



Conservative management of minimally displaced isolated fractures of the ulnar shaft

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The purpose of this prospective study was to compare three different ways of conservative management of isolated fractures of the ulnar shaft: immediate mobilisation, below-elbow plaster cast and above-elbow plaster cast immobilisation. Over a 24-month period, 102 minimally displaced isolated fractures of the distal two-thirds of the ulnar shaft were treated on an outpatient basis. Thirty-two fractures were immobilised with an above-elbow plaster cast for 3 weeks and a below-elbow plaster cast for an additional 3 weeks. Thirty-six fractures were immobilised with a below-elbow plaster cast for 6 weeks. The remaining 34 fractures were managed with immediate mobilisation. Radiological healing, range of motion of the wrist, and pain were assessed. Results were good and were comparable in terms of healing, time to healing, pain and range of motion of the wrist.

Keywords : ulna fractures ; conservative management.

INTRODUCTION

The treatment of isolated ulnar fractures remains controversial, with different authors recommending both surgical and non-surgical management (2-4,9,10). Isolated fractures of the shaft of the ulna are often sustained when the forearm is raised to shield against a direct hit. The isolated fracture of the ulnar shaft is notorious for its frequently prolonged healing time (13). The stability of these fractures is determined by the integrity of the periosteum and

the interosseous membrane, which is influenced by the initial displacement (6). In fractures displaced less than 50%, the periosteum and interosseous membrane are considered to be largely intact. In fractures displaced more than 50% the membranes are considered to be largely disrupted and the fractures are considered unstable (6,12). Since various studies have reported good results with conservative treatment of minimally displaced (less than 50% translation) isolated fractures of the ulnar shaft (4,6,8,12-14), many of these fractures are now treated conservatively. The goal of our study was to examine which conservative management of isolated minimally displaced fractures of the ulnar shaft was best in an ambulant setting.

MATERIAL AND METHODS

We carried out a randomised prospective study to assess the results of three different methods of conservative management of minimally displaced (less than

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50% translation) isolated fractures of the ulnar shaft. We included isolated fractures of the distal two-thirds of the ulnar shaft. All injuries were caused by focal low-energy trauma due to a direct hit on the forearm. All were treated on an outpatient basis. We excluded open fractures, severely comminuted fractures and fractures with displacement of more than 50%. Patients with obvious signs of any infection were excluded. Patients with multiple trauma and patients under 18 years of age were excluded as well.

Patient selection in three different groups was strictly randomised, purely based on date of first presentation at the hospital.

A total of 102 patients were included in the study. Their average age at the time of fracture was 42.2 years (range : 18 to 78). There were 59 women and 43 men. Thirty-eight fractures were on the dominant side, 64 on the non-dominant side. Thirty-two patients were managed with 3 weeks immobilisation in an above-elbow plaster cast followed by an additional 3 weeks in a below-elbow plaster cast. Thirty-six patients were managed with 6 weeks immobilisation in a below-elbow plaster cast. An additional 34 patients were managed with a compression bandage and immediate mobilisation. None of the patients were prescribed non-steroidal inflammatory drugs. All of them were prescribed paracetamol in case of excessive pain.

The patients received a clinical evaluation after 3 weeks and radiographs were taken after 6, 9 and 12 weeks to check radiological fracture healing. At 12 weeks we assessed the range of motion of both wrists (pronation/supination arc, flexion/extension arc), Visual Analogue Scale for pain and radiological fracture heal-

ing (osseous bridging). We compared the range of movement of the affected side with the non-affected side. We also investigated whether there were differences in pain between the three groups by means of a Visual Analogue Scale. Finally we investigated whether there were differences between the three groups as far as delayed-union rate and fracture healing are concerned.

RESULTS

The results for each individual group are presented in table I. All three groups scored very well on the Visual Analogue Scale and there was only minimal loss of rotation and flexion/extension in all three groups. Unfortunately we could not score 12 patients (4 in each group) with respect to range of motion, as they had had a fracture of the contralateral forearm or wrist before. These 12 patients were excluded in the assessment of range of motion. Delayed union (no visible osseous bridging on radiographs after 12 weeks) was found in 13 cases, but surprisingly they all were essentially painless with good range of motion. In the remaining 89 patients bony healing (visible osseous bridging on radiographs) was reached after an average of 10.5 weeks.

We compared Visual Analogue Scale for pain, loss of rotation arc, loss of flexion/extension arc and bony healing in the three groups by means of a non-paired Student t test. The results of this are presented in table II. Since all p values were greater

Table I. — Clinical and radiological results after 12 weeks

		group I : 3w AEP + 3w BEP	group II : 6W BEP	group III : no plaster cast
Visual Analogue Scale for pain	mean	8.62	8.69	8.62
	range	[6 - 10]	[6 - 10]	[6 - 10]
Loss of rotation arc	mean	5.86°	6.66°	5.53°
	range	[-6° - 21°]	[-5° - 21°]	[-6° - 25°]
Loss of flexion/extension arc	mean	4,68°	4,50°	4,33°
	range	[-8° - 16°]	[-6° - 16°]	[-8° - 15°]
Bony healing time	mean	10.7 weeks	10.5 weeks	10.4 weeks
Delayed union		4 / 32= 12.5%	5 / 36= 13.9%	4 / 34= 11.8%

AEP = above elbow plaster cast, BEP = below elbow plaster cast. Visual Analogue Scale : 0 = incapacitating pain, 10 = no pain. Loss of rotation arc and flexion/extension arc : difference in degrees with non-affected side.

Table II. – Results of statistical comparison between all three groups by means of a Student t test.

	Comparison group I - II	Comparison group I - III	Comparison group II - III
Visual Analogue Scale for pain	t = -0.338 SD = 0.845 p = 0.736	t = 0.362 SD = 0.825 p = 0.97	t = 0.384 SD = 0.837 p = 0.70
Loss of rotation arc	t = -0.481 SD = 6.42 p = 0.63	t = 0.190 SD = 6.48 p = 0.85	t = -0.682 SD = 6.48 p = 0.50
Loss of flexion/extension arc	t = 0.117 SD = 5.89 p = 0.91	t = 0.243 SD = 5.42 p = 0.81	t = 0.118 SD = 5.51 p = 0.91
Bony healing time	t = 0.299 SD = 2.13 p = 0.77	t = 0.581 SD = 2.06 p = 0.56	t = 0.274 SD = 2.11 p = 0.78

Group I = 3 weeks above-elbow plaster + 3 weeks below-elbow plaster. Group II = 6 weeks below-elbow plaster. Group III = immediate mobilisation. t = t value in Student's t test. SD = standard deviation. p = p value in Student's t test (statistically significant difference if $p < 0.05$).



Fig. 1. — Radiological follow-up.

Left : radiograph after 4 weeks of an isolated ulnar fracture treated with immediate mobilisation. Right : bony bridging of same fracture after 10 weeks.

than 0.05, we found no statistical difference at all in any investigated parameter between these groups. We could not find any statistical difference in delayed union rate either.

DISCUSSION

The treatment of isolated ulnar shaft fractures remains a topic of discussion with several authors

presenting good results for surgical treatment as well as for conservative treatment. Whenever displacement is greater than 50%, operative treatment has been recommended in literature (6,9,12). For displacement less than 50% both surgical and conservative treatment have been recommended by different authors, both with good results (6,9,12).

Since almost all isolated ulnar shaft fractures result from a direct hit, the vast majority of these fractures present in areas with higher crime rate. Often hospitals in these areas are overwhelmed by an overload of trauma and are forced to treat as many fractures as possible in a conservative way. There is a wide choice within conservative treatment of this type of fractures. In our study all three different conservative treatment strategies were compared and showed good comparable results in terms of healing, healing time, pain and function. Furthermore this type of treatment includes no risk for infection.

Several authors report a low rate of delayed union of these fractures after immediate mobilisation (1,4,5,7,8,11,12), while we found a slightly higher rate of delayed union (12.7%) and slightly longer bony healing time (10.5 weeks) in conservatively treated fractures, than generally described in literature. Most of these delayed unions were asymptomatic and had a good function. When symptomatic, we offered the patient an open reduction and internal fixation. No patient felt symptomatic enough to accept such open reduction and internal fixation.

Since these are only short-term results, it would be worthwhile investigating further whether these patients would present with problems in a long term follow-up over several years. It would be worthwhile to investigate whether the slightly higher delayed-union rate has any long term repercussions.

REFERENCES

1. **Atkin DM, Bohay DR, Slabaugh P, Smith BW.** Treatment of ulnar shaft fractures : a prospective, randomized study. *Orthopedics* 1995 ; 18 : 543-547.
2. **Bhandari M, Schemitsch EH.** Fractures of the shaft of the ulna. *J Orthop Trauma* 2004 ; 18 : 473-475.
3. **Boussouga M, Bousselmane N, Lazrek K, Taobane H.** Surgical management of isolated fractures of the ulnar shaft. *Acta Orthop Belg* 2002 ; 68 : 343-347.
4. **De Boeck H, Haentjens P, Handelberg F, Casteleyn PP, Opdecam P.** Treatment of isolated fractures with below-elbow plaster cast. A prospective study. *Arch Orthop Trauma Surg* 1996 ; 115 : 316-320.
5. **de Jong T, de Jong PC.** Ulnar-shaft fracture needs no treatment. A pilot study of 10 cases. *Acta Orthop Scand* 1989 ; 60 : 263-264.
6. **Dymond IW.** The treatment of isolated fractures of the distal ulna. *J Bone Joint Surg* 1984 ; 66-B : 408-410.
7. **Ekelund AL, Nilsson OS.** Early mobilization of isolated ulnar-shaft fractures. *Acta Orthop Scand* 1989 ; 60 : 261-262.
8. **Gérard F, Garbuio P, Tropet Y, Vichard P.** [Functional treatment of isolated fractures of the ulnar diaphysis in adults. A prospective study apropos of 10 cases and review of the literature.] (French). *Ann Chir Main Memb Supép* 1997 ; 16 : 252-257.
9. **Handoll HH, Pearce PK.** Interventions for isolated diaphyseal fractures of the ulna in adults. *Cochrane Database Syst Rev* 2004 ; 2 : CD000523.
10. **Labbe JL, Peres O, Leclair O, Goulon R, Bertrou V, Saint-Lanne S.** [Isolated fracture of the ulnar diaphysis, from plate osteosynthesis to intramedullary nailing.] (French). *Rev Chir Orthop* 1998 ; 84 : 515-522.
11. **Oberlander MA, Seidman GD, Whitelaw GP.** Treatment of isolated ulnar shaft fractures with functional bracing. *Orthopedics* 1993 ; 16 : 29-32.
12. **Osterman PA, Ekkernkamp A, Henry SL, Muhr G.** Bracing of stable shaft fractures of the ulna. *J Orthop Trauma* 1994 ; 8 : 245-248.
13. **Pollock FH, Pankovich AM, Prieto JJ, Lorenz M.** The isolated fracture of the ulnar shaft. Treatment without immobilization. *J Bone Joint Surg* 1983 ; 65-A : 339-342.
14. **Sarmiento A, Latta LL, Zych G, McKeever P, Zagorski JP.** Isolated ulnar shaft fractures treated with functional braces. *J Orthop Trauma* 1998 ; 12 : 420-424.