



Our results of total hip arthroplasty with anterolateral approach

Enes Gunduz^a, Resit Sevimli^{a,*}, Harun Kose^a

^aInonu University, Faculty of Medicine, Department of Orthopedics and Traumatology, Malatya, Türkiye

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Abstract

Aim: It was aimed to compare the clinical and radiological results of total hip arthroplasty performed with the anterolateral approach with the literature.

Materials and Methods: 65 patients who underwent total hip arthroplasty with anterolateral approach between 2016-2021 were included. Preoperative and postoperative functional status evaluations of the patients were performed using the Harris hip score. In the clinical evaluation of the patients, thigh pain, wound infection, length of hospital stay, body mass index, duration of surgery and complications were also evaluated. In the radiological evaluation, the acetabular and femoral relaxation zones, the presence and amount of vertical and horizontal migration of the acetabular component, the presence and amount of femoral vertical migration, the position of the femoral component, the femoral dorr classification, the angle of inclination of the acetabular component and the presence of heterotrophic ossification were examined.

Results: Of the patients, 29 (44.6%) were male and 36 (55.4%) were female. The mean age of the patients was 61.65 and the mean follow-up period was 40.2 months. Considering the diagnoses of the patients, THA was applied to 51 (70.8%) patients for coxarthrosis, 14 (19.4%) for avascular necrosis, 5 (6.9%) patients for fractures, and 2 (2.8%) patients for septic arthritis. The mean preoperative Harris Hip Score of the patients was 34.2 (18.1-59.9). The mean postoperative Harris Hip score was 88.5 (68.8-96). When the postoperative Harris Hip Score of the patients was evaluated, 53 (73.6%) were evaluated as excellent results, 18 (25%) as perfect results, and 1 (1.4%) as good results.

Conclusion: In our study, the results of total hip arthroplasty performed with the anterolateral approach were successful and satisfactory surgery when performed with appropriate indications and planning.



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Introduction

In the last 40 years, total hip arthroplasty has been a highly successful operation with documented benefits such as significant reduction in pain and improved quality of life. Total hip arthroplasty is cost-effective and improvements in patients' quality of life. Total hip arthroplasty is basically a surgical procedure to increase joint stability, mobility, quality of life, and improve walking.

Various approaches are used for total hip arthroplasty [1,2]. These approaches have different advantages and disadvantages when compared to each other. The anterolateral approach has the advantage of being less invasive and having low dislocation rates and results in early recovery [3,4]. The anterolateral approach has a high satisfaction rate [5]. In the anterolateral approach, the frequency of limping due to gluteus medius insufficiency is higher in patients [6].

Component position is shown as the most important factor affecting stability and wears rates in total hip arthroplasty [7]. It is especially important to set the abduction and anteversion angles of the acetabular component correctly [8]. However, there are studies showing that the surgical approach affects component alignment [9]. In addition, the effects of the surgeon's learning curve and habits on component alignment have been examined in the literature and it has been shown that the radiological and clinical results are more satisfactory after the learning curve [10]. Aim of our study is to compare the clinical and radiological results of total hip arthroplasty with the anterolateral approach with the literature.

Materials and Methods

We included 65 patients who underwent total hip arthroplasty with an anterolateral approach in the Orthopedics and Traumatology Clinic of Inonu University Turgut Ozal Medical Center in 2016-2021 and were followed up regularly. Ethical approval was obtained from the Inonu

*Corresponding author:

Email address: resitsevimli@hotmail.com (Resit Sevimli)

University Health Sciences Non-Invasive Clinical Research Ethics Committee before the study (Session Date: 12-04-2022, Decision Number: 2022/3304). The study was conducted retrospectively. Total hip arthroplasty was performed on 72 hips of 65 patients. In our study, 29 (44.6%) of 65 patients were male and 36 (55.4%) were female.

Inclusion criteria in our study; patients with primary THA performed with an anterolateral approach, patients with a follow-up period of at least 1 year; patients who underwent THA for osteoarthritis, avn, fracture and septic arthritis; and patients with radiographs taken in the appropriate position before, after and during the operation were included in the study.

Exclusion criteria from our study; Patients who underwent THA with lateral approach, anterior approach, posterior approach, patients who could not be followed regularly, patients who did not have appropriate radiographs, patients who underwent THA due to tumor, and patients who underwent partial and revision THA surgery were excluded from the study.

The clinical evaluation of the patients was made according to the Harris Hip Score. The preoperative scores of the patients and the scores at the last control were recorded and evaluated.

In the clinical evaluation of the patients, thigh pain, limping, wound infection, length of hospital stay, body mass index, duration of surgery and complications were also evaluated. In the radiological evaluation of the patients, the acetabular and femoral relaxation zones, the presence and amount of vertical and horizontal migration of the acetabular component, the presence and amount of femoral vertical migration, the position of the femoral component, the femoral dorr classification, the angle of inclination of the acetabular component and the presence of heterotopic ossification were examined.

Results

Seventy-two hips of 65 patients who underwent total hip arthroplasty with the anterolateral approach in the Department of Orthopedics and Traumatology of İnönü University Turgut Özal Medical Center were evaluated.

Of the evaluated patients, 29 (45%) were male and 36 (55%) were female. The mean age of the patients was 61.65 years old. When the patients' preoperative HCS ($p=0.032$) was examined according to age, there was a significant difference, but when the postoperative HCS ($p=0.164$) was examined, no significant difference was observed.

When the postoperative Harris Hip Score of the patients was evaluated, 53 (73.6%) were evaluated as excellent results, 18 (25%) as perfect results, and 1 (1.4%) result.

The mean body mass index (BMI) of the evaluated patients was 27.04. BMI below 25 was grouped as normal, between 25 and 30 as overweight, above 30 as obese. There was a significant difference between preoperative HHS ($p=0.05$) according to the grouped BMI of the patients, but no significant difference was observed between the postoperative HHS ($p=0.997$). There was a significant difference between BMI and radiolucency ($p<0.001$).

The distance between the superior edge of the trochanter major and the upper border of the femoral component was

Table 1. Relationship between demographic data and post-op Harris Hip Score.

	n (%)	p
Gender		
Male	29 (%45)	0.743
Female	36 (%55)	
Side		
Right	38 (%52.8)	0.394
Left	34 (%47.2)	
Etiology		
Coxarthrosis	51 (%70.8)	0.192
AVN	14 (%19.4)	
Fracture	5 (%6.9)	
Septic arthritis	2 (%2.8)	
Dorr		
A	5 (%6.9)	0.32
B	59 (%81.9)	
C	8 (11.1)	

n: number AVN: Avascular necrosis.

Table 2. Dorr classification, femoral migration relationship.

	Femoral Migration			p
	No	>5mm	<5mm	
Dorr A	3 ^a	0 ^{a,b}	2 ^b	0.041
Dorr B	53 ^a	3 ^a	3 ^a	
Dorr C	8 ^a	0 ^a	0 ^a	

The values in the columns are the number(n) value. Different letters in the columns indicate a significant relationship.

Table 3. BMI, femoral migration relationship.

	Femoral Migration			p
	No	>5mm	<5mm	
BMI<25	10 ^a	0 ^a	0 ^a	<0.001
BMI 25-30	52 ^a	2 ^{a,b}	1 ^b	
BMI>30	2 ^a	1 ^b	4 ^b	

The values in the columns are the number (n) value. Different letters in the columns indicate a significant relationship. BMI: Body Mass Index.

Table 4. Radiolucent area, femoral migration relationship.

Radiolucent Area	Femoral Migration			p
	No	>5mm	<5mm	
Yes	14 ^a	3 ^b	5 ^b	<0.001
No	50 ^a	0 ^b	0 ^b	

The values in the columns are the number (n) value. Different letters in the columns indicate a significant relationship.

Table 5. Femoral migration, femoral component axis relationship

Femoral Migration	Femoral Component Axis			
	Normal	Light	Varus	p
No	59 ^a	5 ^a	0 ^b	<0.001
>5mm	1 ^a	1 ^{a,b}	1 ^b	
<5mm	2 ^a	0 ^a	3 ^b	

The values in the columns are the number(n) value. Different letters in the columns indicate a significant relationship.

measured in terms of femoral migration after surgery and in controls, these values were compared and evaluated for femoral migration. More than 5mm of femoral migration was seen in 3 of the hips and less than 5mm of femoral migration was seen in 5 of them. There was a significant difference between femoral migration and femur dorr classification ($p=0.041$) (Table 2). There was a significant difference between femoral migration and BMI ($p<0.001$) (Table 3).

Radiolucent areas were observed in the femoral component of 22 hips (30.5%) examined according to Gruen's zones. There was a significant difference between the radiolucent area and femoral migration ($p<0.001$) and postoperative HSS ($p<0.001$) (Table 4).

We looked at the angle between the femoral component and the medulla of the patients. When we examined the femoral component placements of the patients, the femoral component was placed in the valgus position in 6 hips, the femoral component in the varus in 4 hips, and the neutral position in 62 hips. There was a significant difference between the location of the femoral component and femoral migration ($p<0.001$), radiolucent area ($p=0.007$) and BMI ($p<0.001$), and there was no significant difference between postoperative HSS ($p=0.301$) (Table 5).

We investigated patients for thigh pain. The pain was considered present when reported in the anterior and/or lateral thigh below the inguinal region. Thigh pain was observed in 4 of the patients at the last follow-up. Seven of the patients complained of post-operative thigh pain and it was observed that it did not continue in the follow-ups. There was a significant correlation between thigh pain and postoperative HSS ($p<0.001$) and radiolucent area ($p=0.002$).

Wound infection developed in 8 of the patients. Washing debridement was performed in 2 patients in the early period, and the other 6 were followed up with antibiotic therapy. There was a significant difference between wound infection and hospitalization time ($p=0.007$).

Heterotropic ossification developed in 13 of the patients. Limping was observed in 25 of the patients. Early dislocation developed in 1 patient and revision surgery was performed.

Discussion

One of the important aims of our study is to increase patient satisfaction and to increase the life of the prosthesis. Most of the patients want a joint prosthesis that is made

with a single operation and that they can use throughout their lives. In total hip arthroplasty, a multidisciplinary approach is required to achieve good results in the long term.

In a study conducted by Fillippo Migliorini et al. on 4060 patients, optimal femoral component and acetabular anteversion values were determined with the anterolateral approach. The posterior approach gave the best results in terms of femoral system alignment. This was followed by the anterolateral approach and the posterolateral approach, while the anterior approach gave the worst results. Regarding the acetabular component anteversion, the anterolateral approach gave the closest value to the reference value, followed by the posterior approach and the anterior approach. The lateral approach reported the worst value compared to the reference [11].

It was observed that the patients had preoperative pain, functional limitations, and greatly affected social lives. After the surgery, it is seen that their pain is relieved to a high extent, their functions are better and their social life is positively affected. Our study, it was observed that the preoperative hip score decreased ($p<0.05$) as the age increased. We interpreted that as the age of the patients increased, the symptoms intensified, the pain sensitivity increased, and the functions were more restricted. The successful results of total hip arthroplasty surgery are demonstrated once again in the absence of a significant difference with postoperative age. It is well known that obesity is detrimental to overall health. It has been proven to be a risk factor for coronary artery disease, hypertension and cancer. There is a growing concern that patients with a high body mass index have worse outcomes after primary hip arthroplasty. This has affected some centers to exclude obese patients from being considered for hip arthroplasty until a targeted BMI is achieved [12]. However, the evidence for these decisions has not yet provided a coherent policy based on clinical and radiological criteria [13]. Our patients with high BMI are advised to lose weight before surgery and reach certain values, and if necessary, they are directed to a dietitian. In our study, BMI below 25 was grouped as normal, 25-30 as overweight, and over 30 as overweight. When we examined the relationship between BMI and HSS, it was observed that the preoperative HSS decreased as BMI increased ($p=0.005$). Davi, A.M. et al [14], Guenther, Daniel et al. [15] found that the preoperative HSS decreased as BMI increased. Similar publications in the literature support the result of our study. As the BMI increases, the symptoms intensify and patients have difficulty in walking, and such conditions negatively affect the preoperative HSS. There was no significant difference between BMI and postoperative HSS. We interpret this result to the success of THA surgery. Patient satisfaction in hip arthroplasty is not affected by obesity [16]. Our study, we found a significant difference ($p<0.001$) between BMI and femoral migration. We grouped our patients with femoral migration as less than 5 mm and more than 5 mm. Femoral migration was observed in patients with high BMI in both groups. Akram, Faisal et al. [17] also showed that there is a significant relationship between BMI and femoral migration. In the study of Kutzner, Karl Philip et al. [18], it was shown that there was no significant relationship be-

tween BMI and femoral migration, but there was a significant relationship when patients under 75 kg and over 75 kg were compared. Grant, Tanner W. et al. [19] showed that there is a significant relationship between BMI and femoral migration in fit-and-fill systems, but there is no significant relationship between BMI and femoral migration in tapered systems. In light of this information, we think that the life of THA can be increased by losing weight before surgery, going to a dietitian and choosing the appropriate femoral system in patients with a BMI above normal. We think the relationship between BMI and femoral migration can be revealed more clearly by conducting studies with larger and larger series. Elson [20] reported that operating on a patient with a large BMI made it difficult to identify bone signs through excess adipose tissue. With increasing BMI, the field of vision of the surgical field decreases. Our study, observed that the femoral components were placed in valgus in 6 hips and varus in 4 hips. It was observed that 5 of 6 hips placed in the valgus and 4 hips placed in the varus were all placed in patients with a BMI above 25. There was a significant relationship between BMI and the femoral component axis ($p < 0.001$). We could not find any study in the literature showing the relationship between BMI and the femoral component. We think studies with larger series should be conducted to reveal this relationship more clearly.

When we examined the relationship between Dorr classification and femoral system migration in our study, it was seen that there was a significant relationship with Dorr Type A and no significant relationship with Dorr Type B and Type C ($p < 0.05$). In the study of Narayanan, Rajkishen et al. [21] and Syed, Farhan et al. [22], it was shown that there was no significant relationship between Dorr classification and femoral component migration. Dorr A femurs have wide metaphysis and narrow diaphysis [23]. Due to these structural features, the rectangular conical body does not fit into the metaphyseal-diaphysis junction of Dorr A femurs, resulting in subtle movement of the femoral body. We concluded that the result of our study is related to the use of prosthesis suitable for Dorr A in patients who underwent THA with Dorr A femur. We think that prostheses produced for Dorr A should be used in patient planning. We think that studies with more series should be conducted to evaluate the relationship between Dorr classification and femoral migration.

When we look at the relationship between the radiolucent area and the postoperative HSS, it is seen that there is a significant relationship in our study ($p < 0.001$). In our study, it was observed that there was a significant relationship between the radiolucent area and femoral migration ($p < 0.001$). Takaoka, Yusuke et al. [24] and White, Craig A. et al. [25] did not show a significant relationship between the radiolucent area and femoral migration. To see the relationship between the radiolucent area and femoral migration more meaningfully, studies with larger series are needed.

In our study, when we looked at the relationship between femoral component location and femoral component migration, it was seen that there was a significant relationship in terms of neutral and varus ($p < 0.001$). Migraine was observed in 4 femoral systems placed in varus. When

we looked at the literature, we could not find any study showing this relationship. We think studies with larger series should be conducted to reveal this relationship more clearly. Jonkers, Ilse et al. [26] examined the stress distribution models in their study, and it was found that the stress was highest in the medial, lateral cortex, and distal of the femoral component. In this study, it was also shown that the change in the load distribution changes the von Mises stress distributions. In our study, it was observed that there was a significant relationship between the location of the femoral component and the radiolucent area ($p < 0.05$), and between the BMI and the radiolucent area ($p < 0.001$). A particularly significant association was found in the varus position of the femoral component. We think the placement of the femoral component and the BMI von Mises change the tension distribution. When we examined the literature, we could not find any publication showing the relationship between the location of the femoral component and the radiolucent area. We think studies with more series should be done to reveal this relationship more clearly.

In our study, it was observed that there was a significant relationship between thigh pain and the radiolucent area ($p < 0.05$). In the study of Kang, Joon Soon et al. [27] a significant relationship was shown between thigh pain and Dorr classification and radiolucent area. In the study of Kinov, Plamen et al. [28], a significant relationship was shown between thigh pain and radiolucent area. Thigh pain is a complication that should be considered. In some patients, it is seen that the thigh pain is relieved in the follow-ups, but it negatively affects the result of the prosthesis in patients whose pain does not go away. When we look at a number of studies [29,30] in the literature, we see many patients undergoing revision due to thigh pain. In our study, an adverse effect of thigh pain on HSS was observed, but we did not have a patient who underwent revision due to thigh pain.

Heterotopic ossification is a common complication of total hip arthroplasty. Its prevalence is not the same in all patient groups. The frequency of HO varies between 15% and 90%. Hip ankylosis, male gender and previous history of HO are said to be significant risk factors. Heterotopic ossification was observed in 13 (20%) patients in our study. Eggl, S. et al. [31] showed a significant relationship between the anterolateral approach and heterotopic ossification, and it was shown that the anterolateral approach increased the risk of HO. In the study of Hürliemann, Maya et al. [32] and in the study of Morrey Bernard F. et al. [33], the incidence of heterotopic ossification was found to be higher in THA patients performed with an anterolateral approach. In our clinic, patients are prescribed NSAIDs after surge. Many studies showing that the use of NSAIDs reduces the risk of heterotopic ossification [34-36]. Although we performed THA with an anterolateral approach, we can attribute this to the fact that our rate of heterotopic ossification is relatively lower compared to studies in the literature. Hip functions were restricted in patients with HO stage 3 and stage 4, but the patients did not want revision surgery. It is important for patients to have a complete hip joint, but they care more about pain than range of motion.

As Kong, Xiangpeng et al. [37] stated in their study, the learning curve has a significant effect on the duration of surgery, length of hospital stay and complications. When the years of operation and duration of surgery ($p < 0.001$), length of hospital stay ($p < 0.001$), femoral migration ($p < 0.05$), and femoral system location ($p < 0.05$) were evaluated, there was a significant correlation between the patients in our study. We see that the complications that developed in the patients in our study decreased as the surgical experience increased.

Conclusion

In our study, the results of total hip arthroplasty performed with the anterolateral approach were found to be a successful and satisfactory surgery when performed with appropriate indications and planning. It was observed that the results of Total Hip Arthroplasty were adversely affected in patients with high BMI. We think it is appropriate to direct overweight patients who will undergo THA to lose weight before surgery. We think it is appropriate to keep the patients under observation by increasing the follow-up in cases of radiolucent area, migration of the femoral stem and presence of thigh pain in the follow-ups of patients.

Ethical approval

Ethical approval was obtained for this study from the Inonu University Health Sciences Non-Interventional Clinical Research Ethics Committee (Session Date: 12-04-2022, Decision Number: 2022/3304).

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