RESEARCH ARTICLE

Outcomes of lateral and posterior approaches in hip arthroplasty: A cohort from low-middle-income country

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Abstract

Objective: To compare the postoperative outcomes and complications of the posterior approach and lateral approach for total hip arthroplasty in resource-limited settings.

Method: The retrospective cohort study was conducted at Aga Khan University Hospital, Karachi, from January to July 2024, and comprised data of patients who underwent total hip arthroplasty between January 2014 and December 2019. Key outcomes noted in both posterior approach group A and lateral approach group B were postoperative complications, blood loss, transfusion rates, and length of hospital stay. Data was analysed using STATA 15.

Results: Of the 498 patients, 402(80.7%) were in group A with median age 60 years (interquartile range: 45-70 years), and 96(19.3%) were in group B with median age 55.5 years (interquartile range: 42-69.5 years) (p>0.05). Group B showed higher blood loss and transfusion rates compared to group A (p<0.05). Postoperative complications were significantly more frequent in group B than group A (p<0.05), with infection being the most common 25(5%) patients across the groups. Group A had significantly lower adjusted odds of complications compared to group B (adjusted odds ratio: 0.51; 95% confidence interval: 0.26-0.98).

Conclusions: The posterior approach for total hip arthroplasty was associated with lower blood loss, fewer transfusions and reduced complication rates compared to the lateral approach, making posterior approach a preferred surgical technique in resource-limited settings.

Key Words: Total hip arthroplasty, Postoperative complications, Posterior approach, Lateral approach, Surgical outcomes, Orthopaedic surgery, Resource-limited settings, Hip fracture, Surgical technique, Patient recovery.

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Introduction

Total hip arthroplasty (THA) is an effective and reliable method to treat individuals with debilitating joint pain and functional limitations resulting from conditions like osteoarthritis, inflammatory arthritis, avascular necrosis and fractures[1]. THA has shown excellent outcomes, with 10-year survival exceeding 95%[2]. However, despite the favourable results, 7-15% of patients report dissatisfaction, often due to persistent pain or suboptimal functional recovery, presenting a significant challenge for surgeons worldwide.[3] Classified as intermediate risk surgery by the American College of Cardiology (AC) and the American Heart Association (AHA), it is associated with significant postoperative morbidity[4].

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Variability in outcomes following THA has been significantly attributed to the surgical approach utilised[5]. Since its introduction in the 1960s, the lateral approach (LA) and the posterior approach (PA) have emerged as the most popular choices worldwide[6]. While both approaches are popular, the PA is more widely used globally. In contrast, the LA was introduced to reduce the risk of trochanteric non-union. However, its association with superior gluteal nerve injury, heterotopic ossification and impaired abductor function has limited its use[7]. This may have led to the popularity of PA, which involves dissection through the gluteus maximus[6]. Although presenting with fewer problems regarding gait, PA has been linked to higher dislocation rates compared to LA[8].

Conflicting results have emerged in studies comparing the two surgical approaches, hence uncertainty about the optimal approach for THA exists[9,10]. While the superiority of one technique over the other remains inconclusive globally, the evidence is even more limited in low- and middle-income countries (LMICs), like Pakistan, where patient demographics vary significantly and resources as well as surgical expertise differ widely, which may have a substantial impact on treatment outcomes[11].

The current study was planned to compare the postoperative complications and clinical outcomes associated with LA and PA for THA in an LMIC setting.

Materials and Methods

The retrospective cohort study was conducted at Aga Khan University Hospital, Karachi, from January to July 2024, and comprised data of patients who underwent THA between January 2014 and December 2019. De-identified patient data was retrieved after exemption from the institutional ethics review committee.

All patients aged 18 years and older who underwent THA were included. Patients were excluded if they were under 18 years of age or had incomplete data for the outcome variables.

Data from the medical records was manually extracted and entered into an Excel sheet by trained individuals. Key outcomes noted in both PA group A and LA group B included patient's age, gender, comorbidities, American Society of Anaesthesiologists (ASA) grading, type of anaesthesia, surgical approach, intraoperative complications, postoperative complications, length of hospital stay (LOS) and follow-up outcomes.

Postoperative complications were defined as any unintended or adverse outcome within 30 days of the surgery. This was taken as a composite outcome that included all-cause mortality and any significant morbidity. The postoperative adverse outcomes evaluated for each group included dislocations, infections, venous thromboembolisms, pulmonary embolisms (PEs), others (neuropathies, pain and nerve injuries) and mortality.

Data was analysed using STATA 15. Descriptive statistics were employed to summarise the demographic and clinical characteristics of the sample. For continuous variables, the Shapiro-Wilk test was used to assess data normality. Variables with normal distribution were reported as mean +/- standard deviation, and were analysed by independent sample t-tests. Non-normally distributed variables were reported as median with interquartile range (IQR) and were compared using the Mann-Whitney U test. For categorical variables, frequencies and percentages were calculated, and comparisons were performed using the chi-square test or Fisher's exact test, as appropriate.

To explore outcomes based on surgical complexity, a subgroup analysis was conducted. Patients were stratified into two cohorts based on their primary diagnosis: THA for osteoarthritis (OA) or THA for other complex surgeries. Statistical comparisons were then made within each of the two subgroups. The incidence of adverse outcomes, including postoperative complications, adverse intraoperative events, readmissions and mortality rates, and LOS, was compared between the two groups. Logistic regression models (univariable and multivariable) were constructed to evaluate the association between the surgical approach and postoperative complications while adjusting for potential confounders. Model assumptions, including the absence of multicollinearity, were thoroughly checked.

Two-tailed $p<0.05$ was taken as significant, but $p \leq 0.25$ was considered significant when adjusting for variables in the clinical regression model. The results were reported with 95% confidence interval (CI) to enhance interpretability.

Results

Of the 498 patients, 402(80.7%) were in group A with median age 60 years (interquartile range: 45-70 years), and 96(19.3%) were in group B with median age 55.5 years (interquartile range: 42-69.5 years) ($p>0.05$). The median body mass index (BMI) was slightly higher in group A than group B, but the difference was not significant ($p=0.15$). Comorbidities were also not significantly different between the groups ($p>0.05$). Group B showed higher blood loss and transfusion rates compared to group A ($p<0.05$). Postoperative

Table-1: Demographic and clinical characteristics of the patients (n=498).

Variables	Lateral N= 96	Posterior N= 402	P-values
	Demographic and Clinical Characteristics		
Age in years	Median (IQR): 55.5 (42- 69.5) years	Median (IQR): 60 (45-70)	0.2637*
Gender			0.032
Male	58 (60.42%)	194 (48.26%)	
Female	38 (39.58%)	208 (51.74%)	
BMI	Median (IQR): 25.46 (23.43- 28.65)	Median (IQR): 26.58 (23.43- 29.67)	0.1498*

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Presence of Diabetes			0.695
Yes	25 (26.04%)	97 (24.13%)	
No	71 (73.96%)	305 (75.87%)	
Presence of Asthma/COPD			0.623$
Yes	6 (6.25%)	21 (5.22%)	
No	90 (93.75%)	381 (94.78%)	
Presence of Hypertension			0.601
Yes	43 (44.79%)	193 (47.76%)	
No	53 (55.21%)	210 (52.24%)	
Presence of IHD			0.861$
Yes	12 (12.50%)	47 (11.69%)	
No	84 (87.50%)	355 (88.31%)	
Ambulatory Status			0.852
Home with support/non-ambulatory/CBR	19 (19.79%)	83 (20.65%)	
Others	77 (80.21%)	319 (79.35%)	
Primary Diagnosis			0.067$
AVN	24 (25.00%)	82 (20.40%)	
Dysplastic Hip	5 (5.21%)	20 (4.98%)	
Failed Hip	8 (8.33%)	44 (10.95%)	
Fracture	27 (28.13%)	156 (38.81%)	
OA	19 (19.79%)	78 (19.40%)	
Others (Inflammatory Arthritis/ girdlestone/ Loosening of Prosthesis/ periprosthetic fracture/ Protrusio acetabuli)	13 (13.54%)	22 (5.47%)	
Type of Hip Replacement Surgery			0.173$
Left	43 (44.79%)	179 (44.53%)	
Right	38 (39.58%)	187 (46.52%)	
Simultaneous Bilateral	10 (10.42%)	20 (4.98%)	
Staged Bilateral	5 (5.21%)	16 (3.98%)	
Preoperative Characteristics			
ASA Grade			0.414
≤2	64 (66.67%)	250 (62.19%)	
>2	32 (33.33%)	152 (37.81%)	
Type of Anaesthesia			0.408$
General	86 (89.58%)	371 (92.29%)	
Regional/ Epidural/ Spinal/ combination	10 (10.42%)	31 (7.71%)	
Preoperative Hb levels	Median (IQR): 12.85 (11.45 - 14.3)	Median (IQR): 12.5 (11.3- 14)	0.312*
Intraoperative and Postoperative Characteristics			
Anticoagulant			0.685$
LMWH	87 (90.63%)	369 (91.79%)	
Others (Warfarin, Aspirin, Rivoroxiban, combination therapy, and not received)	9 (9.38%)	33 (8.21%)	
Postoperative Hb levels	Median (IQR): 10.1 (9.05- 11.4)	Median (IQR): 10.3 (9.4- 11.3)	0.3071*

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Blood transfusion			0.018
Yes	48 (50%)	148 (36.82%)	
No	48 (50%)	254 (63.18%)	
Blood loss in ml	Median (IQR): 400 (225-600)	Median (IQR): 250 (150-400)	<0.001*
	Postoperative Characteristics		
Complications	20 (20.8%)	49 (12.2%)	0.021
Morbidity	19 (19.79%)	44 (10.95%)	0.019
Dislocation	6 (6.25%)	11 (2.74%)	0.088$
Infection	6 (6.25%)	19 (4.73%)	0.547$
PE/DVT	5 (5.21%)	11 (2.74%)	0.223$
Others	2 (2.08%)	3 (0.75%)	0.245$
Mortality	1 (1.04%)	5 (1.24%)	0.895$

*Wilcoxon rank-sum (Mann-Whitney) test $ Fisher's Exact test; rest of the P-values are Chi Square test

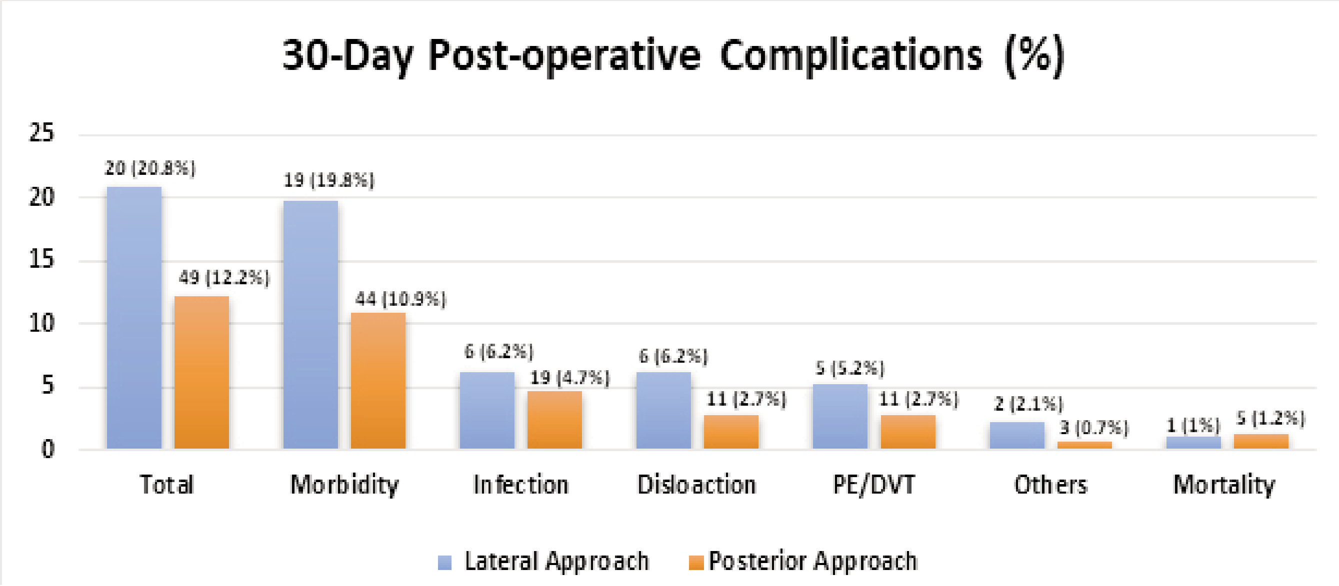

Figure: Comparison of 30-day postoperative complications with respect to the surgical approach.
PE – Pulmonary Embolism, DVT – Deep Vein Thrombosis.

Table-2: Multivariable logistic regression analysis with respect to morbidity/complications.

Variable		**Univariable**			**Multivariable**	
	OR	**95% CI**	**P-value**	**aOR**	**95% CI**	**P-value**
Approached Used						
Lateral	Ref	-	-	Ref	-	-
Posterior	0.49	0.27-0.90	0.021	0.51	0.26-0.98	0.044
BMI	1.04	0.99-1.10	0.081	1.06	1.005- 1.12	0.030
Age in years	1.008	0.99-1.02	0.318			
Gender						
Female	Ref	-	-			
Male	0.64	0.38-1.11	0.115			
Presence of Diabetes						
No	Ref	-	-			
Yes	1.95	1.11-3.41	0.019			

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Presence of Asthma/COPD						
No	Ref	-	-			
Yes	0.53	0.12-2.32	0.407			
Presence of Hypertension						
No	Ref	-	-			
Yes	1.58	0.92-2.69	0.092			
Presence of IHD						
No	Ref	-	-			
Yes	0.92	0.39-2.12	0.847			
Ambulatory Status						
thers	Ref	-	-			
Home with support/non-ambulatory/CBR	3.31	1.89-5.80	<0.001			
Primary Diagnosis						
AVN	Ref	-	-	Ref	-	-
Dysplastic Hip	0.82	0.22-3.11	0.779	0.64	0.16-2.53	0.526
Failed Hip	2.94	1.32-6.53	0.008	2.34	1.01-5.45	0.048
Fracture	0.54	0.25-1.15	0.114	0.52	0.23-1.15	0.110
OA	0.32	0.11-0.94	0.039	0.32	0.11-0.96	0.043
Others (Inflammatory Arthritis/ girdlestone/ Loosening of Prosthesis/ periprosthetic fracture/ Protrusio acetabuli)	1.79	0.68-4.69	0.231	1.04	0.37-2.93	0.931
Type of Hip Replacement Surgery						
Left						
Right	Ref	-	-			
Simultaneous Bilateral	1.35	0.77-2.36	0.285			
Staged Bilateral	0.87	0.24-3.09	0.837			
	0.82	0.18-3.77	0.809			
Type of Anaesthesia						
Others (Regional/ Epidural/ Spinal/	Ref	-	-			
combination)	0.56	0.24-1.28	0.173			
General						
Preoperative Hb levels	0.79	0.68-0.92	0.003			
Intraoperative Adverse Events						
No						
Yes	Ref	-	-			
	2.88	0.87-0.94	0.082			
Anticoagulant						
Others/Not received	Ref	-	-			
LMWH	2.03	0.92-4.47	0.079			
Postoperative Hb levels	0.69	0.57-0.82	<0.001	0.79	0.64-0.97	0.026
Blood transfusion						
No	Ref	-	-	Ref	-	-
Yes	3.64	2.08-6.38	<0.001	2.00	1.04-3.84	0.037
Blood loss in ml	1.0006	0.99-1.001	0.126			

BMI – Body Mass Index, COPD – Chronic Obstructive Pulmonary Disease, IHD – Ischaemic Heart Disease, CBR – Complete Bed Rest, AVN – Avascular Necrosis, OA – Osteoarthritis, ASA – American Society of Anaesthesiologists , Hb – Hemoglobin, LMWH – Low Molecular Weight Heparin, PE – Pulmonary Embolism, DVT – Deep Vein Thrombosis, aOR: Adjusted odds ratio, CI: Confidence interval.

complications were significantly more frequent in group B than group A ($p<0.05$), with infection being the most common 25(5%) patients across the groups (Table 1).

While there were slightly higher rates of infection,

Table-3: Subgroup analysis comprising osteoarthritis and other complex surgeries.

Variable	Osteoarthritis Subgroup			Other Complex Surgeries Subgroup		
	Lateral (N=19)	Posterior (N=78)	p-value	Lateral (N=77)	Posterior (N=324)	p-value
Age in years (Median, IQR)	56 (46-61)	60 (49-70)	0.21*	55 (40-70)	59 (42-70)	0.52*
Gender			0.35$			0.054
Female	7 (37%)	38 (49%)		31 (40%)	170 (52%)	
Male	12 (63%)	40 (51%)		46 (60%)	154 (48%)	
LOS (Median, IQR)	5 (4-6)	6 (5-7)	0.084*	6 (5-8)	6 (5-8)	0.99*
BMI (Median, IQR)	26 (24-29)	27 (25-30)	0.31*	25 (23-28)	26 (23-29)	0.26*
Comorbidities (Yes)						
Diabetes Mellitus	4 (21%)	17 (22%)	1$	21 (27%)	80 (25%)	0.64
Asthma/COPD	3 (16%)	3 (4%)	0.053$	3 (4%)	18 (6%)	0.56$
Hypertension	4 (21%)	31 (40%)	0.13$	39 (51%)	161 (50%)	0.88
IHD	3 (16%)	5 (6%)	0.18$	9 (12%)	42 (13%)	0.76$
Perioperative Variables and Outcome						
ASA Category			0.6$			0.26
<2	13 (68%)	58 (74%)		51 (66%)	192 (59%)	
>2	6 (32%)	20 (26%)		26 (34%)	132 (41%)	
Blood Loss (mL, Median)	500 (300-550)	250 (200-400)	0.007*	400 (200-700)	250 (150-400)	<0.001*
Blood Transfusion	6 (32%)	15 (19%)	0.23$	42 (55%)	133 (41%)	0.032
Outcome (Complications) (Yes)	0 (0%)	5 (6%)	0.26	20 (26.0%)	44 (13.6%)	0.008

*Wilcoxon rank-sum (Mann-Whitney) test
$ Fisher's Exact test; rest of the P-values are Chi Square test
BMI – Body Mass Index, IQR – Interquartile Range, LOS – Length of Hospital Stay, COPD – Chronic Obstructive Pulmonary Disease, IHD – Ischaemic Heart Disease, ASA – American Society of Anaesthesiologists.

dislocation and PE in group B, the differences individually were not statistically significant (Figure).

After adjusting for demographic, preoperative and postoperative factors, the odds of experiencing postoperative complications were significantly lower in group A compared to group B (p=0.04).

Additional factors influencing postoperative complications included BMI, haemoglobin (Hb) level, and blood transfusion (Table 2).

In the OA subgroup, there was no significant difference in the complication rate between the lateral and posterior approaches (p=0.26). In contrast, for the other complex surgeries subgroup, the complication rate was significantly higher in LA than PA (p=0.008). In both the subgroups, the lateral approach was associated with significantly higher intraoperative blood loss (Table 3).

Discussion

The current study is one of the first from LMICs addressing the impact of posterior and lateral surgical approach on postoperative outcomes following THA. The findings indicated a significant association between postoperative complications and the type of surgical approach. The results showed that patients operated with the lateral approach, and those receiving blood transfusions had higher odds of experiencing postoperative complications, a finding that was primarily driven by outcomes in patients undergoing complex surgeries. Among these, infections were the most common across the entire cohort. Overall complications were greater in the lateral approach group.

The outcomes of THA are influenced by various factors, with the surgical approach being a critical determinant. Hip fractures, and consequently the need for hip arthroplasties, are anticipated to increase significantly in the coming years due to increasing geriatric population and resultant fragility fractures[12–13]. This is particularly concerning for developing countries where fragile healthcare systems often face resource constraints.

Optimising treatment modalities to enhance patient satisfaction and improve quality of life remains a primary goal in managing hip fractures. Research has established surgical approach as one of the prime factors influencing these outcomes[5].

The current study demonstrated that LA patients had significantly higher odds of postoperative complications compared to those treated with PA. These findings suggest that PA is associated with better outcomes, possibly due to reduced soft tissue disruption. This aligns with findings from studies in high-income countries of the United States and Saudi Arabia[14,15]. However, while not statistically significant, the current study observed a trend towards a higher rate of dislocation and nerve injury-related complications in LA patients. Historically, LA is associated with lower dislocation and recurrence rate due to its accessibility and effective exposure of the acetabulum and proximal femur[16]. This potential discrepancy can be attributed to the limited sample size in the current study.

Another significant finding of the current study is the association between intraoperative blood loss, transfusion rates and postoperative complications. LA patients experienced higher intraoperative blood loss compared to those treated with PA, which subsequently led to an increased rate of blood transfusions in the same cohort. Multivariate analysis further confirmed that patients requiring blood transfusions had significantly higher odds of postoperative complications. The increased blood loss in LA could be attributed to greater disruption of soft tissues, including the abductor musculature and surrounding vasculature, inherent to this technique[7]. The current findings align with previous studies, establishing a strong link between blood transfusions and increased postoperative morbidity and mortality[09,17]. Transfusion-related complications, including immunomodulatory effects, infection risks and potential volume overload, may partially explain the observed link between transfusions and postoperative morbidity[18].

In the current study, subgroup analysis stratified by surgical complexity led to key insights. While LA was associated with a higher complication rate in the overall cohort, the finding was not uniform across patient types. Specifically, no significant difference in complication rates was observed between the two approaches in the OA subgroup. However, in the cohort of patients undergoing more complex surgeries, LA was linked to a significantly higher rate of adverse events. This suggests that while the approaches may have comparable safety profiles in routine primary THA, the posterior approach may be the safer option for more challenging cases in developing countries. It can be hypothesised that the greater soft tissue disruption and blood loss inherent to LA, while potentially well-tolerated by standard OA patients, may become the critical factor that precipitates complications in a more complex surgery.

A significant challenge in LMICs is the high occurrence of postoperative infection rates, which often exceed globally accepted benchmarks. In the current study, the reported infection rates were notably higher than the incidence of infections in hip arthroplasties reported by Kurtz et al.[19]. The findings align with an observational study which identified postoperative infections as one of the predominant complications in orthopaedic procedures performed in LMICs[20]. The high complication rates observed in the current study could be influenced by the resource constraints typical of LMICs, including limited access to advanced healthcare facilities, variability in infection control protocols, and inconsistencies in the quality of postoperative care provided to patients[21]. Postoperative infections not only compromise clinical outcomes and postoperative quality of life, but also impose significant financial strain. This financial strain is particularly severe in LMICs, where healthcare systems are under-resourced, and patients frequently bear out-of-pocket cost of care[22]. The high incidence of postoperative infections in LMICs exacerbates this issue, leading to financial catastrophe for many families. Bozic et al. emphasised that treating patients with infections following THA demands significantly more hospital and physician resources compared to treating patients undergoing revisions for aseptic loosening or primary THA[23]. In resource-constrained LMICs, high postoperative infection rates need to be mitigated through strict preoperative infection protocols and the use of aggressive perioperative antibiotics[24].

The current study has some limitations. While it provides valuable insights, the retrospective nature and single-centre setting together restrict the applicability of the findings to larger, more diverse populations. The small sample size and difference in the number of patients in PA and LA groups, due to resource constraints, may also reduce the statistical power of the results. Furthermore, it is important to note that a formal sample size calculation was not performed prior to data collection, which adds to the limitations. However, the use of multivariate and subgroup analysis strengthens the findings. Additionally, the lack of long-term follow-up in the study may have introduced biases, and failed to account for changes in patient status over time. Despite the limitations, however, the study offers valuable insights into the impact of surgical approach for THA on postoperative complications in an LMIC setting, serving as a basis for future research in similar contexts.

Conclusion

The posterior approach was associated with fewer complications compared to the lateral approach, which was linked to higher blood loss, transfusion rates and postoperative morbidity. Postoperative infections remain a significant challenge, exacerbating clinical outcomes and healthcare costs in LMICs. There is a need to optimise surgical techniques and perioperative management, especially in resource-limited environments, to improve patient outcomes and minimise complications.

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