ORIGINAL RESEARCH PAPER
Volume - 15 | Issue - 05 | May - 2026 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

COMPARISON OF FUNCTIONAL OUTCOMES BETWEEN MODIFIED HARDINGE VERSUS MOORE APPROACH OF TOTAL HIP REPLACEMENT- AN INTERVENTIONAL STUDY

Orthopaedics

Dr. Praveen kuamr* Junior Resident Department of Orthopedics, Rohilkhand Medical College and Hospital, Bareilly, U.P, India*Corresponding Author

Dr. Ashutosh Kumar Associate Professor Department of Orthopedics, Rohilkhand Medical College and Hospital, Bareilly, U.P, India

Dr. Anant Agarwal Assistant Professor Department of Orthopedics, Rohilkhand Medical College and Hospital, Bareilly, U.P, India

ABSTRACT

Background: The Modified Hardinge (direct lateral) and Moore (posterior) approaches are commonly used in total hip replacement (THR), each with distinct advantages and limitations. Comparative evidence on functional outcomes between these approaches in the Indian population remains limited. **Aim:**To compare perioperative parameters, functional recovery, complications, and patient-centred outcomes between the Modified Hardinge and Moore approaches in primary THR.**Methods:** This interventional comparative study included 62 patients undergoing primary THR at a tertiary care centre. Patients were allocated into Modified Hardinge (n=31) and Moore (n=31) groups. Perioperative variables, Harris Hip Score (HHS), gait recovery, Trendelenburg test, complications, patient satisfaction, and hospital stay were evaluated during follow-up up to one year. Statistical analysis was performed using SPSS v28, with $p<0.05$ considered significant.**Results:** The Modified Hardinge approach showed significantly shorter incision length (14.35±1.11 vs 19.93±0.85 cm), lower blood loss (282.9±20.87 vs 468.52±19.18 ml), smaller hemoglobin drop (1.63±0.27 vs 2.73±0.15 g/dL), and shorter operative duration (73.41±4.6 vs 98.16±6.9 min) (all $p<0.001$). Harris Hip Scores were comparable early but significantly higher in the Modified Hardinge group at 6 months, 1 year, and final follow-up ($p\leq0.030$). Posterior dislocations and nerve-related complications occurred predominantly in the Moore group. Gait normalization, abductor recovery, patient satisfaction, and hospital stay were significantly better with the Modified Hardinge approach.Conclusion: Both approaches achieved functional improvement; however, the Modified Hardinge approach provided superior stability, perioperative efficiency, and long-term functional outcomes, making it a more reliable technique for primary total hip replacement.

KEYWORDS

Total Hip Replacement; Modified Hardinge Approach; Moore Approach; Harris Hip Score; Surgical Outcomes.

INTRODUCTION

Total Hip Arthroplasty (THA) is a widely accepted surgical solution for end-stage hip conditions, offering substantial pain relief and functional restoration.[1] Among the commonly practiced surgical approaches, the Modified Hardinge (direct lateral) and Moore (posterior) techniques remain predominant. Each method presents distinct advantages—while the Moore approach is known for quicker early recovery due to minimal muscle disruption, it carries a higher risk of dislocation. The Modified Hardinge approach, on the other hand, offers enhanced joint stability but may temporarily affect abductor muscle function.[2,3]

Despite their frequent use, there is a lack of direct comparative evidence evaluating the functional outcomes of these approaches, particularly in the Indian population where cultural practices like squatting and sitting cross-legged impose unique functional demands. Existing literature, largely based on Western cohorts, may not reflect the anatomical and lifestyle variations seen in Indian patients.[3,4]

This interventional study is designed to compare the functional outcomes of the Modified Hardinge and Moore approaches in patients undergoing total hip replacement. By assessing parameters such as mobility, pain relief, and patient satisfaction using standardized and culturally relevant tools, the study aims to generate evidence that supports optimal surgical approach selection in the Indian clinical context.

Material and Methods

This interventional comparative study was conducted in the Department of Orthopedics at Rohilkhand Medical College and Hospital, Bareilly. Adult patients (>18 years) requiring primary total hip replacement were enrolled after obtaining written informed consent. Indications included femoral neck fractures (Garden III–IV, Pauwels III), avascular necrosis of the femoral head (Ficat–Arlet III–IV), and advanced hip osteoarthritis (Tönnis III). Patients undergoing revision arthroplasty, those medically unfit for surgery, with active hip infection or sinus, or associated acetabular fracture were excluded.

A total of 62 eligible patients were included and allocated into two equal groups (n=31 each) based on the surgical approach used: Modified Hardinge (direct lateral) and Moore (posterior) approach. In the Modified Hardinge group, patients were positioned laterally and a lazy-J incision centered over the greater trochanter was used. The fascia lata was split in line with the incision, gluteus medius partially detached, anterior capsule exposed, and hip dislocated anteriorly. Abductor repair was performed using non-absorbable sutures during closure. In the Moore group, patients were positioned in lateral decubitus on the contralateral side. A curved posterior incision was made, gluteus maximus split, short external rotators detached, posterior capsule incised, and hip dislocated posteriorly. Prosthesis implantation was performed using standard acetabular and femoral preparation techniques in both groups.

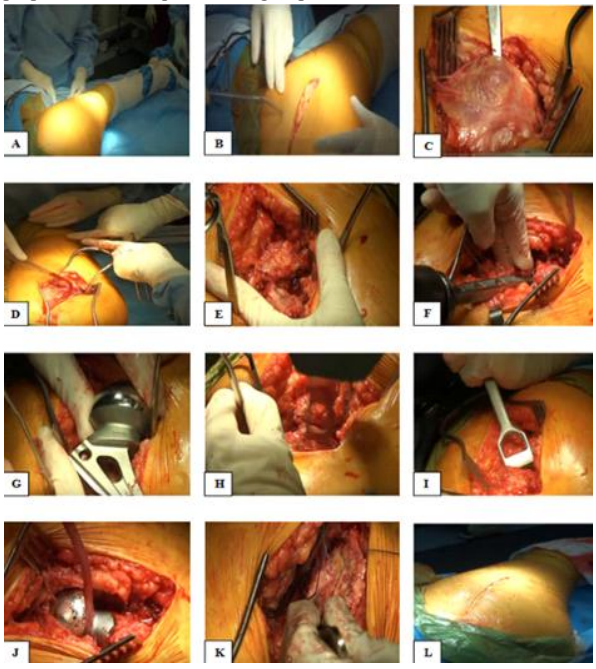

Figure 1: Hardinge's Approach of THA

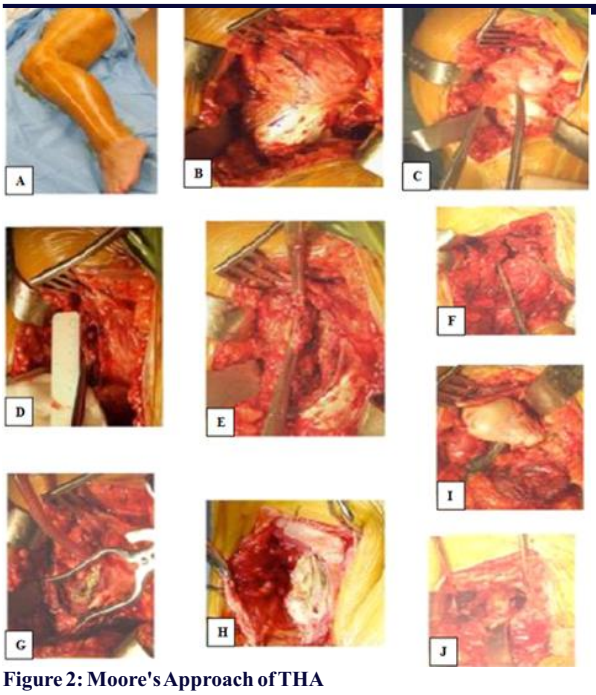

Figure 2: Moore's Approach of THA

Postoperatively, all patients received mechanical thromboprophylaxis and standardized rehabilitation. Mobilization began on postoperative day two. Cemented arthroplasty patients were allowed weight-bearing as tolerated, whereas uncemented cases followed graduated weight-bearing over 6–12 weeks.

Functional outcome was assessed using the Harris Hip Score (HHS) preoperatively and at follow-up intervals up to six months. Abductor function was evaluated using the Trendelenburg test.

Statistical analysis was performed using SPSS version 28. Continuous variables were expressed as mean±SD and compared using unpaired t-test or Mann–Whitney U test as appropriate. Categorical variables were analyzed using chi-square or Fisher's exact test. A p-value <0.05 was considered statistically significant.

RESULTS

Among 62 patients undergoing total hip replacement, baseline demographic and diagnostic characteristics were comparable between the Modified Hardinge and Moore groups. The Modified Hardinge approach demonstrated significantly better perioperative outcomes with shorter incision, less blood loss, smaller hemoglobin drop, and reduced operative duration, along with superior Harris Hip Scores at later follow-up. Complications such as posterior dislocation and nerve palsy occurred predominantly in the Moore group, while gait recovery was earlier and more complete in the Modified Hardinge group.

Table 1. Baseline Demographic and Clinical Characteristics (n = 62)

Variable	Category	Modified Hardinge (n=31)	Moore / Posterior (n=31)	p-value
Age group	18–30	6	7	0.893
	31–40	8	9	
	41–50	10	6	
	51–60	2	3	
	61–70	4	4	
	>70	1	2	
Sex	Male	21	23	0.576
	Female	10	8	
Associated diagnosis	Acute fracture neck femur	5	6	0.590
	Avascular necrosis	9	12	
	Congenital/developmental hip disorder	0	1	
	Infective hip pathology	2	2	
	Intertrochanteric fracture	1	0	
	Neglected/old NOF fracture	2	1	
	Non-union/failed fixation	1	0	
	Osteoarthritis	0	3	
	Osteoarthritis (secondary)	2	0	
	Post-operative THR complication	5	4	
	Subtrochanteric/intertrochanteric fracture	2	1	
	Systemic disease–associated arthritis	1	1	
	Unclassified	1	0	

Table 2. Comparison of Perioperative Parameters Between Surgical Approaches

Variable	Modified Hardinge (Mean ± SD)	Moore (Posterior) (Mean ± SD)	p-value
Incision length (cm)	14.35 ± 1.11	19.93 ± 0.85	<0.001
Intraoperative blood loss (ml)	282.90 ± 20.87	468.52 ± 19.18	<0.001
Hemoglobin drop (g/dL)	1.63 ± 0.27	2.73 ± 0.15	<0.001
Surgery duration (min)	73.41 ± 4.6	98.16 ± 6.9	<0.001

Table 3. Comparison of Harris Hip Scores Between Approaches

Time Point	Modified Hardinge (Mean ± SD)	Moore (Posterior) (Mean ± SD)	p-value
Pre-operative	43.0 ± 5.79	44.9 ± 4.94	0.169
6 Weeks	68.6 ± 6.15	70.7 ± 6.78	0.214
3 Months	77.5 ± 5.16	79.3 ± 4.41	0.151
6 Months	88.3 ± 4.73	85.9 ± 3.68	0.030
1 Year	94.0 ± 2.05	90.0 ± 3.59	<0.001
Final	98.6 ± 1.23	91.9 ± 1.25	<0.001

Table 4. Time-wise Distribution of Complications According to Approach

Time Period	Complication Category	Modified Hardinge (n=31)	Moore (Posterior) (n=31)	Total (n=62)	p-value (χ^2)
Intra-operative	GT fracture	2	0	2	0.081
	Nerve palsy	1	2	3	
	None	29	28	57	
Immediate Post-operative	Abductor weakness	3	4	7	0.315
	Foot drop	0	2	2	
	None	28	25	53	
6-Week Follow-up	Superficial infection	1	2	3	0.063
	Deep infection	0	1	1	
	Posterior dislocation	0	2	2	
	None	30	26	56	
3-Month Follow-up	Wound dehiscence	0	2	2	0.151
	None	31	29	60	
6-Month Follow-up	Posterior dislocation	0	1	1	0.313
	None	31	30	61	
1-Year Follow-up	None	31	31	62	—

Table 5. Time-wise Gait Recovery According to Approach

Time Period	Gait Assessment Category	Modified Hardinge (n=31)	Moore (Posterior) (n=31)	Total (n=62)	p-value (χ^2)
6 Weeks	Mild antalgic gait	24	12	36	0.014 (χ^2 = 12.5, df = 4)
	Near-normal gait	2	3	5	
	Neuropathic / AFO-assisted gait	0	3	3	
	Not walking independently yet	3	3	6	
	Unable to walk	2	10	12	

3 Months	LAMA	0	1	1	0.065 (χ^2 = 10.4, df = 5)
	Mild antalgic gait	3	6	9	
	Moderate antalgic gait	2	2	4	
	Near-normal gait	26	16	42	
	Neuropathic / AFO-assisted gait	0	3	3	
	Unable to walk	0	3	3	
6 Months	LAMA	0	2	2	0.115 (χ^2 = 7.42, df = 4)
	Moderate antalgic gait	3	6	9	
	Near-normal gait	2	1	3	
	Neuropathic / AFO-assisted gait	0	3	3	
	Normal gait	26	19	45	
1 Year	LAMA	0	2	2	0.118 (χ^2 = 4.28, df = 2)
	Neuropathic / AFO-assisted gait	0	2	2	
	Normal gait	31	27	58	

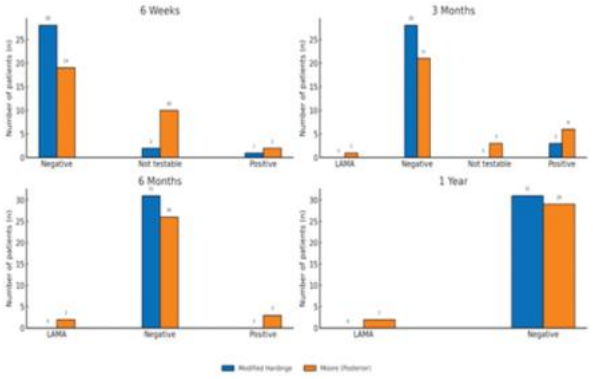

Figure 1: Time-wise Distribution of Trendelenburg Test Results According to Surgical Approach

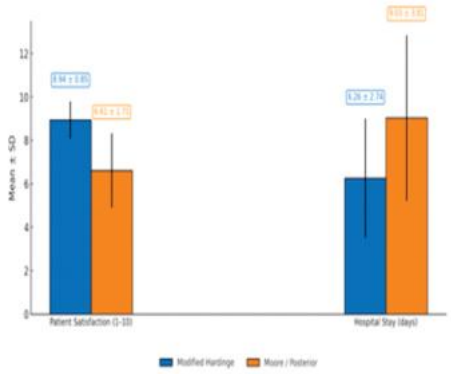

Figure 2: Comparison of Patient Satisfaction and Hospital Stay Between Modified Hardinge and Moore (Posterior) Approaches

DISCUSSION

The present interventional comparative study evaluated functional and perioperative outcomes of total hip replacement performed through the Modified Hardinge and Moore approaches. Both approaches produced substantial functional improvement; however, distinct differences were observed in operative efficiency, stability-related complications, gait recovery, and long-term functional outcomes.

Baseline demographic and clinical characteristics were comparable between the two groups with respect to age, sex, and diagnostic spectrum, indicating absence of selection bias. Downing et al.[5] reported similar age and sex distribution between lateral and posterior total hip replacement cohorts and concluded that demographic comparability permits reliable functional comparison between approaches. Likewise, Jolles and Bogoch[6] observed equivalent baseline characteristics in their comparative series and emphasized that approach-related outcome differences should be interpreted independent of demographic factors. The balanced distribution in the present study therefore supports the validity of subsequent intergroup comparisons.

Perioperative analysis demonstrated significant advantages with the Modified Hardinge approach, including shorter incision length, lower intraoperative blood loss, smaller hemoglobin drop, and reduced operative duration. Jadhav et al.[7] reported significantly lower blood loss and shorter surgical time in patients undergoing the Hardinge approach, attributing this to improved exposure and controlled abductor handling. Kumar et al.[8] similarly observed reduced operative trauma and perioperative morbidity with the lateral approach compared with the posterior technique. These observations closely parallel the perioperative efficiency demonstrated in the present study.

Functional recovery assessed by Harris Hip Score showed comparable early outcomes up to three months but significantly higher scores in the Modified Hardinge group at later follow-up. Jeyaraman et al.[9] reported that although early functional recovery was similar between approaches, lateral-approach patients achieved significantly higher HHS at one year due to improved abductor function and joint stability. Jadhav et al.[7] also demonstrated superior long-term HHS in the Hardinge group, concluding that abductor preservation contributes to sustained functional outcomes. The progressive divergence in Harris Hip Scores observed in the present study is consistent with these findings.

Complication analysis revealed posterior dislocations exclusively in the Moore group, whereas none occurred following the lateral approach. Ozan et al.[10] reported a significantly higher dislocation rate with posterior approaches in fracture neck femur arthroplasty, attributing this to posterior capsular disruption. Similarly, John et al.[11] demonstrated increased instability events in posterior total hip replacement compared with lateral approaches in a comparative analysis. Nerve-related deficits in the present study were also confined to the Moore group, consistent with observations by Jolles and Bogoch[6], who reported higher sciatic nerve vulnerability in posterior exposures. In contrast, transient abductor weakness observed early in some lateral-approach patients has also been described by Aavikkoet al.[12], who noted that abductor dysfunction following the Hardinge approach is typically temporary and resolves with rehabilitation.

Gait recovery and functional independence were achieved earlier in the Modified Hardinge group. Jeyaraman et al.[9] demonstrated faster restoration of near-normal gait in lateral-approach patients due to preservation of abductor mechanics. López et al.[13] similarly reported improved gait symmetry and reduced limp with abductor-preserving approaches. These observations correspond with the earlier gait normalization observed in the present study. Trendelenburg assessment further supported this, as Jadhav et al.[7]and Ozan et al.[10] reported fewer positive Trendelenburg tests following lateral approaches, indicating better abductor recovery, which mirrors the present findings.

Early postoperative mobilization occurred at similar time points in both groups, suggesting that standardized rehabilitation protocols rather than surgical approach primarily determined early ambulation. Downing et al.[5] also observed comparable early mobilization timelines between approaches when postoperative protocols were uniform.

Patient-centred outcomes showed clear superiority of the Modified Hardinge approach, with higher satisfaction scores and shorter hospital stay. Elsadanyet al.[14] reported greater patient confidence and earlier discharge following the Hardinge approach due to improved stability. Chan et al.[15] similarly observed higher patient-reported outcome scores in lateral-approach arthroplasty compared with posterior techniques. These observations closely align with the satisfaction and hospitalization advantages demonstrated in the present study.

CONCLUSION

We concluded that both Modified Hardinge and Moore approaches provided good pain relief and functional improvement after total hip replacement. However, the Modified Hardinge approach showed better overall results. It had shorter incision, less blood loss, smaller hemoglobin drop, and shorter surgery time. Patients operated with the lateral approach recovered walking earlier, had better hip muscle strength, fewer Trendelenburg-positive cases, and higher Harris Hip Scores during follow-up. Dislocation and nerve-related complications were seen mainly in the Moore group. Patients in the Modified Hardinge group were more satisfied and had shorter hospital stay. Therefore, the Modified Hardinge approach appears safer, more stable, and more reliable for total hip replacement.

Conflict of Interest: *None.*
Funding: *None.*
Ethical Approval: *Obtained.*
Consent: *Written consent secured.*

REFERENCES

1. Varacallo MA, Luo TD, Johanson NA. Total Hip Arthroplasty Techniques. StatPearls
2. Kalyanasundaram, Sivaprasad& Krishnathas, Krishanth. (2020). Modified Hardinge Approach for Lesser Complications. Journal of Evidence Based Medicine and Healthcare. 7. 1512-1516. 10.18410/jebmh/2020/318.
3. Saqlain SS, Gill UN, Hamid A, Ud Din S, Mustafa F, Irfan U, et al. Comparison of Moore's Versus Hardinge Approach in Total Hip Arthroplasty in Terms of Harris Hip Score and Post Op Hip Dislocation. Ortho. 2022;2(1):1013.
4. Goyal P, Lau A, McCalden R, Teeter MG, Howard JL, Lanting BA. Accuracy of the modified Hardinge approach in acetabular positioning. Can J Surg. 2016 Aug;59(4):247-53.
5. Downing ND, Clark DI, Hutchinson JW, Colclough K, Howard PW. Hip abductor strength following total hip arthroplasty: a prospective comparison of the posterior and lateral approach in 100 patients. Acta Orthop Scand. 2001;72(3):215–20.
6. Jolles BM, Bogoch ER. Posterior versus lateral surgical approach for total hip arthroplasty in adults with osteoarthritis. *Cochrane Database Syst Rev.* 2004;(1):CD003828.
7. Jadhav SV, Murkute KG, Swamy AP, Badgujar O. Prospective study comparing early functional outcome and gait analysis in femoral neck fracture treated by cemented hemiarthroplasty using modified Hardinge approach and conventional posterior approach. International Journal of Research in Orthopaedics. 2023 Jan;9(1):66.
8. Kumar J, Mane AN, Niraj NK, Rahul K, Bobbili RT, Shankar K. The SPAIRE Approach for Hip Arthroplasty: Short-Term Functional Outcome in an Indian Scenario. Indian Journal of Orthopaedics. 2024 Oct;58(10):1431-9.
9. Jeyaraman M, Ravinath TM, Ajay SS, Sabarish K, Ravi Weera AV. Lateral Hardinge's versus Posterior Southern Moore's Approach in Total Hip Arthroplasty-A Prospective Cohort Study. J Clin Exp Orthop. 2019 Jul;5(2):67.
10. Ozan F, Öncel ES, Koyuncu S, Gürbüz K, Doğar F, Vatansever F, Duygulu F. Effects of Hardinge versus Moore approach on postoperative outcomes in elderly patients with hip fracture. Int J Clin Exp Med. 2016 Jan 1;9(2):4425-31.
11. John TK, Bender B, Parvizi J. Controversies in Total Hip Arthroplasty. InEssentials in Total Hip Arthroplasty 2024 Jun 1 (pp. 171-180). CRC Press.
12. Aavikko A, Puhakka J, Haapala J, Kukkonen J, Mäkelä K, Kosola J. Perioperative platelet rich plasma (PRP) in total hip arthroplasty through the Hardinge approach: protocol to study the effectiveness for gluteus medius healing. Journal of Experimental Orthopaedics. 2018 Dec;5:1-8.
13. López JM, Alcaraz JG, de la Blanca JC, Iliadis AD. Reference suture of gluteus minimus muscle: a modification of the lateral approach in total hip arthroplasty. Current Orthopaedic Practice. 2024 Jan 1;35(1):12-5.
14. Elsadany SG, Salama KS, Elgreatly MT, Fayed MA. Tripolar total hip arthroplasty versus Bipolar hip hemiarthroplasty in displaced femoral neck fracture in elderly: a randomized controlled trial. Medicine Updates. 2025 Jan 1;20(20):110-28.
15. Chan G, Curlewis K, Aladwan R, Hook SE, Rogers BA, Ricketts DM, Stott P. Outcomes of the dislocated hip hemiarthroplasty: a multi-centre study. Hip International. 2025 May:11207000251326038.