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Physiotherapy Rehabilitation After Total Knee Replacement in Geriatric Patients: A Case Report

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Abstract

Background: Total knee replacement (TKR) is commonly performed in patients with advanced knee osteoarthritis. However, pain, limited range of motion (ROM), muscle weakness, and functional impairment may persist during the subacute postoperative phase, particularly in geriatric patients requiring structured physiotherapy rehabilitation.

Objective: To describe the clinical outcomes of physiotherapy rehabilitation in a geriatric patient during the subacute phase after TKR due to bilateral knee osteoarthritis.

Methods: This case report involved a 70-year-old female patient evaluated three months after unilateral TKR. Physiotherapy rehabilitation was conducted once weekly for four weeks and included Transcutaneous Electrical Nerve Stimulation (TENS), infrared therapy, ROM exercise, strengthening exercise, gait training, stair training, and functional exercise. Outcomes were assessed using the Numeric Rating Scale (NRS), goniometer, Manual Muscle Testing (MMT), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and 30-Second Sit-to-Stand (30s STS) test. Data were analyzed descriptively.

Results: After four weeks, movement pain decreased from 6/10 to 4/10. Active knee flexion ROM improved from 100° to 115°, while passive flexion improved from 115° to 125°. Muscle strength improved from grade 3/5 to 4/5. The 30s STS performance increased from 9 to 11 repetitions, and the WOMAC total score decreased from 48 to 40. No adverse events were reported.

Conclusion: The physiotherapy rehabilitation program was associated with clinical improvement in pain intensity, knee ROM, muscle strength, and functional ability in a geriatric patient during the subacute phase after TKR.

Keywords
Physiotherapy; Arthroplasty, Replacement, Knee; Osteoarthritis, Knee; Geriatrics; Rehabilitation

Introduction

Knee osteoarthritis (OA) is one of the most common degenerative musculoskeletal disorders affecting older adults worldwide and represents a major cause of pain, disability, and reduced quality of life.[1,2] The prevalence of knee OA continues to increase due to population aging, obesity, sedentary lifestyle, and increased life expectancy.[3] Patients with bilateral knee OA commonly experience chronic pain, joint stiffness, muscle weakness, impaired gait performance, and limitations in activities of daily living (ADL), which may progressively reduce functional independence and mobility.[4] In advanced stages, conservative management such as pharmacological treatment, exercise therapy, and lifestyle modification may no longer adequately control symptoms, thereby necessitating surgical intervention through Total Knee Replacement (TKR), also referred to as total knee arthroplasty.[5]

TKR is considered one of the most successful orthopedic procedures for reducing pain and improving functional mobility in patients with end-stage knee OA.[3] However, postoperative recovery after TKR is strongly influenced not only by surgical success but also by the quality and continuity of rehabilitation management.[6] Several postoperative impairments may persist during the recovery period, including pain, decreased range of motion (ROM), quadriceps muscle weakness, impaired proprioception, gait abnormalities, balance deficits, and reduced functional performance.[7,8] These impairments may become more pronounced in geriatric patients because aging is associated with sarcopenia, decreased neuromuscular adaptation, impaired postural control, and increased risk of falls. Consequently, physiotherapy rehabilitation plays an important role in facilitating movement recovery, improving muscle activation, restoring functional mobility, and supporting safe reintegration into daily activities after TKR.[9]

The subacute phase approximately three months after TKR represents a clinically important rehabilitation period.[10] At this phase, the surgical wound is generally stable and inflammatory symptoms have decreased; however, deficits in muscle strength, movement control, gait performance, and functional activity may still persist.[8] Previous studies have shown that persistent quadriceps inhibition and movement avoidance behavior after TKR may negatively affect walking ability, stair negotiation, and sit-to-stand performance.[8,11] Inadequate rehabilitation during this phase may therefore contribute to prolonged disability, decreased physical performance, and lower patient satisfaction after surgery.[6,8] For geriatric patients, delayed rehabilitation recovery may further accelerate functional decline and reduce independence in performing ADL.[12] Therefore, structured rehabilitation programs emphasizing pain reduction, ROM restoration, strengthening exercise, gait retraining, and functional exercise are considered essential to optimize postoperative recovery.[13]

Several physiotherapy interventions have demonstrated beneficial effects during rehabilitation after TKR. Transcutaneous Electrical Nerve Stimulation (TENS) may reduce pain through modulation of nociceptive transmission and activation of endogenous analgesic mechanisms.[14] Range of motion exercise, including heel-slide exercise, may improve joint mobility, gait ability, and physical function after surgery.[15] Strengthening exercise targeting the quadriceps and hamstring muscles is also important because muscle weakness remains one of the primary contributors to functional limitation after TKR.[11] In addition, functional exercise such as the 30-Second Sit-to-Stand (30s STS) exercise may improve lower extremity muscle performance, postural control, and movement

coordination in older adults.[16] Evidence-based rehabilitation guidelines additionally recommend progressive exercise and mobility training to improve long-term postoperative function after TKR.[13,17]

Several previous studies have discussed rehabilitation outcomes after TKR; however, reports specifically describing comprehensive physiotherapy rehabilitation in geriatric patients during the subacute postoperative phase remain limited.[18] Most previous studies primarily focused on general adult populations, short-term postoperative management, or isolated exercise interventions.[6,11,15] In addition, rehabilitation challenges in older adults differ from younger populations because geriatric patients frequently present with reduced physiological reserve, impaired balance, decreased adaptability to physical stress, and increased fall risk.[19] These conditions highlight the importance of clinically detailed case reports to support evidence-based geriatric physiotherapy practice and to provide practical descriptions of multimodal rehabilitation implementation in real clinical settings.

Therefore, this case report aimed to describe the clinical outcomes of physiotherapy rehabilitation in a 70-year-old female patient during the subacute phase after TKR due to bilateral knee OA. The rehabilitation program consisted of TENS, infrared therapy, ROM exercise, strengthening exercise, gait training, stair training, and functional exercise. Clinical outcomes were evaluated using the Numeric Rating Scale (NRS), ROM assessment, Manual Muscle Testing (MMT), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and the 30-Second Sit-to-Stand (30s STS) test.

Methods

This study was designed as a clinical case report following the CARE guideline for case report reporting standards. The report described the physiotherapy rehabilitation management of a geriatric patient during the subacute postoperative phase after Total Knee Replacement (TKR) due to bilateral knee osteoarthritis (OA). Rehabilitation was conducted at the Physiotherapy Department of RS PKU Muhammadiyah Sukoharjo from August to September 2025 over a four-week intervention period.

The subject of this case report was a 70-year-old female patient who underwent unilateral left TKR approximately three months before physiotherapy evaluation. The patient was selected because she demonstrated persistent postoperative impairments including movement-related pain, decreased knee range of motion (ROM), muscle weakness, impaired gait performance, and reduced functional mobility affecting activities of daily living (ADL). These impairments were considered clinically relevant for evaluating physiotherapy rehabilitation during the subacute postoperative phase. The patient was able to communicate independently, follow therapeutic instructions, and participate actively during rehabilitation sessions.

Written informed consent for physiotherapy evaluation, rehabilitation intervention, and publication of the case report was obtained from the patient before intervention initiation.[20] Ethical publication principles were implemented by maintaining patient anonymity and confidentiality throughout the manuscript. Because this report was based on a single clinical case without experimental intervention beyond routine physiotherapy management, formal ethical committee approval was not specifically required according to institutional clinical reporting policy.

Clinical evaluation was performed at baseline, mid-intervention, and final evaluation to observe longitudinal clinical changes during rehabilitation. Pain intensity was assessed using the Numeric Rating Scale (NRS), which is considered a valid and reliable instrument for musculoskeletal pain assessment.[21] Active and passive knee ROM were measured in degrees using a universal goniometer with the patient positioned in supine lying. Muscle strength of the knee flexor and extensor muscle groups was evaluated using Manual Muscle Testing (MMT) based on the standard 0–5 grading system. Functional ability was assessed using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), which evaluates pain, stiffness, and physical function in patients with knee OA and post-TKR conditions.[22] Lower extremity functional performance was additionally evaluated using the 30-Second Sit-to-Stand (30s STS) test, which is commonly used to assess functional lower limb strength and mobility performance in older adults.[23] Balance screening was performed using the Romberg Test to identify static balance impairment during standing.

The rehabilitation program consisted of pain management modalities, ROM exercise, strengthening exercise, gait training, stair training, and functional exercise. Intervention sessions were conducted once weekly for four weeks with exercise progression adjusted according to pain response, fatigue level, movement quality, and patient tolerance. The frequency of supervised rehabilitation was determined based on outpatient physiotherapy scheduling and the patient's clinical tolerance during the subacute recovery phase.[24] In addition to supervised intervention, the patient also received education regarding home exercise continuation, safe ambulation, activity modification, and fall prevention strategies to support functional recovery during daily activity.[16]

Before presentation of the intervention protocol, Table 1 summarizes the physiotherapy rehabilitation program used during the intervention period. The rehabilitation approach was selected based on the patient's primary impairments including pain, limited ROM, muscle weakness, gait limitation, and decreased functional independence after TKR.

Table 1. Physiotherapy Rehabilitation Program

Intervention	Parameters	Clinical Purpose
Transcutaneous Electrical Nerve Stimulation (TENS)	Frequency: 120 Hz; pulse duration: 100 μs; sensory-level intensity according to patient tolerance; duration: 15 minutes; patient position: long sitting; frequency: once weekly	To reduce postoperative pain through modulation of nociceptive transmission and gate control mechanisms.[14]
Infrared Therapy	Duration: 15 minutes before exercise intervention; patient position: long sitting	To promote local circulation, reduce stiffness, and facilitate muscle relaxation.[25]
Heel-Slide ROM Exercise	8–10 repetitions × 3 sets; active-assisted movement	To improve knee flexion ROM and movement flexibility after TKR.[15]
Quadriceps and Hamstring Setting Exercise	Isometric contraction; 8–10 repetitions × 3 sets; hold: 5–8 seconds	To facilitate muscle activation and improve knee stability.[11]
Straight Leg Raise Exercise	8–10 repetitions × 3 sets without extensor lag	To improve quadriceps strength and lower extremity control.[11]
Functional Exercise (30s STS Training)	Repeated sit-to-stand exercise; 8–10 repetitions × 3 sets	To improve lower extremity functional performance and postural control.[23]
Gait Training with Quadripod	Supervised gait correction, weight-bearing adaptation, and walking pattern training	To improve ambulation safety, gait confidence, and functional mobility.[26]
Stair Training	Supervised ascending and descending stair practice	To improve coordination and independence during daily mobility activities.[27]

Exercise progression was adjusted gradually according to the patient's tolerance and clinical response. During each session, fatigue symptoms, pain intensity, movement quality, and signs of instability were monitored carefully because geriatric patients commonly demonstrate reduced physiological reserve and increased fall risk during rehabilitation.[16,24] The rehabilitation program

emphasized safe movement performance, gradual muscle activation, progressive mobility training, and restoration of functional independence without provoking excessive joint stress or symptom exacerbation.

The clinical rehabilitation timeline is presented in Figure 1. At baseline (Week 0), the patient underwent an initial evaluation of pain intensity, range of motion, muscle strength, gait performance, balance, WOMAC score, and 30-second sit-to-stand performance. During Week 1, the intervention consisted of TENS and infrared therapy followed by range of motion exercises, isometric strengthening, gait training, and sit-to-stand exercises. In Week 2, strengthening exercises and gait training were progressed according to movement tolerance and pain response. During Week 3, strengthening and functional exercises were continued, with emphasis on stair activity and improvement of movement quality. At Week 4, the patient underwent final reassessment of pain intensity, range of motion, muscle strength, WOMAC score, gait performance, and functional mobility.

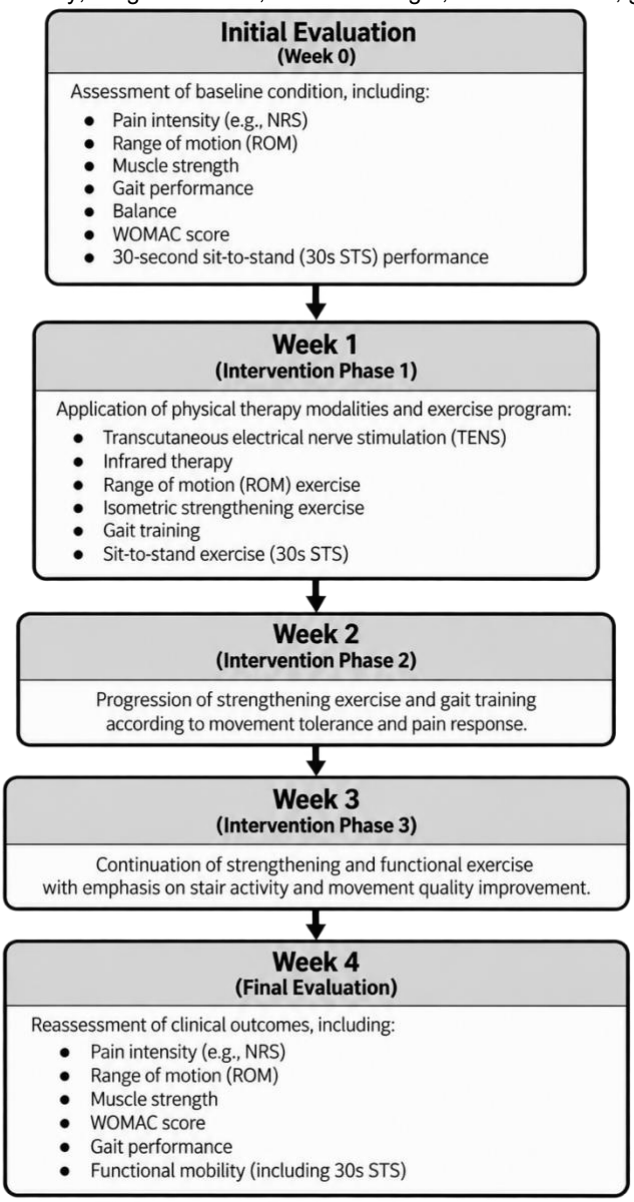

Figure 1. Four-week clinical rehabilitation and assessment timeline following total knee arthroplasty.

Data analysis was performed descriptively using longitudinal clinical observation. Changes in pain intensity, ROM, muscle strength, and functional performance before and after rehabilitation were compared narratively and presented using tables. Inferential statistical analysis, confidence interval calculation, and effect size analysis were not performed because this study involved a single-subject clinical case report design.

Results

Clinical outcomes were evaluated longitudinally during the four-week physiotherapy rehabilitation program to assess changes in pain intensity, knee range of motion (ROM), muscle strength, gait performance, and functional ability in the geriatric patient after Total Knee Replacement (TKR). Evaluations were conducted at baseline (T1), mid-intervention (T2), and final evaluation (T3). Overall, the patient demonstrated gradual clinical improvement throughout the rehabilitation period without adverse events or worsening postoperative symptoms.

Before presentation of rehabilitation outcomes, baseline clinical characteristics were documented to describe the patient's postoperative functional condition before intervention. At the initial evaluation, the patient demonstrated movement-related knee pain, decreased knee flexion ROM, muscle weakness, impaired gait performance requiring a quadripod walking aid, and reduced functional independence during mobility-related activities.

Table 2. Baseline Clinical Characteristics

Variable	Clinical Findings
Age	70 years
Sex	Female
Medical Diagnosis	Bilateral knee osteoarthritis
Surgical Procedure	Left Total Knee Replacement
Postoperative Phase	3 months after surgery
Main Complaints	Knee pain, stiffness, gait limitation, difficulty during sit-to-stand and stair negotiation
Walking Aid	Quadripod
Resting Pain (NRS)	2/10
Tenderness Pain (NRS)	2/10
Movement Pain (NRS)	6/10
Active Knee ROM	Flexion: 100°; Extension: 0°
Passive Knee ROM	Flexion: 115°; Extension: 0°
MMT Score	Knee flexor: 3/5; Knee extensor: 3/5
WOMAC Total Score	48
30s STS Test	9 repetitions

Pain intensity changes during rehabilitation are presented in Table 3. Evaluation was performed to determine clinical changes in resting pain, tenderness pain, and movement-related pain throughout the intervention period.

Table 3. Changes in Pain Intensity Based on Numeric Rating Scale (NRS)

Outcome	T1	T2	T3
Resting Pain	2	1	0
Tenderness Pain	2	2	1
Movement Pain	6	5	4

The findings demonstrated gradual reduction in pain intensity during rehabilitation. The most clinically observable improvement occurred in movement-related pain, which decreased from 6/10 at baseline to 4/10 at the final evaluation. Resting pain completely resolved by the end of the intervention period, while tenderness pain showed slight reduction. These findings indicated improved movement tolerance and decreased discomfort during functional activities such as sit-to-stand transfer and stair negotiation. Changes in knee ROM were evaluated using active and passive measurements to determine progression of postoperative joint mobility during rehabilitation.

Table 4. Changes in Knee Range of Motion (ROM)

Knee ROM	T1	T2	T3
Active Flexion	100°	105°	115°
Active Extension	0°	0°	0°
Passive Flexion	115°	120°	125°
Passive Extension	0°	0°	0°

Progressive improvement in knee flexion ROM was observed throughout the intervention period. Active knee flexion improved from 100° at baseline to 115° at the final evaluation, while passive flexion improved from 115° to 125°. Full knee extension was maintained throughout all evaluations. Increased ROM indicated improved joint flexibility and movement performance, which may contribute to better ambulation and transitional movement ability after TKR.[28]

Muscle strength changes were evaluated using Manual Muscle Testing (MMT) to observe improvement in lower extremity muscle activation during rehabilitation.

Table 5. Changes in Muscle Strength Based on Manual Muscle Testing (MMT)

Muscle Group	T1	T2	T3
Knee Flexor	3/5	3+/5	4/5
Knee Extensor	3/5	3+/5	4/5

The patient demonstrated gradual improvement in knee flexor and extensor muscle strength during rehabilitation. At baseline, muscle performance was limited to active movement against gravity without resistance. At the final evaluation, muscle strength improved to grade 4/5, indicating the ability to tolerate moderate resistance. Improvement in muscle strength may support better knee stability, gait performance, and functional movement during weight-bearing activities.[29]

Functional outcomes were evaluated using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and the 30-Second Sit-to-Stand (30s STS) test to assess changes in pain, stiffness, physical function, and lower extremity functional performance.

Table 6. Changes in Functional Outcomes

Functional Outcome	T1	T2	T3
30s STS Test	9 repetitions	10 repetitions	11 repetitions
WOMAC Pain Subscale	9	9	8
WOMAC Stiffness Subscale	3	3	2
WOMAC Physical Function Subscale	36	34	30
WOMAC Total Score	48	46	40

The 30s STS test improved from 9 repetitions at baseline to 11 repetitions at the final evaluation, indicating improvement in lower extremity functional strength and movement endurance. Similarly, the WOMAC total score decreased from 48 to 40, reflecting reduced pain, stiffness, and activity limitation during daily function. The largest improvement was observed in the physical function subscale, suggesting gradual enhancement in mobility-related ADL performance following rehabilitation.

Although static balance screening using the Romberg Test remained negative throughout the intervention period, clinically observable improvement in gait confidence and movement performance was noted during supervised ambulation and functional

exercise sessions. The patient continued using a quadripod walking aid at the final evaluation; however, dependence during ambulation gradually decreased compared with baseline observation. No adverse events, excessive pain exacerbation, or fall incidents were reported during the rehabilitation period. The clinical rehabilitation process is presented in Figure 2.

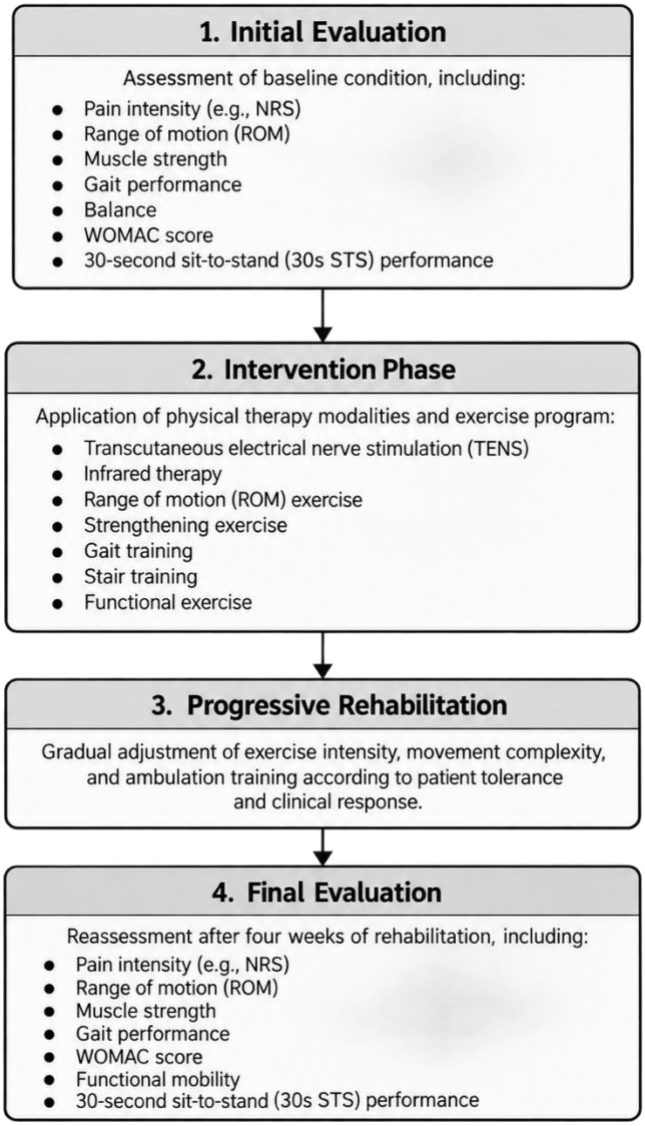

Figure 2. Clinical rehabilitation workflow from initial evaluation to final evaluation after four weeks.

Overall, the patient demonstrated clinically observable improvement in pain intensity, knee mobility, muscle strength, gait performance, and functional ability following the physiotherapy rehabilitation program during the subacute postoperative phase after TKR.

Discussion

This case report demonstrated clinically observable improvement in pain intensity, knee range of motion (ROM), muscle strength, gait performance, and functional ability following a four-week physiotherapy rehabilitation program in a geriatric patient during the subacute phase after Total Knee Replacement (TKR). The rehabilitation program consisted of Transcutaneous Electrical Nerve Stimulation (TENS), infrared therapy, ROM exercise, strengthening exercise, gait training, stair training, and functional exercise. The findings suggest that multimodal physiotherapy rehabilitation may support postoperative recovery and improve functional independence in older adults after TKR.

One of the primary findings observed in this report was the reduction in movement-related pain during weight-bearing and functional activities. Persistent postoperative pain after TKR may contribute to movement avoidance behavior, impaired gait performance, reduced physical activity, and delayed rehabilitation progression.[30] In this study, movement pain decreased from 6/10 to 4/10 after rehabilitation. The reduction in pain intensity may be associated with the combined effects of TENS, therapeutic exercise, and progressive functional activity. TENS is widely recognized as a noninvasive modality capable of modulating nociceptive transmission through gate control mechanisms and activation of endogenous analgesic pathways.[14] The findings in this report were consistent with Özbaş et al., who demonstrated that TENS intervention contributed to pain reduction and improved postoperative function in patients after TKR.[14] Reduced pain intensity may also facilitate greater patient participation during strengthening exercise and gait training because decreased discomfort commonly improves movement confidence and exercise tolerance.

Improvement in knee ROM represented another important outcome of the rehabilitation program. At the final evaluation, active knee flexion improved from 100° to 115°, while passive knee flexion improved from 115° to 125°. Restoration of knee flexion ROM after TKR is clinically important because functional knee flexion is required for stair climbing, sit-to-stand transfer, and ambulation.[31] Previous studies have suggested that approximately 110°–120° of knee flexion is generally necessary for performance of common mobility-related ADL.[28] In this report, ROM improvement may be associated with heel-slide exercise, progressive movement training, and reduced pain-related muscle guarding during activity. An et al. demonstrated that combined exercise

interventions may improve gait ability, physical function, and movement performance after TKR.[15] Improved ROM may additionally contribute to better movement efficiency during functional activities by reducing compensatory movement patterns and increasing confidence during weight-bearing activity.[32]

Muscle strength improvement was also clinically observable throughout the rehabilitation period. Knee flexor and extensor muscle strength improved from grade 3/5 to 4/5 based on Manual Muscle Testing (MMT). Quadriceps weakness is commonly reported after TKR and remains one of the primary contributors to impaired gait performance, reduced balance control, and decreased functional mobility.[8] Persistent quadriceps inhibition after surgery may occur because of pain, swelling, altered neuromuscular activation, and decreased physical activity.[8,11] Therefore, strengthening exercise is considered a fundamental component of postoperative rehabilitation after TKR.[17] In this report, strengthening intervention consisted of quadriceps setting exercise, hamstring setting exercise, and Straight Leg Raise (SLR) exercise performed progressively according to patient tolerance. These findings were consistent with Kondo et al., who reported that quadriceps strengthening exercise improved muscle activation and postoperative physical function after TKR.[11] Improved muscle performance may therefore contribute to enhanced knee stability and improved ambulation safety during weight-bearing movement.[28]

Functional improvement was demonstrated through changes in the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and the 30-Second Sit-to-Stand (30s STS) test. The WOMAC total score decreased from 48 to 40 after rehabilitation, indicating reduced pain, stiffness, and physical functional limitation. Improvement was most apparent in the physical function subscale, suggesting gradual enhancement of mobility-related ADL performance. However, the magnitude of WOMAC improvement was relatively smaller than ROM improvement. This finding may indicate that restoration of functional independence in geriatric patients often requires a longer adaptation period compared with improvement in isolated physical impairments such as joint mobility.[12] Functional recovery after TKR is influenced not only by ROM but also by muscle strength, balance control, gait confidence, endurance, psychological adaptation, and habitual movement behavior.[28]

Similarly, the 30s STS performance improved from 9 to 11 repetitions, indicating improvement in lower extremity functional strength and movement coordination. Sit-to-stand activity requires coordinated activation of the quadriceps, hip musculature, postural control system, and neuromuscular balance regulation.[23] Therefore, improved performance during the 30s STS test may reflect better lower extremity motor control and increased movement efficiency during functional tasks. Although formal dynamic balance reassessment was not performed, clinically observable improvement in gait confidence and ambulation quality was identified during supervised walking activity. The patient continued to use a quadripod at the end of rehabilitation; however, dependence during ambulation gradually decreased compared with baseline performance.

The rehabilitation process in geriatric patients after TKR presents unique clinical challenges compared with younger adult populations. Aging is associated with sarcopenia, decreased neuromuscular adaptability, impaired proprioception, reduced postural reserve, and increased fall risk.[33] Consequently, rehabilitation progression in older adults requires close monitoring of fatigue, pain response, movement quality, and balance safety. In this report, the rehabilitation program emphasized gradual exercise progression, supervised gait training, stair activity adaptation, and functional exercise according to patient tolerance. Monitoring during rehabilitation was particularly important because excessive exercise intensity in geriatric patients may increase fatigue, movement compensation, and fall risk.[34]

The rehabilitation frequency in this report was limited to once weekly supervised physiotherapy sessions. Although improvement was still observed, limited supervision frequency may influence the magnitude and speed of postoperative functional recovery.[6,9] Therefore, patient education and continuation of home exercise programs were considered important to maintain movement practice outside supervised sessions. However, adherence to the home exercise program was not objectively measured in this report and should therefore be interpreted cautiously. Future rehabilitation studies may benefit from incorporating adherence monitoring and patient-reported recovery evaluation to better understand long-term rehabilitation outcomes in geriatric populations.

Several limitations should be considered in interpreting the findings of this report. First, this study involved only a single patient, thereby limiting generalizability to broader populations. Second, the rehabilitation period lasted only four weeks and no long-term follow-up evaluation was performed to determine sustainability of clinical improvement. Third, no control group was available to compare intervention effects. Fourth, dynamic balance evaluation and patient satisfaction outcomes were not comprehensively assessed during follow-up. In addition, observer bias may have occurred because clinical outcomes were evaluated descriptively without inferential statistical analysis. Nevertheless, this report provides clinically relevant information regarding physiotherapy rehabilitation management during the subacute postoperative phase after TKR in geriatric patients.

From a clinical perspective, the findings highlight the importance of individualized and progressive physiotherapy rehabilitation combining pain management, strengthening exercise, gait retraining, and functional mobility exercise after TKR.[17] Early identification of muscle weakness, gait impairment, movement limitation, and fall risk may help physiotherapists design rehabilitation strategies aimed at improving mobility, safety, and independence in older adults.[17] Further studies with larger sample sizes, controlled designs, and longer follow-up periods are recommended to evaluate long-term rehabilitation outcomes and determine optimal physiotherapy rehabilitation protocols for geriatric patients after TKR.

Conclusion

This case report demonstrated that a multimodal physiotherapy rehabilitation program consisting of Transcutaneous Electrical Nerve Stimulation (TENS), infrared therapy, range of motion exercise, strengthening exercise, gait training, stair training, and functional exercise was associated with clinical improvement in a geriatric patient during the subacute phase after Total Knee Replacement (TKR) due to bilateral knee osteoarthritis. Improvements were observed in pain intensity, knee ROM, muscle strength, gait performance, and functional ability following four weeks of rehabilitation.

The findings highlight the important role of structured and progressive physiotherapy rehabilitation in supporting postoperative recovery and functional independence in older adults after TKR.[17] Rehabilitation programs emphasizing pain management, muscle strengthening, movement retraining, and functional mobility exercise may help optimize ambulation performance and daily activity participation in geriatric patients.[17]

Further studies with larger sample sizes, controlled designs, and longer follow-up periods are recommended to evaluate long-term rehabilitation outcomes and determine optimal rehabilitation strategies for geriatric patients after TKR.

Study Limitations

Several limitations should be considered in interpreting the findings of this report. First, this study involved only a single patient, thereby limiting generalizability to broader populations. Second, the rehabilitation period lasted only four weeks without long-

term follow-up evaluation, preventing assessment of sustainability of clinical improvement. Third, no control group was available for comparison of intervention outcomes. Fourth, detailed evaluation of dynamic balance, patient satisfaction, and adherence to home exercise programs was not comprehensively assessed during rehabilitation. In addition, observer bias may have occurred because clinical outcomes were analyzed descriptively without inferential statistical analysis.

Clinical Implications

This report provides clinically relevant information regarding physiotherapy rehabilitation during the subacute postoperative phase after TKR in geriatric patients. The findings suggest that individualized and progressive rehabilitation programs combining pain management, strengthening exercise, gait retraining, stair training, and functional exercise may contribute to improvement in mobility and functional independence in older adults. Early identification of muscle weakness, gait impairment, movement limitation, and fall risk may assist physiotherapists in designing safe and targeted rehabilitation strategies for geriatric populations after TKR.

Patient Perspective

The patient reported gradual improvement in movement confidence and daily mobility performance after participating in the physiotherapy rehabilitation program. The patient stated that pain during walking and sit-to-stand activity became more tolerable and that movement during daily activities felt more comfortable compared with the initial postoperative condition. Although a quadripod walking aid was still used during ambulation, the patient reported feeling more stable and confident while performing walking and stair activities after rehabilitation.

Author Contribution

Serilda 'Alya' Madaniyah: Conceptualization, Investigation, Data Curation, Formal Analysis, Writing – Original Draft, Visualization.
Dwi Rosella Komala Sari: Supervision, Methodology, Validation, Writing – Review & Editing, Project Administration.
Guntur Rusmana Putra: Clinical Supervision, Resources, Validation, Investigation, Writing – Review & Editing.

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Conflict of Interest Statement

The authors declare that there are no conflicts of interest related to this study.

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Ethics Statement

Written informed consent for physiotherapy intervention and publication of this case report was obtained from the patient prior to rehabilitation and manuscript preparation. Patient confidentiality and anonymity were maintained throughout the study in accordance with ethical publication principles and the CARE guideline.

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