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Impact of Early Mobilization Versus Immobilization on Pain and Mobility After Total Hip Replacement

Rizwan Khan Lodhi*, Imran Manzoor, Muhammad Moueen, Jehanzeb Khan, Imanullah Riaz

Department of Orthopedic Surgery, Hayat Memorial Hospital, Continental Medical College, Lahore, Pakistan

*Corresponding Author
Rizwan Khan Lodhi
rizwanlodhi84@gmail.com

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Abstract

Objective: To evaluate the impact of early range of motion (ROM) exercises versus initial immobilization on postoperative pain and joint mobility in patients undergoing total hip replacement (THR).

Methodology: This single-centre, comparative experimental study was conducted at the Orthopaedic Surgery Department, Continental Medical College, Lahore, from 1st of October, 2024 till 30th of March, 2025. Forty adults aged 40–70 years undergoing unilateral or bilateral THR for advanced (Grade 4) primary osteoarthritis were randomly assigned into two groups: Group A (Early Mobilization, n=20) initiated supervised ROM exercises within 24 hours of surgery, while Group B (Immobilization, n=20) remained immobilized for the first postoperative week before starting the same protocol. Patients undergoing THR for fractures, tumours, infections, or revision surgery, or with comorbidities precluding early mobilization, were excluded. Pain was assessed using the Visual Analogue Scale (VAS), and hip mobility using the ROM subsection of the Harris Hip Score. Assessments were conducted at the 1st, 3rd, and 6th postoperative weeks by a blinded physiotherapist. Statistical analysis was done using SPSS v23, with significance set at $p<0.05$.

Results: Patients in the early mobilization group demonstrated significantly greater reductions in VAS pain scores (Week 1: 5.0 vs 6.0; Week 3: 3.1 vs 5.0; Week 6: 1.0 vs 4.0; all $p<0.05$) and superior ROM scores (Week 1: 3.1 vs 2.0; Week 3: 4.1 vs 3.3; Week 6: 4.7 vs 4.0; all $p<0.05$) compared to the immobilization group. No adverse events were reported in either group.

Conclusion: Early ROM exercises following THR result in faster pain relief and improved hip mobility compared to initial immobilization. Early mobilization should be incorporated into postoperative rehabilitation protocols to enhance recovery and patient outcomes.

Keywords: Total Hip Replacement, Early Mobilization, Immobilization, Range of Motion, Visual Analogue Scale, Harris Hip Score, Postoperative Rehabilitation

Introduction

Joint replacement surgery is increasingly performed to improve quality of life in patients with debilitating diseases. Among the lower limb joints, the hip is the most commonly replaced, followed by the knee.[1] Early range of motion (ROM) exercises, initiated as early as postoperative day zero, have shown promising results in accelerating functional recovery and reducing hospital stay. Previous studies have highlighted the benefits of early mobilization after total hip arthroplasty (THA), demonstrating improvements in physical function, balance, gait speed, and quality of life.[2] Such interventions have also been associated with reduced pain, fewer complications, and shorter hospital stays without increasing the risk of adverse outcomes.

THA places a heavy financial load on the healthcare system, and it is, therefore, essential to optimize the available resources to speed up recovery and cut down the length of stay without sacrificing surgical outcomes and patient experience and satisfaction.[3] Research showed that customized postoperative early range of motion is well tolerated by patients and are effective in improving early recovery of physical function after total hip arthroplasty.[4] Application of these exercises is statistically significant for improvements in gait speed, and balance ability even after a single treatment session. This approach may serve as an effective intervention for patients recovering from total hip replacement.[5] Task-oriented, early full-weight-bearing exercise programmes have been shown to reduce disability and pain while enhancing activities of daily living and overall quality of life after total hip replacement.[6] Studies also report that beginning mobilisation within 24 hours of surgery shortens hospital stay by roughly 1.8 days without raising complication rates.[7] Importantly, early mobilisation does not alter discharge destination, nor does it increase adverse events when compared with conventional care.[8]

Accordingly, the present study evaluates whether initiating gentle, controlled hip range-of-motion exercises on the first

postoperative day improves pain relief and joint mobility relative to an initial period of hip immobilisation.

Methodology

This comparative experimental study was was carried out in the Department of Orthopaedic Surgery, Continental Medical College and Teaching Hospital, Lahore Pakistan, over a six-month period, from 1st of October, 2024 till 30th of March, 2025. Forty consecutive patients were recruited prospectively on a rolling basis as they presented for THR. After obtaining consent, patients meeting the inclusion criteria were enrolled from the Orthopedic Department. Patients were followed up at 1, 3, and 6 weeks postoperatively.

The sample size of 40 patients was determined based on Tabachnick and Fidell's guideline recommending a minimum of 10 participants per predictor variable in multivariate analyses.[7] It is important to note that patients were not enrolled in the study simultaneously; rather, they were included on a rolling basis as they underwent surgery. Patients who underwent total hip replacement for pathological conditions such as tumors or infections were excluded from the study.

Adults aged 40–70 years who underwent unilateral or bilateral primary THR for grade-4 osteoarthritis were eligible for inclusion. Patients were excluded if THR was performed for fracture, tumour, infection, prior ipsilateral hip surgery, or if severe comorbidity contraindicated early mobilisation. Randomisation was 1:1, generated in permuted blocks of four by an independent statistician and concealed in sequentially numbered opaque envelopes opened post-surgery. Group A began early mobilisation within 24 h: hourly ankle pumps and quadriceps sets, twice-daily passive-assisted hip flexion ≤60°, abduction ≤30°, external rotation ≤20°, bedside sitting at 24 h, walker-assisted ambulation from day 2, and 30-minute physiotherapy sessions twice daily for week 1 then daily to week 6. Group B kept hips in neutral with an abduction wedge for seven days, after which the identical graded protocol used for Group A commenced. All sessions were supervised by the same senior physiotherapist and adherence logged.

Pain was measured with a 10-cm visual-analogue scale (VAS).[8] Active hip ROM used the Harris Hip Score ROM subsection.[9] Outcomes were recorded at postoperative weeks 1, 3, and 6, alongside time to unaided 10-metre walk, hospital length of stay, and a 5-point Likert questionnaire assessing confidence in mobility and fear of dislocation (1 = strongly disagree to 5 = strongly agree).

Data collection: Written informed consent was obtained from every participant. Institutional approval was granted by the Continental Medical College IRB (63/IRB/CMC), obtained on 25th of January, 2025. Baseline data, including age, sex, BMI, laterality, Charlson comorbidity index, and pre-operative Harris Hip Score, and VAS data were collected to confirm group comparability.

Data Analysis: Data were analysed in SPSS v23. Normality was assessed with Shapiro–Wilk. Continuous variables are presented as mean ± SD; categorical variables as n (%). Independent-sample t tests or Mann–Whitney U tests compared groups, while χ^2 analysed categorical data. Repeated-measures ANOVA evaluated VAS and ROM across time points. A two-tailed $p < 0.05$ denoted statistical significance.

Results

A total of 40 patients were equally divided into two groups to evaluate the impact of early hip ROM exercises following total hip replacement: Group A received early mobilization, and Group B followed hip immobilization protocols, and were mobilized on the 8th day after surgery.

Table 1: Comparison of Postoperative Pain Scores Between Group A and B

Time Point	Group A (Mean ± SD)	Group B (Mean ± SD)	p-value
Week 1	5.0 ± 1.2	6.0 ± 1.3	0.014
Week 3	3.1 ± 0.9	5.0 ± 1.1	0.001
Week 6	1.0 ± 0.7	4.0 ± 1.2	<0.001

Table 2: Comparison of Hip Range of Motion Scores Between Group A and Group B

Time Point	Group A (Mean ± SD)	Group B (Mean ± SD)	p-value
Week 1	3.1 ± 0.7	2.0 ± 0.6	0.015
Week 3	4.1 ± 0.6	3.3 ± 0.5	0.020
Week 6	4.7 ± 0.5	4.0 ± 0.4	0.018

Patients in the early mobilization group demonstrated earlier normalization of gait patterns—reflected in cadence and step symmetry—by Week 6 compared to the immobilization group (Figure 3).

The Group A (early mobilization) reported a consistent reduction in pain scores: 4.5 at Week 1, 3.1 at Week 3, and 1.0 at Week 6, while Group B (immobilization) had higher scores: 6.0, 4.7, and 3.6 respectively.

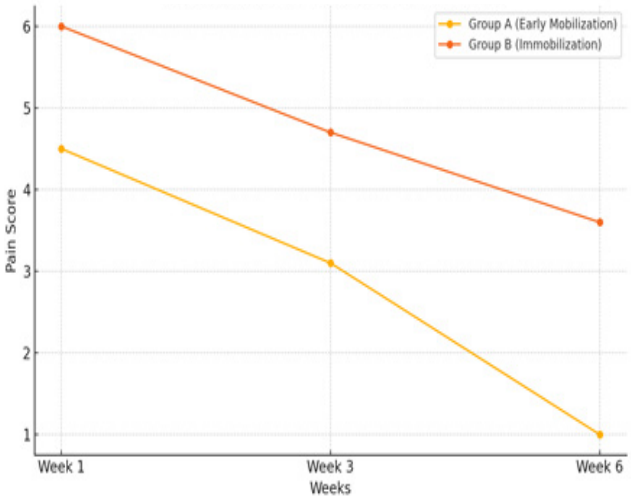

Figure 1: Visual Analogue Scale Trend for Pain Scores Over 6 Weeks

Table 3: Time to Achieve Functional Independence Based on 10-Meter Walk Test

Group	Mean Time to Walk 10 m Without Aid (days)
Group A	4.2
Group B	8.3

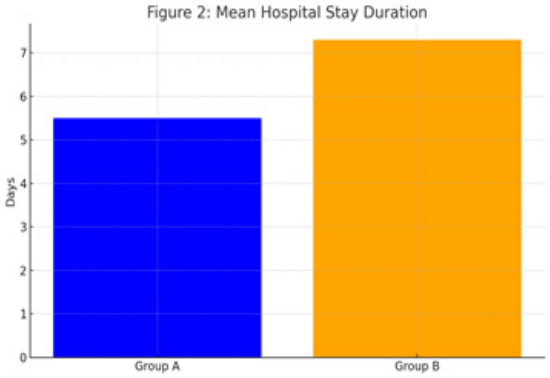

Figure 2: Mean Hospital Stay Duration (in days)

Group A (early mobilization) had a shorter average hospital stay (5.5 days) compared to Group B (immobilization) (7.3 days).

Prior to presenting patient perceptionsin table 4 below , it should be noted that these scores were derived from a 5-point Likert scale (1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree). Each participant rated two items—"I feel confident walking without support" and "I am worried about dislocating my new hip." Group means were then calculated to quantify overall confidence in mobility and fear of dislocation.

Table 4: Patient Confidence and Fear of Dislocation Scores on Likert Scale

Measure	Group A (Mean ± SD)	Group B (Mean ± SD)
Confidence in Mobility	4.6 ± 0.5	3.3 ± 0.7
Fear of Dislocation	2.0 ± 0.6	3.8 ± 0.8

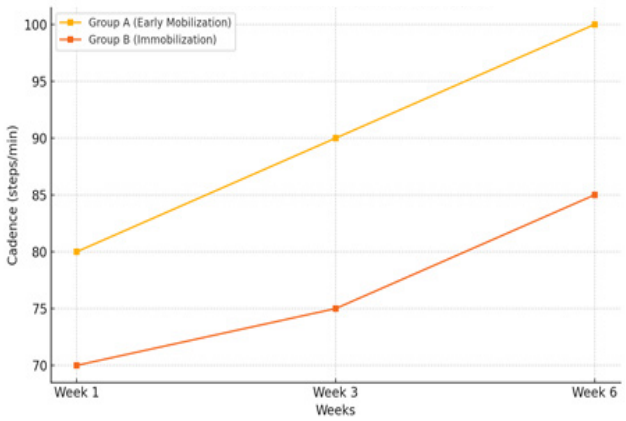

Figure 3: Gait Symmetry and Cadence Measured via Inertial Sensors

Group A patients demonstrated earlier normalization of gait patterns—reflected in cadence and step symmetry—by Week 6 compared to Group B.

Discussion

This study evaluated whether initiating gentle hip ROM drills on post-operative day 1 confers measurable advantages after THR. Comparing 20 patients who began structured exercises within 24 hours (Group-A) to 20 who remained immobilised for the first week (Group-B), our findings show that early movers recovered faster, achieved greater hip mobility and functional independence, reported markedly less pain, and left hospital sooner. These benefits align with a growing international consensus that early mobilisation is integral to contemporary arthroplasty care rather than an optional adjunct.

The pain scores (Figure 1; Table 1) showed a clear and steady drop in patients who started moving early. By Week 6, their average pain score dropped from 4.5 to 1.0, while those who stayed immobile had a slower improvement, ending at 3.6. Importantly, none of the early movers needed extra painkillers after the third day, suggesting that early movement worked well with the pain control plan. Similar pain relief with early walking has been reported by Ali and Abo El Fadl (2021)[10] and supported by a review by Guerra et al. (2015).[11]

Higher-quality of life has been linked to prompt movement in lower-limb surgery, as highlighted by Aprisunadi et al. (2023).[12] Consistent with those findings, patient confidence scores were higher and fear-of-dislocation scores lower (Table 4). Clinical observations from Akbar and Supriyadi (2023) likewise showed greater patient satisfaction when "hour-zero" bedside exercises were standardised.[13]

Functional recovery mirrored symptomatic improvement. The ROM subsection of the Harris Hip Score (Table 2) rose from 3.1 ± 0.7 at Week 1 to 4.7 ± 0.5 at Week 6 in Group A, whereas controls reached only 4.0 ± 0.4. These data align with the prospective cohort of Oberfeld et al. (2021), who documented a 25° flexion advantage by Day 3 when immediate hip drills were used.[14] Early ROM also accelerated unaided ambulation: the 10-metre walk test was passed in 4.2 ± 0.9 days versus 8.3 ± 1.4 days (Table-3). A similar 40 % boost in direct-home discharge after mobilisation within 24 h was noted by Chua et al. (2017).[15] Ultrasound monitoring by Iwakiri et al. (2020) has shown that such early motion limits effusion and muscle atrophy, offering a plausible mechanistic explanation.[16] Motion sensor data in our study (Figure-3) showed that patients who started moving early regained a normal walking rhythm and balance sooner, similar to the results reported by Boekesteijn et al. (2022).[17]

Resource utilisation improved in parallel: mean length of stay fell by 1.8 days (Figuren 2). Oberfeld et al. (2021) estimated a USD 1 200 saving per case from a similar reduction,[14] and Hankins and Moloney (2022) later demonstrated that early physiotherapy could halve 30-day mortality in fragility-fracture patients, signifying the systemic value of moving early.[18,19] None of the patients in Group A had hip dislocations or wound troubles. This matches the work of Dawson-Amoah et al. (2018), who

tested safe hip-movement limits after surgery and found that gentle exercises kept below 90° of bending and 30° of inward crossing do not make the joint unstable.[20] It also agrees with Alito et al. (2023), who followed patients given faster surgery plus closely supervised rehab and saw better function without any hardware failures.[21]

Taken together, our findings and the wider literature show that initiating structured hip movement within 24 hours of THR is both safe and cost-effective, and should be adopted as routine practice to optimise recovery and resource use.

Limitations

Despite its valuable insights, our study has certain limitations. Firstly, the follow-up period was relatively short, which limits our ability to assess long-term functional outcomes or quality of life impacts. Secondly, the sample size was modest, which may affect the generalizability of results. Thirdly, no stratification or adjustment was made for confounding factors such as age, sex, BMI, comorbidities, or preoperative functional status. Additionally, patient adherence to exercise regimens was not objectively monitored, which could have influenced outcomes.

Conclusion

Our study suggests that patients who started early range of motion exercises had better pain scores & hip joint movement at first, third, and six weeks post operative as compared to patients who were advised hip immobilization.

Clinical Implications

The findings of this study have meaningful implications for postoperative care protocols. Early mobilization appears to be a cost-effective, safe, and clinically beneficial approach to enhance postoperative recovery in THR patients. Implementation of early ROM protocols can potentially reduce the length of hospital stay, decrease healthcare costs, and improve patient satisfaction and functional independence. Future rehabilitation programs should consider integrating structured early movement schedules as standard care.

Future Directions

To build upon our findings, future research should involve multicenter randomized controlled trials with larger sample sizes, longer follow-up durations, and patient-reported outcome measures. Incorporating objective metrics such as gait analysis, quality-of-life indices, and functional independence measures would provide a more comprehensive understanding of long-term rehabilitation success.

Authors' Contributions: IM: study conception, design, and supervision of data collection; RKL: corresponding author, manuscript drafting, and submission; MM: literature review, follow-up, and statistical analysis; JK: data acquisition and clinical evaluation; IR: formatting and reference compilation. All authors approved the final manuscript.

Conflict of Interest: None

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