Treatment of distal clavicle fracture with distal radius volar locking compression plate

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Objective: To observe the early clinical outcomes of the internal fixation with distal radius volar locking compression plate (LCP) in treatment of distal clavicle fracture.

Methods: Six patients with unilateral distal clavicle fractures, identified as type II according to Neer classification system, including 4 males and 2 females, were treated with open reduction and internal fixation using a distal radius volar LCP. Bone union was evaluated by routine X-ray radiography, and shoulder joint function were assessed by Constant score system.

Results: All fractures achieved bone union at 6 to 8 weeks postoperatively, and Constant scores ranged from 95 to 100 at the postoperative 10 to 12 weeks.

Conclusion: Fixation of distal clavicle fracture with distal radius volar LCP demonstrates excellent effects of bone union with rarely early complications, thus providing a new technique to treat distal clavicle fracture.

Key words: Clavicle; Fractures, bone; Locking compression plate

Fractures of distal clavicle are common in clinical practice, accounting for about 12%-15% of all clavicle fractures. According to Neer classification system, type II fractures are inherently unstable, in which 22%-33% develop to nonunion after non-operative treatment, as shown by the literature.1 Thus, open reduction and internal fixation has been widely accepted as a standard method for treating this kind of fractures. Although various instruments such as K-wire tension band and clavicular hook plate are currently available for fixing the fractured distal clavicle, each has its relevant complications,2-4 which restrict their clinical applications.

In this paper, the authors provided 6 cases of distal clavicle fracture. They were treated with open reduction and internal fixation by the distal radius volar LCP and the early clinical outcomes were satisfactory, thus indicating the distal radius volar LCP may be an alternative method for treating the unstable distal clavicle fracture.

METHODS

Patients
Six patients with unilateral distal clavicle fracture, aged 23-52 years (mean 36.5 years), were involved in this series, including 4 males and 2 females. All the fractures were identified as type II according to Neer classification system. Four cases resulted from sports injury and 2 from traffic accident.

Surgery and rehabilitation training
An arc incision along with distal clavicle was made under cervical plexus block or general anaesthesia. After the exposure of the fracture ends, reduction was achieved and maintained by towel clamps. If necessary, K-wires were used for temporary fixation. The T-shaped distal radius volar LCP without molding was placed above the distal clavicle, with the T-portion of the plate to fix the inflated distal end of fracture and the shaft with 3 to 5 holes to the long proximal fragment (Fig.1). During surgery, it was suggested to ensure that the screws did not approach into the scapuloclavicular joint by fluoroscopy examination and the ruptured coracoclavicular ligament was repaired for further stabilization of the fracture.

As for the postoperative treatment, the patients wore a collar and cuff sling for 2 to 3 weeks, and passive and active motion was initiated within 2 to 3 days after the
injury discomfort subsided.

**Evaluation of the outcomes**

Bone union was evaluated by radiographies every 2 weeks with initiation at the 6th week after operation. Constant score system was employed to evaluate the function of the shoulder joint 10 to 12 weeks after surgery.

**RESULTS**

All 6 patients were followed up for 12 to 25 weeks. No wound infection was observed. The fractures achieved bone union 6 to 8 weeks after operation (Fig. 2). The shoulder joints regained excellent function without pain 10 to 12 weeks after the procedures (Fig. 3), as showed by Constant score of 95-100 (Table 1). At the end of follow-up, no fixation failure were observed.

**DISCUSSION**

Although there is evidence showing that most non-unions of distal clavicle fracture are painless, thus advocating expectant treatment, in recent years, open reduction and internal fixation are widely recommended for treating unstable distal clavicle fracture, because non-operative treatment needs more time and frequently results in dysfunction of shoulder joint.

The currently available instruments for internal fixation of distal clavicle fracture include K-wire tension-band, coracoid-clavicle screw, clavicular hook plate, and so forth. Although they facilitate bone union, each has its specific shortages. For instance, K-wire migration is commonly seen and traumatic arthritis of scapuloclavicular joint is inevitable after tension-band fixation. The destroy of bone integrity at the part of clavicle above coracoid limits the usage of coracoid-clavicle screw and hook plate, leading to bone resorp-
tion and stress fracture besides acromion impingement and rupture of rotator cuff. Therefore, the authors tried to find a better fixation device which could provide effective stability without damaging the shoulder joint function.

The T-shaped distal radius volar LCP is initially designed to fix distal radius fracture, and the clinical outcomes are excellent. In our cases, we found that this plate had a few advantages in treating unstable distal clavicle fracture. First, the T-portion of the plate fits well to the inflated distal end of clavicle, and the length of the plate shaft with 3-5 holes is approximate to the lateral one-third of the clavicle, making that this plate is anatomically suitable for fixing distal clavicle fracture. Second, the plate is inherently strong and angularly stable, thus facilitating the fixation of fragmented fractures. Third, the plate has low profile, which does not protrude subcutaneously, interfere the scapuloclavicular joint and lead to iatrogenic impingement syndrome and damage to the rotator cuff, therefore less compromising the function of shoulder joint.

In summary, we provided a new technique to treat distal clavicle fracture and obtained early clinical outcomes. However, the long-term effect of this technique needs to be further investigated.

REFERENCES


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