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Posterior Approach to Optimise Patient Reported Outcome from Revision Hip Arthroplasty

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Short title: Posterior Approach Optimises Outcome from Revision Hip Arthroplasty

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Abstract

Introduction
Most total hip arthroplasty (THA) in the UK are performed through a posterior or lateral surgical approach. We aimed to investigate any difference in outcome from revision THA according to the approach at primary and revision THA surgery.

Methods
A retrospective cohort study of 205 patients who underwent revision THA for aseptic loosening. Patients rated their pain from 0-10 and completed the Self-Administered Patient Satisfaction Scale (SAPS), Oxford Hip Score (OHS), WOMAC and Short form-12 questionnaires.

Results
205 patients (209 hips) from a cohort of 238 patients (243 hips, 86%) were available for analysis. The mean follow up was 5 years (SD 1.71).

Grouping by approach 20% (43/209) had both primary and revision procedures via a lateral approach, 20% (43/209) had their primary surgery via a lateral approach and their revision surgery via a posterior approach, whilst 60% (123/209) had both procedures via a posterior approach.

The WOMAC and OHS were significantly better in patients who had a posterior approach for both primary and revision surgery, compared to those that did not (OHS p=0.028, WOMAC p=0.026). We found no significant differences in pain, satisfaction or health-related quality of life between the groups.

Discussion
Choice of approach for revision hip arthroplasty is influenced by a number of factors, but in clinical situations where either a lateral or posterior approach could be used, the posterior approach appears to be associated with better joint-specific outcomes. Registry data may help further explore the associations between surgical approach and the outcome from revision THA.

Keywords
Arthroplasty, Replacement, Hip
Revision, Joint
Patient Outcome Assessment

Introduction

Over 96% of primary total hip arthroplasties performed in England and Wales are carried out through a posterior or a lateral surgical approach (1). Whilst surgeons tend to have a strong preference for the surgical approach they use, there is no high quality evidence available to support the use of one approach over the other (2). Whilst there may be reasons to select one approach over another in a particular patient, such as soft tissue defects, contractures or scars from previous surgery, this suggests that there is equipoise between the choice of lateral or posterior approach.

There is an even greater paucity of evidence when the outcome of revision THA is considered with reference to the surgical approach employed. One retrospective single surgeon study compared isolated acetabular revision in 33 via posterolateral approach to 36 via an anterolateral approach and found a lower rate of dislocation in the anterolateral approach group (3). However, the choice of approach was dictated by the surgeon experiencing a high dislocation rate with the posterolateral approach, hence adopting the lateral approach.

Aseptic loosening is the most common reason for revision THA, accounting for 46% of all revision hip procedures in the National Joint Registry of England, Wales and Northern Ireland (NJR) (1). Data on the surgical approach used for primary and revision hip surgery is recorded as part of the data set but the approach used in revision procedures is not currently reported in the annual or associated online reports (1). Similarly, the approach used in revision procedures is not reported by other national registries (4-7).

To date there have been no studies on the influence of surgical approach at primary and revision THA on the outcome following revision THA. This study aimed to investigate how patient reported outcome measures of pain and function after revision hip surgery, are affected by the surgical approach employed at the primary and subsequent revision THA.

Our null hypothesis was that there would be no difference in outcome from revision THA according to the surgical approach taken at primary and revision THA surgery.

Methods

We performed a retrospective cohort study of patients who underwent revision THA at our institution between January 2006 and March 2010. We identified 275 revision THAs in 267 patients performed for a diagnosis of aseptic loosening, for whom details (including surgical approach) of both the primary and revision procedure were available. The revision procedures were performed by or under the care of 9 Consultant Orthopaedic Surgeons.

This study was conducted as a service evaluation (8). Questionnaires were sent to 267 patients, who were asked to rate their pain from 0-10 and complete patient reported outcome measures including the Self-Administered Patient Satisfaction Scale (SAPS) (9), Oxford Hip Score (OHS) (10), Western Ontario and McMaster University Osteoarthritis Index (WOMAC) (11) and Short form-12 (SF-12) (12) questionnaires.

The Self-Administered Patient Satisfaction Scale (SAPS) is a short questionnaire used to evaluate the results of total hip and knee arthroplasty. Four items are scored on a 4-point Likert scale with responses from very dissatisfied to very satisfied. The scale score is the unweighted mean of the scores with 100 being most satisfied and 25 the least.

The Oxford Hip Score (OHS) is a 12-item questionnaire designed to measure changes in pain and function after total hip arthroplasty. The Oxford Hip Score is scored on a 0-48 scale, where 48 represents a good hip and 0 the worst (13). The minimal clinically important difference (MCID) for the OHS is 5 (14).

The Western Ontario and McMaster University Osteoarthritis index (WOMAC) is a 24-item questionnaire designed to measure pain (5 questions), function (17 questions) and stiffness (2 questions). It uses a 5-point Likert-type scale from 0 to 4 for each question (giving a total scale of 0-96) with higher scores indicating worse outcomes. The MCID for the WOMAC is 9 (15).

The Short-Form 12 (SF-12) questionnaire measures health-related quality of life with physical and mental health composite scores (PCS and MCS) and ranges from 0 to 100, where 100 indicates the highest level of health. The MCID for the SF-12 is 5 for both PCS and MCS (16).

Statistics

Statistical analysis comprised an assessment of data distribution by means of a Kolmogorov-Smirnoff test. Nonparametric data are presented as the median and interquartile range (IQR), parametric data are presented as the mean and standard deviation (SD). Groups were compared using a Kruskal Wallis test. The statistical analysis was carried out with the use of the SPSS for Mac (version 21, IMP SPSS Statistics, Chicago, IL, USA).

Patients

267 patients (275 hips) were identified according to the defined criteria from our database. 19 patients (19 hips) had died, 4 patients (4 hips) were unable to respond due to a diagnosis of dementia and 13 patients (14 hips) declined to participate. There were a further 29 patients (32 hips) that could not be

contacted. This left 205 patients (209 hips) from a possible cohort of 238 patients (243 hips, 86%) available for analysis (see Figure 1).

The mean age of respondents was 69 years (SD 12) with 43% male and 57% right-sided revision THAs. The mean period of follow up was 5.0 years (SD 1.71, range 2.3-9.0).

Grouping by approach 20% (43/209) had both primary and revision procedures performed via a lateral approach, 20% (43/209) had their primary surgery performed via a lateral approach and their revision surgery via a posterior approach, whilst 60% (123/209) had both procedures performed via a posterior approach. No patient had their primary surgery performed via a posterior approach and their revision surgery via a lateral approach (see Figure 1).

A small number of primary (6 hips) and revision (3 hips) surgeries were performed using a trochanteric osteotomy. For the purpose of this study these were classified as a lateral approach. The group of patients who had a trochanteric osteotomy is too small to permit meaningful analysis and therefore to avoid excluding potentially relevant information and allow generalisability of the data generated, they are grouped with the lateral approaches.

Similarly, as the large majority of revisions involved both components (n=185), splitting into subgroups by type of revision surgery (both components n=185, acetabulum only n=19, stem only n=5) would not permit meaningful analysis. However, the proportions within the types of revision surgery are similar. For those having both components revised (n=185), 39/185 were in the Lateral/Lateral group, 37/185 were in the Lateral/Posterior group and 109/185 were in the Posterior/Posterior group. For those having just the acetabular component revised (n=19), 4/19 were in the Lateral/Lateral group, 3/19 were in the Lateral/Posterior group and 12/19 were in the Posterior/Posterior group. For those having just the femoral component revised (n=5), 3/5 were in the Lateral/Posterior group and 2/5 were in the Posterior/Posterior group.

The outcomes by primary and revision THA surgical approach for the pain score, SAPS and SF-12 are shown in table 1. There were no significant differences between the groups for any of these outcomes (p=0.11-0.47).

Results

The outcomes by primary and revision THA surgical approach for the OHS and WOMAC are shown in figure 2 and figure 3. There was a significant difference between the groups for the OHS (p=0.028) with the best outcome

found in patients who underwent both their primary and revision THA through a posterior approach (median 37, IQR 18) when compared to those who had their primary and revision THA performed through a lateral approach (median 31, IQR 15) and those who had their primary THA performed through a lateral approach and their revision THA performed through a posterior approach (median 34, IQR 17). Similar results were found for the WOMAC score ($p=0.026$) with the posterior/posterior approach group (median 19, IQR 42) showing better results than the lateral/lateral group (median 29, IQR 46) and the lateral/posterior group (median 34, IQR 37).

We found no significant differences in pain, satisfaction or health-related quality of life between the three groups.

Discussion

The WOMAC and OHS were significantly better in patients who had a posterior approach for both primary and revision surgery, compared to those that did not.

Surgical approaches commonly utilised for revision THA include the anterior, transgluteal, transtrochanteric and posterior approaches (17, 18). Important considerations for choice of approach include the indication for revision, implant type, degree of bone or soft tissue damage, surgeon experience, patient characteristics such as obesity and the site of previous incisions or approaches (17-19). Previous incisions are utilised when possible to reduce the risk of tissue necrosis, and surgical approaches may also be best re-used rather than dissecting remaining normal tissues (18). However, no single surgical approach is suitable for all cases of revision THA (18) and the approach used is at the discretion of the surgeon.

Anterior approaches occur in front of the abductors and many surgeons feel the approach is not extensile and does not allow sufficient access for complex reconstruction (18). Some surgeons consider that an anterior approach can be extended to achieve distal femoral exposure through dissection of vastus lateralis (20).

Transgluteal approaches detach all or some of the abductor mechanism, while transtrochanteric approaches utilise an osteotomy of the trochanter for exposure (18). In this study, the functional outcomes (OHS and WOMAC) reported appear to be worse when the lateral approach was used either for the primary THA or for the primary and revision THA. This may be due to the associated trauma to the abductor mechanism. Electromyographic (EMG) studies in primary THA have demonstrated increased denervation of the abductor muscles at 2 weeks with a direct lateral approach compared to modified direct lateral or posterior approaches (21). However, by three

months this not statistically significant and did not correlate with Trendelenburg test. In revision THA, fatty degeneration of gluteus medius as assessed by MRI scan has been demonstrated when the direct lateral approach is employed (22). Whilst there was no direct correlation between the cumulative fatty degeneration and the presence of a Trendelenburg sign in the revision group, there was significantly more muscle trauma observed in the revision group than the primary group. This may lead to the negative impact on patient reported function observed in our study.

Posterior approaches occur behind the abductors, minimising the disturbance to the abductor mechanism. The posterior approach is extensile and offers good exposure of most of the hip and femur apart from the ilium and anterior column of the acetabulum (19). However, by disrupting the posterior joint capsule and short external rotators the risk of dislocation has been suggested to be increased (18). A meta-analysis of prospective studies of surgical approach in primary THA showed no significant difference in rate of dislocation between lateral and posterior approaches (23). A study of 1548 revision THA from the Mayo Clinic, found no significant association between postoperative dislocation and surgical approach (24).

The MCID for the WOMAC score is 9 (15) so the differences demonstrated in this study were clinically significant when a posterior approach was used for both primary and revision THA in comparison to patients who had their primary and revision THA performed through a lateral approach and their primary THA through a lateral approach and their revision THA performed through a posterior approach. The MCID for the OHS is 5 (14) so the differences demonstrated in this study were clinically significant when the group who underwent primary and revision surgery via the posterior approach were compared to the group who underwent both via the lateral approach. This threshold was not met when the results of the posterior/posterior group were compared to the lateral/posterior group. Previous studies have not found the WOMAC questionnaire to be statistically significantly different from the OHS in primary THA (25) but there are no studies comparing these outcomes in revision THA.

Whilst this is a retrospective study in one institution, this study includes a large number of patients with a good follow up rate of 86%. A study of OHS after primary THA found that non-responders were statistically younger, with lower baseline OHS scores and lower satisfaction scores than responders (26). However, the difference in OHS between responders and non-responders was just 4 at 12 and 24-month follow up, so was not clinically significant (14). No pre-operative scores were available for the patients in this study and thus change in scores has not been measured, but rather final outcome.

The evidence from this cohort would suggest that in clinical situations when either approach could be used, a posterior approach is preferred to optimise patient reported function following any revision surgery that may be required. Registry data may help further explore the associations between surgical approach for primary and revision THA and the outcome from revision THA, particularly with the availability of Patient Reported Outcome Measure (PROM) scores.

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Outcome	Lateral/Lateral Median (IQR)	Lateral/Posterior Median (IQR)	Posterior/Posterior Median (IQR)	p
Pain (0-10)	1 (6)	1 (6)	1 (6)	0.469
SAPS (25-100)	75 (31)	88 (19)	81 (25)	0.227
SF-12 MCS	51 (16)	49 (15)	54 (18)	0.16
SF-12 PCS	34 (17)	34 (16)	37 (21)	0.11

Table 1: Median and Interquartile ranges (IQR) for Patient Reported Outcome Measures grouped by primary and revision THA surgical approach

Figure 1: Flow diagram of patients through the study

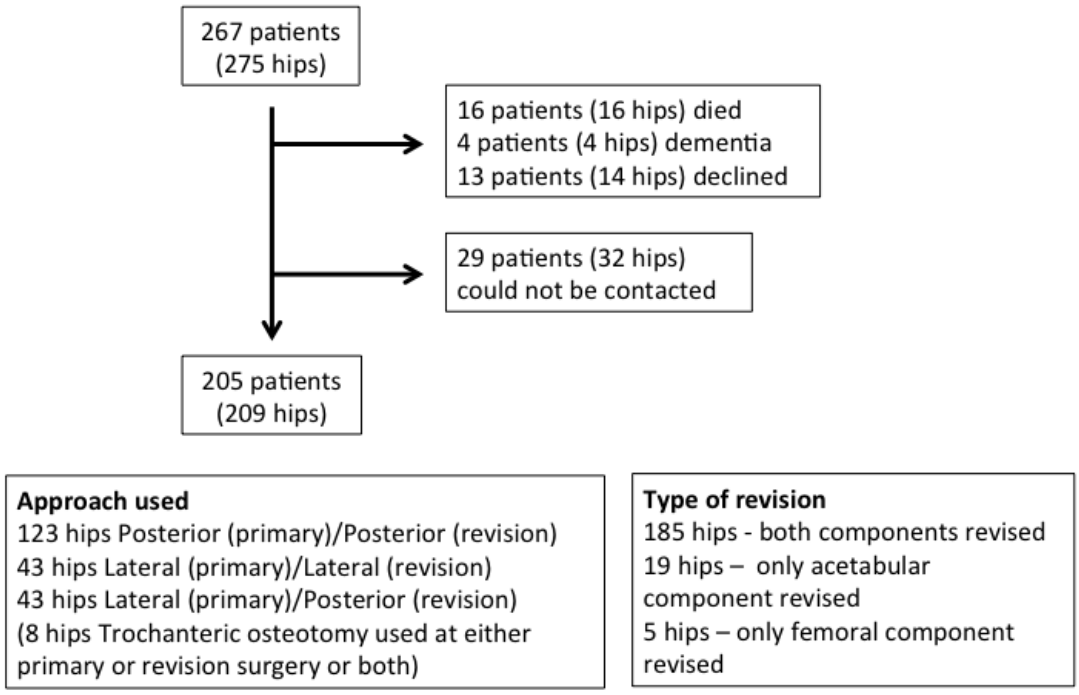

Figure 2: Comparison of Oxford Hip Score grouped by primary and revision THA surgical approach (p=0.028). The median and interquartile range are presented.

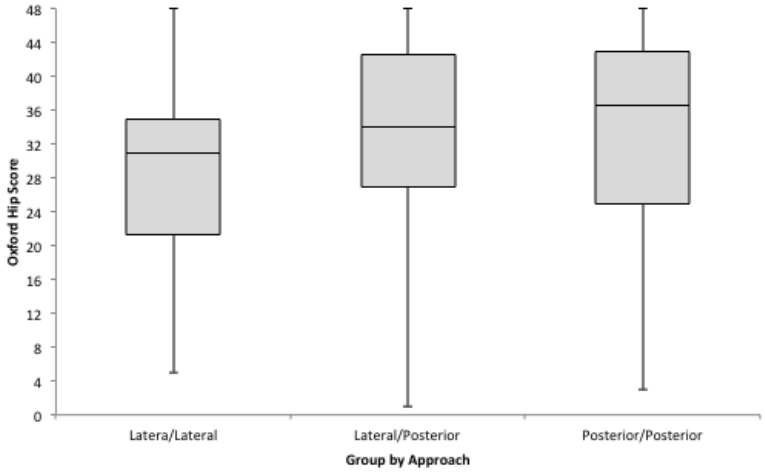

Figure 3: Comparison of WOMAC score grouped by primary and revision THA surgical approach (p=0.026) The median and interquartile range are presented.