

A clinical study on role of different types of plates in surgical management of middle one third clavicle fracture in adults

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ABSTRACT

Background: Fractures of the clavicle is one of the most common injures of human skeleton. It has been traditionally treated non-operatively.

Objectives: The present study was undertaken to evaluate the outcome of different types of plates in surgical management of middle one third clavicle fracture in adults

Methods: Thirty two adult patients with middle one third clavicular fractures treated surgically between July2011 to May 2013 were included for this study. 22 middle third clavicle fractures were fixed with reconstruction plate and screws and six middle third clavicle fractures were fixed with semitubular plate and screws and 4 middle third clavicle fractures were fixed with dynamic compression plate and screws. The functional outcome compared.

Result: Among 32 patients with middle third clavicle fracture treated with plate and screws 30 fractures united at an average of 11.13 weeks.

Conclusion: Clavicle fractures are usually treated conservatively but there are specific indications for which operative treatment is needed like comminuted, displaced middle third clavicle fractures. In this study reconstruction plates were used as it can be contoured to the shape of the clavicle. Semitubular plates were used in 6 patients and it had no complications but it was difficult to contour. Dynamic compression plate is strong but it gives excessive prominence through the skin and it is difficult to contour.

Key words: Clavicle, fracture, non-union, plates, union

Introduction

Fractures of the clavicle have been traditionally treated nonoperatively. In the past few years several publications have described about poor outcomes like malunion and nonunion (15%) after conservative treatment of severely displaced clavicular fractures. [1, 2, 3] The proponents of early fixation of fresh clavicular fractures to prevent complications like malunion and nonunion emphasize the value of accurate reduction and rigid fixation in affording quick pain relief and promoting early functional recovery. [4, 5]

Many methods of treatment for fractures of the clavicle had been

described even though a sling consistently gave good functional results. The author asked why then have clavicular fractures been the target of so much surgical virtuosity? "It is known that all that is necessary is to support the elbow and brace the shoulders". He then went on to remark that fractured clavicle cannot really be immobilized. [6] Only 3 of 2235 (0.1%) patients with middle third clavicle fracture treated by closed methods failed to heal whereas 2 of 45 patients (4.6%) treated with immediate open reduction and fixation developed nonunion. So he felt that the primary cause of non-union appeared to be open reduction and internal fixation. [7] Fractures of middle

third of the clavicle are greatly underrated with respect to pain and disability they produce especially during the first three weeks of treatment. It is also impossible to support and immobilize a fracture of middle third of clavicle in an adult by external means with figure-of-eight bandages. [8] Twenty middle third clavicle fractures undergone plate fixation. It gave relief from pain within 12 hours and resulted in bone union in every case. [9] In a small series for treatment of non-union of middle third of clavicle fixed with plating and bone grafting showed 100% incidence of 5 union by 10 weeks postoperatively without any complications. So it recommended plating and grafting as the treatment of choice for nonunion of the middle third of the clavicle. [10]

The purpose of this study is to gain experience with the surgical management of fresh displaced, comminuted middle third clavicle fractures with plate and screws.

Methodology

The present study was carried out from July 2011 to July 2013 at Orthopaedics Department at my institute after having permission from institutional ethics committee. During this period 32 patients of clavicular fractures were treated surgically by using reconstruction plates, semi tubular plates and dynamic compression plates. Patient of age 17 to 60 who require surgical intervention for displacement and comminution at middle third clavicle fracture were included for this study after taking written consent from them. Patients not willing for surgery and medically unfit for surgery were excluded. Regular follow up for every 4 weeks was done.

Local examination of the affected clavicle for tenderness, instability deformity and shoulder movements were

assessed. X-rays were taken at each follow up visits to know about progressive fracture union and implant position. Rehabilitation of the affected extremity were done according to the stage of fracture union and time duration from day of surgery. Patients were followed up till radiological union. The functional outcome was assessed by Constant and Murley score.

Constant and Murley scoring: The patients are graded as follows

Category

A) Subjective:

1) Pain -15 Points

- No pain - 15
- Bearable pain - 10
- Disabling pain - 5

2) Activities of daily living: - 20 Points

- Ability to perform full work - 04
- Ability to perform Leisure activities/Sports - 04
- Unaffected sleep - 02

Level at which work can be done:

- Up to Waist - 02
- Up to Xyphoid - 04
- Up to Neck - 06
- Up to Head - 08
- Above head - 10

B) Objective:

Range of Movements: 40 Points

a) Active flexion without pain

- 00 – 30 Degrees: 0 points
- 31-60 Degrees: 2
- 61-90 Degrees: 4
- 91-120 Degrees: 6
- 121-150 Degrees: 8
- >151 Degrees: 10

b) Functional external rotation:

- Hand behind head with elbow forwards - 2

- Hand behind head with elbow backwards - 4
- Hand above head with elbow forwards - 6
- Hand above head with elbow backwards - 8
- Full elevation from on top of head - 10

c) Active abduction without pain:

- With dorsum of hand on back, head of third metacarpal reaches
- 00 – 30 Degrees: 0 points
- 31-60 Degrees: 2
- 61-90 Degrees: 4
- 91-120 Degrees: 6
- 121-150 Degrees: 8
- >151 Degrees: 10

d) Functional internal rotation:

- Ipsilateral buttock: 2
- S1 spinous process: 4
- L3 spinous process: 6
- T12 spinous process: 8
- T7 spinous process: 10

e) Strength of abduction: 25 Points

A normal shoulder in a 25 year old man resists 25 pounds without difficulty. The score given for normal power is 25 points, with proportionately less for less power. Patients were graded as below with a maximum of 100 points.

Total score Result

90-100 Excellent

80-89 Good

70-79 Fair

0-70 Poor

Results

Out of 32 patients 28 were male and 4 were female. Maximum number of middle third clavicle fracture was in the age group of 19-29 years. (Table:1) Maximum number of middle third clavicle fracture was in males and was due to fall on

shoulders from two wheelers. (Table:2) Among 32 patients 12 patients affected right side and 20 affected left side. Left side middle clavicle fracture was more common than right side.

Table: 1 Age incidence

Age in Years	No. of middle Third clavicle fracture
19-29	16
30-39	8
40-49	2
50-59	6
Total	32

Table:2 Mode of Injury

Mode of Injury	No. of Middle third clavicle fracture
1. Fall on shoulder from two wheeler	10
2. Road traffic accident	8
3. Simple fall on shoulder	8
4. Run over by a bullock cart	2
5. Fall on outstretched hand (Indirect)	4
Total	32

Table:3 Types of implant used

Type of plate	No. of cases	%
Reconstruction plate	22	68.75
Semi tubular plate	6	18.75
Dynamic Compression	4	12.50

Complications

A complication requiring inpatient treatment and resulting in an additional morbidity of 2 months or more was regarded as a major complication. In two cases reconstruction plate breakage occurred at 8 weeks postoperatively which was replated with dynamic compression plate. (Table: 4)

Table-4: Complications

	Types	No. of cases
Minor	Hypertrophic skin scar	8
	Plate prominence	6
	Delayed union	4
	Plate loosening	2
Major	Pate breakage	2

The functional outcome is assessed by Constant and Murley score and was excellent in 25 patients. (Table:5)

Table: 5 Functional outcome

Functional outcome	Patient
Excellent	25
Good	5
Fair	2
Poor	0
Total	32

Discussion

The present study is compared with Bostman et al ^[11] which treated middle third clavicle fractures, in 103 patients by early open reduction and internal fixation with plate and screws. In our study fall from two wheeler was the cause of fracture in most of the patients (31.25%). The mechanism of injury was due to fall from the two wheeler in 38 Patients (36.8%), slipping and fall in 24 Patients (23.30%), motor vehicle accident in 19

patients (18.45%) and sports in injury 22 patients (21.36%) in study conducted by Bostman et al. This shows direct injury to the shoulder is the common cause of this fracture. Patients of age group 17 to 60 were included in this study and the patients age ranged from 19 to 57years. Middle third clavicle fracture is common between 19 to 29 years in this study(50%). In Bostman et al study patients average age was 33.4 years and the youngest patient age was 19 years and oldest patient age was 62 years. In our study 87.5% males were affected (87.5%) which was in comparable to Bostman where 73.79% males and 26.21% females were involved. In our study 32 patients with mid third clavicular fracture were treated surgically, among them 22(68.75%) clavicle fractures were fixed with reconstruction plate and screws, 6(18.75%) were fixed with semitubular plate and screws and 4(12.5%) were fixed with dynamic compression plate and screws. This in comparison with Bostman et al study where reconstruction plates were used in 46 patients (44.66%), dynamic compression plates were used in 55 patients (53.40%) and semi tubular plates in 2 patients (1.94%). In the initial period of his study dynamic compression plates were used then in later part of his study reconstruction plates were used. Later found there was no difference in the complication rate between the patients treated by dynamic compression plate and reconstruction plate.

All our patients who were operated immobilized in an arm pouch for 4 weeks. Average duration of stay in the hospital was 10.7 days. All the patients were mobilized at the end of 2nd week with the sling. The functional outcome assessment according to Constant and Murley score ^[12] showed excellent functional outcome in 25 patients and good functional outcome in 5 patients

and fair functional outcome in 2 patients who was reported for plate breakage. All the fractures united and there was no non union. No implant removal was done till the end of this study.

In this study primary open reduction and internal fixation with plate and screws of fresh middle third clavicle fractures provides a more rigid fixation and does not require immobilization for longer periods. Reconstruction plates were used as it can be contoured to the shape of the clavicle. It is necessary to put the plate superiorly and at least three screws to be applied medially and three screws laterally.

In this study two reconstruction plate breakage occurred due to the non compliance with the post operative protocol. Semitubular plates were used in 6 patients and it had no complications but it was difficult to contour. Dynamic compression plate is strong but it gives excessive prominence through the skin and it is difficult to contour. Now a days precontoured clavicle plates are available which are strong, easy to apply but costly.

Clavicle fractures are usually treated conservatively but there are specific indications for which operative treatment is needed like comminuted, displaced middle third clavicle fractures. Among the internal fixation methods intramedullary fixation do not control rotation so they require longer period of immobilization till union.

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