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Acetabular Total Hip Arthroplasty Revision: A Summary of Operative Factors, Outcomes, and Comparison of Approaches

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A B S T R A C T

Background: Revision total hip arthroplasty (THA) presents a greater risk to patients than primary THA, and surgical approach may impact outcomes. This study aimed to summarize acetabular revisions at our institution and to compare outcomes between direct anterior and posterior revision THA.

Methods: A series of 379 acetabular revision THAs performed from January 2010 through August 2022 was retrospectively reviewed. Preoperative, perioperative, and postoperative factors were summarized for all revisions and compared between direct anterior and posterior revision THA.

Results: The average time to acetabular revision THA was 10 years (range, 0.04 to 44.1), with mechanical failure (36.7%) and metallosis (25.6%) being the most prevalent reasons for revision. No differences in age, body mass index, or sex were noted between groups. Anterior revision patients had a significantly shorter length of stay (2.2 versus 3.2 days, $P = .003$) and rate of discharge to a skilled nursing facility (7.5 versus 25.2%, $P = .008$). In the 90-day postoperative period, 9.2% of patients returned to the emergency department (n = 35) and twelve patients (3.2%) experienced a dislocation. There were 13.2% (n = 50) of patients having a rerevision during the follow-up period with a significant difference between anterior and posterior approaches (3.8 versus 14.7%, respectively, $P = .049$).

Conclusion: This study provides some evidence that the anterior approach may be protective against skilled nursing facility discharge and rerevision and contributes to decreased lengths of stay. We recommend surgeons select the surgical approach for revision THA based on clinical preferences and patient factors.

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Only about 4% to 5% of total hip arthroplasties (THAs) require revision within a decade of the primary procedure [1], but these rates are higher for younger patients [2], and complications and mortality rates are increased when compared to primary procedures [3,4].

As revision poses a greater risk than primary THA, it is important to investigate factors that may contribute to postoperative outcomes. One factor is the surgical approach used. At our institution, both the posterior approach and the direct anterior approach are utilized in primary and revision THAs. Many studies are available that compare outcomes between these approaches for primary THA; however, there has not been an equivalent investigation for revision THA. A literature search revealed few published studies comparing outcomes [5,6], one study comparing acetabular component positioning [7] between posterior and anterior revision

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THAs, and another study evaluating a minimally invasive direct anterior approach for aseptic cup revision THAs demonstrating anatomic reconstruction of the cup with low associated complications, particularly dislocation [8]. In this study, we investigated differences in outcomes between the posterior and direct anterior approaches to acetabular-component revisions specifically. The primary outcomes of interest include the rate of discharges to skilled nursing facilities (SNF), dislocations, and rerevisions, as these are the outcomes we hypothesized would be most affected by surgical approach. Secondarily, we aimed to summarize the acetabular revision THA population at our institution.

Materials and Methods

This retrospective review of acetabular revision THAs was deemed institutional review board exempt by the institution's clinical research committee. Any revision with exchange of the acetabular component, liner, and/or femoral head without exchange of the femoral component was considered an acetabular revision. Acetabular revisions performed within 90 days of the primary THA (n = 7) and acetabular revisions where the date of primary THA was unknown (n = 1) were excluded. All acetabular revisions were the initial revision performed on the implant. Chart review was completed for 379 cases performed by 9 board-certified orthopaedic surgeons from January 1, 2010 through September 30, 2022.

Mechanism of Failure and Time to Revision

The mechanism of failure of the primary THA was classified into one of seven categories. Definitions for these mechanisms of failure, or reasons for revision, were established by our institution and reported previously [9]. If multiple mechanisms of failure were indicated in the medical record, the most severe reason was considered as the primary mechanism of failure. The seven reasons for revision and associated symptoms or diagnostic criteria are as follows: infection, metallosis, periprosthetic fracture, dislocation, mechanical failure, wound complications, or pain/other (femoral nerve palsy, heterotopic ossification, iliopsoas impingement or tear, osteoarthritis, pain, or scar tissue). The time from primary to revision THA was categorized as 'early failures' occurring within 2 years of the primary procedure or 'late failure' occurring 2 or more years after the primary procedure. The two-year cutoff for early and late failures was selected in alignment with previously published studies [9–11].

Perioperative Protocol

Patients were subject to consistent perioperative protocols in a coordinated joint replacement center. Preoperatively, patients were provided written educational materials, an education class for themselves and their caregivers, medical evaluation, and strengthening via a home exercise program or formal physical therapy.

For perioperative and postoperative care of all total joint arthroplasty (TJA) patients, a standard rapid recovery pathway has been established. Pain was managed with a multimodal regimen of celecoxib, acetaminophen, pregabalin, and short-acting opioids. Patient-controlled analgesia and nerve blocks were not used; anesthesia was either general or neuraxial, determined by the anesthesiologist in consultation with the patient and surgeon. Patients also received intravenous or topical tranexamic acid and day of surgery ambulation when appropriate. Aspirin 325 mg bid was the primary pharmacologic deep vein thrombosis prophylaxis, with warfarin or apixaban used in select high-risk patients. Prior to discharge, all patients had achieved adequate pain control using oral medication, had stable vital signs, were able to ambulate, and had voided.

Data Collection

Information was collected from the electronic medical record on patient demographics and preoperative, perioperative, and postoperative factors. Collected demographics were age, body mass index (BMI), and sex. The recorded preoperative factors were laterality, time from primary THA to revision THA, mechanism of failure, and implant components exchanged. Surgical approach, change in hematocrit (HCT), estimated blood loss (EBL), operating room (OR) time, and length of stay (LOS), were the collected perioperative factors. Postoperative factors were discharge disposition, 90-day emergency department (ED) return, 90-day readmission, 90-day dislocation, 90-day reoperation, rerevision, any postoperative dislocation, and time from revision to last orthopaedic follow-up. The events of ED return, readmission, reoperation, and rerevision were captured for our single institution as well as for any hospital in the state of Maryland participating in the Epic Care Everywhere Network (Verona, WI).

Data Analyses

Patients who had direct anterior approach revision or posterior approach revision THA were compared. Pearson's *chi*-squared tests were used to compare categorical variables between the surgical approach groups; for categorical variables that did not achieve adequate frequency for *chi*-squared analyses, 2-sided Fisher's exact tests were used. Two-sided independent samples *t*-tests were used to compare continuous variables between the surgical approach groups. Logistic regressions were used to control for significant patient factors and determine whether surgical approach was associated with the primary endpoints of rates of discharge to SNF, dislocation, and rerevision. Post-hoc power analyses were conducted for any primary endpoints demonstrating no statistically significant differences between groups. All statistical analyses were performed using R Studio (version 1.4.1717 2009-2021 RStudio, PBC, Boston, MA). Statistical significance was assessed at $P < .05$. Based on the sample sizes and rates observed, the study was 23% powered to detect statistically significant differences in dislocation rates at $\alpha = 0.05$.

There were 379 acetabular revision THAs performed from January 1, 2010 through September 30, 2022, with 326 (86.0%) performed through the posterior approach and 53 (14.0%) via anterior approach. Of the 379 acetabular revisions performed, 210 (65%) underwent primary THA at our institution. The average age of all patients was 69 years (range, 32 to 92). BMI was similar across both groups ($P = .124$). For all patients, the average BMI was 28.7 (range, 14.5 to 59.5). No differences in sex were observed between groups. Time to acetabular revision was a mean of 10 years (range, 0.04 to 44.1). Posterior revision THA was performed at a mean of 10.4 years after primary surgery, and anterior revision THA was performed at a mean of 11.0 years after primary surgery on average; however, this was not statistically significant. Approximately 82% of all patients had their revision done 2 years or more after their initial arthroplasty, with no difference in early or late revision across approach (Table 1).

Results

The most common reasons for revision of primary THA were mechanical failure (n = 139, 36.7%) and metallosis (n = 97, 25.6%). In order, the next most common reasons for acetabular revision were dislocation (n = 71, 18.7%), pain/other (n = 32, 8.4%),

Table 1
Characteristics of All Patients.

Patient Demographics and Surgery Details	All Patients (N = 379)	Posterior (N = 326)	Anterior (N = 53)	*P* Value
Demographics				
Mean age (range)	68.9 (32-92)	69.17 ± 10.6	67.13 ± 10.2	.183
Mean BMI (range)	28.7 (14.5-59.5)	28.52 ± 6.1	29.79 ± 5.5	.124
Sex, women	212 (55.9)	185 (56.7)	27 (50.9)	.370
Procedure details				
Time to rTHA, year	10.1 ± 8.2	10.4 ± 8.1	11.0 ± 8.6	.610
rTHA early or late				.478
<2 y	69 (18.2)	57 (17.5)	12 (22.6)	
≥2 y	310 (81.8)	269 (82.5)	41 (77.4)	

P < .05 are in bold.
Data are expressed as mean ± SD or n (%).
ASA, American Society of Anesthesiologists; BMI, body mass index; rTHA, revision total hip arthroplasty; SD, standard deviation; THA, total hip arthroplasty.

periprosthetic fracture (n = 21, 5.5%), infection (n = 16, 4.2%), and wound complications (n = 3, 0.8%). The distribution of mechanisms of failure between posterior and anterior approach revision THA was similar (*P* = .413) (Fig. 1).

One hundred seventy-six (46.4%) patients had exchange of the acetabular liner and femoral head and 149 (39.3%) had exchange of the acetabular cup, liner, and head, and 52 (13.7%) had another combination of components exchanged. There were no differences in any components exchanged between approaches (Fig. 2).

Overall, patients had a mean decrease in HCT of 7.2 (range, 1.8 to 21.8) and and a mean EBL of 370 mL (range, 100 to 3500). Average OR time was 163 minutes (range, 80 to 388). There were no significant differences between the posterior and anterior approach group for change in HCT (7.3 versus 6.1, *P* = .161) or for EBL (370 versus 381 mL, *P* = .826). There were also no significant differences for OR time (163 versus 165 minutes, *P* = .669) between posterior and anterior approaches, respectively. However, those who had an anterior revision THA had a significantly shorter LOS (2.2 versus 3.2 days, *P* = .003). The average time from revision to last orthopaedic follow-up was 947 days; however, those with a posterior approach had a significantly longer follow-up length (1,008 versus 571 days; *P* = .001) (Table 2).

In total, 86 (22.7%) patients were discharged to a SNF. The rate of discharge to SNF was significantly higher for posterior approach patients (25.2% versus 7.5%, *P* = .008) (Table 2). After controlling for age, sex, and BMI, the anterior approach was protective against discharge to SNF (odds ratio (OR), 0.31; 95% confidence interval (CI): 0.11 to 0.73; *P* = .013) (Table 3).

The rate of 90-day return to the ED was 9.2% (n = 35) (Table 3). There were 32 (8.4%) patients readmitted within 90 days, and 41 (10.8%) patients who returned to the ED or were readmitted within this timeframe. The incidence of these 90-day postoperative events did not significantly differ between revision approaches (Table 2).

Twelve (3.2%) patients experienced a dislocation in the 90-day postoperative period. No differences in 90-day dislocation rates were observed between approaches (Table 2). There were 23 patients (6.1%) who required reoperation within 90-days of revision surgery, and again no significant differences in rate of 90-day reoperation were observed between groups. At all postoperative time points the dislocation rate was 9.0%. Two patients in the anterior approach group (3.8%) and 32 patients in the posterior approach group (9.8%) experienced dislocations, a nonstatistically significant difference (*P* = .254). After controlling for age, sex, and

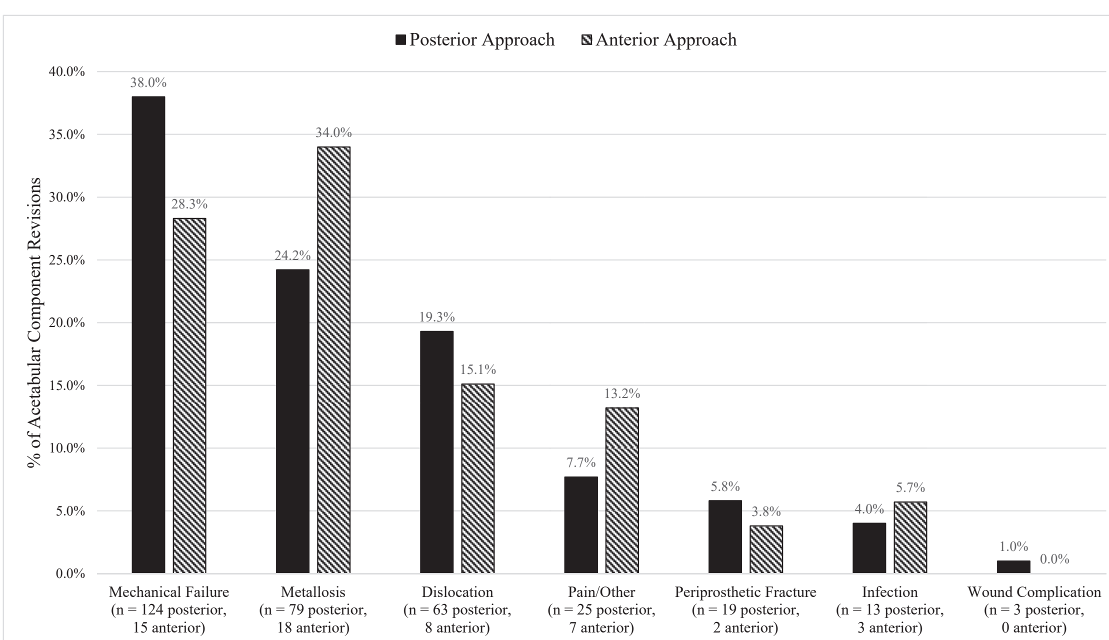

Fig. 1. Reason for revision by revision approach. No statistically significant difference in the distribution of mechanisms of failure was observed (*P* = .413).

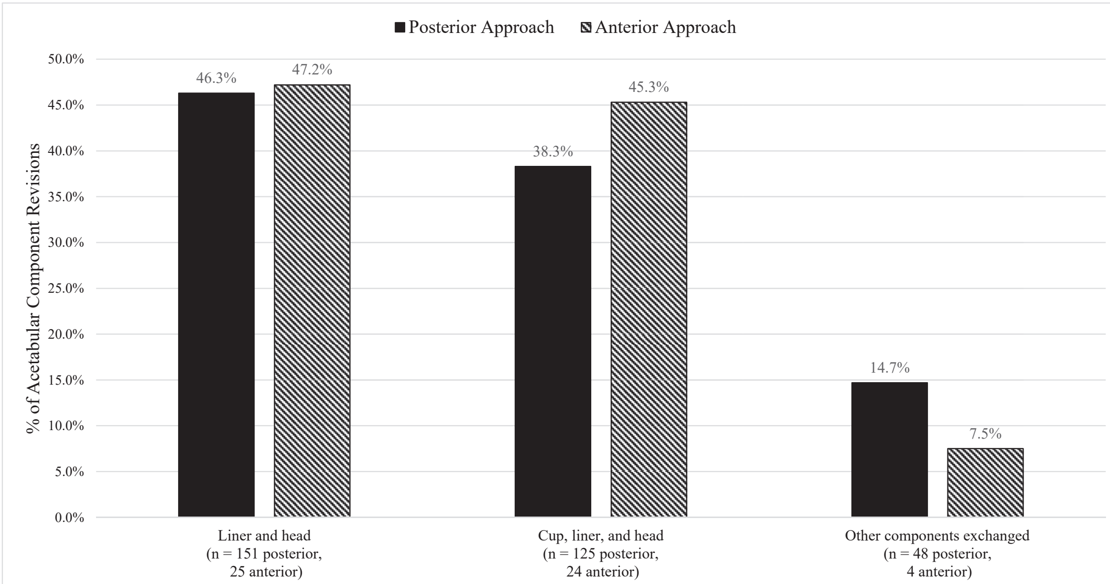

Fig. 2. Components Exchanged by Revision Approach. No statistically significant differences in rates of liner and head ($P = 1.000$); cup, liner and head ($P = .419$); or other component ($P = .233$) exchanges were observed between approaches.

BMI, the anterior approach was not significantly associated with postoperative dislocation (OR, 0.50; 95% CI: 0.12 to 1.46; $P = .263$) (Table 4).

Postoperatively, 13.2% (n = 50) of acetabular revision patients ultimately underwent rerevision of their THA. The leading reasons for rerevision were dislocation (17 cases, 34.0%) and mechanical failure (7 cases, 14.0%). No statistically significant differences in reasons for rerevision were observed between groups ($P = .705$), although only 2 rerevisions occurred in the anterior approach group. These included 1 dislocation and 1 wound complication requiring rerevision. There was a significant difference in the rate of rerevision based on the approach. 14.7% of posterior patients and only 3.8% of anterior patients required rerevision ($P = .049$) (Table 2). After controlling for age, sex, and BMI, the anterior approach was protective against rerevision (OR, 0.27; 95% CI: 0.06 to 0.76; $P = .031$) (Table 5).

Table 2
Perioperative and Postoperative Outcomes.

Outcome	All Patients (N = 379)	Posterior (N = 326)	Anterior (N = 53)	*P* Value
Perioperative Outcomes				
Change in HCT	7.2 ± 3.4	7.3 ± 3.3	6.1 ± 4.1	.161
EBL, mL	371 ± 358	369.5 ± 370	381.0 ± 248	.826
OR time, minutes	163 ± 48	163 ± 50	165 ± 35	.669
LOS, days	3.0 ± 3.2	3.2 ± 3.3	2.2 ± 2.0	.003
Postoperative Outcomes				
Discharge to SNF	86 (22.7)	82 (25.2)	4 (7.5)	**.008**
90-d ED return	35 (9.2)	31 (9.5)	4 (7.5)	.840
90-d readmission	32 (8.4)	29 (8.9)	3 (5.7)	.604
90-d ED or Readmission	41 (10.8)	37 (11.3)	4 (7.5)	.556
90-d dislocation	12 (3.2)	11 (3.4)	1 (1.9)	.880
90-d reoperation	23 (6.1)	22 (6.7)	1 (1.9)	.287
Dislocation	34 (9.0)	32 (9.8)	2 (3.8)	.254
Rerevision	50 (13.2)	48 (14.7)	2 (3.8)	**.049**
Rerevision mechanism of failure				.705
Mechanical failure	7 (14.0)	7 (14.6)	0 (0)	
Pain/Other	8 (16.0)	8 (16.7)	0 (0)	
Dislocation	17 (34.0)	16 (33.3)	1 (50.0)	
Metallosis	4 (8.0)	4 (8.3)	0 (0)	
Periprosthetic fracture	2 (4.0)	2 (4.2)	0 (0)	
Infection	6 (12.0)	6 (12.5)	0 (0)	
Wound complication	6 (12.0)	5 (10.4)	1 (50.0)	
Days revision to last FU	947 ± 1,019	1,008 ± 1,051	571 ± 684	**.001**

$P < .05$ are in bold.
Data are expressed as mean ± SD or n (%).
EBL, estimated blood loss; ED, emergency department; HCT, hematocrit; LOS, length of stay; OR, operating room; rTHA, revision total hip arthroplasty; SD, standard deviation; SNF, skilled nursing facility; THA, total hip arthroplasty; FU, follow-up.

Table 3
Multivariate Logistic Regression: Predictors of Discharge to Skilled Nursing Facility.

Predictors	Odds Ratio	95% Confidence Interval	*P* Value
Age	1.11	1.08-1.14	**<.001**
BMI	0.98	0.94-1.03	.486
Women	1.64	0.97-2.82	.069
Anterior approach	0.31	0.11-0.73	**.013**

P < .05 are in bold.
BMI, body mass index.

Table 5
Multivariate Logistic Regression: Predictors of Re-Revision.

Predictors	Odds Ratio	95% Confidence Interval	*P* Value
Age	1.00	0.97-1.02	.722
BMI	1.01	0.96-1.06	.737
Women	1.48	0.83-2.72	.193
Anterior approach	0.27	0.06-0.76	**.031**

P < .05 are in bold.
BMI, body mass index.

Discussion

Multiple studies have examined the influence of surgical approach on outcomes following primary THA [12–14]. However, similar comparisons for revision THA have only recently been published, and there is limited overlap in described outcomes [5–7]. In this study, we observed a statistical difference in discharge to SNF, LOS, and incidence of rerevision between the posterior and anterior approaches for revision THA. These results demonstrate that our findings contribute to the understanding of acetabular revision THA and can potentially be used as the basis for a future meta-analysis of acetabular revision THA approaches.

Patient demographics were largely similar between posterior and anterior approaches, and our patient demographics were consistent with other studies [6,15]. Time to revision varies widely at anywhere from 3.0 to 17.8 years in previous studies summarizing revision THA and comparing approaches for primary THA [5,6,16]. In our study, time to revision was not an outcome measure, but it was a complex variable that depended on many factors, including implant type, surgical approach, and mechanism of failure [9,16,17].

The most common reasons for revision in our patient population were mechanical failure, pain/other, dislocation, and metallosis. The mechanisms of failure preceding posterior or anterior revision THA were similarly distributed, and this was consistent with other studies on revision THAs [6,7]. Mechanical complications and loosening are often the leading reasons for revision and can comprise 38 to 51% of primary THA failures in a given patient population [6,18–20]. In contrast, other studies have cited dislocation and periprosthetic joint infection to be the predominant mechanisms of failure [15]. A notable aspect of the current study was the relatively high number of revisions for metallosis, which was the second most prevalent cause for primary THA failure, accounting for 97 cases, or 25.6% of acetabular revisions performed. While no difference in metallosis revisions as a percent of posterior or anterior approach revisions overall was observed, 79 (81%) of these cases were revised using the posterior approach. This is presumably related to the fact that the majority of these revisions (61%) were performed during the first five years of the study, prior to wider adoption of the direct anterior approach for revision THA. Given that the risks related to metal-on-metal implants were discovered more than a decade ago, leading to a substantial decrease in their use, this finding is not surprising [21].

In addition to the mechanism of failure, the approach used for the primary THA is an important factor that may influence the approach selected for performance of the acetabular revision. Unfortunately, we were unable to formally assess whether initial approach influenced the revision approach selected due to the fact that only 65% of the primary THAs revised were performed at our institution, thus limiting our ability to collect detailed data on the initial approaches used. Of the 53 direct anterior revisions included in this study, 31 had their primary THA at our institution.

Table 4
Multivariate Logistic Regression: Predictors of Dislocation.

Predictors	Odds Ratio	95% Confidence Interval	*P* Value
Age	1.03	0.99-1.06	.149
BMI	0.99	0.93-1.05	.698
Women	0.80	0.40-1.62	.535
Anterior approach	0.50	0.12-1.46	.263

P < .05 are in bold.
BMI, body mass index.

Previously, the literature estimated LOS for a revision THA at a mean of 3.1 days [6,7]. Both Wilson et al and Kurkis et al did not observe differences in LOS between posterior and anterior revision patients [6,7]. However, the posterior approach was significantly associated with increased discharge to a SNF, while the anterior approach appeared to be protective. Our observed rate of home discharge of 77.3% is within the range of 67 to 87% stated by prior studies [22–24]. However, a recent report by our institution showed the home discharge rate for our primary TJA population is 93% [25]. Thus, the SNF discharge rate in our revision THA population is more than triple that of our TJA population. As nonhome discharge is associated with higher episode-of-care charges [26], increased risk of 30- and 90-day readmissions, and adverse events [24,27], it is beneficial to direct effort to services that advocate for home discharge as a better option for patients.

In the 90-day postoperative period, 9.2% of patients returned to the ED, 8.4% were readmitted, and 10.8% experienced either of these unplanned events. While 90-day ED return is not commonly reported for revision THAs, this rate has been described to be 13% following primary THAs [28]. The rate of readmission in our population was similar to other studies, which report a 90-day readmission rate of 8% to 9% [6,7]. Any discrepancy may be due to inclusion of external readmissions; whereas, comparable studies may exclusively be recording readmissions to a single institution. Additionally, dislocation in the 90-day postoperative period was observed in 3.2% of patients, consistent with the rates of 3% to 9% stated by prior revision THA studies [6,19]. A notable finding of our study was similar dislocation rates between both approaches. This diverges from prior evaluations of dislocation rates in primary THAs, which indicate that rates tend to be lower for the anterior approach (3 to 7%) [5,15,29], than for the posterior approach (15%) [5].

Our rerevision rate of 13.2% with an average follow-up of 947 days was favorable compared to other reported rates that range from 13% to 6% at 1.5 to 3.7 years follow-up [15,17,19]. Springer et al previously stated that the 10-year survivorship for revision THAs was 82% [17], which is considerably lower than the 95 to 96% 10-year survival rate for primary THAs [1,2]. For all patients, more than half of the rerevisions were due to dislocation or instability; dislocation and mechanical failure were the first and second most common reasons for re-revision overall. Springer et al reported instability, aseptic loosening, and osteolysis or wear as the leading reasons for failure of revision THA [17]. Conversely, Jafari et al and Badarudeen et al found infection to be the most common cause of re-revision, followed by dislocation or instability [19,20]. Variation in common reasons for re-revision is to be expected, as implant types and associated mechanisms of failure will evolve from year to year.

There are multiple limitations to this study. Information was collected via retrospective review as opposed to a randomized controlled trial. Detailed chart review allowed for the collection of many potential confounding factors, such as demographics, implant history, and surgeon. Any important factors were controlled for during logistic regression to reduce bias, but the potential for unknown confounders remains. Days to follow-up may also have acted as a confounder as the use of the anterior approach for revisions at this institution has increased over the past decade. Given that patients undergoing posterior approach revisions had much longer follow up periods, it is possible that this contributed to the higher rate of rerevisions observed in this group. Also, our analysis of the distribution of early and late revisions uses the inherently subjective cutoff of 2 years from the primary surgery. While we selected this threshold in alignment with prior studies, no standard definition of "early revision" exists, as others have used cutoffs ranging from 1 to 5 years [30–33]. Despite this limitation, we suggest the two groups were sufficiently similar to conduct valid comparisons, given the fact that the distribution of early and late revisions, actual time to revision, and mechanisms of failure were similar between those revised via the posterior anterior approaches. Furthermore, given the large number of surgeons (9) included in the study, differences in surgical technique or patient management may have confounded our results. One potential confounding factor is that the majority of the anterior revisions were performed by a single high-volume surgeon, which could have an effect on procedure times and complication rates. Approximately 72% of anterior revisions were performed by the high-volume surgeon. However, there was not a significant difference in complication, reoperation, or re-revision rates between this surgeon and others, suggesting this did not significantly confound our results. A second potential surgeon-related confounder is that 4 of the 9 surgeons included performed less than 20 acetabular component revisions over the study period. Collectively, these low-volume surgeons performed 30 revisions included in the study, including only one direct anterior approach revision. However, again, no statistically significant differences in complication rates were observed between the low- and high-volume surgeons. We hypothesize that the consistent use of hospital protocols, which were used across surgeons, mitigated the potential impact of surgeon-specific practice patterns on our results. Also, although we had a small sample size of direct anterior acetabular revision THAs, we attempted to maximize our sample sizes by using a study period of nearly a decade, recognizing that outliers may have a larger impact given the smaller population. Given this limitation, negative results must be interpreted with caution, as a high probability of type 2 error exists. This is exemplified by the fact that our study only achieved 23% power to detect statistically significant differences in one of the primary endpoints of dislocation. In addition, the approach used for the primary THA is an important factor that may influence the approach selected for performance of the acetabular revision. Unfortunately, we were unable to formally assess whether initial approach influenced the revision approach selected due to the fact that only 65% of the primary THAs revised were performed at our institution, thus limiting our ability to collect detailed data on the initial approaches used. Another potential limitation is the long study period. Given the length of time covered by this study, overall trends in discharge locations or advances in implant components and surgical techniques may have changed, contributing to the results observed. Although the relatively small sample size of anterior approach revisions precluded our ability to run an adequately powered comparison of approaches at different time points, we observed no statistically significant differences in overall rates of discharge to SNF or complications when comparing the first six years of the study to the last six years, with the exception of dislocation rates, which were significantly lower from 2017 to 2022. A multicenter study or database analysis would provide larger samples of revision THAs for a meta-analysis that could further support our results. The higher rerevision rate among patients undergoing the posterior approach may be due to factors not captured by our data review, such as surgeon-specific differences or the preferential use of the potentially more extensile posterior approach for more difficult cases.

Conclusion

Overall, this study provides some evidence that the anterior approach for acetabular revision THAs may result in decreased rates of rerevision, discharges to a SNF, and shorter lengths of stay.

Surgeons should therefore select the surgical approach used for revision based on their clinical preferences and patient factors.

References

[1] Paxton EW, Cafri G, Nemes S, Lorimer M, Karrholm J, Malchau H, et al. An international comparison of THA patients, implants, techniques, and survivorship in Sweden, Australia, and the United States. Acta Orthop 2019;90:148–52.
[2] Makarewich CA, Anderson MB, Gililland JM, Pelt CE, Peters CL. Ten-year survivorship of primary total hip arthroplasty in patients 30 years of age or younger. bone Jt J 2018;100-B:867–74.
[3] Nichols CI, Vose JG. Clinical outcomes and costs within 90 Days of primary or revision total joint arthroplasty. J Arthroplasty 2016;31:1400–1406.e3.
[4] Hwang SK. Experience of complications of hip arthroplasty. Hip Pelvis 2014;26:207–13.
[5] Baba T, Homma Y, Jinnai Y, Tanabe H, Banno S, Watari T, et al. Posterior versus direct anterior approach in revision hip arthroplasty using Kerboull-type plate. SICOT J 2020;6:1–6.
[6] Kurkis GM, Chihab S, Farley KX, Anastasio AT, Bradbury TL, Guild GN. Anterior revision hip arthroplasty is associated with higher wound complications but fewer dislocations compared to posterior revision hip surgery. J Arthroplasty 2021;36:250–4.
[7] Wilson JM, Schwartz AM, Farley KX, Anastasio AT, Bradbury TL, Guild 3rd GN. Postoperative acetabular component position in revision hip arthroplasty: a comparison of the anterior and posterior approaches. Hip Int 2020;32:466–74.
[8] Horsthemke MD, Koenig C, Gosheger G, Hardes J, Hoell S. The minimalinvasive direct anterior approach in aseptic cup revision hip arthroplasty: a mid-term follow-up. Arch Orthop Trauma Surg 2019;139:121–6.
[9] Kelmer G, Stone AH, Turcotte J, King PJ. Reasons for revision: primary total hip arthroplasty mechanisms of failure. J Am Acad Orthop Surg 2021;29:78–87.
[10] Sharkey PF, Lichstein PM, Shen C, Tokarski AT, Parvizi J. Why are total knee arthroplasties failing today–has anything changed after 10 years? J Arthroplasty 2014;29:1774–8. https://doi.org/10.1016/j.arth.2013.07.024.
[11] Schroer WC, Berend KR, Lombardi AV, Barnes CL, Bolognesi MP, Berend ME, et al. Why are total knees failing today? Etiology of total knee revision in 2010 and 2011. J Arthroplasty 2013;28(8 Suppl):116–9. https://doi.org/10.1016/j.arth.2013.04.056.
[12] Higgins BT, Barlow DR, Heagerty NE, Lin TJ. Anterior vs. posterior approach for total hip arthroplasty, a systematic review and meta-analysis. J Arthroplasty 2015;30:419–34.
[13] Miller LE, Gondusky JS, Bhattacharyya S, Kamath AF, Boettner F, Wright J. Does surgical approach affect outcomes in total hip arthroplasty through 90 Days of follow-up? A systematic review with meta-analysis. J Arthroplasty 2018;33:1296–302.
[14] Wang Z, Hou JZ, Wu CH, Zhou YJ, Gu XM, Wang HH, et al. A systematic review and meta-analysis of direct anterior approach versus posterior approach in total hip arthroplasty. J Orthop Surg Res 2018;13:229.
[15] Hasler J, Flury A, Dimitriou D, Finsterwald M, Helmy N, Antoniadis A. Is revision total hip arthroplasty through the direct anterior approach feasible? Arch Orthop Trauma Surg 2020;140:1125–32.
[16] Eto S, Hwang K, Huddleston JI, Amanatullah DF, Maloney WJ, Goodman SB. The direct anterior approach is associated with early revision total hip arthroplasty. J Arthroplasty 2017;32:1001–5.
[17] Springer BD, Fehring TK, Griffin WL, Odum SM, Masonis JL. Why revision total hip arthroplasty fails. Clin Orthop Relat Res 2009;467:166–73.
[18] Mast NH, Laude F. Revision total hip arthroplasty performed through the Hueter interval. J Bone Joint Surg Am 2011;93(Suppl 2):143–8.
[19] Badarudeen S, Shu AC, Ong KL, Baykal D, Lau E, Malkani AL. Complications after revision total hip arthroplasty in the medicare population. J Arthroplasty 2017;32:1954–8.
[20] Jafari SM, Coyle C, Mortazavi SM, Sharkey PF, Parvizi J. Revision hip arthroplasty: infection is the most common cause of failure. Clin Orthop Relat Res 2010;468:2046–51.

[21] Silverman EJ, Ashley B, Sheth NP. Metal-on-metal total hip arthroplasty: is there still a role in 2016? Curr Rev Musculoskelet Med 2016;9:93–6.
[22] Ponzio DY, Poultsides LA, Salvatore A, Lee YY, Memtsoudis SG, Alexiades MM. In-hospital morbidity and postoperative revisions after direct anterior vs posterior total hip arthroplasty. J Arthroplasty 2018;33:1421–1425.e1.
[23] Graves SC, Dropkin BM, Keeney BJ, Lurie JD, Tomek IM. Does surgical approach affect patient-reported function after primary THA? Clin Orthop Relat Res 2016;474:971–81.
[24] Bini SA, Fithian DC, Paxton LW, Khatod MX, Inacio MC, Namba RS. Does discharge disposition after primary total joint arthroplasty affect readmission rates? J Arthroplasty 2010;25:114–7.
[25] Kelmer GC, Turcotte JJ, Dolle SS, Angeles JD, MacDonald JH, King PJ. Preoperative education for total joint arthroplasty: does reimbursement reduction threaten improved outcomes? J Arthroplasty 2021;36:2651–7.
[26] Sabeh KG, Rosas S, Buller LT, Roche MW, Hernandez VH. The impact of discharge disposition on episode-of-care reimbursement after primary total hip arthroplasty. J Arthroplasty 2017;32:2969–73.
[27] Keswani A, Tasi MC, Fields A, Lovy AJ, Moucha CS, Bozic KJ. Discharge destination after total joint arthroplasty: an analysis of postdischarge outcomes, placement risk factors, and recent trends. J Arthroplasty 2016;31:1155–62.
[28] Kelly MP, Prentice HA, Wang W, Fasig BH, Sheth DS, Paxton EW. Reasons for ninety-day emergency visits and readmissions after elective total joint arthroplasty: results from a US integrated healthcare system. J Arthroplasty 2018;33:2075–81.
[29] Cogan A, Klouche S, Mamoudy P, Sariali E. Total hip arthroplasty dislocation rate following isolated cup revision using Hueter's direct anterior approach on a fracture table. Orthop Traumatol Surg Res 2011;97:501–5.
[30] Angerame MR, Fehring TK, Masonis JL, Mason JB, Odum SM, Springer BD. Early failure of primary total hip arthroplasty: is surgical approach a risk factor? J Arthroplasty 2018;33:1780–5. https://doi.org/10.1016/j.arth.2018.01.014.
[31] Burke NG, Gibbons JP, Cassar-Gheiti AJ, Walsh FM, Cashman JP. Total hip replacement-the cause of failure in patients under 50 years old? Ir J Med Sci 2019;188:879–83. https://doi.org/10.1007/s11845-018-01956-8.
[32] Dobzyniak M, Fehring TK, Odum S. Early failure in total hip arthroplasty. Clin Orthop Relat Res 2006;447:76–8. https://doi.org/10.1097/01.blo.0000203484.90711.52.
[33] Bozic KJ, Lau E, Ong K, Chan V, Kurtz S, Vail TP, et al. Risk factors for early revision after primary total hip arthroplasty in Medicare patients. Clin Orthop Relat Res 2014;472:449–54. https://doi.org/10.1007/s11999-013-3081-9.