



Low transcondylar fractures of the distal humerus: results of open reduction and internal fixation

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Background: This study presents the outcomes of low transcondylar fractures of the distal humerus treated by open reduction and internal fixation.

Methods: Between 1996 and 2010, 263 distal humeral fractures were managed at our institution. Patients with a true low transcondylar fracture treated by open reduction and internal fixation were included. Fourteen patients form the basis of this study. Fracture fixation was achieved through a triceps-sparing approach, a triceps tongue, or an olecranon osteotomy. Internal fixation was performed with parallel plates, orthogonal plates, a single lateral plate, or a single medial plate. The clinical outcome was measured with pain levels, range of motion, and the Mayo Elbow Performance Score. Radiographs at latest follow-up were assessed for union, delayed union, nonunion, and hardware failure.

Results: At most recent follow-up, 11 patients had no pain, 2 had mild pain, and 1 had moderate pain. The mean Mayo Elbow Performance Score was 85. The mean arch of motion was 95°. Complications included nonunion, delayed union, wound complications, deep infection, and heterotopic ossification.

Discussion: Stable internal fixation of low transcondylar fractures is perceived as difficult to achieve because of the very small size of the distal fragment. However, the results of our study indicate that internal fixation of low transcondylar fractures of the distal humerus is associated with a high union rate and satisfactory clinical results. Elbow arthroplasty does not need to be considered for most patients with a low transcondylar distal humeral fracture.

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

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Keywords: Distal humeral fracture; low transcondylar fracture; open reduction and internal fixation

Distal humeral fractures have an incidence of 5.7 per 100,000 persons in the population per year.²¹ So-called low transcondylar fractures represent about 9% of these and are considered a distinct pattern among the classical fractures of the distal humerus.^{17,21} These injuries are characterized by a

very consistent transverse extra-articular fracture line through or below the lateral epicondyle and at the level of or just above the medial epicondyle. Stable internal fixation may be extremely difficult to achieve because of the very small size of the distal fragment, especially in the presence of poor bone quality and comminution.^{8,14,17,21,24,28} For these reasons, total elbow arthroplasty may be considered for selected low transcondylar fractures.^{2,10,18} However, the outcome of internal fixation for this specific type of injury is difficult to understand because most reports on internal fixation of distal humeral fractures group together multiple subtypes.^{8,17,20} The

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purpose of this study is to report on the outcome of a series of patients with a low transcondylar fracture of the distal humerus treated by open reduction and internal fixation.

Materials and methods

This is a retrospective case study of the outcome of a series of patients with low transcondylar fractures of the distal humerus treated by open reduction and internal fixation. Our trauma registry was queried for adult distal humeral fractures that were treated surgically between 1996 and 2010.

To be included in this study, the fracture had to be considered a true low transcondylar fracture. We defined this fracture type as (1) an extra-articular fracture and (2) a fracture with a single transverse fracture line that always exited at the level of or below the lateral epicondyle laterally and at the level of or just above the medial epicondyle. None of the fractures included in the study extended proximal to the roof of the olecranon fossa affecting the columns. There were various amounts of comminution. We excluded patients with less than 6 months of follow-up.

We identified 263 consecutive distal humeral fractures through our registry. Two individuals reviewed all radiographs to determine how many fractures fulfilled the previously mentioned criteria. A low transcondylar fracture treated with internal fixation was found in 20 patients (7.6%). Of the 20 patients identified, 1 patient died within a few days after surgery of causes unrelated to the fracture. Five additional patients were lost to follow-up. The remaining 14 patients form the basis of this study.

The mean age at the time of surgery was 71 years (range, 40-97 years). Three patients were aged between 40 and 60 years, 3 patients were aged between 61 and 70 years, and 8 patients were aged 71 years or older. Of the patients, 9 were women and 5 were men. The left elbow was involved in 6 cases and the right elbow in 8. The mechanism of injury involved a fall from a standing height (9 cases), a fall down the stairs (3 cases), a fall off a ladder (1 case), and a fall off of a stool (1 case). There were no open fractures.

Fracture fixation was achieved through a triceps-sparing approach (8 elbows), a triceps tongue (4 elbows), or an olecranon osteotomy (2 elbows). The ulnar nerve was transposed in 10 elbows. Internal fixation was performed with parallel plates (11 elbows), orthogonal plates (1 elbow), a single lateral plate (1 elbow), or a single medial plate (1 elbow). After closure, the elbow was placed in a bulky non-compressive dressing with an anterior plaster slab to maintain the elbow in extension, and the upper extremity was elevated. Active-assisted and passive motion was encouraged 2 weeks after the surgical procedure. All patients were permitted gentle daily activities and were instructed not to lift anything heavier than a glass of water for the first 6 weeks.

Clinical outcome was assessed based on pain level, range of motion, and the Mayo Elbow Performance Score (MEPS). Pain was described as none, mild, moderate, or severe. Range of motion was measured in degrees for flexion, extension, pronation, and supination. Radiographs obtained at latest follow-up visit were assessed for union, delayed union, nonunion, and hardware failure.

Results

Mean follow-up time was 11 months (range, 6-16 months). Mean time between the injury and surgery was 6 days

Case No.	Time to surgery (d)	Age (y)	Gender	Approach	Plate position	UNT	Follow-up (mo)	Range of motion (°)	Flexion (°)	Extension (°)	Pronation (°)	Supination (°)	MEPS	Pain	Complication	Further surgery
1	1	57	Male	TS	P	Yes	16	115	135	20	85	75	Excellent	None	Delayed healing	No
2	3	84	Female	T0	M	Yes	15	110	115	5	80	80	Excellent	None	Delayed healing	No
3	7	59	Female	T0	P	No	6	45	90	45	85	85	Poor	Moderate	Nonunion	Yes
4	2	64	Female	TS	P	Yes	7	140	140	0	85	85	Excellent	None	None	No
5	6	66	Female	TS	P	No	6	95	110	15	85	85	Good	Mild	None	No
6	10	71	Male	TS	P	No	7	95	120	25	85	85	Excellent	None	None	No
7	6	97	Female	TS	P	Yes	12	100	120	20	85	85	Excellent	None	None	No
8	9	77	Female	TS	P	Yes	14	90	100	10	85	85	Excellent	None	Nonunion	No
9	7	77	Female	IVT	O	Yes	11	120	130	10	80	50	Excellent	None	None	No
10	5	40	Male	TS	L	No	16	75	125	50	80	65	Good	None	None	No
11	4	88	Female	IVT	P	Yes	13	110	140	30	60	60	Excellent	None	Skin infection and dehiscence	Yes
12	5	79	Male	IVT	P	Yes	11	100	130	28	80	70	Good	None	Deep infection	Yes
13	6	73	Female	IVT	P	Yes	6	80	100	20	85	85	Excellent	None	None	No
14	6	64	Male	TS	P	Yes	8	60	85	25	80	70	Fair	Mild	Heterotopic ossification	Yes

IVT, Inverted V tenotomy; L, lateral; M, medial; O, orthogonal; P, parallel; T0, transolecranon osteotomy; TS, triceps sparing; UNT, ulnar nerve transposition.

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