Original Research Article

Direct Lateral Versus Posterior Approach in Patients Undergoing Hip Arthroplasty: Short Term Functional Outcome and Review of Recent 5-year Literature

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ABSTRACT

Introduction: There is still limited evidence to support either the direct lateral approach (DLA) or the posterior approach (PA) for hip arthroplasty. The aim of this study is to compare the short-term clinical outcomes of both approaches and discuss the findings from recent literature.

Methods: This is a cohort study of the hip arthroplasty registry at our institution from January 2019 until January 2020. Functional evaluation using the Harris Hip Score was carried out before surgery, three months after surgery, and six months after surgery. The primary clinical endpoint was determined as the intraindividual rise at the six-month evaluation versus its preoperative level. Statistical analysis with T-test and Mann Whitney Test.

Results: A total of 68 patients underwent the surgery, equally distributed between the LA and PA group (n=34 for each). Postoperatively, no significant difference in HHS score was found between the two groups at three months for the pain score ($p = 0.534$) and functional score ($p = 0.772$), as well as at six months for both the pain ($p = 0.995$) and functional score ($p = 0.790$). The change in total HHS score from preoperative assessment to postoperative 3rd and 6th months between both surgical approaches was also not significantly different ($p = 0.693$ and $p = 0.505$, respectively).

Conclusion: Hip arthroplasty that performed with posterior and lateral approaches resulted in similar intraoperative morbidity assessed through amount of blood loss and also similar clinical and functional outcome as assessed through length of stay and Harris Hip Score.

Keywords: Harris Hip Score, hip arthroplasty, direct lateral approach, posterior approach
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INTRODUCTION

Hip fracture is regarded as a "fragile" fracture in the elderly with osteoporosis or osteopaenia brought on by a little fall. A hip fracture patient is typically 77 years old. Hip fractures occurred in 1.7 million people globally in 1990; by 2050, that number is anticipated to increase to 6.3 million.[1]

Displaced intracapsular neck of femur fractures may be treated with joint replacement operations. There are two main joint replacement techniques for treating misplaced intracapsular neck of femur fractures: partial hip replacement and total hip replacement. Partial hip replacement is the preferable option because the large diameter hemiarthroplasty "head" portion lowers the risk of dislocation in the frail, low mobility group. Total hip replacement is preferable for those who are more active since it can result in a better functional outcome.[2]

The posterior approach (PA) and the direct lateral approach (DLA) are the two surgical techniques most frequently employed for the hip region. In terms of maintaining gait, the posterior approach is preferable because the superior gluteal nerve is protected more and the abductor muscles are not divided. A direct lateral approach, on the other hand, may cause a late Trendelenburg gait and a delay in the restoration of abductor strength. The advantage of DLA is the acetabulum's clear visibility, which promotes cup alignment and may lower dislocation rates. Additionally, because the surgical location is farther away, there is a reduced risk of sciatic nerve damage.[3]

The strategy adopted is frequently determined by surgeon preference, and current recommendations are based on a small body of evidence. Dislocation rates have historically been used to form recommendations. Due to technological advancements and a better awareness of patient priorities, outcomes like post-operative function and pain may be viewed as more important in the current situation. This study compares the functional results of elderly patients who underwent hip arthroplasty using direct, lateral, and posterior surgical methods.

SUBJECTS AND METHODS

A prospectively established cohort was used in this investigation, which was carried out between January 2019 and January 2020. The inclusion criteria were met by patients who were brought to our facility with a displaced intracapsular hip fracture who underwent arthroplasty. With the approval of their next of kin or legal guardian, patients who were unable to consent were allowed to participate in the study. Inability to provide permission and pathological fractures requiring a particular prosthesis or therapy were exclusion criteria. The surgeon's preference determined the surgical strategy.

Similar preoperative, intraoperative, and postoperative care were given to the patient. The patient's membership in the organization was disclosed to the physician performing the surgery. The medical staff caring for the patient during their hospital stay and those evaluating the results, however, were blinded to the surgical technique used.

Surgical Procedure

Direct Lateral Approach

A longitudinal incision is made 3–5 cm proximal and 5–8 cm distal to the tip of the greater trochanter with the patient in the lateral decubitus position. The fascia is split in line with the skin incision between the tensor fascia latae and the gluteus maximus, then retracted with a retractor. The gluteus medius splits at the midpoint between the muscle's most anterior and posterior ends. The gluteus minimus and the joint capsule are divided around the neck of the femur. External rotation and flexion of the hip and knee are performed to dislocate the femoral head. To safely perform a femoral neck osteotomy with an oscillating saw, Hohmann retractors are inserted around the femoral neck.[4]

Posterior Approach

In the lateral decubitus position, the skin incision begins 5 cm distal to the greater trochanter and proceeds proximally to the greater trochanter, based on the diaphysis of the femur. It then curves for 6 cm toward the posterior superior iliac spine.[4]

Overlying the gluteus maximus, the fascia latae is incised, splitting the muscle bluntly down to the short external rotators. The gluteus maximus is retracted with a Charnley retractor, and care must be taken for the sciatic nerve that runs posterior to the short external rotators. The tenotomy of the short external rotators and piriformis is then performed at their insertion onto the greater trochanter. After incising the posterior joint capsule, the femoral head was dislocated by internally

rotating the hip, and then the femoral neck was osteotomized.[4]

Postoperative Management

A standardized physiotherapy program was planned for all patients until hospital discharge at the fifth postoperative day, including a walking training with partial weight-bearing started from first postoperative day. After hospital discharge, physiotherapy continued on an individual basis, and walking training was done using a walker. Forced internal and external rotation was prohibited, and hip flexion was limited to 90° during the first four weeks of postoperative management.

Primary Clinical Outcome

The Harris Hip Score (HHS) was used as the primary outcome. Data were collected for gender, age, the body region being operated on, the procedure performed, the length of stay, and the surgical approach. Patients were scheduled for follow-up in the outpatient clinic three months and six months after surgery. The primary clinical outcomes evaluated with HHS were function, pain, and range of motion (ROM). The main clinical endpoint was described as the intraindividual increase at the six-month evaluation compared with its preoperative measurement. The maximum score of HHS is 100 points, covering function (seven items, 0–47 points), pain (one item, 0–44 points), absence of deformity (one item, four points), and ROM (two items, five points). Function is subdivided into gait (33 points) and activities of daily living (14 points). A cumulative score of 90–100 indicates an excellent result, 80–90 indicates a good result, 70–80 indicates a fair result, and <70 indicates a poor result.

RESULTS

There were a total of 68 patients undergoing the surgery, equally distributed between the group using the Lateral Approach (LA) and Posterior Approach (PA) (n=34, each). The mean age of patients was 69.68 ± 14.66 years in the LA group and 68.59± 16.52 years in the PA group (p = 0.775), with an equal distribution of gender (p = 0.575). The most common cause of pathology was trauma in both groups. The lateral approach was most commonly used in pathology around the femoral neck (50%), followed by hemiarthroplasty (91.4%). However, the posterior approach was mostly used in pathology around the intertrochanteric area (35.3%) and in hemiarthroplasty procedures (70.6%). There was no significant difference regarding length of stay between the LA group (11.34 ± 6.40 days) and the PA group (10.26 ± 3.85 days) (p = 0.490). (Table 1).

Parameters	Lateral Approach Group	Posterior Approach Group	p-value
Age (years); mean ± SD	69.68 ± 14.66	68.59± 16.52	0.775
Sex			0.575
Male; n (%)	10 (29.4%)	7 (20.6%)	
Female; n (%)	24 (70.6%)	27 (79.4%)	
Cause			0.510
Trauma; n (%)	30 (88.2%)	27 (79.4%)	
Non-Trauma; n (%)	4 (11.8%)	7 (20.6%)	
Region Involved			0.000
Intertrochanteric; n (%)	14 (41.2%)	12 (35.3%)	
Femoral Neck; n (%)	17 (50.0%)	11 (32.4%)	
Other; n (%)	3 (8.8%)	11 (32.4%)	
Procedures			0.017
Total Hip Arthroplasty; n (%)	3 (8.8%)	10 (29.4%)	
Hemiarthroplasty; n (%)	31 (91.2%)	24 (70.6%)	
Blood Loss; mean ± SD	323.33 ± 187.91	425 ± 251.845	0.177
Length of Stay (LOS); mean ± SD	11.26 ± 5.79	10.21 ± 3.57	0.820

Table 1. Baseline Characteristic

HHS Score		Group		
Time	Domain	Lateral Approach	Posterior Approach	p-value
Pre-op	Pain	9.12 ± 2.88	8.82 ± 3.27	0.692
	Functional	20.97 ± 3.90	21.91 ± 3.07	0.196
	Total HHS	30.09 ± 4.65	30.74 ± 4.32	0.555
3rd month	Pain	31.18 ± 5.91	32.06 ± 6.41	0.526
	Functional	22.82 ± 6.09	22.18 ± 6.33	0.693
	Total HHS	54.09 ± 4.28	55.06 ± 3.00	0.325
6th month	Pain	39.18 ± 4.62	38.59 ± 5.11	0.722
	Functional	33.59 ± 6.64	33.41 ± 6.00	0.909
	Total HHS	72.76 ± 5.74	72.00 ± 5.21	0.781

Table 2. Distribution of Harris Hip Score (HHS)

Changes in HHS Score	Group		
	Lateral Approach	Posterior Approach	p-value
Changes in Pre- op to 3rd Month	24.00 ± 4.73	24.32 ± 3.76	0.756
Changes in Pre- op to 6th Month	42.68 ± 7.40	41.26 ± 7.29	0.431

Table 3. Change in Total Harris Hip Score (HHS)

Preoperatively, no significant difference in HHS score was found between the two groups in terms of pain score ($p = 0.692$) and functional score ($p = 0.198$). Postoperatively, there was expected improvement in the HHS score. However, no significant difference in HHS score was found between the two groups after three months for the pain score ($p = 0.534$) and functional score ($p = 0.772$), also after six months for both the functional score ($p = 0.790$) and pain ($p = 0.995$). The complete result of our study was displayed in Table 2. As a result, the change in total HHS score from preoperative assessment to postoperative 3rd and 6th months between both surgical approaches was also not significantly different ($p = 0.693$ and $p = 0.505$, respectively). (Table 3).

DISCUSSION

This study adds yet another factor to take into account when choosing a hip arthroplasty technique. After three and six months, there was no significant difference in the functional results between the two strategies. Similar morbidity, as measured by intraoperative blood loss and duration of stay, was also discovered. This is presumably due to the extensive body of material that has already been written about both surgical methods, which helped us identify their respective flaws. (Table 4)

The incidence of abductor insufficiency is the main difference between the posterior and lateral approaches. There is an increased incidence of abductor insufficiency following the use of the direct lateral approach in THA procedures. For the posterior approach, the reported incidence ranges from 0% to 16%, whereas the direct lateral approach has a range of 4% to 20%.[4] A randomized controlled trial study by Witzleb et al. (2009) showed slightly better functional outcomes in patients implanted via the posterior approach after three months.[3]

In the last five years, studies comparing both surgical approaches have concluded that four out of five functional outcomes were comparable. Kristensen et al. (2016), however, found that patients undergoing hip arthroplasty with PA had less pain and a better quality of life. The author assumed that this was related to the use of the posterior approach in the group with uncemented implants. Patients who are in good physical condition are more likely to use uncemented implants.[5–9]

As for intraoperative morbidity, a previous study showed that PA is superior to DLA regarding intraoperative blood loss.[9] However, there is conflicting evidence regarding the operation time. A randomized controlled trial study with 60 patients undergoing cementless total hip arthroplasty found a significantly shorter operating time using a direct lateral approach compared to a posterior approach (67 minutes vs 76 minutes, $p < 0.001$).[3]

No	Reference	Conclusion	Outcome					Follow up period	Adverse event
			Pain	Blood Loss	Outcome Score	Dislocation Rate	Time Operation		
1	Hongisto et al 2018	Hemiarthroplasty using a lateral approach predisposed to the need for ambulatory aids 1 year after hip fracture. The posterior approach, however, predisposed to hip dislocation.	No difference	N/A	N/A	PA 4 (3.4%); DLA 0 (0%)	N/A	1 year	N/A
2	Kristensen et al 2016	Hemiarthroplasty for hip fracture per- formed through a posterior approach rather than a direct lateral approach results in less pain, with better patient satisfaction and better quality of life. The risk of reoperation was similar with both approaches.	Mean 4 month PA 23; DLA 25 (p=0.01) 12 month PA 18; DLA 21 (p=0.001) 36 month PA 17; DLA 20 (p=0.02)	N/A	EQ 5D index Score 4 month PA 0.47; DLA 0.45 (p=0.2) 12 month PA 0.58; DLA 0.55 (p=0.01) 36 month PA 0.6 ; DLA 0.56 (p=0.08)	N/A	PA 67 min; DLA 76 min	3 years	Walking problem in DLA > PA No Walking Problem : 4 month PA 27% ; DLA 20% (p<0.001) 12 month PA 40% ; DLA 30% (p<0.001) 36 month PA 35% ; DLA 42% (p=0.009)
3	Mukka et al 2016	Patients treated with HA for FNF using either the DL or PL approaches had comparable functional outcome after 1 year. The PL approach had a tendency towards a higher reoperation rate.	N/A	PA 239 (± 186); DLA 254 (± 141)	1 Year Follow Up WOMAC PA 79 (± 24.0); DLA 79 (± 22) Harris Hip Score PA 72 (± 17); DLA 71 (± 18)	Single dislocation PA 1; DLA 2 Recurrent dislocation PA 6; DLA 1	PA 66 (± 18) min; DLA 90 (± 21) min	1 year	Number of hips with any complication PA 15 (18.1%); DLA 9 (8.8%) ; (p=0.08)
4	Petis 2018	Temporal gait parameters were similar following THA for all approaches. Differences in gait kinematics and kinetics exist; however, given the small absolute differences, the clinical importance of these changes remains undetermined.	N/A	N/A	Step Length (m) Preop PA 0.53 [0.35–0.67]; DLA 0.48 [0.39–0.53]; p=0.89 6 weeks PA 0.58 [0.51–0.69]; DLA 0.48 [0.31–0.58]; p=0.18 12 weeks PA 0.60 [0.53–0.71]; DLA 0.56 [0.43–0.64]; p=0.19 Stride Length (m) Preop PA 1.06 [0.83–1.29]; DLA 0.95 [0.76–1.05]; p=0.08 6 weeks PA 1.14 [0.99–1.36]; DLA 0.98 [0.66–1.11]; p=0.19 12 weeks PA 1.20 [1.11–1.37]; DLA 1.12 [0.91–1.29]; p=0.15 Gait Velocity (m/s) Preop PA 0.86 [0.53–1.06]; DLA 0.76 [0.60–0.95]; p=0.10 6 weeks PA 0.98 [0.75–1.15];DLA 0.82 [0.36–0.96]; p=0.36 12 weeks PA 1.09 [0.99–1.33];DLA 1.00 [0.84–1.14]; p=0.33	N/A	N/A	12 weeks	N/A
5	Apparajit et al 2017	The rate of early surgical complications and outcome measures after posterior and lateral approaches is not significantly different.	N/A	PA 144.75±17.68; DLA 148.38±15.03	Harris Hip Score 3 mo :PA 67.22±7.61; DLA 65.01±7.35; p=0.191 6 mo :PA 76.45±6.31; DLA 74.06±6.81; p=108 12 mo :PA 85.62±6.04; DLA 83.40±5.09; p=0.094	PA 2 (5%) ; DLA 0 (0%)	PA 48.43±5.38 min; DLA 47.50±7.59 min	1 year	infection PA 17.50%; DLA 12.5%

Table 1. Summary of literature search about current study on surgical approach of hip arthroplasty

A prospective comparative study comprising 80 patients with intracapsular neck femur fractures between 50 and 80 years of age treated with hemiarthroplasty found similar operation times between the posterior and direct lateral approaches (48.43±5.38 and 47.50±7.59 minutes, respectively). A longer operation time is known to correlate with the amount of blood loss. As for our study, the similarity of intraoperative morbidity between the two approaches can be attributed to the well-known pitfalls of the two approaches.

The direct lateral approach has a lower risk of prosthetic dislocation and a lower rate of the secondary procedure compared to the posterior approach. The incident of prosthetic dislocation was high with posterior approach (5%) as compared to lateral approach (0%) and the rate of secondary procedures was high with posterior approach (12.5%) as compared to lateral approach (7.5%).[9] This unfavorable outcome might be related to the sacrifice of external rotator muscles in the posterior approach. We attempt prevent this in our cohort by advocating safe hip position to the patients and their caregivers.

Our study has several limitations. The first is the limited number of samples. Despite that, the sample size is sufficient to draw conclusions with sufficient power. There was also no randomization, and the selection of the surgical approach was entirely attributed to surgeon preference. These limitations suggest the need for further studies with a larger number of samples and the use of a randomized control study.

CONCLUSION

Both posterior and lateral methods of hip arthroplasty provided comparable intraoperative morbidity as measured by blood loss, as well as equal clinical and functional outcomes as measured by hospital stay and the Harris Hip Score.

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Ethical Approval

The research protocol for Ethical Clearance from the Research Ethics Commission at the Faculty of Medicine, Udayana University/Sanglah Hospital Denpasar was submitted before the research was carried out. Subjects who met the study criteria were given an explanation of the purpose of the study and asked to fill out written informed consent. Researchers have also attached a secondary data collection permit in the form of a medical record at Sanglah Hospital Denpasar.

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