

# The effects of capsular repair on quality of life after hip arthroplasty with the anterolateral approach

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## Ethics Committee Approval

The scientific ethics committee of Ahi Evran University approved the study with the number 2018-07/68, dated 10.04.2018.

All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.

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## Conflict of Interest

No conflict of interest was declared by the authors.

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## Abstract

**Background/Aim:** Hip fractures, commonly observed worldwide, cause severe functional problems and pose an economic burden. This study investigated the effects of different surgical approaches of joint capsule repair on morbidity and mortality and aimed to increase the quality of life after surgery with the most proper treatment option.

**Methods:** This prospective case-control study was conducted on 186 patients over 65 years of age admitted to our clinic from 2006 to 2012 for displaced femoral neck fracture. All patients were treated via a hemiarthroplasty. The patients (66 males, 110 females with an overall mean age of 80.43 years (70-90)) were followed up regularly. All patients were divided into two groups: Group 1 was treated with capsular repair, and Group 2 without. The groups were compared in terms of pre-and peri-operative data, demographics, concomitant diseases, post-operative complications, mortality rates, pain level, and hip scores. Hospitalization time, average surgical duration, and time from fracture to the operation were also noted.

**Results:** We found no significant differences between the groups in terms of surgery preferences ( $P>0.05$ ). The survival of patients was significantly higher, blood loss was significantly less, and perioperative mortality rates were insignificantly lower in the noncapsular repair group ( $P=0.005$ ,  $P=0.015$ , and  $P=0.515$ , respectively).

**Conclusion:** The use of capsule repair during hip hemiarthroplasty in patients over 65 years of age had no negative impact on mortality or morbidity. Surgical preference changes during hip arthroplasty procedures are essential.

**Keywords:** Gestational diabetes mellitus, Mouse double minute X expression, Hofbauer cells, Placenta

## Introduction

Hip fractures are a significant public health problem and can lead to disability, reduced quality of life, and increased mortality. In general, hip fractures affect around 1.5 million people per year worldwide and mainly occur in the elderly [1]. There are different treatment choices. Hip arthroplasty (HA) is one of the most preferred orthopaedic surgical operations due to its high success rate, early restoration, and low procedure-related morbidity. It contributes to early ambulation and good functional recovery. It can control the pain of patients and improve function and limb deformity. While reaching the hip joint in surgical treatment, approaches differ according to surgical experience. In this regard, the anterolateral and posterolateral approaches are frequently used to reach the hip joint. In addition to lower dislocation rates, the anterolateral approach provides particularly good acetabulum visualization. However, patients are more likely to have lameness due to the weakness of the gluteus medius.

HA with the posterior approach has the advantages of less soft tissue injury, shorter operation time, less bleeding volume, and faster recovery. At present, the posterior approach for hip arthroplasty is more commonly used than the anterior approach [2]. However, complications after the posterior approach are higher than those in the anterior approach, especially early post-operative dislocation.

Most of these patients have severe cardiovascular, respiratory, and hematopoietic system diseases. One of the most common complications in patients during the peri-operative period is anaemia treated primarily by blood transfusion. In the literature, many studies found that 30% to 70% of the elderly patients with hip fractures needed a peri-operative allogeneic blood transfusion [3, 4].

The hip joint capsule stabilizes the hip joint and the lower extremity; however, it is incised and frequently excised during hip arthroplasty. Depending on the surgical method, whether capsule repair is performed is an important technical detail. However, its effect on joint proprioception and other risk factors is still controversial [5].

The purpose of this controlled trial was to compare the results of arthroplasty using the anterior approach, investigate whether the rates of post-operative morbidity and mortality differ between the two groups, and whether the type of capsule repair affects the patient's activity scoring.

## Materials and methods

### Study population

A total of 186 hip fracture patients were treated with an arthroplasty from 2006 to 2012. The same surgeon group undertook all HA procedures in the anterolateral approach. Medical data were collected retrospectively. The patients participating in the study were divided into two groups based on the capsular repair. The first group comprised 95 hips, whose anterior capsule was excised during surgery, while the second group included 91 hips.

The surgical technique used for the two groups of patients, the standard anterolateral approach, was identical apart from the means of managing the anterior capsule. During this

surgical procedure, the rectus femoris muscles and piriformis tendon were split in the insertion site on the trochanter and carefully separated from the posterior capsule. The demographic variables, used medications and comorbidities, types of fractures, hospitalization and surgery dates, time and cause of death, as well as the seniority levels of the operating surgeon and anesthesiologist were noted. In addition, patient age, sex, and pre-fracture ambulatory status, and their number of comorbidities were all retrieved. The general state of health was defined by the number of significant comorbidities, which are diabetes mellitus, congestive heart failure, cardiac arrhythmias, ischemic heart disease, previous cerebrovascular accidents, renal disease, Parkinson's disease, hypertension, chronic obstructive pulmonary disease, and anticoagulation therapy. Patients' ambulatory status was determined using the Barthel Index of Activities of Daily Living and the Harris Hip Score. Post-operative pain was assessed using the Likert pain score with responses ranging from 0 to 10. Additionally, peri-operative data and post-operative complications were noted. The regional scientific ethics committee of Ahi Evran University approved the study with the number 2018-07/68 on 10.04.2018.

### Surgical technique

The same group of doctors performed all surgeries. The patients were divided into repair and dissection groups based on the articular capsule repair status during surgery. While the patient was lying in supine position on the edge of the large trochanter table, a Watson-Jones incision was performed. The muscles were separated by dissection, and the capsule was opened longitudinally along the femoral neck.

Using the "H" -shaped articular capsule incision, based on cutting the hip articular capsule throughout the direction of the femoral neck, the articular capsule was opened on both sides to reach the femoral head, femoral neck, and upper edge of the acetabulum. The stability of the hip joint was assessed in both groups, with the hip joint at 45 degrees of external rotation or internal rotation or 90 degrees of flexion. For repair, the articular capsule flaps were encircled to the front of the femoral neck and appropriately overlapped with a 2/0 vicryl suture. Smith and Nephew uncemented Hydroxyapatite-coated biotype total hip prostheses were used.

### Postop care protocol

The patients were mobilized with two canes and allowed full weight-bearing immediately postoperatively, with no movement restrictions. They received the standard rehabilitation care of the department.

### Statistical analysis

Kolmogorov-Smirnov and Shapiro-Wilk tests were used to test quantitative variables for normality of distribution. Among the normally distributed quantitative variables, the differences between the groups were assessed with the independent t-test. Conversely, the analysis of non-normally distributed quantitative variables was performed with the Mann-Whitney U test. Qualitative variables were analyzed with the chi-square and Fisher's Exact tests. Descriptive statistics of normally distributed continuous data were presented as mean (SD), and descriptive statistics of non-normally distributed data, with median (min-max). Observation numbers (N) are given for qualitative variables. A *P*-value of 0.05 was considered

significant. Statistical analysis of the study was performed with the SPSS v21.0 software for Windows.

### Results

A total of 1050 registry entries fulfilling the inclusion criteria were identified and included in the study. The study was conducted with 186 patients, of which 66 (35.5%) were male, and 120 (64.5%) were female (n = 120/186). The overall mean age was 80.43 (7.47) years. Their mean length of hospital stay after the operation was 3 (1-11) days.

In this study, capsule repair was performed in 95 patients, while 91 were repaired with the noncapsular method. Of the 186 patients included in the study, 87 were operated on the right and 99 on the left. Descriptive information of variables from the patients, classified based on their operation methods, is given in Table 1.

Table 1: Demographic features of the patients underwent hip arthroplasty

Variables	Capsule Repaired Group 1 (n=95) mean (SD)	Non-capsule Repaired Group 2 (n=91) mean (SD)	P-value
Gender			
male	36	30	0.687
female	59	61	
Age	81.46 (7.63)	79.36 (7.18)	0.055
Dementia			
Yes	4	3	0.919
No	91	86	
BMI	26.46 (4.24)	26.62 (4.50)	0.804
Fracture Type			
Collum	53	53	0.855
Trochanter	42	36	
Side			
Right	45	43	0.980
Left	50	48	

The effects of capsule repair on the variables during and after the surgery, such as intraoperative blood loss, transfusion, Likert pain scale, Harris hip score, and walking aid, were evaluated and statistically illustrated in Table 2.

Forty-one patients (22.04%) in Group 1, and 35 patients (18.81%) in Group 2 had died by the end of the follow-up period, and 13 (6.98%) of 186 patients died in the hospital. The mortality rates of the patients who had surgery are given below (Table 3).

Cox regression analysis revealed that among the patient's age, gender, the surgeon's experience, and surgical site, only the age of the patients was a significant risk factor for mortality. The HR ratio, which indicates the increased risk of mortality caused by a one-unit increase in the patient's age, was 1.07 (P<0.001). The HR ratio for gender was 1.528. Men were found at 1.528 times higher risk of periodic death (P=0.066). The side of the operated hip was not a significant parameter for mortality outcome (P=0.637). The HR ratio for the side of the operated hip was 1.117. Again, the surgeon's experience (HR: 1.016) was not a significant risk factor for survival (P=0.532). The result of the analysis is given in Table 4.

The mean survival of patients who did and did not undergo capsule repair were 34.50 (1-82) months, and 45 (1-86) months, respectively. According to these results, the survival of patients without capsule repair was higher than that of patients who underwent a capsule repair. However, based on the Wilcoxon (Gehan) value calculated for two different surgery preferences, the Kaplan-Meier test result, and the Log Rank (Mantel-Cox) value were insignificant (P=0.209 and P=0.532, respectively) (Figure 1).

Table 2: The comparison of surgery outcomes between the study groups

Variables	Capsule repaired (Group 1) (n=95) range	Non-capsule repaired (Group 2) (n=91) range	P-value
Intraoperative blood loss (cc) transfusion (Unit)	450(200-700)	400(250-700)	0.015
0	18	35	
1	18	25	0.000
2	36	27	
3	19	2	
4	4	2	
Mortality			
Yes	41	35	0.515
No	54	56	
Time-until-death (months)	34.5 (1-82)	45(1-86)	0.695
Likert pain scale			
0	12	7	
1	23	39	0.057
2	6	35	
3	14	10	
Harris hip score	78(0-94)	80(0-96)	0.005
Walking aid			
Yes	26	2	0.878
No	69	67	

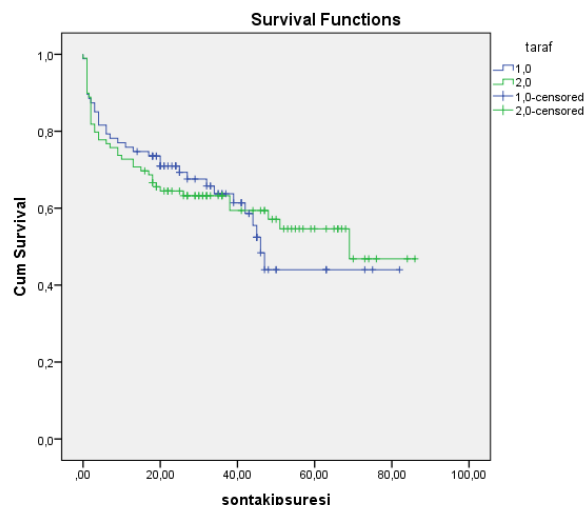
Table 3: The mortality rate after discharge

Time point (months)	Right	Left	Total
0-12	21	27	48
13-24	4	8	12
25-36	4	1	5
37-48	6	2	8
>49	0	3	3
Total	35	41	76

Table 4: Cox regression to analyze factors that impact survival after the surgery

	B	SE	Wald	P-value	HR	95.0% CI for HR	
						Lower	Upper
Gender	0.424	0.234	3.297	0.066	1.528	0.967	2.415
Age	0.075	0.018	17.889	<0.001	1.078	1.041	1.116
Side	0.111	0.235	0.222	0.637	1.117	0.705	1.770
Surgeon experience	0.016	0.026	0.390	0.532	1.016	0.966	1.069

Figure 1: Comparison the surgery techniques according to survival after the surgery (P=0.532) (Kaplan Meier curves)



### Discussion

Fractures of the hip are common in older adults. Osteoporosis, comorbidities, and increased levels of minor trauma increase the incidence and complicate the treatment of such fractures [6]. Hip replacement surgery, total or partial arthroplasty, is a currently accomplished therapeutic modality that encourages repairing the damaged hips. In addition, under favorable conditions, surgical approaches for hip arthroplasty should attain capsule repairing as well. The HA method has recently gained popularity in improving the quality of capsule repair and assuring strength in the long term [5].

Many surgical approaches for total HA aim to maximize capsule preservation and/or repair capsule incisions, while others excise the capsule to improve exposure. Capsule preservation

and repair can help lower dislocation rates and maintain the defenses of the native hip against hypermobility [5, 7].

Capsule repair combined with HA allows the ligaments to wrap and stretch around the surface of the head of the repaired capsule's leash in a range of motion identical to the native hip. After follow-up, the combination of capsule repair and HA yields better short-term results than total HA despite the age of the patients, as is reported in the study of Zang et al. and Lu et al. Capsule protection and repair help prevent early post-operative hip joint dislocation and positively affect hip biomechanics [8, 9].

The most important result of the present study was elucidating the slight effects of HA on mortality and quality of life in treating hip fractures. This study also examined the impact of different surgical approaches on mid-term clinical results.

In this study conducted with 186 patients, blood loss was higher in patients who underwent capsule repair compared to those who did not.

Common causes of failure in surgical applications are the treatment of osteonecrosis and delayed hip arthroplasty. Owing to minimized muscle damage, decreased blood loss, and early functional recovery, the anterior approach is popularized and currently preferred by 10% of orthopedic surgeons performing HA [10]. It is known that older patients do not tolerate re-do surgery, therefore, the anterolateral approach is more convenient than posterolateral one [11]. Only patient age was a significant risk factor for the mortality. On the other hand, the survival of patients who did not undergo capsule repair was higher than the group.

### Conclusion

The anterior or posterior capsular repair preference for primary HA procedure hardly affects post-operative long-term morbidity, hip quality and activity scores, and does not affect mortality.

The present study has enough sample size and presents long-term follow-up results. We evaluated various demographic features and their possible effect on the procedural outcomes; nevertheless, a more detailed evaluation of chronic diseases (such as osteoporosis) and their impact on procedural long-term success could be performed in further studies.

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