

REVISION HIP ARTHROPLASTY

A Retrospective Survey

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A survey of revision hip arthroplasties was performed, using a retrospective review of the patients' case notes and radiographs, and an assessment of the patients, at least 1 year after the revision. The patients were divided into three categories: a) First revision hip arthroplasty (41 patients); b) Second revision hip arthroplasty (8 patients); c) Revision of femoral hemi-arthroplasty (14 patients). The reasons for revision, the type of revision and the final outcome have been identified in each group. This is the first study which allows direct comparison of the final outcome, as assessed by accurate objective criteria, between patients having revision hip arthroplasty for different reasons. Radiographs of the hip arthroplasty after the original operation and after revision have been analysed.

The final outcome of first revision hip arthroplasty and revision of hemi-arthroplasty to total hip replacement was generally good. The outcome of second revision hip arthroplasty was generally poor.

Key words: exchange operation; infected arthroplasty; total hip replacement arthroplasty

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Revision hip arthroplasty is now widely practised in the treatment of failed hip replacement and the results from various centres have already been published (Dupont & Charnley 1972, Eftekhar et al. 1973, Dandy & Theodorou 1975, Hunter et al. 1979).

Previous studies have only used crude methods of assessing the outcome after revision hip arthroplasty, usually according to necessity for further surgery. We have graded patients after revision operation using an accurate, objective method based on the scoring system devised by Harris (1969). All our patients were assessed at least 1 year after revision so that a useful evaluation could be made.

This study allows an accurate comparison of outcome to be made between groups of patients having first revision THR, second revision THR

and revision of hemi-arthroplasty to THR, which has not previously been reported.

PATIENTS AND METHODS

All patients who had had a revision hip arthroplasty at Addenbrooke's Hospital, Cambridge over the period January 1978 to August 1980 were identified. Sixty three patients were included in the series and all their case notes were available for study. There were 41 patients who had had THRs revised for the first time, eight patients who had had THRs revised for the second time, and 14 patients who had had hemi-arthroplasties revised.

A personal review (N.S.B.) of the patients, using the Harris method was undertaken. All patients were assessed at least 1 year after the revision operation (range 12–43 months, average 24 months). An objective score out of 100 was obtained, and the patients categorised as follows: 100–80, good; 79–60, satisfactory; less than 60, poor.

Patients who had excision arthroplasty as a salvage procedure following THR are unlikely to achieve better than "poor". This was confirmed by reviewing four patients 1 year after excision arthroplasty, all of whom scored between 20 and 40 points.

Forty eight patients who had had a revision THR were reviewed. In addition 12 patients had had excision arthroplasties, one patient had died and two patients were untraceable.

The most difficult evaluation was differentiation between patients with prostheses which were loose only, and those which were loose and infected. We studied the original pre-operative evaluation, the revision operative findings, bacteriological investigations and post revision course. Using all these parameters we made an overall assessment in determining those patients with an infected prosthesis.

Fifty one patients had radiographs available, taken after the original and after the revision operation. Using the antero-posterior radiograph of the pelvis, an assessment was made of acetabular cup orientation and the position of the stem of the femoral prosthesis within the femoral shaft. Although this only assesses the hip replacement in one plane, it was not possible to compare lateral radiographs of the hip which were not standardised views. The angle between the axis of the prosthesis and the femoral shaft was measured. Positioning of the femoral prosthesis was classified as valgus, neutral or varus. For the purposes of this study, any valgus angulation between the axes of the stem of the prosthesis and femoral shaft was designated valgus, the neutral group was allowed up to 3° measured varus, and any measurement above 3° was designated as varus.



Figure 1. Radiograph showing gross loosening and fracture of the femur around the stem of a McKee-Farrar prosthesis inserted 9 years prior to revision.

RESULTS

First revision of a THR (41 patients)

Mechanical failure. Thirty one patients (average age of 66.6 years, range 37–82 years) had revision operations because of mechanical failure. The average interval between original and revision operations was 5.3 years.

Twenty seven patients had what was considered to be purely mechanical loosening. Fifteen patients had only loose femoral prostheses, of which three sustained fatigue fracture of the stem of the prosthesis. Eight had only acetabular loosening and in four both components were loose. Three patients had revisions because malposition of the acetabular cup had resulted in dislocation. One patient, involved in a car accident, sustained a fracture around the stem of the femoral prosthesis, necessitating revision using a long stem prosthesis.

The outcome of all patients after first revision of a THR is given in Table 1. The assessment of follow-up showed no difference between those revised for femoral or acetabular loosening.

Infection. Ten patients (average age 69.5 years, range 51–79 years) had revision operations for infection. The average interval between original and revision operations was 4.0 years.

Five of the infected hips were revised to THRs as a one-stage procedure and the other five were converted to excision arthroplasties. The decision to proceed to excision arthroplasty or a revision THR was made principally on the appearance at the revision operation but pre-operative assessment was also taken into account. Gross infection was treated by excision arthroplasty and less extensive infection was treated by exchange arthroplasty.

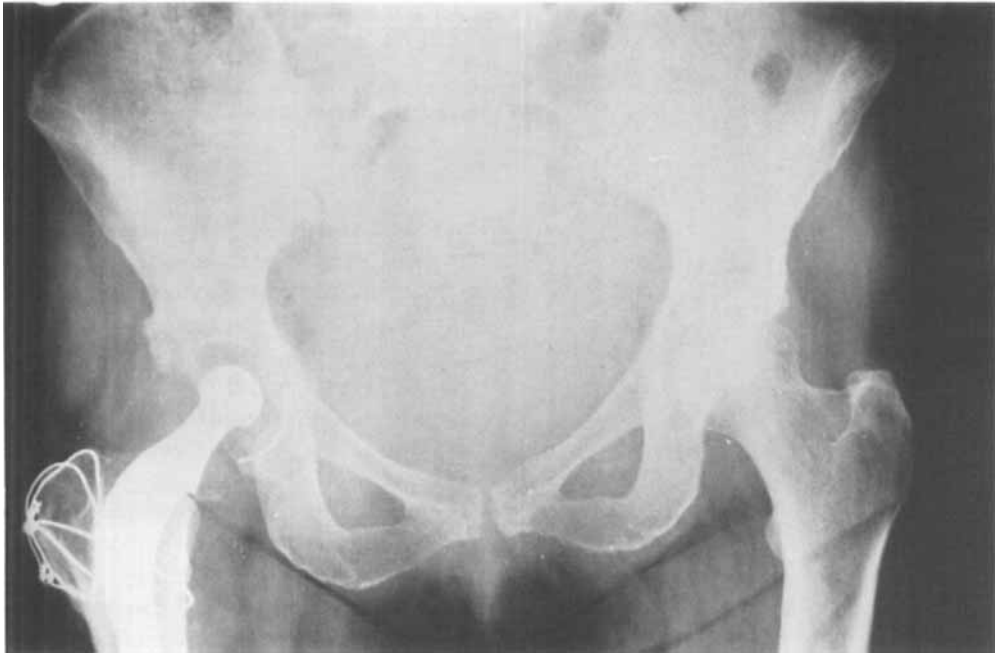


Figure 2. Malposition of this acetabular cup lead to dislocations so that revision was necessary.



Cultures taken at operation revealed a growth of *Staph. aureus* in four patients, micrococcus in two and anaerobic strep. in one. No growth was obtained from the remaining three patients.

Excision arthroplasty. Nine patients (average age of 74.0 years, range 67–82 years) had excision arthroplasties. Five of the excision arthroplasties were done for infection. Two were done for mechanical loosening with gross loss of bone stock around the femoral prosthesis resulting in a fracture of the femur around the stem of the prosthesis. In one patient, fracture occurred before revision and, in the other, during an attempt to revise to a THR. The remaining two excision arthroplasties were performed because of a doubtful diagnosis at the time of revision. An overall assessment of these two patients, including the post-operative outcome, suggests that there was no infection present.

Figure 3. Gross acetabular penetration by a Thompson's prosthesis.



Figure 4. This shows a Charnley THR with valgus positioning of the femoral prosthesis. There is also non-union of the greater trochanter with disruption of the trochanteric wires and periarticular calcification. At revision operation the femoral prosthesis was loose.

The second revision operation was performed for loosening of the acetabular cup in three patients, loosening of both components in one, and dislocation in one. The remaining three patients had increasing pain as a reason for intervention but no specific explanation was included in the operative findings to account for this, in particular there was no evidence that the patients were infected.

Two of the patients at the first revision had had only one of the components revised and, at the second revision, the other component had failed.

Second revision operations included three patients in whom Eichler Rings were used and one in which a Getscher trochanteric fixation device was used. An excision arthroplasty was performed in one patient.

The results of this group were relatively poor as shown in Table 1.

Second revision of a THR (eight patients)

The average age of the patients was 70.1 years (range 59–79 years). The average interval between original operation and first revision was 2.7 years, and the average interval between first and second revision was 4.2 years.

Revision of hemi-arthroplasty (14 patients)

Fourteen patients (average age of 76.6 years, range 62–97 years) had revision of a hemi-arthroplasty. There were 12 patients with Thompson's prostheses and two with Monk's prostheses in this group. Twelve patients had re-

Table 1. The final outcome in different categories of revision hip arthroplasty

	Total no.	Results				
		Good	Satisfactory	Poor	Excision arthroplasty	Dead or untraced
First revision THR	41	15	9	8	9	—
Mechanical loosening	27	12	5	6	4	—
Infected	10	3	2	—	5	—
Malposition of acetabular cup	3	—	2	1	—	—
Fracture around femoral prosthesis	1	—	—	1	—	—
Second revision THR	8	1	1	4	1	1
Revision of hemiarthroplasty	14	2	6	2	2	2

vision to THR whereas two patients with Thompson's prostheses had an excision arthroplasty, one for infection and one for dislocation.

Four of the hemi-arthroplasties revised to THRs had had previous operations; two had had Smith Petersen nails, one Moore's pins and one a Pugh nail.

Ten Thompson's were revised to THRs, of which nine were revised because of migration or penetration of the acetabulum, and one for recurrent dislocation. All the Thompson's prostheses had been cemented in place. The two Monk prostheses were revised to THRs for loosening.

Radiographic analysis

Forty nine patients in the series originally had a THR, and in 38 of these the immediate post-operative radiograph was available for review. The stem of the femoral prosthesis was varus in 12, neutral in 23 and valgus in three. Of 12 sets of radiographs available from patients who had loose femoral prostheses, seven had varus prostheses, whilst a group of 18 patients who presented with infection or acetabular problems included only three with varus femoral prostheses. No valgus femoral prosthesis was loose at revision. Three patients had acetabular components in gross valgus on the original post-operative radiograph and they were considered to have malposition of the cup at revision. There was no correlation between acetabular cup orientation and the reason for subsequent revision.

The radiographs after revision of 42 of the 51 patients who underwent revision to a THR were available for study. The stem of the femoral prosthesis was varus in seven, neutral in 28 and valgus in seven. There was no correlation between the assessment at follow-up and the position of the femoral prosthesis or acetabular cup orientation after revision.

DISCUSSION

We have objectively graded the success of the revision hip arthroplasty and can compare patients having different types of revision, and with

different reasons for undergoing revision operations. The comparison of the outcome of revision hip arthroplasties performed as first revision operation, second revision operation, and revision of hemi-arthroplasties within the same hospital can therefore be made.

The Harris scoring system does have inherent problems as it assesses the patient as a whole, so that contralateral hip disease or other medical problems can jeopardise the score of the hip under examination. However, it has been adopted as it is well established as a method of assessing the outcome of hip operations. It has well delineated criteria, based mainly on pain and function, which give an objective assessment as a score out of 100. We found that Harris's original categories were not appropriate for the older patients we were assessing as they did not correlate well with the overall clinical impression of the patient. We, therefore, defined three categories according to the patient's score, as previously stated – good, satisfactory and poor. These categories did correlate well with the overall impression of the patient. For example, patients in the good group were able to walk with no aid and were pleased with the results of the operation. The satisfactory group, in general, used a stick and had some pain. The poor group consisted of patients whose results were functionally unsatisfactory.

Previous work has already suggested that varus positioning of the femoral components leads to its premature loosening (Pellicci et al. 1979); this view is upheld by our work.

Revision hip arthroplasty for loose components has produced good results; only a few needed excision arthroplasty because of gross loosening and loss of bone stock. There is no place for the replacement of only one component at revision.

A surprising facet of the work was the exceptional results produced in patients having a 1 stage revision THR for infection. Of course, patients undergoing exchange arthroplasties were a selected group and represent the least infected, as patients with gross infection had excision arthroplasties. As a result of his experience in the revision of infected THRs Buchholz has categorised some organisms as "difficult to treat" (Buchholz et al. 1979). None of our patients who

had excision arthroplasties had any of these organisms cultured from operative specimens. However the final outcome in this small group undergoing exchange arthroplasty for infection is comparable to exchange arthroplasty for loosening. Per-operative systemic antibiotics, Gentamicin loaded cement (Palacos®) and long-term post-operative systemic antibiotics have been used routinely.

The second revision hip arthroplasties in general did badly. The poor results are probably a reflection of increasing technical difficulties at subsequent operations and the use of non-standard components such as Eichler Rings illustrates this point. Possibly, the poor results reflect low grade infection, unrecognised clinically and bacteriologically but sufficient to cause recurrent pain and loosening of the prosthesis.

Series have already been reported on total hip replacement for failed femoral head hemiarthroplasty (Amstutz & Smith 1979), and our series, although consisting of older patients, confirms the generally good results.

First revision hip arthroplasty of failed THR has been shown to be a useful treatment giving a reasonable functional outcome, while the results of second revision arthroplasty were poor. Careful assessment is recommended before subjecting a patient to a third major operation in view of such a poor success rate.

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