

Study of Mid-Shaft Clavicle Fracture Treated with Precontoured Locking Compression Plate at Tertiary Care Hospital

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Received: 26-12-2022 / Revised: 13-01-2023 / Accepted: 03-02-2023

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Conflict of interest: Nil

Abstract

Background and Aim: The majority of displaced mid shaft clavicle fractures do not require surgery. Non-union, delayed union, and improper union are all risks associated with non-operative therapy of these fractures with axial shortening. The purpose of the current study was to examine a tertiary hospital's precontoured locking compression plate treatment of a mid-shaft clavicle fracture.

Material and Methods: The current study is a prospective, observational analysis carried out at the orthopaedics department of the medical college and affiliated hospital. A two-year study period was involved. The study included young individuals, closed fractures, and displaced clavicle fractures. Clavicle fractures were treated with a locking compression plate that was precontoured. Follow-up was conducted every two weeks until three months, then once a month until six months, then once every two months until one year.

Results: Mean age was recorded to be 46.57 ± 15.23 years, majorities of the male, had road traffic accident (81.25 %) and unilateral clavicle fracture was found in majority of the patients (96.87 %). Results were analyzed both clinically and radiologically. Mean operation time was 49.41 ± 15.70 minutes and return to activity was noted in 8.81 ± 8.60 weeks.

Conclusion: Utilizing a precontoured clavicular locking compression plate, which is biomechanically stable and enables stable angular and multi-planar fixation of distal fragment regardless of bone quality, produced positive results in the fracture fixation of the small distal fragments of the lateral end clavicular fractures. In order to achieve maximal compression, quick fracture healing, and early mobilisation, precontoured locking compression plates have been equipped with compression mechanisms.

Keywords: Compression Plate, Mid Shaft Clavicle Fractures, Unilateral Clavicle Fracture, Road Traffic Accident.

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Introduction

The clavicle, which connects the thorax to the shoulder girdle, aids in shoulder girdle movements. Due to their subcutaneous location, clavicles fracture is a common

traumatic injury in the shoulder girdle. Either a low-energy or high-energy collision is what causes it. An S-shaped bone called the

clavicle serves as a strut between the sternum and the glenohumeral joint [1,2].

A clavicle fracture makes up between 44% and 66% of all fractures and accounts for 2.6% of all fractures that occur around the shoulder. The medial and lateral thirds of the clavicle only account for 15% and 5% of all clavicle fractures, respectively, while the middle third accounts for 80% of all clavicle fractures. With certain types of immobilisation, the majority of minimally displaced clavicle fractures can be successfully managed without surgery [3,4].

The most commonly used system of classification of clavicular fractures is that of Allman. It is divided into 3 groups [1,5].

1. Group I: Middle-third fractures.
2. Group II: Lateral-third fractures.
3. Group III: Medial- third fractures.

The mid-clavicular region of the clavicle has a weak spot, which accounts for the majority of fractures in this area. A thorough understanding of the various muscle and ligamentous stresses acting on the clavicle is required to comprehend the nature of clavicle fracture displacement and to draw the conclusion that certain fracture patterns are hazardous if not reduced and surgically stabilised [6-9].

The majority of displaced mid shaft clavicle fractures do not require surgery. Non-union, delayed union, and improper union are all risks associated with non-operative therapy of these fractures with axial shortening. Other problems include excruciating pain, neurological issues, loss of shoulder function, protruding calluses that form, edoema, and skin stretching that is unsatisfactory from an aesthetic standpoint [10-12].

People who engage in a lot of activity may be less willing to accept a lengthy healing period and decreased shoulder function, necessitating more aggressive treatment for middle third clavicle fractures. These clavicle

fractures can be quickly fixed, allowing for early shoulder mobility and greater patient comfort. Fixation of the clavicle improves function in situations of concomitant scapula fractures by restoring the mechanics of the shoulder [2,13].

There are several surgical approaches for treating clavicle mid-shaft fractures, including plate fixation, intramedullary K-wire fixation, and Steinmann pin fixation. When plates are utilised to treat a severe displaced or comminuted fracture, a strong anatomical reduction can be achieved. There are several different types of plates, including semi-tubular, Sherman, dynamic compression, locking clavicle, and dynamic compression plates [14]. The most popular of them is the clavicle locking compression plate (LCP), which is precontoured to a S shape in accordance with the curvature of the clavicle. The purpose of the current study was to examine a tertiary hospital's precontoured locking compression plate treatment of a mid-shaft clavicle fracture.

Materials and Methods

The present study is the prospective and the observational analysis done in the department of the orthopaedics, medical college and associated hospital. Study was done for the period of 2 years. The study was approved by institutional ethics committee. Young patients, closed fractures, displaced clavicle fractures are included in the study. Confidentiality and anonymity of the patient's information were maintained during and after the study

Inclusion criteria: After obtaining their written agreement, adult male and female patients in the age range of 18 to 60 who arrived to our hospital with a displaced middle third clavicle fracture (Robinson type 2B1) and displaced fracture were enrolled for this study.

Exclusion criteria:

1. Age < 18 years and >60 years
2. Open fractures
3. Fracture in medial or lateral third of clavicle.
4. Pathological fractures
5. Undisplaced fractures
6. Polytrauma patient
7. Established non-union from a previous fracture
8. Any medical contraindication to surgery or general anaesthesia
9. Patient refusing Surgery (lack of consent)

Routine investigation along with HIV, HBsAg screening tests were done before surgery on all included patients. The anatomy of the fracture was assessed with X-rays. Diagnosis of the fracture was done after clinical and radiological examinations. For the surgical procedure, written informed consent was obtained. All patients were operated on as soon as feasible after the doctor cleared the patient for surgery. In the emergency room (ER), arm pouches were given to each patient for use as a temporary splint for their fracture. Prior to admission, a pre-anaesthetic assessment and surgical profile were completed. Under supine anaesthesia, general anaesthesia was used to operate on all of our patients.

Clavicle fractures were treated with a locking compression plate that was precontoured. For five days, analgesics and antibiotics were administered. An arm bag was used to immobilise the operated upper limb. To examine how the fracture pieces were aligned, check x-rays were acquired. After being examined on the second post-operative day, the wound was later released with an

arm pouch. Codman's exercises and pendulum movements were introduced on the third postoperative day. Second week: Exercise with full range of motion was permitted in place of the sling.

Up until three months, follow-ups were conducted every two weeks, then monthly until six months, and then every two months until one year. Sports and heavy lifting should be avoided for the first 12 weeks. Constant and Murley scores were used to evaluate the functional outcome. Data was gathered and organised using Microsoft Excel, and descriptive statistics were used for statistical analysis.

Results

During study period 64 midshaft clavicle fractures were treated with precontoured locking compression plate at the hospital. Out of the 64 cases, 58 patients were male and 6 patients were female. Age of the included patient varies from 18 years to 60 years. Mean age was recorded to be 46.57 ± 15.23 years, majorities of the male, had road traffic accident (81.25 %) and unilateral clavicle fracture was found in majority of the patients (96.87 %). Results were analyzed both clinically and radiologically.

In present study, mean operation time was 49.41 ± 15.70 minutes and return to activity was noted in 8.81 ± 8.60 weeks. The different complications that were noted were Dyesthesia, Wound dehiscence and Painful shoulder. No motion limitation or hypertrophic scars were noted. At 1 year follow-up, excellent Constant score was noted in majority of 83.38 % patients.

Table 1: Follow Up Constant Score in the included Patients

Constant score	Interpretation	No. of cases
< 30	Unsatisfactory	0
31 – 40	Fair	0
41 – 60	Good	2
61 – 70	Very good	8
> 70	Excellent	54

Discussion

Treatment for clavicle fractures is typically conservative. Poor outcomes were identified after conservative treatment for displaced middle third clavicle fractures in studies undertaken to examine the outcomes of conservative therapy by Hill *et al.* in 1997, Nordqvist *et al.* in 1998, and Robinson *et al.* in 2004. As a result, there are unique symptoms including displacement and comminuted middle third clavicle fracture [15,16].

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 incapacity before resulting in longer-term deformity and disability. The central third of the bone (76–82%) is most frequently fractured, while the distal (12–21%) and medial (3-6%) thirds are less frequently broken. The majority of these fractures have often been managed with figure-of-eight harnesses, slings, or benign neglect [6,17].

In our study, men experience clavicle fractures more frequently than women. Patients comprised 58 men and 6 women. This is analogous to prior research by Elidrissi Mohammed *et al.* in which two patients were female and 32 patients were male, out of 34 total patients. Out of 20 patients in a research by Dhoju *et al.*, 16 were men and 4 were women. This leads us to the conclusion that it occurs more frequently in those who are active.

Plate fixation may be less technique-sensitive and offers instant rigid attachment with rotational stability. However, potential downsides include hypertrophic scarring, skin irritation from implant prominence, infections, and implant failure. Contrarily, intramedullary fixation results in superior

cosmetic outcomes and is less invasive with respect to implant prominence. It does have certain drawbacks, though, such as the need for intraoperative radiation exposure, damage to neurovascular structures, and the removal of the implant to stop migration.

In the Kakkar RS *et al.* trial, all 32 patients experienced fracture union within the first 6 months of follow-up. According to Constant-Murley scoring, 56.25% of the cases had excellent results, 34.37% had good results, 6.25% had fair results, and 3.12% had bad results. By restoring the anatomy, biomechanics, and contact loading characteristics of the clavicle, open reduction and internal fixation surgery with precontoured locking compression plates in the displaced midshaft clavicle fractures significantly lowers the incidence of nonunion and improves functional outcomes, leading to higher patient satisfaction [15].

The use of locking compression plates for the treatment of displaced midshaft clavicle fractures results in better biomechanical stability, high postoperative constant scores, good fracture union rates, rapid pain relief, rapid return to activity, high patient satisfaction rates, and excellent functional outcomes. When utilised in particular situations such displaced with or without comminuted middle third clavicle fracture, the benefits of plating outweigh the risks.

Conclusion

Utilizing a precontoured clavicular locking compression plate, which is biomechanically stable and enables stable angular and multi-planar fixation of distal fragment regardless of bone quality, produced positive results in the fracture fixation of the small distal fragments of the lateral end clavicular fractures. In order to achieve maximal compression, quick fracture healing, and

early mobilisation, precontoured locking compression plates have been equipped with compression mechanisms.

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