



PROSPECTIVE INVESTIGATION OF PRECONTOURED LOCKING COMPRESSION PLATES USED TO TREAT CLAVICLE FRACTURES

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Article Info: Received 13 January 2020; Accepted 24 February. 2020

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Conflict of interest statement: No conflict of interest

ABSTRACT:

Background: Due to its subcutaneous position, clavicle fracture is a common bone injury in the shoulder region. Treatment options for clavicle mid-shaft fractures include plate fixation, intramedullary K-wire fixation, and Steinmann pin fixation. The purpose of the current study was to examine a tertiary hospital's precontoured locking compression plate treatment of midshaft clavicle fractures.

Goals and objectives: The purpose of the current study was to examine a tertiary hospital's precontoured locking compression plate treatment of midshaft clavicle fractures.

Material and Methods: This study involved patients with isolated closed midshaft clavicle fractures with displacement > 2 cm, shortening > 2 cm, and Robinson classifications 2B1 and 2B2 who were aged 19 to 60 years, of either gender (displaced fractures).

Results: 64 midshaft clavicle fractures were treated with precontoured locking compression plates at our institution during the trial period. The majority were male (78.26%), the mean age was 43.12 11.28 years, and the majority suffered road traffic accidents (81.50%) and unilateral clavicle fractures (96.43%). In the current study, the average surgery lasted 46.19 12.33 minutes, and a return to normal activities took 7.39 4.28 weeks. Dysthesia (6.50%), Wound dehiscence (3.26%), and Painful shoulder (9.59%) were complications reported. There were no obvious mobility restrictions or hypertrophic scars. Only 12 fractures (18.38%) needed 14 weeks to heal, which is faster than the average (53.26%). Excellent Constant scores were reported in 83.38% of patients during the 1-year follow-up.

Conclusion: Precontoured locking compression plates are used in unstable displaced comminuted fractures in the middle part of the clavicle to provide fracture stability, promote early union, allow for early mobility, and avoid motion restriction and shoulder stiffness.

Keywords: precontoured locking compression plates, comminuted fractures, midshaft clavicle, early union, early mobility.

Introduction:

Due to its subcutaneous position, clavicle fracture is a common bone injury in the shoulder region. Clavicle fractures are said to make up between 2 and 4 percent of all fractures¹. The majority of clavicular fractures, 80–85% of all fractures, are middle-third fractures. Clavicle fractures primarily affect males under the age of 30; however, they are more common in both sexes above the age of 70². Adults with non-displaced clavicular fractures should get conservative therapy, which includes early rehabilitation and immobilisation in an arm sling

or figure-of-eight bandage. A number of studies compared surgical and non-surgical treatment options for treating clavicular fractures in adult athletes³. The results show that surgical treatment has significant postoperative strength benefits, functional outcomes, a shorter recovery period before returning to normal activity, and a lower nonunion rate⁴.

Treatment options for clavicle mid-shaft fractures include plate fixation, intramedullary K-wire fixation, and Steinmann pin fixation. Particularly in severe displaced or comminuted fractures, locking compression plate fixation can

aid in achieving strong anatomical reduction⁵. There are several different types of plates, including semi-tubular, Sherman, and dynamic compression plates. The most favoured among them is a reconstruction plate or a pre-contoured locking compression plate⁶.

Aims & objectives:

The purpose of the current study was to examine a tertiary hospital's precontoured locking compression plate treatment of midshaft clavicle fractures.

Material And Methods:

This study, which was done at the orthopaedic department of a medical college in Central INDIA, was prospective and observational. A two-year study period was used (from May 2019 to June 2021). The institutional ethics committee gave its approval to the project.

Inclusion criteria: Patients between the ages of 19 and 60, of either gender, who have isolated closed midshaft clavicle fractures with displacement and shortening measurements greater than 2 cm and Robinson classifications 2B1 and 2B2 (displaced fractures).

Exclusion criteria: Open fracture. proximal or distal third of the clavicle fracture. Around the shoulder girdle, pathological fractures and other traumas. Neurovascular damage that is related. Clavicle fractures fixed using different techniques.

When the patient was admitted, a signed informed consent was acquired. All of the patients received surgical treatment, including open reduction and internal fixation with locking compression plates, and they all underwent ongoing follow-up care in our outpatient department (OPD).

In the emergency room, a thorough general physical examination, detailed history taking,

antero-posterior (AP) chest X-rays of both shoulders, an AP clavicle radiograph, 300 cephalo-caudal views, and injury paperwork were all completed. 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 general anaesthesia, all of our patients were operated on while lying on their backs with sandbags under their scapulae. Clavicle fractures were treated using locking compression plates that were 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. Beginning on the third post-operative day, Codman's exercises and pendulum movements were introduced. 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

64 midshaft clavicle fractures were treated with precontoured locking compression plates at our institution during the trial period. The majority were male (78.26%), the mean age was 43.12 ± 11.28 years, and the majority suffered road traffic accidents (81.50%) and unilateral clavicle fractures (96.43%).

Table 1: General characteristics

Particular	Mean/ No. of patients	Percentage
Mean Age (years)	43.12 ± 11.28	
Gender		
Male	50	78.13%
Female	14	21.88%
Mode of Injury		0.00%
RTA	52	81.25%
Fall from Height	12	18.75%
Laterality		0.00%
Right	34	53.13%
Left	28	43.75%
Bilateral	2	3.13%

In the current study, the average surgery lasted 46.19 ± 12.33 minutes, and a return to normal activities took 7.39 ± 4.28 weeks. Dysthesia (6.50%), Wound dehiscence (3.26%), and Painful shoulder (9.59%) were complications reported. There were no obvious mobility restrictions or hypertrophic scars.

Table 2: Surgical characteristics and complications

Particular	Mean/ No. of patients	Percentage
Operation time (min)	46.19 ± 12.33	
Return to activity (weeks)	7.39 ± 4.28	
Complications		
Dysthesia	4	6.25%
Wound dehiscence	2	3.13%
Painful shoulder	6	9.38%

Only 12 fractures (18.38%) needed 14 weeks to heal, which is faster than the average (53.26%).

Table 3: Radiological union in weeks.

Union in weeks	Number of cases	Percentage
8	4	6.25%
10	14	21.88%
12	34	53.13%
14	12	18.75%

Excellent Constant scores were reported in 83.38% of patients during the 1-year follow-up.

Table 4: Constant score

Constant score	Interpretation	Number of cases	Percentage
<30	Unsatisfactory	0	0.00%
30-39	Fair	0	0.00%
40-59	Good	2	3.13%
60-69	Very good	8	12.50%
>70	Excellent	54	84.38%

Discussion

The shoulder can move anteriorly and centrally in clavicle fractures with substantial shortening, which may impair glenohumeral and scapulothoracic function⁷. The middle shaft bone is particularly prone to fracture due to its tiny cross section and the usual muscular stresses operating on it. For midshaft fractures, plating, an elastic stable intramedullary nail (ESIN), and Sonoma CRx intramedullary nails outperformed nonoperative therapies in terms of function and time to radiographic union⁸⁻¹⁰. With rotational stability and an initial rigid fixation, plate fixation may be less technique-sensitive. However, potential downsides include hypertrophic scarring, skin irritation from implant prominence, infections, and implant failure. On the other hand, intramedullary fixation is less invasive, results in implants that are more subtly visible, and is better for cosmetic reasons¹¹. 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 prevent migration¹². In a research by Kumar A, anatomic locking compression plate treatment resulted in union in 17 out of 20 patients, on average, after 3 months (12 weeks). There were three patients with delayed union, one patient with plate loosening, and three patients with plate prominence. Constant and Murley scores after fracture union demonstrate that 15 patients had outstanding functional outcomes, 4 had acceptable outcomes, and 1 had a fair outcome¹³.

Out of 50 instances, 47 (94.0%) had great outcomes without problems, according to H. Shashidhara et al. Bone grafting was used to treat 2 (4.0%) cases with delayed union, and the plate was removed from 1 (2.0%) case where the medial portion of the plate was exposed at the 8-week mark. The best method for managing displaced clavicle fractures is surgically treating them with pre-contoured locking compression plates and screws with lag screws. This method produced outstanding outcomes. 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 results¹⁴. The anatomy, biomechanics, and contact loading characteristics of the clavicle are restored with open reduction and internal fixation surgery in the displaced midshaft clavicle fractures with pre-contoured locking compression plates. This procedure also significantly lowers the incidence of non-union with improved functional outcomes, leading to higher patient satisfaction. In a trial including 100 patients, Karki P et al. reported that 98% of patients experienced union, with an average waiting period of 4.16 ± 1.23 months. Functional outcomes were outstanding in 80% of cases and satisfactory in 17%. There were two significant issues; one required a second procedure and the removal of the hardware owing to a severe infection, and the other developed a nonunion. One patient experienced a refracture two weeks after having their implant removed due to further trauma¹⁵. 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 as displaced with or without comminuted middle third clavicle fracture, the benefits of plating outweigh the risks (Robinson Type 2B1, 2B2).

Conclusion

Precontoured locking compression plates are used in unstable displaced comminuted fractures in the middle part of the clavicle to provide fracture stability, promote early union, allow for early mobility, and avoid motion restriction and shoulder stiffness. Our study's main weaknesses were its limited sample size and single-center design. To more thoroughly assess the results and side effects of precontoured plates, larger randomised controlled studies are required.

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