



International Journal of Orthopaedics Sciences

ISSN: 2395-1958
IJOS 2019; 5(3): 01-03
© 2019 IJOS
www.orthopaper.com
Received: 01-05-2019
Accepted: 03-06-2019

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Operative treatment of clavicle midshaft fractures by locking plate

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DOI: <https://doi.org/10.22271/ortho.2019.v5.i3a.1496>

Abstract

A clavicle fracture, also known as a broken collarbone, is a bone fracture of the clavicle. Symptoms typically include pain at the site of the break and a decreased ability to move the affected arm. Complications can include a collection of air in the pleural space surrounding the lung, injury to the nerves or blood vessels in the area, and an unpleasant appearance^[1, 2].

Objective: To study the surgical management and to assess its functional outcome in displaced mid shaft clavicular fractures. Patients of both sexes belonging to adult age group presenting with fracture clavicle to Orthopedic Department, Vydehi institute of medical sciences and research centre, Bengaluru, of are admitted from January 2015 to December 2015. In the present study maximum number of patients belongs to 28 to 37 years age group (9 cases) followed by 38 to 47 years age group (5 cases), maximum number of patients sustained clavicle fracture due to fall on shoulder (13 cases) followed by RTA (07 cases), maximum number of patients sustained clavicle fracture due to fall on shoulder (13 cases) followed by RTA (07 cases). Several studies have examined the safety and efficacy of primary open reduction and internal fixation for completely displaced midshaft clavicular fractures and have noted high union rate with a low complication rate.

Keywords: Operative treatment, clavicle midshaft fractures, locking plate

Introduction

A clavicle fracture, also known as a broken collarbone, is a bone fracture of the clavicle. Symptoms typically include pain at the site of the break and a decreased ability to move the affected arm. Complications can include a collection of air in the pleural space surrounding the lung, injury to the nerves or blood vessels in the area, and an unpleasant appearance^[1, 2].

It is often caused by a fall onto a shoulder, outstretched arm, or direct trauma. The fracture can also occur in a baby during childbirth. The middle section of the clavicle is most often involved. Diagnosis is typically based on symptoms and confirmed with X-rays^[3].

Clavicle fractures are typically treated by putting the arm in a sling for one or two weeks. Pain medication such as paracetamol may be useful. It can take up to five months for the strength of the bone to return to normal. Reasons for surgical repair include an open fracture, involvement of the nerves or blood vessels, or shortening of the clavicle by more than 1.5 cm in a young person^[4].

Clavicle fractures most commonly occur in people under the age of 25 and those over the age of 70. Among the younger group males are more often affected than females. In adults they make up about 5% of all fractures while in children they represent about 13% of fractures.

Clavicle fractures are commonly known as a breaking of the collarbone, and they are usually a result of injury or trauma. The most common type of fracture occurs when a person falls horizontally on the shoulder or with an outstretched hand. A direct hit to the collarbone can also cause a break. In most cases, the direct hit occurs from the lateral side towards the medial side of the bone. The muscles involved in clavicle fractures include the deltoid, trapezius, subclavius, sternocleidomastoid, sternohyoid, and pectoralis major muscles. The ligaments involved include the conoid ligament and trapezoid ligament. Incidents that may lead to a clavicle fracture include automobile accidents, biking accidents, horizontal falls on the shoulder joint, or contact sports such as football, rugby, hurling, or wrestling.

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A discontinuity in the bone shape often results from a clavicular fracture, visible through the skin, if not treated with surgery. Surgical procedures often call for open reduction internal [plate] fixation where an anatomically shaped titanium or steel plate is affixed along the superior aspect of the bone by several screws. In some cases, the plate is removed after healing due to discomfort, to avoid tissue aggravation, osteolysis or sub acromial impingement. This is especially important with a special type of fixation plate called hook plate. With anatomical plates plate removal is considered an elective procedure that is rarely necessary. An alternative to plate fixation is elastic TEN intramedullary nailing. These devices are implanted within the clavicle's canal to support the bone from the inside. Typical surgical complications are infection, neurological symptoms distal the incision, and nonunion of the bone

Objective: To study the surgical management and to assess its functional outcome in displaced mid shaft clavicular

fractures.

Methodology: Patients of both sexes belonging to adult age group presenting with fracture clavicle to Orthopedic Department, Vydehi institute of medical sciences and research centre, Bengaluru, of are admitted from January 2015 to December 2015.

Inclusion criteria: Adult male and female patients above 18 years who require surgical intervention for displacement and comminution at middle third clavicle fracture were included for this study after taking written consent from them.

Exclusion criteria

1. Age < 18 years
2. Open fractures

Results

Table 1: Age and Sex wise distribution of cases

Age	Male	Female	Total
18 to 27 years	02	00	02
28 to 37 years	06	03	09
38 to 47 years	03	02	05
48 to 57 years	01	02	03
>58 years	00	01	01
Total	12	08	20

In the present study maximum number of patients belongs to 28 to 37 years age group (9 cases) followed by 38 to 47 years age group (5 cases).

Table 2: Distribution of Cases based on Mode of Injury

Mode of injury	Number of patients
RTA	07
Fall On Shoulder	13
Total	20

In the present study maximum number of patients sustained clavicle fracture due to fall on shoulder (13 cases) followed by RTA (07 cases).

Table 3: Distribution of Cases based on Outcome

Functional outcome	Number of patients
Excellent	12 cases
Good	04 cases
Fair	04 cases
Poor	00 cases
Total	20

In our study 12 patients had excellent functional results and 4 patients had good functional outcome, while only 4 patients had fair functional outcome.

Discussion

In the present study maximum number of patients belongs to 28 to 37 years age group (9 cases) followed by 38 to 47 years age group (5 cases), maximum number of patients sustained clavicle fracture due to fall on shoulder (13 cases) followed by RTA (07 cases), maximum number of patients sustained clavicle fracture due to fall on shoulder (13 cases) followed by RTA (07 cases).

Between April 2003 and October 2009, N. Modi *et al.*

operated on 62 clavicle fractures using LCP plates through infraclavicular approach. All patients were followed up until clinical and radiological union was achieved (radiological union was determined by the presence of bridging callus and absence of fracture lines). At the final follow-up 53 patients were available for review. There were 42 male and 11 female patients with an average age of 45 years. The fractures were classified using the system described by CM Robinson (28 Type B1 fractures and 25 Type B2 fractures). The average union time was 4.6 months. There was 1 superficial infection treated with oral antibiotics. There was 1 stress fracture medial to the plate which was treated non-operatively and the fracture united. There were 2 plate failures which required revision, one at 8 days post-op and other at 6 weeks [5].

In 2010, Gereon Schiffer *et al.* presented and evaluated the current treatment options on the basis of a selective review of the literature. They confirmed some long-held concepts and refuted others. The risk of non-union after conservative treatment was previously reported as 1% to 2% but has turned out to be much higher in selected subgroups such as in patients with severe displacement, female patients, and patients of advanced age. Furthermore, new implants and techniques have made surgery safer and more likely to result in bony union with a Reconstruction plate or reconstruction LCP for clavicle shaft fractures can be used to obtain stable fixation [6, 7].

In 2011, Darren S. Drosdowech *et al.* in a biomechanical study compared four different techniques of fixation of middle third clavicular fractures. Twenty fresh-frozen clavicles were randomized into four groups. Each group used a different fixation device (3.5 Synthes reconstruction plate, 3.5 Synthes limited contact dynamic compression plate, 3.5 Synthes locking compression plate, and 4.5 DePuy Rockwood clavicular pin). All constructs were mechanically tested in bending and torque modes both with and without a simulated

inferior cortical defect. Bending load to failure was also conducted. The four groups were compared using an analysis of variance test. The plate constructs were stiffer than the pin during both pure bending and torque loads with or without an inferior cortical defect. Bending load to failure with an inferior cortical defect revealed that the reconstruction plate was weaker compared with the other three groups. The limited contact and locking plates were stiffer than the reconstruction plate but demonstrated statistical significance only with the cortical defect^[8].

Conclusion

Several studies have examined the safety and efficacy of primary open reduction and internal fixation for completely displaced mid shaft clavicular fractures and have noted high union rate with a low complication rate. In a large number of complex clavicle fractures a satisfactory outcome is possible with a low complication rate using a locked compression plate. Primary internal fixation of displaced comminuted mid-shaft clavicular fractures leads to predictable and early return to function.

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