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Is revision as good as primary hip replacement?

A COMPARISON OF QUALITY OF LIFE

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Primary total hip arthroplasty (THA) is one of the most effective ways of improving quality of life (QoL). We have compared the improvement in QoL in 62 patients who had a cemented revision of a THA with that of 62 primary replacements.

One year after operation the median QoL score had been significantly improved in both groups; from 0.870 to 0.990 in the primary group ($p < 0.0001$) and from 0.870 to 0.980 in the revised group ($p < 0.0001$). There was no significant difference in the improvement in scores between the groups ($p = 0.29$).

When reviewed after four years there was no difference in the pain score for either group ($p = 0.89$), but that for function had deteriorated significantly. This was associated with revision surgery ($p = 0.018$) and a low preoperative QoL score ($p = 0.004$).

We conclude that both primary and revision operations give a significant improvement in the QoL but function after revision may be less durable than after a primary arthroplasty.

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Primary total hip arthroplasty (THA) has been shown to produce the greatest improvement in quality of life for its cost.[1] Compared with primary arthroplasty a revision is technically more complex, requires a longer stay in hospital and gives rise to significantly more perioperative complications.[2] Despite this, a survivorship of 95% at ten years has been reported.[3]

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Recently, Britton et al[4] have questioned the use of survivorship as the sole outcome measure for THA, showing that variables such as pain may also be a useful way of determining outcome. Most studies, however, report survivorship as opposed to other outcome measures.

Assessment of the quality of life (QoL) allows the benefit of health-care to be expressed independent of technical concerns, survival data and diagnosis.[5] It has a numerical value which can be generated from a patient-derived classification of health states called the Rosser Index Matrix[6,7] (Table I). The classification examines disability and distress. There are 29 different health states, each with a numerical QoL score (Table II). The information can be collected in one of three ways: from questionnaires completed by the patient, by clinical assessment, or by reprocessing previously collected disease-specific data.[7] The QoL can then be recalculated as the QALY (Quality Adjusted Life Year) which is based on knowledge of the life expectancy of the patient and the duration of the effect of the intervention. The QALY has a role in the allocation of resources.[1,8,9]

Our aim was to establish whether the results after revision compare with the well-documented improvement in the QoL and the cost-effectiveness of primary THA.[10-13] The same type of cemented Charnley prosthesis was compared prospectively in two groups of patients, the first of which had routine primary arthroplasty and the second revision for aseptic loosening. In view of the short follow-up and low rate of failure in both groups it was decided not to convert the QoL into the QALY.

Patients and Methods

We studied prospectively 62 consecutive revision operations performed for painful, aseptic loosening by, or under the supervision of, the senior author (RNV). We excluded patients with infection, recurrent dislocation or fracture. In all a cemented, Charnley-type implant (De Puy International Ltd, Leeds, UK) was inserted through the posterior approach. Allograft was used at the discretion of the surgeon. We excluded patients in whom other makes of component had been used. There were 39 men and 23 women with a mean age of 71 years at the time of surgery (SD 10; range 29 to 91). The mean body mass index (BMI) was 24.2 kg/m^2 (SD 5.3).

Table I. The Rosser Index Matrix[6]

Disability	
I	No disability
II	Slight social disability
III	Severe social disability and/or impairment of performance at work
IV	Choice of work or performance at work severely limited Housewives and old people are able to do light housework only, but able to go shopping
V	Unable to undertake any paid employment Unable to continue any education Old people confined to home except for escorted outings and short walks, and unable to do any shopping
VI	Confined to chair or wheelchair or able to move around in the house only with support from an assistant
VII	Confined to bed
VIII	Unconscious
Distress	
A	No distress
B	Mild
C	Moderate
D	Severe

Table II. The Rosser Index Matrix showing a QoL score for each distress/disability combination[7]

	Distress			
Disability	**A**	**B**	**C**	**D**
I	1.000	0.995	0.990	0.967
II	0.990	0.986	0.973	0.932
III	0.980	0.972	0.956	0.912
IV	0.964	0.956	0.942	0.870
V	0.946	0.935	0.900	0.700
VI	0.875	0.845	0.680	0.000
VII	0.677	0.564	0.000	-1.486
VIII	-1.028			

A similar group of 62 consecutive patients having a primary, cemented Charnley arthroplasty for osteoarthritis, performed by, or under the supervision of, the senior author, was also studied. The posterior approach was used in all cases. There were 37 women and 25 men with a mean age of 73 years at the time of surgery (SD 7; range 56 to 84). The mean BMI was 24.1 kg/m^2 (SD 2.9).

The patients' symptoms were assessed before operation and then at annual intervals using a modified Harris hip score.[14] This quantifies patient-derived information to produce a numerical score based on pain and function. Its qualitative nature allows it to be translated directly into Rosser distress (pain) and disability (function) categories (Table I), which are then applied to the Rosser Index Matrix to derive QoL scores (Table II). The Index Matrix allocates scores from -1.486 to 1.000. A score of 1.000 indicates complete normality, and a state equivalent to death gives a score of 0.000. A score of -1.486 indicates a state worse than death.

We obtained the information for postoperative follow-up by using a postal questionnaire, followed by a telephone call if necessary. If the patient died or required further surgery on the hip they were withdrawn from the study.

Because of the skewed nature of the data, non-parametric tests were used; medians and interquartile ranges (IQR) are quoted, except for the BMI and age for which the mean and standard deviation (SD) are used to allow comparison with other studies. To compare the improvement in pre- and postoperative scores we used an independent-sample Wilcoxon matched-pairs signed-rank sum test. The chi-squared test (using Yates' continuity correction) was used to assess the rate of deterioration of the distress scores between the revision and primary groups at one and four years. Finally, a logistic regression analysis was used to determine whether the four-year postoperative improvement in the score was maintained. The number of patients in the revision group at five years was considered to be too small to allow meaningful analysis.

The data concerning disability and distress were analysed independently. Failure was defined as a score worse than that at the end of the first year. For example, if the postoperative disability score was two, failure was a score of three or higher. Similarly with the distress score, a score of A deteriorating to B was considered a failure. The significance of the type of operation adjusted for age, BMI, gender and preoperative score was assessed as to the relationship to the decrease in the score.

Results

In the revision group 48 patients had both the femoral and acetabular components revised, seven had the acetabular component only and seven just the femoral component. Bone allograft was used in both the femur and acetabulum in five patients, in the femur alone in two, and in just the acetabulum in 15. Two patients required further revision during the period of study. There were seven deaths. In the primary group ten died during the period of review and one patient required revision. Thus, the groups were not specifically matched at an individual level, but had similar mean ages and BMIs. The numbers of men and women were comparable.

The rate of response to the questionnaire was 100% in both groups at one year. In the primary group no patient was lost to follow-up but three defaulted in the revision group, two at two years and one at three. The preoperative one- and four-year Rosser Index Matrices are shown in Tables III and IV and the median QoL scores for the primary and revision groups in Table V. In the primary group the postoperative median was improved by 0.120 ($p < 0.0001$) and in the revision group by 0.110 ($p < 0.0001$). There was therefore a significant improvement in the QoL in both groups with no significant difference between primary and revision surgery ($p = 0.29$).

There were only two patients whose QoL scores were worse after operation as compared with before; both were in the revision group. One had increased the QoL score to above the preoperative score by the end of the second year,

Table III. Rosser Index Matrices for the primary group before operation and on review at one and at four years

	A	B	C	D
Before operation				
1	-	-	-	1
2	-	-	7	2
3	-	-	6	11
4	-	-	1	29
5	-	-	-	5
6	-	-	-	-
At review at one year				
1	9	4	1	-
2	19	19	4	1
3	2	-	-	-
4	-	-	1	-
5	1	-	-	-
6	-	-	-	-
At review at four years				
1	16	6	-	-
2	13	12	2	1
3	1	1	-	-
4	-	-	-	-
5	-	-	-	1
6	-	-	-	-

Table IV. Rosser Index Matrices for the revision group before operation and on review at one and at four years

	A	B	C	D
Before operation				
1	-	-	-	-
2	-	-	2	4
3	-	-	8	1
4	-	-	-	2
5	-	-	-	7
6	-	-	-	5
At review at one year				
1	3	-	-	-
2	12	11	4	-
3	4	3	5	1
4	-	-	3	1
5	2	-	-	2
6	-	-	-	-
At review at four years				
1	2	1	-	-
2	4	5	2	1
3	2	1	1	2
4	-	-	2	1
5	-	-	1	-
6	-	-	-	-

Table V. The median QoL scores during the study period for both groups

		Number of patients	Median	Interquartile range
Primary				
Preop		62	0.870	0.086
Year	1	60	0.990	0.006
	2	58	0.990	0.014
	3	56	0.990	0.014
	4	53	0.990	0.014
	5	51	0.990	0.014
Revisions				
Preop		62	0.870	0.042
Year	1	60	0.980	0.044
	2	49	0.973	0.044
	3	39	0.976	0.048
	4	25	0.980	0.048
	5	14	0.983	0.030

Table VI. Results of logistic regression analysis for deterioration in function from one to four years after operation

Risk factor	p value	Relative risks	95% Confidence interval
Revision surgery	0.018	6.7 times	1.39 to 32.5
Male	0.059	6.2 times	0.93 to 40.8
Age	0.054	1.85/5 years	0.99 to 3.46
Preop QoL score	0.040	1.18/0.01 QoL	1.05 to 1.32

an improvement which was maintained. The other required revision during the second year for migration of the acetabular component within allograft that had failed to consolidate.

In both groups the QoL scores maintained this improvement over the preoperative score (Table V). At follow-up at four years there was no significant difference ($p = 0.89$) in deterioration in the distress scores between the primary and revision groups. The function score showed that 26% of the revision operations, as opposed to 9% of the primary procedures, were failing at four years. This is not significant by chi-squared analysis ($p = 0.10$), but logistic regression analysis adjusting for age, gender and preoperative QoL has shown that the type of operation (i.e., primary *v* revision) is significantly associated with the fall in the function score ($p = 0.018$). A low preoperative QoL score is also significantly associated with a deterioration in the function score at four years ($p = 0.040$). The odds ratios and their confidence intervals are shown in Table VI.

Discussion

The translation of existing scoring systems into Rosser health-state categories is open to criticism as a potential source of error and subjectivity.[8] The Harris hip score, however, is closely comparable to the Rosser categories, allowing the patient to answer questions relevant to his or her symptoms using the same parameters of pain (distress) and function (disability). It is of course recognised that distress and disability are not the only determinants of QoL.

Our study compared the improvement in QoL in two groups of consecutive patients having primary and revision THAs. While the economics[2] and survivorship[3] of revision surgery are well documented, measurement of QoL has not previously been recorded for this group of patients. One year after surgery the median QoL score had been significantly improved in both groups, from 0.870 to 0.990 in the primary group ($p < 0.0001$) and from 0.870 to 0.980 in the revision group ($p < 0.0001$). There was no significant

difference in the one-year scores achieved for each group. Significant improvement was maintained until five years after operation, although by then the number of patients in the revision group is small.

Since primary THA has been shown to be one of the most cost-effective ways of improving QoL,[1] the observation that at one year a revision operation is as effective as a primary procedure justifies its use. Analysis of both groups at four years has shown that while there was no significant difference in the deterioration of the pain score, the function score had deteriorated in the revision group ($p = 0.018$) and was significantly associated with a low QoL score ($p = 0.040$) before operation.

The fall in the function score is of concern, but Britton et al[4] have shown that pain relief is the most important factor in determining patient satisfaction. Furthermore, the group of patients followed at four years was small and future studies on the long-term sustainability of the improvement in QoL after revision are warranted. Once the true duration of the benefit is known the QoL can be converted into the QALY to assist with allocation of resources.

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