



## Open Archive Toulouse Archive Ouverte (OATAO)

OATAO is an open access repository that collects the work of some Toulouse researchers and makes it freely available over the web where possible.

This is an author's version published in: <https://oatao.univ-toulouse.fr/23063>

**Official URL :** <https://doi.org/10.1016/j.otsr.2017.10.015>

### To cite this version :

Marot, Vincent and Bayle-Iniguez, Xavier and Cavaignac, Étienne and Bonneville, Nicolas and Mansat, Pierre and Murgier, Jérôme *Results of non-operative treatment of olecranon fracture in over 75-year-olds.* (2018) *Orthopaedics & Traumatology: Surgery & Research*, 104 (1). 79-82. ISSN 1877-0568

Any correspondence concerning this service should be sent to the repository administrator:

[tech-oatao@listes-diff.inp-toulouse.fr](mailto:tech-oatao@listes-diff.inp-toulouse.fr)

# Results of non-operative treatment of olecranon fracture in over 75-year-olds

V. Marot, X. Bayle-Iniguez, E. Cavaignac, N. Bonneville, P. Mansat, J. Murgier\*

Département de chirurgie orthopédique et traumatologique, hôpital Pierre-Paul-Riquet, CHU de Toulouse, place du Docteur-Baylac, TSA 40031, 31059 Toulouse cedex 9, France

## A B S T R A C T

**Introduction:** Surgery is the gold-standard treatment of displaced olecranon fracture, but is associated with numerous complications, especially in the elderly. Functional results of non-operative treatment in this population have never been analyzed in a prospective study.

**Study hypothesis:** Non-operative treatment of isolated olecranon fracture with stable elbow-joint in over 75-year-olds gives functional results comparable to those of surgery as reported in the literature, with fewer complications.

**Material and methods:** A prospective study analyzed functional results of non-operative treatment of isolated closed Mayo I and II olecranon fracture with stable elbow, in patients aged  $\geq 75$  years. The principal assessment criterion was functional recovery on the Mayo Elbow Performance Score (MEPS) and QuickDASH at 6 months.

**Results:** Twenty-two fractures in 21 patients were included. Mean MEPS was 95.26/100 (range, 85–100), and mean QuickDASH 4.3 (range, 0–29.55). Eighteen fractures showed osteoarthritis of the olecranon. There were no cases of elbow instability. There were no complications.

**Discussion:** Non-operative treatment of olecranon fracture in patients aged  $\geq 75$  years provided excellent functional results at 6 months, without associated complications.

**Type of study:** Single-center prospective observation cohort study.

**Level of evidence:** IV.

### Keywords:

Olecranon fracture  
Non-operative treatment  
Elderly patient

## 1. Introduction

Olecranon fracture accounts for 10% of upper-limb fractures [1]. Mean age is 50 years for males and 63 years for females [2]. Surgery is often performed in elderly patients: internal fixation by tension-band wiring, plate or intramedullary nail [3], or fragment excision and triceps reinsertion [4]. However, surgery is not risk-free, especially in the elderly, where risk of scar disunion and infection is greater due to fragile skin cover. Moreover, material migration is more frequent in case of osteoporosis, and may lead to disassembly [5,6]. Fixation may lead to various iatrogenic complications, with rates of 30% in the general population [7,8]. Assessments of surgical treatment in the general population reports Mayo Elbow Performance Score (MEPS) ranging from 79.8 [9] to 97 [10] and the Quick disabilities of the arm, shoulder and hand (QuickDASH) score from 3.3 [9] to 14 [11] depending on the surgical technique [12].

Non-operative treatment is already used by some authors [13,14], and may be a valid alternative when displacement is not severe. There are presently no guidelines on treatment in elderly patients. To our knowledge, there are no prospective assessments of non-operative treatment of olecranon fracture.

### 1.1. Study hypothesis

Non-operative treatment of isolated stable olecranon fracture in over 75-year-olds gives good functional results comparable to those of surgery as reported in the literature, with fewer complications.

### 1.2. Objectives

The main study objective was to assess the functional results of non-operative treatment in over 75-year-olds admitted to our department for olecranon fracture without severe displacement. The secondary objective was to assess functional sequelae of olecranon fracture in over 75-year-olds managed non-operatively.

\* Corresponding author.

E-mail address: [murgier.jerome@hotmail.fr](mailto:murgier.jerome@hotmail.fr) (J. Murgier).

**Table 1**  
Results.

Number of patients	Age	MEPS			QuickDASH			ROM at 6 months		VAS at 6 months
		1.5 months	3 months	6 months	1.5 months	3 months	6 months	Extension	Flexion	
22	88.8	92.89 (80–100)	95.26 (85–100)	95.26 (85–100)	11.13 (0–29.55)	4.3 (0–29.55)	4.3 (0–29.55)	$-15^{\circ} \pm 8^{\circ}$ ( $5^{\circ}$ – $30^{\circ}$ )	$135^{\circ} \pm 6^{\circ}$ ( $130^{\circ}$ – $140^{\circ}$ )	1 (0–3)

## 2. Material and methods

A single-center prospective continuous observational study was performed from January to October 2016.

### 2.1. Patients

All patients aged  $\geq 75$  years admitted to or seen in emergency in the orthopedic department of the Pierre-Paul-Riquet hospital of Toulouse, France, for isolate, closed, stable olecranon fracture without severe displacement (Mayo types 1 and 2) [15] were included. Exclusion criteria comprised known history of severe cognitive disorder or refusal to participate.

### 2.2. Treatment

Non-operative treatment was founded on 2 weeks' elbow-to-body sling-and-swathe immobilization in a comfortable position ( $70$ – $90^{\circ}$  flexion and neutral pronation-supination), with associated analgesia. Immobilization was then removed definitively and rehabilitation was initiated: firstly analgesic physiotherapy associated to unrestricted below-threshold passive elbow mobilization, then work on all active ranges of motion at 6 weeks, associated to muscle reinforcement beginning at 8 weeks, and ending with proprioception exercises.

### 2.3. Endpoints

The main endpoint was functional recovery at 6 months post-trauma on MEPS and QuickDASH [16,17]. Complications were also inventoried.

The main assessment was performed at 6 months post-trauma, in consultation with a single investigator (VM). Follow-up was classical, with control consultations at 6 weeks and 3 months post-trauma, including MEPS and QuickDASH.

Fractures were classified according to displacement and stability on the Mayo Clinic system: a double-entry table with 3 rows (I: non-displaced fracture; II: stable displaced fracture; III: unstable displaced fracture) and 2 columns (a: single fracture line; b: comminution) [15].

Any complications were also noted.

### 2.4. Statistics

Sample size: our department's recruitment of elderly patients with olecranon fracture averages 20 per year. For a single-center prospective observational pilot study, the recommended number of patients to treat was 20.

## 3. Results

By the end of the inclusion period, 22 fractures in 21 patients were included. There was female predominance: 18/21 (82%); mean age was 88.8 years (range: 77–95 years). Fracture types were: 6 Mayo I-a, 2 Mayo I-b, 10 Mayo II-a, and 4 Mayo II-b. Nine of the 22 fractures (41%) involved the dominant side. There was no loss



**Fig. 1.** Non-union fracture.



**Fig. 2.** Healed fracture.

to follow-up. Three patients were initially recruited but excluded due to severe cognitive disorder.

Functional scores at 6 months were: mean MEPS, 95.26/100 (range: 85–100), with 16 excellent and 6 good results; mean QuickDASH, 4.3 points (range: 0–29.55) (Table 1). Mean range of motion at 6 months were:  $-15^{\circ} \pm 8^{\circ}$  (range,  $5$ – $30^{\circ}$ ) extension,  $135^{\circ} \pm 6^{\circ}$  (range:  $130$ – $140^{\circ}$ ) flexion, and full pronation-supination.

Mean pain score on a 0–10 visual analog scale (VAS) was 1 (range: 0–3). Eighteen of the 22 fractures (82%) showed non-union (Figs. 1 and 2). There were no cases of elbow instability at last follow-up.

There were no local (cutaneous, functional impotence, etc.) or general complications (loss of autonomy, failure to thrive, etc.).

**Table 2**  
Functional results of different treatments in the literature.

Authors	Treatment	Number of patients	Age (years)	Fracture	Follow-up (months)	Scores		Extension deficit
						MEPS	QuickDASH	
Tarallo et al.	Tension band wiring	33	51.82	Mayo II-a, II-b	33	88.3	12.4	-9.7
	Plate fixation	45	49.38	Mayo II-a, II-b	33	89.1	10.7	-7.8
Delsole et al.	Tension band wiring	23	64.5	Mayo I-a, I-b, II-a, II-b	13.5	97		-3.5
	Hook plate	25	65.76	Mayo I-a, I-b, II-a, II-b	14.4	93.6		-8.6
Schliemann et al.	Tension band wiring	13		Mayo II-a	43	92	14	
	Plate fixation	13		Mayo II-a	43	77	12.5	
Chen et al.	N-T memory connector	20	47.8	Mayo II-a, II-b, III-a, III-b	36	87	3.3	-4.2
	Plate fixation	20	48.9	Mayo II-a, II-b, III-a, III-b	36	79.8	4	-2.9
Veras et al.	Non-operative	12	81.8	Parker I	15.2			-7.5

#### 4. Discussion

Functional results for non-operative treatment of olecranon fracture in  $\geq 75$ -year-olds were excellent and comparable to those of surgery.

Extension deficit was systematic, but without impact on quality of life, as seen from the scores. This is in agreement with Morrey et al., who reported a functional range of elbow motion of 30–130° for everyday activity [18].

It was interesting to find that olecranon non-union, present in 18 cases, was always well tolerated. Thus, can be explained by the well-known biomechanical phenomenon of olecranal patellization, which restores active extension of the elbow [19]. In the present cohort, fractures mainly involved the non-dominant side, which may have contributed to the lack of loss of autonomy which is typical of this type of fracture [2], as seen from the MEPS and QuickDASH scores. Even so, patients with dominant-side fracture also showed good tolerance of treatment.

There have been previous studies of non-operative management of olecranon fracture [13] [8,19], but all were retrospective. Newman et al. [14] reported 3 weeks' cast immobilization in 45–90° flexion for strictly non-displaced fracture. For Veras et al. [13], 8 out of 12 patients had good clinical results, with a mean -7.5° extension deficit, and 9 cases of non-union, in a series with a mean age of 81.8 years and a mean 15 months' follow-up. Duckworth et al. [19] reported a mean QuickDASH score of 2.9, Oxford Elbow Score of 47% and 91% satisfaction in 23 patients with a mean age of 76 years and a mean 6 years' follow-up. Gallucci et al. [8] reported 1/10 pain on VAS, a mean -15° extension deficit and 22 non-unions in 28 patients with a mean age of 82 years and a mean 16 months' follow-up.

Compared to the literature on surgical treatment in the general population, the present results are comparable or better [20], as seen from Table 2. Tarallo et al. [21] reported poorer functional results, with slightly less extension deficit, at 33 months' follow-up in 33 patients with a mean age of 51 years, presenting with Mayo II-a or II-b fracture, managed by tension-band wiring. The same authors likewise found poorer functional scores but less extension deficit at 33 months' follow-up in 45 patients with a mean age of 49 years presenting with Mayo II-a and II-b fracture treated by plate fixation. Delsole et al. [10] reported a slightly higher mean MEPS and less extension deficit, at 13.5 months' follow-up in 23 patients with a mean age of 64 years presenting with Mayo I-a, I-b, II-a and II-b fracture, managed by tension-band wiring. The same authors reported a slightly lower MEPS and less extension deficit at 14.4 months' follow-up in 25 patients with a mean age of 66 years presenting with Mayo I-a, I-b, II-a and II-b, fracture treated by plate fixation. Schliemann et al. [11] reported lower MEPS and QuickDASH at 43 months' follow-up in 13 patients presenting with presenting with Mayo II-a fracture, managed by tension-band wiring. The same authors reported lower MEPS and QuickDASH at

43 months' follow-up in 13 patients presenting with presenting with Mayo II-a fracture, managed by plate fixation.

Surgical complications can occur: painful protrusion of fixation material under the skin (20–75% of fractures) [7], excessive wire protrusion [13,14] on the anterior side of the ulna liable to cause painful blocking in pronosupination, radio-ulnar synostosis [22], ulnar neuritis (12%) [23], iatrogenic anterior interosseous nerve lesion during transcortical tension-band wiring [24], heterotopic ossification (7–37%) [25,26], scar disunion (14%) [8], infection, and elbow osteoarthritis (1%) [10]. Moreover, anesthesia risk is higher in elderly subjects [27,28]. Gallucci et al. [8] reported a 30% complications rate after surgery.

Non-operative treatment is open to certain criticisms, particularly concerning extension deficit. However, it is interesting to note that surgical treatment gives similar results in the general population, with deficits ranging from -4° to -15° [14].

The present study had certain limitations. It would have been interesting to compare operative and non-operative treatment, but our recruitment is too small to implement such a design. It would also have been interesting to assess loss of triceps strength, although this is less functionally troublesome in this population.

#### 5. Conclusion

Non-operative treatment of olecranon fracture without severe displacement in patients aged  $\geq 75$  years gave excellent functional results at 6 months post-trauma, with fewer complications than for surgery.

#### Disclosure of interest

The authors declare that they have no competing interest.

#### References

- [1] Brolin TJ, Throckmorton T. Olecranon Fractures. *Hand Clin* 2015;31:581–90.
- [2] Duckworth AD, Clement ND, Aitken SA, Court-Brown CM, McQueen MM. The epidemiology of fractures of the proximal ulna. *Injury* 2012;43:343–6.
- [3] Argintar E, Cohen M, Eglseider A, Edwards S. Clinical results of olecranon fractures treated with multiplanar locked intramedullary nailing. *J Orthop Trauma* 2013;27:140–4.
- [4] Inhofe PD, Howard TC. The treatment of olecranon fractures by excision of fragments and repair of the extensor mechanism: historical review and report of 12 fractures. *Orthopedics* 1993;16:1313–7.
- [5] von Rüden C, Augat P. Failure of fracture fixation in osteoporotic bone. *Injury* 2016;47:S3–10.
- [6] Féron J-M, Thomas T, Roux C, Puget J. Osteoporosis and the orthopaedic surgeon in 2007. *Rev Chir Orthop Appar Mot* 2008;94:S99–107.
- [7] Macko D, Szabo RM. Complications of tension-band wiring of olecranon fractures. *J Bone Joint Surg Am* 1985;67:1396–401.
- [8] Gallucci GL, Piuze NS, Stullitel PAI, Boretto JG, Alfie VA, Donndorff A, et al. Non-surgical functional treatment for displaced olecranon fractures in the elderly. *Bone Jt* 2014;96-B:530–4.
- [9] Chen X, Liu P, Zhu X, Cao L, Zhang C, Su J. Design and application of nickel-titanium olecranon memory connector in treatment of olecranon fractures: a prospective randomized controlled trial. *Int Orthop* 2013;37:1099–105.

- [10] DelSole EM, Pean CA, Tejwani NC, Egol KA. Outcome after olecranon fracture repair: does construct type matter? *Eur J Orthop Surg Traumatol Orthop Traumatol* 2016;26:153–9.
- [11] Schliemann B, Raschke MJ, Groene P, Weimann A, Wähnert D, Lenschow S, et al. Comparison of tension band wiring and precontoured locking compression plate fixation in Mayo type IIA olecranon fractures. *Acta Orthop Belg* 2014;80:106–11.
- [12] Matar HE, Ali AA, Buckley S, Garlick NI, Atkinson HD. Surgical interventions for treating fractures of the olecranon in adults. *Cochrane Database Syst Rev* 2014;CD010144.
- [13] Veras Del Monte L, Sirera Vercher M, Busquets Net R, Castellanos Robles J, Carrera Calderer L, Mir Bullo X. Conservative treatment of displaced fractures of the olecranon in the elderly. *Injury* 1999;30:105–10.
- [14] Newman SDS, Mauffrey C, Krikler S. Olecranon fractures. *Injury* 2009;40:575–81.
- [15] Morrey BF. Current concepts in the treatment of fractures of the radial head, the olecranon, and the coronoid. *Instr Course Lect* 1995;44:175–85.
- [16] Fayad F, Lefevre-Colau MM, Gautheron V, Macé Y, Fermanian J, Mayoux-Benhamou A, et al. Reliability, validity and responsiveness of the French version of the questionnaire Quick Disability of the arm, shoulder and hand in shoulder disorders. *Man Ther* 2009;14:206–12.
- [17] Hudak PL, Amadio PC, Bombardier C, The upper extremity collaborative group (UECG). Development of an upper extremity outcome measure: the DASH (disabilities of the arm, shoulder and hand) [corrected]. *Am J Ind Med* 1996;29:602–8.
- [18] Morrey BF, An K-N, Chao EYS. Functional evaluation of the elbow. In: Morrey BF, editor. *The elbow and its disorders*. Philadelphia: W.B. Saunders; 1993. p. 86–97.
- [19] Duckworth AD, Bugler KE, Clement ND, Court-Brown CM, McQueen MM. Non-operative management of displaced olecranon fractures in low-demand elderly patients. *J Bone Joint Surg Am* 2014;96:67–72.
- [20] Powell AJ, Farhan-Alanie OM, Bryceland JK, Nunn T. The treatment of olecranon fractures in adults. *Musculoskelet Surg* 2017;101:1–9.
- [21] Tarallo L, Mugnai R, Adani R, Capra F, Zambianchi F, Catani F. Simple and comminuted displaced olecranon fractures: a clinical comparison between tension band wiring and plate fixation techniques. *Arch Orthop Trauma Surg* 2014;134:1107–14.
- [22] De Carli P, Gallucci GL, Donndorff AG, Boretto JG, Alfie VA. Proximal radio-ulnar synostosis and nonunion after olecranon fracture tension-band wiring: a case report. *J Shoulder Elbow Surg* 2009;18:e40–4.
- [23] Ishigaki N, Uchiyama S, Nakagawa H, Kamimura M, Miyasaka T. Ulnar nerve palsy at the elbow after surgical treatment for fractures of the olecranon. *J Shoulder Elbow Surg* 2004;13:60–5.
- [24] Parker JR, Conroy J, Campbell DA. Anterior interosseus nerve injury following tension band wiring of the olecranon. *Injury* 2005;36:1252–3.
- [25] Foruria AM, Augustin S, Morrey BF, Sánchez-Sotelo J. Heterotopic ossification after surgery for fractures and fracture-dislocations involving the proximal aspect of the radius or ulna. *J Bone Joint Surg Am* 2013;95:e66.
- [26] Koh KH, Lim TK, Lee HI, Park MJ. Surgical treatment of elbow stiffness caused by post-traumatic heterotopic ossification. *J Shoulder Elbow Surg* 2013;22:1128–34.
- [27] Boddart J, Raux M, Khiami F, Riou B. Perioperative management of elderly patients with hip fracture. *Anesthesiology* 2014;121:1336–41.
- [28] Griffiths R, Beech F, Brown A, Dhese J, Foo I, Goodall J, et al. Perioperative care of the elderly 2014: association of anaesthetists of Great Britain and Ireland. *Anaesthesia* 2014;69:S81–98.