Comparison Between the Direct Anterior and Posterior Approaches for Total Hip Arthroplasty Performed for Femoral Neck Fracture

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Objectives: To compare 90-day and 1-year outcomes, including mortality, of femoral neck fracture patients undergoing total hip arthroplasty (THA) by direct anterior approach (DAA) versus posterior approach (PA).

Design: Retrospective cohort.

Setting: Level I Trauma Center.

Patients: One hundred forty-three consecutive intracapsular femoral neck fractures treated with THA from 2010 to 2018. The minimum follow-up was 12 months, and the average follow-up was 14.6 months (12–72 months).

Main Outcome Measures: Postoperative outcomes, including discharge ambulation, dislocation, periprosthetic joint infection, revision THA, and mortality at 90 days and 1 year after THA.

Results: Of the 143 THA included, 44 (30.7%) were performed by DAA while 99 (69.3%) were performed by PA. In-hospital outcomes were similar between the cohorts. Compared with DAA patients, PA patients were more likely to ambulate without assistance preinjury (88.9% vs. 72.7%, $P = 0.025$) and be nonambulatory at the time of discharge (27.3% vs. 11.4%, $P = 0.049$). There were no significant differences in 90-day and 1-year postoperative outcomes between the DAA and PA groups, including dislocation, periprosthetic joint infection, periprosthetic fracture, mechanical complications, and revision surgery. Although there was no difference in mortality rate at 90 days, at 1-year follow-up the mortality rate was lower in the DAA group (0% vs. 11.1%, $P = 0.018$).

Conclusions: Performing THA by DAA provides similar benefits in regards to medical and surgical outcomes compared with the PA for displaced femoral neck fracture. However, the DAA may lead to decreased 1-year mortality rates, possibly, because of improved early ambulation capacity that is an important predictor of long-term mortality.

Key Words: femoral neck fracture, total hip arthroplasty, approach, direct anterior, posterior, mortality

Level of Evidence: Therapeutic Level III. See Instructions for Authors for a complete description of levels of evidence.

(*J Orthop Trauma* 2021;35:41–48)

Accepted for publication May 29, 2020.

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The authors report no conflict of interest.

Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site (www.jorthotrauma.com).

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DOI: 10.1097/BOT.0000000000001883

INTRODUCTION

Femoral neck fractures are associated with significant morbidity, mortality, and health care costs, with increasing prevalence as the population ages.[1] Over the past 30 years, despite improvements in medical management and advances in surgical technique, the 1-year mortality rates in hip fracture patients remain largely unchanged at 20%–30%.[2] Currently, 15% of all total hip arthroplasty (THA) procedures are performed for nonelective diagnoses, including displaced femoral neck fracture.[3]

Many studies have recently compared perioperative and short-term postoperative outcomes of THA performed electively for osteoarthritis according to surgical approaches, including direct anterior approach (DAA), posterior approach (PA), and direct lateral approach (LA).[4–8] Perceived benefits of the DAA include muscle-sparing technique with less soft tissue trauma, reduced dislocation rates, and early functional recovery. Although the results of comparative studies between DAA and PA have been mixed, most studies, including a recent systematic review and meta-analysis,[5] show no difference in revision rate, length of stay, dislocation rate, or infection rate.[4,6,9–12] However, the DAA is associated with greater pain relief and functional recovery in the early postoperative phase (2 weeks) compared with the PA[12–15] and higher patient-reported outcome measures for functional recovery at 2 weeks compared with LA.[8] That said, these early postoperative advantages disappear at 3 months and 1 year after surgery.[12,14]

The optimal approach for patients undergoing elective THA remains a topic of controversy. However, no studies to date have compared the different surgical approaches for patients undergoing THA for femoral neck fractures. Given the high mortality rate and significant morbidity in this patient population, optimizing every aspect of management may have a significant impact. Previous studies demonstrate a strong ability of hip fracture patient's early postoperative ambulation capacity in predicting 1-year survivorship.[16–19] We hypothesize that the DAA, with slightly improved functional outcomes early after surgery,[20] may impart greater benefits in improving outcomes and decreasing mortality rates for femoral neck fracture patients undergoing THA compared with their PA counterparts. The purpose of this study, therefore, was to compare 90-day and 1-year outcomes and mortality between the DAA and PA in patients undergoing THA for femoral neck fracture.

PATIENTS AND METHODS

After receiving institutional review board approval, we conducted a retrospective review at our institution, a tertiary care referral center. All patients undergoing primary THA from January 2010 to May 2018 were identified using the *Current Procedural Terminology (CPT)* code (27130). Patients with a primary diagnosis of fracture were included in the initial cohort, whereas all other primary diagnoses (osteoarthritis, rheumatoid arthritis, pathologic fracture, collapse of the femoral head secondary to avascular necrosis, femoral head fracture, intertrochanteric fracture, subtrochanteric fracture, etc) were excluded from the study. In addition, concurrent bilateral femoral neck fractures and baseline nonambulatory patients were excluded from the study. Only those patients with an intracapsular femoral neck fracture were included, resulting in 172 hips from 169 patients. An additional 29 polytrauma patients were excluded for having concomitant acetabular fracture or life-threatening brain injury, which may confound the outcomes. The final cohort consisted of 143 consecutive hips (140 patients) undergoing primary THA performed by 10 different trauma-trained[2] or arthroplasty-trained[8] surgeons. The trauma surgeons performed 10 THAs by the PA; there were no 1-year mortalities in these 10 patients. Three patients had contralateral THA for femoral neck fractures in which the injuries occurred at separate times, with a minimum of 8 months between injuries.

Patient Characteristics and Definitions

Patient and injury characteristics, comorbidities, and operative variables were obtained by a medical record review (Tables 1 and 2). Fractures were classified according to initial injury radiographs using both the Garden and Pauwels classification systems.[21] Injury energy was defined as low energy being a fall from standing (FFS) or fall from less than 5 feet of height, whereas all other injury mechanisms were considered high energy [motor vehicle crash (MVC), fall from greater than 5 feet, pedestrian vs. car, etc.]. Outcomes of interest were recorded by a chart review, including dislocation, periprosthetic joint infection (PJI), implant loosening, periprosthetic fracture, revision THA rates for any reason, and mortality. PJI was defined using the Musculoskeletal Infection Society criteria.[22] External medical records attached to patient charts were reviewed for dislocations and other complications treated at outside facilities. Online obituary searches performed on every patient in the study were used to identify any mortality not recorded in the medical records.

TABLE 1. Patient Characteristics and Comorbid Conditions of Femoral Neck Fractures Treated by Total Hip Arthroplasty

Characteristics	Total	DAA	PA	*P*
Patients*	143	44 (31)	99 (69)	NA
Females*	80 (55.9)	28 (63.6)	52 (52.5)	0.274
Age, mean (y)	66 (24–89)	66 (24–86)	66 (25–89)	0.920
BMI, mean (kg/m^2)	25.5 (14.2–59.1)	25.2 (17.9–36.7)	25.6 (14.2–59.1)	0.992
Side of injury (R)*	78 (55)	22 (50)	56 (57)	0.474
Comorbidities*				
DM	35 (24.5)	12 (27.3)	23 (23.2)	0.675
Tobacco use	59 (41.3)	17 (38.6)	42 (42.9)	0.714
HTN	77 (53.8)	23 (52.3)	54 (55.1)	0.856
Parkinson	3 (2.1)	1 (2.3)	2 (2.0)	1.00
Hypothyroid	25 (17.5)	8 (18.2)	17 (17.4)	1.00
PVD	3 (2.1)	0 (0.0)	3 (3.0)	0.553
CKD/ESRD	18 (12.6)	7 (15.9)	11 (11.2)	0.428
Liver disease	4 (2.8)	1 (2.3)	3 (3.1)	1.00
CVA/stroke	5 (3.5)	2 (4.6)	3 (3.1)	0.645
Dementia	4 (2.8)	2 (4.6)	2 (2.0)	0.587
HIV	0	0	0	NA
Renal transplant	1 (0.7)	0 (0.0)	1 (1.6)	1.00
Hepatitis C	23 (16.1)	8 (18.2)	15 (15.3)	0.806
MI	5 (3.5)	1 (2.3)	4 (4.1)	1.00
COPD	23 (16.0)	4 (9.1)	19 (19.2)	0.143

*Values given as total number and (%).

BMI, body mass index; HTN, hypertension; DM, diabetes mellitus; PVD, peripheral vascular disease; CKD/ESRD, chronic kidney disease/end-stage renal disease; CVA, cerebrovascular accident; MI, previous myocardial infarction; COPD, chronic obstructive pulmonary disease.

Surgical Technique and Perioperative Protocols

Patients were allocated to each surgical approach group depending on the call schedule and the comfort level of each individual surgeon with performing THA. The surgical approach used by the surgeon was determined by surgeon comfort and training with the technique. On-call nonarthroplasty fellowship-trained surgeons uncomfortable with performing THA are not obliged to do the case and may transfer care to an arthroplasty-trained surgeon. The standard DAA and PA were used for this study, creating the 2 cohorts of interest. All DAA surgeries were performed by surgeons who do at least 50 total THAs with the DAA each year and having satisfied their "learning curve."[23] The external rotators and capsule were repaired in 93% of the PA cases, with the remaining 7% having traumatic capsule tears that were not repairable. No capsular repair was performed during DAA.

Perioperative and postoperative institutional protocols were adhered to with minor variations depending on surgeon preference. Perioperative details were obtained by a chart review and compared between the 2 cohorts to ensure they were homogenous (Table 3). The cohorts were similar in implant details, use of tranexamic acid (TXA), type of perioperative antibiotic used, anesthesia (general vs. spinal), use of drains, wound lavage/prophylaxis before closure, and postoperative pain control methods (Table 3). All patients received perioperative antibiotics within 1 hour of incision. The PA cohort had a significantly increased rate of abduction pillow use (46.5% vs. 6.8%, $P < 0.0001$) and postoperative hip precautions (96% vs. 25%, $P < 0.0001$). Patients were deemed fit for discharge when they were medically maximized and had reached the goals of physical therapy. Ambulation status and distance walked at the time of discharge were recorded from the last inpatient physical therapy note before hospital discharge, with nonambulatory patients being wheelchair bound and those ambulating with assistance requiring a rolling walker.

Patients were seen in the institution's orthopaedic clinics as part of routine postoperative follow-up during scheduled time frames or in consult in the emergency department or during hospital readmission for complications in which radiographs and/or physical examination were performed. All patients included in the study had a minimum of 1-year follow-up unless they died before reaching the 1-year mark. The mean follow-up time was 14.6 months for the DAA cohort (12–47) and 14.4 months for the PA cohort (12–72) ($P = 0.503$).

Statistical Analysis

Patient characteristics, injury characteristics, operative details, and outcomes between the DAA and PA groups were compared using Fisher exact and χ^2 tests for categorical variables and *t* tests for continuous variables. In addition, the 1-year mortality was compared between nonambulatory and ambulatory with assistance patients at discharge. *P* values of less than 0.05 were considered statistically significant.

TABLE 2. Injury Characteristics of Femoral Neck Fractures Treated by Total Hip Arthroplasty

Variable*	Total (n = 143)	DAA (n = 44)	PA (n = 99)	*P*
Fracture pattern				0.841
Femoral neck				
Garden II	6 (4.2)	2 (4.5)	4 (4.1)	
Garden III	35 (24.5)	12 (27.3)	23 (23.2)	
Garden IV	102 (71.3)	30 (68.2)	72 (72.7)	
Fracture classification				
Pauwels I	9 (6.2)	3 (6.8)	6 (6.1)	0.959
Pauwels II	68 (47.6)	20 (45.5)	48 (48.5)	
Pauwels III	66 (46.2)	21 (47.7)	45 (45.5)	
Displaced fracture	137 (95.8)	42 (95.5)	95 (95.9)	0.643
Mechanism of injury				0.018
MVC	25 (17.5)	2 (4.5)	21 (21.2)	
FFS	106 (74.1)	39 (88.6)	70 (70.7)	
FFH	6 (4.2)	3 (6.8)	3 (3.0)	
Others	6 (4.2)	0 (0)	5 (5.1)	
Injury energy (% low)	109 (76.2)	39 (88.6)	70 (70.7)	0.070
Injury severity score, mean (SD)	10.6 (4.6)	10.4 (4.4)	10.7 (4.9)	0.509
Baseline walking capacity (preinjury)				0.025
Unassisted	120 (83.9%)	32 (72.7%)	88 (88.9%)	
Assisted	23 (16.1%)	12 (27.3%)	11 (11.1%)	
Time-to-surgery, median, hours (IQR)	22 (13.8–44)	20 (16–34)	20 (13–45.8)	1.00

*Values given as total number and (%) unless otherwise noted.
FFH, fall from height; IQR, interquartile range (upper and lower quartiles).

RESULTS

Patient Characteristics and Comorbidities

The study cohort included 143 THAs (80 women and 63 men), with an average age of 65.7 years (range 24–89 years). The median time between initial assessment in the emergency department and THA (time-to-surgery) was 22 hours (interquartile range 13–48.5 hours). Six total patients (3 DAA and 3 PA) had chronic fractures and were ambulating using an assist device with a mean time-to-surgery of 279 hours (range 208–415 hours). Of these patients, 44 THAs (30.7%) were performed by DAA while 99 THAs were performed using PA (69.3%). There was no significant difference between the 2 cohorts in any of the comorbidities recorded (Table 1).

In addition, the fracture patterns by both the Garden classification ($P = 0.841$) and the Pauwels classification (0.959) were similar between the approach groups (Table 2). Both surgical approach groups had similar proportions of low-energy mechanism of injury (70.7% PA vs. 88.6% DAA, $P = 0.070$). Accordingly, PA patients were more likely to have been involved in an MVC (22.2% vs. 6.8%, $P = 0.018$) compared with DAA patients. However, the injury severity score (ISS) and the median time-to-surgery from admission were similar between the 2 groups (Table 2). There were no mortalities within 1-year postoperatively in the MVC group. The PA patients were more likely to ambulate without assistance at baseline before sustaining femoral neck fracture compared with the DAA patients (88.9% vs. 72.7%, $P = 0.025$).

Perioperative Characteristics and In-Hospital Outcomes

For patients undergoing THA by the DAA, the mean operative duration was 11 minutes shorter, whereas estimated blood loss and intraoperative blood transfusion were similar (Table 3). There was no difference between DAA and PA in any of the in-hospital complications studied or discharge disposition (Table 4). There was no difference between the 2 groups in the median length of stay (4.9 days for DAA vs. 5.5 days for PA, $P = 0.050$), with both approaches having a median postoperative length of stay of 4 days ($P = 1.00$). Patients having THA by the PA were more likely to be nonambulatory (wheelchair bound) at the time of discharge compared with the DAA (27.3% vs. 11.4%, $P = 0.049$). Of the patients that were ambulating, there was no difference between the 2 approaches in ambulation distance before discharge (Table 4).

TABLE 3. Perioperative Characteristics for Patients Undergoing THA for Femoral Neck Fracture

Variable*	Total (n = 143)	DAA (n = 44)	PA (n = 99)	*P*
ASA score, mean	2.94 (2–4)	2.98 (2–4)	2.93 (2–4)	0.586
Operative duration, mean, minutes	94 (41–382)	86 (41–245)	97 (45–372)	0.019
EBL, mean, mL	372 (50–1650)	376 (50–1650)	371 (100–1200)	0.463
Capsular repair	92 (64.3)	0 (0)	92 (92.9)	<0.0001
Implant details				0.553
Uncemented	140 (97.9)	44 (100)	96 (97.0)	
Perioperative antibiotics				0.573
Cefazolin	127 (88.8)	40 (90.9)	87 (87.9)	
Clindamycin	8 (8.1)	3 (6.8)	5 (5.0)	
Vancomycin or ceftriaxone	8 (8.1)	1 (2.3)	7 (7.1)	
TXA use	82 (57.3)	24 (54.5)	58 (58.6)	0.672
Anesthesia type (general)	135 (94.4)	39 (88.6)	96 (97.0)	0.059
Intraoperative blood transfusion (% yes), mean units pRBCs	22 (15.4)	7 (15.9), 1.3u	15 (15.2), 1.9u	1.00
Hemovac drain use	85 (59.4)	24 (54.5)	61 (61.6)	0.878
Wound lavage before closure				0.095
Normal saline	109 (76.2)	37 (84.1)	72 (72.7)	
Povidone-iodine	25 (17.5)	7 (15.9)	18 (18.2)	
Vancomycin powder	9 (6.3)	0 (0)	9 (9.1)	
Postoperative variables				
Abduction pillow	49 (34.3)	3 (6.8)	46 (46.5)	<0.0001
Hip precautions	106 (74.1)	11 (25.0)	95 (96.0)	<0.0001
WBS, (% WBAT)	125 (87.4)	39 (88.6)	86 (86.9)	1.00
Postoperative pain control				0.340
PCA	94 (65.7)	26 (59.1)	68 (68.7)	
Oral	49 (34.3)	18 (40.9)	31 (31.3)	

*Values given as total number and (%) unless otherwise noted.

ASA, American Society of Anesthesiologists; EBL, estimated blood loss; pRBC, packed red blood cells; WBS, weight bear-status; WBAT, weight-bearing as tolerated; PCA, patient-controlled analgesia.

TABLE 4. Acute Postoperative Outcomes of Femoral Neck Fractures Treated by Total Hip Arthroplasty

Outcome*	Total (n = 143)	DAA (n = 44)	PA (n = 99)	P
Altered mental status/delirium	15 (10.5)	6 (13.6)	9 (9.2)	0.555
ARF	9 (6.3)	1 (2.3)	8 (8.1)	0.275
DVT	0	0	0	NA
PE	4 (2.8)	1 (2.3)	3 (3.0)	1.00
MI	4 (2.8)	1 (2.3)	3 (3.0)	1.00
ARDS	3 (2.1)	1 (2.3)	2 (2.0)	1.00
CVA/stroke	0	0	0	NA
Total hospital blood transfusion, n (% yes), mean units pRBCs	39 (27.3), 3.1u	12 (27.3), 3.3u	27 (27.3), 3.0u	0.768
ICU stay	23 (16.1)	6 (13.6)	17 (17.2)	0.238
ICU days†	6.2 (1–25)	3.5 (2–7)	7.1 (1–25)	
LOS, d‡	5.3 (2–36)	4.9 (2–12)	5.5 (2–36)	0.050
LOS after surgery, d‡	4.0 (1–11)	4.0 (1–5)	4.0 (2–11)	1.00
Ambulation at discharge				0.049
Ambulatory	111 (77.6)	39 (88.6)	72 (72.7)	
Nonambulatory	32 (22.4)	5 (11.4)	27 (27.3)	
Discharge ambulation distance (feet)†	95.4 (5–474)	97.6 (5–320)	94.0 (5–474)	0.676
Discharge disposition				
Home	76 (53.1)	28 (63.6)	48 (49.5)	0.255
SNF	29 (20.3)	6 (13.6)	23 (23.7)	
IPR	36 (25.2)	10 (22.7)	26 (26.8)	

*All values given as total number and (%) unless otherwise noted.
†Values given as mean and (range).
‡Values given as median and (interquartile range).
ARF, acute renal failure; ARDS, acute respiratory distress syndrome; CVA, cerebrovascular accident; DVT, deep venous thrombosis; ICU, intensive care unit; IPR, inpatient rehabilitation; LOS, length of stay; MI, acute myocardial infarction; PE, pulmonary embolus; pRBC, packed red blood cells; SNF, skilled nursing facility.

Ninety-Day and 1-Year Outcomes

There were no significant differences in 90-day outcomes between the DAA and the PA for femoral neck fracture patients in this cohort, including dislocation, revision THA for loosening, PJI, periprosthetic fracture, revision THA for any reason, and mortality (Table 5). Similar trends were seen in 1-year outcomes (Table 5). There was no difference in heterotopic ossification formation or leg length discrepancy requiring heel lifts (see **Table**, **Supplemental Digital Content 1**, http://links.lww.com/JOT/B126). The DAA group had a higher risk of lateral femoral cutaneous nerve (LFCN) paresthesia (9.1% vs. 1.0%, $P = 0.031$) that completely resolved at 1 year in all affected patients. However, the PA group had significantly increased 1-year mortality compared with the DAA (11.1% vs. 0%, $P = 0.018$). At 1 year, there were 0 deaths in the DAA group and 11 deaths in the PA group. In addition, patients who were nonambulatory at discharge had increased rates of 1-year mortality compared with those who were ambulating with assistance (22% vs. 4%, $P = 0.0026$), regardless of surgical approach, although all 11 mortalities did occur in the PA cohort.

Given the discrepancy between the PA and DAA groups with respect to injury mechanism energy (70.7% vs. 88.6%, $P = 0.070$) and associated rate of MVC (21.2% vs. 4.5%, $P = 0.018$), a subanalysis was performed limiting the patient population to only those with low-energy injury mechanism (FFS). This analysis confirmed the results of the overall cohort, with the PA group (n = 70) having an increased risk of 1-year mortality compared with the DAA group (n = 39), 12.9% versus 0% ($P = 0.025$). Similarly, the PA group had an increased risk of 90-day mortality compared with the DAA group (10.0% vs. 0%, $P = 0.048$). Furthermore, we did not observe any 1-year mortalities within the group of patients having MVC as mechanism of injury or within the group of patients having ISS >15.

DISCUSSION

THA is the preferred treatment for displaced femoral neck fractures in active, independently mobile patients who are cognitively intact.[24] Both the DAA and the PA are well-established approaches for THA performed in the elective setting, demonstrating excellent operative and functional outcomes.[5–9] A surgical approach for THA in elective cases has been extensively studied and remains a topic of controversy regarding superiority of one surgical approach over another.[5,6,9] This is the first study comparing the 90-day and 1-year outcomes of the DAA and PA for THA performed on patients sustaining a femoral neck fracture. The results of our study indicate that DAA THA for femoral neck fracture confers similar postoperative outcomes at 90 days and 1 year but a significantly lower 1-year mortality rate compared with PA.

The overall mortality rate at 1 year after femoral neck fracture has remained elevated at around 20% with little improvement over the course of time.[2,25] The 1-year mortality

TABLE 5. Major Outcomes, 90-Day and 1-Year, of Femoral Neck Fractures Treated by Total Hip Arthroplasty

Outcome, n (%)	Total (n = 143)	DAA (n = 44)	PA (n = 99)	*P*
90 day				
Dislocation	9 (6.3)	1 (2.3)	8 (8.1)	0.275
Revision THA for implant loosening	2 (1.4)	1 (2.3)	1 (1.0)	0.522
PJI	4 (2.8)	0 (0)	4 (4.0)	0.312
Periprosthetic fracture	3 (2.1)	2 (4.5)	1 (1.0)	0.224
Revision THA for any reason	5 (3.5)	2 (4.5)	3 (3.0)	0.643
Mortality	7 (4.9)	0 (0)	7 (7.1)	0.100
1 year				
Dislocation	9 (6.3)	1 (2.3)	8 (8.1)	0.275
Revision THA for implant loosening	2 (1.4)	1 (2.3)	1 (1.0)	0.522
PJI	7 (4.9)	0 (0)	7 (7.1)	0.100
Periprosthetic fracture	4 (2.8)	2 (4.5)	2 (2.0)	0.582
Revision THA for any reason	8 (5.6)	2 (4.5)	6 (6.1)	1.000
Mortality	11 (7.7)	0 (0)	11 (11.1)	0.018

reported in this study of 7.7% is much less than previous THA studies for femoral neck fracture that averaged 13%.[20,26] These previous reports are concordant with the 1-year mortality in our PA group of 11.1%. However, our DAA cohort had no mortalities at 1 year, which echoes the recently reported rate of 6.6% noted by Dimitriou et al[27] in their hip fracture population who underwent THA through the DAA. Of note, our DAA group was much smaller at 44 patients compared with their 150 that can limit the number of mortalities observed and potentially create a type II error. The reduced risk of 1-year mortality we report for patients undergoing the DAA compared with the PA was confirmed on subanalysis of only patients with low-energy mechanisms of injury (FFS). Interestingly, this subanalysis also revealed a reduced 90-day mortality risk for the DAA group compared with the PA group, which was not observed in the overall general patient population.

We postulate that the improvement in 1-year mortality in the DAA group may owe to earlier cessation of walking aid use, longer postoperative ambulation distance, decreased narcotic use, and earlier mobilization as demonstrated in prospective trials in elective THA.[7,13,14] The aforementioned studies show increased early functional improvements, ambulation, and mobilization in DAA patients compared with PA for elective THA, but these differences disappear at 6 weeks postoperatively.[7,13,14] However, the femoral neck fracture population is generally older with more medical comorbidities compared with their elective THA counterparts.[28–30] Our study demonstrated that the PA patients had increased mortality rates at 1 year compared with the DAA patients (P = 0.018), whereas the PA patients were more likely to be nonambulatory at discharge (P = 0.049) despite being more likely to ambulate without assistance before their injury (P = 0.025). Our results are further supported by the aforementioned elective THA studies comparing the DAA with the PA and previous studies in the physical therapy literature demonstrating significant correlation between ambulation at hospital discharge and survival at 1 year for femoral neck fracture patients.[16–19]

Recent studies have assessed this link between mortality and ambulation in the hip fracture population as a whole, regardless of surgical approach or procedure performed.[16–19] Heinonen et al[17] showed that the ambulatory level at 2 weeks after surgery was a significant predictor of survivorship at 1 year. Imura et al[18] demonstrated that the ambulatory level at day of discharge was a more reliable indicator of postoperative survival at 1 year from hip fracture than baseline ambulation status. Although those results were from univariate analyses, Iosofidis et al analyzed numerous confounding variables in a multivariate regression analysis and showed that ability to walk during hospitalization was the only independent variable associated with increased survival at 1 year after surgery.[19] Hence, earlier ambulation and return to function may play a greater role in reducing postoperative mortality in hip fracture patients than in elective THA given that minute positive differences in this highly morbid population are likely to manifest improved outcomes.

All remaining outcomes assessed in our study, including dislocation, PJI, revision, postoperative periprosthetic fracture, heterotopic ossification formation, and leg length discrepancy requiring heel lifts, were similar between the DAA and the PA cohorts. Similarly, the reported dislocation rates in the elective THA population have not differed between different approaches.[5,6,9] Despite not being significantly different in our study, the dislocation rate for the PA cohort was 8.1% while the dislocation rate of the DAA cohort was 2.3%, which is consistent with that of Dimitriou et al[27] who reported a similar dislocation rate of 2.7% for DAA THA performed for femoral neck fracture. The DAA did show significantly higher rates of LFCN paresthesia compared with the PA (9.1% vs. 1.0%, P = 0.031). This is corroborated by a previous study in elective THA by Martin et al,[7] who reported LFCN paresthesia in 17% of DAA compared with 0% of PA (P = 0.0035). Although this is inconvenient to patients, the clinical significance remains low with resolution of most symptoms at 1-year follow-up.

This study should be interpreted with understanding of its potential limitations. The main limitation is its retrospective design with the potential for selection bias. However, comorbid conditions, age, sex, body mass index, mechanism of injury, fracture classification, ISS, American Society of Anesthesiologists status, and time-to-surgery were similar between the 2 cohorts. The only difference between the 2 cohorts was mechanism of injury, with the PA cohort having increased rates of MVC compared with the DAA and accordingly, there was a trend toward increased rates of high-energy injuries in the PA cohort. That said, the only adverse outcomes in patients injured in an MVC were one case of PJI and 2 mortalities—both occurring more than 1-year postoperatively. For that reason, combined with the similarity between the cohorts in ISS (10.4 for DAA vs. 10.7 for PA, $P = 0.509$) and all other major covariates—beyond mechanism of injury/injury energy—these 2 cohorts were ultimately well matched for a retrospective analysis, minimizing concerns for potential selection bias. In addition, postoperative protocols were consistent throughout the study and major variables that were surgeon dependent were similar between the 2 cohorts. However, hip precautions and abduction pillows were used significantly more often in patients having the PA compared with those with the DAA. Although more recent evidence in the elective THA population favors foregoing the use of precautions and abduction pillows,[31] the evidence supporting foregoing hip precautions in the high-risk hip fracture patients is lacking. Precautions may limit the ambulation of patients after surgery and their recovery, but the potential impact of this could not be determined in this retrospective study. The role precautions/abduction pillows play in this population independent approach used would be best examined through future large, prospective studies. TXA was not consistently given because the literature in the hip fracture population is not as robust as in elective THA but was ultimately similar between the 2 cohorts. Multivariate logistic regression analysis to identify independent risk factors for mortality, particularly with regards to a surgical approach, could not be performed because there were 0 mortalities in the DAA cohort. Finally, the number of patients in this study is small at 143 total patients. One hundred patients per group would be needed to sufficiently power the study if the mortality decreased from 20% (traditional mortality rate at 1 year after displaced femoral neck fracture)[2] to 6.6% (1-year mortality rate for DAA for femoral neck fracture reported by Dimitriou et al).[27] Although we identified 99 PA patients meeting inclusion criteria, there were only 44 DAA patients meeting the inclusion criteria given that this approach is a more recently described technique. To address this inherent limitation of a retrospective study, a post hoc power analysis was performed for the 1-year mortality outcome reported in our study, demonstrating that our study is powered at 92%. These limitations serve as further indication that future multicenter, prospective trials are necessary to make definitive conclusions about the optimal approach in femoral neck fracture patients.

CONCLUSIONS

In conclusion, the results of this study demonstrate that the DAA THA performed for femoral neck fracture has similar 90-day and 1-year postoperative outcomes and complications but significantly reduced postoperative mortality at 1 year when compared with the PA. This may be explained by the greater functional recovery and mobilization femoral neck fracture patients achieve with the DAA during their hospital admission, manifesting in improved survival at 1 year. Given the potential impact of this finding, future large, prospective studies are needed to make definitive recommendations regarding the optimal approach to THA for these patients.

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