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Direct Anterior Approach to Total Hip Arthroplasty Improves the Likelihood of Return to Previous Recreational Activities Compared with Posterior Approach

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ABSTRACT

Total hip arthroplasty offers relief and functional improvement, with the rate of direct anterior approach (DAA) increasing compared with the posterior approach (PA). This study aimed to assess the effect of surgical approach on return to recreational activity after total hip arthroplasty. Total hip arthroplasty performed for primary or posttraumatic osteoarthritis were identified; 100 DAA patients were matched with 100 PA patients on age, sex, diagnosis, and surgical year. Patients were mailed a recreational activity survey, Harris Hip Function, and Hip disability and Osteoarthritis Outcome Score questionnaires. Two hundred surveys were mailed, 130 (65%) responded (66 DAA and 64 PA) and were included. The mean follow-up was 2.5 years for the DAA group and 2.3 years for the PA group (P = 0.256). Among DAA patients, 51% returned to activity within 6 months, compared with 44% of PA patients (P = 0.360). Among those who returned to activity, 71% in the DAA group tried their main presurgery sport, compared with 53% in the PA group (P = 0.019). Twenty-eight percent of DAA patients and 4% of PA patients reported the surgical approach influenced their return to activity (P = 0.001). Outcome scores were clinically similar between groups. Objective data did not favor one approach over the other.

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Total hip arthroplasty (THA) is one of the most successful operations in orthopaedics because of its pain relief, functional improvement, high satisfaction, and low complication rates. The rates of THA have increased over the past several decades. Sloan et al[1] reported that the annual incidence of primary THA in the United States increased by 105% from 2000 to 2014 and projected a 71% growth by 2030 (635,000 procedures). As a consequence of improved survivability, younger patients are being offered THA and surgeons must be prepared to counsel patients regarding participation in sport and recreational activities after hip arthroplasty.

Sport and recreation can have positive benefits on the overall health and quality of life for older individuals, and the most common deterrent is medical limitations.[2] Physical activity trends over the past three decades have changed, leading to more people older than 50 participating in recreational activity. A cross sectional study found that 30% of adults aged 55 to 64 participated in sport in 2005, an increase from 11.9% in 1985.[3] Before hip arthroplasty, approximately 35% of patients in European studies[4] and up to 80% of patients in Australian studies[5] participated in sport. Several European studies have characterized return to sporting activity after THA and found greater than 60% of return to physical activity after lower limb arthroplasty.[4,6]

Over the past two decades, the rate of direct anterior approach (DAA) THA has increased in popularity despite no definitive high level evidence for long-term superiority to the traditional posterior approach (PA).[9] The initial increase in popularity was aimed at reducing dislocation rates in THA; however, as enhanced capsular closure and larger heads became more popular, dislocation became less common with the PA.[10,11] DAA has continued to gain popularity because of a desire to decrease soft-tissue damage and improve recovery. Although perception is that DAA results in less tissue damage, this has not been supported in the literature.[12] Most studies comparing DAA with PA focus on early recovery, and there is little comparing return to recreational activity or sport profiles of DAA and PA hip arthroplasties.

Return to recreational activity may influence choice of surgical approach. The purpose of this study was to identify the effect of two surgical approaches (direct anterior and posterior) on return to recreational activity. We hypothesized that there would be no difference between direct anterior and posterior approach regarding patients' return to recreational activity.

Methods

Our institutional review board approved joint arthroplasty database was used to identify 145 consecutive primary THA using the DAA between 2015 and 2018 by a single surgeon (WDB). The surgeon began using anterior approach approximately 4 years before data review for this study. No patients within the first year (approx. 50 cases) of DAA were included in this study to avoid learning curve bias. Patients undergoing revision arthroplasty were excluded. Decision to perform DAA or PA was up to the surgeon's discretion using a shared decision-making process with the patient. DAA THA were matched 1:1 with PA THA performed by the same surgeon during the same period, based on age (±2 years), sex, diagnosis, and year of surgery. Implant geometry was up to the discretion of the surgeon. The surgeon prefers the use of size 32 mm or larger femoral heads, based on compatibility with the acetabular implant. The diagnosis for all patients was either primary or posttraumatic osteoarthritis. Enhanced recovery protocols were used with patients ambulating on the day of surgery. Postoperative pain management was identical between the two groups. Patients who had an intraoperative complication or underwent a revision arthroplasty during the follow-up period were excluded. DAA and PA surgeries were performed using consistent methods for soft-tissue handling and technical protocols. A minimum of one-year follow-up was required. A custom survey (Appendix, http://links.lww.com/JG9/A173) was developed to analyze return to recreational activity, based on a previous study with osteochondral allografts.[13] The custom survey, along with the Harris Hip Function (HH-F) survey and Hip disability and Osteoarthritis Outcome Score, Joint Replacement (HOOS Jr.), was mailed to 100 DAA and 100 PA patients. A second mailing to the same patients was performed if there was no response within 2 months.

Surgical Technique

Posterior approach was performed in a standard fashion in lateral decubitus position with meticulous posterior capsule repair similar to Pellici et al[10] Intraoperative radiographs were obtained on all patients to ensure appropriate sizing and positioning of implants. Direct anterior approach hip arthroplasties were performed on a specialized table using inter-nervous plane with Heuter modification. The antero-superior capsule was repaired if possible. Posterior approach THA patients had limited hip precautions postoperatively for 6 weeks, which included no crossing of the legs. DAA also had limited anterior hip precautions including no hyperextension or excess external rotation. Postoperative pain management and rehab protocols were identical between the two groups. No difference in preoperative counselling for return to sport or recreation was given based on approach. Patients were allowed to return to low-impact activities as soon as tolerated and high-impact activities at earliest 6 weeks.

Statistical Analysis

Means and frequencies were used to describe patient demographics (to confirm matching and to assess for

differences on variables that were not matched). Chi-square tests were used to compare responses on the recreational activity survey between the DAA and PA groups. The Wilcoxon signed-rank test was used to compare change within each group from preoperatively to follow-up on the HH-F and HOOS Jr. scores. Mann-Whitney *u*-tests were used to compare scores between groups preoperatively, at latest follow-up, and change from the preoperative to follow-up visit (difference scores). Statistical significance was set at $P < 0.05$, and two-tailed tests were used.

Results

A total of 130 (65%) patients responded to the custom survey and were included in the study. Of the 130 THA, 66 were DAA and 64 were PA. The follow-up duration was similar between the DAA and PA groups (Table 1). The American Society of Anesthesiologists' (ASA) physical status classification scores and body mass index (BMI) were captured from the arthroplasty database. Preoperative HH-F scores and HOOS Jr. were also captured from the database. The ASA was graded one or two in 75.4% of patients and slightly favored the DAA group. BMI differed between groups (24.6 in DAA vs 27.0 in PA; $P = 0.006$).

HH-F and HOOS Jr. scores are presented in Table 1. No statistically significant difference was noted in preoperative HH-F scores between the two groups; however, the PA group started at a slightly lower level than the anterior group (28.2 and 30.9, respectively). Postoperative HH-F scores were slightly higher for the DAA group compared with the PA group (42.4 and 41.0,

Table 1. Patient Demographics and Outcome Scores

	Direct Anterior Approach (DAA)	Posterior Approach (PA)	*P* value
Age at time of surgery	67.0 ± 8.9	67.3 ± 10.1	0.856
Sex			0.904
Male	21 (32%)	21 (33%)	
Female	45 (68%)	43 (67%)	
Follow-up duration (yr)	2.5 ± 0.86	2.3 ± 0.86	0.256
ASA physical status			0.139
1	6 (9%)	3 (5%)	
2	49 (74%)	40 (62%)	
3	11 (17%)	20 (31%)	
4	0 (0%)	1 (2%)	
BMI (kg/m^2)	24.6 ± 3.9	27.0 ± 4.7	0.006
Surgical side			0.767
Left	32 (48%)	27 (42%)	
Right	31 (47%)	34 (53%)	
Bilateral	3 (5%)	3 (5%)	
Harris Hip Function			
Preoperative	30.9 ± 5.7	28.2 ± 10.6	0.550
Postoperative	42.4 ± 8.0	41.0 ± 7.1	0.048
Change[a]	24.7 ± 18.4	24.3 ± 19.6	0.772
HOOS jr.			
Preoperative	49.9 ± 14.4	53.0 ± 20.0	0.339
Postoperative	87.0 ± 19.8	84.8 ± 18.5	0.298
Change[a]	39.6 ± 20.2	34.7 ± 24.2	0.377

ASA = American Society of Anesthesiologists, BMI = body mass index, HOOS Jr = Hip disability and Osteoarthritis Outcome Score, Joint Replacement

[a]Change scores calculated among the subset of patients who had both preoperative and postoperative data available

respectively; $P = 0.048$). The change in HH-F scores was not different between the two groups. Preoperative, postoperative, and change HOOS Jr. scores were similar between groups.

Seven recreation-related questions were included in the survey (Appendix, http://links.lww.com/JG9/A173). Six months after the THA, 51% of patients in the DAA group returned to recreational activities compared with 44% of patients in the PA group ($P = 0.360$). Twenty-six percent of patients in the DAA group and 39% of patients in the PA group did not return to sport after surgery at any time point ($P = 0.102$). Among those who did return to activity after the THA, 71% of patients in the DAA group responded that they had attempted their main presurgery sport compared with 53% of patients in the PA group ($P = 0.019$) (Table 2). Twenty-eight percent of patients in the DAA group and 4% of patients in the PA group reported that the surgical approach influenced their return to sport ($P = 0.001$).

Patients were asked to list up to five recreational activities. We included any activity that would be considered "capable of achieving a result requiring physical exertion and/or physical skill."[2] The total number of recreational activities reported from the DAA group was 122 compared with 81 in the PA group (Table 3). This suggested a more active recreational profile for those who received the DAA compared with PA. Low-impact activities were more common in both cohorts.

Walking was the most common recreation in both cohorts (40% in the DAA group and 32% in the PA group). Exercise classes such as jazzercise or boot camp were found to be the most common high-impact activity in both groups.

Discussion

To our knowledge, this is the first study comparing DAA and PA surgical approaches in total hip arthroplasty regarding patient-reported return to recreational activity. Several novel findings were present within these data. The results of the recreational activity questionnaire were statistically favorable toward DAA THA in two questions and trending toward DAA in the others. HH-F and HOOS Jr. scores did not clinically favor one surgical approach over the other. This may be related to the ceiling effect of the HH as noted by Wamper et al[14] The HOOS Jr. does not have ceiling limitations of HH[15] but may not be sensitive enough to detect a difference in recreational activities. The HOOS sport and recreation

Table 2. Results of Recreational Activity Survey

Group	Q1: Did Problems With Your Hip Limit Ability to Return to Sports? (% No)	Q2: Did Other Reasons (Besides Your Hip) Limit Your Ability to Return to Sports? (% Yes)	Q3: Does your Hip Allow You to Participate in Regular Exercise? (% Yes)	Q4: Do you Currently Participate in Any Sports? (% Yes)	Q5: Have you Attempted Your Main Pre-Surgery Sport? (% Yes)	
DAA	73%	14%	91%	76%	71%	
PA	83%	22%	88%	63%	53%	
P value	0.121	0.139	0.464	0.074	0.019	
	Q6: How long did it take to return to pre-surgery sport?					
Group	<3 mo	3-6 mo	6-12 mo	>12 mo	Have not returned	Q7: Do you feel the surgical approach influenced your return to sport? (% yes)
DAA	21%	29%	21%	2%	26%	28%
PA	19%	25%	14%	0%	39%	2%
P value			0.595			0.001

DAA = Direct Anterior Approach, PA = Posterior Approach

Table 3. Types of Recreational Activities Reported

DAA group			PA group		
Low impact	Total	%	**Low impact**	Total	%
Walking	26	40%	Walking	21	32%
Cycling	18	28%	Cycling	16	25%
Swimming	10	15%	Swimming	9	14%
Golf	7	11%	Golf	9	14%
Yoga	5	8%	Yoga	2	3%
Gardening	4	6%	Gardening	2	3%
Animal training	2	3%	Animal training	2	3%
Fishing	1	2%	Sailing	1	2%
Sailing	1	2%	Horseshoes	1	2%
Snowshoeing	1	2%	Paddle boarding	1	2%
Responses	75		Responses	43	
% Activity	61%		% Activity	53%	
High impact	Total	%	**High impact**	Total	%
Exercise class	19	29%	Exercise class	15	23%
Hiking	9	14%	Weightlifting	6	9%
Weightlifting	9	14%	Surfing	4	6%
Running	3	5%	Hiking	3	5%
Skiing	2	3%	Tennis	3	5%
Tae Kwon do	1	2%	Skiing	2	3%
Tennis	1	2%	Dance	2	3%
Surfing	1	2%	Horseback riding	2	3%
Dance	1	2%	Running	1	2%
Kayak	1	2%			
Responses	47		Responses	38	
% Activity	39%		% Activity	47%	

DAA = Direct Anterior Approach, PA = Posterior Approach

subscore may be a more useful outcome measure for these data. In a study of TKA patients, Steinhoff et al evaluated the use of the KOOS and found it was more sensitive and had less ceiling effects than the Knee Society score.[16] A similar study has not been performed in the hip. The sport and recreational activity questionnaire used in this study has not been validated, which is a weakness, but given the lack of a detailed and validated tool, we believe a customized activity questionnaire was appropriate for the purposes of this study. A 65% response rate was obtained for the survey. The 35% who did not respond may have been because of the patient changing addresses or not wanting to participate. There was an equal response rate between anterior and posterior approaches.

Return to sport and recreation after THA is a complex intersection of patient and surgeon preferences combined with objective pain and functional outcome. The most current recommendations from the American Association of Hip and Knee Surgeons (AAHKS) from 2007 regarding return to athletic activity after THA are based on a survey to member surgeons.[7] Most high-impact activities were not allowed. Intermediate and low-impact activities for the most part were allowed. The authors noted that compared with previous surveys performed in the 1990s, surgeons had become more liberal with their acceptance of allowing patients to participate in intermediate and higher-impact activities after THA. This change was because of the perception that patients and implants can handle increased loads

and greater extremes of motion. A similar survey was conducted in Denmark in 2014 and found profoundly different opinions on the attitude of surgeons on patients returning to athletic activities.[8] The survey found that 55% of high-volume arthroplasty surgeons allow for high-impact activities after THA compared with 21% in the AAHKS 2007 survey. At our institution, policies regarding participation in activities post-THA are much more lenient than the 2007 AAHKS guidelines. Decision-making is based on the patients' experience and a risk benefit conversation with the patient about the potential risk of increased wear on the implant, fracture, and hip dislocation.

The recreation profile is not the first of its kind in hip arthroplasty but is the first to compare direct anterior and posterior approaches. The study by Wylde et al.[5] has the most extensive sport profile after total joint arthroplasty. The authors found that approximately 26% of patients were unable to return to sporting activities after hip arthroplasty. These results are similar to our findings with 22% of patients reporting that their hip limited their ability to return to recreational activity and 41% admitting that they did not return to sport. The most common low-impact activities reported by Wylde et al. were swimming, walking, and golf. Our study found that walking, cycling, and exercise classes are the most common. This may be a reflection of recreational trends in our population. The total number of reported recreational activity responses by DAA arthroplasty outweighed the PA arthroplasty 122 to 81. A clear limitation in this study is the lack of data on preoperative recreational activities. Therefore, we were not able to determine whether the difference in recreational profile is related to the surgical approach or patients' preoperative inclinations.

The effect of surgical approach on THA outcome is controversial. Several studies compared PA and DAA in regards to functional recovery. DAA seems to result in earlier discontinuation of gait aids, increased steps per day,[17] and less pain and narcotic requirements.[18,19] Validated outcome measurements including Harris Hip Score (HHS), HOOS, Western Ontario and McMasters Universities osteoarthritis index have been reported in randomized controlled trials comparing DAA and PA. One randomized controlled trial (RCT) study by Zhao et al[19] found improved HHS scores at 3 months with DAA. In a recent retrospective study, Graves et al[20] demonstrated no significant difference in University of California Los Angeles (UCLA) activity score between DAA and PA, but a slight transient improvement favoring DAA in Physical Rand−12 scoring. In a meta-analysis by Wang et al,[18] DAA resulted in higher HHS and lower VAS at 2 and 4 weeks. These differences disappear three to six months postoperatively. In a systematic review and meta-analysis by Higgins et al,[9] nine studies comparing DAA and PA approach THA were analyzed for functional outcome measures. Four of the nine studies had outcomes favorable to DAA and the other five were not significantly different. Some have attributed early improved postoperative recovery to less tissue damage; however, Meneghini et al[12] found that both approaches had notable tissue damage.

To our knowledge, there has been no study directly evaluating the effect of surgical approach on return to recreational activities. Traditional measures of functional outcome such as the Harris Hip Score and HOOS Jr. are not sensitive to higher levels of activity and may have ceiling effects that do not effectively measure functional differences that allow for participation in recreational activities. Although recreational profiles have been performed on patients undergoing THA, none have compared the types of activities performed postoperatively based on surgical approach.[4]

Finally, a notable difference was observed in patients' perception of whether the surgical approach affected their return to activity after the THA (28% in the DAA group vs 4% in the PA group). This difference may be indicative of selection bias. HH-F and HOOS Jr. scores were clinically similar in the two groups, but more patients having a DAA believed that surgical approach was an important variable in their outcome. Although difficult to study, the effect of patient perception of the surgical procedure, independent of objective and subjective outcome measure, is intriguing and may be worthy of further study.

This study has some important limitations. Selection bias was possible in that the decision on which approach to use was made using a shared decision-making model. In this approach, the patient's opinions and desires are incorporated into the surgeon's decision regarding what approach might provide the lowest risk and best chance of a favorable outcome. In this model, central obesity as evidence by a large pannus, or complex anatomy or deformity might favor the use of the PA over DAA. Owing to factors such as direct to consumer marketing, patients often perceive that the direct anterior approach results in more rapid rehabilitation and higher levels of function, even when this has not been supported by peer-reviewed literature. Surgeons may often use this perception to leverage patients' "belief" in their surgical outcome, creating a placebo effect of sorts.

It is also possible that the two groups were different populations. Although patient characteristics were

remarkably similar in almost every demographic variable including ASA classification as an indicator of medical comorbidities (Table 1), a statistical difference was noted in BMI that could confound the study finding. We note that although the PA group had a statistically higher BMI than the DAA group (24.6 vs 27), this difference, although statistically different, was not necessarily a clinically important difference and often represent differences in muscle mass rather than the levels of obesity. In this study, both groups had similar preoperative hip function and activity scores despite differences in BMI. Nonetheless, we acknowledge that BMI may play a role in activity levels of patients, regardless of the medical or surgical intervention being studied.

Conclusion

Fifty-nine percent of patients returned to some form of recreational activity after THA. The most common recreational activities were walking, cycling, and exercise classes. Compared with the posterior approach, patients undergoing THA using the direct anterior approach were more likely to attempt their preoperative sporting activities, participated in a greater amount of recreational activities, and had a stronger perception that the approach influenced their return to recreational activities. A prospective randomized study would be valuable to analyze recreational profiles throughout recovery from THA. These findings may help practitioners counselling patients regarding recreational activities after total hip arthroplasty.

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