Distal humerus fracture in the elderly: Does conservative treatment still have a role?

L. Pidhorz\textsuperscript{a,}\textsuperscript{*}, P. Alligand-Perrin\textsuperscript{a}, E. De Keating\textsuperscript{a}, T. Fabre\textsuperscript{b}, P. Mansat\textsuperscript{c}, the Société française de chirurgie orthopédique et traumatologie (SoFCOT)\textsuperscript{d}

\textsuperscript{a} Service d’orthopédie-traumatologie, centre hospitalier du Mans, 194, avenue Rubillard, 72000 Le Mans, France
\textsuperscript{b} Service d’orthopédie-traumatologie, hôpital Pellegrin, place Amélie-Raba-Léon, 33076 Bordeaux cedex, France
\textsuperscript{c} Centre hospitalier universitaire de Toulouse, institut de l’appareil Locomoteur, place du Dr-Baylac, 31059 Toulouse, France
\textsuperscript{d} 56, rue Boissonnade, 75014 Paris, France

Accepted: 19 August 2013

**KEYWORDS**
Distal humerus fracture; Immobilization; Conservative treatment; Malunion; Osteoarthritis

**Summary**
Introduction: Conservative treatment is exceptional in fracture of the distal extremity of the humerus in patients over 65 years of age. In a selected population, however, it may be an attractive option.

Materials and methods: One prospective and one retrospective study included a total of 56 patients, with a mean age of 84.7 years (range, 68–100 yrs). All were managed by 6 to 8 weeks’ brachial-antebraclial-palmar immobilization, without fracture reduction. Fractures were AO type A in 18 cases, type B in 8 cases and type C in 30 cases.

Results: At a mean 20.2 months’ follow-up in the retrospective and 8.6 months in the prospective series, mean MEPS score was 83 and 86 points with 75% and 83% satisfactory results respectively and mean Quick-DASH 31.3 and 34.4 points respectively. There were 3 non-unions. There was extra-articular malunion in 70% and intra-articular malunion in 65% of cases in the retrospective series, versus 16% intra-articular malunion in the prospective series. The rate of osteoarthritis increased over time, with more than 50% grade 2 or 3 in the retrospective series at end of follow-up. There were 3 complications: 2 hematomas and 1 skin lesion (localized pressure ulcer). There were 3 fracture displacements, not requiring change in management.

Discussion: Conservative treatment for fracture of the distal extremity of the humerus in patients over 65 years of age is exceptional, but conserves patient’s independence and provides

\* Corresponding author.
\E-mail address: lpidhorz@ch-lemans.fr (L. Pidhorz).

1877-0568/$ - see front matter © 2013 Published by Elsevier Masson SAS.
http://dx.doi.org/10.1016/j.otsr.2013.10.001

Please cite this article in press as: Pidhorz L, et al. Distal humerus fracture in the elderly: Does conservative treatment still have a role? Orthopaedics & Traumatology: Surgery & Research (2013), http://dx.doi.org/10.1016/j.otsr.2013.10.001
Introduction

During the 1979 SoFCOT (French Society of Orthopedic Surgery and Traumatology) symposium on fractures of the distal extremity of the humerus, Pierre Lecestre quoted Dr Albin Lambotte as saying, in 1913, that "Almost all fractures of the elbow should undergo surgery, which is the only means of perfect repair" [1].

One century on, is Lambotte still right? Does conservative treatment still have any place in the very if not overly interventionist arsenal of the modern orthopedic surgeon? Is it a default attitude in certain situations, or are there precise indications? The literature fails to answer these questions, as there have been few dedicated English or French-language studies.

The SoFCOT 2012 symposium sought to answer 3 important questions: What are the real role and modalities of conservative management of fractures of the distal extremity of the humerus? In what kind of patient may a form of treatment, considered by many to be out of date as compared to surgery, be indicated? And, if such an attitude is implemented, what results can be expected and foretold to families at the outset of treatment?

Material and methods

Patients

The 2012 SoFCOT symposium analyzed treatment results in isolated non-pathologic fracture of the distal extremity of the humerus in patients aged 65 years or over, in a multicenter observational study involving 19 academic and non-academic hospitals.

There were 2 series: one, retrospective, included patients treated between January 1st 2000 and December 31st 2010; the second, prospective, included those treated between June 15th 2010 and October 15th 2011. Minimum follow-up was 6 months.

The double series included 56 patients managed conservatively for fracture of the distal extremity of the humerus: i.e., 11% of the distal humerus fracture patients included in the 2012 symposium study. 69% of the fractures were managed by osteosynthesis, and 20% by elbow prosthesis. 34 of the 56 patients (in 12 of the 19 centers) were analyzed retrospectively and 22 prospectively (in 8 of the 19 centers). Patient data are presented in Table 1.

Mean age in both series was 84.7 years (range, 68—100 years), 65% aged over 80 years. ASA scores [2] were 1, 2 or 3 in 92% of cases. There was female predominance (49/56). One-third of patients had history of osteoporotic fracture. Katz scores [3] were more or less identical in the two series: 4.5 in the retrospective and 4.8 in the prospective series.

There was only 1 immediate postoperative complication: a Gustilo 1 open fracture in the retrospective series [4]. There were no vascular or nervous complications, still less any associated lesions (exclusion criterion). Radiologically (Table 2), all fracture types were present, both extra- and intra-articular. Conservative treatment was less frequent in the prospective than in the retrospective series in case of type B or C fracture (involving the joint surface) [5].

Treatment

Conservative treatment was mainly simple brachial-antebrachial-palmar (BABP) cast immobilization. There were also 3 elbow-to-body immobilizations, 1 immobilization with the elbow in >90° flexion, and 5 functional treatments after short immobilization. Mean hospital stay in both series was 6 days. Mean immobilization time was identical in both series: 7 weeks (range, 15—120 days).

Assessment

The population study was a classical epidemiological study: age, gender, ASA score [2], history of osteoporotic fracture, residence, Katz score [3] (assessing patient independence), but also including variables specific to this kind of fracture. Results focused on hospital stay and immobilization times, complications, Katz score at last follow-up, residence at last follow-up, Mayo Elbow Performance Score (MEPS) [6] and Quick-DASH score [7]. AP and lateral elbow radiographs assessed fracture consolidation, intra- or extra-articular malunion and osteoarthrosis on the Bröberg-Morrey criteria [8].

Statistics

Univariate analysis was performed using STATA® software version 11.0 (www stata com; StataCorp LP, College Station, TX 77845, USA). Pre-treatment and end-of-follow-up data

Table 1  Study population epidemiology.

<table>
<thead>
<tr>
<th></th>
<th>Prospective series (22 patients)</th>
<th>Retrospective series (34 patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>87.4</td>
<td>84.7</td>
</tr>
<tr>
<td>Age &gt; 80</td>
<td>64%</td>
<td>65%</td>
</tr>
<tr>
<td>Sex ratio</td>
<td>20 F / 2 M</td>
<td>29 F / 5 M</td>
</tr>
<tr>
<td>Living at home</td>
<td>55%</td>
<td>70%</td>
</tr>
<tr>
<td>History of osteoporotic fracture</td>
<td>36%</td>
<td>27%</td>
</tr>
<tr>
<td>ASA score (1, 2 or 3)</td>
<td>90%</td>
<td>94%</td>
</tr>
</tbody>
</table>

Please cite this article in press as: Pidhorz L., et al. Distal humerus fracture in the elderly: Does conservative treatment still have a role? Orthopaedics & Traumatology: Surgery & Research (2013), http://dx.doi.org/10.1016/j.otsr.2013.10.001
were compared on Mann-Whitney tests. Chi² test were used to compare categoric variables. The significance threshold was set at 5%. The two series were not combined, for reasons of statistical validity.

Results

Overall results

Mean follow-up was 20.2 months in the retrospective series (range, 6–92 months) and 8.6 (6–20) in the prospective series. Mean Katz score at end of follow-up was practically identical in the 2 series (4.2 in the retrospective series and 4.3 in the prospective series), as was mean MEPS at end of follow-up: 86 points in the prospective series, with 83% good or excellent results, and 83 points in the retrospective series with 75% good or excellent results. Mean Quick-DASH at end of follow-up was 31.3 points in the prospective series (range, 0–72.7) and 34.4 points in the prospective series (0–77.3). The results are presented in Table 3.

Clinical results

On the MEPS criteria, pain was absent in 75% of the prospective and 79% of the retrospective series; arc of motion was graded at 15 points in 60% and 20 points in 20% of the prospective series and respectively 51% and 36% of the retrospective series; stability was graded at 10 points in 95% of the prospective series and 91% of the retrospective series; and functional capacity was graded at respectively 17.8 and 16.7. Joint range of motion in the retrospective series was 110° flexion with 29° flexion contracture, with normal pronation in 91% of cases and normal supination in 85%. In the prospective series, the respective results were 120°, 26°, 80° and 80°. The humero-ulnar axis was consistently in varus or valgus except in 2 cases. Muscle force in flexion was normal or slightly reduced in 93% of cases in both series. This force in extension was normal or slightly reduced in 85% of cases in both series. The clinical results are presented in Table 3.

Radiological results

There were 3 cases of non-union (5.3%). Seventy percent of patients showed extra-articular malunition; 62% showed >15° malunion in the frontal plane and 46% >10° malunion in the sagittal plane. Intra-articular malunion affected 65% of cases in the retrospective and 16% in the prospective series. There was ossification in 47% and 24% of cases, respectively.

Osteoarthritis as assessed on the Bröberg-Morrey classification [8] is presented in Table 4. It was more frequent with longer follow-up, as in the retrospective series where almost 50% of patients had grade 2 or 3 osteoarthritis.

Success was 15% in terms of anatomic radiological consolidation, 94% in terms of radiological consolidation regardless of orientation, and 73% in terms of radiological consolidation associated with good or excellent clinical results.

Complications

Complications in both series were benign: 2 hematomas and 1 skin lesion (localized pressure ulcer), and 3 fracture displacements not requiring modification of treatment.

Table 2 Distribution of type of conservatively managed fracture of the distal extremity of the humerus on the AO radiological classification [5].

<table>
<thead>
<tr>
<th>AO classification</th>
<th>Prospective series (22 patients)</th>
<th>Retrospective series (34 patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type A (extra-articular)</td>
<td>10 (45%)</td>
<td>8 (23%)</td>
</tr>
<tr>
<td>Type B (partially articular)</td>
<td>4 (18%)</td>
<td>4 (12%)</td>
</tr>
<tr>
<td>Type C (totally articular)</td>
<td>C1 4 8 (36%)</td>
<td>C2 3</td>
</tr>
<tr>
<td></td>
<td>C3 1</td>
<td>C4 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C5 22</td>
</tr>
</tbody>
</table>

Table 3 Clinical results for conservative treatment.

<table>
<thead>
<tr>
<th></th>
<th>Prospective series (22 patients)</th>
<th>Retrospective series (34 patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow-up</td>
<td>8.6 months</td>
<td>20.2 months</td>
</tr>
<tr>
<td>Pre/Post-treatment Katz score</td>
<td>4.8 / 4.3</td>
<td>4.5 / 4.2</td>
</tr>
<tr>
<td>MEPS</td>
<td>86 points</td>
<td>83 points</td>
</tr>
<tr>
<td>Quick-DASH</td>
<td>34.4 points</td>
<td>31.3 points</td>
</tr>
<tr>
<td>Flexion</td>
<td>120°</td>
<td>110°</td>
</tr>
<tr>
<td>Flexion contracture</td>
<td>26°</td>
<td>29°</td>
</tr>
<tr>
<td>Prolation</td>
<td>80% normal</td>
<td>91% normal</td>
</tr>
<tr>
<td>Supination</td>
<td>80% normal</td>
<td>85% normal</td>
</tr>
</tbody>
</table>

Table 4 Incidence of osteoarthritis at follow-up on the Bröberg-Morrey classification [8] (%).

<table>
<thead>
<tr>
<th>Grade</th>
<th>Prospective series</th>
<th>Retrospective series</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>50</td>
<td>18</td>
</tr>
<tr>
<td>1</td>
<td>20</td>
<td>33</td>
</tr>
<tr>
<td>2</td>
<td>25</td>
<td>42</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
Discussion

Conservative treatment of fractures of the distal extremity of the humerus in the elderly is a time-honored attitude, which used mainly to be reserved to fractures inaccessible to other techniques or where health status contraindicated surgery. It consists in immobilization of varying duration (6 to 12 weeks) by resin cast or rigid fixator, with the elbow in 90° flexion. Some authors recommend trans-olecranon traction followed by plaster cast immobilization [9]. Eastwood recommended functional treatment based on early mobilization in 1937 [10], then by Brown and Morgan in 1971 [11]. The same treatment may be implemented using an external fixator that is locked between mobilization sessions [12].

The conservative treatment applied in the present study usually involved a BABP plaster cast. No trans-olecranon traction was applied, as it would have confined these elderly patients to bed, with the notorious risks associated with prolonged decubitus. No surgical fracture reduction was undertaken: the fracture was left as it was once conservative treatment had been decided upon. We were not able to confirm whether BABP immobilization was isolated or associated to shoulder immobilization in a jacket or a Dujarrier bandage.

We recommend initial BABP plaster cast immobilization, with padded elbow, for a total 6 to 8 weeks, according to evolution on X-ray. The shoulder should be immobilized in a Dujarrier bandage, which ensures immobility whereas a removable jacket is an invitation to non-compliance. Shoulder immobilization is usually for 3 to 4 weeks. A resin BABP cast may then replace the plaster cast, which is lighter and easier for elderly patients. Follow-up consultations follow the rhythm of the orthopedic treatment sessions: weekly for the first 3 weeks, then at week 6 and thereafter according to the habits of the surgeon.

There were several reasons for the small number of patients included in the present series. The received wisdom, still very present, is that such fractures are to be managed surgically, as Lambotte argued in the early 1900s and was reiterated in Lecestre’s introduction to the 1979 SoFCOT symposium [1]. In the retrospective series, covering 11 years of practice, the relatively small number of inclusions was due to the difficulty of access of our hospital’s medical information systems (Programme de médicalisation des systèmes d’information [PMSI]) or to inadequate patient coding at that time. Moreover, many were outpatients, not included in the databases. In the prospective series, covering the 16 months of inclusion, the relatively large number of patients can be attributed to the teams’ vigilance in referring all in- and out-patients with this type of fracture. Minimum follow-up was 6 months; many patients, especially during the period covered by the retrospective study, were followed-up for less than 6 months as surgeons did not systematically call elderly patients back in after consolidation had been achieved, whence a high rate of loss to follow-up before 6 months. The inclusion criterion was highly restrictive: only isolated fracture, excluding any patients with associated lesions. The positive side to such restrictive inclusion was the elimination of any interfering variable.

In the 1979 SoFCOT symposium [1], conservative treatment was reported for 115 cases (23%), with satisfactory results in 66%. Complications other than stiffness (in 22% of cases) were rare. In 2007, the Western France Orthopedic Society (SOO) also investigated conservative management of complex articular fractures of the distal extremity of the humerus in the elderly [13]. Non-surgical treatment was used in 19 cases (8%), indicated mainly by general health factors (reduced functional demand, highly osteoporotic bone): mean age was 86 years, with two-thirds of patients categorized ASA 3 or 4 [2], and a mean Katz score of 4.5 [3]. Fractures, three-quarters of which were type A (A2-3, A3) [5], were not a determining factor in choice of treatment. Follow-up showed that conservative treatment provided satisfactory MEPS results in a half of cases [6].

Katz score [3] grades patients’ independence, and was practically unchanged between the immediate pre-trauma period and end of follow-up in the present series. This shows that, in certain cases, which we shall seek to identify, conservative treatment by no means deteriorates these patients’ quality of life. The MEPS is a specific elbow score, which revealed very satisfactory results, graded good or excellent in 80% of subjects in both series; likewise, range of motion was satisfactory. Muscle force in both series was only slightly impaired after conservative treatment. The QuickDASH score of about 33 out of 100 in both series was quite acceptable (100 = most severe incapacity).

Radiology found many malunions, typical of conservative treatment. The high rate in the retrospective series corresponded to a difference in recruitment: i.e., the higher rate of joint fractures in the retrospective series. Conservatively managed elbows inevitably evolve progressively toward osteoarthritis: signs of osteoarthritis become more numerous with increasing follow-up.

An identikit picture of the patient typically treated conservatively in the present series would be: female patient, in her 80s, living at home, with a low ASA score [2], a good Katz score [3], with no history of fracture, and presenting with a non-displaced fracture free of serious complications. Immobilization will then be for 49 days. The patient’s Katz score will be maintained, the MEPS score will be good [6], flexion-extension will be 80° to 90° with normal pronation-supination, residual humero-ulnar axis deviation, and almost certainly malunion, although without impact on upper limb function.

Conclusion

Conservative treatment of fractures of the distal extremity of the humerus in patients over 65 years of age is exceptional. It is, however, certainly and demonstrably safe, with no serious complications reported. It allows continued independence and provides satisfactory clinical results, with no severe joint stiffness or elbow instability. One must simply accept a rather unpleasant, non-anatomic radiological aspect. In 2013, conservative treatment should remain part of our arsenal. In selected cases, one needs to “know how not to operate”, as Pr Ivan Kempf put it in an interview he gave with the newspaper Les Dernières Nouvelles d’Alsace on his retirement.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

Please cite this article in press as: Pidhorz L, et al. Distal humerus fracture in the elderly: Does conservative treatment still have a role? Orthopaedics & Traumatology: Surgery & Research (2013), http://dx.doi.org/10.1016/j.otsr.2013.10.001
Acknowledgments

The authors thank all of the Symposium participants, who made this study possible: L. Hubert, F. Mallard and N. Bigorre (Angers), A. Gabrion (Amiens), L. Obert and M. Ferrier (Besançon), T. Fabre and H. Demezon (Bordeaux), C. Hulet, B. Lebel and F. Dordain (Caen), D. Saragaglia and M. Milaire (Grenoble), J. Tonetti, A. Djahangiri and A. Cikes (Lausanne), L. Pidhorz, P. Alligand and E. De Keating (Le Mans), J.-L. Charissoux and M. Benassayag (Limoges), G. Herzberg (Lyon), B. Coulet (Montpellier), F. Sirveaux and A. Jacquot (Nancy), A. Galey and B. Augereau (HEGP-Paris), S. Levante, N. Mebtouche and T. Begué (Paris), F. Duparc (Rouen), P. Clavert and G. Ducrot (Strasbourg), P. Mansat and H. Nouaille Degorce (Toulouse), L. Favard and J. Brunet (Tours).

References