

Original research

Outcomes of Total Hip Arthroplasty Via the Direct Anterior vs Alternative Approaches for Acute Femoral Neck Fractures

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ABSTRACT

Background: Total hip arthroplasty (THA) performed for displaced femoral neck fractures (FNF) is becoming a more frequent treatment in the active elderly population. The complication profiles associated with THA surgical approaches in the fracture setting are unclear. The purpose of this study was to compare a series of THA for FNF performed via the direct anterior (DA) approach vs alternative approaches (anterolateral and posterolateral).

Methods: A retrospective review identified 52 patients who underwent primary THA for FNF between 2009 and 2018, including 20 via the DA approach and 32 by alternative approaches. All procedures were exclusively performed by high-volume arthroplasty surgeons. Perioperative results, complications, and clinical outcomes were compared with those of routine statistical methods. Mean follow-up duration was 3 years (range, 1–8).

Results: The average age was 74 years (range, 57–92) with similar baseline characteristics between the 2 groups ($P = .09$). The DA cohort demonstrated significantly shorter length of stay (3 days vs 5 days, $P < .01$) and discharge to home vs skilled nursing facility (40.0% vs 9.4% $P = .014$). There was a trend toward decreased complications (0% vs 16%, $P = .08$). There were no dislocations or fractures in either cohort. Final Harris Hip Scores (94 vs 81, $P = .07$) and return to community ambulation (96%) were similar between DA and alternative approach groups.

Conclusion: The DA approach to THA performed for FNF appears safe with improved outcomes compared with alternative approaches. Larger studies are needed to verify these results.

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Introduction

Femoral neck fractures (FNFs) are a common orthopedic injury which can result in significant morbidity and mortality. With the increasing age of our population, the number of hip fractures is expected to continue to rise [1,2]. There are a variety of methods for surgical treatment of acute FNFs, including internal fixation and partial or total hip arthroplasty (THA) [3]. Owing to the high rate of nonunion encountered with internal fixation, estimated to be approximately 33%, arthroplasty is becoming a more frequently selected treatment [4,5]. In 2013 alone, nearly a 40% increase in utilization of THA for FNFs was seen compared to the previous decade [6,7].

The reason for the increased use of THA is thought to be partially due to decreased complication rates and possible economic advantages compared with the alternative options. Recent studies indicate lower rates of failure, revision, mortality, and hospital length of stay. These same reports also demonstrate superior clinical and functional outcomes with THA compared with hemiarthroplasty [5–8].

Despite the growing support for the use of THA in the management of acute FNFs, concerns regarding potential increased blood loss, surgical duration, and dislocation risks remain [4,6,9]. It has been recommended by some to avoid certain approaches or use technology such as dual mobility components to reduce the risk of dislocation after THA for a FNF [10]. Many of these prior studies, however, have not evaluated the complication profile of THA for FNFs based on surgical approach. The purpose of this study was to compare perioperative results, complications, and clinical outcomes in a series of THAs performed for acute FNFs via the direct anterior (DA) approach vs alternative approaches (anterolateral and

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posterolateral) when the procedure was performed by high-volume joint surgeons. Our hypothesis was that DA THAs performed for FNFs would have fewer complications and superior clinical outcomes than alternative approaches.

Material and methods

After obtaining institutional review board approval, a retrospective review of THAs was performed for acute FNFs at our hospital between 2009 and 2018. All data were obtained via chart review including baseline patient characteristics and demographics, perioperative course, complications requiring readmissions and reoperations, and final clinical follow-up with Harris Hip Scores (HHS).

A total of 52 consecutive patients who had at least 1 year of follow-up were identified; 20 of whom underwent a DA approach compared with 32 (7 anterolateral and 25 posterolateral) by alternative approaches (Fig. 1). The average age was 74 years (range, 57–92) with similar baseline demographic data and operative characteristics between the 2 groups (Table 1). There was no statistically significant difference noted in age, sex, laterality, fracture type, BMI, preoperative ambulatory status, or American Society of Anesthesiologists classification (all $P \geq .087$). Length of follow-up was noted to be shorter in the DA cohort than that in the alternative approach group (median: 2.4 vs 3.0 years, $P = .047$). All surgeries were performed by high-volume subspecialty total joint surgeons (>100 procedures per year) or the arthroplasty fellow. Surgical approach was based on surgeon preference, with all approaches performed by multiple surgeons through the study period. Postoperative protocols were the same between groups, with the exception of posterior hip precautions included for the posterolateral approach group.

Statistical methods

For comparison, the anterolateral and posterolateral approaches were combined into one group of 32 patients, classified as the alternative approach group. Continuous variables were summarized with the sample median and range. Categorical variables were summarized with number and percentage. Comparisons of baseline characteristics and follow-up length between the DA and alternative approach groups were made using a Wilcoxon rank sum test (continuous and ordinal variables) or Fisher's exact test (categorical variables). Comparisons of postoperative outcomes between the DA and alternative approach groups were made using a log-rank test (complication, reoperation, dislocation), a linear regression model that was adjusted for follow-up length (HHS), a Wilcoxon rank sum

Table 1
Demographic and operative characteristics.

Variable	Direct anterior approach (N = 20)	Anterolateral or posterior approach (N = 32)	P value
Age at surgery (y)	75.2 (58.1, 92.9)	76.7 (58.2, 91.9)	.93
Sex (male)	7 (35.0%)	9 (28.1%)	.76
Laterality (right)	13 (65.0%)	12 (37.5%)	.087
Fracture type			1.00
Basicervical	2 (10.0%)	3 (9.4%)	
Subcapital	8 (40.0%)	14 (43.8%)	
Transcervical	10 (50.0%)	15 (46.9%)	
BMI	25.9 (16.2, 35.5)	25.6 (18.1, 37.1)	.72
Preoperative ambulation status			1.00
Community ambulator	20 (100.0%)	31 (96.9%)	
Household ambulator	0 (0.0%)	1 (3.1%)	
ASA classification			.25
2	7 (35.0%)	7 (21.9%)	
3	13 (65.0%)	24 (75.0%)	
4	0 (0.0%)	1 (3.1%)	
Cement or pressfit			.28
Cement	0 (0.0%)	3 (9.4%)	
Pressfit	20 (100.0%)	29 (90.6%)	
Arthroplasty specialist			.21
Staff surgeon	13 (65.0%)	26 (81.3%)	
Fellow	7 (35.0%)	6 (18.8%)	
Length of follow-up (y)	2.4 (1.1, 4.5)	3.0 (1.0, 7.9)	.047

The sample median (minimum, maximum) is given for continuous variables. *P* values result from a Wilcoxon rank sum test (continuous and ordinal variables) or Fisher's exact test (categorical variables).

ASA, American Society of Anesthesiologists; BMI, body mass index. Bold indicates a statistical significance ($P < .05$).

test (hospital length of stay), or Fisher's exact test (discharge destination, postoperative ambulation status, and worsening of ambulation status from preoperative to postoperative time). *P* values <0.05 were considered as statistically significant, and all statistical tests were two-sided. Statistical analyses were performed using the R Statistical Software (version 3.6.2; R Foundation for Statistical Computing, Vienna, Austria).

Results

Postoperative outcomes were compared between the DA and alternative approach cohorts, delineated in Table 2. Compared with the alternative approach group, patients undergoing DA THA had a

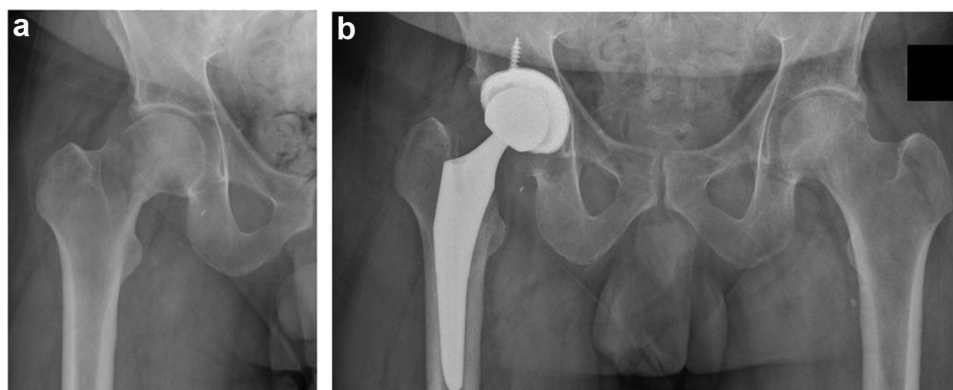


Figure 1. Anteroposterior radiographs demonstrating an acute femoral neck fracture (a), treated with a total hip arthroplasty (b).

Table 2
Comparison of postoperative outcomes between direct anterior and anterolateral/posterior surgical approaches.

Postoperative outcome	Direct anterior approach (N = 20)	Anterolateral or posterior approach (N = 32)	P value
Complication	0 (0.0%)	5 (15.6%)	.089
Reoperation	0 (0.0%)	2 (6.3%)	.30
Dislocation	0 (0.0%)	0 (0.0%)	1.00
Harris Hip Score	94 (62, 100)	81 (44, 100)	.072
Hospital length of stay (d)	3 (2, 10)	5 (2, 8)	.001
Discharge destination			.014
Home	8 (40.0%)	3 (9.4%)	
Skilled nursing facility	12 (60.0%)	29 (90.6%)	
Postoperative ambulation status			.52
Community ambulator	20 (100.0%)	30 (93.8%)	
Household ambulator	0 (0.0%)	2 (6.3%)	
Worsening of ambulation status from preoperative to postoperative	0 (0.0%)	1 (3.1%)	1.00

The sample median (minimum, maximum) is given for continuous variables. P values result from a log-rank test (complication, reoperation, dislocation), a linear regression model that was adjusted for follow-up length (Harris Hip Score), a Wilcoxon rank sum test (hospital length of stay), or Fisher's exact test (discharge destination, postoperative ambulation status, and worsening of ambulation status from preoperative to postoperative). Bold indicates a statistical significance ($P < .05$).

significantly shorter hospital length of stay (median: 3 vs 5 days, $P = .001$). In addition, patients undergoing DA THA were more frequently discharged home rather than a skilled nursing facility (40.0% vs 9.4%, $P = .014$).

Overall, complications requiring a readmission or reoperation occurred less often in patients undergoing DA THA; however, this did not reach statistical significance (0.0% vs 15.6%, $P = .089$). Complications in the alternative approach group included a distal femur fracture (1), acute postoperative infection requiring irrigation and debridement (1), acetabular component loosening (1), postoperative hematoma (1), and mechanically assisted crevice corrosion and adverse local tissue reaction (1). There were no notable differences in reoperation or dislocation rates or ambulation status between the 2 surgical approach groups (all $P \geq .30$).

There was no difference in HHS between the DA THA group compared with the alternative approach group in linear regression analysis adjusting for length of follow-up (median: 94 vs 81, $P = .072$). At final follow-up, 96% of patients were community ambulators with no significant difference between cohorts ($P = .52$).

Discussion

With a growing population of independent and active elderly in the United States, there is a commensurate increase in the incidence of FNFs and heightened focus on best treatment options—internal fixation vs arthroplasty. Historically there has been a high rate of reported complications, including a 10% dislocation rate, when THA has been performed in the setting of an acute FNF [11]. This high complication rate has previously directed surgeons away from total joint arthroplasty, instead preferring internal fixation or hemiarthroplasty as the treatment of choice. More recent data, however, have demonstrated up to a 33% rate of nonunion and 35% rate of reoperation in patients who undergo internal fixation [12]. Similarly, there is a concern for acetabular wear and erosion with hemiarthroplasty [13,14]. Owing to these limitations, there is an increasing body of literature that supports THA as the preferred treatment for FNFs. These studies report superior clinical outcomes as well as economic advantages related to a lower reoperation rate [4,6,8,15–17].

Early rehabilitation and mobilization are critical considerations in the management of acute FNFs. The DA approach has been reported to have improved early rehabilitation when compared with alternate approaches [17,26]. In our study, we found a significantly reduced hospital length of stay in the patients that underwent THA via the DA approach vs the anterolateral or posterolateral

approaches. In addition, a significantly larger proportion of these patients were discharged to their home rather than to a skilled nursing facility than in the alternative approach group. These findings were in spite of a similar baseline ambulatory status and American Society of Anesthesiologists classification between groups. Although beyond the scope of this study, improved rehabilitation and less utilization of extended care facilities could potentially have a significant cost-saving on health-care expenditures related to acute FNF treatment.

Owing to the perceived higher dislocation rate after THA, authors have previously recommended against performing the procedure through a posterolateral surgical approach and encouraged the use of dual mobility implants in an effort to decrease the risk of postoperative dislocations [18]. A limitation from these early studies was that the procedures were not always performed by surgeons who specialize in total joint arthroplasty. Recent studies have demonstrated improved outcomes when procedures were completed at high-volume arthroplasty centers [19,20]. In the present study, which included THAs only performed by high-volume arthroplasty, we noted an overall low complication rate independent of approach used. No patient suffered a postoperative dislocation in either cohort. In contrast to other studies, we did not find a statistically significant difference in complication rates between the anterior and alternative approaches [21,22]. Notably, we did not encounter previously described complications with the anterior approach, such as intraoperative fractures, which was likely a result of the surgeon experience with the approach [23–25].

Late clinical outcomes were similar between cohorts, with no statistical difference in ambulatory status between groups. Importantly, 96% of patients remained community ambulators at final follow-up. The DA approach had a higher HHS (94 vs 81), but the difference was neither statistically significant ($P = .072$) nor clinically meaningful (<16 points) [27].

There are several limitations to this study, including all the limitations inherent to a retrospective review study design. In addition, this was performed at an institution which does not have a high trauma volume, thereby limiting the sample size. Owing to the low numbers, the possibility of a type II error (ie, a false-negative finding) is important to consider; we cannot conclude that there is no true difference in a given outcome between the DA and alternative approach groups simply because of the presence of a nonsignificant P value. We did not include complications that did not require readmission or reoperation, so we are likely underestimating overall complications in both cohorts. Finally, the procedures were performed by arthroplasty surgeons who routinely

perform THA through the various approaches studied. Selection bias for approach based on surgeon comfort is a concern. As such, these results may not be generalizable.

Conclusions

The DA approach to THA performed for acute FNF appears safe with improved outcomes, including shorter hospital length of stay and increased discharge to home, when compared with alternative approaches to the hip. Larger studies are needed to verify these results.

Conflict of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

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