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Original Research Article

Management of Clavicle Fractures using Precontoured Locking Compression Plate

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Abstract:

Current study conducted to analyze the role of precontoured locking compression plate in unstable comminuted clavicular fractures. Study included 40 patients with mid third clavicular fractures which were treated surgically by precontoured LCP & screws. The common cause of this fracture was a fall from a vehicle, and the majority of patients were men. The left side accounted for 65% among all fractures. In 34 patients (85%) surgery was done within 1st week. The indication for surgery in middle third clavicle fracture was ALLMAN Type 1B in 36 patients (displacement >100%) and ALLMAN Type 1A in 4 patients (displacement <100%). The mean length of hospital stay was 11.5 days. In 36 patients, the duration of union of means of 9.3 wk (8 - 12 weeks). According to the Constant Murley score, the functional prognosis was outstanding in 34 patients (85%), good in 4 patients (10%), and fair in 2 patients (5%). Precontoured locking compression plates in unstable displaced comminuted fractures in middle 3rd clavicle give fracture stability, allow early mobility and thereby prevent the shoulder stiffness. Bone union with a precontoured locking clavicle plate is possible by lowering complication rates in midshaft comminuted displaced clavicle fractures, and the functional outcome was satisfactory.

Keywords: clavicle fractures precontoured locking clavicle plate, ALLMAN Type.

Introduction

Clavicle is the only long bone placed horizontally and it connects the upper limb & thorax at shoulder girdle. Clavicle fracture accounts to 6-10% of all orthopaedic fractures. The Allman classification divided Clavicle fractures into three groups; Group I: Middle third, Group II: Lateral third, and Group III: Medial third [1].

The mid-clavicular region has a weak spot in the clavicle, which accounts for the majority of fractures in this location [2]. Midclavicular fractures are one of the most common skeletal injuries, accounting for 3% to 5% of all fractures and 45% of shoulder injuries. The incidence of nonunion of midclavicular fractures is commonly quoted as 0.1% to 0.8%, and nonoperative treatment has long been the mainstay.

The incidence of nonunion of midclavicular fractures is commonly quoted as 0.1% to 0.8%, and nonoperative treatment has long been the mainstay [3]. According to more recent statistics based on comprehensive fracture classification, the incidence of nonunion in displaced comminuted midshaft clavicular fractures in adults ranges between 10% and 15% [4].

Nonunion occurs in 15% of extensively displaced fractures of the middle third clavicle treated without surgery. Nonunion occurred in all fractures with an initial shortening of greater than 2cm [4,5]. Using a locking compression plate, a favourable outcome with a low complication rate is attainable in a substantial proportion of complicated clavicle fractures [6].

The long-held belief that the vast majority of clavicle fractures heal without surgery is no longer valid. The degree of discomfort and incapacity experienced during the first three weeks of conservative treatment has been underestimated, and the widely held belief that nonunion does not occur is incorrect. Studies have demonstrated that subgroups of individuals with these injuries have a higher prevalence of nonunion and specific abnormalities in shoulder functioning [7-10]. There are subgroups of people who appear to be prone to developing this consequence, either due to intrinsic

variables like age or gender, or due to the type of damage received. Sherman plates, dynamic compression plates, and semi tubular plates are examples of plates.

The most desired are a reconstruction plate or a precontoured locking compression plate. Study aimed to know the functional outcome of displaced middle-third clavicular fractures treated with pre-contoured locking compression plate by evaluating the radiological union and clinical union of fractures, and functional mobility of shoulder joint.

Materials and Methods

Inclusion Criteria:

1. Patients of age group (18 to 60 years).
2. Clavicular fractures (ALLMAN TYPE 1)
3. Closed fractures.

Exclusion Criteria:

1. Age > 60 years.
2. Associated fractures of glenoid, Scapula, proximal Humerus.
3. Shoulder joint conditions like periarthritis of shoulder joint, adhesive capsulitis, rotative cuff tendinitis.
4. Compound injuries of clavicle.

History was obtained regarding the pattern of the injury. Any anomalies in the respiratory and cardiovascular system was investigated. Open reduction and internal fixation with anatomical locking plate under brachial block and general anaesthesia. Patient is kept on antibiotics & analgesic for 3-5 days. Pendulum shoulder exercises are started by end of 2nd week. After 1-month active shoulder range of movements are started but abduction is limited to 90^0. Patient is followed up every 4-6 weeks and assessed clinically and radiologically for progressive callus formation. The functional outcome was assessed by Constant and Murley score.

Pain - 15 Points; No pain - 15 Points; Bearable pain – 10 Points; Disabling pain – 5 Points;

Activities of daily living: - 20 Points; Ability to perform full work – 04 Points; Ability to perform Leisure activities/Sports- 04 Points; Unaffected sleep – 02 Points; Level at which work can be done: Up to Waist – 02 Points; Up to Xyphoid – 04 Points; Up to Neck – 06 Points; Up to Head- 08 Points; Above head – 10 Points.

X-rays were acquired at each follow-up appointment to identify the implant position and the rate of progressive fracture union.

Results

Table 1: Study qualitative pre and post-operative variables

Variable	No. of patients	Percentage
Mode of injury		
Fall on shoulder from vehicle	18	45
Road traffic accident	10	25
Simple fall on shoulder	8	20
Fall on out stretched hand	4	10
Side affected		
Right	14	35
Left	26	65
Allman Type-1		
1A	4	10
1B	36	90
Time of surgery		
<7 days	34	85
7-14 days	6	15
Duration of Union		
8-12 weeks	36	90
>12 weeks	4	10
Complications		
Plate breakage	0	0
Hypertrophic skin scar	2	5
Plate prominence	4	10
Delayed union	0	0
Plate loosening	2	5
Functional outcome		
Excellent	34	85
Good	4	10

Fair	2	5
Poor	0	0

Discussion

Most clavicle fractures can be treated conservatively. Specific fractures like displaced with or without comminution required surgical stabilization.

Middle third clavicle fractures frequently occurred in 14 patients (35%) between the ages of 19 and 29. The oldest patient was 58 years old, and the youngest patient was 19 years old. The mean age of the patients was 35.25 years. This indicates that young individuals are more likely to experience clavicle midshaft fractures.

Similarly, in a study done by VanBeek et al [11], mean age of patients in plating group was 36 years (range 13-68 years).

Male predominance was clearly seen in our study with male constituting 90% cases which was comparable to study done by Cho et al [12] where male predominance was 78%.

Direct injury occurred in 36 patients (90%), with 18 patients (45%) suffering from a fallon their shoulder from a vehicle, 10 patients (25%) suffering from a road traffic collision, and 8 patients (20%) suffering from a simple fall on their shoulder after sliding. Indirect damage occurred in four patients (10%) as a result of a fall on an outstretched hand.

In this study, 26 patients (65%) had left-sided fractures and 14 patients (35%) had right-sided fractures. Kumar and Amar study [12] shows that most common mode of injury due RTA, direct injury due to fall on shoulder in 16 patients (80%) and indirect mode of injury like those due to fall on outstretched hand in 4 patients (20%). In Bostman et al. [13] study the mode of injury from direct injury was 78.55% and indirect injury in 21.36%. Type 1 middle third fracture type-1A (displacement less than 100%) occurred in 4 patients (10%) and type-1B (displacement more than 100%) fracture occurred in 36 patients (90%).

In this study, 34 patients (85%) had surgery in the first week, while 6 (15%) had surgery in the second week. All of the patients were operated on while under general anaesthesia. In 22 patients (55%) 7-hole locking compression plates were used. In 8 patients (20%), 6-hole locking compression plates were employed, whereas 10 patients (25%) used 8-hole locking compression plates. Locking and cortical screws of following sizes 12-18 mm were used. At the conclusion of 12 weeks, 36 patients (90%) in this trial had union. Union happened in four patients (10%) at the end of 16 weeks each.

In this study, 2 patients (5%) had hypertrophic skin scars, 4 patients (10%) hadplate prominence, and another 2 patients (10%) had plate loosening. Plate prominence occurred in 4 patients (10%). Following the union of the fracture, for the same reason, one patient underwent implant removal. Kumar and Amar study shows that plate prominence seen in 15% cases which was the main reason for implant removal in our study.

In Van Beek et al study shows 32% cases had plate prominence in precontoured plate and 64% in non-contoured plate group.

In this study, 34 patients (85%) had excellent functional outcomes, 4 patients (10%) had good functional outcomes, and 2 patients (5% had fair functional outcomes). Rigid internal fixation and early mobilisation help new displaced clavicle fractures because it improves pain immediately and delays shoulder stiffness and non-union (comminuted middle third and displaced lateral third fractures).

The functional outcome as assessed by Constant and Murley score shows excellent functional outcome in 85% patients, good functional outcome in 10% and fair in 5% patient which was comparable to studies of Bostman et al [13] and VanBeek et al., which showed similar results.

Conclusion

Bone union with a precontoured locking clavicle plate was possible by lowering complication rates in midshaft comminuted displaced clavicle fractures, and the functional outcome was satisfactory. Precontoured locking compression plate is a very good option of implant for displaced comminuted middle third clavicle fracture as it offers advantages like immediate pain relief, fracture stability and early mobilisation of shoulder.

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