Surgical outcomes of direct anterior approach versus lateral approach in primary total hip arthroplasty

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Background
Total hip arthroplasty (THA) is a frequent orthopedic surgery. There are different approaches to hip such as anterior, posterior, or lateral approach.
Objectives
To assess the outcome of THA performed through the direct anterior approach (DAA) versus lateral approaches.
Patients and methods
This study involved 40 matched patients who underwent primary, elective THA. All cases were classified according to THA approach into two groups: 20 patients who underwent THA with a DAA and 20 patients with the lateral approach. We recorded reoperation rate, postoperative complications, visual analog scale pain scores, and modified Harris hip score (mHHS) for all patients.
Results
When mHHS was studied, it showed significant improvement postoperatively in both DAA and lateral approach groups (P<0.001). The DAA group showed a higher significant mHHS value at preoperatively (P=0.015), 1 month (P<0.001), 3 months (P<0.001), and 9 months (P=0.001) more than the lateral approach group. Regarding complications, the lateral approach group showed a significant increase in developing wound infection and instability (P=0.048, 0.027, and 0.048, respectively). No significant differences were found when comparing groups regarding loosening, deep infection, femoral complications, and acetabular malposition (P>0.05). Six cases in the lateral approach group needed reoperation with significant difference between this group and DAA group (P=0.027).
Conclusion
The DAA is a safe and efficacious surgical technique with reducing morbidity, complications, and accelerating functional recovery than the lateral approach in THA.

Keywords:
direct anterior approach, lateral approach, total hip arthroplasty

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Introduction

Total hip arthroplasty (THA) is a frequent orthopedic surgery. Although there are overall great outcomes, there is competition for advancement in THA outcomes. The best surgical method for THA is still debated, with increased emphasis on minimally invasive procedures to reduce recovery time [1].

There are different approaches to hip such as anterior, posterior, or lateral approach. Surgical techniques posterior to the trochanter, such as the posterolateral, Moore, or Southern techniques, have the benefit of conserving the abductor but have a high dislocation incidence. Anterior approach of the trochanter has usually entailed some portion of the abductor attachment, as in the direct lateral (Hardinge) and anterolateral (Watson-Jones) approaches [2].

Recently, an anterior approach to the trochanter that spare the abductor muscle and use intermuscular planes has been established; the most common of these procedures, the direct anterior approach (DAA), access the hip capsule through the inter-nervous plane between the sartorius and tensor fascia lata when the patient lies supine [3].

The goal of this study was to assess the results and the incidence of complications after THA by DAA versus lateral approach.

Patients and methods

This was a prospective cohort study that involved 40 matched patients who underwent primary, elective THA that was carried out at the Orthopedic

Department of Helwan University Hospital from January 2018 to January 2020. Informed consent was obtained from all participants before enrollment in the study. The study was approved by the institutional ethics committee in the Orthopedic Department of Orthopedic Surgery, Helwan University, Cairo, Egypt.

All participants had been classified into two groups: 20 patients who underwent THA with a DAA and 20 patients with the lateral approach. The two groups are almost of the same age groups. Patients undergoing revision arthroplasties and those undergoing any other technique were excluded from this study.

Demographics data, American Society of Anesthesiologists score, and preoperative diagnosis were recorded for all patients. All of the procedures were carried out by a single fellowship-trained arthroplasty surgeon. The surgeon chose the technique for each patient separately.

The DAA was done in the supine position on a standard operating table with fluoroscopy by a single surgeon. The same surgeon also performed the lateral approach, which was done in the lateral decubitus position using fluoroscopy.

Follow-up for all patients was done to record reoperation rate, postoperative complications, as well as perioperative factors including operative time, visual analog scale pain scores, analgesic consumption as measured in morphine milligram per day in PCA, the length of hospital stay, discharge, and follow-up by patient modified Harris Hip score (mHHS) [4] for pain and function at 1, 3, and 9 months.

Statistical analysis

Analysis of data was performed using SPSS v. 25 (Statistical Package for the Social Sciences, 25.0. Armonk, NY: IBM Corp. Released 2019. IBM SPSS Statistics) for Windows. Mean and SD were used for quantitative data and frequency and distribution for qualitative data. We used Student *t* test, Mann–Whitney *U* test, and Fisher exact test to compare between both groups. *P* value was considered significant when less than or equal to 0.05.

Results

This study involved 40 patients who underwent THA. There were 26 (65%) males and 14 (35%) females. The mean patient age was 50.23 ± 12.99 (26.0–70.0) years. The patients were classified into two groups: 20 patients underwent THA with the DAA and 20 patients with the lateral approach. Both groups were comparable in terms of age, age groups, and sex. The male-to-female ratio in the DAA group was 3:1 and in the lateral approach group was 2.33:1 (*P*=0.507). The most common age group among patients in the DAA group was 50–59 years (35%) and in the lateral approach group was more than or equal to 60 years (40%). The mean age in the DAA group was 48.40 ± 13.64 years, with the range being 26–70 years, and in lateral approach group was 52.05 ± 12.40 years, with the range being 28–70 years (Table 1).

Table 2 presents perioperative data, duration of surgery, and length of hospital stay in both groups. Most of the patients in the DAA group [15 (75%)] and the lateral approach group [14 (70%)] were diagnosed as having osteoarthritis with no significant difference between both groups (*P*=0.723). Moreover, there was no significant difference between both groups regarding

Table 1 Demographic characteristics of the study group

	DAA group (*N*=20) [*n* (%)]	Lateral approach group (*N*=20) [*n* (%)]	*P* value
Age (years)			
Mean±SD	48.40 ± 13.64	52.05 ± 12.40	0.369≠
Median	51.0	56.0	
Range	26.0–70.0	28.0–70.0	
Age (groups)			
20–29	2 (10.0)	1 (5.0)	0.611‡
30–39	4 (20.0)	2 (10.0)	
40–49	2 (10.0)	4 (20.0)	
50–59	7 (35.0)	5 (25.0)	
≥60	5 (25.0)	8 (40.0)	
Sex			
Male	15 (75.0)	14 (70.0)	0.507
Female	5 (25.0)	6 (30.0)	

DAA, direct anterior approach.
≠Mann–Whitney *U* test.
‡χ^2 test.

Table 2 Preoperative and operative data characteristics in the two studied groups

	DAA group (*N*=20) [*n* (%)]	Lateral approach group (*N*=20) [*n* (%)]	*P* value
Diagnosis			
Posttraumatic	5 (25.0)	6 (30.0)	0.723
Osteoarthritis	15 (75.0)	14 (70.0)	
Surgery time (min)			
Mean±SD	71.25±9.44	66.50±8.75	
Median	70.0	67.5	0.157
Range	60.0–90.0	50.0–80.0	
Length of hospital stay (days)			
Mean±SD	2.15±0.37	2.95±0.76	
Median	2.0	2.0	0.001**
Range	2.0–3.0	2.0–5.0	

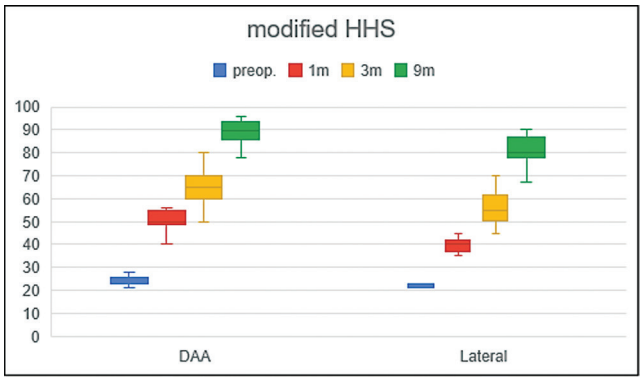
DAA, direct anterior approach.
‡χ^2 test.
**No significance.

Table 3 Analysis of preoperative versus postoperative modified Harris hip score in the two studied groups

	Preoperative	1 month postoperative	3 months postoperative	9 months postoperative	*P* value†
DAA group (*N*=20)					
Mean±SD	23.75±2.05	50.40±4.12	65.85±6.91	88.65±5.35	
Median	23.0	50.0	65.0	89.5	<0.001**
Range	21.0–28.0	40.0–56.0	50.0–80.0	78.0–96.0	
Lateral approach group (*N*=20)					
Mean±SD	22.30±0.98	39.55±3.39	56.80±6.65	81.40±6.01	
Median	23.0	40.0	55.0	80.0	<0.001**
Range	21.0–23.0	35.0–45.0	45.0–70.0	67.0–90.0	
P value≠	0.015*	<0.001**	<0.001**	0.001**	

DAA, direct anterior approach.
≠Mann–Whitney *U* test.
‡χ^2 test.
†Friedman test.
*No significance.
**No significance.

Figure 1



Analysis of preoperative versus postoperative modified HHS. HHS, Harris hip score.

surgery time (*P*=0.157). The lateral approach group showed a significant increase in hospital stay compared with the DAA group (*P*=0.001).

When mHHS was studied, it showed statistically significant improvement postoperatively in both DAA and lateral approach groups (*P*<0.001). The DAA group showed a higher significant mHHS value at preoperatively (*P*=0.015), 1 month (*P*<0.001), 3 months (*P*<0.001), and 9 months (*P*=0.001) more than the lateral approach group, as shown in Table 3 and Fig. 1.

Pain was assessed preoperatively, as well as at days 1, 2, and 3. The DAA group reported significantly less pain preoperatively than the lateral approach group (*P*=0.028) with no significant difference between them at days 1, 2, and 3 (*P*>0.05). There were no significant changes in visual analog scale score between preoperative and postoperative periods in each group, as illustrated in Table 4.

The distance ambulated in feet within the two groups increased significantly from preoperatively to day 2 (*P*<0.001). There were differences in the distance ambulated in feet comparing the DAA group to the lateral group in day 1 (*P*=0.002) and day 2 (*P*=0.001). There were no differences in morphine dose comparing the DAA group with the lateral group (Table 5).

Rate of blood transfusion was found to be significantly higher in the lateral approach group when compared

Table 4 Visual analog pain score in the two studied groups

	Preoperative	1st day	2nd day	3rd day	*P* value†
DAA group (*N*=20)					
Mean±SD	3.43±0.47	3.53±0.65	3.20±0.58	3.32±0.69	
Median	3.35	3.30	3.0	3.15	0.189
Range	2.80–4.0	2.50–5.0	2.0–4.20	2.50–6.0	
Lateral approach group (*N*=20)					
Mean±SD	3.76±0.49	3.60±0.57	3.52±0.44	3.45±0.51	
Median	4.0	3.50	3.50	3.50	0.062
Range	3.0–4.5	3.0–5.0	3.0–4.0	3.0–4.0	
P value≠	0.028*	0.820	0.056	0.583	

DAA, direct anterior approach.
≠Mann–Whitney *U* test.
†Friedman test.
*No significance.

Table 5 Distance ambulated in feet and morphine dose in the two studied groups

	Preoperative	1st day	2nd day	*P* value†
Distance ambulated in feet				
DAA group (*N*=20)				
Mean±SD	31.50±19.81	73.05±14.68	126.0±29.98	<0.001**
Median	27.50	77.50	120.0	
Range	10.0–70.0	50.0–100.0	70.0–180.0	
Lateral approach group (*N*=20)				
Mean±SD	19.05±7.69	54.50±18.49	92.0±28.58	
Median	20.0	60.0	105.0	<0.001**
Range	10.0–30.0	10.0–90.0	10.0–120.0	
P value	0.098	0.002**	0.001**	
Morphine dose				
DAA group (*N*=20)				
Mean±SD	20.0±0.0	20.50±2.24	19.50±2.24	0.368
Median	20.0	20.0	20.0	
Range	20.0–20.0	20.0–30.0	10.0–20	
Lateral approach group (*N*=20)				
Mean±SD	20.0±0.0	21.0±3.08	19.5±3.94	0.273
Median	20.0	20.0	20.0	
Range	20.0–20.0	20.0–30.0	10.0–30.0	
P value≠	1.00	0.553	0.979	

DAA, direct anterior approach.
≠Mann–Whitney *U* test.
† Friedman test.
**No significance.

with the DAA group (*P*=0.049). Regarding complications, the lateral approach group showed significant increase in developing wound infection and instability (*P*=0.048, 0.027, and 0.048, respectively). No significant differences were found when comparing groups regarding loosening, deep infection, femoral complications, and acetabular malposition (*P*>0.05). Six cases in the lateral approach group needed reoperation with significant difference between this group and the DAA group (*P*=0.027) (Table 6).

Discussion

Minimally invasive techniques to THA are becoming more essential to both patients and surgeons. Surgeons also advocate anterior approach THA, as a survey of American Association of Hip and Knee Surgeons members revealed that 22.8% have websites discussing the advantages of anterior approach of THA [5].

The DAA has been demonstrated to reduce muscle injury while also allowing for a rapid recovery to function. However, the DAA has drawbacks, including femoral preparation issues, meralgia paresthetica, and wound complications [6].

The current study showed that the surgery time in DAA was higher than the lateral approach without significance. A meta-analysis by Yue *et al*. [7] included 12 studies which showed that the DAA approach was slower than the lateral approach by an average of 7.99 min.

Our study revealed that DAA group showed a higher significant mHHS value at preoperatively (*P*=0.015),

Table 6 Postoperative complications in the two studied groups

	DAA group (*N*=20) [*n* (%)]	Lateral approach group (*N*=20) [*n* (%)]	*P* value‡
Blood transfusion			
0	15 (55.0)	7 (35.0)	0.049*
1	4 (40.0)	6 (30.0)	
2	1 (5.0)	6 (30.0)	
3	0	1 (5.0)	
Wound contamination			
No	19 (95.0)	15 (75.0)	0.048*
Yes	1 (5.0)	5 (25.0)	
Deep infection			
No	20 (100.0)	19 (95.0)	0.317
Yes	0	1 (5.0)	
Instability			
No	19 (95.0)	13 (65.0)	0.048*
Yes	1 (5.0)	7 (35.0)	
Femoral complications			
No	20 (100.0)	17 (85.0)	0.605
Yes	0	3 (15.0)	
Acetabular malposition			
No	19 (95.0)	17 (85.0)	0.251
Yes	1 (5.0)	3 (15.0)	
Loosening			
No	19 (95.0)	18 (90.0)	0.487
Yes	1 (5.0)	2 (10.0)	
Reoperation			
No	19 (95.0)	14 (70.0)	0.027*
Yes	1 (5.0)	6 (30.0)	

DAA, direct anterior approach.
‡χ^2 test or Fisher exact test.
*No significance.

1 month (P<0.001), 3 months (P<0.001), and 9 months (P=0.001) more than the lateral approach group. Many studies revealed similarly outstanding postoperative results after THA regardless of approach, in the range from 2 weeks to 5 years [8–10]. Restrepo *et al*. [11] observed improved HHS score that remained up to 2 years after surgery. Ilchmann *et al*. [12] discovered that the lateral technique resulted in better HHS score at 6 weeks, 12 weeks, and 1 year postoperatively.

Van Driessche *et al*. [13] discovered that the lateral approach appears to be equally successful as the DAA in postural control and balance supporting rapid return to function, ambulation, and discharge. This result is connected to our research. Moreover, given the present opioid crisis, it is critical to prevent overuse narcotics, and the lateral approach was similar to the DAA in terms of opioid intake during hospitalization. Both studies used neuraxial anesthesia as well as a combined non-narcotic analgesic treatment, leading to reduction of narcotic intake. According to pain on postoperative day 0 and postoperative day 1, the DAA had limited advantages over the lateral approach.

We observed that six cases in the lateral approach group needed reoperation in the form of formal revision THA, whereas the DAA group had one case of reoperation, which was a superficial irrigation and debridement only. There was a significant difference between the lateral approach group and the DAA group.

The surgeon verifies proper component size and location by employing intraoperative fluoroscopy [14]. Because this side was not used, the lateral approach may have suffered from mild acetabular component malposition because patients were in the lateral decubitus posture, which may reflect the greater risk of revision.

The difficulty of preparing the femur with the DAA has been documented. Perforation, fracture, and femoral stem subsidence are all more prevalent with the DAA than with the lateral approach [15]. Furthermore, no femoral problems were observed in our DA group. These findings are connected to the different learning curves of the two approaches. Moreover, there are technical variations such as operational duration, soft tissue manipulation, and femoral side preparation.

There were significantly lower blood losses in the DAA group in our study, which was known by a small change in hemoglobin values after surgery, low amount of drained blood, and low amount of blood transfusion required after surgery.

The main complication in our both groups was wound healing complication ranging from superficial infections to deep seated infection. Jahng *et al.* [16] revealed that obese and diabetic patients with DAA showed an increase in the risk of wound complications. In this study, there were five (25%) patients in the lateral approach who had wound complications that were managed by conservative treatment and wound debridement, whereas in the DA group, there was one (5%) patient who had wound healing complications that needed a reoperation. Despite these superficial wound healing problems, only one (5%) patient in the whole research had a profound periprosthetic joint infection. The difference in wound healing issues among both techniques might be attributed to the site of the incision.

Conclusions

We attempted to verify a minimally invasive DAA as a safe and effective technique in minimizing morbidity, complications, and early functional recovery. Special caution is needed if the lateral approach is performed without fluoroscopy, as the lateral approach has a greater revision incidence than the DAA.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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