CONSERVATIVE TREATMENT OF FRACTURES AND FRACTURE-DISLOCATIONS OF THE UPPER END OF THE HUMERUS

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This paper reports a prospective study of 72 consecutive patients with fractures or fracture-dislocations of the upper end of the humerus, treated during 1981. Most were elderly and treatment was conservative. Of the 72 patients 64 were followed up for a period of six months. Observations were made on the type of fracture, the speed and pattern of recovery of shoulder movements, on the time of commencement of physiotherapy, and on its duration.

We found that with conservative treatment alone, 94% of our patients had good or satisfactory results at six months from injury. The criteria for manipulation are discussed and the literature is reviewed.

In recent years there has been a tendency to advocate operative treatment as the method of choice for certain fractures of the upper end of the humerus. This may be appropriate for younger patients. We feel, however, that with most fractures in elderly patients, satisfactory results can be obtained with conservative treatment. To test the validity of this impression the study described in this paper was undertaken.

MATERIAL AND METHODS

Seventy-two consecutive patients with fractures or fracture-dislocations of the upper end of the humerus were assessed when first seen at the Accident and Emergency Department, Victoria Infirmary, Glasgow, and were subsequently followed up in the outpatient clinic. Admission to hospital was occasionally necessary for social problems or where manipulation under anaesthesia was required. Eight of the 72 patients were lost to follow-up.

All the fracture-dislocations were reduced by manipulation. Fractures without dislocation were manipulated only if there was complete separation of the fragments; five such patients were manipulated, four with two-part fractures and one with a three-part fracture.

Neer's classification (1970a,b) was used (Fig. 1; Table I). Epiphysial injuries were excluded and two patients below the age of 20 years also were excluded in view of the rarity of upper humeral fractures at this age.

The patients were treated with a collar-and-cuff sling, an axillary pad and a body bandage; these were applied either immediately, or after manipulation. Soon after treatment commenced, check radiographs were taken.

Physiotherapy began with gentle assisted abduction, the proximal part of the upper limb being supported in a sling and the patient lying supine; gravity-assisted passive movements also were performed. Usually the patients were treated in the physiotherapy department three times a week; in addition they were taught exercises to perform at home four times daily. These exercises were continued for three to four weeks and the patients then progressed to more vigorous shoulder movements. On average, physiotherapy began 27 days after the injury and continued for 61 days.

Assessment. In our assessments we measured active movements and considered glenohumeral and scapulothoracic movements as one combined movement, since it is not feasible clinically to make a distinction between the two components (Wallace 1982). The range of the following movements was recorded: medial rotation, lateral rotation, abduction in the coronal plane, flexion, and extension. Rotation was measured with the elbow flexed 90° and the arm held beside the trunk.

The result was considered acceptable if the patient could abduct above 60°, could place the hand above the head and behind the neck, was satisfied with the usefulness and power of the limb and had no pain. Admittedly 60° of abduction is a modest amount, but for elderly people it is just adequate (Knight and Mayne 1957; Mills 1974). With abduction of less than 60°, or inability to reach above the head or behind the neck, or any degree of pain, the result was considered poor. Abduction above 110° was classified as a good result.

Pain was classified as mild if it did not interfere with sleep or daily activities and did not require analgesics; it
was considered moderate if it interfered with sleep or daily activities unless simple analgesics were given; and it was considered severe if it interfered with sleep or daily activities unless strong analgesics were given.

The Fisher exact test was used in the statistical analysis.

RESULTS
There were 53 women and 19 men in the follow-up study. The average age of the women was 67 years (range 40 to 86) and that of the men 64 years (range 54 to 83); the overall average age was 66 years (Fig. 2). The majority of the injuries were caused by simple falls, and the right and left humerus were almost equally affected.

Thirty-seven patients (51%) had minimally displaced fractures; all these were in Neer's Group I (Table I); there were no Group II fractures. The remaining 35 patients had displaced fractures; 32 had two-part fractures and 3 had three-part fractures.

Of the 64 patients we were able to follow up, 36 had good results and 24 had acceptable results (Table II).

Five fractures were manipulated but all five subsequently redisplaced; one of these five had a good result, one an acceptable result, two had poor results and one was not available at the six-month assessment. Of the remaining two patients with poor results, one was a 65-year-old alcoholic man who refused operation for an un-united fracture of the surgical neck at four months from injury (Table III) as he was satisfied with his shoulder; the other was an 81-year-old woman with an undisplaced fracture of the surgical neck which united, but in whom shoulder movements were unsatisfactory.

Pain was complained of in eight patients during the first six months; in only one was this severe. After six months no patient had pain sufficient to interfere with sleep or daily activities.

With regard to movements, the recovery of medial rotation reached its maximum in three months. Abduction took six months to reach its maximum; in some patients abduction continued to improve despite persistent limited lateral rotation.

Neer's four-segment displacement classification of humeral neck fractures. (Reproduced by kind permission of Dr C. S. Neer II.)
The nine patients with displaced greater tuberosity fractures (Neer’s Group IV) had results similar to the 15 patients with displaced surgical neck fractures ($P = 0.266$). The patients with fracture-dislocations (Neer’s Group VI) progressed more slowly than the others, they experienced more pain, and they needed a longer course of physiotherapy, but eventually they settled. Of the three patients with three-part fractures, two had acceptable results (one, a woman aged 81, was manipulated and redisplaced) and one had a good result. The radiographic appearances did not correspond with the functional results (Table III).

### Table I. Distribution of patients according to Neer’s classification

<table>
<thead>
<tr>
<th>Group</th>
<th>Women</th>
<th>Men</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>29</td>
<td>8</td>
<td>37</td>
<td>51</td>
</tr>
<tr>
<td>Group II</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Group III</td>
<td>12</td>
<td>6</td>
<td>18</td>
<td>25</td>
</tr>
<tr>
<td>Group IV</td>
<td>7*</td>
<td>2</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>Group V</td>
<td>1†</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Group VI</td>
<td>5</td>
<td>2</td>
<td>7</td>
<td>10</td>
</tr>
</tbody>
</table>

*Including two patients who had three-part fractures
† This was a three-part fracture

### Table II. Results at six months in the 64 patients who were followed-up

<table>
<thead>
<tr>
<th></th>
<th>Good</th>
<th>Acceptable</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
<td>Number</td>
</tr>
<tr>
<td>Group I</td>
<td>21</td>
<td>62</td>
<td>12</td>
</tr>
<tr>
<td>Group III</td>
<td>6</td>
<td>40</td>
<td>6</td>
</tr>
<tr>
<td>Group IV</td>
<td>5</td>
<td>56</td>
<td>4</td>
</tr>
<tr>
<td>Group V</td>
<td>0</td>
<td>—</td>
<td>1</td>
</tr>
<tr>
<td>Group VI</td>
<td>4</td>
<td>80</td>
<td>1</td>
</tr>
<tr>
<td>All groups</td>
<td>36</td>
<td>56</td>
<td>24</td>
</tr>
</tbody>
</table>

### DISCUSSION

Fractures of the upper end of the humerus are common in elderly people, most of whom have retired or are approaching retirement (Jones 1933; Gurd 1940; Buhr and Cooke 1959; Ekström, Lagergren and von Schreeb 1965; Horak and Nilsson 1975; Lentz and Meuser 1980).

### Table III. The effect of some complications on the outcome at six months from injury

<table>
<thead>
<tr>
<th>Case</th>
<th>Sex</th>
<th>Age</th>
<th>Fracture group</th>
<th>Complication</th>
<th>Abduction (degrees)</th>
<th>Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>54</td>
<td>VI</td>
<td>Partial ulnar nerve palsy</td>
<td>160</td>
<td>±</td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>69</td>
<td>VI</td>
<td>Partial circumflex nerve palsy and persistent displacement of greater tuberosity</td>
<td>120</td>
<td>±</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>75</td>
<td>III</td>
<td>Deformed head</td>
<td>120</td>
<td>—</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>71</td>
<td>IV*</td>
<td>Persistent displacement of greater tuberosity</td>
<td>110</td>
<td>—</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>72</td>
<td>I</td>
<td>Late displacement of greater tuberosity with slight impingement</td>
<td>100</td>
<td>—</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>67</td>
<td>IV</td>
<td>Subacromial bone mass</td>
<td>80</td>
<td>—</td>
</tr>
<tr>
<td>7</td>
<td>F</td>
<td>84</td>
<td>I</td>
<td>Delayed union of greater tuberosity and sclerosis</td>
<td>150</td>
<td>±</td>
</tr>
<tr>
<td>8</td>
<td>F</td>
<td>62</td>
<td>I</td>
<td>Non-union of greater tuberosity and sclerosis</td>
<td>160</td>
<td>—</td>
</tr>
<tr>
<td>9</td>
<td>M</td>
<td>65</td>
<td>III</td>
<td>Non-union of the fragments</td>
<td>50</td>
<td>±</td>
</tr>
</tbody>
</table>

— No pain
± Occasional pain which did not require treatment
* Three-part fracture
The incidence and pattern of these injuries are similar to those of fractures of the neck of the femur (Buhr and Cooke 1959; Horak and Nilsson 1975) and in the aged their frequency is second to that of femoral neck fractures (Buhr and Cooke 1959). The relative neglect of upper humeral fractures in the literature (Table IV) may be explained in part by the fact that most are treated as outpatients. Nevertheless they do impose a therapeutic problem and the timing of clinic attendances can be planned better if we know the expected rate of recovery of shoulder movement.

We consider that the functional requirements of the shoulder in the elderly are active abduction above 60° combined with the ability to place the hand above the head and behind the neck; with this combination they can accomplish most daily activities. Our justification for presenting the results at six months from injury is that these fractures heal well and can be expected to approach their final state by then (Knight and Mayne 1957; Ekström et al. 1965; Moriber and Patterson 1967; Lentz and Meuser 1980). Even with the most severe of these fractures pain seldom remains a significant factor (Knight and Mayne 1957; Mills 1974).

Many authors have discussed how soon, with functional methods of treatment, physiotherapy should be started (Roberts 1932; Frankau 1933; Codman 1934; Alldredge and Knight 1940; Miller 1940; Brostrom 1943; Hermann 1944; Ekström et al. 1965; Clifford 1981; Injury: editorial 1981). In our study patients who achieved a good result started physiotherapy slightly earlier and needed a slightly shorter course than those with merely acceptable results, but this difference was not statistically significant. From a current prospective study with a larger number of patients we hope to define a plan for physiotherapy.

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Number of patients</th>
<th>Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roberts 1932</td>
<td>96</td>
<td>Fracture-dislocation</td>
</tr>
<tr>
<td>Alldredge and Knight 1940</td>
<td>14</td>
<td>Fracture-dislocation</td>
</tr>
<tr>
<td>Dehne 1945</td>
<td>337</td>
<td>Fracture-dislocation</td>
</tr>
<tr>
<td>Stewart and Hundle 1955</td>
<td>323</td>
<td>Fracture</td>
</tr>
<tr>
<td>Knight and Mayne 1957</td>
<td>40</td>
<td>Fracture-dislocation</td>
</tr>
<tr>
<td>DePalma and Cautilli 1961</td>
<td>89</td>
<td>Fracture-dislocation</td>
</tr>
<tr>
<td>Nevisier 1962</td>
<td>15</td>
<td>Fracture-dislocation</td>
</tr>
<tr>
<td>Moriber and Patterson 1967</td>
<td>124</td>
<td>Fracture-dislocation</td>
</tr>
<tr>
<td>Neer 1970a</td>
<td>300</td>
<td>Fracture-dislocation</td>
</tr>
<tr>
<td>Neer 1970b</td>
<td>117</td>
<td>Fracture-dislocation</td>
</tr>
<tr>
<td>Mills 1974</td>
<td>32</td>
<td>Fracture-dislocation</td>
</tr>
<tr>
<td>Lentz and Meuser 1980</td>
<td>124</td>
<td>Fracture-dislocation</td>
</tr>
<tr>
<td>Stableforth 1984</td>
<td>81</td>
<td>Fracture-dislocation</td>
</tr>
</tbody>
</table>

Fracture-dislocation includes both fractures and fracture-dislocations

With regard to reduction of the fracture, accuracy is not essential because of the multiaxial nature of the glenohumeral joint and the presence of scapulothoracic movement (Figs 3 and 4). Miller (1940) maintained that incomplete reduction was compatible with a good functional result providing the greater tuberosity was not left in an elevated position under the acromion. Like DePalma and Cautilli (1961) we have seen many patients with displaced fractures in which the position improved after simply suspending the arm in a collar-and-cuff.

**Table IV. Published articles on the management of humeral neck fractures and describing more than 10 patients**

**Fig. 3**
Anteroposterior and lateral views of a man aged 75 whose two-part fracture united in this poor position. He could, despite this, perform any activity he wished. He had 130° of abduction, 30° of lateral rotation and 40° of medial rotation.
Similarly, although Moriber and Patterson (1967) and Mills (1974) observed a high rate of redisplacement after manipulation, the functional results were adequate. Five patients in our series with fractures (without dislocation) were manipulated; all five redisplaced, either fully or partially. We therefore question the value of manipulation alone for displaced humeral neck fractures without dislocation, and would recommend additional percutaneous K-wire fixation if manipulation is judged necessary. Like DePalma and Cautilli (1961) and Mills (1974) we found that the radiographic appearance did not correlate with the clinical outcome.

**Conclusion.** Operative treatment may be indicated in relatively young patients with completely displaced surgical neck fractures; but most patients with undisplaced or with two-part displaced humeral neck fractures are elderly and obtain a satisfactory result with physiotherapy alone. Patients with displaced greater tuberosity fractures in our series did no worse than those with displaced surgical neck fractures.

We would like to extend our thanks to the consultant orthopaedic surgeons at the Victoria Infirmary, Glasgow, for permission to study their patients. Thanks are also due to Mrs G. Macfarlane, Deputy Superintendent Physiotherapist, for her invaluable help and to Mrs Barbara Young for invaluable secretarial help.

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