

A Study on Surgical Management of Clavicle Midshaft Fractures by Locking Plate

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ABSTRACT

Introduction: Fractures of the clavicle is one of the most common injuries of human skeleton. It has been traditionally treated non-operatively. The present study was undertaken to study the role of surgical treatment in fresh displaced or comminuted clavicular fractures.

Material and Methods: Thirty adult patients with clavicular fractures treated surgically with locking compression plate and screws between September, 2013 to March, 2015.

Results: All thirty case of clavicle midshaft fractures were treated with pre contoured locking plate under general anaesthesia. Passive range of motion stated in third post op day. Average hospital stay was 10 days. The average time for fracture union is 9.3 weeks (8 – 12 weeks). The functional outcome according to Constant and Murley score is excellent in 19 patients (63.3%) and good in 11 patients (36.7%).

Conclusion: This study shows stable fixation with pre contoured locking compression plate and screws for fresh displaced or comminuted middle third clavicle fracture gives immediate pain relief and prevents the development of shoulder stiffness and non union.

Keywords: Clavicle, injuries, fractures, internal fixation, methods, surgery, plate

INTRODUCTION

Clavicle fractures account for 2.6% of all fractures and for 44% of fractures around the shoulder.¹ Middle third fractures account for 80% of all clavicle fractures. Most of the patients are men (68%), and left side involves more commonly (61%). Among middle third clavicle fractures, displaced ones account for 48% and comminuted ones account for 19%. Whereas fractures of the lateral and medial third of the clavicle account for 15% and 5% respectively.¹ Recent studies in the adult literature have shown a greater prevalence of symptomatic malunion, nonunion, and poor functional outcomes after nonsurgical management of displaced fractures.² Also persistent wide separation of fragments with interposition of soft tissue may lead to failure of closed reduction. There is 15% nonunion rate in widely displaced fractures of middle-third of the clavicle treated without surgery and all fractures with initial shortening of more than 2cm resulted in nonunion.³ Present research was planned to study the surgical management and to assess its functional outcome in fresh displaced mid shaft clavicular fractures, to study the complications associated with it and their management and to study the duration of union.

MATERIAL AND METHODS

The present study was carried out from September, 2013 to March, 2015 at Orthopaedics Department in Mahatma Gandhi Memorial hospital, Warangal. During this period 30 patients of clavicle mid shaft fractures were treated surgically.

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

- Age < 18 years.
- Open fractures.
- Fracture in medial or lateral third of clavicle.
- Pathological fractures.
- Undisplaced fractures.
- Associated head injury.
- Associated with neuro vascular injury.
- Established non-union from previous fracture.
- Associated acromioclavicular joint dislocation.

Any medical contraindication to surgery or general anaesthesia (heart diseases, renal failure or active chemotherapy)

Patient information and history like Name, age, sex, his occupation and address were recorded. The detailed mode of injury was also noted. Informed consent was taken and there were no ethical issues.

Instruments (figure-1)

- 3.5 mm 7 to 9 hole Clavicle locking compression plate
- power drill
- 3.0 mm drill bit
- Bone levers
- Hexagonal screw driver
- 3.5mm universal drill guide
- Depth gauge
- 4.0 mm locking screw of varying sizes (12-20 mm)
- 3.5mm cortical screw of varying sizes (12-20 mm)
- General instruments like retractor, periosteal elevator, reduction clamps and bone lever.

Surgical technique: Under general anesthesia, patient was kept supine on table. A bolster was kept between the spine and medial border of scapula to get reduction of fragments. Under sterile conditions draping was done to the affected side of the clavicle. About 7-9 cms, incision was made in the anterior aspect of clavicle centering over the fracture site. The skin subcutaneous

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tissue and platysma were divided without undermining the edges. The overlying fascia and periosteum were next divided. The osseous ends were freed from surrounding tissue. Minimal soft tissue and periosteum dissection was done. Fracture fragments were reduced and plate was applied over the superior aspect of the clavicle.

At the junction of the medial and middle third of the clavicle, the inferior surface is exposed so that a protective instrument can be inserted during drilling to prevent injury to neurovascular structure (figure-2).

The locking compression plate was fixed to the medial and lateral fragment with locking screws/ cortical screws and at least three screws in medial and lateral fragment were applied. Wound was closed in layers after ensuring meticulous hemostasis and sterile dressing was applied.

Post Operative care: Patients were kept NBM orally for 4 to 6 hours post-operatively and Intravenous fluids and other medications were given as needed.

Follow up: Patient were advised to review at every 4weeks at outpatient department. On each follow up, patients were checked for any signs of infection, tenderness, instability, deformity. Range of shoulder movements were noted. On each visit X ray examination was done to assess fracture healing. Physiotherapy was advised according to the postoperative time and stage of fracture union (Figure-3). Patients were followed up till radiological union.

The functional outcome were assessed by Constant and Murley score.^{4,5}

RESULTS

The present study consists of thirty patients with clavicle midshaft fractures were treated surgically with locking compression plate and screws between September, 2013 and March 2015 at Mahathma Gandhi Memorial hospital, Warangal. All the patients were available for follow-up and they were followed every 4 weeks. Results were analyzed both clinically and radiologically.

Among the thirty midshaft clavicle fracture patients, most were in the age group between 19-39 years (66%), above 50 years there were only 2 cases. Average age was 33.8 years.

In our study all patients were males, 17 cases were roadtraffic accident and 13 patients were due to fall on shoulder. In this present study, patients with Robinson Type-2 B1 (Displaced with simple or butterfly fragment) classification were 17 patients (56.6 %) and Type-2 B2 (displaced with comminution) classification were 13 patients (43.7%). Most of the patients in our study were operated within 5 days (28 patients - 93.3%). Two patients (6.7%) were operated after 5 days. In our study 6, 7, 8, 9 hole plates were used to treat the fracture depending on the type and comminution. 6 hole plate in 3 patients (10%), 7 hole plate in 12 patients (40%), 8 hole plate in 12 patients (40%) and 9 hole plate in 3 patients (10%). There were no major complications in this study.

The fracture was considered to be united when clinically there was no tenderness, radiologically the fracture line was not visible and full unprotected function of the limb was possible. Majority of the cases are united by the end of 10 weeks (86.6) and between 10 – 12 weeks (13.4%). There were no delayed



Figure-1: Instruments for implants.



Figure-2: Surgical details – Implant and important structures to be protected.



Range of motion



Figure-3: Pre op – Post op xrays and physiotherapy protocol.

union or non union cases. Average time for union is 9.3weeks. The functional outcome according to Constant and Murley score is excellent in 19 patients (63.3%) and good in 11 patients (36.7%).

DISCUSSION

Clavicle fractures are regularly treated conservatively. Studies

conducted by Hill et al⁶ in 1997, Nordqvist et al⁷ in 1998 and Robinson et al in 2004 found poor results following conservative treatment of displaced middle third clavicle fracture. There were various operative methods for the treatment of clavicle midshaft fractures like intramedullary K-wire fixation or Steinmann pin fixation and plate fixation. The procedures like intramedullary K wire or Steinmann pin fixation result in low resistance to torque, carry risks of pin loosening and infection. Plates such as Sherman plates, dynamic compression plates, and semitubular plates can be effective in obtaining anatomical reduction, applying direct compression to the fracture site, and producing resistance to torque. However, it is very difficult to hold the plates to clavicle in severely comminuted cases.

In contrast, reconstruction plates can be manipulated to fit the contour of the clavicle to obtain firm fixation. With this plates penetration of the opposite cortex with screw may cause damage to the subclavian artery and brachial plexus.

The present study on surgical management of clavicle midshaft fractures by locking plate is compared with Bostman et al⁸ study who treated middle third clavicle fractures by early open reduction and internal fixation with plate and screws in 103 patients. It is also comparable with Cho et al⁹ study where 41 patients with a clavicle midshaft fracture were treated by internal fixation with a reconstruction plate and reconstruction locking compression plate.

In our study, pre contoured locking plates were used in treatment of clavicle midshaft fractures instead of recon plate. The advantages with these plates include strong fixation due to locking between the screw and plate, and blood supply preservation due to minimal contact between plate and cortical bone.¹⁰ When LCPs are used to treat clavicle midshaft fractures, the risks of injury to the subclavicular artery or brachial plexus can be reduced because fixation can be achieved without the tip of the screw reaching the opposite bone cortex and periosteal stripping can be minimized to promote rapid union. It is believed that the surgery time can be reduced using LCPs because accurate plate contouring is not necessary and periosteal stripping could be minimized using self tapping screws.¹¹

Complications such as screw loosening and plate failure were not observed in the pre contoured LCP group. distinct scars on the shoulder are currently considered major complications due to the increasing cosmetic demand. Four of our patients had hypertrophic scarring after surgery and complained of discomfort in carrying out their daily activities

This study had some limitations because of the small number of cases.

CONCLUSION

In conclusion, bony union could be achieved with pre contoured Locking Plates and the clinical outcomes were satisfactory. Overall, operative procedures using pre contoured Locking Compression Plate can be effective in the treatment of clavicle midshaft fractures. All the fractures united and there was no delayed union and non union.

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