



Outcomes of Femoral Neck Fracture Surgery Compared Elective Total Hip Arthroplasty: Evaluation of 340 Patients

Elektif Total Kalça Artroplastisi ile Karşılaştırıldığında Femur Boyun Kırığı Cerrahisi Sonuçları: 340 Hastanın Değerlendirilmesi

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Abstract

Objective: This study aims to determine the frequency of total hip arthroplasty and hemiarthroplasty in patients with femoral neck fractures (FNF); and to identify whether there is a difference between patients who underwent hip arthroplasty with the diagnosis of femoral neck fracture and hip osteoarthritis in terms of demographic characteristics such as age, gender, comorbid diseases and surgical procedures, need for intensive care and mortality.

Method: This retrospective study included 340 patients who underwent hip arthroplasty in Antalya Atatürk State Hospital Clinic of Orthopaedics and Traumatology. The patients were first divided into two groups as those who underwent hip arthroplasty due to FNF and due to hip osteoarthritis, and were then compared in terms of study parameters.

Results: The mean age of patients operated on due to FNF and hip osteoarthritis was 77.2±10.7 years and 57±13.3 years, respectively. 98.3% of patients underwent unilateral hip replacement (HR) and 97.8% of them partial HR; 83.5% unilateral and 100% total HR due to FNF and hip osteoarthritis, respectively (all p<0.001). Length of hospital stay was found to be statistically significantly higher in patients operated for hip osteoarthritis (p=0.005), while the need for intensive care unit admission (p<0.001) and mortality rate (p=0.011) was higher in FNF patients.

Conclusion: Almost all of patients who underwent hip arthroplasty due to FNF received partial HR. Patients with FNFs appear to be at higher risk in terms of mortality and morbidity due to their demographic and clinical characteristics, in addition to comorbidities and also hemodynamic disorders that may occur secondary to trauma. It is, therefore, necessary to contribute to reducing morbidity and mortality by taking preoperative and postoperative precautions and maintaining careful follow-up care.

Keywords: Arthroplasty, femoral neck fractures, hip, osteoarthritis, replacement

Öz

Amaç: Bu çalışmada, femur boyun kırığı olan hastalarda total kalça artroplastisi ve hemiarthroplastisi tercih sıklığının belirlenmesi; femur boyun kırığı ve kalça osteoartriti tanılarıyla kalça artroplastisi ameliyatı yapılan hastalar arasında yaş, cinsiyet, komorbid hastalıklar gibi demografik özellikler, yapılan cerrahi işlem ve özellikleri ile yoğun bakım ihtiyacı ve mortalite açısından bir fark olup olmadığının araştırılması amaçlanmıştır.

Yöntem: Retrospektif çalışmaya Antalya Atatürk Devlet Hastanesi Ortopedi ve Travmatoloji Kliniği'nde kalça artroplastisi ameliyatı yapılan toplam 340 hasta dahil edildi. Hastalar femur boyun kırığı ve kalça osteoartriti nedeniyle kalça artroplastisi ameliyatı yapılanlar olmak üzere iki gruba ayrıldı ve çalışma parametreleri açısından karşılaştırıldı.

Bulgular: Femur boyun kırığı ve kalça osteoartriti tanısıyla opere edilen hastaların yaş ortalaması sırasıyla 77,2±10,7 ve 57±13,3 yıl olarak hesaplandı. Her iki grupta da hastaların istatistiksel olarak anlamlı bir bölümünü kadınlar oluşturuyordu. Femur boyun kırığı tanısı olan hastaların %98,3'üne (p<0,001) tek taraflı ve %97,8'ine parsiyel (p<0,001); kalça osteoartriti tanısı olan hastaların %83,5'ine (p<0,001) tek taraflı ve %100'üne total (p<0,001) kalça protezi uygulandı. Hastanede yatış süresi kalça osteoartriti tanısıyla opere edilenlerde (p=0,005), yoğun bakım ihtiyacı (p<0,001) ve mortalite oranı (p=0,011) ise femur boyun kırığı tanısıyla opere edilenlerde istatistiksel olarak anlamlı düzeyde daha fazla bulundu.

Sonuç: Kliniğimizde femur boyun kırığı tanısıyla kalça artroplastisi yapılan hastaların neredeyse tamamına yakınında parsiyel kalça protezi tercih edildiği saptandı. Hastaların demografik, klinik ve laboratuvar özellikleri ile eşlik eden komorbiditeler ve travmaya sekonder ortaya çıkabilecek hemodinamik bozukluklar nedeni ile femur boyun kırığı olan hastaların mortalite ve survey açısından daha fazla risk altında olduğu görülmektedir. Preoperatif ve postoperatif alınacak önlemlerle, takipte dikkatli olunarak morbidite ve mortalitenin düşürülmesine katkı sağlanmalıdır.

Anahtar kelimeler: Artroplastisi, femur boyun kırıkları, kalça, kalça protezi, osteoartrit



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Introduction

Osteoarthritis (OA) is a leading cause of pain and disability, and reason for using healthcare services among adults (1). According to 2019 data, an estimated 240 million people worldwide have symptomatic and activity-limiting OA (2). After the knee, the hip is the second largest joint most commonly affected by OA (1). Several professional organizations have developed guidelines for the treatment and management of OA. In general, these guidelines recommend that patients with OA should be offered a range of non-pharmacological interventions, including relevant training, dietary weight management (for those who are overweight), and structured exercise programmes (3-7). Paracetamol, oral NSAIDs, topical NSAIDs, duloxetine, opioids, intra-articular (IA) corticosteroid, and IA hyaluronic acid are often preferred in pharmacological treatment in addition to supportive/complementary treatments in the conservative treatment of hip OA (3-7). However, surgical treatment is indicated in advanced-stage cases that have failed to respond to medical and supportive treatments. In the earlier stages, on the other hand, joint sparing procedures such as pelvic osteotomy or hip arthroscopy may be considered, depending on patients' underlying diagnosis. However, these procedures do not generally suffice in patients with severe degenerative changes. It is, therefore, of fundamental importance to consider hip resurfacing or total hip replacement (THR) options for patients with advanced joint damage (1).

Femoral neck fracture (FNF), on the other hand, is an important health condition in older age due to its frequent occurrence especially in elderly patients (accounting for approximately 3.6% of adult fractures) (8), leading to high mortality and morbidity. All over the world, hip fractures have been reported to be among the top 10 causes of disability in adults (9). Total hip arthroplasty (THA), hemiarthroplasty (HA) or internal fixation techniques can be utilized in the surgical treatment of FNFs. It is still controversial whether hip replacement should be performed in THA surgery or HA surgery for patients with FNFs (8,9). In addition to studies suggesting that THA provides better functional outcomes compared to HA in selected and active elderly patients (10), there is also evidence for clinically insignificant improvement in function and quality of life at long-term follow-up (9). However, over the years, there has been a remarkable increase in the use of THA, with significant variations across all geographical regions and locations (11).

In the relevant literature, there are studies comparing the results of THA surgery in patients with FNFs or hip OA (12-

14) and the results of THA and HA surgeries in patients with FNFs (8,9,15). With the aim of drawing attention to the fact that the surveys of the patients with FNFs and hip OA may present serious differences due to different demographic and clinical characteristics, this study attempted to investigate whether there was a difference in terms of the demographic characteristics such as age, gender, and comorbidities of the patients who underwent surgeries due to two different indications, as well as the surgical procedures and their features, the need for intensive care and mortality among such patients, and to determine the preferences for either THA or HA surgery in patients with FNFs.

Materials and Methods

Study Design and Participants

The population of the retrospective study consisted of 381 patients who underwent hip arthroplasty surgery in Antalya Atatürk State Hospital at the Orthopedics and Traumatology Clinic between 2017 and 2020. The patients who underwent revision hip arthroplasty and patients with missing data were excluded from the study, which continued with 340 patients.

The patients were divided into 2 groups as those who underwent hip arthroplasty surgery for FNFs and those who underwent elective THA due to hip OA, and were compared in terms of study parameters.

Data Collection and Laboratory Measurements

Demographic characteristics such as age and gender, as well as comorbidities, clinical features, treatment and outcome data of the patients in the study sample were obtained from electronic medical records and patients' surgery notes.

Ethical Approval

Prior to the study, necessary ethical approval was obtained from the Clinical Research Ethics Committee of University of Health Sciences Turkey, Antalya Training and Research Hospital with the decision number 16/2 dated 25 August 2022. The study was conducted in accordance with the Declaration of Helsinki.

Statistical Analysis

Statistical analysis was made using IBM SPSS Statistics for Windows, Version 23.0 (IBM Corp., Armonk, NY, USA). The Shapiro-Wilk test was used to test the normality of the data. Descriptive analyses were presented using mean \pm standard deviation, median (IQR) or n (%), when appropriate.

Categorical data were analyzed by the Pearson's chi-squared or Fisher's Exact test. The Mann-Whitney U test and Student's t-test were used for the analysis of non-normally and normally distributed numerical data, respectively. Two-sided p-value less than 0.05 was considered statistically significant.

Results

The mean age of the patients who underwent hip arthroplasty due to FNFs was 77.2±10.7 years, and the mean age was 57±13.3 years in those operated on due to hip OA (p<0.001). Women accounted for a significantly higher proportion in OA group than FNF group (p=0.016). Comorbid diseases were found to be statistically significantly more common in patients who underwent surgery due to FNFs (p<0.001). The most common comorbidities were hypertension (HT), cardiovascular diseases, and diabetes mellitus (DM) in patients who were operated on due to FNFs, whereas such comorbidities included DM, HT and chronic kidney failure in patients who underwent arthroplasty due to hip OA. In addition, anemia was found to accompany 63.6% of the patients who underwent hip arthroplasty due to FNFs and 36.7% of them who underwent surgery due to hip OA (p<0.001) (Table 1).

Of all the patients who underwent hip arthroplasty due to FNFs, it was clear that the preferred surgical procedure

Table 1. Comparison of demographic characteristics of patients with hip arthroplasty surgery due to FNFs and hip OA

Variables	Patients with hip arthroplasty due to FNFs (n=231)	Patients with hip arthroplasty due to hip OA (n=109)	p-values
Age (years)	77.2±10.7	57±13.3	<0.001
Female	77.1±10.6	57.1±13.7	<0.001
Male	77.4±10.9	56.9±12.4	<0.001
Gender			
Female	141 (61)	81 (74.3)	0.016
Male	90 (39)	28 (25.7)	
Comorbidities	209 (90.5)	50 (45.9)	<0.001
HT	113 (48.9)	8 (7.3)	<0.001
DM	44 (19)	12 (11)	0.062
CVD	59 (25.5)	1 (0.9)	<0.001
COPD	20 (8.7)	1 (0.9)	0.012
CRF	13 (5.6)	2 (1.8)	0.191
Anemia	147 (63.6)	40 (36.7)	<0.001

Results are presented as mean ± standard deviation, median (interquartile range) or n (%). Student's t-test, Mann-Whitney U test, Pearson chi-square test. FNF: Femoral neck fracture, OA: Osteoarthritis, HT: Hypertension, DM: Diabetes mellitus, CVD: Cardiovascular diseases, COPD: Chronic obstructive pulmonary disease, CRF: Chronic renal failure

was HA (p<0.001) for 97.8% of them, while it was unilateral surgery for 98.3% (p<0.001). On the other hand, 83.5% (p<0.001) of them who underwent surgery due to hip OA received a unilateral procedure, whereas 100% (p<0.001) of them underwent total unilateral hip replacement. The cementless fixation technique was used in 99.1% of the patients who were operated on due to hip OA and the cemented fixation technique in 68% of those who underwent arthroplasty due to FNFs (p<0.001). The length of hospital stay was statistically significant in patients operated on due to hip OA (p=0.005), and likewise, the need for ICU admission (p<0.001) as well as in-hospital (p=0.011) and 1-year (p<0.001) mortality rates in patients operated on due to FNFs were statistically significant (Table 2).

Discussion

It was revealed that HA was the preferred surgical procedure in almost all of the patients with FNFs who underwent hip arthroplasty surgery in our clinic, with the length of hospital stay being statistically significantly higher in the patients who were operated on due to hip OA, while the need for

Table 2. Comparison of follow-up and treatment characteristics of patients with hip arthroplasty surgery due to FNFs and hip OA

Variables	Patients with hip arthroplasty due to FNFs (n=231)	Patients with hip arthroplasty due to hip OA (n=109)	p-values
Body side			
Unilateral	227 (98.3)	91 (83.5)	<0.001
Bilateral	4 (1.7)	18 (16.5)	
Partial/total			
Partial	226 (97.8)	0 (0)	<0.001
Total	5 (2.2)	109 (100)	
Use of cement			
Cementless	74 (32)	108 (99.1)	<0.001
Cemented	157 (68)	1 (0.9)	
Length of hospital stay	4 (3-6)	7 (6-10)	<0.001
Ward only	6 (4-10)	7 (6-10)	0.005
Ward + ICU	3 (3-5)	3 (3-3)	0.213
ICU admission	135 (58.4)	7 (6.4)	<0.001
Length of ICU stay	1 (1-1)	1 (1-1)	0.174
In-hospital mortality	16 (6.9)	0 (0)	0.011
1-year mortality	42 (18.18)	1 (0.92)	<0.001

Results are presented as mean ± standard deviation, median (interquartile range) or n (%). Student's t-test, Mann-Whitney U test, Pearson chi-square test. FNF: Femoral neck fracture, OA: Osteoarthritis, ICU: Intensive care unit

ICU admission and mortality rates were statistically higher in patients operated on due to FNFs.

In the literature, there are studies comparing the results of THA in patients with FNFs or hip OA (12,13) and the results of THA and HA in patients with FNFs (8,9,14). With the aim of emphasizing the fact that the surveys of the patients with FNFs and hip OA may present notable differences depending on different demographic and clinical characteristics, this study attempted to investigate whether there was a statistical significance in terms of the demographic characteristics such as age, gender, and comorbidities of the patients who underwent surgeries due to two different indications, as well as the surgical procedures and their features, the need for intensive care and mortality among such patients, and to determine the preferences for either THA or HA surgery in patients with FNFs.

The results of our study regarding the surgical procedure used in patients with FNFs undergoing hip arthroplasty indicated that THA was much less preferred in our clinic when compared to the results reported in the literature. For example, a study examining the variations in treatment choices for patients with FNFs over the years by utilizing the data obtained from the American Board of Orthopaedic Surgery database and evaluating approximately 20,000 FNF cases reported that the THA preference rate, which was 0.7% in 1999, increased to 7.7% in 2011, and that the rate of preference for HA decreased from 67.1% to 63.1% in the same period. In the same study, the remaining part of the rates belonged to the internal fixation technique (15). Gausden et al. (10) also investigated the contemporary reasons for any THA failures in patients with FNFs and followed those with FNF who underwent arthroplasty for an average of 6 years between 2000 and 2017. In that study, THA was reported to be the preferred technique for 9.6% of the patients who underwent hip arthroplasty due to FNFs, whereas it was HA in 91.4% of them in the same period (10). Although we neither examined the variations in treatment choices in FNF patients over the years, nor included any patients who underwent internal fixation technique in our study, it was found that the rate of THA among patients who underwent hip arthroplasty was lower than what was reported in the literature, with a rate of 2.2%. The tendency of orthopedic surgeons to shorten the operation time, the poor general condition of patients, and the faster provision of medical supplies for partial prosthesis due to the fact that patients are operated under emergency conditions can be considered as the factors influencing the preference

of HA as a surgical procedure in patients with FNFs in our clinic, when compared to the literature. As reported by Li and Luo (8) in their review, we also agree that many aspects such as the age of the patients, whether or not they have osteoporosis, the type of FNF preoperative reduction, and the needs of the patient should be taken into account in the selection of surgical methods for FNFs in elderly patients in our clinic.

In one of the studies comparing the early postoperative results of patients who underwent THA for FNFs and hip OA, Charette et al. (16) evaluated the 2008-2016 database of the American National Surgical Quality Improvement Program, and reported an increased risk of postoperative complications, such as increased mortality and major morbidity, re-operation, prolonged operative time, increased length of hospital stay, and reduced likelihood of being discharged home in the patients who underwent THA due to FNFs compared to those operated due to OA. Another study comparing the patients, who underwent THA surgery due to FNFs and hip OA diagnoses, by evaluating a very large series reported that perioperative mortality and pulmonary embolism rates were statistically significantly higher in the group operated due to FNFs (17). Likewise, another review of a large patient series reported that the prevalence of complications was 3 times higher in a group of trauma patients and, unlike our study, the duration of hospital stay was found to be longer in those operated due to FNFs. The same study mentioned that patients with FNFs, in general, were an extremely fragile group of patients requiring additional perioperative and postoperative care (12). Due to the small number of patients who underwent THA due to FNFs in our study, we could not make a statistically significant comparison of their results with those of the patients who underwent THA due to hip OA; nevertheless, we found that 2 (of 5 patients) (40%) of the patients who underwent THA due to FNFs developed the need for ICU hospitalization, yet without any in-hospital or one-year mortality, and that 7 (6.4%) of the patients (109 patients) who underwent THA due to hip OA required ICU admission, yet with no mortality rates. Still, as mentioned earlier, the number of patients who underwent THA due to FNFs in our clinic was only 5 (2.2%), which does not allow a sound statistical evaluation.

Moreover, the study of Yoo et al. (18), evaluating more than 6,000 FNF patients who underwent HA, reported mortality rates of 3.08% in the 65-79 age group, and 5.28% in the 80-99 age group. In the same study, the length of hospital stay was found to be 35.08 (\pm 37.72) days in the 65-79 age

group, and 35.33 (± 36.98) days in the 80-99 age group (18). The study of Chammout et al. (19) focusing on the results of primary HA in elderly patients with cognitive dysfunction and displaced FNFs reported the one-year mortality rate as quite high as 31%. It was also mentioned in the same study that at least one third of patients with hip fractures had impaired cognitive status at levels that could complicate their postoperative rehabilitation, emphasizing that this condition would result in inadequate rehabilitation when observed in all patients included in their study (19). In our study, in-hospital mortality rate was 2.65% and one-year mortality rate was 18.58% in all age groups of 226 FNF patients with a mean age of 77 (minimum: 49, maximum: 99) years, who underwent HA, whereas the average length of hospital stay was 5.59 days, which is quite low compared to the results reported in the literature.

The most similar study to ours in general was the one conducted by Le Manach et al. (20) in France, with nearly 700,000 patients from 864 medical centers. In that study, a relatively larger proportion of patients who underwent elective total hip replacement (THR) were male compared to those who underwent hip fracture surgery, and that they had developed less comorbidity. The study further reported that ICU admission was 1.28% after hip fracture surgery and 0.37% after elective THR, with the in-hospital mortality rate being 3.42% after hip fracture surgery and 0.18% after elective THR (20). Our study found that a statistically significant proportion of patients who underwent both hip fracture surgery and elective THR surgery were women. In addition, similar to the study of Le Manach et al. (20), our study revealed that comorbid diseases were found to be statistically significantly more common in patients who underwent hip fracture surgery compared to those who underwent elective THR surgery. In our study, on the other hand, the rate of ICU stay was 58.4% after hip fracture surgery, 6.4% after elective THR, while the in-hospital mortality rate was found to be 2.59% and 0%, respectively. The reason why the mortality rate was generally found to be quite low compared to the literature may be that especially advanced elderly FNF patients with comorbidities were followed in the ICU on the 1st post-operative day, and of course, all patients in need were followed up in the ICU for as long as necessary, which also explains the high ICU hospitalization rates.

In the practical application of the Anesthesia and Reanimation Clinic in our hospital, ICU follow-up after FNF has become almost standard. We believe that this practice significantly reduces the in-hospital mortality

rate compared to the literature. This is a result that can be obtained as a suggestion from our research. This can be considered as one of the strengths of our research. On the other hand, the number of studies conducted to determine HA and THA preference rates in FNF cases is limited in our country. In this sense, we believe that our research will contribute to the literature. And this is another strength of our research.

Study Limitations

The fact that HA was preferred in almost all of the FNF patients in our clinic did not allow for a statistically sound comparison between THA and HA in terms of parameters such as hospital stay, ICU admission rate, and mortality rate, which is considered as one of the important limitations of our study.

Conclusion

In our clinic, it was determined that partial hip replacement was the preferred surgical procedure for almost all patients who underwent hip arthroplasty due to FNFs. Although partial and THR surgeries performed for FNF and hip OA indications are similar in terms of operation techniques and endoprostheses used, it is believed that patients with FNFs are more at risk in terms of mortality and survey because of the demographic, clinical and laboratory characteristics of the patients, accompanying comorbidities, and hemodynamic disorders that may occur secondary to trauma. Therefore, regardless of any indication and/or technique, every patient who has undergone hip arthroplasty should be evaluated as a whole, and careful follow-up should contribute to reducing morbidity and mortality along with preoperative and postoperative measures such as anemia treatment as well as blood pressure/blood sugar regulation.

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Ethics

Ethics Committee Approval: The ethical approval for the study was obtained from the University of Health Sciences Turkey, Antalya Training and Research Hospital, Clinical Research Ethics Committee with the decision number 16/2 dated 25 August 2022.

Informed Consent: Since it was a retrospective file scanning study, informed consent was not obtained from the patients.

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