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Original article

Outcome of distal end clavicle fractures treated with locking plates

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ABSTRACT

Purpose: Fractures of the lateral end of the clavicle are relatively uncommon. These fractures are unstable due to the various deforming forces which act on the fragments as well as the small distal fracture fragment. At most times the deforming forces are not taken into consideration, and the fracture is not fixed securely. In this study, we assessed a fixation technique using the precontoured locking plates to find out whether it provided a stable fixation with good functional outcome.

Methods: Totally, 32 patients with lateral end clavicle fracture (Neer's Type II) were included in the study. After the informed consent and preoperative investigations were obtained, open reduction and internal fixation was done using a 3.5 mm precontoured superior locking plate with lateral extension under general anesthesia. Postoperative X-rays were done on day 1 and every 6 weeks after operation, until radiological union was achieved. The postoperative pain was assessed using Visual Analogue Scale (VAS) on postoperative days 1, 2 and 10. Postoperatively arm pouch sling was given for 2 weeks followed by active mobilization. Patients were asked to do their daily routine work and avoid lifting heavy weights. The functional outcome was assessed at the end of 2nd and 6th months with the help of Disabilities of the Arm, Shoulder and Hand (DASH) scoring.

Results: There were no intraoperative complications in the procedure. The mean VAS score on post-operative day 1 was found to be 5 which decreased to 3 on day 2 and 0 on day 10. The mean DASH score was calculated as 11.63 at the end of postoperative month 2 and then 4.6 at the end of month 6. There was one case of malunion in whom the overhead abduction was restricted but was not painful and was managed conservatively.

Conclusion: The precontoured locking plates with lateral extension may be a good method to fix the fractures of the lateral end clavicle, which provide a stable fixation with good functional outcome with very few instances of stiffness and decreased range of motion of the shoulder with the hook plates and failure of fixation in screw and K-wire fixations. It may well be the answer to the fixation questions of the lateral clavicle fractures, although larger comparative studies between the surgical treatment methods are required to confirm the same.

Introduction

Fractures of the clavicle are common injuries of adults, accounting for about 3% of all injuries.[1] They are often caused by either a direct blow to the anterior chest wall or by a fall on the outstretched hand. The commonest site of fracture in clavicle is the midshaft followed by the lateral end, which accounts for about 25% of all the clavicle fractures.[2,3] Twenty-five percent of these fractures are unstable due to the displacing forces acting on the fracture fragments: an inferior force on the lateral clavicle fracture fragment and an anterosuperior force on the medial clavicle fragment. These fractures can be classified using the Neer's Classification.[4] The lateral fractured fragment is small and hence, it is difficult to get an anatomical reduction and also poses problems in its fixation, which results in instability of the lateral clavicle fractures. Many treatment modalities have been used for the management of such fractures. Nonoperative methods are associated with high rates of nonunion (22%–50%),[5–7] out of which 14% cases[6] were symptomatic. Many operative treatment

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modalities have been tried for the management of lateral clavicle fracture including coracoclavicular screws,[8–10] Kirschner wires,[11] tension bands,[12–15] hook plates,[16,17] nonlocked[18] and locked plates.[16,19–22] The operative modalities are not without complications. These include non-united and malunited fractures, pin migration, impingement of the plate, bleeding, the requirement of removal of the plate[16,18] in all the fixation modalities. In this study, we have evaluated the functional and radiological outcomes of the patients in whom a locking plate was used for fixation of the lateral end of clavicle fractures, in the younger population.

Materials and methods

Patients

This study was conducted in Indraprastha Apollo Hospital, New Delhi from 2012 to January 2015. All patients with an acute fracture of lateral end clavicle (Neer's Type II) were considered for the study. We excluded the patients who had fractures more than 7 days old, and also patients with neurovascular deficits. All patients were adults, and no minors were included in this study. After informed consent had been obtained, 32 patients were included in this study. After initial management of the patient, surgery was planned, and the patient underwent surgery as soon as possible. In all the patients open reduction and internal fixation (ORIF) using a 3.5 mm pre-contoured superior locking plate with lateral extension was done.

Surgery

All the surgeries were performed by a single surgeon (the first author) under general anesthesia and in the supine position with a roll of towel in between the scapula to retract the clavicle. The head of the patient was turned towards the opposite side to get a clear view of the operating site. A horizontal incision was taken over the superior clavicle, centering the fracture. This was followed by subcutaneous dissection taking care of the supraclavicular nerves. Division of platysma exposed the clavicle. The reduction was achieved and maintained by a temporary Kirchner wire fixation. A precontoured locking compression plate (LCP, superior anterior clavicle plate with lateral extension) was used to fix the fracture, with the help of 3.5 mm locking and cortical screws on the medial side and 2.7 mm locking screws on the lateral side (Fig. 1). The closure was done in layers.

Postoperative care

Postoperative period was uneventful in all the cases. Arm pouch was given to all the patients. Post operatively all the patients were advised mobilization of the elbow and wrist. Patients were discharged after 2 days and staple removal done at 1 week. Shoulder mobilization was started on 10 days after the pain subsided and the arm pouch was removed at 2 weeks. X-ray assessment of the clavicle was done on the 1st postoperative day and after every 6 weeks, until radiological union was achieved. The postoperative pain was assessed using Visual Analogue Scale (VAS) on 1st, 2nd, and 10th postoperative day. The analgesics were stopped after 2 days and advised to be taken if the VAS score was more than 4. The dressing was done on the 2nd day and suture removal on 7th postoperative day. The clinical outcome was assessed on the 2nd and 6th month postoperatively using Disabilities of the Arm, Shoulder and Hand (DASH) scoring system.[23] The patients were also followed up with the Constant–Murley scoring at the second and sixth month postoperatively. The patient was kept in follow up till the bony union was achieved.

Results

Thirty-two cases of lateral clavicle fracture were included in this study with 71.85% of cases (23 cases) having a fracture in the left clavicle. There were no cases of bilateral clavicle fractures. The average age of the patients was 25.6 years, ranging from 18 to 28 years. The mode of injury of the fracture was road traffic accidents in 22 patients, followed by fall at home (9 patients) and fall on the street (2 patients). The mean duration of operative fixation since the time of injury was 2.2 days (ranging from 6 h to 5 days). None of the cases had any distal neurovascular deficit. The operating time ranged from 42 to 67 min (average: 53 min). In all cases, a 4-hole precontoured plate was used. There were no significant intra- or postoperative events noted in any of the cases. All the immediate postoperative X-rays showed satisfactory reduction and fixation. The average postoperative period of stay was 1.7 days (range: 1–3 days). None of the cases had any postoperative wound infection or neurovascular deficit.

The mean VAS score on the 1st postoperative day was found to be 5 which decreased to 3 on the 2nd day and 0 on the 10th postoperative day. The mean time of bone union was found to be 15.3 weeks. The main complication was malunion which was seen in one case who was not symptomatic (Fig. 2) and nonunion in one case (Fig. 3). The mean DASH score was 11.63, 2 months postoperatively and 4.6 at the end of 6 months. The average Constant–Murley scores were 85 at 2 months postoperatively and 92 at 6 months postoperatively. According to the Constant–Murley score, the functional outcomes were excellent in 7 patients (21.85%), good in 19 (59.37%), moderate in 6 (18.75%). None of the plates had to be removed for any implant failures.

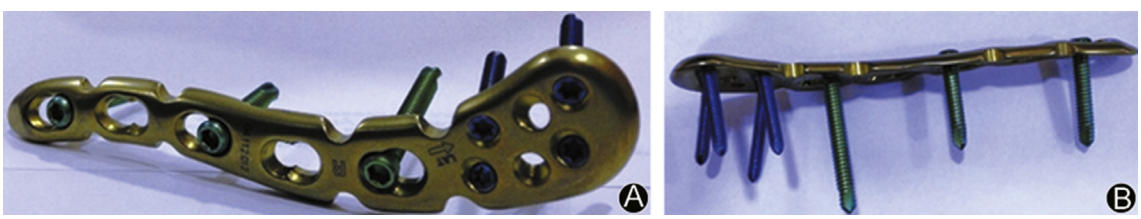

Fig. 1. Precontoured lateral clavicle locking plate. A: superior view; B: side view.

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