NEU PRESS
SELCUK MEDICAL JOURNAL
SELÇUK TIP DERGİSİ
DOI:http://dx.doi.org/10.30733/std.2026.01981
Selcuk Med J 2026;42(3): 269-278

OPEN

RESEARCH ARTICLE

Direct Anterior Versus Posterolateral Approaches in Total Hip Arthroplasty: A Comparative Evaluation of Early and Late Clinical Outcomes

Total Kalça Artroplastisinde Direkt Anterior ve Posterolateral Yaklaşımların Karşılaştırılması: Erken ve Geç Dönem Klinik Sonuçların Değerlendirilmesi

Ugur Ozdemir[1], Muhammed Fatih Serttas[2]

[1]Bandırma Onyedi Eylül University Faculty of Medicine, Department of Orthopaedics and Traumatology, Balıkesir, Türkiye
[2]Marmara University Pendik Training and Research Hospital, Department of Orthopaedics and Traumatology, İstanbul, Türkiye

ABSTRACT
Objective: The direct anterior approach (DAA) and posterolateral approach (PLA) are commonly used in total hip arthroplasty (THA). This study aimed to compare these approaches in terms of complication rates and functional outcomes.
Materials and Methods: This retrospective study included 130 patients who underwent THA for primary hip osteoarthritis (DAA: 53; PLA: 77). All patients underwent preoperative radiological and comorbidity assessments. Clinical outcomes were evaluated using the Harris Hip Score (HHS), University of California Los Angeles (UCLA) Activity Score, and Visual Analog Scale (VAS) for pain preoperatively, at 3 months, and at final follow-up. Patients were followed at regular intervals for at least 1 year.
Results: There were no significant differences between groups in intraoperative blood loss, transfusion requirements, or hospital stay. Operative time was longer in the DAA group (p=0.008). The overall complication rate was higher in the DAA group (p=0.049). Both groups showed significant improvement in clinical scores over time. HHS was significantly higher in the DAA group at 3 months, but this difference diminished at final follow-up. The DAA group demonstrated higher UCLA scores at final follow-up. Multivariable regression analysis identified preoperative UCLA score as an independent predictor of final UCLA score (B=0.371; p<0.001).
Conclusions: DAA was associated with longer operative time but showed no significant disadvantage in major perioperative outcomes compared to PLA. While DAA provided an early functional benefit, long-term outcomes were comparable. Final outcomes appeared to be influenced more by patient-related factors than surgical approach. Therefore, surgical approach selection should be individualized based on patient characteristics and surgeon experience.

Keywords: Total hip arthroplasty, posterolateral approach, direct anterior approach, primary hip osteoarthritis, complications

ÖZET
Amaç: Total kalça artroplastisinde (TKA) direkt anterior yaklaşım (DAA) ve posterolateral yaklaşım (PLA) sık kullanılan tekniklerdir. Bu çalışmanın amacı, bu iki yaklaşımı komplikasyon oranları ve fonksiyonel sonuçlar açısından karşılaştırmaktır.
Gereç ve Yöntemler: Primer kalça osteoartriti nedeniyle TKA uygulanan 130 hasta retrospektif olarak incelendi (DAA: 53; PLA: 77). Tüm hastalar preoperatif radyolojik değerlendirme ve komorbiditeler açısından analiz edildi. Klinik değerlendirmede Harris Kalça Skoru (HHS), UCLA Aktivite Skoru ve Görsel Analog Skala (VAS) ağrı skoru preoperatif dönemde, postoperatif 3. ayda ve son kontrolde değerlendirildi. Hastalar en az 1 yıl süreyle düzenli aralıklarla takip edildi.
Bulgular: Gruplar arasında intraoperatif kanama miktarı, transfüzyon ihtiyacı ve hastanede kalış süresi açısından anlamlı fark saptanmadı. Operasyon süresi DAA grubunda daha uzundu (p=0.008). Toplam komplikasyon oranı DAA grubunda daha yüksekti (p=0.049). Her iki grupta da klinik skorlar zamanla anlamlı şekilde iyileşti. HHS, postoperatif 3. ayda DAA grubunda daha yüksekken, bu fark son kontrolde ortadan kalktı. Son kontrolde UCLA skorları DAA grubunda daha yüksekti. Çok değişkenli regresyon analizinde preoperatif UCLA skoru, son kontrol UCLA skorunun bağımsız belirleyicisi olarak saptandı (B=0.371; p<0.001).
Sonuç: DAA, daha uzun ameliyat süresi ile ilişkili olmakla birlikte, temel perioperatif sonuçlar açısından PLA'ya göre belirgin bir dezavantaj göstermemiştir. DAA erken dönemde fonksiyonel avantaj sağlasa da uzun dönem sonuçlar benzerdir. Nihai sonuçların cerrahi yaklaşımdan çok hasta özelliklerinden etkilendiği görülmektedir. Bu nedenle cerrahi yaklaşım seçimi, belirli bir tekniğin üstünlüğünden ziyade cerrah deneyimi ve hasta profiline göre bireyselleştirilmelidir.

Anahtar Kelimeler: Total kalça artroplastisi, posterolateral yaklaşım, direkt anterior yaklaşım, primer kalça osteoartriti, komplikasyonlar

Received: 31 March 2026 **Accepted:** 8 July 2026 **Published Online:** 14 September 2026

Corresponding Author: Ugur Ozdemir, Bandırma Onyedi Eylül University Faculty of Medicine, Department of Orthopaedics and Traumatology, Balıkesir, Türkiye
e-mail: ugurozdemir.md@gmail.com

Cite this article as: Ozdemir U, Serttas MF. Direct Anterior Versus Posterolateral Approaches in Total Hip Arthroplasty: A Comparative Evaluation of Early and Late Clinical Outcomes. Selcuk Med J 2026;42(3): 269-278

Disclosure: *Author has not a financial interest in any of the products, devices, or drugs mentioned in this article. The research was not sponsored by an outside organization. Author has agreed to allow full access to the primary data and to allow the journal to review the data if requested.*

INTRODUCTION

Total hip arthroplasty (THA) is a frequently performed surgical procedure that improves the quality of life in patients with functional loss due to arthritic hip pain. However, it has been reported that 7%–15% of patients who undergo THA experience persistent complaints after surgery, preventing them from returning to full function and activity levels. Reasons for postoperative patient dissatisfaction include fixation failure, instability, and tissue damage related to the surgical procedure. Choosing the optimal surgical approach can help reduce these risks and improve THA outcomes (1). Although numerous studies have been conducted on this issue in recent years, the most appropriate surgical approach for THA remains debatable. The direct anterior approach (DAA) and posterolateral approach (PLA) are commonly used in THA. These approaches have their own advantages and disadvantages. The PLA is preferred because it provides an excellent field of view of the femoral shaft and has a low risk of femoral fracture. Furthermore, it can be easily expanded distally when needed. A potential disadvantage of the posterior approach is an increased risk of posterior dislocation due to cutting of the external rotator muscles (2). However, this risk can be reduced with improved closure techniques. Although there is a risk of sciatic nerve damage with the PLA, the incidence of this complication is low (2,3).

The DAA is a less invasive approach that, in theory, reduces these complications by using the intermuscular and internervous planes between the rectus femoris and tensor fascia lata muscles. It is thought that this muscle-sparing approach leads to faster, easier postoperative recovery, and better functional outcomes (4). For these reasons, the use of DAA with THA has become increasingly popular. As it has become more widespread among surgeons, the number of studies on this approach has also increased. Many researchers have reported advantages, including lower dislocation risk, less postoperative pain, shorter hospital stays, and faster functional recovery, in patients undergoing THA with DAA (5). Although good short-term results have been reported in the literature, some recent studies have shown that DAA does not provide superior long-term results compared with other approaches. In fact, some studies have reported higher rates of complications, such as nerve injuries, fractures, and infections, associated with DAA (6). Within the scope of this research, we aimed to elucidate and compare surgical approaches with respect to complication rates and functional outcomes. Briefly, early- and late-phase functional outcomes and the safety of DAA were compared with those of PLA.

MATERIALS AND METHODS

Patients

This retrospective analysis was conducted between 2018 and 2024. A total of 130 patients (58 women and 72 men) underwent THA for primary hip osteoarthritis. All patients underwent radiological evaluation, including preoperative and postoperative anteroposterior (AP) pelvic radiographs and lateral hip radiographs. Preoperative AP pelvic radiographs were used to determine limb length and offset planning, with the contralateral side as a reference. Template creation was performed using preoperative AP and lateral hip radiographs. Postoperative radiographs were obtained during routine follow-up visits to assess implant position, lateral offset difference, limb length discrepancy, and potential implant-related complications. The acetabular cup version was measured on standardized AP hip radiographs according to the method described by Lewinnek et al. (7) (Figure 1a). The acetabular cup inclination angle (Figure 1b), lateral offset difference (Figure 2a), and limb length discrepancy (Figure 2b) were assessed on postoperative AP pelvic radiographs, as demonstrated in the corresponding figures.

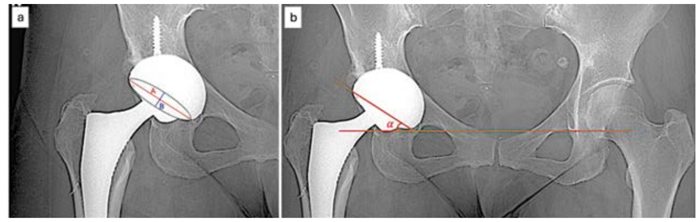

Figure 1. (a) A: The length of the long axis of the acetabular component and B: The length of the short axis of the projected ellipse, reflecting the maximum diameter of the implant. (b) The acetabular cup inclination: angle between the inter-teardrop line and the line connecting the superior and inferior rims of the acetabular component.

Each patient was evaluated for additional comorbidities preoperatively and classified according to the Charlson Comorbidity Index (CCI). For clinical evaluation, the Harris

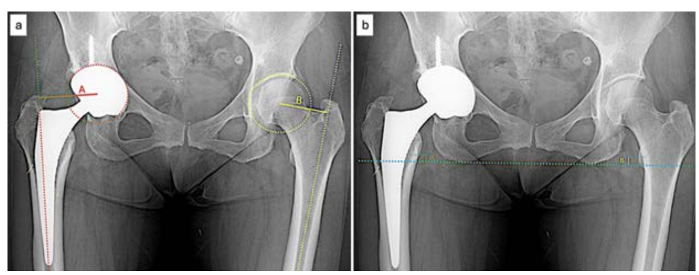

Figure 2. (a) Lateral offset difference: The perpendicular horizontal distance from the center of the femoral head to the anatomical axis of the femoral shaft (A) The same measurement was performed on the contralateral hip (B), and the difference was calculated. (b) Limb length discrepancy: The perpendicular distance from the center of the lesser trochanter to a horizontal line passing through the ischial tuberosities on operated side (A) and same measurement for contralateral hip (B), and the difference was calculated.

Hip Score (HHS), University of California, Los Angeles (UCLA) Activity Score, and Visual Analog Scale (VAS) – pain score were used preoperatively, at 3 months postoperatively, and at the final follow-up. Patients were followed up at 2 weeks, 4 weeks, 3 months, 6 months, and then at 6-month intervals for at least 1 year after surgery, and treatment success was evaluated clinically and functionally.

In addition to these data, the following data were recorded: age, sex, side of the affected area, follow-up time, surgical approach, surgical duration, use of intraoperative fluoroscopy, amount of intraoperative bleeding, need for blood transfusion, length of hospital stay, body mass index (BMI), smoking status, development of complications, and need for secondary surgery.

Surgical Procedure

In total, 53 patients underwent DAA, and 77 underwent PLA. All surgeries were performed by a single, experienced surgeon in both DAA and PLA approaches, who had completed the learning curve for these techniques during the study period. PLA was performed using the capsular closure technique described by Pellicci et al. (8). The Smith–Petersen approach, in which the anterior capsule is excised, was used for DAA. All patients received standard prophylactic antibiotics during the intraoperative and postoperative periods. The same implants were used in all patient groups, and all implants are uncemented. (Polarstem Hip Reconstruction System Smith & Nephew, Cordova, USA) Intraoperative fluoroscopy was used for appropriate component placement. During surgery, the surgeon performed the shuck test, kick test, and hip pistoning maneuvers in each patient to confirm hip stability. In the postoperative period, all patients received thromboprophylaxis, antiembolic stockings, and early mobilization to prevent venous thrombosis. The same pain control protocols were used in all patients. Patients were allowed to walk with a walker or crutches on the first postoperative day and to bear weight to the extent tolerated. Lower extremity isometric contraction exercises, hip and knee flexion-extension exercises, and exercises involving craniocaudal reciprocal movements of the pelvis were initiated in the second week postoperatively.

Patients in the PLA group were informed about the precautions to prevent posterior hip dislocation; for 1 month postoperatively, crossing the legs, hip flexion greater than 90°, and internal rotation on the operated side were not allowed. These precautions constituted the only difference in the rehabilitation protocols between the two groups. After achieving the functional range of motion, muscle strength, and stability, light sports activities were started 3 months postoperatively. To objectively evaluate the length of hospital stay, discharge criteria such as the ability to perform daily living activities without assistance, controllable pain with analgesics, no discharge from the wound site, and no abnormal findings in postoperative blood tests were applied.

Inclusion Criteria

Patients aged 50 years or older who underwent THA for primary hip osteoarthritis were included in this retrospective analysis. Patients who met the inclusion criteria underwent surgical treatment with a DAA or PLA.

Exclusion Criteria

Patients with inflammatory arthritis, hip osteonecrosis, degenerative hip dysplasia, femoral deformity, neuromuscular pathology, BMI >40 kg/m^2, previous ipsilateral hip surgery, failure to attend regular follow-up visits, or incomplete clinical records were excluded from the study.

Ethics Approval

All procedures were performed in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and the Declaration of Helsinki (1975, as revised in 2008). Our institution has granted ethics committee approval with protocol number (E-67961857-050.04-167783), and informed consent has been obtained from all participants.

Statistical Analysis

The distribution characteristics of continuous variables were evaluated using the Kolmogorov–Smirnov test, histogram analysis, and consideration of skewness and kurtosis values (±2). Categorical variables are presented as numbers and percentages [n (%)]. In contrast, continuous variables are presented as mean ± standard deviation for normally distributed variables and as median (interquartile range, IQR) for non-normally distributed variables. For intergroup comparisons, the Student's t-test was used for normally distributed variables and the Mann–Whitney U test for non-normally distributed variables. Pearson chi-square test or Fisher's Exact test, where appropriate, was used for comparisons of categorical variables. Time-dependent changes in clinical functional scores across surgical techniques were evaluated using a mixed-design analysis of variance (mixed ANOVA), with time as the within-subject factor and surgical technique as the between-subject factor. The assumption of sphericity was evaluated using the Mauchly test. The Greenhouse–Geisser correction was applied when the assumption was not met. To control for potential confounding effects of observed differences in baseline characteristics between groups, factors affecting the final control clinical scores were evaluated using multivariable linear regression analyses. Surgical technique was included as the primary independent variable, and the relevant preoperative score, follow-up time, BMI, and CCI were used as covariates. In all statistical analyses, a two-sided p-value <0.05 was considered statistically significant.

RESULTS

Table 1 presents the distribution of demographic and surgical characteristics. No significant differences were found between the DAA and PLA groups in age, gender, BMI, smoking status, or CCI (p>0.05). The side distribution differed between the groups (p=0.011). The follow-up time was longer in the PLA group than in the DAA group (p=0.002). When surgical characteristics were evaluated, the surgical time was longer in the DAA group than in the PLA group (p=0.008). No significant differences were observed between the groups in terms of intraoperative bleeding volume, transfusion requirements, or length of hospital stay (p>0.05).

Table 1. Distribution of Demographic and Surgical Characteristics

Variables (N=130)	Total	DAA (n=53)	PLA (n=77)	P-value
Gender				0.899
Male	72 (55.4)	29 (54.7)	43 (55.8)	
Female	58 (44.6)	24 (45.3)	34 (44.2)	
Age (years)	55±11	54±11	55±10	0.356
BMI (kg/m²)	26.5±3.8	27.2±3.7	26±3.9	0.083
Side	0.011			
Right	61 (46.9)	32 (60.4)	29 (37.7)	
Left	69 (53.1)	21 (39.6)	48 (62.3)	
Smoking	15 (11.5)	5 (9.4)	10 (13)	0.533
CCI	0.810			
0	58 (44.6)	22 (41.5)	36 (46.8)	
1	57 (43.8)	25 (47.2)	32 (41.6)	
2	15 (11.5)	6 (11.3)	9 (11.7)	
Follow-up period (months)	51.7±16.5	46.3±14	55.4±17.1	0.002
Surgery time (min)	103 (97-115)	110 (100-120)	101 (97-111)	0.008
Intraoperative bleeding amount (mL)	373.3±75.6	383.4±74.3	366.4±76.2	0.208
Transfusion requirement	22 (16.9)	12 (22.6)	10 (13)	0.149
Hospital stay (days)	2.9±0.9	2.8±0.9	3±0.9	0.089

Categorical variables are presented as numbers and percentages [n (%)], and continuous variables are presented as mean ± standard deviation for normally distributed variables and as median (interquartile range, IQR) for non-normally distributed variables. † BMI: Body mass index; ‡ CCI: Charlson comorbidity index

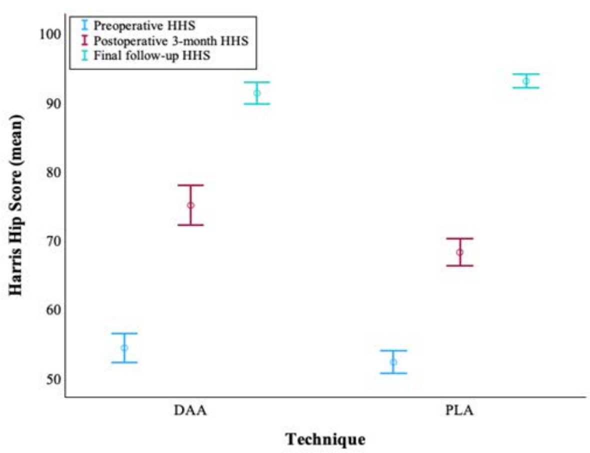

Figure 3. Time-dependent changes in mean HHS according to surgical technique. Error bars represent 95% confidence intervals.

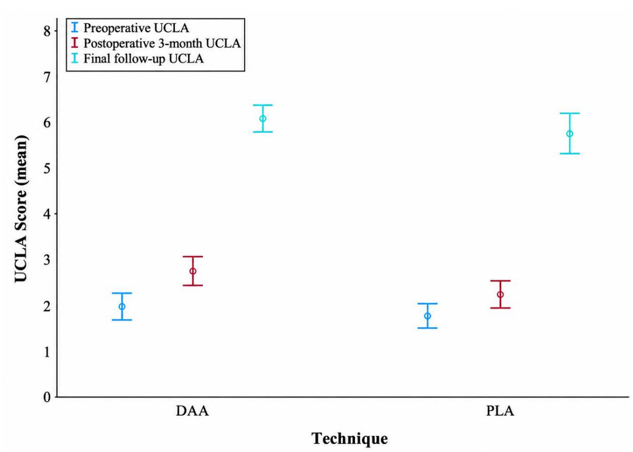

Figure 4. Time-dependent changes in mean UCLA score according to surgical technique. Error bars represent 95% confidence intervals.

Table 2 shows the time-dependent changes in clinical functional scores according to the surgical techniques applied to the patients. When evaluated using HHS (Figure 3), a significant increase over time was observed in both groups in the postoperative period (time effect, p<0.001). A significant difference was found between the DAA and PLA techniques in the overall intergroup assessment (group effect, p=0.010). Furthermore, the significant group-by-time interaction (p<0.001) indicates that the functional recovery pattern differs across surgical techniques. Looking at the mean values, HHS were higher in the DAA group, especially at the 3rd postoperative month, compared with the PLA group, and the difference between the groups decreased at the last follow-up. When UCLA activity scores (Figure 4) were examined, a significant increase was observed in both groups over time (p<0.001). A significant difference was found between the DAA and PLA groups in overall scores (p=0.008), and the group-by-time interaction was also significant (p=0.008). At the last follow-up measurements, the mean UCLA scores in the DAA group were higher than those in the PLA group. In terms of VAS

Table 2. Time-Dependent Changes in Clinical Scores

Variables (N=130)	DAA (n=53)	PLA (n=77)	P-value (Group)	P-value (Time)	P-value (Group x Time)
HHS			0.010	<0.001	<0.001
Before surgery	54.4±7.4	52.3±7.4			
3rd month post-operative	75.1±10.5	68.3±8.5			
Final follow-up	91.4±5.5	93.1±4.4			
UCLA activity score			0.008	<0.001	0.008
Before surgery	1.93±0.59	1.78±0.46			
3rd month post-operative	2.72±0.74	2.24±0.68			
Final follow-up	6.06±0.63	5.75±0.99			
VAS			<0.001	<0.001	0.142
Before surgery	5.9±0.7	6.5±1.1			
3rd month post-operative	1.3±0.9	1.5±0.8			
Final follow-up	0.4±0.2	0.8±0.7			

Changes over time were analyzed using repeated measures ANOVA. † HHS: Harris Hip Score; †† UCLA: University of California Los Angeles; ††† VAS: Visual Analog Scale

Table 3. Radiological Evaluation

Variables (N=130)	Total	DAA (n=53)	PLA (n=77)	P-value
Anteversion	18.5±4.2	16.2±4	20±3.7	<0.001
Inclination	43.4±3.3	45.3±2.5	42±3.2	<0.001
Lateral offset difference (mm)	0.4±1.5	0.3±1.5	0.5±1.5	0.478
Limb length discrepancy (mm)	0.3±1.6	0±1.7	0.5±1.5	0.068

Categorical variables are presented as numbers and percentages [n (%)], and continuous variables are presented as mean ± standard deviation

Table 4. Complications

	DAA Group n (%)	PLA Group n (%)	Total n (%)	P- value
Complications	8 (15.1)	3 (3.9)	11 (8.5)	0.049
Dislocation	-	1 (1.3)	1 (0.8)	
Infection	2 (3.8)	-	2 (1.5)	
Intraoperative fracture	1 (1.9)	1 (1.3)	2 (1.5)	
Wound healing problem	5 (9.4)	1 (1.3)	6 (4.6)	
Secondary surgery	2 (3.8)	-	2 (1.5)	0.164

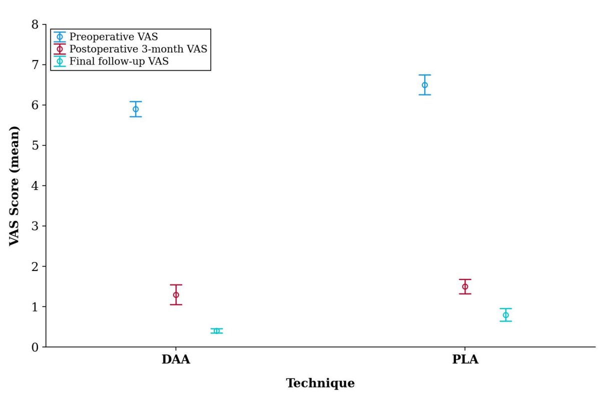

Figure 5. Time-dependent changes in mean VAS score according to surgical technique. Error bars represent 95% confidence intervals.

pain scores (Figure 5), a significant decrease was observed in both groups in the postoperative period (time effect, p<0.001). Although a significant difference was found between the groups in overall pain levels (group effect, p<0.001), the lack of a significant group-by-time interaction (p=0.142) indicates that the reduction in pain occurred similarly across the surgical techniques over time.

Radiological evaluations are presented in Table 3. Significant differences were found between the groups in terms of anteversion and inclination angles on radiological evaluation (p<0.001). However, no significant difference was observed between the groups in terms of lateral offset difference and limb length discrepancy (p>0.05). Complications are presented in Table 4. The total complication rate was higher in the DAA group than in the PLA group (p=0.049). No significant difference was found between the groups regarding the need for secondary surgery (p=0.164). Low rates of dislocation, infection, intraoperative fracture, and wound healing problems

Table 5. Multivariable Linear Regression Analysis of Factors Affecting the Final Control Clinical Score

Variables	B	Standard Error	t	P-value
HHS				
Pre-operative HHS	0.025	0.060	0.420	0.675
Technique (DAA vs PLA)	1.610	0.953	1.690	0.094
Follow-up time	0.472	0.568	0.348	0.278
BMI	0.009	0.028	0.323	0.747
CCI	0.382	0.898	0.425	0.671
Model Summary: R=0.183; R^2=0.034; Adjusted R^2=0.003; F=1.086; p=0.366				
UCLA activity score				
Pre-operative UCLA	0.371	0.086	4.329	<0.001
Technique (DAA vs PLA)	0.908	0.661	1.374	0.172
Follow-up time	0.648	0.382	0.442	0.536
BMI	-0.003	0.019	-0.176	0.860
CCI	0.793	0.624	1.270	0.206
Model Summary: R=0.411; R^2=0.169; Adjusted R^2=0.142; F=6.334; p<0.001				
VAS				
Pre-operative VAS	-0.100	0.064	-1.576	0.117
Technique (DAA vs PLA)	0.478	0.134	3.564	<0.001
Follow-up time	0.694	0.824	0.126	0.745
BMI	-0.003	0.004	-0.673	0.502
CCI	0.057	0.122	0.463	0.644
Model Summary: R=0.323; R^2=0.104; Adjusted R^2=0.076; F=3,643; p=0.008				

† HHS: Harris Hip Score; †† UCLA: University of California Los Angeles; ††† VAS: Visual Analog Scale; †††† BMI: Body mass index; ††††† CCI: Charlson comorbidity index
Technique was entered as a categorical factor variable (Reference: DAA).

were observed in both groups.

Table 5 presents the results of the multivariable linear regression analysis evaluating the factors affecting the final control clinical scores. The model created was found to be statistically insignificant (F=1.086; p=0.366) for HHS. No independent effects of preoperative HHS, surgical technique, follow-up time, BMI, and CCI variables were found on the final control HHS (p>0.05). However, the models created for the UCLA activity score (F=6.334; p<0.001) and VAS score (F = 3.643; p = 0.008) were found to be statistically significant. According to the analysis results, the preoperative UCLA score was identified as an independent predictor of the final control UCLA score (B=0.371; p<0.001). No independent effects of surgical technique, follow-up time, BMI, and CCI variables on final control UCLA scores were observed (p>0.05). The analysis revealed that the surgical technique was an independent predictor of the final control VAS score (B=0.478; p<0.001). Preoperative VAS score, follow-up time, BMI, and CCI variables did not have an independent effect on the final control VAS scores (p >0.05).

DISCUSSION

In our study, the lack of differences between the DAA and PLA groups in terms of age, sex, body mass index (BMI), smoking status, and CCI in patients undergoing THA is consistent with the literature, which shows that these two approaches are generally applied in similar patient populations. Retrospective cohort and meta-analysis studies, in particular, have reported that surgical approach preference is largely determined by the surgeon's experience and center preference, while demographic and comorbidity profiles do not differ significantly (9, 10). Although the difference in side distribution points to a possible methodological bias, there is no strong evidence that it directly affects clinical outcomes; therefore, while reporting it is important in interpreting the results, it does not appear to be a major confounding variable. The longer follow-up period in the PLA group can be explained by the fact that DAA is a relatively new technique with a more pronounced learning curve, as reported in the literature. The fact that the PLA approach has been used as a "traditional" method for a longer time in many centers results in PLA cohorts with longer follow-up data. This situation requires careful interpretation, especially when comparing late-stage complications and revision rates. This is because shorter follow-up periods in the DAA group can cause late-onset problems to appear lower than they actually are. Meta-analyses also highlight that a significant portion of studies on DAA focus on short- and medium-term outcomes, while long-term data are relatively limited.

The finding that surgical time was significantly longer in the DAA group is consistent with the existing literature. Both in single-surgeon series and multicenter studies, DAA has been reported to be associated with longer operation times than PLA, especially in the early stages of the learning curve, and that this difference may decrease but not completely disappear as experience increases (10-12). While some studies have shown that DAA is associated with greater intraoperative blood loss in addition to longer surgical time (13), it is noteworthy that no difference was found in the amount of bleeding and transfusion needs in our series. This finding is further supported by recent studies reporting comparable perioperative blood loss between different surgical approaches (14-16). It may be related to the surgeon's experience, hemostasis techniques, anesthesia protocols, and blood transfusion thresholds applied in our center, and suggests that DAA is not necessarily associated with "greater blood loss," and that this disadvantage can be minimized with appropriate surgical and perioperative management. The lack of difference between the groups in terms of length of stay is somewhat at odds with some meta-analyses and cohort studies in the literature. Many studies have reported that DAA is associated with shorter hospital stays and faster early functional recovery (10,15); however, this advantage can be diminished in centers with standardized rehabilitation protocols, early mobilization policies, and strict discharge criteria. Our data suggest that similar rehabilitation and discharge algorithms were applied to both approaches in our center, and that the surgical approach alone did not determine the length of stay. From this perspective, this study provides a nuanced contribution, consistent with the literature, showing that the theoretical advantages of DAA become clinically apparent only when considered in conjunction with organizational and rehabilitation processes.

These results reflect the functional outcomes of THA between the DAA and PLA groups, consistent with the literature; however, this remains a topic of debate. Our study showed that HHS increased significantly over time in both groups. However, a clear superiority of the DAA group was observed, particularly at 3 months postoperatively, with the difference decreasing at the final follow-up. This pattern aligns with numerous studies reporting an early functional gain advantage for DAA, with scores converging in the medium-to long-term. A 2025 review reported that DAA provided a significant advantage over the posterior approach in terms of HHS, especially at early follow-ups (2–6 weeks); however, the difference disappeared by 6–12 months (12,17,18). Similarly, in the retrospective study by Wang et al. [10], HHS were significantly higher in the DAA group than in the PLA group at 6 weeks, 3 months, and 6 months; but the long-term difference was minimized. In our findings, the significant difference in favor of DAA at 3 months and the decrease in this difference at the last follow-up can be interpreted as a typical pattern reflecting the muscle-sparing and early mobilization advantages of DAA, as well as the "catch-up" potential of the PLA group over time. The significant group × time interaction statistically confirms this "early advantage–late convergence" pattern described in the literature.

The significant increase in UCLA activity scores over time in both groups is an expected result, consistent with pain reduction and increased functional capacity after TKA. However, the fact that the DAA group demonstrated higher UCLA scores than the PLA group at the final follow-up can be explained by the literature, even though the UCLA activity score has been evaluated in a limited number of studies. This may be explained by the muscle-sparing nature of DAA, which uses an intermuscular interval without detaching muscles, whereas the posterior approach involves splitting the gluteus maximus and releasing the short external rotators, leading to greater soft-tissue disruption. Wang et al. (10) reported that the DAA group achieved lower early postoperative muscle damage, higher muscle strength, and better hip joint function (including pain level, activity capacity, activities of daily living, and overall activity degree). In that study, postoperative creatine kinase (CK) levels were significantly lower in the DAA group than in the PLA group, and a significant negative correlation was identified between CK levels measured at 48 h and the 6-month HHS. This finding suggests that early muscle damage may be associated with long-term functional outcomes. Furthermore, the study reported that muscle strength values were significantly higher in the DAA group on postoperative days 4 and 7; on day 7, pain level, activity capacity, activities of daily living, and overall hip function were also superior in the DAA group compared with those in the PLA group. These early advantages may translate into a positive impact on long-term functional capacity. Accordingly, the higher late-term UCLA activity scores observed in the DAA group in our study support this interpretation. Although many studies have reported comparable overall functional scores in the long term (12,15,17), a sustained advantage in favor of DAA may be evident in measures that more sensitively assess activity level. Therefore, the higher end-stage UCLA scores in the DAA group can be considered a unique and hypothesis-generating finding of our study; it would be appropriate to discuss this alongside factors such as patient profile, rehabilitation protocols, and surgeon experience (13,19).

The significant decrease in VAS pain scores over time in both groups and the insignificant group × time interaction indicate that the pattern of pain improvement follows a similar course, independent of the surgical approach. Although differences in general pain levels were observed between the groups, the parallelism of the time-course curves suggests that the long-term effects of DAA and PLA are similar. Some studies have reported that DAA is associated with lower VAS pain scores on postoperative days 1 and 2 compared to the posterior approach (14,17). In contrast, other investigations have found no significant difference between surgical approaches during the early postoperative period (days 1 and 2) (20). Furthermore, Peng et al. (17) reported no difference in pain scores between the groups at the 1-year postoperative follow-up. Although detailed VAS data for the early postoperative period are not reported in our study, the strong time effect and insignificant interaction are consistent with the "small early advantage – equalization in the long term" model in the literature. In this respect, the general opinion that the choice of surgical approach affects early postoperative comfort and rehabilitation speed more than the long term in terms of pain is supported.

The significant differences in the anteversion and inclination angles between the DAA and PLA groups in our study suggest that the placement of the acetabular component is particularly sensitive to the surgical approach. While Sun et al.'s (9) meta-analysis comparing DAA and PLA did not report a significant difference in inclination, it highlighted that acetabular component anteversion was higher in the PLA group in some studies and that a more "controlled" anteversion could be achieved with DAA. Surgeons who prefer the anterior approach avoid excessive anteversion to reduce the risk of anterior dislocation. Nevertheless, conflicting results exist in the literature; some studies have reported greater cup anteversion with the DAA, although this difference did not reach statistical significance (21). In contrast, Barrett et al. (22) found a greater inclination and lower anteversion with DAA, suggesting that these differences are likely surgeon-dependent. From this perspective, the anteversion and inclination differences observed in our study are consistent with the literature, suggesting that fluoroscopy use and patient positioning may influence component placement.

Furthermore, these findings may reflect the deliberate component positioning strategies adopted by the surgeon to remain within the safe zone and minimize the risk of dislocation associated with the selected surgical approach. Although DAA has been theoretically suggested to provide superior component control and limb length restoration, no significant differences were observed between the groups regarding lateral offset difference or limb length discrepancy in our study. This finding is consistent with the current literature (9,13,21). The absence of significant differences between the groups in terms of lateral offset restoration and limb length discrepancy, both of which are known to affect hip biomechanics and postoperative function, together with the fact that the mean anteversion and inclination values in both groups were within the accepted safe zones, suggest that the observed radiological differences may not have had a clinically meaningful impact on functional outcomes. Overall, our findings support the prevailing view in the literature that both approaches can provide comparable radiological and clinical outcomes when performed by experienced surgeons using modern planning and measurement techniques.

Complications occurred in 8.5% (n=11) of the patients included in the study. Early infections requiring secondary surgical intervention were observed in two patients in the DAA group, which is consistent with previous studies reporting that prolonged operative time is associated with an increased risk of surgical site infection (23,24). Although the posterior approach has classically been associated with a higher risk of dislocation, this difference has been reported to decrease significantly with the development of capsular and soft-tissue repair techniques. (8) The absence of a significant difference between the groups in terms of the need for secondary surgery suggests that most complications were minor in nature.

The low rates of dislocation, infection, intraoperative fracture, and wound-healing problems observed in both groups in our series are consistent with the data reported from high-volume centers and are likely related to surgeon experience, appropriate patient selection, and the standardization of perioperative protocols (9,13). This finding supports the literature suggesting that complication rates can be kept low when proper surgical techniques and perioperative protocols are applied, regardless of the surgical approach (2). Nevertheless, in our study, the significantly higher overall complication rate observed in the DAA group than in the PLA group (p=0.049) is consistent with studies highlighting the technical challenges associated with the DAA approach (9). Previous studies have shown that the risk of postoperative complications may increase during the surgeon's learning curve when performing DAA (25,26). In the large-scale meta-analysis by Sun et al. [9], although all surgeons performing THA via DAA were reported to have extensive experience, higher complication rates were still observed in the DAA group than in the PLA group. Therefore, it has been emphasized that DAA is a technically more demanding approach that should be performed by experienced hip surgeons and may be associated with higher complication rates during the initial adoption phase.

In our study, the significant positive effect of the preoperative UCLA activity score on postoperative activity levels indicates that patients with higher preoperative activity levels tend to achieve higher levels of physical activity in the postoperative period. This finding is consistent with previous studies reporting that insufficient physical activity prior to total hip or knee arthroplasty is a strong predictor of persistent limitations in physical activity at 6 and 12 months after surgery (27-29). Therefore, we believe that interventions aimed at increasing physical activity in the preoperative period may have significant potential for improving postoperative activity levels. Current evidence has shown that preoperative rehabilitation improves muscle strength and gait function and facilitates earlier postoperative mobilization in patients (30,31).

Strengths and Limitations

This study has several strengths. First, all procedures were performed by a single experienced surgeon who had completed the learning curve for both approaches, thereby minimizing variability related to the surgical technique. Second, perioperative management, rehabilitation protocols, pain control strategies, and discharge criteria were standardized for all patients, reducing potential confounding factors associated with postoperative care. In addition, both clinical (HHS, UCLA, and VAS) and radiological parameters were comprehensively evaluated, allowing a multidimensional assessment of surgical outcomes. The use of multivariable regression analysis to evaluate factors affecting final clinical outcomes further strengthened the analytical framework of the study.

Nevertheless, several limitations should be acknowledged. The retrospective design may have introduced selection bias and limited causal inferences. The study was conducted at a single center with a relatively moderate sample size, which may have affected the generalizability of the findings. Finally, the lack of randomization in surgical approach selection may have introduced treatment allocation bias.

CONCLUSION

This study demonstrated that both approaches in THA can provide safe and satisfactory clinical, functional, and radiological outcomes when appropriate surgical planning is applied. Although DAA provided some early functional advantages, long-term outcomes were largely comparable between the two approaches. Therefore, neither approach could be considered clearly superior based on the findings of the present study.

DECLARATIONS

Conflict of Interest: *The authors declare that they have no conflict of interest.*

Financial Disclosure: *The authors declare that they have no relevant financial relationships to disclose.*

Acknowledgements: *The authors would like to thank all patients who participated in this study and the clinical staff involved in their care.*

Funding: *No financial support was received for this study.*

Author Contributions: *Concept: U.Ö. Design: U.Ö. Data Collection or Processing: U.Ö., M.F.S. Analysis or Interpretation: M.F.S. Literature Search: U.Ö., M.F.S. Writing: U.Ö.*

Address correspondence to: *Ugur Ozdemir, Bandırma Onyedi Eylül University Faculty of Medicine, Department of Orthopaedics and Traumatology, Balıkesir, Türkiye*
e-mail: *ugurozdemir.md@gmail.com*

REFERENCES

1. Anger M, Valovska T, Beloeil H, et al. PROSPECT guideline for total hip arthroplasty: A systematic review and procedure-specific postoperative pain management recommendations. Anaesthesia. 2021;76(8):1082-97. doi:10.1111/anae.15498
2. Ang JJM, Onggo JR, Stokes CM, et al. Comparing direct anterior approach versus posterior approach or lateral approach in total hip arthroplasty: A systematic review and meta-analysis. Eur J Orthop Surg Traumatol. 2023;33(7):2773-92. doi:10.1007/s00590-023-03528-8
3. Jin Z, Wang L, Qin J, et al. Direct anterior approach versus posterolateral approach for total hip arthroplasty in the treatment of femoral neck fractures in elderly patients: a meta-analysis and systematic review. Ann Med. 2023;55(1):1378-92. do i:10.1080/07853890.2023.2193424
4. Singh G, Khurana A, Gupta S. Evaluation of Direct Anterior Approach for Revision Total Hip Arthroplasty: A Systematic Review. Hip Pelvis. 2021;33(3):109-19. doi:10.5371/hp.2021.33.3.109
5. Leibovitch L, Machinski E, Fernandes A, et al. Direct anterior vs other surgical approaches in patients with lumbar stiffness undergoing total hip arthroplasty: A systematic review and meta-analysis. Arch Orthop Trauma Surg. 2024;145(1):48. doi:10.1007/s00402-024-05682-y
6. Tsai SHL, Lau NC, Chen WC, et al. Total hip arthroplasty has higher complication rates in patients with stiff spines: A systematic review and network meta-analysis. J Orthop Surg Res. 2022;17(1):353. doi:10.1186/s13018-022-03237-8
7. Lewinnek GE, Lewis JL, Tarr R, et al. Dislocations after total hip-replacement arthroplasties. J Bone Joint Surg Am. 1978;60(2):217-20.
8. Pellicci PM, Bostrom M, Poss R. Posterior approach to total hip replacement using enhanced posterior soft tissue repair. Clin Orthop Relat Res. 1998;(355):224-28. doi:10.1097/00003086-199810000-00023
9. Sun X, Zhao X, Zhou L, et al. Direct anterior approach versus posterolateral approach in total hip arthroplasty: A meta-analysis of results on early post-operative period. J Orthop Surg Res. 2021;16(1):69. doi:10.1186/s13018-021-02218-7
10. Wang Z, Bao HW, Hou JZ, et al. The Direct Anterior Approach versus the Posterolateral Approach on the Outcome of Total Hip Arthroplasty: A Retrospective Clinical Study. Orthop Surg. 2022;14(10):2563-70. doi:10.1111/os.13444
11. Fransen B, Hoozemans M, Vos S. Direct anterior approach versus posterolateral approach in total hip arthroplasty: One surgeon, two approaches. Acta Orthop Belg. 2016;82(2):240-48.
12. Wang Z, Hou JZ, Wu CH, 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(1):229. doi:10.1186/s13018-018-0929-4
13. Nassar JE, Ammar LA, Madi M, et al. Direct Anterior Approach and Posterior Approach for Total Hip Arthroplasty: A Systematic Umbrella Review of Meta-Analyses of Randomized Controlled Trials. Orthop Rev (Pavia). 2025;17:137665. doi:10.52965/001c.137665
14. Yang XT, Huang HF, Sun L,et al. Direct Anterior Approach Versus Posterolateral Approach in Total Hip Arthroplasty: A Systematic Review and Meta-analysis of Randomized Controlled Studies. Orthop Surg. 2020;12(4):1065-73. doi:10.1111/os.12669
15. Awad ME, Farley BJ, Mostafa G, et al. Direct anterior approach has short-term functional benefit and higher resource requirements compared with the posterior approach in primary total hip arthroplasty : A meta-analysis of functional outcomes and cost. Bone Joint J. 2021;103-b(6):1078-87. doi: 10.1302/0301-620X.103B6.BJJ-2020-1271.R1.
16. Yan L, Ge L, Dong S, et al. Evaluation of Comparative Efficacy and Safety of Surgical Approaches for Total Hip Arthroplasty: A Systematic Review and Network Meta-analysis. JAMA Netw Open. 2023;6(1):e2253942. doi: 10.1001/jamanetworkopen.2022.53942.
17. Peng L, Zeng Y, Wu Y, et al. Clinical, functional and radiographic outcomes of primary total hip arthroplasty between direct anterior approach and posterior approach: A systematic review and meta-analysis. BMC Musculoskeletal Disorders. 2020;21(1):338. doi:10.1186/s12891-020-03318-x
18. Zhao HY, Kang PD, Xia YY, et al. Comparison of early functional recovery after total hip arthroplasty using a direct anterior or posterolateral approach: A randomized controlled trial. J Arthroplast. 2017;32:3421–28. doi: 10.1016/j.arth.2017.05.056. Epub 2017 Jun 8.
19. Yang Z, Feng S, Guo KJ, et al. Patient-reported results of simultaneous direct anterior approach and posterolateral approach total hip arthroplasties performed in the same patients. J Orthop Traumatol. 2021;22(1):46. doi:10.1186/s10195-021-00611-w
20. Gazendam A, Bozzo A, Ekhtiari S, et al. Short- term outcomes vary by surgical approach in total hip arthroplasty: A network meta-analysis. Arch Orthop Trauma Surg. 2022;142(10):2893-02. doi:10.1007/s00402-021-04131-4
21. Moerenhout K, Derome P, Laflamme GY, et al. Direct anterior versus posterior approach for total hip arthroplasty: A multicentre, prospective, randomized clinical trial. Can J Surg. 2020;63(5):E412-E417. doi:10.1503/cjs.012019
22. Barrett WP, Turner SE, Leopold JP. Prospective randomized study of direct anterior vs postero-lateral approach for total hip. J Arthroplasty 2013;28:1634-8. doi: 10.1016/j.arth.2013.01.034.
23. Pugely AJ, Martin CT, Gao Y, et al. The incidence of and risk factors for 30 day surgical site infections following primary and revision total joint arthroplasty. J Arthroplasty. 2015 Sep;30(9

Suppl):47-50. doi: 10.1016/j.arth.2015.01.063.

24. George J, Mahmood B, Sultan AA, et al. How fast should a total knee arthroplasty be performed? An analysis of 140,199 surgeries. J Arthroplasty. 2018;33(8):2616–22.
25. Spaans AJ, van den Hout JA, Bolder SB. High complication rate in the early experience of minimally invasive total hip arthroplasty by the direct anterior approach. Acta Orthop 2012;83:342-46. doi: 10.3109/17453674.2012.711701.
26. Poehling-Monaghan KL, Kamath AF, Taunton MJ, et al. Direct anterior versus miniposterior THA with the same advanced perioperative protocols: surprising early clinical results. Clin Orthop Relat Res 2015;473:623-31. doi: 10.1007/s11999-014-3827-z.
27. Hodges A, Harmer AR, Dennis S, et al. Prevalence and determinants of physical activity and sedentary behaviour before and up to 12 months after total knee replacement: a longitudinal cohort study. Clin Rehabil. 2018;32(9):1271-83. doi:10.1177/0269215518769986
28. Harding P, Holland AE, Delany C, et al. Do activity levels increase after total hip and knee arthroplasty? Clin Orthop Relat Res 2014; 472(5): 1502–11. doi: 10.1007/s11999-013-3427-3.
29. Naal F, Impellizzeri F, Leunig M. Which is the best activity rating scale for patients undergoing total joint arthroplasty? Clin Orthop Relat Res 2009; 467(4): 958–65. doi: 10.1007/s11999-008-0358-5.
30. Gilbey HJ, Ackland TR, Wang AW, et al. Exercise improves early functional recovery after total hip arthroplasty. Clin Orthop Relat Res. 2003;408:193-00. doi: 10.1097/00003086-200303000-00025.
31. Wang AW, Gilbey HJ, Ackland TR. Perioperative exercise programs improve early return of ambulatory function after total hip arthroplasty: a randomized, controlled trial. Am J Phys Med Rehabil. 2002;81:801–06. doi: 10.1097/00002060-200211000-00001.