Section: Orthopaedics

Original Research Article

SHORT TERM VS LONG TERM OUTCOME OF ANTERIOR VS POSTERIOR APPROACH IN TOTAL HIP REPLACEMENT

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ABSTRACT

Background: The aim of this study was to evaluate and compare short-term and long-term outcomes of total hip replacement (THR) using anterior and posterior surgical approaches.

Material and Methods: This prospective and comparative study was conducted at a tertiary care hospital and included 140 patients undergoing primary THR for osteoarthritis or avascular necrosis. Patients were divided into two groups: 70 underwent the anterior approach, and 70 underwent the posterior approach. Functional outcomes were assessed preoperatively, at 6 weeks (short-term), and at 12 months (long-term) using the Harris Hip Score (HHS) and Visual Analog Scale (VAS) for pain. Recovery metrics such as time to independent ambulation and length of hospital stay were recorded. Complications, including rates of dislocation, infection, and thromboembolism, were also analyzed.

Results: Demographic characteristics were similar between the two groups. At 6 weeks, the anterior approach demonstrated a faster recovery with significantly shorter time to independent ambulation (5.60 ± 1.40 vs. 6.90 ± 1.60 days, $p < 0.001$) and hospital stay (3.10 ± 0.80 vs. 4.20 ± 0.90 days, $p < 0.001$). Functional outcomes (HHS and VAS) improved significantly in both groups at 6 weeks and 12 months, with no statistically significant differences between approaches. Short-term dislocation rates were 0.00% in the anterior group and 2.86% in the posterior group, while long-term rates were 1.43% and 4.29%, respectively, but these differences were not significant. Infection and thromboembolism rates were comparable in both groups. At 12 months, 71.43% of patients in the anterior group reported excellent outcomes, compared to 67.14% in the posterior group ($p = 0.58$).

Conclusion: Both anterior and posterior approaches achieved excellent long-term outcomes and patient satisfaction. However, the anterior approach provided significant advantages in short-term recovery, including faster ambulation and shorter hospital stays, with comparable complication rates. The choice of approach should be based on patient-specific factors and surgical expertise.

Keywords: Total Hip Replacement, Anterior Approach, Posterior Approach, Short-term Outcomes, Long-term Outcomes.

INTRODUCTION

Total hip replacement (THR) is one of the most successful and frequently performed orthopedic procedures globally. It is primarily indicated for the management of debilitating hip conditions such as osteoarthritis, avascular necrosis, rheumatoid arthritis, and post-traumatic arthritis. The procedure aims to alleviate pain, restore joint function, and improve the quality of life for patients. Over the years, advancements in surgical techniques, implants, and perioperative care have significantly improved outcomes for patients undergoing THR. Among these advancements, the choice of surgical approach plays a critical role in influencing both short-term and long-term outcomes.[1,2] The anterior and posterior approaches are two widely used techniques in total hip replacement. Each has unique anatomical, technical, and functional implications that can impact patient recovery and outcomes. The posterior approach, often regarded as the traditional technique, provides excellent visualization of the hip joint, facilitating easy access to the femur and acetabulum. However, it involves detachment of the posterior soft tissue structures, which may lead to a higher risk of dislocation postoperatively. Despite this, the posterior approach is valued for its versatility, simplicity, and suitability for a wide range of hip pathologies and patient anatomies.[3,4] In contrast, the anterior approach has gained popularity in recent years due to its muscle-sparing technique, which avoids detaching major muscle groups. This approach leverages the intermuscular and internervous plane, minimizing soft tissue disruption and potentially enabling faster recovery. Patients undergoing the anterior approach often report reduced postoperative pain, shorter hospital stays, and quicker functional improvement. However, the anterior approach is technically demanding and has a steeper learning curve, which may limit its widespread adoption among surgeons.[5,6] Short-term outcomes following THR include metrics such as time to independent ambulation, length of hospital stay, and early complications like dislocation, infection, and thromboembolism. These parameters are critical for assessing the immediate effectiveness of the surgical approach and patient recovery. Faster recovery times and fewer complications in the short term can lead to reduced healthcare costs, improved patient satisfaction, and earlier return to normal activities. Long-term outcomes, on the other hand, focus on the durability of the implant, functional scores, pain relief, and overall patient satisfaction. These outcomes are essential for evaluating the sustained success of the surgical procedure and its impact on the patient's quality of life.[7,8] The choice between the anterior and posterior approaches in THR has sparked considerable debate among surgeons, with proponents of each approach citing distinct advantages and limitations. While the posterior approach remains the gold standard in many settings due to its technical simplicity and broad applicability, the anterior approach is increasingly being adopted for its potential benefits in early recovery and reduced dislocation risk. Understanding the comparative outcomes of these two approaches in both the short and long term is vital for informing surgical decision-making and optimizing patient care.[9] This study seeks to explore and compare the short-term and long-term outcomes of the anterior and posterior approaches in total hip replacement. By examining parameters such as functional outcomes, complication rates, recovery metrics, and patient satisfaction, this research aims to provide a comprehensive evaluation of these two surgical techniques. Such an analysis is critical for guiding surgeons in selecting the most appropriate approach based on patient-specific factors and desired outcomes. Given the growing demand for total hip replacement due to an aging population and increasing prevalence of degenerative joint diseases, the need for evidence-based surgical strategies has never been greater. Patients undergoing THR today have higher expectations for both the speed of recovery and the durability of the implant. As such, understanding the nuances of different surgical approaches and their implications on both immediate and long-term outcomes is essential for meeting these expectations and delivering optimal care.

MATERIALS AND METHODS

This study was a prospective and comparative analysis conducted at tertiary care hospital. The aim was to evaluate and compare short-term and long-term outcomes of total hip replacement (THR) performed using the anterior versus posterior surgical approaches. Patients were followed preoperatively and at defined postoperative intervals to assess clinical and functional outcomes. A total of 140 patients undergoing primary THR for osteoarthritis or avascular necrosis were enrolled consecutively based on their eligibility and consent. Patients were divided equally into two groups based on the surgical approach planned by the operating surgeon:

- **Anterior Approach Group**: 70 patients
- **Posterior Approach Group**: 70 patients

Inclusion criteria included patients aged 18–80 years undergoing elective THR, with no prior hip surgery and a minimum follow-up of 12 months. Patients were excluded if they had severe comorbidities that could significantly affect recovery, were undergoing revision hip surgery, or were unable to provide complete follow-up data.

Methodology

Patients were assessed at baseline (preoperatively), at 6 weeks (short-term outcome), and at 12 months or more (long-term outcome). Data collection included clinical examinations, functional assessments, and documentation of complications. The primary outcomes evaluated were:

1. **Functional outcomes**: Harris Hip Score (HHS) and Visual Analog Scale (VAS) for pain.
2. **Complications**: Rates of dislocation, infection, and thromboembolic events.
3. **Recovery metrics**: Time to achieve independent ambulation and length of hospital stay.

Surgical Procedure

Anterior Approach

The direct anterior approach was performed using a muscle-sparing technique to minimize soft-tissue trauma. Patients were positioned supine on either a traction or standard operating table, facilitating precise limb manipulation and intraoperative fluoroscopic guidance. A longitudinal incision (8–10 cm) was made starting at the anterior superior iliac spine and extending distally along the tensor fascia lata. The intermuscular plane between the sartorius and tensor fascia lata was carefully dissected without detachment or damage to muscles. The anterior hip capsule was incised to expose the femoral head and acetabulum, preserving capsular tissue for repair. After femoral head removal, the acetabulum and femur were prepared for prosthesis implantation. Implant components were aligned and positioned carefully. The hip capsule was repaired, and the wound was closed in layers using absorbable sutures and staples or subcuticular sutures.

Posterior Approach

The posterior approach, also known as the Moore or Southern approach, was performed with patients in the lateral decubitus position. This approach offered broad visualization of the joint, suitable for a wide range of cases. A curved incision (10–15 cm) was made, starting at the posterior superior iliac spine and extending distally along the gluteus maximus toward the femur. The gluteus maximus was split, and the short external rotators, including the piriformis and obturator internus, were detached to expose the posterior hip capsule. The capsule was incised, and the femoral head was dislocated posteriorly. After acetabular and femoral preparation, prosthetic components were implanted with attention to restoring femoral offset and achieving proper alignment. The posterior capsule and short external rotators were repaired during closure to enhance joint stability. The wound was closed in layers using absorbable sutures and skin staples or subcuticular sutures.

Standardized Perioperative Care

Standardized perioperative protocols were followed to minimize variability. The same cementless acetabular and femoral implant designs were used for all patients. Prophylactic antibiotics were administered 30–60 minutes before the incision to reduce infection risk. Thromboembolic prophylaxis, using low-molecular-weight heparin or direct oral anticoagulants, was started postoperatively and continued for 4–6 weeks. Pain management utilized a multimodal approach, combining regional anesthesia and oral analgesics. Early mobilization was encouraged, with physiotherapy initiated on the first postoperative day to facilitate recovery and independence.

Statistical Analysis

Descriptive statistics were used to summarize patient characteristics and baseline data. Continuous variables were compared using independent t-tests or Mann-Whitney U tests, while categorical variables were analyzed using chi-square tests. Longitudinal outcomes were evaluated using paired t-tests and repeated measures ANOVA to identify changes over time within and between groups. Statistical significance was set at $p < 0.05$.

RESULTS

Demographic Characteristics of Patients

The demographic characteristics of patients in both the anterior and posterior approach groups were comparable, as shown in Table 1. The mean age was 65.40 ± 8.20 years in the anterior group and 66.10 ± 7.90 years in the posterior group, with no statistically significant difference (p = 0.45). Gender distribution was similar in both groups, with 40 males and 30 females in the anterior group compared to 38 males and 32 females in the posterior group (p = 0.67). The mean BMI was 27.80 ± 4.30 kg/m² in the anterior group and 28.10 ± 4.10 kg/m² in the posterior group (p = 0.59). Diagnoses were predominantly osteoarthritis in both groups (92.86% anterior vs. 90.00% posterior, p = 0.54), with avascular necrosis comprising a smaller percentage (7.14% anterior vs. 10.00% posterior). These findings indicate that both groups were well-matched demographically.

Functional Outcomes (HHS and VAS Scores)

Table 2 highlights the functional outcomes assessed preoperatively, at 6 weeks (short-term), and at 12 months (long-term). Preoperative Harris Hip Score (HHS) and Visual Analog Scale (VAS) scores were similar between the groups (HHS: 42.30 ± 6.50 anterior vs. 43.10 ± 7.00 posterior, p = 0.42; VAS: 7.50 ± 1.20 anterior vs. 7.60 ± 1.30 posterior, p = 0.74).

At 6 weeks, both groups demonstrated significant improvements in functional outcomes. The HHS was higher in the anterior group (75.80 ± 8.20) compared to the posterior group (73.60 ± 8.40), although this difference was not statistically significant (p = 0.18). VAS scores showed similar reductions in pain in both groups (3.10 ± 0.90 anterior vs. 3.40 ± 1.00 posterior, p = 0.15).

At 12 months, the anterior group had a slightly higher HHS (90.40 ± 5.10) compared to the posterior group (88.90 ± 5.80), but the difference was not statistically significant (p = 0.11). VAS scores were also slightly lower in the anterior group (1.20 ± 0.60 vs. 1.40 ± 0.70, p = 0.09). Both approaches demonstrated excellent functional recovery over the long term.

Short-Term and Long-Term Complications

As shown in Table 3, the anterior approach group had no cases of short-term dislocation, while the posterior group reported 2 cases (2.86%, p = 0.20). Over the long term, 1 case of dislocation (1.43%) occurred in the anterior group compared to 3 cases (4.29%) in the posterior group, though the difference was not statistically significant (p = 0.30). Infection rates were identical in both groups, with 1 case (1.43%) reported short-term and 2 cases (2.86%) long-term in each group (p = 1.00). Thromboembolic events were slightly more frequent in the posterior group (1.43% short-term and 2.86% long-term) compared to the anterior group (0.00% short-term and 1.43% long-term), but these differences were not statistically significant (p = 0.31 and p = 0.56, respectively).

Recovery

Recovery metrics, detailed in Table 4, favored the anterior approach group. The mean time to independent ambulation was significantly shorter in the anterior group (5.60 ± 1.40 days) compared to the posterior group (6.90 ± 1.60 days, p < 0.001). Similarly, the length of hospital stay was shorter in the anterior group (3.10 ± 0.80 days) compared to the posterior group (4.20 ± 0.90 days, p < 0.001). These findings indicate that patients undergoing the anterior approach had a faster short-term recovery compared to those in the posterior approach group.

Patient Satisfaction and Overall Outcomes

Table 5 summarizes patient satisfaction and overall outcomes. At 12 months, a slightly higher percentage of patients in the anterior group reported excellent outcomes (71.43% vs. 67.14%), but this difference was not statistically significant (p = 0.58). Good outcomes were reported by 25.71% in the anterior group and 28.57% in the posterior group (p = 0.68). Fair outcomes were rare in both groups (2.86% anterior vs. 4.29% posterior, p = 0.65), and no patients reported poor outcomes. These findings suggest that both approaches achieve high levels of patient satisfaction and favorable outcomes over the long term.

Table 1: Demographic Characteristics of Patients

Characteristic	Anterior Approach (n=70)	Posterior Approach (n=70)	p-value (ANOVA)
Age (years), Mean ± SD	65.40 ± 8.20	66.10 ± 7.90	0.45
Gender (Male:Female)	40:30	38:32	0.67
BMI (kg/m²), Mean ± SD	27.80 ± 4.30	28.10 ± 4.10	0.59
Diagnosis (%)			
- Osteoarthritis	65 (92.86%)	63 (90.00%)	0.54
- Avascular Necrosis	5 (7.14%)	7 (10.00%)	

Table 2: Functional Outcomes (HHS and VAS Scores)

Time point	Metric	Anterior Approach (Mean ± SD)	Posterior Approach (Mean ± SD)	p-value (ANOVA)
Preoperative	Harris Hip Score (HHS)	42.30 ± 6.50	43.10 ± 7.00	0.42
	Visual Analog Scale (VAS)	7.50 ± 1.20	7.60 ± 1.30	0.74
Short-Term (6 Weeks)	Harris Hip Score (HHS)	75.80 ± 8.20	73.60 ± 8.40	0.18
	Visual Analog Scale (VAS)	3.10 ± 0.90	3.40 ± 1.00	0.15
Long-Term (12 Months)	Harris Hip Score (HHS)	90.40 ± 5.10	88.90 ± 5.80	0.11
	Visual Analog Scale (VAS)	1.20 ± 0.60	1.40 ± 0.70	0.09

Table 3: Short-Term and Long-Term Complications

Complication	Timeframe	Anterior Approach (n=70)	Posterior Approach (n=70)	p-value (ANOVA)
Dislocation (%)	Short-Term	0 (0.00%)	2 (2.86%)	0.20
	Long-Term	1 (1.43%)	3 (4.29%)	0.30
Infection (%)	Short-Term	1 (1.43%)	1 (1.43%)	1.00
	Long-Term	2 (2.86%)	2 (2.86%)	1.00
Thromboembolism (%)	Short-Term	0 (0.00%)	1 (1.43%)	0.31
	Long-Term	1 (1.43%)	2 (2.86%)	0.56

Table 4: Recovery Metrics

Metric	Anterior Approach (Mean ± SD)	Posterior Approach (Mean ± SD)	p-value (ANOVA)
Time to Independent Ambulation (days)	5.60 ± 1.40	6.90 ± 1.60	<0.001**
Length of Hospital Stay (days)	3.10 ± 0.80	4.20 ± 0.90	<0.001**

Table 5: Patient Satisfaction and Overall Outcomes

Outcome	Anterior Approach (%)	Posterior Approach (%)	p-value (ANOVA)
Excellent (HHS > 90)	50 (71.43%)	47 (67.14%)	0.58
Good (HHS 80–89)	18 (25.71%)	20 (28.57%)	0.68
Fair (HHS 70–79)	2 (2.86%)	3 (4.29%)	0.65
Poor (HHS < 70)	0 (0.00%)	0 (0.00%)	-

DISCUSSION

The demographic characteristics of patients in the anterior and posterior approach groups were comparable in terms of age, gender, BMI, and diagnosis. This alignment ensures a fair comparison of outcomes between the two surgical techniques. Hartmann et al. (2019) reported similar findings in their cohort, where the mean age and BMI of patients undergoing anterior and posterior approaches did not differ significantly.[10] Rashid et al. (2020) highlighted the predominance of osteoarthritis as the primary indication for THR, accounting for over 90% of cases in their study, similar to the present study.[11] Functional outcomes, as assessed by HHS and VAS scores, showed significant improvements in both groups at 6 weeks and 12 months. The anterior approach demonstrated slightly better HHS (90.40 ± 5.10 vs. 88.90 ± 5.80) and lower VAS scores (1.20 ± 0.60 vs. 1.40 ± 0.70) at 12 months, though these differences were not statistically significant. Similar trends were reported by Rathod et al. (2021), who observed no significant difference in HHS between the anterior and posterior groups (89.80 ± 4.90 vs. 88.50 ± 5.10, p = 0.20) at 12 months.[12] Gofton et al. (2020) emphasized the advantage of muscle-sparing techniques, like the anterior approach, in preserving periarticular musculature, potentially contributing to better long-term outcomes.[13] Tiberi et al. (2018) also found no significant differences in VAS pain scores between the two approaches, with mean scores of 1.50 ± 0.70 (anterior) and 1.70 ± 0.80 (posterior, p = 0.12) at 12 months. [14] The anterior approach demonstrated lower dislocation rates in both the short term (0.00% vs. 2.86%, p = 0.20) and long term (1.43% vs. 4.29%, p = 0.30). Wyles et al. (2022) reported similar findings, with dislocation rates of 0.5% in the anterior group and 2.3% in the posterior group (p = 0.04), highlighting the protective role of intact posterior soft tissues in reducing dislocation risk.[15] Infection rates and thromboembolic events were comparable between the two groups in this study, consistent with Liu et al. (2021), who observed infection rates of 1.7% and 2.1% and thromboembolic events of 1.2% and 1.5% in the anterior and posterior groups, respectively.[16] Recovery metrics significantly favored the anterior approach, with faster times to independent ambulation (5.60 ± 1.40 days vs. 6.90 ± 1.60 days, p < 0.001) and shorter hospital stays (3.10 ± 0.80 days vs. 4.20 ± 0.90 days, p < 0.001). Barrett et al. (2019) similarly reported shorter mean hospital stays in the anterior group (3.0 ± 1.1 days vs. 4.1 ± 1.2 days, p < 0.001), attributing the difference to reduced soft tissue trauma and earlier mobilization.[17] Malek et al. (2023) emphasized the cost-efficiency of the anterior approach due to reduced hospital stays and quicker recovery, with mean hospital stays of 2.8 days (anterior) vs. 4.0 days (posterior). The muscle-sparing nature of the anterior approach likely accounts for the faster recovery observed in these studies, supporting its growing popularity for THR.[18] At 12 months, both groups demonstrated high levels of patient satisfaction, with slightly more excellent outcomes in the anterior group (71.43% vs. 67.14%, p = 0.58). This trend aligns with Ji et al. (2020), who reported excellent outcomes in 72% of anterior and 68% of posterior approach patients (p = 0.44).[19] Williamson et al. (2021) emphasized that patient-reported outcomes are generally equivalent between approaches when surgeries are performed by experienced surgeons. Factors such as patient expectations, preoperative education, and surgeon expertise may have a greater influence on satisfaction than the choice of surgical approach.[20]

CONCLUSION

This study highlights the comparable long-term outcomes of anterior and posterior approaches in total hip replacement, with both techniques achieving excellent functional recovery and high patient satisfaction. However, the anterior approach demonstrates significant advantages in short-term recovery, including faster ambulation and shorter hospital stays. Both approaches have low and similar complication rates, emphasizing their safety and effectiveness when performed by experienced surgeons. The choice of approach should be guided by patient-specific factors and surgical expertise to optimize outcomes and satisfaction.

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