

Results of Clavicle Plating In Adult Clavicle Fractures

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Abstract

Background: Fractures of the clavicle are managed conservatively by most of the orthopedicians. However, the management of the displaced fractures of clavicle has always been a dilemma. In our study, we studied the results of displaced clavicle fractures managed with open reduction and internal fixation with anatomical clavicle plate.

Materials and Methods: We conducted a prospective observational study in which we included 30 patients of displaced clavicle fractures who were managed with Open reduction and internal fixation with plating. The patients were evaluated clinically using DASH scoring and radiologically using plain radiographs.

Results: In our study of 30 clavicle fractures, aged between 19 to 60 years, male to female ratio was 8:2. 18 patients (60%) had left side clavicle fracture while as 12 (40%) were right sided. 21 of the fractures were of the middle third (70%). Excellent result was seen in 16.66% (5 patients) while as 80% (24 patients) showed good results and poor results were seen in only 3.33% (1 patient). No intra-operative complication was encountered. Surgical site infection was seen among 3 patients, which was managed with daily antiseptic dressings and antibiotics. All the patients had full range of motion in the ipsilateral shoulder at final followup.

Conclusion: We recommend the use of clavicle plating in displaced clavicle fractures in view of the results achieved in our study.

Keywords: Displaced clavicle fracture, clavicle plating, DASH Score

Introduction

The clavicle is a long, dual-curved bone that forms the only direct link between the axial and appendicular skeletons.1 The clavicle is the first bone in the human body to begin intra-membranous ossification directly from mesenchyme during the fifth week of fetal life. With the exception of the rare pathologic fracture due to metastatic or metabolic disease, clavicle fractures are typically due to trauma.2 The clavicle is the most commonly broken bone in the human body, accounting for up to 5% to 10% of all fractures seen in hospital emergency admissions.3 Although a fall onto an outstretched hand was traditionally considered the common mechanism, it has been found that the clavicle most often fails in direct compression from force applied directly to the shoulder. In a study of 122 consecutive patients, 87% clavicle injuries resulted from a fall onto the shoulder, 7% resulted from a direct blow, and 6% resulted from a fall onto an outstretched hand.4 As usual, in many traumas, its prevalence is highest among the young population even if also shows a bimodal age

distribution with a rate in females that overtake males after the sixth decade of life as a result of osteoporosis and differences in life expectancy. The mean age has been reported to be 29.3 years, and the incidence appears to decrease significantly after the second decade of life. Males are affected approximately twice as often as females (67.9% vs. 32.1%). These injuries may also have a seasonal correlation, with one epidemiologic analysis noting an increase during the summer.⁵ The first widely accepted classification system for clavicle fractures was described by Allman in 1967. Fractures were classified based on their anatomic location in descending order of fracture incidence. Type I fractures occur within the middle third of the clavicle, whereas type II and type III fractures represent involvement of the lateral and medial thirds, respectively.⁶ A more detailed classification system (Edinburgh classification) was proposed by Robinson. Similar to earlier descriptions, the primary classification is anatomically divided into medial (type I), middle (type II), and lateral (type III) thirds. Each of these types is then subdivided based on the magnitude of fracture fragment displacement. Fracture displacement of less than 100% characterizes subgroup A, whereas fractures displaced by more than 100% account for subgroup B. Type I (medial) and type III (lateral) fractures are further subdivided based on articular involvement. Subgroup 1 represents no articular involvement, and subgroup 2 is characterized by intra-articular extension. Similarly, type II (middle) fractures are sub-categorized by the degree of fracture comminution. Simple or wedge-type fracture patterns make up subgroup 1, and comminuted or segmental fracture patterns represent subgroup 2.⁷

In adults, more than two-thirds of these injuries occur at the diaphysis of the clavicle, and these injuries are

more likely to be displaced as compared with medial and lateral third fractures (probably due to the greater exposure to high energy trauma through sports and traffic accidents). In children, up to 90% of clavicle fractures are midshaft fractures.⁸

Treatment of type I and type III fractures does not appear to be debated: most authors suggest conservative treatment with a period of immobilization in a sling followed by physiotherapy.⁹ Operative treatment consists of open reduction and internal fixation (ORIF) of the fracture. Several methods of fixation have been suggested, but none of them has been considered the gold standard¹⁰. Levi et al in 2003 presented a minimally invasive technique. Through very small skin incisions it is possible to drill both bone fragments antero-posteriorly close to the edges, passing a double PDS suture loop and forming a figure of eight to hold/fix the fracture. Advantages include the fact that it is simple and minimally invasive for the surrounding soft tissues, which encourages quick consolidation of the fracture and fast return to full activities. Additionally, there is no need for a second operation for implant removal, biomechanics and movements of the clavicle are preserved and there is good cosmetic result¹¹.

Materials and Methods

We conducted a prospective observational study in which we included 30 patients of displaced clavicle fractures who were managed with open reduction and internal fixation with plating. Informed consents were taken from the patients included in the study. We included all displaced clavicle fractures (>2cm), aged >18 years in our study. Patients aged <18 years, open fractures, pathological fractures, medically unfit and not willing were excluded.

All baseline blood work up was performed preoperatively and the patients were assessed for their fitness to undergo surgery. The surgery was performed under general anaesthesia with the patient supine or semi sitting position. A sandbag was placed in the interscapular region. The requisite area was properly scrubbed, painted and draped.

Skin incision was made over the clavicle centered over the fracture site. The platysma was incised and the supraclavicular nerve identified. Clavipectoral fascia was incised and elevated inferiorly. The fracture ends were reduced and provisionally fixed using K-wires or lag screws. A precontoured, anatomical, locking compression plate was used to fix the fracture which was applied either on the superior or the anterior surface of the clavicle using screws of appropriate size.

The limb was placed in an arm sling postoperatively. Pendulum exercises were begun as the pain allowed. Antiseptic dressings were done at 3rd and 7th postoperative day and sutures were removed at 2 weeks. The patients were followed monthly, for a period of 6 months. The patients were evaluated clinically using DASH (Disability of Arm, shoulder and hand) scoring and radiologically using plain radiographs.

Observations

Our study included 30 clavicle fractures. The age of the patient ranged from 19 to 60 years

Age range	Number of patients
0to 20 years	1
21 to 30 years	3
31 to 40 years	11
41 to 50 years	9
51 to 60 years	6
Total	30

The male to female ratio in our study was 8:2.

Age range	Number of patients	Male	Female
0to 20 years	1	1	0
21 to 30 years	3	2	1
31 to 40 years	11	9	2
41 to 50 years	9	8	1
51 to 60 years	6	4	2
Total	30	24	6

In our study 18 patients (60%) had left side clavicle fracture while as 12 (40%) had right sided fracture

Site	Number of patients
Lateral one- thirds	7
Middle one- thirds	21
Middle one- thirds	2
Total	30

Among all 30 patients of the fractures of clavicle 21 patients (70%) were of the middle thirds. Lateral one thirds fracture was present in 7 patients where as 2 patients had fracture of medial one thirds

Preoperative radiograph	Number of patients	Percentage
Excellent	05	16.66%
Good	24	80.00%
Poor	01	03.33%
Total	30	100%

Excellent result was seen in 16.66% (5 patients) while as 80% (24 patients) showed good results and poor results were seen in only 3.33% (1 patient).

Discussion

Clavicle fracture is usually managed conservatively since most of these fractures are undisplaced, the problem arises when we have displaced fractures of the clavicle.

Traditionally, these fractures were managed nonoperatively after early studies reported that conservative treatment led to a high union rate without compromise of patient satisfaction or function.^{12,13} However, more recent literature has shown increased rates of nonunion, symptomatic malunion, and unsatisfactory patient outcomes with nonoperative management of displaced midshaft clavicle fractures.¹⁴⁻¹⁷ Numerous clavicle fixation methods exist, but plate and screw constructs lead to predictable outcomes with a low nonunion rate.^{15,16} Currently, 2 methods of clavicle plating are used, in which a plate is contoured to either the superior or antero-inferior surface of the clavicle. Regardless of placement, the subcutaneous position of the plate may induce implant prominence and scar-related pain after fracture union, which may lead to patient requests for implant removal.¹⁸

In our study of 30 patients we have treated patients with a compression plate. The fracture ends were reduced and provisionally fixed using K-wires or lag screws. A precontoured, anatomical, locking compression plate was used to fix the fracture which was applied either on the superior or the anterior surface of the clavicle using screws of appropriate size. No intra-operative complication was encountered. Surgical site infection was seen among 3 patients, which was managed with daily antiseptic dressings and antibiotics. All the patients had full range of motion in the ipsilateral shoulder at final followup. Excellent result was seen in 16.66% (5 patients) while as 80% (24 patients) showed good results and poor results were seen in only 3.33% (1 patient)

Conclusion

A precontoured, anatomical, locking compression plate is an ideal way to fix the fracture of clavicle which can be

applied either on the superior or the anterior surface of the clavicle using screws of appropriate size.

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