

Clinical and Functional Evaluation of Direct Lateral (Modified Hardinge) Approach in Primary Total Hip Replacement: A Prospective Study

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Abstract:

Background: Total hip replacement (THR) is a highly effective surgical procedure for managing end-stage hip disorders. The choice of surgical approach significantly influences postoperative stability, functional recovery, and complication rates. The direct lateral (Modified Harding) approach is widely used due to its inherent stability and reduced risk of dislocation.

Aim: To evaluate the clinical and functional outcomes of the direct lateral (Modified Hardinge) approach in primary total hip replacement.

Materials and Methods: This prospective observational study was conducted in the Department of Orthopedics at Chirayu Medical College & Hospital from January 2024 to December 2025. A total of 20 patients undergoing primary THR using the Modified Hardinge approach were included. Patients were followed up for a short-term period of 6 months. Functional outcomes were assessed using the Harris Hip Score (HHS), along with evaluation of pain, range of motion, and postoperative complications.

Results: The study included 20 patients with a mean age of 58.6 ± 9.4 years, with male predominance (60%). The most common indication was avascular necrosis (50%). The mean Harris Hip Score improved significantly from 42.3 ± 6.8 preoperatively to 86.5 ± 5.2 at 6 months follow-up. No cases of dislocation were observed. Mild abductor weakness was noted in 15% of patients and improved with physiotherapy. Overall, most patients achieved good to excellent functional outcomes.

Conclusion: The direct lateral (Modified Hardinge) approach is a safe and effective technique for primary total hip replacement, providing excellent functional outcomes and low complication rates in short-term follow-up.

Keywords: Total hip replacement, Modified Hardinge approach, Direct lateral approach, Harris Hip Score, Functional outcome

I. Introduction

Total hip replacement (THR) is regarded as one of the most successful and cost-effective surgical interventions in modern orthopedics, providing reliable pain relief and restoration of function in patients with end-stage hip disorders [1]. With increasing life expectancy and rising prevalence of degenerative joint diseases, the demand for THR has grown substantially worldwide [2]. Common indications include osteoarthritis, avascular necrosis of the femoral head, rheumatoid arthritis, and fracture neck of femur, all of which significantly impair quality of life and mobility [3].

The choice of surgical approach in THR remains a subject of ongoing debate, as it directly influences intraoperative exposure, postoperative recovery, complication rates, and long-term outcomes [4]. Among the various approaches described—posterior, anterolateral, and direct lateral—the direct lateral (Modified Hardinge) approach has gained widespread acceptance due to its inherent stability and lower risk of postoperative dislocation [5].

Originally described by Hardinge, the direct lateral approach involves splitting the fibers of the gluteus medius and minimus, allowing adequate visualization of the hip joint while preserving posterior soft tissue structures [6]. This preservation is considered a key factor in reducing dislocation rates, which are reported to be higher with posterior

approaches [7]. However, concerns regarding potential abductor insufficiency, postoperative limp, and delayed functional recovery have been raised, necessitating further evaluation of this technique [8].

Functional outcome following THR is commonly assessed using validated scoring systems such as the Harris Hip Score (HHS), which evaluates pain, function, deformity, and range of motion [9]. Early postoperative outcomes, particularly within the first six months, are crucial in determining the success of the procedure and the effectiveness of the surgical approach [10].

Despite the widespread use of the Modified Hardinge approach, there remains limited prospective data from Indian tertiary care centers evaluating its short-term clinical and functional outcomes. Given variations in patient demographics, disease patterns, and rehabilitation practices, it is essential to generate region-specific evidence.

Therefore, the present study was undertaken to clinically and functionally evaluate the direct lateral (Modified Hardinge) approach in primary total hip replacement, with a focus on short-term outcomes over a follow-up period of six months.

II. Materials and Methods

Study Design and Setting

This prospective observational study was conducted in the Department of Orthopedics at Chirayu Medical College & Hospital, Bhopal, India, over a period of two years (January 2024 to December 2025). The study aimed to evaluate the clinical and functional outcomes of the direct lateral (Modified Hardinge) approach in primary total hip replacement (THR).

Study Duration

Period of two years: January 2024 to December 2025

Study Population

A total of 20 consecutive patients undergoing primary THR during the study period were included. All procedures were performed by experienced orthopedic surgeons using a standardized surgical technique.

Inclusion Criteria

- (i) Patients aged ≥ 18 years undergoing primary total hip replacement
- (ii) Indications including osteoarthritis, avascular necrosis, or fracture neck of femur
- (iii) Patients willing to participate and comply with follow-up protocol

Exclusion Criteria

- (i) Revision hip arthroplasty
- (ii) Active infection around the hip joint
- (iii) Severe comorbid conditions precluding surgery
- (iv) Patients lost to follow-up

Preoperative Assessment

All patients underwent detailed clinical evaluation, including history, physical examination, and radiological assessment. Baseline functional status was assessed using the Harris Hip Score (HHS), a validated tool for evaluating hip function [9].

Surgical Technique

All patients underwent primary THR using the direct lateral (Modified Hardinge) approach, as originally described by Hardinge [6]. Patients were positioned in the lateral decubitus position. A longitudinal incision was made centered over the greater trochanter.

The fascia lata was incised, and the gluteus medius was split at the junction of its anterior one-third and posterior two-thirds. The gluteus minimus was elevated, and the hip capsule was exposed and incised. After dislocation of the femoral head, standard femoral and acetabular preparation was performed, followed by implantation of prosthetic components.

Meticulous repair of the abductor mechanism was performed at closure to restore muscle function and minimize postoperative limp.

Postoperative Protocol

All patients followed a standardized rehabilitation protocol, including:

- Early mobilization within 24–48 hours
- Progressive weight-bearing as tolerated
- Physiotherapy focusing on abductor strengthening and range of motion

Follow-up and Outcome Measures

Patients were followed up at regular intervals and evaluated at 6 months postoperatively (short-term follow-up).

Outcome measures included:

- Pain assessment
- Range of motion
- Functional outcome using Harris Hip Score (HHS) [9]
- Postoperative complications (dislocation, infection, abductor weakness, limb length discrepancy)

Statistical Analysis

Data were analyzed using standard statistical methods. Continuous variables were expressed as mean $\pm$ standard deviation (SD), while categorical variables were presented as frequencies and percentages.

Preoperative and postoperative functional scores were compared, and statistical significance was considered at $p < 0.05$.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee of Chirayu Medical College & Hospital. Written informed consent was obtained from all participants.

III. Results

A total of 20 patients underwent primary total hip replacement using the direct lateral (Modified Hardinge) approach and were followed up for 6 months.

The study population consisted of 12 males (60%) and 8 females (40%), with a mean age of 58.6 ± 9.4 years (range: 42–72 years).

Table 1: Demographic Profile of Patients

Parameter	Value
Total patients	20
Male	12 (60%)
Female	8 (40%)
Mean age	58.6 ± 9.4 years
Age range	42–72 years

The most common indication for total hip replacement was avascular necrosis (50%), followed by osteoarthritis (30%) and fracture neck of femur (20%).

Table 2: Indications for Total Hip Replacement

Indication	Number	Percentage
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Avascular necrosis	10	50%
Osteoarthritis	6	30%
Fracture neck femur	4	20%
Total	20	100%

All patients demonstrated significant improvement in clinical and functional parameters at 6 months follow-up. Pain levels decreased markedly, and mobility improved in all cases.

The mean Harris Hip Score (HHS) improved from 42.3 ± 6.8 preoperatively to 86.5 ± 5.2 at 6 months, indicating excellent functional recovery.

Table 3: Functional Outcome (Harris Hip Score)

Parameter	Preoperative	6 Months Follow-up
Mean HHS	42.3 ± 6.8	86.5 ± 5.2
Interpretation	Poor	Good–Excellent

Range of motion also improved significantly postoperatively, with most patients achieving near-normal hip mobility.

Table 4: Range of Motion Improvement

Movement	Preoperative	6 Months
Flexion	$60^\circ \pm 10^\circ$	$110^\circ \pm 8^\circ$
Abduction	$20^\circ \pm 5^\circ$	$40^\circ \pm 5^\circ$
Internal rotation	$10^\circ \pm 4^\circ$	$25^\circ \pm 5^\circ$

Postoperative complications were minimal. No cases of dislocation were observed. Mild abductor weakness was seen in 3 patients (15%), which improved with physiotherapy.

Table 5: Postoperative Complications

Complication	Number	Percentage
Dislocation	0	0%
Infection	1	5%
Abductor weakness	3	15%
Limb length discrepancy	1	5%

Key Findings

- Significant improvement in Harris Hip Score (42 → 86)
- No dislocations observed
- Majority achieved good to excellent functional outcomes
- Minimal complications with manageable abductor weakness

Discussion

Total hip replacement (THR) is widely regarded as one of the most successful reconstructive procedures in orthopedics, providing reliable pain relief and functional restoration in patients with end-stage hip disease [1]. With the increasing burden of degenerative joint disorders and rising life expectancy, the demand for THR continues to grow globally [2,3]. The choice of surgical approach plays a crucial role in determining postoperative outcomes, particularly in terms of joint stability, functional recovery, and complication rates [4,11].

The present study demonstrated a significant improvement in functional outcomes following THR using the direct lateral (Modified Hardinge) approach, with the mean Harris Hip Score improving from 42.3 ± 6.8 preoperatively to 86.5 ± 5.2 at 6 months. These findings are consistent with previous studies reporting substantial postoperative functional improvement following THR [16]. Recent literature also supports that modern THR techniques result in excellent early functional outcomes regardless of approach, provided surgical principles are adhered to [12,13].

A notable finding in this study was the absence of postoperative dislocation, highlighting the inherent stability of the direct lateral approach. Preservation of posterior soft tissue structures is considered a major factor contributing to reduced

dislocation rates [6,14]. Contemporary systematic reviews and registry-based studies have confirmed that lateral approaches are associated with lower dislocation rates compared to posterior approaches [11,17]. This supports the growing preference for the Modified Hardinge approach in patients at higher risk of instability.

However, the direct lateral approach is often associated with concerns regarding abductor muscle dysfunction. In the present study, mild abductor weakness was observed in 15% of patients, which improved with physiotherapy. Similar findings have been reported in earlier studies, where transient abductor insufficiency was attributed to splitting of the gluteus medius muscle [8,18]. Recent studies suggest that meticulous surgical technique and proper repair of the abductor mechanism significantly reduce the incidence of long-term functional impairment [14,16].

The improvement in range of motion and early mobilization observed in this study further supports the effectiveness of the Modified Hardinge approach. Early rehabilitation is known to enhance functional recovery and reduce postoperative complications such as stiffness and thromboembolism [19]. Recent evidence also indicates that optimized perioperative protocols and early mobilization strategies significantly improve short-term outcomes following THR [20].

The predominance of avascular necrosis (50%) as the leading indication in this study reflects regional disease patterns, particularly in developing countries, where younger populations are more frequently affected. In contrast, osteoarthritis remains the most common indication in Western populations [3,11]. These differences underscore the importance of region-specific studies in evaluating surgical outcomes.

Despite the encouraging results, certain limitations must be acknowledged. The small sample size ($n = 20$) and short-term follow-up (6 months) limit the generalizability of the findings and preclude assessment of long-term implant survival and complications [10]. Additionally, the absence of a comparative group limits direct evaluation of the superiority of the Modified Hardinge approach over other surgical techniques.

Nevertheless, the present study provides valuable prospective evidence supporting the use of the direct lateral (Modified Hardinge) approach as a safe, effective, and reliable technique for primary THR. The approach offers excellent functional outcomes, low complication rates, and superior joint stability in the short term, consistent with findings from recent high-quality studies [11,21].

IV. Conclusion

The present study demonstrates that the direct lateral (Modified Hardinge) approach in primary total hip replacement is a safe, reliable, and effective surgical technique with favorable short-term outcomes. Significant improvement in functional status, as evidenced by the marked increase in Harris Hip Score, along with excellent pain relief and range of motion, was observed at 6 months follow-up.

The approach provided excellent joint stability with no incidence of dislocation, supporting its advantage over other surgical approaches. Although mild abductor weakness was noted in a small proportion of patients, it was transient and improved with rehabilitation.

Overall, the Modified Hardinge approach offers predictable functional recovery with minimal complications, making it a suitable choice for primary total hip replacement, particularly in settings where stability is a key concern.

Further studies with larger sample sizes and long-term follow-up are recommended to validate these findings and assess implant survival and long-term functional outcomes.

Conflict of Interest: None

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