Outcome of Charnley total hip replacement across a single health region in England

THE RESULTS AT FIVE YEARS FROM A REGIONAL HIP REGISTER

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Using a regional arthroplasty register we assessed the outcome at five years of 1198 primary Charnley total hip replacements (THRs) carried out in 1152 patients across a single UK health region in 1990. Information regarding outcome was available for 1080 hips (90%) and 499 had an independent clinical and radiological assessment.

By five years the known rate of aseptic loosening was 2.3%, of deep infection 1.4%, of dislocation 5.0% and of revision 3.2%. The radiological assessment of 499 THRs revealed gross failure in a further 5.2%, which had been previously unrecognised. The combined rate of failure of nearly 9% is higher than those published from specialist centres and surgeons, but is probably more representative of the norm.

Our study supports the need for a national register and surveillance of THRs. It emphasises that all implants should be followed, and suggests that the results of such surgery, when performed in the general setting, may not be as good as expected.

Patients and Methods

We studied all patients who had had a primary Charnley THR during 1990, as registered with the Trent Regional Arthroplasty study (TRAS). This is the only regional arthroplasty register in England. Since the beginning of 1990 it has recorded all primary total hip and knee replacements performed throughout the Trent region. Patients are entered on the register by the surgeon carrying out the operation who completes a standard form at the time of the procedure and returns it to the study centre. The form contains clinical, medical and operative details which are then entered into a computerised database. The data are validated by a peripatetic clerk, who checks theatre records, consultant records and the patient administration system of each hospital to ensure that no information is lost and that the data provided are accurate.

In 1995 we began a detailed five-year assessment. An attempt was made to contact all living patients, inviting them to attend their local hospital for a clinical and radiological assessment. This was performed by a single independent observer (DF), using the standard system for...
recording results as proposed in the consensus document by the Société International de Chirurgie Orthopédique et de Traumatologie, the Task Force on Outcome Studies of the American Academy of Orthopaedic Surgeons, and the Hip Society,\textsuperscript{15} which has subsequently been validated.\textsuperscript{16} Patients unable to attend were given the option of an assessment by telephone and were sent a simple questionnaire regarding their hip replacement. Patients who did not respond were written to again and then traced by the Office of National Statistics (ONS). In addition, an attempt was made to review all orthopaedic entries in the medical notes of the cohort, and basic details regarding the THR were sought from their general practitioner.

In order to compare the group of patients who were clinically and radiologically assessed with those who were not, data were analysed by logistic regression models using SPSS version 7.5 for Windows (SPSS Inc, Chicago, Illinois).

During 1990, 1198 Charnley THRs were performed on 1152 patients under the care of 56 consultants in 18 NHS and six private hospitals. There were 703 women and 449 men with a mean age at operation of 69.1 years (21 to 103); 19% were less than 60 years of age. The preoperative diagnosis was osteoarthritis (OA) in 87%, rheumatoid arthritis (RA) in 7% and miscellaneous in the remaining 6%. In 82% of the procedures a clean-air theatre was used, in 11% a standard general theatre and in the remaining 7% no information was available about the theatre. All patients received prophylactic antibiotics.

The procedure was performed by a consultant in 49% of cases, a senior orthopaedic trainee assisted by a consultant in 10%, a senior orthopaedic trainee without a consultant in 34% and by other grades of surgeon in 7%.

Results

Response rates and patient assessment (Fig. 1). We were able to review the medical notes of 1158 of the 1198 THRs. Forty sets were not located. Of the notes scrutinised, 1130 contained detailed information on the operation which was analysed to determine intraoperative complications. Such information was missing from the remaining 28 sets.

At five years, 226 (20%) patients with 231 THRs had died. A review of the medical notes for this group provided data on the outcome for 221 hips.

Of the remaining 967 arthroplasties, 731 (76%) had some form of independent review. A clinical and radiological assessment was performed on 499 (52%) and a telephone or simple self-administered questionnaire on 230 (24%). Information for five years of follow-up was also available from the medical notes or the records of the general practitioner for a further 130 THRs in patients known to be alive, but were missing for 108 hips.

Outcome data at five years were available for 1080 THRs (90%). Data from this verified and validated group are analysed below together with information from those which had been independently assessed.

Complications during operation. Complications occurred during the operation in 49 of 1130 procedures (4.4%) (Table I). Fracture or perforation of the femur led to one case of long-term palsy of the sciatic nerve associated with extrusion of cement, migration of one stem towards the knee and stem revision for aseptic loosening. Acetabular fractures or perforations were associated with two revisions, one for aseptic loosening and one for an infection, and two dislocations. One patient died from malignant hyperpyrexia and another, who developed disseminated intravascular coagulopathy, collapsed with a pulmonary

![Fig. 1](image-url)

Algorithm showing the breakdown of the cohort and the outcome data available.
embolus but was successfully resuscitated. Two of the prostheses which were found to be unstable at operation, had recurrent dislocations, one of which needed exploration and augmentation of the acetabular component.

**Postoperative complications.** By five years, 305 of 1080 THRs (28.2%) had encountered some form of complication, some of them multiple (Table II). Many of these were related to the urinary tract (6.2%), thromboembolic disease (5.7%), superficial wound infection or haematoma (3.1%) or to medical problems in the immediate postoperative period (2.6%). Specific complications relating to the prosthesis included dislocation in 54 (5%), of which ten (0.9%) had more than one episode. Loosening occurred in 25 (2.3%) and a proven deep infection in 15 (1.4%). All of the latter operations had been performed in a clean-air theatre and antibiotic prophylaxis had been used.

**Revisions.** By five years, 35 of 1080 prostheses (3.2%) had undergone revision. Both components had been revised in 22, the acetabulum alone in three and the femoral component alone in ten. The indications for revision were aseptic loosening in 40%, infection in 37% and recurrent dislocation in 23%.

**Clinical and radiological assessment.** A standard clinical and radiological examination has been carried out on 499 patients and a further 231 have been assessed by telephone or by a simple questionnaire. The standard assessment included the calculation of a Harris hip score (HHS). The mean HHS was 79.4 and when graded as described by Harris, 51% had a good or excellent outcome (Fig. 2). Patient satisfaction was 94.1% (530 of 563; direct questioning in the clinic 470 of 499; and by telephone 60 of 64).

Radiographs were obtained and assessed for the 499 THRs reviewed in the clinic. It was already known that 19 had failed since 14 had been revised and five were awaiting operation for loosening. Assessment of the remaining 480 revealed a further 25 (5.2%) previously unrecognised radiological ‘failures’ with gross migration, fracture of the cement or extensive lucencies. The overall number of failures in this group was therefore 44 of 499 (8.8%).

In order to assess whether this unrecognised radiological failure was applicable to the whole cohort, using multivariate logistic regression analysis we compared the radiographs of 480 THRs not known to have failed with the remaining 448 THRs which did not have radiographs and were not known to have failed. There was no significant difference for the age of the patient (p = 0.82) or the primary diagnosis (p = 0.24) but there was for gender (p = 0.006); more male patients were radiologically assessed (41%) than were not (32%) (Table III). A further comparison of the group of previously unrecognised radiological ‘failures’ with those which had satisfactory radiographs at five years showed no significant difference for age (p = 0.53), gender (p = 0.25) or primary diagnosis (p = 0.39), using multivariate logistic regression analysis (Table IV). There is a possible potential for bias, with concerned patients or those not under regular review more likely to accept the invitation for a clinical assessment. This may explain the higher proportion of men attending for radiological assessment with an increased likelihood of them having radiological signs of failure. This did not reach statistical significance.

**Discussion**

This is the first study in the United Kingdom to assess independently the outcome of the primary Charnley THR across a health region. It gives a unique insight into the objective and subjective outcomes of this commonly used prosthesis.

<table>
<thead>
<tr>
<th>Complication</th>
<th>Incidence</th>
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<tbody>
<tr>
<td>Urinary retention/infection</td>
<td>67 (6.2)</td>
</tr>
<tr>
<td>Dislocation</td>
<td>54 (5.0)</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>34 (3.1)</td>
</tr>
<tr>
<td>Wound infection/haematoma</td>
<td>33 (3.1)</td>
</tr>
<tr>
<td>Deep-venous thrombosis</td>
<td>28 (2.6)</td>
</tr>
<tr>
<td>Systemic in postoperative period</td>
<td>28 (2.6)</td>
</tr>
<tr>
<td>Known loosening</td>
<td>25 (2.3)</td>
</tr>
<tr>
<td>Deep infection</td>
<td>15 (1.4)</td>
</tr>
<tr>
<td>Upper gastrointestinal haemorrhage</td>
<td>15 (1.4)</td>
</tr>
<tr>
<td>Trochanteric bursitis/nonunion</td>
<td>8 (0.7)</td>
</tr>
<tr>
<td>Recurrent subluxation</td>
<td>3 (0.3)</td>
</tr>
<tr>
<td>Sciatic nerve palsy</td>
<td>2 (0.2)</td>
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Table II. Number (%) of postoperative complications in 1080 operations

<table>
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<tr>
<th>Radiological assessment</th>
<th>Age (%)</th>
<th>Primary diagnosis (%)</th>
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<tbody>
<tr>
<td></td>
<td>% male</td>
<td>≤60</td>
</tr>
<tr>
<td>Yes (n = 480)</td>
<td>41</td>
<td>22</td>
</tr>
<tr>
<td>No (n = 418)</td>
<td>32</td>
<td>20</td>
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Table III. Comparison of groups which did and did not have a radiological assessment
Since the initial description by Charnley, there have been many series published (Table V). Specialist centres and surgeons have reported rates of failure of less than 10% at more than ten years and a recent randomised, prospective trial from a single centre with differing grades of surgeon, reported a revision rate of 4% at 6.5 years.

Evidence from the Scandinavian registers indicate five-year revision rates of 2.9% in Norway and less than 5% in Sweden. Our known loosening rate of 2.3% and revision rate of 3.2% compare favourably with these results. When the unrecognised radiological failures are included, however, the estimated combined failure rate is nearly 9%. Britton et al reported similar results, with revision or severe pain in 5.6 ± 3.4% at six years for 159 Charnley THRs performed by a single surgeon from a non-specialist unit. Our results and those of Britton et al are worse than those from the specialist centres which often use revision as the definition of failure (Table V), but are probably of more relevance for clinicians, patients and managers of health-care in the UK.

The rate of deep infection of 1.4% is similar to the 0% to 1.4% reported in recent studies. The dislocation rate of 4.6% is higher than the 2% to 4% reported from smaller series. These are an accurate indication of expected rates within the NHS and provide a benchmark for comparison, but whether they are acceptable or could be improved upon is open to debate. The overall patient satisfaction of 94.1% is high and similar to that of other published series.

National arthroplasty registers are well established in Norway and Sweden and have a proven record of providing quality assurance of the practice of joint replacement. Our study, utilising the TRAS, is a unique observation of THR in the UK and highlights the potential of such a register to assess the outcome of major joint arthroplasty. Most of the patients with unrecognised radiological failures had been discharged from routine clinical follow-up, and a register based solely on revisions would have given a falsely optimistic impression of the performance of the implant. This confirms and emphasises the need for long-term follow-up, particularly by radiographs.

If the recent problems with the Capital THR (3M Healthcare) are not to be repeated, some form of registration and surveillance of implants should be instituted. The need for this for all implants is further emphasised by the findings which indicate that the results using a prosthesis of proven reliability, performed in a general setting and independently assessed, may not be as good as expected.
References