RESEARCH ARTICLE / *Araştırma Makalesi*

At Least Four-Year Follow-Up Results of Total Hip Replacement Surgery Usıng A Direct Anterior Approach

Direk Anteriror Yaklaşım Kullanılarak Uygulanan Total Kalça Protez Cerrahisinin En Az Dört Yıllık Takip Sonuçları

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Abstract

Introduction	This study aims to evaluate the clinical and radiological results of patients who were followed for at least four years after total hip arthroplasty, which was performed using a direct anterior approach and to compare the results with different surgical approaches in the literature.
Materials and Methods	The study included 37 patients who underwent total hip replacement surgery using the direct anterior approach. Harris hip scores and lower extremity functional scores were recorded. The correlations between the scores and gender, body mass index, length of hospital stay, and inclination angle were examined.
Results	Of the cases, 26 (70.3%) were female and 11 (29.7%) were male. The mean age was 51.2 (26-76) years. The patients were followed up for an average of 58 (48-72) months. No significant difference was determined between the improvement in Harris hip score and gender, age, body mass index, and length of hospital stay. Postoperative acetabular inclination was 40.8° (35 - 55). One of the patients had early dislocation and three patients had serous wound draiage. Three patients developed n.cutaneus femoris lateralis injury. Five patients had periprosthetic fracture during surgery.
Conclusion	In our study, it was seen that patients had successful and fast functional results when total hip replacement was performed using a direct anterior approach. Compared to the literature, faster recovery was observed in the early period compared to other approaches; however, no difference was seen between the approaches in the mid- and long term.
Keywords	Direct anterior approach, Total hip arthroplasty, mid-term results

Öz

Amaç	*Bu çalışmanın amacı, direkt anterior yaklaşım kullanılarak uygulanan ve en az 4 yıl takip edilen total kalça artroplastisi ile tedavi edilmiş hastaların klinik ve radyolojik sonuçlarının değerlendirilmesi, elde edilen sonuçların literatürdeki farklı cerrahi yaklaşımlar ile karşılaştırılmasıdır.*
Yöntem ve Gereçler	*Direkt anterior yaklaşım kullanılarak total kalça protezi uygulanan 37 hasta çalışmaya alındı. Harris kalça skorları ve alt ekstremite fonksiyonel skorları kaydedildi. Elde edilen skorlar ile cinsiyet, vücut kitle indeksi, yatış süreleri ve inklinasyon açısı arasındaki ilişki araştırıldı.*
Bulgular	*Olguların 26'sı kadın (%70,3), 11'i erkek (%29,7) olup ortalama yaş 51.2(26-76) idi. Hastalar ortalama 58 (48-72) ay takip edildi. Harris kalça skorundaki düzelme ile cinsiyet, yaş, vücut kitle indeksi ve yatış süreleri arasında anlamlı bir fark görülmedi. Ameliyat sonrası grafilerde asetabular inklinasyon ortalama olarak 40,8° (35-55) ölçüldü. Hastalarımızın birinde erken dönem dislokasyon görüldü. Üç hastada seröz akıntı gelişti. Üç hastada n.cutaneus femoris lateralis hasarı gelişti. Beş hastada ameliyat sırasında periprostetik kırık görüldü.*
Sonuç	*Yaptığımız çalışmada, direkt anterior yaklaşım kullanarak uygulanan total kalça protezi, uygun endikasyon ve cerrahi teknikle yapıldığında hastalarda başarılı ve hızlı fonksiyonel sonuçlar elde edildiği görülmektedir. Literatür ile karşılaştırıldığında erken dönemde diğer yaklaşımlara göre daha hızlı iyileşme görülmekte fakat orta ve uzun dönemde yaklaşımlar arasında fark görülmemektedir.*
Anahtar Kelimeler	*Direk anterior yaklaşım, kalça artroplasitisi, orta dönem sonuçlar*

INTRODUCTION

Total hip arthroplasty ranks first among all orthopedic surgeries with best outcomes. Among approaches applied in surgery, which one is superior is still controversial.[1–3] The most commonly used approaches are the anterolateral, direct lateral, posterolateral, and anterior approaches. There are structures that require attention and muscle and tendon structures that need to be dissected in each approach. The direct anterior approach (DAA) was defined many years ago and its popularity has been rapidly increasing in recent years.[4] The surgery is completed by entering the area between the tensor fascia lata and sartorius muscles, without cutting any muscles. Studies have shown that DAA has many advantages compared to other approaches, such as faster rehabilitation, less pain, and decrease in blood loss and hospital stays.[5–8] However, the long learning curve of DAA is one of its disadvantages.

This study aimed to evaluate the clinical and radiological results of patients who had been treated with total hip arthroplasty using DAA and followed up for at least four years.

MATERIALS and METHODS

In this retrospective study, we included 37 patients with primary and secondary hip osteoarthritis, who underwent total hip arthroplasty with DAA and were regularly followed up. Total hip replacement was performed on 42 hips of 37 patients. Patients who came for regular checkups were included in the study. Preoperatively, all patients were evaluated clinically, radiologically, and functionally and their laboratory findings were examined. The 'template' procedure was performed using hip radiographs taken in accordance with the standards. The preoperative and postoperative second-year functional results of the patients were evaluated and scored according to the Harris hip function evaluation scale.

Surgical procedure

The patient was anesthetized before the surgery, taken on a standard operating table, and placed in the supine position (Figure 1). The pelvis was raised approximately 5 cm with supports.

Figure 1: A support of approximately 5 cm is placed under the pelvis

General anesthesia was administered to all patients and a skin incision of approximately 8-9 cm was made on the cleavage area between the sartorius and tensor fascia. Acetabulum was rimerized at 40-45 degrees of abduction and 10-15 degrees of anteversion under fluoroscopy control and the appropriate acetabular cup was placed in the anteversion and abduction determined under fluoroscopy control (Figure 2),

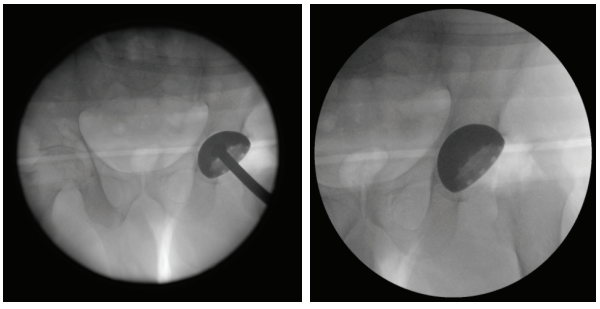

Figure 2: Evaluation of the appropriate position of the acetabular component

Soft tissue releases were performed to reach the femoral canal; the table was flexed approximately 30 degrees; the opposite leg was abducted and the hip was placed in the position of '4' figure (Figure 3).

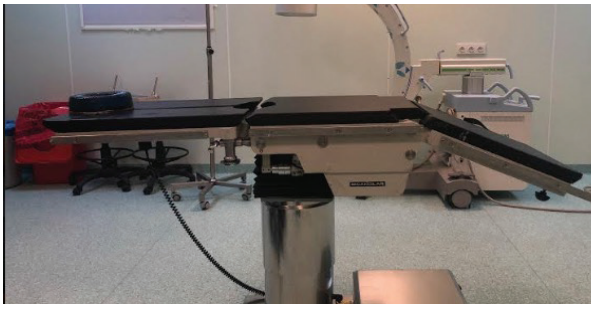

Figure 3: The table is tilted approximately 30° down to reach the femur.

The hip was examined with appropriate trials. The stability of the hip and the equality of length of the legs were checked. Equality of the legs was assessed through medial malleolar examination and with a metal stick passing through the lower border of both ischium (Figure 4). Cementless femoral stem and cementless alumina-ceramic head were used in all patients. The patients were not drained. Postoperatively, patients started physical therapy and walked within 24 hours.

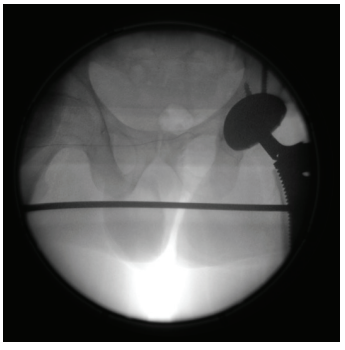

Figure 4: Evaluation of hip height difference

The patients were invited to the outpatient clinic at the second week, sixth week, third month, sixt month, and first year after discharge and for annual follow-ups. Hemogram values on the first and third days were recorded. VAS scores were recorded at the sixth-month follow-up. Functional outcomes were assessed at postoperative sixth month according to the Harris hip function evaluation scale.

Statistical analysis

The data obtained in the research were transferred to the computer environment and analyzed in the SPSS 18.0 program. Number, percentage, min, max, and mean±standard deviation were used in descriptive statistics. The student t-test was used for comparison of independent groups and paired t-test was used for comparison of dependent groups. Pearson correlation analysis was performed for the correlation analysis of continuous data. A p-value of <0.05 was considered statistically significant.

Ethical Aspects

Ethics Committee approval was obtained from the Ethics Committee of Sakarya University Faculty of Medicine Dean's Office.

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RESULTS

The demographic characteristics and diagnoses of the patients included in the study are presented in Table1. Preoperatively, all hips were in the weak group according to the Harris hip score whereas all patients were in the good and excellent groups at the end of an average of 32-month follow-up. Six of them had good results and 31 had excellent results.

Tablo 1: Age, gender, BMI, and etiology of the patients		
Mean Age (min. Max. Range)		**54.68 (26- 76)**
Gender	**Male**	26 70.2%
	Female	11 29.8%
Side of operation site	**Right**	19
	Left	13
	Bilateral	5
Body mass index (BMI)	**Obese**	15
	Non-obese	22
Etiology	**Primary coxarthrosis**	20 47.5%
	Developmental hip dysplasia	14 33.3%
	Avascular necrosis	5 11.9%
	Femoral neck fracture	3 7.1%

Acetabular inclination in postoperative radiographs was measured. Mean acetabular inclination was 40.8° (35 - 55). When the data were compared according to gender, there was no significant difference in terms of BMI, and postoperative Harris hip score, The data are presented in Table 2 in detail.

Table 2: Comparison of Data According to Gender			
Gender	**Female (mean±sd) n:26**	**Male (mean±sd) n:11**	**P-value**
Harris hip score postoperative	95.84±3.91	94.45±2.72	0.27
BMI	28.13±3.90	29.55±3.30	0.28

When the data of those aged 60 and over and those younger than 60 were compared, there was no significant difference in terms of postoperative Harris hip score, length of hospital stay, postoperative inclination, duration of follow-up, and BMI (Table 3).

Table 3: Comparison According to Age Group			
Age	**<60 (mean±sd) n:18**	**60 and over (mean±sd) n:19**	**P-value**
Harris Hip Score postoperative	95.72±2.86	95.10±4.36	0.59
BMI	28.59±4.74	28.52±2.34	0.95
Length of Hospital Stay (day)	3.24±1.78	2.84±1.83	0.49
Postoperative Inclination	41.81±5.81	39.95±4.73	0.27

When the data of the group with a BMI of 30 and above and those with a BMI of less than 30 were compared, no significant difference was found in terms of Harris hip score, length of hospital stay, postoperative inclination, and duration of follow-up. (Table 4)

Table 4: Comparison According to BMI			
BMI	**<30 (mean±sd) n:22**	**30 and over (mean±sd) n:15**	**P-value**
Harris Hip Score postoperative	95.87±3.30	94.82±4.03	0.36
Length of Hospital Stay (day)	3.30±1.96	2.71±1.53	0.30
Postoperative Inclination	40.74±5.06	41.18±5.85	0.80

Our patients were admitted to the hospital on the day before the surgery. The mean postoperative length of hospital stay was three days (minimum 1, maximum 8) and 12 patients were discharged within the first 24 hours. The mean duration of postoperative follow-up of the patients was 32 (minimum 8, maximum 52) months. When the data of those with one day of hospitalization and those with more than one day were compared, no significant difference was found in terms of postoperative Harris hip score and time of walking. (Table 5)

Table 5: Comparison According to Length of Hospital Stay			
Length of hospital stay	**1 day (mean±sd) n:12**	**More than 1 day (mean±sd) n:30**	**P-value**
Harris Hip Score postoperative	94.40±3.45	95.86±3.66	0.24

The mean preoperative Harris hip score of the patients was 48±7.94 (minimum 38-maximum 65) and the mean postoperative score was 95.43±3.62 (83-100) during outpatient clinic control examinations. Significant improvement was seen between preoperative and postoperative Harris hip scores (p=0.001).

Complications

A serous wound drainage occurred at the early postoperative wound site in three of 42 hips who underwent total hip arthroplasty in our clinic. In all three patients, BMI was above 30. The discharge was terminated in two of these patients without the need for a radical intervention other than antibiotic therapy and dressing. Debridement was performed on one patient. Since the infection was not eliminated, the prosthesis was removed in the third postoperative week and an antibiotic spacer was implemented. This patient was scheduled for revision surgery but died due to internal reasons.

Nervus femoris cutaneus lateralis is at risk in total hip arthroplasty. In three patients, it was damaged with the direct anterior approach. The complaints of the patients were numbness and burning sensation on the tigh anterolateral. In two of these patients' complaints disappeared in the sixth week. In five cases, a femoral fracture occurred during the surgery. Of these fractures, three were calcareous fissures and two were trochanter major type. Fractures were fixed with cerclage. It was observed that all cases resulted in the complete union at the outpatient clinic examinations in the sixth month. The prosthesis was dislocated in one patient on the first postoperative day. It was reduced at the bedside before discharge and no dislocation was observed in the fifth-year follow-up. All complication data are presented in Table 6.

Table 6: Complications	
Wound problems	
Superficial SSI	2
Deep PJI	1
Dislocation	1
Periprosthetic fracture	
Vancouver A	5
Vancouver B	0
Vancouver C	0
Aseptic Loosening	0
Revision	
Acetabular Component	0
Femoral Component	0
Total Revision	1
N.Cutaneus femoris lateralis injury	3

DISCUSSION

Many studies claimed that total hip arthroplasty surgeries performed using the direct anterior approach (DAA) provide less muscle damage, faster recovery, and a more comfortable walk in the postoperative period compared to other approaches.[9–12] In a study, 150 cases of total hip replacement were examined: a posterior approach was used in 50 patients and a direct anterior approach was used in 100 patients. It was observed that the length of hospital stay was shorter in the anterior group. In the first six weeks after surgery, pain and the use of narcotic analgesics were less in the anterior group. Compared to the control group, patients who used the direct anterior approach showed faster recovery.[8] Bergin PF et al. compared the direct anterior and posterior approaches in terms of muscle damage and inflammation markers. In all patients, serum creatinine kinase (CK) and inflammation markers were checked preoperatively and on the postoperative first and second days. Inflammation markers were found to be low in the direct anterior group. CK elevation was 5.5 times higher in the posterior group. As a result, it was shown that the direct anterior approach caused less muscle damage.[10]

Seven studies comparing anterior and posterior approaches and a total of 2302 patients were reviewed. The direct anterior group was found to be significantly superior in four studies comparing patients' pain and function in the early postoperative period.[13] In another study, direct anterior (DAA) and posterior (PA) approaches were compared at the postoperative sixth week. The hospital stay was recorded as 1.4 days in the DAA group and 2.0 days in the PA group. Pain score was significantly better in the DAA group. Patients in the DAA group quit walking aids earlier. Despite all these findings, there was no significant functional difference between the two groups at the end of the sixth week.[14] Many other studies reported good results in the early period.[15–18] When the preoperative and postoperative Harris scores of our cases were compared, statistically significant clinical results were obtained in the early period, supporting the literature.

Day-case surgery defined as patient discharge on the same day after surgery. In a study conducted in 2018, studies comparing day-case knee and hip arthroplasty and hospitalized arthroplasty were assessed. There was no difference in comorbidity and mortality. However, it was observed that outpatient arthroplasty costs 30% less on average. Similar results were obtained with the conventional method with patient training, pain control, blood loss control, and thromboprophylaxis.[19] In another retrospective study comparing the posterior approach with DAA, it was shown that patients in the DAA group were discharged earlier.[20] Twelve of our patients were discharged in the first 24 hours. No significant difference was found in terms of pain, postoperative Harris hip score, morbidity and time of walking when compared with those with more than one-day hospitalization.

Hip arthroplasty was performed using the direct anterior approach and 99 patients with lateral cutaneus femoris neuropraxia were included in the study. At the end of the mid-term follow-up, it was seen that 75% of the patients continued to have neuropraxia. No pain, limitation of movement, or loss of function was observed in the patients.[21] The incidence of neuropraxia was reported between 1% and 67% in the literature.[15,22] Most paresthesias regress spontaneously; very few patients have true marelgia paresthetica.[15,22–24] In our study, neuropraxia was observed in three of 42 patients. At the end of the 6th week, the complaints of one patient continued in the postoperative second year. Similar to the literature, the cases had no loss of strength, pain, or loss of function.

Periprosthetic fractures occurring during surgery in DAA are defined in the literature. These fractures are mostly trochanter major and calcar fractures.[17,23,25] Many articles showed that the incidence of fracture decreases as the experience of the surgeon increases.[17,25,26] During surgery, periprosthetic fracture developed in five of 42 hips included in the study. In their study, Masonis et al included 300 patients who underwent total hip arthroplasty and reported 3 calcar fracture in the first 62 cases %4.8.27 Similarly, in the study of Jewett and Collision, the first 200 cases were included and 10% intraoperative fractures were seen in 20 cases. In our study, 11% intraoperative fractures were seen in 5 patients. In this study three of the fractures were in the calcar fissure and two were in the trochanter major. All fractures were cable-fixed.

According to the literature, the risk of infection in patients with DAA is similar to those in other approaches. Periprosthetic joint infection rates in literature vary between 0.57% and 2.23%.[28] The risk was significantly higher especially in patients with high BMI.[29] Since the skin incision was on the inguinal area, wound healing problems were observed especially in obese patients due to the fact that the wound remained moist. In the present study, three obese patients had skin healing problems and two of them healed with dressing. In our study, periprosthetic infection developed in one %2.38 patient. This rate is seen to be high when compared to the literature. We think that more case series are needed to get more accurate results.

Dislocation rates after total hip arthroplasty with DAA are

various in the literature. In a study of 494 patients, the rate of dislocation was 0.61%.[23] All cases were closed-reduced and none of patients developed recurrent dislocation. In the study of Siguer et al., dislocation rates were reported as 0.96%.[30] In our study, dislocation was observed in one patient during post-operative patient transfer. The dislocation was reduced as closed, and the dislocation of this patient did not recur in the 5th year follow-up. We think that postoperative patient transfer is important and that maximum care should be taken.

CONCLUSION

Total hip arthroplasty using a direct anterior approach gives good results with appropriate indications and appropriate surgical techniques. As for disadvantages, the cutaneus femoris lateralis nerve is at risk and femoral access is limited. As a result of fewer muscle incisions during the surgery, patients can be rehabilitated and discharged early. Controlled trials including larger numbers of patients and other approaches are needed to better evaluate the results.

In this study, national and international ethical rules were complied with.

Ethics Committee approval was obtained from the Ethics Committee of Sakarya University Faculty of Medicine Dean's Office.

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Conflict of Interest

The authors declare that they have no conflicts of interest. The authors declare that they do not use any financial support.

Author Contributions

Concept: A.A., L.B Design: A.A Supervision: M.E. Materials: A.A, A.C.E Data: A.A., A.C.U. Literature search: A.A, A.C.E Analysis: N.T, L.B. Writing: A.A Critical revision: A.A, M.E

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