



Simultaneous Versus Staged Bilateral Total Hip Arthroplasty Via A Lateral Approach

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Abstract

Introduction: Studies comparing simultaneous bilateral total hip arthroplasty (simBTHA) and staged bilateral total hip arthroplasty (stgBTHA) using a lateral approach are rare. The aim of this study was to compare staged and simultaneous total hip arthroplasty surgeries performed with the lateral approach.

Methods: In this study, 53 BTHA patients (106 cases) treated in our clinic between 2015 and 2022 were included. Of these patients, 21 received simBTHA and 32 received stgBTHA. The patients were divided into two groups: simBTHA and stgBTHA. The groups were evaluated in terms of periprosthetic fracture, blood transfusion rate, gender, age, Body Mass Index (BMI), ASA scores, operation time, and hospital stay. Functional outcomes and major complication rates were compared between the groups. The Harris Hip Score was used to assess functional outcomes.

Results: Blood transfusion rates and hospital stay times were higher in the simBTHA group than in the stgBTHA group. Periprosthetic infection, pulmonary embolism, hematoma, mortality, and >10 mm leg length discrepancy were not found in either group. Harris scores of the simBTHA group and stgBTHA group were 94.3±6.5 and 92.3±5.9, respectively (p=0.203). The major complication observed was perioperative periprosthetic fracture (PPF) in 4 (7.6%) cases. The PPF rate was higher in the simBTHA group (14.2%) compared to the stgBTHA group (3.1%); however, this difference was not statistically significant (p=0.289). The blood transfusion rate was significantly higher in the simBTHA group than in the stgBTHA group (p=0.010).

Discussion and Conclusion: The main finding of this study is that simBTHA with a lateral approach is associated with increased blood transfusion requirements and periprosthetic fracture complications. Therefore, simultaneous BTHA via the lateral approach may not be preferable, especially in patients with increased perioperative risk.

Keywords: Bilateral; lateral approach; simultaneous; staged; total hip arthroplasty.

Approximately 15–25% of patients who have undergone total hip arthroplasty (THA) also require a second contralateral procedure within 5 years [1]. There are two THA surgery options for bilateral advanced hip osteoarthritis: simultaneous bilateral total hip arthroplasty (simBTHA) and staged bilateral total hip arthroplasty (stgBTHA). In the

literature, some opinions suggest that complications may increase due to the longer operation time in simultaneous surgeries [2].

simBTHA offers potential cost savings due to a single hospital admission and only one anesthesia exposure. However, periprosthetic fracture, perioperative bleeding,

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blood transfusion, pulmonary embolism, mortality, and complication rates may increase. In stgBTHA, the risk of deep venous thrombosis (DVT) and embolism may be higher as a result of later mobilization due to the continuation of pain in the contralateral hip [3]. To clarify this controversial situation in the literature, we compared the complication and functional results of simBTHA and stgBTHA.

Our experienced authors preferred the lateral approach for THAs over the anterior approach, which they were not accustomed to. Thus, all THA cases, including simBTHA, were performed using the lateral approach. In our study, we aimed to assess the reliability of the lateral approach in simultaneous surgeries by comparing simBTHA and stgBTHA via the lateral approach. Our hypothesis was that complications due to increased operative time in simBTHA with a lateral approach would be higher and that stgBTHA would be safer.

Materials and Methods

Patients and Groups

In our clinic, bilateral THA was administered to 68 patients out of 364 THA cases performed between 2015 and 2022. Ethics committee approval was obtained according to the Helsinki Declaration on 03.04.2023 (HNEAH-KAEK 2023/KK/55). Among them, 53 patients who met the inclusion criteria and were available during follow-up were included in the study. Of these patients, 21 received simBTHA and 32 received stgBTHA. The patients were evaluated retrospectively. Institutional Review Board (IRB) approval was obtained. Patients with bilateral primary or secondary osteoarthritis and patients who were recommended THA for both hips were included in the study. Patients with a previous hip surgery, bone ankylosis, high hip dysplasia (Crowe types 3 and 4), and insufficient follow-up time were excluded from the study (Fig. 1). The general indication for simultaneous bilateral hip replacement was determined to be cases where postoperative mobilization would be more difficult if only one hip was replaced. Both groups of patients were informed preoperatively about the advantages and disadvantages of bilateral and staged surgical techniques by the senior surgeons. The absolute indication for the surgical technique in both groups was determined according to patient preference. Staged BTHA cases with a stage interval >15 months were not included in the study. All patients underwent surgery with a cementless femoral stem and acetabular cup. Periprosthetic fracture, operation time, blood transfusion rate, hospital stay, American Society of Anaesthesiologists (ASA) score, and body mass index (BMI) were compared between the groups.

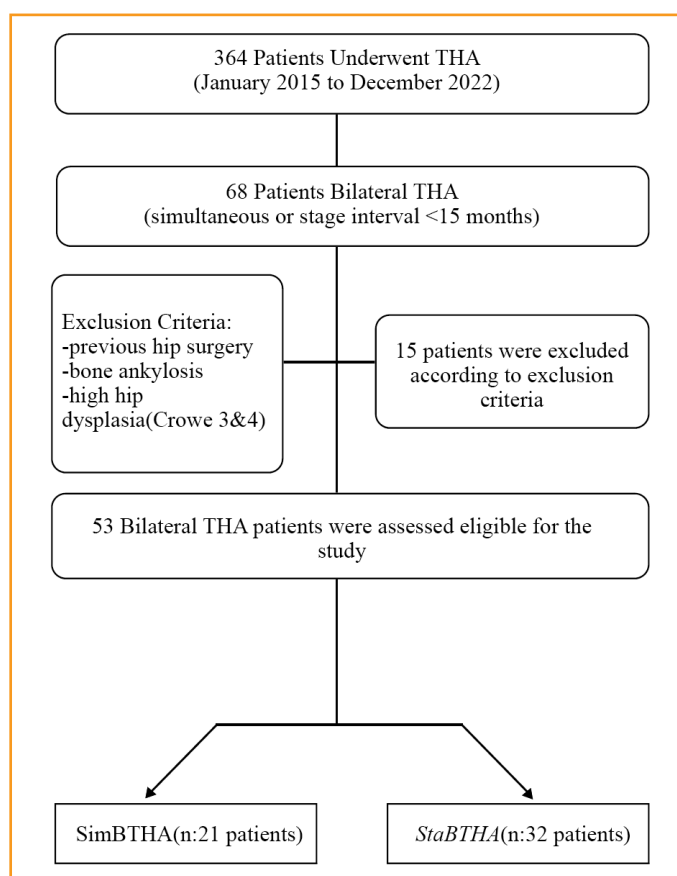


Figure 1. Flowchart of the study.

Outcome Measures

Major complications such as mortality, DVT, pulmonary embolism, periprosthetic fracture, prosthetic dislocation, acetabular cup malposition, and infection were recorded and compared between the groups. Leg length discrepancy (LLD) ≥ 10 mm was considered a major complication. Cases with LLD <10 mm were not considered to have a major complication because they were tolerable for patients and were not clinically significant. The rates of re-admission and revision surgery were compared. In the evaluation of acetabular cup malposition, cup inclination and anteversion were evaluated using the Lewinnek technique. For clinical outcomes, Harris Hip Scores were examined and compared.

Surgical Technique

All cases were prepared for the surgical procedure and operated on by two authors experienced in lateral THA surgery. A digital preoperative template was used to determine the hip rotation center, femoral offset, perioperative LLD, and optimal component length and position for all patients.

Patients were given low molecular weight heparin (enoxaparin 0.4 cc) 24 hours before surgery. One hour before surgery, prophylactic preoperative antibiotic cefuroxime axetil (i.v. 2 g) was administered. The cases were started primarily from the hip with the most common pain complaint. The procedure began by positioning the patient in the lateral decubitus position. A longitudinal incision was made extending 3–5 cm proximal and about 5–8 cm distal to the tip of the greater trochanter. The fascia was split at the interval between the tensor fascia latae and gluteus maximus in line with the skin incision. The tendon and muscle fibers of the gluteus medius were then visualized and split in a one-third anterior/two-thirds posterior fashion. The split was carried distally to the vastus ridge, leaving a cuff of the gluteus medius tendon for repair following the procedure. Anterior capsulectomy was performed, and the hip was dislocated anteriorly. The foot was placed anteriorly in the sterile bag. Then, the femoral neck osteotomy was performed approximately 15 mm proximal to the trochanter minor, and the femoral head was removed.

The acetabulum was prepared with the leg externally rotated and the knee extended on the table. Hohmann retractors were carefully placed anteriorly, posteriorly, and inferiorly around the acetabulum to provide adequate visualization. The acetabulum was deepened by medializing to the tabula interna. Soft tissue landmarks, such as the transverse acetabular ligament, reamer positioning relative to the floor, and cup positioning guides, were used to verify the acetabular version and inclination. The acetabulum was prepared at a 40° inclination and 15° anteversion angle. The acetabular cup was placed without cement as a press-fit. Then a 10° angled insert was placed as standard.

When preparing the proximal femur, the hip was flexed to

nearly 90° and externally rotated, and the foot was placed in the sterile bag anteriorly with the knee flexed. The femoral medulla was expanded to the bone cortex with a rasp. The optimal head/neck option was determined using the femoral rasp with trial implants. Hip movements were examined in all directions, stability was checked, and LLD was observed. The optimal size cementless femoral stem was placed, and the hip was reduced with the selected appropriate size femoral head. The amount of bleeding was recorded during the operation. Tranexamic acid was injected into the joint to control bleeding. A hemovac drain was placed. The gluteus medius fibers were repaired as much as possible. Then all subcutaneous soft tissues and skin were closed. The wound was dressed.

In simultaneous cases, surgical covers were removed, and lateral decubitus positioning was achieved on the operated side for the contralateral hip. The same procedures were applied to the other side.

Postoperative Rehabilitation

The postoperative rehabilitation protocols were similar in simultaneous and staged cases. Six hours after surgery, the patient was allowed to sit. All patients were allowed full weight bearing and to walk with a walker on the first operative day. Patients who were able to ambulate on their own after surgery were discharged. The first follow-up was performed during the third week after surgery, and physical therapy was started. Subsequent follow-up visits were performed at 6 weeks, 3 months, and 6 months.

Statistical Analysis

Mean, standard deviation, median, minimum, maximum, frequency, and percentage were used for descriptive statistics. The distribution of variables was checked using

Table 1. Preoperative diagnosis of the patients.

	Total BTHA		Simultaneous BTHA		Staged BTHA		p
	n	%	n	%	n	%	
Pre-Operative Diagnose							
Primer OA	29	54.7	13	61.9	16	50.0	0.394 ^{X²}
AVN	13	24.5	3	14.3	10	31.3	0.160 ^{X²}
DDH	7	13.2	2	9.5	5	15.6	0.521 ^{X²}
Achondroplasia	1	1.9	1	4.8	0	0.0	0.396 ^{X²}
Perthes Sequela	1	1.9	1	4.8	0	0.0	0.396 ^{X²}
Seconder OA(AS)	2	3.8	1	4.8	1	3.1	1.000 ^{X²}

X² Chi-square test; *Primer OA, primer osteoarthritis, *AVN, avascular necrosis, DDH, developmental dysplasia of hip, *Seconder OA(AS), seconder osteoarthritis(ankylosan spondylitis)

the Kolmogorov–Smirnov test. The Mann–Whitney U test was used for the comparison of quantitative data. The chi-square test was used for the comparison of qualitative data. SPSS 28.0 was used for statistical analyses.

Results

The mean follow-up period of our study was 27 (13–96) months. The mean age of the patients was 56.3 (24–74) years. There was no statistically significant difference ($p>0.05$) in patient age between the groups. In the study, 28 patients were women and 25 were men. The distribution of gender and ASA score was similar between the groups. The mean stage interval time of stgBTHA cases was 126.1 ± 118.6 days (range 4–455 days). BMI scores of simBTHA and

stgBTHA cases were 26.2 and 27.7, respectively. There was no statistically significant difference in BMI scores between the two groups. There was no significant difference ($p>0.05$) in the distribution of preoperative diagnosis between the stgBTHA and simBTHA groups (Table 1). The blood transfusion rate was significantly higher in the simBTHA group than in the stgBTHA group ($p=0.010$). The mean operation time was 184.0 minutes in the simBTHA group and 106.3 minutes in the stgBTHA group.

Hematoma, 90-day mortality, component malposition, pulmonary embolism, ≥ 10 mm LLD, and infection as major complications were not found in any cases. There was no significant difference ($p>0.05$) between the groups in the rate of LLD, component malposition, hematoma, DVT, dislocation, or revision surgery. The most common major complication (7.6%) was perioperative periprosthetic fracture. All cases were type A fractures in the Vancouver periprosthetic fracture classification. The PPF complication rate was higher in the simBTHA group (14.2%) compared to the stgBTHA group (3.1%); however, this difference was not statistically significant ($p=0.289$). Most of the periprosthetic fractures (75%) seen in the simBTHA group were specifically in the trochanteric region (only trochanteric tip). Placement of the acetabular cup in the safe zone using the Lewinnek technique was successful for both groups, and there was no statistically significant difference ($p>0.05$). There was no significant difference ($p>0.05$) between the revision and re-admission rates for simBTHA and stgBTHA. The Harris scores for the simBTHA cases were 94.3 ± 6.5 , and for the stgBTHA cases were 92.3 ± 5.9 . There was no significant difference ($p>0.05$) in Harris scores between the groups (Tables 2 and 3).

Table 2. The demographics and complications of the patients.

	Min-Max	Medyan	Mean $\pm$ SD/n-%
Age	24.0-74.0	55.0	56.3 $\pm$ 12.3
Gender			
Female			28-52.8%
Male			25-47.2%
BMI	22.0-37.6	27.0	28.4 $\pm$ 4.5
ASA			
I			14-26.4%
II			30-56.6%
III			9-17.0%
Staged BTHA			32-60.4%
Simultaneous BTHA			21-39.6%
Blood Transfusion			
(-)			20-37.7%
(+)			33-62.3%
I			26-49.1%
II			3-5.7%
III			4-7.5%
Stage Interval in stgBTHA	4.0-455.0	86.0	126.1 $\pm$ 118.6
Harris	77.0-100.0	92.0	93.1 $\pm$ 6.2
VAS	6.0-10.0	9.0	8.8 $\pm$ 1.3
Hospital Stay Time	2.0-7.0	3.0	3.3 $\pm$ 1.0
Operation Time	89.0-225.0	120.5	136.6 $\pm$ 39.9
Follow-Up Time	13.0-96.0	27.0	32.5 $\pm$ 17.0
Major complications			
Component malposition			1-1.9%
DVT			1-1.9%
Dislocation			1-1.9%
Periprosthetic fracture			4-7.6%
Revision surgery			2-3.8%
Re-admission			4-7.6%

*BMI, body mass index, *ASA, American society of anesthesiologist, *BTHA, bilateral total hip arthroplasty, *DVT, deep venous thrombosis.

Discussion

There are three main surgical approach options available for THA: the anterior, lateral, and posterior approaches. Each approach has its own advantages and disadvantages. In many studies in the literature, the anterior approach is often recommended because simBTHA surgery can be performed with a single surgical cover in the supine position and the operation time may be shorter. It is thought that the anterior approach has fewer complications due to the shorter operation time, and therefore this approach is recommended by many authors for simultaneous surgeries. However, studies in the literature have shown that complication rates increase when a surgeon uses an unfamiliar surgical approach [4–6].

Table 3. The demographics, functional score and complications of the patients.

	Simultaneous BTHA		Staged BTHA		p
	Mean±SD/n-%	Median	Mean±SD/n-%	Median	
Age	51.0±11.9	54.0	56.4±9.8	58.0	0.136m
Gender					
Female	9-42.9%		19-59.4%		0.239 X ²
Male	12-57.1%		13-40.6%		
BMI	26.2±2.8	26.0	27.7±3.1	27.0	0.098m
ASA					
I	7-33.3%		7-21.9%		0.145X ²
II	13-61.9%		17-53.1%		
III	1-4.8%		8-25.0%		
Pre-Operative Diagnose					
Primer OA	13-61.9%		16-50.0%		0.394X ²
AVN	3-14.3%		10-31.3%		0.160X ²
DDH	2-9.5%		5-15.6%		0.521X ²
Achondroplasia	1-4.8%		0-0.0%		0.396X ²
Perthes Sequela	1-4.8%		0-0.0%		0.396X ²
Seconder OA(AS)	1-4.8%		1-3.1%		1.000X ²
Blood Transfusion					
(-)	3-14.3%		17-53.1%		0.010X ²
(+)	18-85.7%		15-46.9%		
I	13-61.9%		13-40.6%		
II	2-9.5%		1-3.1%		
III	3-14.3%		1-3.1%		
Harris	94.3±6.5	96.0	92.3±5.9	92.0	0.208m
VAS	8.8±1.3	9.0	8.8±1.2	9.0	0.947m
LLD					
(-)	19-90.5%		31-96.9%		0.555X ²
(+)	2-9.5%		1-3.1%		
Lewinnek Ase. Cup Safe Zone					
(-)	0-0.0%		1-3.1%		1.000X ²
(+)	21-100%		31-96.9%		
Hematoma					
(-)	20-95.2%		31-96.9%		1.000X ²
(+)	1-4.8%		1-3.1%		
DVT					
(-)	21-100%		31-96.9%		1.000X ²
(+)	0-0.0%		1-3.1%		
Dislocation					
(-)	21-100%		31-96.9%		1.000X ²
(+)	0-0.0%		1-3.1%		
Revision Surgery					
(-)	20-95.2%		30-93.8%		1.000X ²
(+)	14.8%		2-6.3%		
Hospital Stay Time	4.0±1.1	4.0	2.8±0.7	2.5	0.000m
Operation Time	179.5±25.8	184.0	108.4±13.2	106.3	0.000m
Follow-Up Time	25.6±11.9	20.0	37.1±18.4	32.5	0.006m

X² Chi-square test / m Mann-Whitney u test; *BTHA, bilateral total hip arthroplasty, *BMI, body mass index, *ASA, American society of anesthesiologist, *LLD, leg length discrepancy, *DVT, deep venous thrombosis.

Similar to previous meta-analyses, there was no significant difference in the dislocation rate between the simBTHA and stgBTHA groups in the present study [7–10]. Dislocation was detected in only one case in the stgBTHA group. We think that the reason for this low dislocation rate is that the lateral approach is very stable and safe.

The most common complication in our study was perioperative periprosthetic fracture (PPF). PPFs were seen in 4 (7.6%) cases: 3 (14.2%) in the simBTHA group and 1 (3.1%) in the stgBTHA group. Similar to the literature, the PPF complication rate in the simBTHA group was higher than in the stgBTHA group [8]. In our study, although there was a noticeable percentage difference between the groups, it was not statistically significant. A high rate of trochanter-type fracture was observed in the simBTHA group as a specific complication. Three (75%) of the PPFs in the simultaneous group were trochanter-type fractures. This higher PPF rate compared to the literature may be attributed to the lateral approach and potentially accelerated surgical maneuvers during single-session simBTHA.

In this study, the average operation time of the simBTHA group was 76 minutes longer than that of the stgBTHA group. Berend et al. [2] reported that infection rates may be higher due to the long operation time of simBTHA with the lateral approach. In addition, they reported that lying on the freshly operated wound side in the lateral decubitus position may also increase the infection rate by causing tissue irritation. Therefore, they did not recommend the lateral approach for simBTHA surgery [2].

Gou et al. [11] found cumulative blood transfusion rates significantly higher in the simultaneous group compared with the staged group. In our study, the cumulative blood transfusion rate was also significantly higher in the simultaneous group. At the same time, the cumulative amount of perioperative bleeding was high. Perioperative periprosthetic fracture may also have been a contributing factor. In conclusion, simultaneous surgery appears to be a disadvantage when complications related to blood transfusion are considered.

In this study, the Harris score was 94.3 ± 6.5 in the simultaneous group, similar to the literature, and 92.3 ± 5.9 in the staged group. There was no statistically significant difference between the two groups. Kim et al. [3] found that the functional results and patient satisfaction of simBTHA cases were higher compared to the stgBTHA group in their study conducted with the posterior approach. In that study, they reported Harris scores

similar to ours, with 95.9 ± 4.8 in the simultaneous group and 90.7 ± 8.2 in the staged group. Kim et al. [3] explained that the surgery was more accurate in the simultaneous group than in the staged group, rehabilitation of both hips was possible earlier, and patients had faster recovery and missed less work. However, due to the higher risk of periprosthetic fracture and increased blood transfusion rate in simultaneous surgery, it may be safer to perform bilateral hip arthroplasty in stages.

Limitations

The primary limitations of this study are its retrospective design and the relatively small sample size. The lack of preoperative gait analysis and hip scoring is also a limitation in terms of comparison with postoperative scores. Furthermore, the study was conducted in a single clinic, and all surgeries were performed by only two experienced authors. One of the strengths of the study is that it provides a detailed comparative analysis between simultaneous and staged BTHA via a lateral approach.

Conclusion

The main finding of this study is that simBTHA with a lateral approach is associated with increased perioperative bleeding and periprosthetic fracture complications. Therefore, we do not recommend simultaneous BTHA surgery via the lateral approach.

Ethics Committee Approval: The study was approved by Haydarpaşa Numune Training and Research Hospital Ethics Committee (No: HNEAH-KAEK 2023/KK/55, Date: 03.04.2023).

Conflict of Interest: The authors declare that there is no conflict of interest.

Informed Consent: Informed consent was waived because of the retrospective nature of the study and the analysis used anonymous clinical data.

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