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Case Report

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Post-operative complications and rehabilitation challenges following total knee replacement: a case report

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ABSTRACT

Total knee replacement (TKR) is a widely performed surgical procedure for advanced osteoarthritis (OA), aimed at relieving pain and restoring joint function. However, post-operative complications, including persistent pain, joint stiffness, and poor adherence to rehabilitation protocols, can impair functional recovery and quality of life. This case report describes a 56-year-old female, Mrs. Valarmathi, who presented with persistent right knee pain, stiffness, and mobility limitations following a TKR performed for severe OA. Clinical evaluation revealed reduced range of motion, muscle weakness, altered gait mechanics, kinesiophobia, and moderate depressive symptoms. Despite structured physiotherapy interventions involving cryotherapy, TENS, passive and active mobilization, and strengthening exercises, the patient's progress was hindered by poor home program compliance. Subsequent development of a suspected joint infection requiring aspiration further complicated her recovery. The case highlights the multifactorial challenges in post-TKR rehabilitation, including musculoskeletal impairments, psychosocial barriers, and lack of patient adherence. Early physiotherapy, patient education, psychological support, and close follow-up are essential to prevent complications and enhance functional outcomes. This case underscores the importance of a comprehensive, multidisciplinary approach to TKR rehabilitation. Patient education and adherence to home exercises are critical to optimizing recovery and preventing avoidable setbacks.

Keywords: Total knee replacement, osteoarthritis, rehabilitation, physiotherapy, case report, kinesiophobia, postoperative complications

INTRODUCTION

Osteoarthritis (OA) is a chronic, progressive joint disorder that predominantly affects synovial joints, leading to the deterioration of articular cartilage, subchondral bone remodeling, synovial inflammation, and structural damage to surrounding tissues such as ligaments, menisci, and periarticular muscles. While traditionally considered a degenerative consequence of aging and mechanical "wear and tear," current research highlights a multifactorial etiology involving genetic predisposition, biomechanical stress, joint injuries, metabolic imbalances, and chronic inflammation driven by proinflammatory mediators.[1] OA primarily targets heavily used, weight-bearing joints such as the knees, hips, spine, and hands, presenting clinically with joint pain, stiffness, and limited mobility that worsen with activity and may persist at rest in advanced stages. Diagnosis is mainly clinical, supplemented by radiologic evaluation, although imaging findings may not always align with symptom severity. Key risk factors include aging, obesity, joint trauma, and uneven mechanical loading. Socioeconomic and racial disparities also influence OA prevalence, severity, and access to care. With no definitive cure or disease-modifying treatments available, initial management emphasizes non-surgical interventions like weight reduction, physical therapy, and pharmacological pain relief. Surgical approaches such as arthroplasty are reserved for cases unresponsive to conservative care.[2]

PREVALENCE

Knee OA is a growing public health concern in India, with prevalence rates varying significantly across regions due to demographic, lifestyle, and environmental factors. Nationwide, community-based studies estimate that approximately 28.7% of adults suffer from knee OA, with rural South India showing even higher rates-up to 34.6% among individuals aged 40 and above.[3] Urban populations, particularly the elderly, are at increased risk, with some reports indicating prevalence as high as 41.1%.[4] In Tamil Nadu, the burden remains substantial; for instance, a study in the rural areas of Kanchipuram district reported a knee OA prevalence of 27.1%, closely mirroring findings from other parts of the state. Notably, older women exhibit higher susceptibility.[5] In Puducherry, the situation appears more

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severe among the urban elderly, where a striking 56.6% were found to have knee OA.[6] However, studies conducted in clinical settings, such as tertiary care hospitals, suggest a more conservative estimate of around 19.6%, likely due to methodological differences.[7] These findings underscore the regional variability in OA prevalence and highlight the need for targeted public health interventions and improved access to early diagnosis and conservative management strategies.

TOTAL KNEE REPLACEMENT

Arthroplasty, or joint replacement surgery, is usually recommended when other treatments no longer ease joint pain or disability, especially in cases like osteoarthritis. Before considering surgery, doctors may try options such as pain and anti-inflammatory medications, physical therapy, cortisone or lubrication injections, activity modification, walking aids, exercise, and weight loss. People who undergo arthroplasty often experience significant relief from joint pain, improved movement, and better quality of life.[1] The most commonly replaced joints are the hip and knee, though the shoulder, elbow, ankle, and fingers can also be treated.[8]

Total knee replacement (TKR), also known as total knee arthroplasty (TKA), is a surgical procedure in which the damaged or degenerated surfaces of the knee joint are replaced with artificial implants to relieve pain and restore mobility. It is most commonly performed in patients suffering from advanced osteoarthritis or other debilitating joint conditions that have not responded to conservative treatments.[9] In recent years, India has witnessed a significant rise in the number of TKR procedures, with approximately 70,000 joint replacements conducted annually, a large portion of which are knee surgeries. This surge reflects both the increasing burden of osteoarthritis and improvements in surgical techniques and healthcare accessibility. In Tamil Nadu, data from the Chief Minister's Comprehensive Health Insurance Scheme (CMCHISTN) between January 2017 and July 2021 revealed that 20,165 TKR surgeries were performed-1,420 in government hospitals and 18,745 in private institutions-highlighting the growing demand for knee replacement in the state.[10] Although specific statistics for Puducherry are limited, the region's aging population and the availability of specialized orthopaedic services suggest a parallel upward trend in TKR procedures. This increasing reliance on surgical intervention underscores the need for early diagnosis, preventive strategies, and comprehensive post-operative care to improve patient outcomes.

LACK OF KNOWLEDEGE ABOUT THE REHABILITATION AFTER THE SURGERY

In rural areas, the situation is exacerbated by limited access to physiotherapy services and a shortage of trained professionals, resulting in delayed or inadequate rehabilitation for orthopedic patients.[11] This skepticism can hinder collaborative care and delay the initiation of essential rehabilitation protocols. The cumulative effect of these factors underscores the urgent need for educational initiatives targeting both healthcare providers and patients to enhance the understanding and integration of physical rehabilitation in orthopedic care.

CASE DESCRIPITION

Mrs. Valarmathi, a 56-year-old female with a history of right TKR for severe osteoarthritis, presents with persistent anterior knee pain, stiffness, and functional limitations. Clinical assessment reveals reduced active and passive range of motion, particularly in knee flexion and extension. Muscle strength testing shows bilateral lower limb weakness (notably in quadriceps and gluteal), with associated muscle tightness in the quadriceps, hamstrings, gastrocnemius, and ilio-tibial band. Gait analysis shows compensatory mechanisms such as hip hiking, circumduction, and forward trunk lean, indicating impaired dynamic stability and limited knee flexion during swing phase. Sensory function remains intact, but postural assessment indicates pelvic tilt, spinal misalignment, and gluteal atrophy, suggesting core and hip involvement. The presence of kinesiophobia (Tampa score: 40) and moderate depressive symptoms (PHQ-9: 9) highlight psychosocial barriers that may impede rehabilitation. Collectively, these findings suggest a multifactorial dysfunction involving musculoskeletal impairment, altered biomechanics, and psychological factors, requiring a comprehensive, phased management approach.

CHIEF AND PAST MEDICAL HISTORY

A 56-year-old female patient presented on November 5/2024 with complaints of persistent pain in the right knee following a TKR procedure performed on October 3, 2024, at a government Hospital in Puducherry, Since the surgery, she has experienced significant difficulty with knee flexion and extension, as well as problems with walking and performing daily activities. The patient reported that prior to the TKR; she had been using Ayurvedic medications for pain relief due to severe OA in the right knee. X-Ray findings also indicate early signs of OA in the left knee. Her medical history is notable for Diabetes Mellitus and BP, which she has had for the past potentially contributing to delayed post-surgical recovery.

PAIN ASSESSMENT

- **Duration of symptoms:** Chronic
- **Mode of onset:** Gradual
- **Location of pain:** Anterior aspect of the knee
- **Radiation:** No shooting pain down the leg
- **Depth of pain:** Deep
- **Quality/type of pain:** Stabbing
- **Symptom pattern:** Constant
- **Consistency of pain:** Present for hours
- **Severity of pain:** Non-tolerable
- **Time of occurrence:** Both day and night time
- NPRS
- **At best:** 4
- **At worst:** 8
- **Aggravating factors:** While bending the knee
- **Relieving factors:** While applying cryotherapy and rhythmic oscillation of knee
- **Pain affects the mood:** Yes
- **Mood:** Depressed

ON OBSERVATION

- **Attitude of limb:** Right leg slightly externally rotated.
- **Surgical scar:** Present (1 cm, anterior aspect of knee).
- **Skin tone:** Vascular changes/chronic inflammatory.

- **Gait pattern:** Stiff knee gait (right side).
- **Knee position:** Right knee appears to be flexed throughout the gait cycle, particularly during the stance phase.

  → in-complete knee extension during stance phase reduces weight acceptance on that limb.
- **Step length:** Step length is shortened on the affected side.
- **During swing phase:** Patient does not achieve enough knee flexion.

  → Compensation may be required to clear the limb, such as hip hiking and trunk leaning.
- **Weight bearing:** Patient is guarding the right leg due to pain.
- **Trunk & uppebody:** Slight bend forward in order to maintain balance. → Reduced arm swing in upper body

Clinical Implication

- Reduced gait efficiency → higher energy cost during walking (Figure 1, 2).

Figure 1. On observation from superior view of knee

Figure 2. On observation lateral aspect of knee

ON PALPATION

- **Swelling present:**
  - **Right:** 18 cm
  - **Left:** 15 cm
  - → Significantly swollen. Indicates fluid retention/ inflammation → restricts knee movement.
- **Tone/spasm:**
  - Protective spasm (↑)
  - Hamstring & quadriceps may be tight
- **Tenderness:**
  - Grade III

On examination (Table):

Table. Motor assessment

Muscle group	Right	Left
Knee		
Quadriceps (ext)	3/5	3/5
Hamstring (flex)	3/5	3/5
Hip		
Gluteus maximus (ext)	3/5	3/5
Gluteus medius (abd)	3/5	3/5
Gluteus minimus	3/5	3/5
Internal & external rotators	3/5	3/5
Ankle-DF/PF	3/5	3/5

Muscle tightness (right leg):

- **Muscles involved:**
  - Quadriceps, hamstring, gastrocnemius, ilio tibial band, hip flexors
- **End-feel:**
  - Firm (knee flexion) due to soft tissue tightness
  - Quadriceps restriction
  - **Knee extension:** Hamstring restriction
- **Patellar mobility:**
  - Reduced due to soft tissue tightness

Trick movement (hip hiking):

- Patient lifts the limb by raising the pelvis on the opposite side to help clear the ground
- **Reason:** Limited knee flexion; reduced foot clearance → compensatory lift of leg

Circumduction gait:

- Patient swings the affected leg outwards in a semi-circular motion instead of lifting it straight forward
- **Reason:** Knee flexion is inadequate → makes straight leg swing difficult

Vaulting (on the opposite limb):

- The unaffected limb plantar flexes excessively to allow the affected leg to clear the ground

- **Reason:** Affected knee is stiff, so patient raises the heel of the unaffected leg to compensate

Forward trunk lean (during stance phase):

- Patient leans forward
- **Reason:** Helps shift body weight; demand dependence

Reduced Step Length:

- Step on the affected limb is shorter than normal
- **Reason:** Fear of weight-bearing, pain, stiffness → Limits normal stride

Capsular pattern:

- Post-surgical fibrosis/adhesion in the knee joint capsule

Type of muscle contraction causing movement problems:

- Both concentric and eccentric contraction of muscles are affected

Sensory assessment:

Dermatome assessment:

- L3, L4 (bilateral) → Normal

Sensory tests:

- Light touch-normal
- Pinprick test-normal
- Vibration test-normal
- 2-point discrimination-normal
- Pain, temperature-preserved

Kinesiophobia:

- Present
- Use of Tampa Scale for measurement

Postural assessment:

Anterior view (ant view):

- Pelvic tilt/shift due to weight distribution or muscle imbalance
- **Knee:** Bow legs (both)
- **Foot:** Excess supination
- Uneven shoulders
- ↓ Arm & body chain

Lateral view (lat view):

- Trunk alignment-forward lean
- Knee joint-slight knee flexion
- **Ankle/toe:** Weak dorsiflexion

Posterior view (post view):

- Pelvic asymmetry
- Hip hiking present
- Spinal alignment-postural scoliosis
- Gluteal atrophy
- Uneven shoulders

Balance (static & dynamic):

- **Timed up & go test:** Slow & unsteady gait
- **SLS (single leg stance):** Difficult, ↓ 30 seconds

Coordination (non-equilibrium):

- Heel to shin test
- **Foot tapping:** Slow

Investigation:

- **X-Ray:** Shows TKR (total knee replacement) fitting properly (**Figure 3**).

Figure 3. After the procedure of TKR on the right knee

TKR: Total knee replacement

Functional assessment:

- **FIM (functional independence measure):**
  - **Motor:** 55
  - **Cognitive:** 27
  - **Total score:** 82
  - → (Moderate dependence)

Clinical scores:

- **Tampa score:** 40
- **Depression score (PHQ-9):** 9 (moderate)

Medical diagnosis: OA knee grade 4 (Kellegren And Lawrence)

- **Surgical procedure:** Total knee arthroplasty
- **TKR complication:** Post surgical chronic pain

PHYSIOTHERAPY DIAGNOSIS

Tibiofemoral Hypomobility

Patient presents with post-operative tibiofemoral hypomobility syndrome (TFHypo) following TKR, characterized by restricted knee flexion beyond 45 degrees, deep joint pain during weight-bearing, joint stiffness, swelling, capsular tightness, diminished patellar mobility, and protective muscle spasms, culminating in moderate functional dependence (FIM score: 82). Secondary

features align with tibiofemoral rotation with valgus (TFRVal) syndrome, including valgus knee alignment, gluteal weakness, increased hip internal rotation, dynamic instability, gait compensations such as hip hiking and trunk lean, and tightness in the ilio -tibial band, quadriceps, and hamstrings. Psychosocial factors, notably kinesiophobia and depression, further exacerbate movement avoidance and valgus loading patterns. This complex interplay of mechanical and psychosocial impairments underscores the necessity for a comprehensive rehabilitation approach addressing both joint mobility and alignment to optimize functional recovery.

Management

Short-term goals:

- Reduce pain & stiffness
- Initiate knee ROM
- Improve quadriceps strength
- Improve balance & weight shifting
- Correct gait pattern

Long-term goals:

- Achieve functional knee ROM
- Normalize gait pattern
- Improve lower limb strength
- Enhance dynamic balance
- Regain functional independence
- Reduce kinesiophobia
- Improve psychological well-being

Treatment

Physiotherapy and pharmacotherapy

Pain management:

- Cryotherapy (5 to 10 minutes)
- TENS (Burst mode, frequency:100 to 125 HZ)
- Grades I and II (knee and patella) mobilizations are specifically designed for pain management. Grade I involves small amplitude, rhythmic oscillations at the beginning of the available joint range, primarily targeting pain relief without provoking symptoms. Grade II consists of larger amplitude oscillations within the midrange of joint movement, also aimed at alleviating pain without reaching the joint's end range.

Knee ROM goals:

- Wax therapy-3 pad method: dip and wrap
- Passive-assisted knee flexion
- Heel slides
- Hold and contact relax technique
- Movement with mobilization for flexion and extension glides (**Figure 4**).

Stretching:

- Low load sustained stretching are performed for hamstring, quadriceps
- Hamstring
- Gluteal
- Calf
- Ilio-tibial band

Figure 4. Tens application for pain

Balance & coordination:

- Single leg stance
- Foam surface weight shifting

Strength training:

- Quads (Isometrics)
- SLR (Straight Leg Raise)
- Seated knee extensions
- Gluteal bridges long arc
- Clamshell
- Prone knee extension
- Marching the hips
- Calf raises
- Plantar flexor, dorsiflexors, invertors and evertors strengthening with Theraband
- Swiss ball kicking

Functional activities:

- Kneel sitting
- Quadruped position
- Kneeling
- Cross sitting to normal position

Gait training:

- Weight shifting drills
- Pillar bar walking
- Stair climbing

DISCUSSION

The patient initially arrived at the physiotherapy department in a wheelchair. She had been referred by the orthopedic doctor, who recommended the use of Continuous Passive Motion (CPM) therapy along with knee strengthening

exercises. The exact range of knee flexion was unknown, as the surgery had been performed in a government hospital and detailed surgical records, including information about the prosthetic components used, were not available. Therefore, CPM therapy was initiated with a starting range of 0–40 degrees for the first two days. Initially, the patient experienced significant fear and reluctance to mobilize the leg using CPM, as uncontrolled knee flexion exacerbated the pain. As a result, CPM was not introduced in the early stages of rehabilitation. Instead, wax therapy was employed to help reduce joint adhesions and improve mobility, facilitating easier passive mobilization of the knee joint. Following wax therapy, passive mobilization techniques, specifically anterior, posterior & patellar gliding, were performed, along with exercises within a range of 0-45 degrees. Initially, the patient's range of motion was limited to 0-5 degrees. After initial sessions, the patient began to complain of pain during mobilization beyond 45 degrees of knee flexion. To manage this, ultrasound therapy for scar mobilization and transcutaneous electrical nerve stimulation (TENS) for pain relief were initiated. Passive mobilization was discontinued, and the patient was encouraged to perform active knee flexion exercises. Functional positions such as transitioning from quadruped to kneeling and knee sitting were practiced. From the edge of the couch, the patient was guided to fall backward, allowing the legs to move freely off the table while performing medial and lateral active gliding movements with mobilization techniques. Low-sustained stretching techniques were introduced.

Knee strengthening exercises included both static and dynamic quadriceps activation. In long sitting, the patient performed static quadriceps contractions by pressing down on a foam roller placed under the knee. Dynamic strengthening included short arc exercises in the supine position with a weight cuff, as well as exercises in high sitting. In prone lying, a pillow was placed under the leg for pressing exercises. The patient also practiced transitioning from cross-sitting to an extended position. Hamstring strengthening was carried out in the prone position using a Theraband and weight cuffs. Dorsiflexors and plantarflexors, as well as invertors and evertors, were trained. For hip strengthening, standing marching exercises with weight cuffs were performed, along with clamshell exercises for the hip abductors. Gluteus maximus strengthening was achieved through prone straight leg raises. Weight-bearing activities were introduced, such as kicking a ball with the unaffected leg to encourage weight bearing on the affected side. The patient was also trained in stair climbing and eccentric control. Balance and coordination exercises included single-leg standing, closed-stance standing with eyes open and closed, and tandem walking. The treatment sessions continued; however, after a few days, there was no improvement in knee flexion beyond 45 degrees. Upon inquiry, the patient admitted to not following the prescribed exercise program at home, which became a major setback in her recovery. She also reported experiencing severe pain at night. Later, she returned with a noticeable bulge over the anterior aspect of the knee, which appeared to be an infection, as it was accompanied by pus formation. It was revealed that, instead of adhering to the exercise regimen, she had been frequently applying hot and cold packs at home to manage the pain. Subsequently, she underwent aspiration of the pus at the hospital. After this procedure, she did not return for further physiotherapy sessions.

However, following the treatment, there was noticeable improvement. The patient's psychological well-being was also significantly affected, as she was unable to perform daily activities that she could before the surgery. To address this, we provided psychological support to enhance the treatment outcomes and achieve better results in rehabilitation.

FEAR OF MOVEMENT AND PAIN LEAD TO POOR TREATMENT OUTCOMES

It is shown in **Figure 5**.

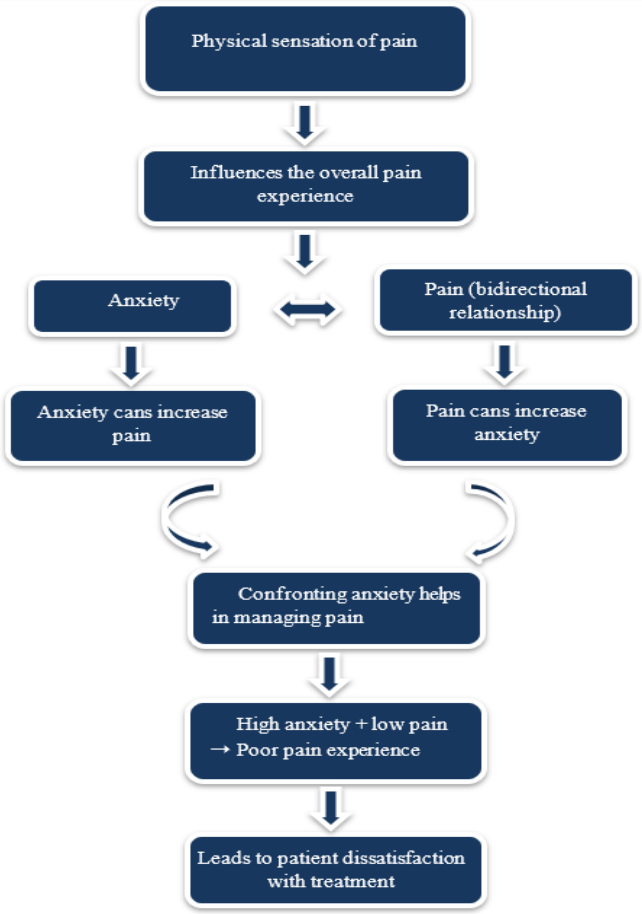

Figure 5. Fear of movement

CONCLUSION

This case underscores the importance of a comprehensive, pre-operative measures& multidisciplinary approach to TKR rehabilitation. Patient education and adherence to home exercises are critical to optimizing recovery and preventing avoidable setbacks

ETHICAL DECLARATIONS

Informed Consent

The patient signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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