

RADIOLOGICAL AND FUNCTIONAL OUTCOMES OF NEER TYPE 2 DISPLACED LATERAL END OF CLAVICLE FRACTURE OSTEOSYNTHESIS USING PLATE AND SUTURE ANCHOR

Divyprasad Bamaniya¹, Ashish Suthar¹, Kashyap Zala²

¹Assistant Professor, Department of Orthopedics, Medical College, Baroda, Gujarat, India.

²Assistant Professor, Department of Orthopedics, GMERS Medical College, Ahmedabad, Gujarat, India

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Corresponding Author:
Dr. Kashyap L Zala,
Email: drkashyapzala@gmail.com

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Abstract

Background: Lateral end of clavicle fractures are difficult to treat due to comminution of lateral fragment. Fixation to coracoid provides additional stability. Aims: This is a retrospective cohort study describing outcomes of treatment of displaced lateral end of clavicle fracture (Neer type 2), using suture anchor and lateral clavicular locking compression plate (LCP). **Materials and Methods:** Patients with Neer type 2 clavicle fractures operated between January 2019 to December 2021, at our hospital, were included in the study. Case records and radiographs were assessed retrospectively. Disability of the Arm, Shoulder, and Hand Questionnaire (DASH) was used for recording functional outcomes. Statistical analysis: Mean and range were calculated from the data. **Result:** Nineteen patients were followed up for a mean duration of 24.8 months (range 13-38 months). The mean DASH score at final follow up was 9.8 (range 2-24). All fractures united at mean 28.8 weeks after surgery (range 24-52 weeks). Two patients had implant impingement and required implant removal. Two patients had numbness over the incision. No other complications were noted. **Conclusion:** Treatment of Neer type 2 clavicle fractures with suture anchor and LCP was giving good functional and radiological outcomes with low complication rate.

INTRODUCTION

Distal fractures of the clavicle with displacement poses a challenge for osteosynthesis as there is very low bone stock available for fixation of the distal fragment.^[1] Non-operative treatment of these fractures has shown high nonunion rates up to 31%.^[2] Patients treated with non-operative methods have prolonged morbidity and time off work. So surgery is the treatment of choice for displaced lateral end clavicle fractures.^[3] The operative treatment of these fractures is also associated with surgery related complications.

The most common mode of failure of these fractures is failure of the fixation of the distal fragment and subsequent displacement.^[4] Multiple methods of reconstruction of the coracoclavicular ligament have been described in the literature with good results, like screws, hook plates, suture anchors, autografts, tight rope devices, mersilene tape.^[5-8] Using screws for stabilizing the coracoclavicular joint will be restricting the normal clavicular motion during shoulder movements.^[5] Screw fixation is bound to fail within 6 to 8 weeks, but will provide stability while the fracture unites. We are routinely using

flexible reconstruction of the coracoclavicular ligament using suture anchors or mersilene tape along with locking compression plate fixation.

In this retrospective cohort study we are describing functional and radiological outcomes of Neer type 2 displaced clavicle fractures, treated with suture anchor and locking compression plate (LCP) fixation.

MATERIALS AND METHODS

Patients having displaced lateral end of clavicle fracture and operated on from January 2019 to December 2021, and having at least a 1-year follow-up, were included in the study. A total of 22 patients were operated on in the above-mentioned time period for the displaced lateral end of clavicle fracture. All patient records were analyzed retrospectively including case records, pre-operative, and post-operative radiographs, surgery notes, and functional scores at each follow-up. Neer's classification was used for fracture classification.^[9] Patients were followed up at 6 and 12 weeks and at 6 and 12 months. Disability of the Arm, Shoulder and Hand

Questionnaire (DASH) was used for functional outcomes at each follow-up.^[10]

Complications were recorded: Three patients were lost to follow-up before 12 months follow up after surgery. So, the data of 19 patients was analyzed. Demographic details of the patients were according to Table 1.

Surgical technique: All patients were operated on under general anesthesia, in a modified beach chair position. The acromioclavicular joint was marked with a needle using an intra-operative radiograph [Figure 1 b and c]. A skin incision was made along the anterior border of the clavicle, and the fracture was exposed. The coracoid base was identified by palpation and a 5-mm suture anchor was inserted, and threads of the suture anchor were passed through drill holes in the clavicle and tied together after achieving reduction [Figure 1d]. An appropriate length locking plate [Figure 1e]. The wound was closed layer-wise.

Post-operative physiotherapy was started as soon as the pain permitted. A short arm sling support was given to all patients. The pendulum exercises were continued for up to 4 weeks, and after that passive and active shoulder movements were started. Overhead abduction was allowed after 6 weeks.

Statistical analysis: Epi Info software (Center of Disease Control & Prevention, USA) was used for data collection and analysis. Mean values and range were calculated for variables.

RESULTS

A total of 19 patients were included in the study, out of which 10 had right and 9 had left clavicle fractured, 7 had other bones fractured which required fixation, and 3 had a head injury. The mean duration of surgery after fracture was 3.2 days (range 1-9 days). The mean operative duration was 71 minutes (range 50-90 minutes). No blood transfusion was needed for any patient. The implants used were 3 or

4-hole anatomically contoured 3.5 mm lateral end clavicle LCP. Post-operative x-rays were done and showed good fracture reduction. No intra-operative complication was reported. The mean DASH score at the final follow-up was 9.8 (range 2- 24). All patients had an excellent DASH score, representing activities of daily life were the least affected. Two patients had their implants removed for implant impingement. The mean duration of implant removal was 11 months post-operative. Two patients had a numbness over the incision site that improved over time. There were no implant failures, malunions, non-unions, or wound complications. The mean duration of union was 28.8 weeks (range 24-52 weeks). All results are mentioned in Table 2.

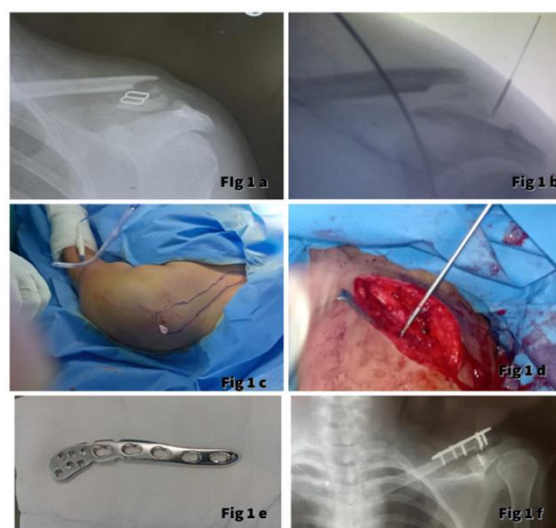


Figure 1: A case of 23 year old female with displaced comminuted lateral end clavicle fracture. 1a: Preoperative radiograph, 1 b & c: Marking of acromioclavicular joint with needle under c-arm image, 1d: Exposure and insertion of 5 mm suture anchor in coracoid, 1e: Lateral clavicle LCP, 1f: Postoperative radiograph.

Table 1: Statistical details of the cases

Variables	N
Total number of patients	19
Male: Female	8:11
Right: Left	10:9
Mean age	48.6 years(Range 19- 58 years)
Mean duration between injury and surgery	3.2 days (1-9 days)
Mean duration of surgery	71 minutes (50-90 minutes)
Associated injuries:	
Same limb fracture	3
Other limb fracture	4
Head injury	3

Table 2: Statistical details of functional and radiological outcomes

Variables	Results
Mean follow up	24.8 months (Range 13- 38 months)
Mean DASH score at final follow up	9.2 (Range 2-24)
Mean duration for union	28.8 weeks (24-52 weeks)
Complications	
Non-union	0
Malunion	0
Neurovascular injury	0
Hardware impingement	2

DISCUSSION

The concepts of treatment for lateral end clavicle fractures changed drastically over the last few decades. In 1993, a 15-year follow-up study of 110 patients was published including all types of clavicle fractures, out of that 23 were Neer type 2 fracture-dislocations.^[11] The author found that there is negligible chance of having permanent shoulder disability, so such injuries do not require surgery.^[11] But recent studies have found that though clavicle shaft fractures are treated without surgery with minimal consequences, the incidence of symptomatic nonunion and malunion was high in Neer type 2 fractures with displacement of the lateral end clavicle.^[1] Few studies showed non-union rates up to 31%.^[12] Locking plates were routinely used for these fractures, and hook plates for the fractures with a very low bone stock of the lateral fragment.^[13,14] All these studies had shown good results with a low complication rate, but the hook plates had impingement in the subacromial space and required implant removal in symptomatic cases.^[7] Hook plate needs implant removal as soon as consolidation of fracture takes place, so as to prevent implant impingement.^[15]

Failure of the locking plate in the lateral end clavicle fracture was almost exclusively due to failure of the purchase of locking screws in the lateral fragment of the bone, resulting in the pullout of the implants.^[8] The reconstruction of coracoclavicular ligaments was thought to provide a more stable construct to give more stability to unite. Any hard metal/ rigid implant fixing the clavicle to the coracoid hindered the normal motion between the clavicle and the coracoid (an essential element of the shoulder range of motion) – the principal reason why the screw (a rigid implant) had failed - either broke or lost purchase from the bone.^[5] On the contrary, a flexible fixation using a suture anchor, a mersilene tape, or a tendon autograft was thought to allow minimal motion between the clavicle and the coracoid, and showing satisfactory result with high union rates, good functional outcomes, and low complications.^[16] Our study showed similar result with no major complications. Implant impingement due to plate was the most common subtle complication. In our study, we had only 2 patients having implant impingement, that required implant removal. The suture anchor was left in situ for all of them without any complication.

CONCLUSION

Use of a suture anchor for the reconstruction of coracoclavicular ligaments along with anatomically

contoured locking plate osteosynthesis provides nonrigid stable fixation with low complication rates with excellent functional and radiological outcomes.

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