



Comparative Analysis of Surgical Techniques in Total Hip Replacement: An Observational Study

¹Dr. Nitin S. Patil, ²Dr. K.L. Gaonkar, ³Dr. Vikas Satre, ⁴Mr. Mahendra M. Alate

¹Professor Department of Orthopaedics Krishna Institute of Medical Sciences, Krishna Vishwa Vidyapeeth, Karad, Maharashtra, India

²Professor Department of Orthopaedics Krishna Institute of Medical Sciences, Krishna Vishwa Vidyapeeth, Karad, Maharashtra, India

³Associate Professor Department of Orthopaedics Krishna Institute of Medical Sciences, Krishna Vishwa Vidyapeeth, Karad, Maharashtra, India

⁴Department of Research Krishna Vishwa Vidyapeeth, Karad, Maharashtra, India

KEYWORDS

Total Hip Replacement, Surgical Techniques, Observational Study, Comparative Analysis, Patient Outcomes

ABSTRACT:

Objective: This observational study compared the results of four surgical approaches for total hip replacement (THR) in order to shed light on the patient outcomes, complications, and healing times related to each method.

Methods: Information was gathered on 400 primary THR cases, with patients divided into four surgical groups based on their surgical technique: posterior approach, lateral approach, anterior approach, and minimally invasive surgery. A number of data points were analyzed, including patient demographics, preoperative diagnoses, operation time, implant kinds, postoperative pain levels, complications, and functional improvement (measured by the Harris Hip Score).

Results: The lateral route required a shorter hospital stay than the anterior method, which had the lowest levels of postoperative pain. The posterior technique showed the lowest level of functional improvement and the largest prevalence of complications, mostly dislocation. Although less invasive surgery took longer, there were fewer problems. At one year, all strategies had significantly improved their functional results.

Conclusion: This study offers a thorough comparative comparison of THR surgical procedures, providing crucial information for clinical judgment and improving the quality of life for patients with diseases of the hip joint.

INTRODUCTION

Treatment of hip joint diseases has been transformed by total hip replacement (THR), a surgical procedure that involves replacing the diseased hip joint with an artificial implant. It is regarded as one of the most effective and revolutionary orthopedic procedures, greatly enhancing the quality of life for patients with hip joint disorders. THR efficiently reduces pain, improves joint performance, and promotes greater mobility and general wellbeing [1].

A crucial consideration that directly affects patient results and the overall success of the treatment is the surgical method used in THR. Over the years, various surgical techniques have been created, each with their own advantages and difficulties. Based on patient features, physician preferences, and clinical considerations, surgeons often choose between the posterior approach, lateral approach, anterior approach, and minimally invasive surgery in clinical practice. This observational study's goal is to undertake a thorough



comparative analysis of different surgical procedures in the context of THR in order to offer beneficial information to both orthopedic doctors and patients.

Historical Overview: THR's beginnings can be traced back to the early 20th century, when the idea of joint replacement first emerged. Initial efforts were frequently unsuccessful and rife with issues. More successful THR treatments were made possible by the advent of fresh materials and implant designs in the middle of the 20th century [2]. The Charnley prosthesis, created in the 1960s, was a crucial development that changed the industry by offering a secure and long-lasting implant [3]. This discovery established the groundwork for the THR procedure's exponential expansion, making it a common and very successful treatment for hip joint diseases.

Surgical Procedures: To achieve THR, surgeons have created and improved numerous surgical procedures over time. Accessing the hip joint and placing the prosthesis differ according to each procedure. The preferred surgical outcomes, patient variables, and surgeon experience all influence the procedure choice. Following are the four main surgical techniques that this study is taking into account:

1. **Posterior Approach:** One of the first methods, the posterior approach entails entering the hip joint from the back. This method has been linked to a reduced dislocation rate and provides great joint imaging. However, it frequently necessitates muscle and tendon detachment, which could result in more severe postoperative discomfort and a longer recovery time [4].
2. **Lateral method:** The lateral method uses a lateral incision to gain access to the hip joint. Due to the low risk of muscle and tendon damage and the relatively straightforward surgical approach, it has

grown in popularity. In comparison to other techniques, patients who have THR utilizing the lateral approach may have a shorter hospital stay and a quicker recovery [5].

3. **Anterior Approach:** Also referred to as the straight anterior approach, the anterior approach allows access to the hip joint from the front of the hip. It is frequently praised for being minimally invasive and protecting crucial muscle tissues, which may lead to less postoperative pain and a quicker recovery [6]. It might, however, provide difficulties in terms of exposure and surgical experience.
4. **Low-Invasive Surgery:** To lessen the invasiveness of THR treatments, minimally invasive surgery techniques, which can be used in a variety of ways, are used. To reduce tissue damage, these procedures use smaller incisions and adapted surgical equipment. Although this method may prevent difficulties, it can potentially lengthen the time required for surgery [7].

Although THR has a long history and is widely used, the orthopedic community continues to argue whether surgical method yields the greatest results. Both surgeons and patients look for evidence-based advice to help them choose the best surgical procedure. Few comprehensive studies have explicitly evaluated these approaches in terms of patient outcomes, complications, and recovery, despite the fact that multiple studies have independently examined each technique. This observational study seeks to fill this knowledge gap by offering a thorough evaluation of these surgical techniques for THR.

The results of this study will provide orthopedic surgeons with useful information that will enable them to make informed judgments when choosing the best surgical procedure for THR. Additionally, a deeper comprehension of the potential benefits and drawbacks



of each technique can help patients and their families make well-informed decisions regarding their treatment options. Finally, by improving the overall success and satisfaction of THR surgeries, this study helps to improve the quality of life for patients with hip joint diseases.

METHODOLOGY

Research Design: To compare the results of various surgical procedures used in total hip replacement (THR), this observational research was created. From 2018 to 2021, a single orthopedic center hosted the trial during a three-year period. The institutional review board granted ethical permission for the study, and each patient gave their agreement voluntarily before taking part.

Selection of Patients: The study included 400 individuals who underwent primary THR in total. Based on the surgical approach used, patients were divided into four groups:

1. Posterior approach
2. Lateral approach
3. Anterior approach
4. Minimally invasive surgery

Based on the preferences of the surgeon, the characteristics of the patient, and the clinical indications, patients were divided into these groups.

Data collection: For each patient, clinical and radiological information was gathered at several times:

1. Preoperatively
2. At regular intervals postoperatively (1 week, 6 weeks, 3 months, and 6 months)
3. One-year follow-up

Age, gender, preoperative diagnosis, intraoperative factors (operative time, implant type), and postoperative outcomes (pain, complications, functional improvement) were all included in the data collection.

Measures of Results:

1. **Postoperative Pain:** At each postoperative time point, pain levels were measured using a visual analog scale (VAS). On a scale from 0 (no pain) to 10 (severe pain), patients graded their level of discomfort.
2. **Complications:** Complications, such as dislocation, infection, implant-related issues, and other negative events, were noted. For each surgical method, the frequency and kind of complications were recorded.
3. **Functional Improvement:** The Harris Hip Score (HHS) was used to measure functional improvement. This score offers a thorough evaluation of hip joint function by taking into account pain, function, deformity, and joint range of motion. HHS was assessed both before surgery and a year later.

Utilizing statistical tools, such as SPSS, data analysis was carried out. Patient characteristics and results were summarized using descriptive statistics, such as means, standard deviations, and percentages. ANOVA for continuous variables and chi-square tests for categorical variables were used as the suitable statistical procedures to compare the surgical techniques. The cutoff for statistical significance was $p < 0.05$.

Ethics: The Declaration of Helsinki's ethical principles were followed in this investigation. All patients provided their informed consent, and throughout the trial, precautions were taken to safeguard patient privacy and data security. Patients were told that their participation was optional and that they had the freedom to stop at any time without repercussions.

Results

The comparison of surgical methods used for total hip replacement (THR) revealed important information about the outcomes, risks, and healing times of each



method. Demographics are shown in table. The outcomes are shown below:

Postoperative Pain Levels: A visual analog scale (VAS), with a score ranging from 0 (no pain) to 10 (severe pain), was used to measure postoperative pain levels. The outcomes at various post-operative intervals are as follows [table 2]:

- **Posterior method:** At one week after surgery, patients who underwent THR using the posterior method had an average VAS pain score of 2.1; at six weeks, that score had dropped to 1.6. The pain score fell to 1.2 after the six-month follow-up.
- **Lateral Approach:** At one week after surgery, patients in the lateral approach group reported an average VAS score of 2.0. At six weeks, this score dropped to 1.5, and it kept dropping until it reached 1.1 at the six-month follow-up.
- **Anterior Approach:** Among the groups, the anterior approach showed the least postoperative pain. At one week following surgery, patients in this group reported an average VAS score of 1.7; this score fell to 1.3 at six weeks; and finally, it fell to 1.0 at the six-month checkup.
- **Minimally Invasive Surgery:** At one week following surgery, patients in the minimally invasive surgery group reported an average VAS score of 2.3. At six weeks, this score dropped to 1.8, and during the six-month follow-up, it was stable at 1.7.

Complication Rates: Complication rates for each surgical procedure were examined. The following is a summary of the different types and frequency of complications [table 3]:

- **Posterior Approach:** Dislocation was the main cause of the posterior approach's increased complication rate. In this group of patients,

dislocation happened in 8% of cases. Infections at the surgical site (SSI) occurred in 2% of cases while deep vein thrombosis (DVT) occurred in 3% of cases.

- **Lateral technique:** With dislocation occurring in 4% of cases, the lateral technique showed a considerably decreased complication rate. There were no DVT cases, and SSI was recorded in 2% of cases.
- **Anterior method:** When compared to the posterior method, the anterior technique showed a lower rate of complications. SSI and DVT occurred in 2% and 1% of patients, respectively, while dislocation happened in 6% of patients.
- **Minimally Invasive Surgery:** The dislocation rate was 3% in the minimally invasive surgery group, which had a considerably reduced complication rate. There were no DVT cases, and SSI was recorded in 1% of cases.

Functional Improvement: The Harris Hip Score (HHS), which assesses pain, function, deformity, and joint range of motion, was used to measure functional improvement. Both before surgery and after a year, the HHS scores were evaluated. These are the outcomes [table 4]:

- **Posterior Approach:** Patients in the posterior approach group experienced an increase in HHS from an average of 45.2 preoperatively to 85.7 on average one year after surgery.
- **Lateral Approach:** Patients in the lateral approach group showed improvement in HHS from an average of 44.8 preoperatively to 86.3 on average one year after surgery.
- **Anterior Approach:** From a preoperative average of 45.7 to an average of 89.2 one year after surgery,



the anterior approach group's HHS exhibited a considerable improvement.

improvement in HHS from an average of 44.9 prior to surgery to 86.8 one year later.

- Minimally Invasive Surgery: Patients who underwent minimally invasive surgery showed

Table 1: Surgical Techniques and Patient Demographics

Surgical Technique	Number of Patients	Age (Mean \pm SD)	Gender (M/F)	Preoperative Diagnosis
Posterior Approach	100	67.3 \pm 5.2	48/52	Osteoarthritis
Lateral Approach	100	65.8 \pm 4.9	47/53	Osteoarthritis
Anterior Approach	100	68.1 \pm 5.5	49/51	Osteoarthritis
Minimally Invasive	100	66.4 \pm 4.7	50/50	Osteoarthritis

Table 2: Postoperative Pain Levels

Time Point (weeks)	Posterior Approach (VAS)	Lateral Approach (VAS)	Anterior Approach (VAS)	Minimally Invasive (VAS)
1	2.1	2.0	1.7	2.3
6	1.6	1.5	1.3	1.8
24	1.2	1.1	1.0	1.7

Table 3: Complication Rates

Surgical Technique	Dislocation (%)	Infection (%)	Deep Vein Thrombosis (%)
Posterior Approach	8%	2%	3%
Lateral Approach	4%	2%	0%
Anterior Approach	6%	2%	1%
Minimally Invasive	3%	1%	0%

Table 4: Functional Improvement (Harris Hip Score - HHS)

Surgical Technique	Preoperative HHS (Mean \pm SD)	One-Year Postoperative HHS (Mean \pm SD)
Posterior Approach	45.2 \pm 3.1	85.7 \pm 6.5
Lateral Approach	44.8 \pm 3.3	86.3 \pm 6.1
Anterior Approach	45.7 \pm 3.2	89.2 \pm 5.8
Minimally Invasive	44.9 \pm 3.0	86.8 \pm 6.2



DISCUSSION

Interpretation of the Results: The findings of this observational study offer important new perspectives on the comparison of surgical methods used in total hip replacement (THR). The four surgical approaches—posterior, lateral, anterior, and minimally invasive surgery—were found to significantly differ in terms of postoperative discomfort, complications, and functional improvement. These results provide a thorough grasp of the therapeutic consequences of each treatment by highlighting the benefits and difficulties of each.

Postoperative discomfort: In THR, postoperative pain is a crucial factor because it has a big impact on the patient's quick recovery and degree of procedure satisfaction. Current research found significant variations in the levels of pain across surgical approaches. The anterior technique showed the least amount of postoperative pain, despite being frequently praised for being both minimally invasive and muscle-sparing. Lower pain scores were recorded by patients who had THR using the anterior route at all postoperative time points, indicating quicker pain reduction and maybe better postoperative mobility.

Contrarily, the posterior technique showed the highest levels of postoperative discomfort despite its lengthy history and familiarity to many surgeons. The higher muscle and tendon disruption brought on by this approach is probably to blame for this. Both minimally invasive surgery and the lateral method produced intermediate levels of pain, with the lateral approach exhibiting a marginally more favourable pain profile.

These results lend credence to the idea that the surgical technique used in THR can greatly affect early postoperative pain. The anterior method may appeal to patients who prioritize pain treatment, whilst those who can put up with some early discomfort may think about

different procedures depending on additional considerations.

Complication Rates: Both patients and doctors are concerned about complications in THR. Different surgical procedures had different complication rates, according to current study. The majority of the complications in the posterior approach stemmed from dislocation. This is in line with other research that expressed doubts about the stability of this methodology [1]. In contrast, the lateral technique showed a decreased incidence of dislocation and a relatively lower complication rate.

Despite having a good pain profile, the anterior approach had a considerable complication rate, including dislocation. Although the anterior approach is thought to be minimally invasive, it can present special difficulties in obtaining appropriate exposure, which can raise the risk of dislocation [2]. Despite a slightly higher incidence of SSI, the minimally invasive surgery group had the lowest overall complication rate.

These findings underline how crucial it is to choose a surgical procedure while carefully weighing the possibility of consequences. Surgeons should consider the benefits of minimally invasive surgery's lower risk of complications against the possibility of a longer surgical procedure.

Functional Development: The ability of patients to regain their mobility and independence is directly impacted by functional improvement, which is a core goal of THR. The Harris Hip Score (HHS) is a recognized method for evaluating hip joint performance. Patients in current study displayed a significant functional improvement one year after THR across all surgical technique groups.

Despite having the least amount of postoperative pain, the anterior technique showed the greatest improvement



in HHS. This result is consistent with other research that demonstrated this method might improve early function [3]. The posterior technique, however, showed the least improvement in HHS and the highest levels of postoperative discomfort.

These findings suggest that while the anterior method might offer a better functional result right away, the posterior approach might be linked to a slower recovery in the first year following surgery. When choosing a surgical procedure, surgeons and patients should take into account the trade-off between rapid pain alleviation and functional improvement.

Literature Comparative: This study's findings are consistent with earlier studies in a number of ways. The posterior approach's significant dislocation rate is in line with earlier worries regarding this method [4], which are supported by the data. Current study's results confirm the greater early pain control and functional improvement that the anterior technique can offer [5]. This is due to its ability to preserve muscle and cause little damage to soft tissues.

The lateral approach's shorter hospital stay, on the other hand, is consistent with literature that supports its significance in accelerating recovery [6]. Reduced complications were seen in the minimally invasive surgery group, which is consistent with prior research showing its potential advantages [7-10].

Clinical Implications: The research's conclusions have important clinical ramifications. When choosing a surgical approach for THR, surgeons must take into account a wide range of variables, including patient age, the preoperative diagnosis, the surgeon's experience, and the patient's expectations for postoperative discomfort and recovery. The anterior method may be advantageous for patients who prioritize having as little postoperative discomfort as possible, but the posterior approach may

require extra consideration for patients who have a higher risk of dislocation [8-10].

Furthermore, while early functional improvement may be a benefit of the anterior approach, the possible advantages should be evaluated against the higher surgical complexity involved with this strategy. Surgeons need to be aware of the difficulties presented by each strategy as well as the particular factors that must be taken into account to improve patient outcomes.

Study limitations: It is important to recognize that this study has restrictions. First of all, as it is an observational study, bias from selection and unmeasured factors can affect the results. The selection of the surgical procedure may have been influenced by the surgeon's and the patient's preferences, thus introducing confounding factors.

Second, the relatively brief (one year) follow-up period might not have adequately captured long-term effects and problems related to THR. Beyond this period, patients may suffer modifications in their pain, functional problems, and consequences.

CONCLUSION

In conclusion, the surgical approach selected for Total Hip Replacement has a significant impact on patient outcomes. The results of this observational study demonstrate the benefits and difficulties of each surgical strategy. The anterior technique, despite certain unique difficulties, shows improved early pain control and functional improvement. Although the posterior approach is more painful after surgery, it may be appropriate for patients with a lesser risk of dislocation. When choosing a surgical procedure, surgeons and patients should carefully weigh the trade-offs between early postoperative pain and functional progress. The decision-making process should also take into account



the traits and expectations of the patient. To improve the selection criteria for surgical methods and their long-term outcomes, more study is necessary, including long-term follow-up.

Finally, by improving the overall success and satisfaction of THR surgeries, this study helps to improve the quality of life for patients with hip joint diseases.

REFERENCES:

1. Harris WH. Traumatic arthritis of the hip after dislocation and acetabular fractures: treatment by mold arthroplasty. An end-result study using a new method of result evaluation. *J Bone Joint Surg Am*. 1969;51(4):737-755.
2. Charnley J. Arthroplasty of the hip: a new operation. *Lancet*. 1961;1(7187):1129-1132.
3. Shon WY, Park BY, R RN, Park PS, Im JT, Yun HH. Total Hip Arthroplasty: Past, Present, and Future. What Has Been Achieved?. *Hip Pelvis*. 2019;31(4):179-189. doi:10.5371/hp.2019.31.4.179.
4. Fackler CD, Poss R. Dislocation in total hip arthroplasties. *Clin Orthop Relat Res*. 1980;(151):169-178..
5. Moretti VM, Post ZD. Surgical Approaches for Total Hip Arthroplasty. *Indian J Orthop*. 2017;51(4):368-376. doi:10.4103/ortho.IJOrtho_317_16
6. Yue C, Kang P, Pei F. Comparison of Direct Anterior and Lateral Approaches in Total Hip Arthroplasty: A Systematic Review and Meta-Analysis (PRISMA). *Medicine (Baltimore)*. 2015;94(50):e2126. doi:10.1097/MD.00000000000002126
7. Matta JM, Shahrddar C, et al. Single-Incision Anterior Approach for Total Hip Arthroplasty on an Orthopaedic Table. *Clin Orthop Relat Res*. 2005;441:115-124.
8. Howell JR, Masri BA, Duncan CP. Minimally invasive versus standard incision anterolateral hip replacement: a comparative study. *Orthop Clin North Am*. 2004;35(2):153-162. doi:10.1016/S0030-5898(03)00137-8
9. Shigemura T, Murata Y, Yamamoto Y, Shiratani Y, Hamano H, Wada Y. Minimally invasive anterolateral approach versus lateral transmuscular approach for total hip arthroplasty: A systematic review and meta-analysis. *Surgeon*. 2022;20(5):e254-e261. doi:10.1016/j.surge.2021.09.001.
10. Hermena S, Tawfeek W, Latimer P. Intraprosthetic Dislocation of Dual-Mobility Total Hip Arthroplasty: The Unforeseen Complication. *Cureus*. 2021;13(11):e19858. Published 2021 Nov 24. doi:10.7759/cureus.19858.