Need and sequence of large joint replacements in rheumatoid arthritis. A 25-year follow-up study

T.M. Palm¹, K. Kaarela², M.S. Hakala², H.J. Kautiainen¹, H.P.J. Kröger¹, E.A. Belt¹

¹Department of Orthopaedics and ²Department of Rheumatology, Rheumatism Foundation Hospital, Heinola; ³Kuopio University Hospital, Department of Orthopaedics, Kuopio, Finland.

Please address correspondence to: Dr Eero Belt, Rheumatism Foundation Hospital FIN-18120 Heinola, Finland. E-mail: eero.belt@reuma.fi

Received on August 29, 2001; accepted in revised form on November 19, 2001. © Copyright CLINICAL AND EXPERIMENTAL RHEUMATOLOGY 2002.

Key words: Rheumatoid arthritis, follow-up study, inception cohort, large joint replacement.

ABSTRACT

Objective
The aim of the present study was to evaluate the number and sequence of large joint replacements (LJR) performed in long-term rheumatoid arthritis (RA) from an inception cohort of 103 patients with rheumatoid factor (RF)-positive RA followed over 25 years.

Methods
A total of 83 patients attended the 15-year and 68 patients the 20-year follow-up. Patient documents and radiographs were evaluated in the beginning of 2001 and a complementary interview was arranged to assess the number and sequence (timing) of LJR s performed.

Results
The cumulative number of LJR s performed for 22 patients (19 women) during the 25 years of follow-up was 41. Seventeen total hip joint replacements (THR) (42% of the total number of 41 LJR s) were performed on 13 patients, median time from the diagnosis to the operation being 14 years; 14 total knee replacements (TKR) (34%) on 11 patients (after a median time of 17 years); 3 total shoulder replacements (TSR) (7%) on 3 patients (median time of 18 years); and 7 total elbow replacements (TER) (17%) on 4 patients (median time of 21 years), respectively. Six patients had undergone three or more LJR s during the follow-up period.

Conclusion
During our 25 years of follow-up, in 27% of RA patients LJR was needed, and 41% of them needed more than one replacement.

Introduction
Only replacement surgery can improve functional disability, relieve pain, and correct the malposition and instability of a destroyed joint during the course of rheumatoid arthritis (RA). Total hip replacement has a fixed place in the surgical treatment of RA, and the position of total knee replacement became well-established during the 1980s and 1990s. On the other hand techniques for shoulder and elbow replacement were introduced rather late in the 1980s for common use. The aim of the present study is to present the number and sequence of large joint replacements performed on RA patients in an inception cohort with attention to multiple replacements (1).

Patients and methods
During 1973-1975 a total of 117 patients with recent (≤ 6 months) and rheumatoid factor (RF)-positive RA were studied at the Rheumatism Foundation Hospital in Heinola, Finland. The selection criteria, data collection strategy and details of the patients have been described earlier (2, 3). All the patients were ≥ 16 years old at onset, and in subsequent evaluations fulfilled the 1987 ACR criteria for RA. The disease was erosive in 102 patients. The severity of their disease has been recently discussed (4). The follow-up examinations were performed at onset and at 1, 3, 8, 15 and 20 years from entry into the study. At the 8-year follow-up 103 patients (70 women) had RF-positive RA, and they formed the present study group. The mean age of the patients at the disease onset was 45.0 (SD 13.2; range 17-70) years.

A total of 83 patients attended the 15-year, and 68 patients the 20-year follow-up, as 28 others had died and 7 did not attend. In the beginning of 2001, patient documents, medical records and radiographs were evaluated with respect to the large joint replacements (hip, knee, shoulder and elbow) and synovectomies performed, and moreover a complementary interview was arranged to assess the number and timing of the large joint replacements performed. Eight patients have died since the 20-year follow up, and thus 60 patients completed the follow-up of 25 years.

Results
No synovectomies were performed on the hips of the 103 patients during the follow-up, but a total of 12 synovectomies (on 8 patients) were performed for the knees, one synovectomy for the shoulder and 7 synovectomies (on 6 patients) for the elbows.
One elbow was operated on using the resection arthroplasty technique in 1985 (5). A total of 41 large joint re-
Large joint replacements in RA / T.M. Palm et al.

placements were performed on 22 patients (19 women) cumulatively during the 25 years. One knee was replaced in 1973 using the McIntosh prosthesis. The apparent cause of replacement was osteoarthritis, and other joint symptoms had begun during the same year. The operated joints, time after onset to arthroplasty, and the sequence of replacements are presented in Figure 1. Seventeen total hip replacements (42% of the large joint replacements) were performed on 13 patients, 14 total knee replacements (34%) on 11 patients, 3 total shoulder replacements (7%) on 3 patients, and 7 total elbow replacements (17%) on 4 patients, respectively. Two out of 3 replaced shoulders were total arthroplasties. The mean age of the 22 patients with large joint replacements was 57 (30-77) years at the time of the first replacement, and the mean age of 6 patients with multiple (3 or more) large joint replacements was 51 (30-67) years, respectively. Five patients had died after the large joint replacement. In Figure 1 they are patients no. 1, 3, 4, 5, and 14; all with hip arthroplasties.

Of the 22 patients, 13 had only one joint replacement, three had 2, three had 3, two had 4, and one 6 arthroplasties, respectively. Details of replacements are presented in Table I. Hips were replaced a mean of 14 (median 13; range 7-21) years from the onset of disease, knees 16 (17; 0-27) years, shoulders 18 (19; 11-25) years, and elbows 21 (23; 11-26) years, respectively (Fig. 1). If the knee replacement in 1973 and Vainio (resection) arthroplasty of the elbow in 1985 were excluded, total knee replacements would have been performed 18 (17; 13-27) years and total elbow replacements 21 (23; 19-26) years from the entry.

Cement fixation was used in 15 out of 17 total hip replacements, in 10 out of 14 total knee replacements, in all of the shoulders, and in 6 out of 7 elbows operated on. Four re-arthroplasties were performed for 3 patients during the follow-up. The cause of revision procedure was an aseptic loosening of acetabular components in 2 hips (6 and 11 years after the primary total hip replacement), loosening of both components in one hip (13 years after the pri-

---

### Table I. Details of large joint arthroplasties performed cumulatively for 22 patients with rheumatoid factor positive rheumatoid arthritis during 25 years.

<table>
<thead>
<tr>
<th>Arthroplasty performed</th>
<th>Hip</th>
<th>Knee</th>
<th>Shoulder</th>
<th>Elbow</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>13</td>
<td>11</td>
<td>3</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>Number of procedures</td>
<td>17</td>
<td>14</td>
<td>3</td>
<td>7</td>
<td>41</td>
</tr>
<tr>
<td>Cement fixation used, N (%)</td>
<td>15 (89)</td>
<td>10 (71)</td>
<td>3 (100)</td>
<td>*6 (86)</td>
<td>34 (83)</td>
</tr>
<tr>
<td>Re-arthroplasties performed</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Time from disease onset to primary replacement years, mean</td>
<td>14</td>
<td>16</td>
<td>18</td>
<td>21</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>13 (7-21)</td>
<td>17 (0-27)</td>
<td>19 (11-25)</td>
<td>23 (11-26)</td>
<td>16 (0-27)</td>
</tr>
</tbody>
</table>

* In one elbow a resection arthroplasty technique was used.
mary total hip replacement), and instability (3 years after the primary total knee replacement) in one knee. Nineteen patients (86%) of 22 needed no revision surgery.

**Discussion**

In the present inception cohort followed for up to 25 years, 27% of the patients needed large joint replacements. Hakala et al. in 1994 reported similar results (20%) for a community-based cross-sectional RA series with a mean disease duration of 16 years (6). However, none of their patients had undergone replacement of the shoulders or elbows. They emphasised that the low level of restriction in mobility - only 1% of the patients were restricted to a wheelchair - could be primarily attributed to the large joint replacements.

In their study of 1,600 RA patients, Wolfe and Zwillich reported that 25% of patients will undergo a total joint replacement during the disease period of 22 years (7). Of the 525 arthroplasties in the series of Wolfe and Zwillich, 57% were knee replacements, 35% were hip replacements, and only 3% were shoulder and elbow arthroplasties. The only major differences between their and our findings were the proportions of total knee and elbow replacements. In our series knees constituted only 34% of the large joint replacements, and elbows 17%, because since 1992 total elbow replacement has been a relatively common procedure at our hospital. The most probable explanations for the differences in the distribution of types of large joint replacements reported from various centres or countries are different treatment traditions and volumes invested in the orthopaedic surgery. The finding that large joint replacements of the upper extremities are done later and more rarely than those of the lower extremities may be due to factors other than the progress of the disease itself in the given joint areas - for example the prevailing guidelines for the timing of operations, the golden rule being that the large joint replacements of lower extremities are performed first. With this rule the optimal moment for total shoulder replacement may have passed before it is actually undertaken, i.e., the disease process progresses in the shoulders to the phase when rotator cuff rupture is usually seen (8).

In other prospective series by Reilly et al. and Corbett et al. from Bath and Middlesex, respectively, arthroplasties performed only for survivors were presented (9, 10). In the Bath cohort large joint replacements were performed on 18 patients out of 35 survivors. In the Middlesex cohort 28 operations were performed on 12 out of 64 survivors (19%), including 4 total hip replacements, 8 total knee replacements, and 2 total elbow replacements. The results of the present study and the cohorts cited are in many aspects parallel.

To our knowledge, the present series is the only prospective study which presents the timetable and sequence of large joint replacements performed in long-term seropositive RA patients. It appeared that 27% of patients underwent large joint replacements during a period of 25 years. Hips were replaced at an earlier stage than knees and especially elbows.

**References**