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Early Physiotherapy in Acute Postoperative Phase After Total Knee Replacement: A Case Report

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Abstract

Background: Knee osteoarthritis is a leading cause of pain and functional limitation in older adults. Total Knee Replacement (TKR) is commonly performed in advanced cases, but early postoperative pain, limited range of motion (ROM), and reduced mobility may delay recovery. Evidence on immediate clinical responses during the first few postoperative days remains limited.
Objective: To describe early physiotherapy management and changes in pain, ROM, and functional mobility during the first three postoperative days following TKR.
Methods: A case report was conducted on a 61-year-old female following TKR for advanced knee osteoarthritis. Physiotherapy was initiated on postoperative day one and provided once daily for three consecutive days. Interventions included breathing exercises, ankle pumping, muscle setting, ROM exercises, transfers, sit-to-stand, and gait training. Outcomes were assessed using the Numeric Rating Scale, goniometric ROM, and Modified Rivermead Mobility Index. Changes were analyzed descriptively.
Results: Pain at rest decreased from 7 to 3 and movement pain from 7 to 4. Knee flexion improved from 45° to 120°, extension from −10° to 0°, and MRMI from 7 to 34, indicating improvements in pain, ROM, and functional mobility.
Conclusion: Early physiotherapy within the first three postoperative days may contribute to short-term improvements in pain, ROM, and functional mobility following TKR. Findings should be interpreted cautiously due to the single-case design and short observation period.

Keywords
Osteoarthritis; Knee Arthroplasty; Physical Therapy; Rehabilitation; Mobility

Introduction

Knee osteoarthritis (OA) is a progressive degenerative joint disorder characterized by articular cartilage degradation, subchondral bone remodeling, and synovial inflammation, which collectively contribute to pain, stiffness, and functional impairment.[1,2] The condition represents a major public health concern, particularly among older adults, due to its high prevalence and its substantial impact on mobility, independence, and quality of life.[3] Recent global evidence indicates that musculoskeletal disorders, including knee OA, remain among the leading causes of years lived with disability worldwide, highlighting the need for effective clinical management strategies.[1,3]

In advanced stages of OA, particularly Kellgren–Lawrence grade IV, structural joint damage becomes severe and is often accompanied by persistent pain, joint deformity, and marked functional limitation.[4] These pathological changes frequently result in significant impairment in activities of daily living, including walking, stair negotiation, and transitional movements.[5] When conservative management fails to alleviate symptoms, Total Knee Replacement (TKR) is widely recommended as an effective surgical intervention to reduce pain and restore joint function.[6,7]

Despite the clinical effectiveness of TKR, postoperative recovery is frequently complicated by early-phase impairments, including pain, edema, restricted range of motion (ROM), muscle weakness, and reduced functional mobility.[8] These impairments may delay rehabilitation progress, prolong hospital stay, and negatively affect long-term outcomes.[7] In particular, inadequate early mobilization has been associated with increased risk of joint stiffness, impaired neuromuscular activation, and delayed functional recovery.[8,9]

Early physiotherapy intervention has been proposed as a key component in addressing these postoperative challenges. The primary objectives of early rehabilitation include pain modulation, restoration of joint mobility, prevention of complications associated with immobilization, and facilitation of functional independence.[7,10] Exercise-based interventions, including ROM exercises, muscle strengthening, and functional training, have been shown to improve postoperative outcomes by enhancing circulation, promoting neuromuscular activation, and supporting gradual return to activity.[7,8] These mechanisms are particularly relevant in the acute postoperative phase, where early physiological adaptation may influence subsequent recovery trajectories.[9]

Current rehabilitation guidelines emphasize the importance of initiating physiotherapy as early as possible following TKR, with a focus on progressive and individualized exercise programs.[7,11] However, although substantial evidence from randomized controlled trials and systematic reviews supports the effectiveness of rehabilitation programs, most studies primarily evaluate outcomes in the subacute and long-term phases.[7,11] Evidence specifically examining immediate clinical responses within the first few postoperative days remains limited, particularly in real-world clinical settings.[9]

Furthermore, existing literature often lacks detailed reporting of early-phase physiotherapy implementation, including exercise dosage, progression strategies, and short-term patient responses.[7] This gap limits the translational value of research findings for clinicians managing patients during the critical acute phase following surgery.

Therefore, a clear research gap exists regarding the short-term clinical effects of early physiotherapy interventions within the first few days after TKR, especially in routine clinical practice settings.[9]

This study is novel in that it focuses on the immediate postoperative period (first three days) and provides a detailed clinical description of physiotherapy implementation and patient response in a real-world setting. Therefore, this study aims to describe the implementation of early physiotherapy intervention and to evaluate its short-term effects on pain, range of motion, and functional mobility in a patient following Total Knee Replacement.

Methods

This study employed a case report design to provide an in-depth and contextualized description of early physiotherapy management and its short-term clinical outcomes following Total Knee Replacement (TKR). This design was selected to capture detailed clinical processes and immediate patient responses during the acute postoperative phase, which are often not fully represented in controlled trials. However, it is acknowledged that case report designs have inherent limitations, particularly low external validity and limited generalizability.

The subject was a 61-year-old female diagnosed with advanced knee osteoarthritis who underwent unilateral TKR. Physiotherapy intervention was initiated on postoperative day one at the orthopedic ward of RS Ortopedi Prof. Dr. R. Soeharso Surakarta in October 2025. At baseline, the patient presented with knee pain, restricted range of motion (ROM), and impaired functional mobility, affecting activities such as bed mobility, transfers, and ambulation.

Data collection was conducted using standardized physiotherapy assessment procedures. Pain intensity was measured using the Numeric Rating Scale (NRS), a widely validated and reliable instrument for musculoskeletal conditions, with scores ranging from 0 (no pain) to 10 (worst possible pain).[1] Knee ROM was measured using a universal goniometer, with standardized patient positioning (supine position for flexion and extension) and consistent anatomical landmark alignment to ensure measurement reliability. Functional mobility was assessed using the Modified Rivermead Mobility Index (MRMI), a validated tool consisting of eight items evaluating mobility tasks, with a total score ranging from 0 to 40, where higher scores indicate better functional performance.[6] To minimize measurement bias, all assessments were performed by the same licensed physiotherapist, and standardized instructions were applied consistently across all sessions. The physiotherapist had clinical experience in musculoskeletal and postoperative rehabilitation.

The physiotherapy intervention was delivered once daily for three consecutive days, with each session lasting approximately 15–20 minutes. The intervention program was structured progressively based on the patient's clinical condition and tolerance. The program included breathing exercises and ankle pumping (2–3 sets of 10–15 repetitions) to enhance circulation and reduce the risk of postoperative complications; static quadriceps and gluteal setting exercises (3 sets of 10 repetitions with 5–10 seconds hold) to facilitate early neuromuscular activation; passive, active-assisted, and active ROM exercises to improve joint mobility; and functional training including bed mobility, transfer training, sit-to-stand, and gait training using a walker with partial weight-bearing.

The intervention approach was aligned with general principles of postoperative TKR rehabilitation, including early mobilization, progressive loading, and functional task training as recommended in contemporary rehabilitation guidelines. [Perlu referensi tambahan: guideline rehabilitasi TKR]

Progression of the intervention was standardized across sessions. On day one (T1), the focus was on pain control, circulation, and assisted movement. On day two (T2), exercises were progressed to active-assisted and active movements with increased patient participation. On day three (T3), the intervention emphasized functional independence, including transfer training and supervised ambulation.

As an introduction to the timeline, repeated evaluations were conducted to capture short-term clinical changes during the intervention period. The sequence of intervention and assessment time points is presented in Table 1.

Table 1. Clinical Timeline of Intervention and Assessment

Time Point	Description
T0	Baseline assessment prior to physiotherapy (postoperative day one)
T1	After first physiotherapy session
T2	After second physiotherapy session
T3	After third physiotherapy session

Data analysis was conducted descriptively by presenting absolute and percentage changes in pain, ROM, and functional mobility across time points. Percentage change was calculated to provide additional clinical interpretation of improvement. Given the single-subject design, inferential statistical analysis was not performed. Clinical significance was interpreted using commonly reported minimal clinically important differences (MCID) from the literature, particularly for NRS, where a reduction of ≥2 points is generally considered clinically meaningful.[9] Informed consent was obtained from the patient prior to participation, and all personal identifiers were removed to ensure confidentiality. Ethical approval was waived due to the case report design in accordance with institutional policy.

Results

This study aimed to evaluate short-term changes in pain intensity, knee range of motion (ROM), and functional mobility following early physiotherapy intervention in the acute postoperative phase after Total Knee Replacement (TKR). Data were collected at four time points (T0–T3) to capture the clinical progression over three consecutive days. To provide a clear overview of clinical progression, the changes in all outcome measures across time points are summarized in Table 2.

Table 2. Changes in Pain, Range of Motion, and Functional Mobility

Outcome Measure	T0	T1	T2	T3	Absolute Change	Percentage Change
Pain (NRS – Rest)	7	7	5	3	−4	−57.1%
Pain (NRS – Movement)	7	7	6	4	−3	−42.9%
Knee Flexion (°)	45	45	70	120	+75	+166.7%
Knee Extension (°)	−10	−10	−5	0	+10	100% improvement to neutral
MRMI Score	7	10	18	34	+27	+385.7%

As shown in Table 2, all outcome measures demonstrated progressive changes across the observation period. Pain intensity at rest and during movement decreased over time, with reductions observed from T2 and further changes at T3.
Knee ROM showed gradual improvement across time points. Flexion increased from 45° at baseline to 120° at T3, while extension limitation decreased from −10° to 0°.

Functional mobility, as measured using the Modified Rivermead Mobility Index (MRMI), increased across all time points, with the score rising from 7 at T0 to 34 at T3. As a complement to the quantitative outcome measures, the patient's functional progression during the intervention period is presented in Table 3 to provide a chronological overview of mobility changes.

Table 3. Clinical Progression of Functional Mobility

Time Point	Functional Status
T0	Required assistance for bed mobility; unable to stand independently
T1	Able to sit with assistance; initiated standing with support
T2	Improved transfer ability; began assisted ambulation
T3	Greater independence in transfers; ambulated with a walker under supervision

Overall, the data indicate consistent changes in pain, joint mobility, and functional performance across the three-day observation period.

Discussion

This case report demonstrates that early physiotherapy intervention in the acute postoperative phase following Total Knee Replacement (TKR) was associated with improvements in pain intensity, joint range of motion (ROM), and functional mobility over a three-day period. These findings extend existing evidence by providing detailed insight into immediate clinical responses within the first days after surgery, a period that remains underrepresented in current literature.[9]

The reduction in pain observed in this case may be explained by several physiological mechanisms associated with early mobilization and therapeutic exercise. Active and assisted movements can enhance local circulation, facilitate venous return, and reduce inflammatory mediators within the joint environment, thereby contributing to pain modulation.[4] Neuromuscular activation, particularly of the quadriceps muscle, may also reduce nociceptive input through improved joint stabilization and motor control.[12]

Importantly, the observed reduction in NRS scores (Δ=−4 at rest and Δ=−3 during movement) exceeds commonly reported minimal clinically important difference (MCID) thresholds (≥2 points), indicating that the improvement is not only statistically observable but also clinically meaningful. This supports previous findings that effective early pain management is critical for enabling patient participation in rehabilitation and preventing delayed recovery.[9,13]

The improvement in knee ROM observed in this case is consistent with evidence highlighting the importance of early mobilization in preventing postoperative stiffness.[8] Restricted ROM following TKR is commonly associated with inflammation, pain, and protective muscle guarding.[8] Early ROM exercises may promote collagen alignment, reduce periarticular adhesions, and enhance synovial fluid distribution, which contributes to improved joint mobility.[10] Randomized controlled trials have demonstrated that early exercise interventions can significantly improve ROM outcomes without increasing complication risk, supporting the clinical relevance of early-phase rehabilitation.[7,8]

Functional mobility improvements, reflected by the substantial increase in MRMI scores, are likely related to enhanced neuromuscular activation and task-specific training.[12] Early strengthening exercises targeting the quadriceps and gluteal muscles are essential for restoring lower limb stability and facilitating safe weight-bearing.[11,12] Task-oriented interventions such as transfer training and gait exercises may accelerate motor relearning processes, improve coordination, and enhance postural control.[7,14]

The magnitude of improvement in MRMI (Δ=+27) indicates a substantial gain in functional independence within a short period, although direct comparison with MCID values for MRMI remains limited in current literature. Nevertheless, the rapid progression from assisted bed mobility to supervised ambulation suggests meaningful functional recovery during the acute phase.

The incorporation of gait training with partial weight-bearing reflects adherence to contemporary rehabilitation strategies. Controlled mechanical loading provides essential stimuli for tissue adaptation while minimizing excessive stress on the surgical site.[7] Gradual progression of weight-bearing activities supports normalization of gait patterns and improves overall functional outcomes.[9]

Despite these findings, several limitations must be acknowledged. First, as a single-case report, the findings cannot be generalized to broader populations, and individual patient characteristics may influence outcomes. Second, the short duration of intervention (three days) limits the ability to assess long-term recovery and sustainability of improvements. Third, the absence of a comparator or control condition restricts causal inference regarding the effectiveness of the intervention.

Potential sources of bias should also be considered, including measurement bias and observer bias, given that all assessments were conducted by the same physiotherapist. Additionally, the lack of objective biomechanical or imaging-based outcomes may limit the comprehensiveness of evaluation.

From a clinical perspective, this case highlights the importance of initiating physiotherapy early in the postoperative phase to address pain, restore mobility, and promote functional independence. Early, structured, and progressive rehabilitation may facilitate faster recovery trajectories when appropriately tailored to patient tolerance and clinical status.

Future research should focus on randomized controlled trials with larger sample sizes and extended follow-up periods to determine the effectiveness and optimal parameters of early physiotherapy interventions following TKR. Additionally, further investigation into underlying mechanisms, including neuromuscular activation and inflammatory responses, is warranted to refine rehabilitation strategies.

Conclusion

This case report demonstrates that early physiotherapy intervention in the acute postoperative phase following Total Knee Replacement was associated with improvements in pain reduction, increased knee range of motion, and enhanced functional mobility over a three-day period. These findings directly address the study objective by illustrating measurable short-term clinical changes during the immediate postoperative phase.

The observed reduction in pain exceeded commonly reported clinical thresholds, while improvements in joint mobility and functional performance indicate meaningful early recovery progression. From a practical perspective, these findings support the implementation of early, structured, and progressive physiotherapy to facilitate initial recovery and promote functional independence. However, given the single-case design, short duration of intervention, and absence of a comparator, these results should be interpreted as preliminary clinical evidence and cannot be generalized to broader populations.

Further research using larger samples, controlled study designs, and longer follow-up periods is required to establish the effectiveness, clinical significance, and optimal parameters of early physiotherapy interventions following Total Knee Replacement.

Author Contribution

Hasan Mujaddid: Conceptualization, Data curation, Investigation, Methodology, Writing original draft.
Suryo Saputra Perdana: Supervision, Validation, Writing review and editing.
Prihantoro Larasati: Clinical assessment, Investigation, Supervision, Writing review and editing.

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Conflict of Interest Statement

The authors declare no conflict of interest.

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Ethics Statement

Written informed consent was obtained from the patient for participation in the case report and use of relevant clinical information for publication. Patient identity and personal identifying information were not disclosed.

References

1. Yao Q, Wu X, Tao C, Gong W, Chen M, Qu M, et al. Osteoarthritis: pathogenic signaling pathways and therapeutic targets. Signal Transduct Target Ther. 2023;8:56.
2. Vincent TL, Alliston T, Kapoor M, Loeser RF, Troeberg L, Little CB. Osteoarthritis pathophysiology. Clin Geriatr Med. 2022;38(2):193-219.
3. Steinmetz JD, Culbreth GT, Haile LM, Rafferty Q, Lo J, Fukutaki KG, et al. Global, regional, and national burden of osteoarthritis, 1990-2020 and projections to 2050: a systematic analysis for the Global Burden of Disease Study 2021. Lancet Rheumatol. 2023;5(9):e508-e522.
4. Song J, Ye Z, Li W, Chen Z, Wang X, Chen W. Association between radiographic severity with health-related quality of life in elderly women with knee osteoarthritis: a cross-sectional study. PLoS One. 2025;20(5):e0319482.
5. Shimizu H, Shimoura K, Iijima H, Suzuki Y, Aoyama T. Functional manifestations of early knee osteoarthritis: a systematic review and meta-analysis. Clin Rheumatol. 2022;41(9):2625-2634.
6. Logerstedt AD, Radach LJ, Scalzitti DA, Stevens-Lapsley JE, Zeni JA Jr. Physical therapist management of total knee arthroplasty. Phys Ther. 2020;100(9):1603-1631.
7. Konnyu KJ, Thoma LM, Cao W, Aaron RK, Panagiotou OA, Bhuma MR, et al. Rehabilitation for total knee arthroplasty: a systematic review. Am J Phys Med Rehabil. 2023;102(1):19-33.
8. Lee B, Yoon D, Yim J. Effects of an early exercise program with cryotherapy on range of motion, pain, swelling, and gait in patients with total knee arthroplasty: a randomized controlled trial. J Clin Med. 2024;13(5):1420.
9. Menéndez-Vega F, Núñez-Rodríguez S, González-Bernal JJ, Fernández-Solana J, Aparicio de Águeda P, Santamaría-Peláez M. Timing matters: early versus delayed rehabilitation after total knee arthroplasty and its impact on functional recovery: a systematic review. J Funct Morphol Kinesiol. 2026;11(2):233.
10. Alrawashdeh W, Eschweiler J, Migliorini F, El Mansy Y, Tingart M, Rath B. Effectiveness of total knee arthroplasty rehabilitation programmes: a systematic review and meta-analysis. J Rehabil Med. 2021;53(6):jrm00200.
11. Quesnot A, Mouchel S, Ben Salah S, Baranes I, Martinez L, Billuart F. Randomized controlled trial of compressive cryotherapy versus standard cryotherapy after total knee arthroplasty: pain, swelling, range of motion and functional recovery. BMC Musculoskelet Disord. 2024;25(1):176.
12. Wei G, Shang Z, Li Y, Wu Y, Zhang L. Effects of lower-limb active resistance exercise on mobility, physical function, knee strength and pain intensity in patients with total knee arthroplasty: a systematic review and meta-analysis. BMC Musculoskelet Disord. 2024;25(1):730.
13. Tanikawa H, Harato K, Ogawa R, Sato T, Kobayashi S, Nomoto S, et al. Local infiltration of analgesia and sciatic nerve block provide similar pain relief after total knee arthroplasty. J Orthop Surg Res. 2017;12(1):101.
14. Yan X, Li P, Li J, Song L, Jing J, Fu X, et al. Comparative efficacy of early exercise interventions for recovery outcomes after total knee arthroplasty: a systematic review and network meta-analysis. Front Med (Lausanne). 2026;13:1883684.