



Minifragment plating for fractures of the distal radius

Angel Antonio MARTINEZ, Vicente CANALES, Jorge CUENCA, Antonio HERRERA

From Miguel Servet University Hospital, Zaragoza, Spain

Twelve patients with fracture of the distal radius were treated by open reduction and internal fixation with titanium minifragment plates. There were 8 women and 3 men, with a mean age of 42 years. The mean follow-up was 18 months. According to the score of Gartland and Werley, 11 patients had an excellent result and one patient had a good result. All patients reported no pain in their activities of daily living and were satisfied with the result. All workers returned to work. One patient developed reflex sympathetic dystrophy which resolved with treatment. No patients needed plate removal because of irritation of the tendons. The results obtained with this technique appear promising, although more cases are needed to achieve a definitive conclusion.

INTRODUCTION

Displaced fractures of the distal radius are difficult to treat successfully by nonoperative methods. Most authors have recommended the operative option when articular incongruity exceeds 1 or 2 mm (1, 9, 12).

Several surgical methods have been used to treat these fractures. External fixation has obtained good results in 80-90% of cases (5, 8, 11, 16), but complications such as pin tract infections and reflex sympathetic dystrophy have been relatively common (5, 11, 16). Plate osteosynthesis has yielded good results in 90% of cases (4, 7, 13). However, plates have been associated with irritation of extensor tendons when the approach was dorsal (7, 13), and rup-

ture of the flexor pollicis longus tendon when the approach was volar (4). Wrist arthroscopy has enabled to assess the articular surface during the fixation of distal radius fractures. It has been reported to be useful as an assistance method when used in combination with external fixation or percutaneous pinning (3).

We present our experience with minifragment plate fixation for distal radius fractures.

PATIENTS AND METHODS

Between 2001 and 2002, 12 patients with fracture of the distal radius were treated by open reduction and internal fixation with titanium minifragment plates (Normed, Tuttlingen, Germany). There were 8 women and 3 men, with a mean age of 42 years (range, 18 to 60 years).

According to the AO classification there were 6 type A3 fractures, 2 type B1 fractures, 2 type C1 fractures and 2 type C2 fractures. The indication for operation was failure of closed reduction (2, 12): radial shortening greater than 5 mm, dorsal angulation or radial inclination greater than 10° and an articular step-off greater

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- Angel Antonio Martinez, MD, Orthopaedic Surgeon.
 - Vicente Canales, MD, Associate Professor.
 - Jorge Cuenca, MD, Orthopaedic Surgeon.
 - Antonio Herrera, MD, Professor and Chairman.

Department of Orthopaedic and Trauma Surgery. Miguel Servet University Hospital. Zaragoza. Spain.

Correspondence: Angel A. Martínez, C/Princesa, 11-13, 1°C, Zaragoza 50005. Spain. E-mail: anmarti@wanadoo.es.

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Fig. 1. — Preoperative posteroanterior (a) and lateral (b) radiographs of a patient with a type A3 fracture. Posteroanterior (c) and lateral (d) radiographs showing healing after stabilisation with 3 minifragment plates.

than 2 mm. We used this method in relatively younger patients, because we considered old age with osteoporosis as a relative contraindication (10). A dorsal approach was used in type A and B fractures and a volar approach in type C fractures. We used one plate in one case of B1 fracture, 3 plates in two cases of A3 fracture (fig 1) and 2 plates in the other patients (table I). We did not use bone grafts in any case. Postoperatively, the forearm was immobilised in a plaster cast for 4 weeks. All patients were assessed clinically and radiologically at a mean follow-up of 18 months (14-24). Plates were not removed. We recorded the range of movement of the wrist and forearm rotation. The radiological parameters measured and compared with the uninjured wrist were palmar slope, radial inclination, radial length and articular incongruity. Degenerative changes were graded according to Knirk and Jupiter (9). The modified functional scoring system of Gartland and Werley was used (6, 14).

RESULTS

Clinical and radiological union occurred at 6 to 8 weeks in all cases. The reduction was maintained after internal fixation in all patients.

Motion (table II): wrist flexion averaged 60° (range, 45-75°). Average wrist extension was 67°

(range, 55-80°). All patients could fully pronate their forearm to 90°. There was full supination to 90° in all patients, except in one who had supination to 80°. Radial deviation of the wrist averaged 23° (range, 15-35°), whereas the average ulnar deviation was 34° (range, 20-45°).

Function (table I): at final follow-up, the functional results according to the Gartland and Werley score (1, 6, 14), were excellent in 11 cases and good in 1 case. All patients reported no pain in their activities of daily living and were satisfied with the result. All patients with an occupation returned to work.

Radiological results (table III): the average amount of radial shortening was 0.5 mm (range, 0-1 mm). There was 1-mm radial shortening in 6 patients. Articular congruency was fully restored in 9 patients; there was a step-off of 1 mm in the remaining three. The angulation of the radial articular surface on lateral projection was reduced in 7 patients. The average loss of palmar slope was 4° (range, 5-12°). The radial inclination angle was reduced in 5 patients. The average loss of radial inclination was 2° (range, 4-6°). The radiocarpal joint space was normal in 7 patients and slightly

Table I. — Demographic and technical data

Patient #	Age	Sex	AO type	Approach	Plates	G & W	Grade of arthritic change at follow-up	Complications
1	34	M	A3	Dorsal	3	E	0	RSD
2	26	F	B1	Dorsal	1	E	0	
3	44	F	C1	Palmar	2	E	0	
4	56	F	A3	Dorsal	3	E	1	
5	60	F	A3	Dorsal	2	E	1	
6	18	M	C1	Palmar	2	E	0	
7	30	M	B1	Dorsal	2	E	0	
8	54	F	A3	Dorsal	2	G	1	
9	42	F	C2	Palmar	2	E	0	
10	40	F	C2	Palmar	2	E	1	
11	56	F	A3	Dorsal	2	E	1	
12	39	M	A3	Dorsal	2	E	0	

M : male ; F : female ; E : excellent ; G : good ; G & W : Gartland and Werley ; RSD : reflex sympathetic dystrophy.

Table II. — Mobility

Patient #	Flex	Ext	Pron	Supin	RD	UD
1	65	65	90	90	28	35
2	75	80	90	90	35	40
3	65	70	90	90	25	35
4	50	70	90	90	20	30
5	55	65	90	90	25	35
6	60	60	90	90	25	35
7	75	80	90	90	30	40
8	45	55	90	80	15	20
9	60	65	90	90	20	30
10	60	60	90	90	20	35
11	55	65	90	90	15	30
12	55	70	90	90	25	45

Flex : flexion ; Ext : extension ; Pron : pronation ; Supin : supination ; RD : radial deviation ; UD : ulnar deviation.

diminished in 5 patients (table I).

Complications : one patient developed reflex sympathetic dystrophy which resolved with treatment. There were no infections or other complications. No patients needed plate removal because of irritation of the tendons.

DISCUSSION

Plate fixation has been successfully used in the treatment of distal radius fractures. Dorsal plating has an increased risk of extensor tendons irritation and rupture (7, 13) which may necessitate plate

removal. The risk of tendons irritation was found to be significantly lower with a low-profile plate compared with normal plates (13). Volar plating has been reported to have several complications, such as rupture of the flexor pollicis longus tendon, late carpal tunnel syndrome, adhesion of flexor tendons and reflex sympathetic dystrophy (4). Moreover, the palmar approach has an increased risk of damaging the median nerve. Letsch *et al* (10) obtained better results with dorsal plating than with volar plating. Patients older than 80 years and women had significantly worse results. The existence of osteoporosis can result in a worse purchase of screws and the stability obtained may be poor. Such patients may require a longer period of postoperative immobilisation, and the functional results achieved may therefore be worse. We have used miniplating osteosynthesis in relatively young individuals to avoid this theoretical problem. Drobetz and Kutscha-Lissberg (4) used a locking screw plate system to improve fixation, but the size of the plate and the edges of screws caused a high rate of tendon rupture.

Miniplating fixation allows for an accurate reduction. Intraarticular fragments can be fixed with several plates. When bigger plates are used, small fragments cannot be treated using the plate alone and additional bone grafting is required to maintain reduction (4). With external fixation, the accuracy of restoration of the articular surface is

Table III. — Radiological parameters compared with the uninjured wrist

Patient	Loss of palmar slope (degrees)	Loss of radial inclination angle (degrees)	Loss of radial length (mm)	Articular step-off (mm)
1	5	0	0	0
2	0	0	0	0
3	0	4	1	0
4	12	0	1	0
5	8	6	1	0
6	0	0	0	1
7	0	0	0	1
8	5	0	1	0
9	5	5	1	1
10	0	0	0	0
11	7	5	1	0
12	5	4	0	0

not always satisfactory, and the prolonged ligamentotaxis required may result in stiffness.

We have not noted any problems of tendon irritation, and implant removal has not been necessary. All patients were asymptomatic and no cases of extensor tenosynovitis or tendon rupture were noted. This method is technically demanding and takes time, but we think that the fixation achieved is very good and the period of postoperative immobilisation could be shortened in the future. The present report has the limitation of its small number of cases, but the results obtained are promising.

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