THE STANMORE TOTAL ELBOW REPLACEMENT FOR RHEUMATOID ARTHRITIS

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Between 1970 and 1982, 50 total elbow replacements were carried out for rheumatoid arthritis using the Stanmore prosthesis. A long-term follow-up of the 44 elbows available for review is presented. Thirty-four of these (77%) had good results, five were fair, and five were poor. The complications and limitations are discussed.

Surgical treatment for rheumatoid arthritis of the elbow has until recently been limited to synovectomy, usually combined with excision of the radial head or with excision arthroplasty. The results of synovectomy are, at best, unpredictable and excision arthroplasty has failed to produce reliably good results, especially with regard to stability (Hurri, Pulkki and Vainio 1964; Dee 1972; Dickson, Stein and Bentley 1976). If too little bone is removed re-ankylosis ensues, and if too much bone is excised a flail elbow results.

The Stanmore hinged total elbow prosthesis has been in clinical use since 1970; since then its basic features have remained unchanged, but minor alterations have been made in the materials used for the prosthesis and in its assembly. No changes at all have been made since the end of 1974. Since 1970, 50 elbows have been replaced by Stanmore prostheses, nearly all for severe rheumatoid involvement.

The first hinged elbow arthroplasty was reported by Dee in 1972. Since then various other prostheses have been described, most of which have been unconstrained or partially constrained (McKee 1973; Souter 1973; Engelbrecht 1975; Lowe 1978; Wadsworth 1981). However, few long-term studies of significant numbers of patients have been published. This paper presents the results of a long-term follow-up of 44 elbows reviewed independently by two of the authors (JRJ and CJMG), with a maximum follow-up of 11 years.

MATERIAL AND METHOD

The prosthesis. The current prosthesis consists of a humeral component of Alivium (cobalt–chrome–molybdenum alloy) which is 13 cm long and articulates through a high molecular weight polyethylene bearing (RCH 1000) with an ulnar component, also of Alivium and which is 10.5 cm long (Fig. 1). The overall width of the joint is 20 mm, allowing the humeral component to be inserted between the humeral condyles. The ulnar component is 7 mm wide allowing it to be seated within the retained portion of the olecranon. There are right and left models to allow for maintenance of the carrying angle.

Only three special instruments are needed for the insertion of this prosthesis: (i) a simple device to facilitate separation of the components so that a trial reduction can be carried out before fixation (Fig. 2); (ii) a syringe or gun with a long nozzle for inserting a semi-liquid cement such as Simplex C; and (iii) flexible powered reamers ranging from 5 to 8 mm in diameter (Fig. 3).

Operative technique. The elbow joint is exposed through the standard posterior approach and the ulnar nerve is transposed anteriorly. A tongue of triceps tendon is turned down, and the common flexor and extensor origins are reflected forwards before excising the head of the radius (if this is still present). The joint is dislocated and the tip of the olecranon removed flush with the base of the trochlear notch, taking care to preserve the triceps attachment. The medullary cavity of the ulna is located with a Paton’s burr and enlarged with serial flexible reamers over a guide wire, until it will accept the stem of the ulnar component.

A small triangle of bone is removed with nibblers from the centre of the trochlea to the apex of the olecranon fossa. The humeral medullary cavity is located with a Paton’s burr and reamed to take the humeral component. The triangle between the condyles is gradually and carefully enlarged until adequate to accept the humeral component, the bearing of which should lie at the level of the epicondyles (Fig. 4).

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A trial reduction is now performed and tested in flexion and extension to ensure that there is no pistoning of the components. Division of the anterior capsule is usually necessary to obtain full extension, and the ulnar osteophytes are trimmed as necessary. The device for disarticulating the elbow is applied and the components are removed. Acrylic cement is injected into each cavity with a gun or syringe. The two components are inserted simultaneously and assembled immediately with the elbow held in extension until the cement has set. The wound is closed over suction drainage and the elbow immobilised at 90° for 7 to 10 days.

Patients. Of 40 patients with a total of 50 Stanmore elbows inserted during the period between 1970 and 1981, two had died before follow-up and four were unable to attend. There were thus 34 patients (44 elbows) who were available for clinical examination and radiography. There were 11 men and 23 women with an average age of 60 years (range 25 to 85 years) and an average follow-up of six years (2 to 11 years). The diagnosis in all cases was rheumatoid arthritis; 16 of the patients were seropositive and 18 seronegative.

Indications. The main indication for replacement in all our patients was severe pain in a badly involved rheumatoid joint.

RESULTS

The patients were asked how their pain had been influenced by the operation. In addition to this subjective assessment the objective findings were recorded. Measurements were made of the range of flexion, extension, pronation and supination; the overall function was assessed; and a full set of radiographs was taken.

The results were classified into three groups, good,
Table I. Criteria for assessment of results

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>No pain</td>
</tr>
<tr>
<td></td>
<td>An increased range of movement permitting increased activities</td>
</tr>
<tr>
<td></td>
<td>No clinical signs of loosening</td>
</tr>
<tr>
<td></td>
<td>No change in occupation/hobbies</td>
</tr>
<tr>
<td></td>
<td>Patient satisfied with result</td>
</tr>
<tr>
<td>Fair</td>
<td>Occasional pain on use</td>
</tr>
<tr>
<td></td>
<td>No increase in range of movement</td>
</tr>
<tr>
<td></td>
<td>Patient not completely satisfied with result</td>
</tr>
<tr>
<td>Poor</td>
<td>Pain on any movement</td>
</tr>
<tr>
<td></td>
<td>Feeling of instability</td>
</tr>
<tr>
<td></td>
<td>Loosening or infection requiring revision to a further prosthesis or excision arthroplasty</td>
</tr>
<tr>
<td></td>
<td>Change in occupation/hobbies and/or patient dissatisfied</td>
</tr>
</tbody>
</table>

Table II. Relief of pain after operation

<table>
<thead>
<tr>
<th>Pain</th>
<th>Number of elbows Before operation</th>
<th>After operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>No pain</td>
<td>0</td>
<td>34</td>
</tr>
<tr>
<td>Pain on use</td>
<td>21</td>
<td>6</td>
</tr>
<tr>
<td>Rest pain</td>
<td>36</td>
<td>1</td>
</tr>
<tr>
<td>Rest and night pain</td>
<td>30</td>
<td>0</td>
</tr>
</tbody>
</table>

fair and poor, as shown in Table I. Of the 44 elbows, 34 (77%) had good results, five were fair and five poor.

Pain. The effect which the operation had on pain is shown in Table II. Rest pain was completely relieved in 82% of elbows; 77% became completely pain free and 14% had occasional pain on use.

Movement. Figure 5 shows the average range of flexion and extension before and after operation; Figure 6 shows the range of pronation and supination. Although fixed flexion was little changed by the operation, the amount of flexion was improved on average by 25°.

Radiography. Radiographs taken at follow-up were assessed with particular reference to the position and seating of the prosthetic components in the bone, the position of the axis of the joint, and for evidence of loosening or infection (Figs 7 and 8). Nine elbows at follow-up had some degree of radiolucency around one or other component of the prosthesis. This group of elbows had an average follow-up of 4 years (range 1 to 7 years). Six of these elbows were in the “good” group and had no pain or clinical signs of loosening on stressing the elbow. Early in the series, one patient with radiographic evidence of loosening was explored, but no loosening was found at operation. Only two patients were assessed as being clinically loose on stressing; they were put into the “poor” group. None of the nine elbows has been painful and therefore no revisions have so far been necessary.

Complications. In five elbows one or other condyle of the humerus was fractured during the operation. In only one elbow has this subsequently been associated with loosening.

Postoperative stiffness occurred in two elbows: both were manipulated under anaesthesia, after which one regained a good range of movement, but the other showed little change.

Four patients (four elbows) had persistent numbness and/or weakness after the operation; in three of these the ulnar nerve was known to have been damaged during the
operation. Five patients (five elbows) had mild paraesthesia; in one this recovered within two weeks.

Four elbows suffered wound breakdown as a result of necrosis of the wound edges; in three of these patients the wound was resutured and healed satisfactorily. One patient, however, required a myocutaneous flap; the wound then became infected and the prosthesis had to be removed, leaving a pain-free and stable excision arthroplasty. Two further elbows became infected: one an excision arthroplasty was carried out, with a good result; the other was revised at five months and another Stanmore prosthesis inserted, with a good result at follow-up after two years.

Three elbows became loose in the absence of infection: one was replaced with a similar prosthesis and remains satisfactory; the other two have not been sufficiently troublesome to warrant further operation.

DISCUSSION

The main objectives in total replacement of the elbow are relief of pain and restoration of stability and mobility. The Stanmore hinged prosthesis is inherently stable, so that stability need not be discussed further.

Pain, the main indication for surgery, was reduced in nearly all patients, and in most it was eliminated completely.

The range of movement improved in most patients although some fixed flexion remained a common feature, in spite of the fact that at the completion of the operation full extension was possible. The elbow is immobilised at a right angle after the operation and perhaps immobilisation in a more extended position would reduce the amount of fixed flexion without any loss in the range of movement. Morrey et al. (1981b) suggested a position of 40° to 50° of flexion which may also help wound healing.

In many patients the increased range of pain-free movement led to improvement in the range of activity and to greater independence. Functional analysis has shown that the average person needs from 30° to 130° of flexion and 50° each of pronation and supination in order to accomplish day-to-day tasks (Morrey et al. 1981a). Most of our patients achieved somewhere near this range of movement. Only one patient with eventual loss of movement was dissatisfied; most patients found a small decrease in range of movement was more than compensated for by freedom from pain.

Although the incidence of complications was relatively high (61%) compared with other prosthetic replacements, most were minor—for example, transient ulnar nerve symptoms or minor wound breakdown. Of the

![Fig. 7](image1)

Anteroposterior and lateral radiographs of a satisfactory total elbow replacement.

![Fig. 8](image2)

![Fig. 9](image3)

Radiograph of excision arthroplasty; the olecranon occupies the gap between the humeral condyles.
three cases of deep infection, all had a satisfactory end-result after further operative treatment by excision arthroplasty or by subsequent replacement with another Stanmore elbow. If the Stanmore replacement needs to be removed, the retained part of the olecranon can be placed between the condyles of the humerus (Fig. 9). The two patients on whom this procedure was carried out were left with a stable pain-free elbow.

Nine elbows appeared radiographically to be loose at follow-up, but only two patients had any symptoms and none of the elbows has required revision.

We feel that the Stanmore hinged total elbow has a place in treating the severely involved rheumatoid joint with loss of stability. Although various surface replacements and semiconstrained prostheses are now available (McKee 1973; Souter 1973; Dee 1975; Engelbrecht 1975; Gschwend 1975; Lowe 1978; Wadsworth 1981; Morrey et al. 1981b), there have been problems with loosening and instability in some. Such prostheses may have a place in the less severely affected joint.

The Stanmore total elbow prosthesis appears to have stood the test of time with good results up to 11 years after operation. We feel that complications such as fracture of the humeral condyle, breach of the ulnar cortex, and ulnar nerve damage can be reduced by improved operative techniques. Most of these complications have been avoided in the more recent patients as greater experience of the operation has been gained.

REFERENCES