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Original Article

Acetabulum-Only Revision Total Hip Arthroplasty Is Associated With Good Functional Outcomes and Survivorship

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ABSTRACT

Background: The coexistence of a stable femoral and a loose acetabular component may pose a clinical dilemma for the surgeon. Our study aims at comparing the intermediate functional outcomes and survivorship of acetabulum-only revision total hip arthroplasty (ArTHA) with an age-matched and gender-matched total revision THA (TrTHA) group.

Methods: We retrospectively reviewed prospectively collected data on the pain, function, and total Harris Hip Scores (HHS) and complication profile for ArTHA and TrTHA cohorts from our regional arthroplasty database. Kaplan-Meier survivorship, with the need for repeat revision surgery as the end point, was used for survival analysis.

Results: Among 538 cases, there were fewer acute medical complications in ArTHA and a similar dislocation rate for both cohorts. Preoperative HHS for pain, function, and total were better in the ArTHA cohort, but only the function score reached statistical significance. No significant differences in subsequent years for all aspects of HHS, except the function score was significantly better in the ArTHA cohort at year 1. And 10.0% of ArTHAs and 7.8% of TrTHAs had required rerevision. The 5-year survivorship was 90.3% (95% confidence interval ± 2.1%) for the ArTHA cohort and 92.7% (95% confidence interval ± 1.8%) for the TrTHA cohort ($P = .394$). The ArTHA with posterior approach (n = 118) group had the lowest dislocation rate and the best trend of functional outcomes.

Conclusion: ArTHA can provide similar functional outcomes and dislocation rate to TrTHA, with an acceptable rerevision rate. The posterior approach in this study was not associated with a significant dislocation rate.

During revision hip surgery, the coexistence of a stable with a loose component may pose a clinical dilemma for the surgeon. There is some limited evidence in the literature to suggest that acetabulum-only revision total hip arthroplasty (ArTHA) can be technically challenging due to the limited exposure [1]. Furthermore, it has been suggested that ArTHA is associated with a higher instability and dislocation risk due to a potential difficulty in soft tissue balancing [2], and the obvious fact that only 1 component can be realigned. As the rate and incidence of implant loosening can be variable, some authors further suggested that total revision THA (TrTHA) with new implants can enhance the longevity of revision THA (rTHA) in general [3–5].

Nonetheless, the removal of a well-fixed femoral implant can result in significant damage to the remaining bone stock, more soft tissue trauma, and a longer operative time, all of which, when considering the longer-term outcomes, are potentially detrimental [5]. In addition, dislocation remains a relatively common and distressing complication following rTHA [6]. Many studies have been done to determine the best approach for primary THA to reduce dislocation risk [7,8]. However, there is no clear consensus with regard to this in rTHA [9,10].

Based on our experience, we have not agreed with the common belief that ArTHA is associated with less good functional outcome and survivorship. In practice, it is nearly always a well-fixed femoral stem with a loose acetabular component. Furthermore, we believe

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that both anterolateral and posterior approaches have their own merits and limitations, and the approach should be based on patient characteristics, surgeon's experience, and surgeon's preference. We therefore conducted this retrospective review of our experience to evaluate the medium-term functional outcomes and survivorship of ArTHA in a relatively large cohort with an age-matched and gender-matched TrTHA cohort. Our study further determines (1) the complication profiles and rerevision rate in both cohorts and (2) the functional outcomes and survivorship of ArTHA and TrTHA with different surgical approaches.

Patients and Methods

With Caldicott approval, we reviewed all ArTHA cases with an age-matched and sex-matched cohort of TrTHA from a prospective arthroplasty database that registers every patient undergoing joint arthroplasty in our region. The TrTHA cohort was selected from a possible 883 cases where:

- Age was between the minimum and maximum ages in the ArTHA cohort;
- Date of operation was between the earliest and latest dates of operation in the ArTHA cohort; and
- Surgery was performed at the same hospitals as those in the ArTHA cohort.

An individual match for each ArTHA case was randomly selected from a subset of TrTHA cases of the same gender, age, and year of operation. Where none existed, age matching was relaxed in increments of 1 year either way, to a maximum of 3 years until a match was found. When more than 1 possible match existed, the TrTHA case was randomly chosen. If they remained unmatched, the ArTHA cases were excluded.

The functional outcomes for rTHA were based on Harris Hip Score (HHS) according to pain, function, and the total score (Appendix 1). The reason for rTHA, and the preoperative HHS at years 1, 3, and 5 across both cohorts were identified and compared. In addition, the functional outcomes between the ArTHA and TrTHA cohorts with different surgical approaches were further analyzed. Our grouping cohorts were as follows: acetabulum-only revision THA with anterolateral approach (ArTHA [AL]), acetabulum-only revision THA with posterior approach (ArTHA [P]), total revision THA with anterolateral approach (TrTHA [AL]), and total revision THA with posterior approach (TrTHA [P]). Subsequently, the rerevision rate and indication for rerevision were compared between the study cohorts.

The Charnley classification was used to assess patient's comorbidities where:

- A—1 hip affected;
- B—Both hips affected;
- C—Multiple joint disease or other disabilities leading to difficulties in walking [11].

Medical and surgical complications were compared. Chest pain, myocardial infarction, and cardiac arrest were considered as cardiac complications. Gastrointestinal bleeding was classified as a gastrointestinal complication. Urinary tract infection and acute kidney injury were classified as renal complications. Chest infection was classified as a respiratory complication. Wound complications included delayed wound healing, wound dehiscence, excessive bleeding, blistering, and excessive bruising. For infection complications, we only considered positive laboratory culture and reported superficial and deep infection during hospital stay. Reported nerve deficit and ankle dorsiflexion weakness were considered as nerve injury complications. Patients with more than one complication reported were placed into ">1 complications" category. For surgical complications, we specifically recorded the incidence of acute dislocation and acute periprosthetic fracture.

Statistical analysis was performed using Statistical Package for the Social Sciences software (SPSS for Microsoft, version 21.0). The mean, range, and percentage were used for descriptive statistics. The Shapiro-Wilk test was used to test data normality, and the Mann-Whitney test was used to assess the statistical significance between ArTHA and TrTHA cohorts. The Kruskal-Wallis test was used to assess the statistical significance between both cohorts with different surgical approaches. The Kaplan-Meier survivorship, with the need for rerevision surgery as the end point, was used for survival analysis. Censored observations, such as patients who died and those who were lost to follow-up, were included in the survivorship analysis. The survivorship analysis was based on the assumption that not all implants will be revised and even if the exact time of rerevision for censored observations was not known, the implant was at least known to be unrerevised before being censored [12]. The log-rank test was used to identify significant differences between the survival curves of the study cohorts. A P value less than .05 were regarded as statistically significant.

Results

There were 355 ArTHA cases in the regional database, from year 1993 to 2014. Thirty-nine unmatched cases, 12 hip resurfacing cases, and 1 deceased case with insufficient detail were excluded. We compared a total of 269 ArTHA cases to a randomized age-matched and gender-matched TrTHA cohort. Among the 538 cases, we had a rate of loss of 29.7% (160 of 538) with a 68.1% (109 of 160) death rate within these lost cases, from an unrelated event. The rate of loss was similar across both ArTHA and TrTHA cohorts (29.4% vs 30.1%). We have assumed that the causes of loss to follow-up other than death itself were similar in the 2 cohorts.

Patient demographics are shown in Table 1. The majority of patients fell into Charnley class C for both ArTHA and TrTHA cohorts. The BMI and survival years did not differ significantly for both cohorts ($P = .468$ and .942). The length of hospital stay for the ArTHA cohort was significantly shorter than for the TrTHA cohort (9 days vs 12 days; $P = .001$). At year 1, our institute achieved patient satisfaction rates of 93.4% (184 of 197) and 95.9% (188 of 196) for ArTHA and TrTHA cohorts, respectively. At year 5, our institute again achieved comparative patient satisfaction rates for both ArTHA and TrTHA cohorts (93.5% [87 of 93] vs 92.8% [90 of 97]). The most common indication for performing rTHA for both cohorts was aseptic loosening, followed by dislocation for ArTHA and infection for the TrTHA cohort (Table 2).

The comparison of HHS for pain, function, and total score is shown in Figure 1A-C. The preoperative HHS for pain, function, and total were better in the ArTHA cohort, but only the function score reached statistical significance ([function score, $P = .020$]; [pain and total score, $P = .154$ and .053]). Furthermore, there were no significant differences in subsequent years for all aspects of HHS, except the function score was significantly better in the ArTHA cohort at year 1 ($P = .045$). Further analysis revealed that the TrTHA cohort had a higher score improvement at year 1 than the ArTHA cohort in all 3 aspects of HHS, but only HHS for pain reached statistical significance ($P = .021$; Table 3).

During our study period, we had 149 ArTHA (AL), 118 ArTHA (P), 130 TrTHA (AL), and 135 TrTHA (P) cases. Six cases were excluded as no surgical approaches were recorded. The comparison of all 3 aspects of HHS for the surgical approaches is shown in Figure 2A-C. ArTHA (P) group was associated with the best preoperative HHS and performed best in the subsequent years for function and total