

A paradigm shift in the surgical reconstruction of extra-articular distal humeral fractures: Single-column plating



Gregory M. Meloy^a, Matthew A. Mormino^b, Peter A. Siska^a, Ivan S. Tarkin^{a,*}

^aUniversity of Pittsburgh Medical Center, Department of Orthopaedic Surgery, Pittsburgh, PA, USA

^bUniversity of Nebraska Medical Center, Department of Orthopaedic Surgery, Omaha, NE, USA

ARTICLE INFO

Article history:

Accepted 5 July 2013

Keywords:

Distal humeral fracture
Extra-articular
Single-column plating
Dual-column plating

ABSTRACT

Objectives: The study aimed (1) to examine if there are equivalent results in terms of union, alignment and elbow functionally comparing single- to dual-column plating of AO/OTA 13A2 and A3 distal humeral fractures and (2) if there are more implant-related complications in patients managed with bicolumnar plating compared to single-column plate fixation.

Design: This was a multi-centred retrospective comparative study.

Setting: The study was conducted at two academic level 1 trauma centres.

Patients/participants: A total of 105 patients were identified to have surgical management of extra-articular distal humeral fractures Arbeitsgemeinschaft für Osteosynthesefragen/Orthopaedic Trauma Association (AO/OTA) 13A2 and AO/OTA 13A3.

Intervention: Patients were treated with traditional dual-column plating or a single-column posterolateral small-fragment pre-contoured locking plate used as a neutralisation device with at least five screws in the short distal segment.

Main outcome measurements: The patients' elbow functionality was assessed in terms of range of motion, union and alignment. In addition, the rate of complications between the groups including radial nerve palsy, implant-related complications (painful prominence and/or ulnar nerve neuritis) and elbow stiffness were compared.

Results: Patients treated with single-column plating had similar union rates and alignment. However, single-column plating resulted in a significantly better range of motion with less complications.

Conclusions: The current study suggests that exposure/instrumentation of only the lateral column is a reliable and preferred technique. This technique allows for comparable union rates and alignment with increased elbow functionality and decreased number of complications.

© 2013 Elsevier Ltd. All rights reserved.

Introduction

Open reconstruction of extra-articular distal humeral fracture has traditionally been performed with the use of orthogonal plating [1–4]. This strategy is typically effective in creating a biomechanical milieu of absolute stability to encourage uneventful union with optimal alignment. Further, rigid bicolumnar plating allows for aggressive early rehabilitation to optimise elbow functionality. However, dual plating in the context of a diminutive soft-tissue envelope infamously leads to implant-related complications. In fact,

ulnar neuritis reportedly occurs in upwards of 51% of patients following open reduction and internal fixation of distal humeral fractures using the dual-plating technique [5].

As an alternative to bicolumnar plating, single plating using a fixed-angle pre-contoured device is an attractive option [6–8]. Cordero et al. reported in a multicentre study that this technique is both safe and efficacious. A union rate of 97% was reported with minimal risk of iatrogenic complication such as nerve injury [6]. However, we know of no report to date that has compared the results of single-plate fixation of extra-articular distal humerus fractures to dual plating.

The purpose of this study is to compare the surgical reconstruction of extra-articular distal humerus fractures with traditional bicolumnar plating to single-plate fixation using a pre-contoured posterolateral-based locking plate. Two hypotheses are proposed: (1) equivalent results in terms of union, alignment and

* Corresponding author at: Department of Orthopaedic Surgery, University of Pittsburgh Medical Center, Kaufmann Medical Building, 3471 Fifth Avenue, Pittsburgh, PA 15213, USA. Tel.: +1 412 605 3262; fax: +1 412 687 3724.

E-mail address: tarkinis@upmc.edu (I.S. Tarkin).

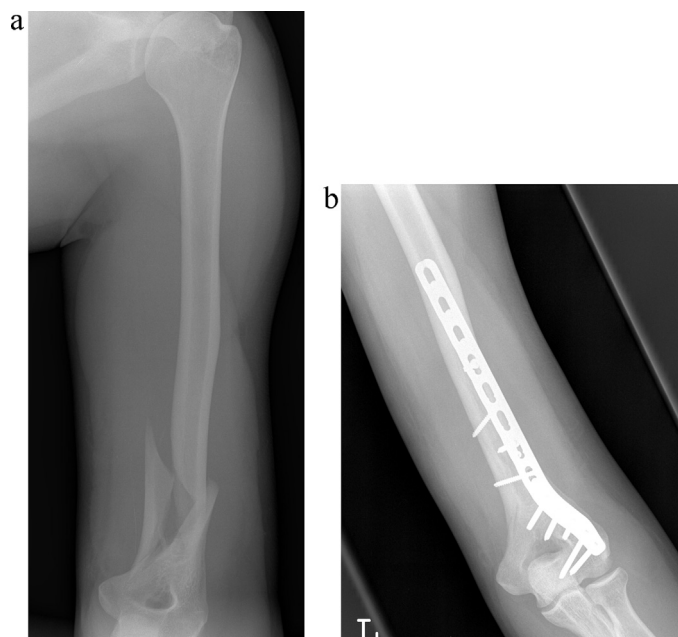


Fig. 1. (a) Preop AO/OTA 13A3 distal humeral fracture. (b) Single column plating with a precontoured small fragment posterolateral locking plate used as a neutralization device with 5 fixed angle screws in the short distal segment. Immediate rehabilitation instituted after wound healing resulting in optimal elbow functionality.

elbow functionally will be realised on comparing single- to dual-column plating and (2) more implant-related complications will occur in patients managed with bicolumnar plating.

Materials and methods

The orthopaedic trauma databases at two academic level-1 trauma centres was used to identify all patients who had undergone operative fixation for closed distal humeral fracture. All extra-articular fractures (Arbeitsgemeinschaft für Osteosynthesefragen/Orthopaedic Trauma Association, AO/OTA 13A2 and A3) from 2006 to present were included for further review. All patients included in the study were followed up at least until fracture union.

During the study period, single-column locked posterolateral plating through a lateral paratricipital approach (Fig. 1) evolved into the preferred treatment paradigm. This group of patients has previously been reported in a study identifying the safety and efficacy of this technique [6]. In the current study, this new treatment strategy was compared to the more traditional bicolumnar plating technique using either triceps splitting or preserving exposures.

For purposes of this study, fracture union was defined by bridging bone noted on three of four cortices on orthogonal radiographs by 4 months by an independent reviewer not involved with the initial surgical management of the patient. The elbow range of motion was recorded. Further, specific complications such as nonunion, malunion, radial nerve palsy and implant-related complications (painful prominence and or ulnar nerve neuritis) were recorded.

Table 1
Patient characteristics.

	Number included	Number excluded	Age	Sex	Fracture type	Implant irritation	Elbow stiffness	Tricep rupture	Premature hardware failure	Iatrogenic radial nerve injury
Dual plating	48	5	43 ± 22.16	31f 18m	A2-5 A3-43	5	3	1	0	6
Single plating	45	6	35 ± 19.4	23F 22M	A2-8 A3-37	1	0	0	1	0

The cohorts were examined for statistical differences in demographics (paired *t*-test) and fracture type (chi-squared test). The paired *t*-test was used to compare differences in the elbow range of motion. The chi-squared test was performed to examine the differences in union rate and number of complications between patients managed with the single- or the double-plating technique.

Results

Demographics

A total of 105 patients with an extra-articular distal humeral fracture comprised the study group (Table 1). Group 1 was managed with dual-column plating while single plating was performed for group 2. No statistical difference was found between the groups' age and fracture type. The mean duration of follow-up was 6.1 months (range 2–24 months).

Group 1 consisted of 53 extra-articular distal humeral fractures treated with dual-column plating. Of those, 43 had an A3 fracture and five had an A2 fracture. Five patients were excluded due to inadequate follow-up, leaving 48 in Group 1. The mean age of the dual-plating cohort was 43 ± 22.16 years.

Group 2 comprised 51 patients who were managed with a single pre-contoured posterolateral locking plate. Thirty seven patients had an A3 fracture, and eight had an A2 fracture. The mean age of the single-plating cohort was 35 ± 19.4 years. Six of those patients had inadequate follow-up for evaluation of outcomes.

Fracture union and alignment

Comparable union rates were realised for both groups. All patients in Group 1 went on to union, while the union rate in Group 2 was 97.8%. The difference in union rates was not statistically significant ($p = 0.15$). One patient in Group 2 sustained a high-energy fall 1 month postoperatively resulting in hardware failure. She was revised to a double-plating strategy. Another patient in Group 2 had delayed union with 11° malunion in the sagittal plane secondary to postoperative bending of the plate without catastrophic failure. The rest of the cases in both groups (97.8% of the total) were aligned within 5° of the anatomical axis.

Elbow range of motion

In comparing the range of motion between the two cohorts, Group 2 (single plating) had better overall range of motion than Group 1. In Group 1 (dual plating), the mean elbow flexion achieved was 127.09 ± 14.96° and the mean elbow extension was –12.44 ± 10.84°. In Group 2, the mean elbow flexion achieved was 136.1 ± 7.7° and the mean elbow extension was –3.62 ± 4.96°. The difference between the groups in both elbow flexion and extension was found to be statistically significant ($p < 0.05$).

Complications

The overall complication rate was significantly greater in Group 1 (dual plating) compared to Group 2 (single plating) ($p = 0.002$).

Download English Version:

<https://daneshyari.com/en/article/6084029>

Download Persian Version:

<https://daneshyari.com/article/6084029>

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