66%), while 2 patients were more than 50 years of age. The average age is 33.8 years.

A study by Ramesh *et al.* [15] demonstrated that in a group of 20 patients, 45% were in the age group of 21-30 years. The youngest patient being 19 years, while the oldest is 60 years old.

Most of the patients presenting to our hospital with clavicle fractures were a result of road traffic accidents. This result had similar findings as compared to the numerous studies done by Ramkumar *et al.* [14], Mohamed E. Attia *et al.*, [18] & H. Jiang *et al.* [16].

The two groups in our study had their functional outcomes and complication rates compared. The operative group had better functional outcomes across all follow-ups than in the non-operative group ($p > 0.05$) (Figure 7). There were no cases of non-union in the operative group, whereas the non-operative group had 13 cases. None of the patients in the operative group had symptomatic mal-union. One year following injury, the operated patients had better functional and cosmetic outcomes than the non-operative group patients (Figure 9 & 10) [7].

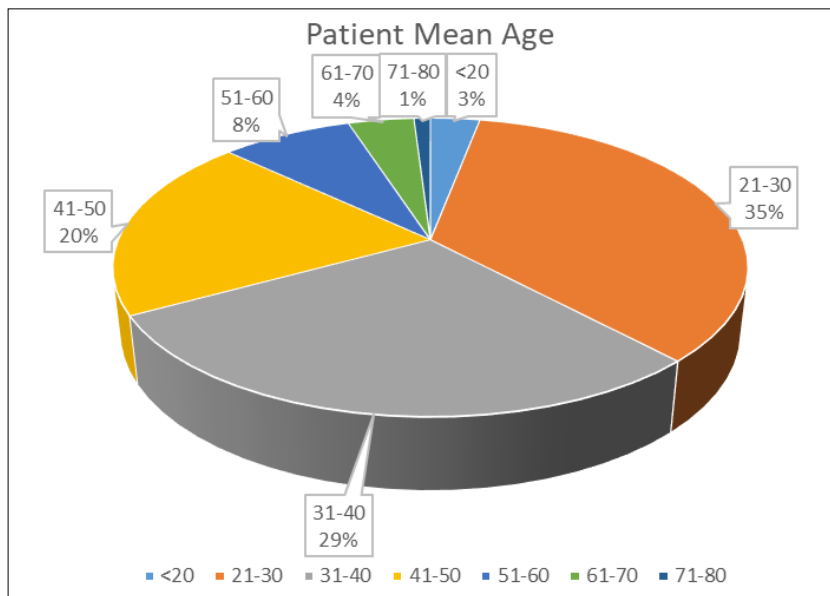


Fig 6: Mean age of patients

Conclusion

According to the study conducted on 100 patients, we observed that the conservative group had a higher rate of complications compared to the operative group. We noticed that early primary plate fixation of midshaft clavicle fractures resulted in better functional outcomes for the patients and a rapid return to function and work. In patients treated

operatively, there were zero instances of non-union or malunion. The operated patients were delighted with the range of movement and appearance of their shoulders. In conclusion, we reiterate that patients with midshaft clavicular fractures treated operatively showed better functional outcomes and earlier return to their daily activity compared to those who were treated conservatively (Figure 7, 9 & 10).

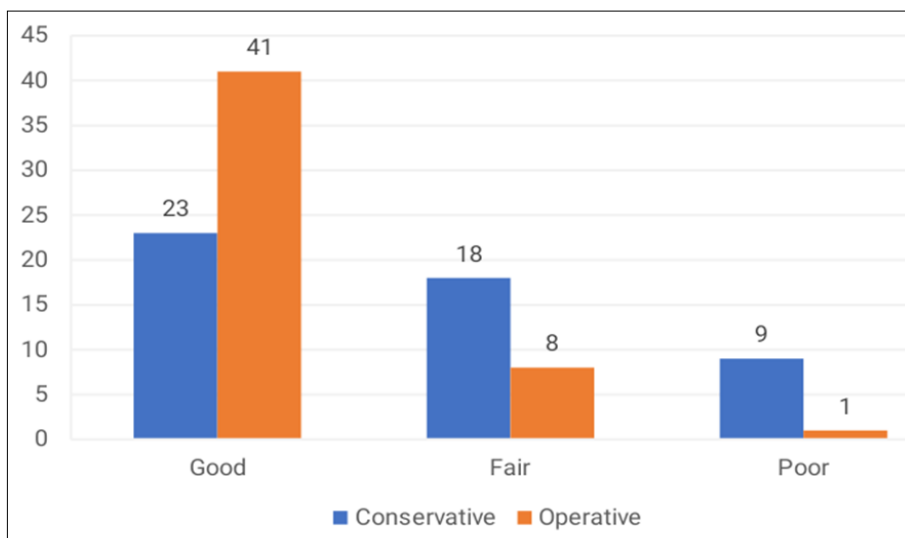


Fig 7: Functional outcome result

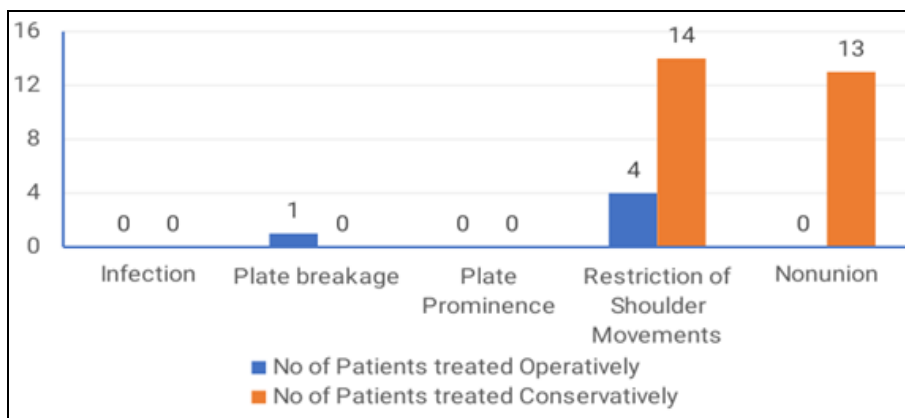


Fig 8: Complications noted



Fig 9: ROM of Conservatively Treated Patient



Fig 10: ROM of surgically treated patient

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