Treatment of primary degenerative arthritis of the elbow by ulnohumeral arthroplasty

A LONG-TERM FOLLOW-UP

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Between 1990 and 1996 we performed 20 consecutive ulnohumeral arthroplasties for primary osteoarthritis of the elbow.

The outcome was assessed using the Disabilities of Arm, Shoulder and Hand Score (DASH) and the Mayo Elbow Performance Score (MEPS) at a mean follow-up of 75 months (58 to 132). There were excellent or good results in 17 elbows (85%) using the DASH score and in 13 (65%) with the MEPS (correlation coefficient 0.79). The mean fixed flexion deformity had improved by 10° and the range of flexion by a mean of 20°.

In 16 elbows (80%) the benefits of surgery had been maintained, and of 16 patients working at the time of operation, 12 (75%) had returned to the same job.

There was no correlation between radiological recurrence of degenerative changes and the amount of fixed flexion deformity, the flexion arc, or the elbow scores.

Morrey in 1992 modified the technique taking a core of the membrane of the olecranon fossa using a bone trephine. He called the procedure ulnohumeral arthroplasty and, using the Mayo Elbow Performance Score (MEPS), reported that 12 of his 15 patients had a good or excellent result at a mean follow-up of 33 months.

Although both authors noted on radiographs that the degenerative changes tended to recur, no attempt was made to correlate the incidence of recurrence with outcome.

We have assessed clinically 19 patients who underwent 20 ulnohumeral arthroplasties using the Disabilities of the Arm, Shoulder and Hand (DASH) score and the MEPS at a mean postoperative follow-up of 75 months (58 to 132). Anteroposterior and lateral radiographs were taken and the radiological findings correlated with the clinical outcome.

Patients and Methods

Between 1990 and 1996 we performed 20 ulnohumeral arthroplasty procedures on 19 patients. There were 18 men and one woman with a mean age of 51.4 years (31 to 72). One patient had bilateral procedures. Thirteen operations were on the dominant and seven on the non-dominant elbow.

The mean follow-up period was 75.0 months (58 to 132). None of the patients required further procedures such as excision of the radial head or transposition of the ulnar nerve.

All patients were interviewed and examined using the DASH questionnaire and the MEPS. The DASH questionnaire has 30 questions, each scoring 1 to 5 points. The final score is obtained by subtracting 30 from the total. We rated function as excellent (<20 points), good (20 to 39 points), fair (40 to 60 points) or poor (>60 points). The MEPS evaluates patients out of 100 according to pain (45 points), range of movement (20 points), stability (10 points) and function (25 points). Function of the joint is classified as excellent (>90 points), good (75 to 89 points), fair (60 to 74 points) or poor (<60 points). The fixed flexion deformity and flexion arc were recorded and compared with preoperative values.

Anteroposterior and lateral radiographs were taken in all patients. The fenestration in the olecranon fossa was assessed for recurrence of bone, and graded by the degree of regrowth which had occurred. Radiographs which had more...
than 75% of fenestration still visible were graded as ‘open’, between 25% and 75% as ‘partially open’ and less than 25% as ‘closed’.

Results

Damage to the ulnar nerve or wound infection did not occur.

Figure 1 shows the DASH score and MEPS. Seventeen elbows were rated as good or excellent by the DASH questionnaire, whereas only 13 had the same rating using the MEPS. There was, however, a correlation coefficient of 0.79 for both sets of scores.

Figure 2 illustrates the perceived benefit which the patients received and maintained after their operations. The median line between the best and worst scenarios extrapolates to give 50% who still had satisfaction at eight years. Three patients reported a deterioration in function because of increasing pain in the elbow (2) or increasing stiffness (1).

Three patients were not in employment before operation, and had not sought work afterwards. Of the 16 who were employed before surgery, 12 (75%) had returned to the same job, one had changed to a lighter job, and three had either become unemployed (12.5%) or retired (6.3%).

Table I gives the improvement in both the fixed flexion deformity and the range of flexion from preoperative measurements to those recorded at follow-up. The mean improvement at review was 10° and 20°, respectively.

The radiographs of the elbows were graded, and the results are shown in Table II. Although half had significant radiological evidence of recurrence of bone formation within the fenestration of the olecranon fossa, there was no relationship between the apparent amount of recurrence and clinical endpoints, such as the fixed flexion deformity or the total range of flexion, or with either of the scores of elbow function.

Discussion

The long-term results of ulnohumeral arthroplasty have not previously been assessed using a recognised elbow scoring system.

Kashiwagi\textsuperscript{5} reported his experience in 111 elbows. He noted an improvement of 88% in spontaneous pain and of 67% in pain on movement; 76% gained flexion and 55% extension. The mean follow-up was 54 months (6 months to 11 years).\textsuperscript{3} He did not, however, use a validated scoring system.

In his series, Morrey\textsuperscript{2} evaluated his results using the MEPS. He found that 12 of 15 patients (80%) had either a good or excellent result at a mean follow-up of 33 months.

Our results, with a mean follow-up of more than twice that of Morrey’s patients, show that both the objective and subjective elbow scores are maintained in most patients. The patients’ perception of benefit is maintained, with 12 of the 16 working patients still employed in their original

### Table I. Mean (range) fixed flexion deformity (degrees) and flexion arc (degrees) before and after operation

<table>
<thead>
<tr>
<th>Grade</th>
<th>Fixed flexion deformity</th>
<th>Flexion arc</th>
</tr>
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<tbody>
<tr>
<td>Preop</td>
<td>42.6 (10 to 80)</td>
<td>62.3 (10 to 110)</td>
</tr>
<tr>
<td>Postop</td>
<td>32.3 (15 to 50)</td>
<td>82.3 (35 to 120)</td>
</tr>
</tbody>
</table>

### Table II. The degree of radiological recurrence at review

<table>
<thead>
<tr>
<th>Recurrence</th>
<th>Number of elbows</th>
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<tbody>
<tr>
<td>Open, &gt;75% visible</td>
<td>4</td>
</tr>
<tr>
<td>Partial, 25% to 75% visible</td>
<td>6</td>
</tr>
<tr>
<td>Closed, &lt;25% visible</td>
<td>10</td>
</tr>
</tbody>
</table>

Fig. 1

Histogram showing the DASH score and MEPS according to grade for all patients.

Fig. 2

Graph showing the perceived benefit received and maintained by the patients.
Anteroposterior radiographs of a 47-year-old man immediately after operation (a) and at review at five years (b). The MEPS was 100 and the DASH score 4.

Anteroposterior radiographs of a 50-year-old man immediately after operation (a) and at review at eight years (b). The MEPS was 80 and the DASH score 15.
occupations. Improvements in both the mean fixed flexion deformity and the mean range of flexion were maintained by 10° and 20°, respectively.

In recent years modifications of ulnohumeral arthroplasty have been advocated. Savoie, Numley and Field\(^6\) reviewed 24 patients who had undergone the procedure arthroscopically and although encouraging results were obtained, 18 had simultaneous excision of the radial head. This was not a feature of the original technique and thus makes comparison with results after the open procedure difficult.

Cohen, Redden and Stanley\(^7\) compared arthroscopic ulnohumeral arthroplasty with the open technique. At a mean follow-up of 35 months they concluded that the arthroscopic procedure was better for relief from pain, but worse for improving range of movement.

Although both Kashiwagi\(^1\) and Morrey\(^2\) noted that with time there was recurrent growth of bone at the fenestration of the olecranon fossa this had not been formally evaluated.

It was our assumption that regrowth of bone and progressive closure of the fenestration of the olecranon fossa would be associated with deteriorating function. When the radiographs were evaluated, however, no correlation was found between the functional assessment and the disappearance of the fenestration (Fig. 3). This surprising finding is probably linked to the fact that before operation the membrane of the olecranon fossa is grossly thickened. Postoperatively, as the fenestration begins to close, regrowth of bone occurs from the circumference of the opening (Fig. 4). Although the fenestration may close completely with time, our contention is that the regrown membrane does not thicken to the same extent as that present before operation, suggesting that radiological evidence of recurrent growth of bone and closure of the fenestration of the olecranon fossa is a poor indicator for assessing the progress of osteoarthritis of the elbow after ulnohumeral arthroplasty.

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References