



## Results of parallel plate fixation of comminuted intra-articular distal humeral fractures

Tapio Flinkkilä, MD, PhD\*, Juhana Toimela, BM, Kai Sirniö, MD, Juhana Leppilahti, MD, PhD

*Division of Orthopedic and Trauma Surgery, Department of Surgery, Oulu University Hospital, Oulu, Finland*

**Background:** This study investigated the results of parallel plate fixation of comminuted distal humeral fractures in a consecutive series of patients.

**Methods:** Parallel plate fixation was used in 47 patients (30 women), mean age 60 years (range 18-98 years), with Arbeitsgemeinschaft für Osteosynthesefragen (AO) type C distal humeral fractures during 2007 to 2011. Medical records and radiographs were retrospectively assessed. Thirty-five patients completed Disabilities of Arm, Shoulder and Hand (DASH) outcome measure and the RAND Medical Outcomes Study 36-Item Short Form (SF-36) Health Survey. Twenty-seven patients underwent clinical examination, Mayo Elbow Performance Score (MEPS) rating, and radiography after 3.9 years (range, 1.6-7.9 years) of follow-up.

**Results:** The mean flexion arc was lower on the affected side vs the unaffected elbow ( $123^\circ$  vs  $140^\circ$ ,  $P = .03$ ). The mean MEPS was 88; the result was excellent in 14, good in 8, fair in 3, and poor in 2 patients. DASH results indicated slight impairment of upper extremity function compared with the reference value (26 vs 10,  $P = .001$ ). RAND SF-36 scores indicated normal quality of life compared with reference values from the Finnish population. Forty-four fractures united uneventfully. One case each of nonunion and malunion occurred. One olecranon osteotomy failed to unite. There were 3 cases of infection. Prominent hardware was a common late problem, and plates often required removal. The complication rate was 7 of 47 (15%); 4 of these patients (9%) required reoperation. The hardware removal rate was 13 of 47 (28%).

**Conclusion:** Parallel plate fixation is an effective method to treat comminuted distal humeral fractures. Good elbow function can be restored in most cases with minor impairments that do not worsen quality of life.

**Level of evidence:** Level IV, Case Series, Treatment Study.

© 2014 Journal of Shoulder and Elbow Surgery Board of Trustees.

**Keywords:** Distal humeral fractures; plate fixation; treatment outcome; comminuted fractures; intra-articular fractures; elbow function; complications

The Oulu University Hospital administration approved the review of medical records and the re-examination of patients at the outpatient clinic (approval 228/211).

\*Reprint requests: Tapio Flinkkilä, MD, PhD, Division of Orthopedic and Trauma Surgery, Department of Surgery, Oulu University Hospital, PL 21, FIN-90029 OYS, Oulu, Finland.

E-mail address: [tapio.flinkkila@ppshp.fi](mailto:tapio.flinkkila@ppshp.fi) (T. Flinkkilä).

Comminuted distal humeral fractures are complex injuries, and open reduction and internal fixation (ORIF) is usually indicated.<sup>29</sup> The goal of treatment is to reduce the fracture anatomically and fix the fragments rigidly enough to allow early motion. The most accepted operative method is plate fixation of both columns of the distal humerus. This

technique usually restores satisfactory function of the elbow joint even in severely comminuted fractures.<sup>29</sup>

There are, however, several controversial issues regarding the treatment of these fractures. Owing to complex anatomy, surgical exposure is difficult. Olecranon osteotomy usually results in the best exposure of articular fragments and is regarded as the gold standard.<sup>20,26,33</sup> Some have suggested that even comminuted fractures can be anatomically reduced and fixed using paratricipital incisions (extensor-on approach) to avoid potential adverse effects associated with olecranon osteotomy.<sup>5,8,9</sup> Although many techniques (including plates) can be used to fix the olecranon osteotomy, only a few studies have reported the results of plate fixation.<sup>14,35</sup> Other controversial issues include plate configuration (parallel or perpendicular) at the distal humerus and management of the ulnar nerve. Some clinicians recommend anterior transposition; however, its role in reducing postoperative ulnar nerve symptoms remains unclear.<sup>38</sup>

Elderly patients with a comminuted distal humeral fracture may experience better function if they are primarily treated with total elbow replacement (TER) instead of fixation.<sup>25</sup> Although several clinicians recommend TER as the first-line treatment if the fracture is not amenable to fixation, no real information exists regarding how often TER is needed.

The availability of computed tomography (CT) scanning with 3-dimensional (3D) image reconstruction has helped preoperative planning, and new fixation strategies, precontoured plates, and small screws have expanded indications for ORIF. Even highly comminuted fractures of osteoporotic bone that were previously considered not amenable to fixation can be treated with success using ORIF.

The study's aim was to investigate fracture union, complications, and functional results of precontoured parallel plate fixation of comminuted intra-articular, Arbeitsgemeinschaft für Osteosynthesefragen (AO) type C distal humeral fractures in a consecutive series of patients.

## Methods

A computer search of our hospital's files identified 57 consecutive patients with comminuted distal humeral fracture (AO type C)<sup>28</sup> between 2007 and 2011 (Fig. 1). Ten patients were excluded: 1 patient refused the operation and was treated nonoperatively, 1 was treated with percutaneous pinning, 6 with rheumatoid arthritis (RA) with moderate to severe elbow joint destruction were treated primarily with total elbow replacement (TER), and 2 lived abroad and were lost to follow-up at an early stage (<6 weeks). In the remaining 47 patients (30 women, 17 men), who were a mean age at the time of fracture of 60 years (standard deviation [SD], 19; range, 18-98 years), parallel plate fixation was used to treat comminuted intra-articular AO type C distal humeral fractures.

## Patients

The patients' medical records and radiographs were reviewed retrospectively. The mechanisms of injury comprised falling from

standing height in 29, bicycle accident in 7, falling down stairs in 3, falling from a height in 3, sports-related in 3, motor vehicle accident in 1, and a machine injury in 1. The left elbow was affected in 16 and the right in 31. There were 8 open fractures, all assessed as Gustilo-Anderson grade 1.<sup>13</sup> According to AO classification, the fractures were classified from plain radiographs as C1 in 16, C2 in 23, and C3 in 8 patients. Five patients had additional fractures, including a distal radius fracture in 2, scaphoid fracture in 1, acetabulum fracture in 1, and proximal humeral fracture in 1. Primary radial nerve palsy was diagnosed in 2 patients. Surgical details, possible complications, and reoperations were recorded from the medical files.

## Operative technique

Preoperative CT imaging was used if the operating surgeon considered it necessary (Fig. 2). The patient was placed in the lateral decubitus position, a sterile tourniquet was used, and a posterior midline incision was made with medial and lateral full-thickness skin flaps. The ulnar nerve was identified and decompressed. The medial and lateral borders of the triceps muscle were identified and opened. Olecranon osteotomy was performed in 36 patients to view and reduce the articular surface; however, reduction of the articular fragments without osteotomy was possible in 11 patients. The operating surgeon decided on the exposure type.

Parallel plating with Mayo elbow plates (Acumed, Hillsboro, OR, USA) was used in all cases (Fig. 3). Distal and proximal fixation both used 3.5-mm cortical screws. The olecranon osteotomy was fixed with a posterior plate from the same implant system in 29 patients. An Olecranon Rod (Acumed) was used in 3 patients. Although Olecranon Rod fixation was attempted in 1 additional patient, a large drill bit broke the ulnar diaphysis and a long posterior plate was used to fix the iatrogenic fracture and osteotomy. An Olecranon Osteotomy Nail (Synthes, Oberdorf, Switzerland) was used in 2 cases and was attempted in 1 additional patient; however, it failed to compress the osteotomy, and a posterior plate was used instead. The ulnar nerve was returned to its anatomic position, and the wound was closed. No drains were used.

## Postoperative management

The arm was supported with a sling or cast for 2 weeks postoperatively. After the swelling had subsided, the wound was healing, and sutures were removed, a physiotherapist initiated guided, gentle range of motion (ROM) exercises. Patients routinely visited the outpatient clinic at 6 and 12 weeks. Formal physiotherapy was initiated if ROM was not progressing at the 6-week postoperative visit. Progressive splinting at night was used if extension did not progress. Additional visits were scheduled if necessary.

## Outcome measures

### Function

The Disabilities of Arm, Shoulder and Hand (DASH),<sup>17</sup> to assess upper arm function and symptoms, and the RAND Medical Outcome Study 36-Item Short Form (SF-36) questionnaire, to assess quality of life (QOL),<sup>1</sup> were mailed to patients. Thirty-five

Download English Version:

<https://daneshyari.com/en/article/4074432>

Download Persian Version:

<https://daneshyari.com/article/4074432>

[Daneshyari.com](https://daneshyari.com)