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Case Report

Impact of Physiotherapy Rehabilitation on Extension Lag Following Anterior Cruciate Ligament (ACL) Reconstruction: A Case Report

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Abstract

Case Description: A 48-year-old male with a complete left ACL tear underwent arthroscopic reconstruction the day after injury. Eight weeks post-op, he had limited knee flexion, extension lag, and walking difficulty. A personalized rehab program with MET, ROM, strengthening, proprioception, balance, gait training, and home exercises was started, focusing on addressing extension lag.

Outcome: The comprehensive, closely monitored rehabilitation program resulted in significant functional recovery, allowing the patient to resume work 12 weeks after surgery. Despite complications like delayed recovery, this case demonstrated a relatively rapid return to activity.

Discussion: This case shows that even with delayed recovery and extension lag, early return to function after ACL reconstruction is possible with timely surgery, personalized rehab, and good patient compliance.

Conclusion: This case suggests that timely ACL reconstruction, combined with a personalized rehabilitation plan and consistent physiotherapy, can enable early return to function—even in patients with complicated cases.

Keywords: ACL; Arthroscopic-ACL Reconstruction; Knee Rehabilitation; Extension Lag; Functional Recovery; Return to Function

Abbreviation

ACL: Anterior Cruciate Ligament; DM: Diabetes Mellitus; HTN: Hypertension; ROM: Range of Motion; RPTS: Repetitions; SLR: Straight Leg Raise; NMES: Neuromuscular Electrical Stimulator

Introduction

Physiotherapy rehabilitation programs are widely recognized as essential for optimizing recovery following anterior cruciate ligament (ACL) reconstruction. These programs aim to restore func-

tional independence by improving range of motion (ROM), muscle strength, and neuromuscular coordination [1]. Regardless of the graft type used during surgery, physiotherapy is routinely prescribed to promote optimal outcomes and facilitate a safe return to activity. One of the primary rehabilitation goals is the restoration of quadriceps muscle strength, which is frequently compromised postoperatively. Research has consistently reported persistent quadriceps weakness following ACL reconstruction, which can delay recovery and limit performance [2]. Rehabilitation that includes quadriceps-strengthening exercises has been shown to significantly improve both muscle function and overall physical performance [3]. Among the functional impairments observed post-ACL surgery, extension lag—defined as the inability to actively extend the knee fully despite having full passive range—remains a notable concern. Extension lag is typically associated with quadriceps inhibition, pain, effusion, or arthrogenic muscle inhibition, and, if unresolved, may hinder normal gait, delay return to sport, and lead to long-term joint dysfunction. Therefore, rehabilitation programs are tailored to individual patient needs, with key goals including restoring full knee extension, enhancing muscular strength, regaining neuromuscular control, and ultimately enabling return to pre-injury activity levels [4].

Patient information

This case involves a 38-year-old male cricket coach, residing on the outskirts of Jabalpur, who regularly trains junior and sub-junior cricket players. The patient sustained a left knee injury while actively participating in a game of cricket. The injury occurred while he was running to catch a ball, during which he experienced a sudden "pop" sound in the left knee. Interestingly, he did not feel significant pain immediately after the incident and was able to ride his motorcycle to a nearby hospital. At the initial medical facility, clinical evaluation and imaging, including MRI and X-ray, revealed a complete tear of the left anterior cruciate ligament (ACL). The patient was subsequently advised bracing of the knee in full extension and instructed to ambulate using walker without weight bearing. He underwent arthroscopic ACL reconstruction surgery, using semitendinosus and gracilis autografts. The patient was discharged with advice to continue isometric exercises for the hamstrings and quadriceps, along with ankle-toe movements to promote circulation. He was instructed to maintain non-weight bearing ambulation using walker to protect the surgical site. A physiotherapy follow-up was scheduled to address issues such as extension lag and to aid in restoring joint mobility and muscle strength. Despite the absence of severe initial symptoms, the patient's postoperative course was complicated by extension lag and restricted range of motion, which significantly limited his ability to resume active coaching duties. He had no H/O DM, HTN, TB, BA, thyroid disorders, or any previous hospitalizations or surgeries. The patient also reported no H/O smoking, alcohol use, or other addictions, and his family history was unremarkable. He actively managed his condition on his own continuing the exercises which were being advised at the time of discharge. The patient moved to Dehradun after two months and consulted for the ongoing progress. He presented to the physiotherapy department, reporting difficulty with knee flexion and extension, discomfort during walking, and an inability to sit with the knee bent. At that time, he was on Vitamin-D and Calcium supplements.

Clinical findings

The patient injured his knee on 9th March 2025 and underwent ACL reconstruction on 10th March 2025. After being discharged from the hospital, he did not consult any physiotherapist despite of being advised to consult in Physiotherapy OPD after 2 weeks. He moved to Dehradun after 8 weeks and presented to the Physiotherapy OPD for a routine check-up. After obtaining informed consent, a physical examination was performed. The patient was alert, cooperative, and oriented, comfortable in supine and sitting positions. Vital signs were normal with a pulse of 70 bpm and respiration rate of 16 per minute. He was afebrile and showed abdominothoracic breathing. In supine, both hips were level. The patient had an ectomorphic build with atrophy of quadriceps, hamstrings and calf muscles on the affected side and signs of inflammation were noted. The affected limb rested with the hip externally rotated, knee slightly flexed at 8°, ankle plantarflexed, and foot inverted. Palpation revealed no tenderness or spasms, but the knee was moderately warm. Three surgical scars were present: 4 cm medial to the tibia, 1 cm above, and 1 cm below the lateral patella. Gait assessment showed reduced knee flexion during walking.

	Movement	AROM	PROM
Affected Limb	Hip Flexion	115	120
	Hip Extension	10	20
	Knee Flexion	110	115
	Knee Extension	0	0
	Ankle Plantarflexion	45	50
	Ankle Dorsiflexion	15	22
Non-Affected Limb	Hip Flexion	115	120
	Hip Extension	15	20
	Knee Flexion	125	130
	Knee Extension	8 extension lag	0
	Ankle Plantarflexion	45	50
	Ankle Dorsiflexion	18	22

Table 1: Range of Motion of joints on Day 1 of Treatment.

	Affected Limb	Non-Affected Limb
Above Patella	42 cm	42 cm
Below Patella	36 cm	36 cm
Quadriceps	51.0 cm	53.5 cm
Calf	38 cm	39 cm

Table 2: Girth Measurement of Limbs on Day 1 of Treatment.

Diagnostic assessment

Before surgery, the anterior drawer, Lachman's, and McMurray's tests were positive, suggesting ACL and possible meniscus injury. Peripheral pulses were intact. MRI confirmed a Grade 3 ACL tear, with trace meniscal damage. Post-surgery, quadriceps and hamstring strength was grade 4. The final diagnosis was a complete ACL tear.

Therapeutic intervention

Short-term physiotherapy goals included patient education, reducing swelling, restoring knee ROM up to 125° within upcoming 2 weeks, strengthening the quadriceps and hamstrings, and improving gait. Long-term goals were to achieve deep squats, maintain muscle strength, and continue a structured home exercise program. Patient was asked to include cryotherapy to reduce inflammation, along with active and passive ROM exercises. He began supervised physiotherapy, with one session per day for 45 minutes, six days a week. Rehabilitation focused on ROM, strength, proprioception, pain management, swelling reduction, balance and gait training, and aerobic conditioning. Detailed guidance and education were provided throughout.

Phase 5: Week 9-10	Aim	Protocol
ROM	Reduce Knee Extension Lag, to achieve ROM to 125°	MET for Quadriceps in Prone. MET for Hamstrings in supine. Static Stretches for quadriceps and hamstrings for 20 seconds, 3 sets. Active heel slides in supine followed with passive slides. Patellar Mobilization.
Strength	Progress strength in Quadriceps, Hamstrings, Calves, Abductors and Adductors	NMES over quadriceps for 15 minutes. Isometrics Quads and Hams, Abductors and Adductors. Heel raises on flat surface. Seated Knee Extension with 2 Kg weight cuff. SLR with 2 Kg weight cuff. Hams Curl with 2 Kg weight cuff in prone. Wall supported squats for 10 rpts.
Proprioception And Gait Training	Progress Proprioception, Return to functional activities.	Reverse walk. Side walking. Single leg standing. Walking over uneven surfaces.
Cryotherapy	To reduce edema	Use of cold pack for 8-10 minutes, 4 times/day

Table 3: Detailed Regimen of Physiotherapy for Phase 5 (Week 09-10).

Phase 5: Week 11-12	Aim	Protocol
ROM	To achieve Full ROM and deep squats	Continue Stretching protocols
Strength	Progress strength in Quadriceps, Hamstrings, Calves, Abductors and Adductors	Heel raises at edge of stairs. Seated Knee Extension with 4 Kg weight cuff. SLR with 3 Kg weight cuff. Hams Curl with 3 Kg weight cuff in prone. Deep Squats with 2 kg medicine ball for 10 rpts. Single leg squats progressing from 15° to 90° 10 rpts.
Proprioception And Gait Training	Progress Proprioception, Return to functional activities.	Unstable surfaces, walking around obstacles for 10 min for proprioceptive feedback. Single leg stance 30-60 secs for gait training. Basic emphasis was given on swing phase to increase knee flexion, weight shifting side to side, forward and backward. Agility Training.
Cryotherapy	To reduce edema	Use of cold pack for 8-10 minutes, 4 times/day
Aerobic Training	To build endurance	Static Bicycle for 10 minutes. Slow running.

Table 4: Detailed Regimen of Physiotherapy for Phase 5 (Week 11-12).

Outcomes

The patient returned to Jabalpur and was instructed and a written exercise regimen were given which he has to be followed at home regularly. At that time, a physical examination was performed, and no complaints or abnormal findings were reported. The patient had returned to work 12 weeks postoperatively, at which point functional recovery was already complete. By the end of the rehabilitation period, 12 weeks after surgery, the patient demonstrated full ROM, isometric quadriceps strength graded 5/5 on both the affected and contralateral sides, no signs of joint instability, and no postoperative complications.

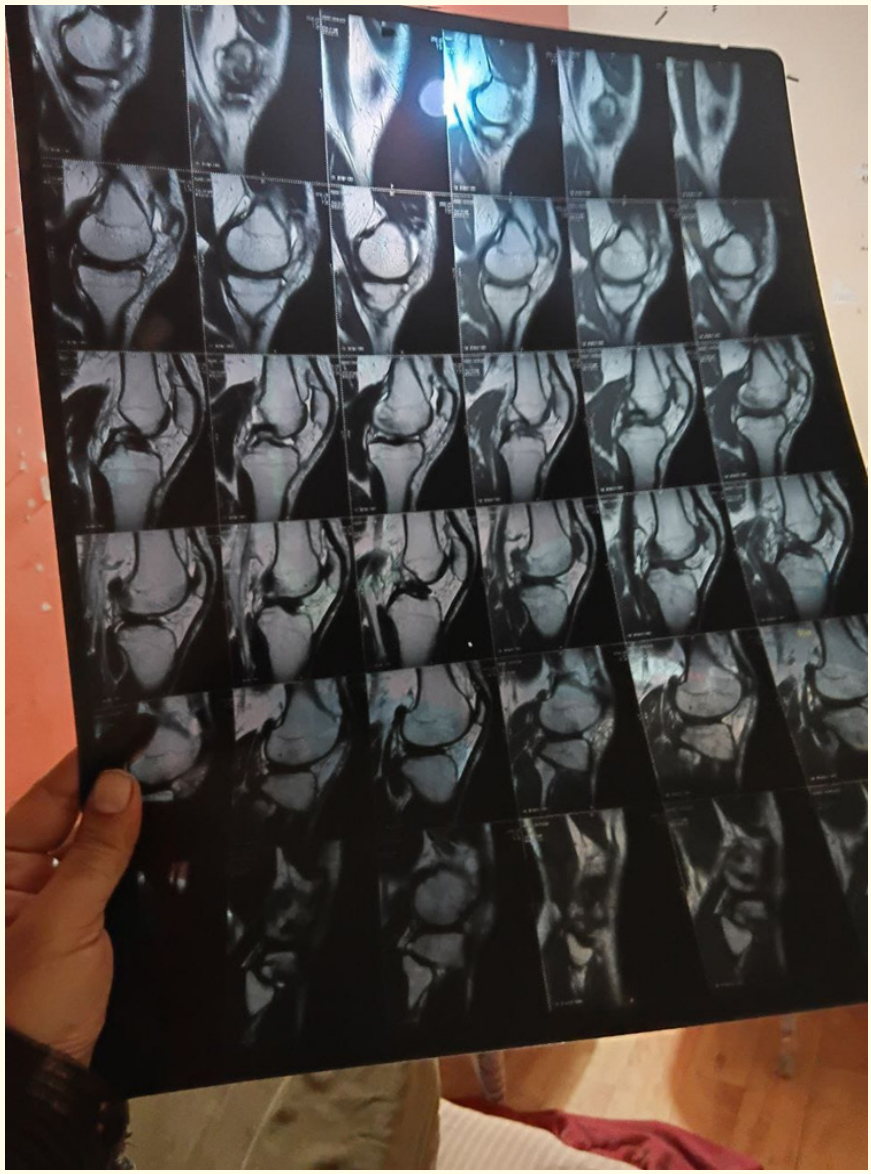

Image 1

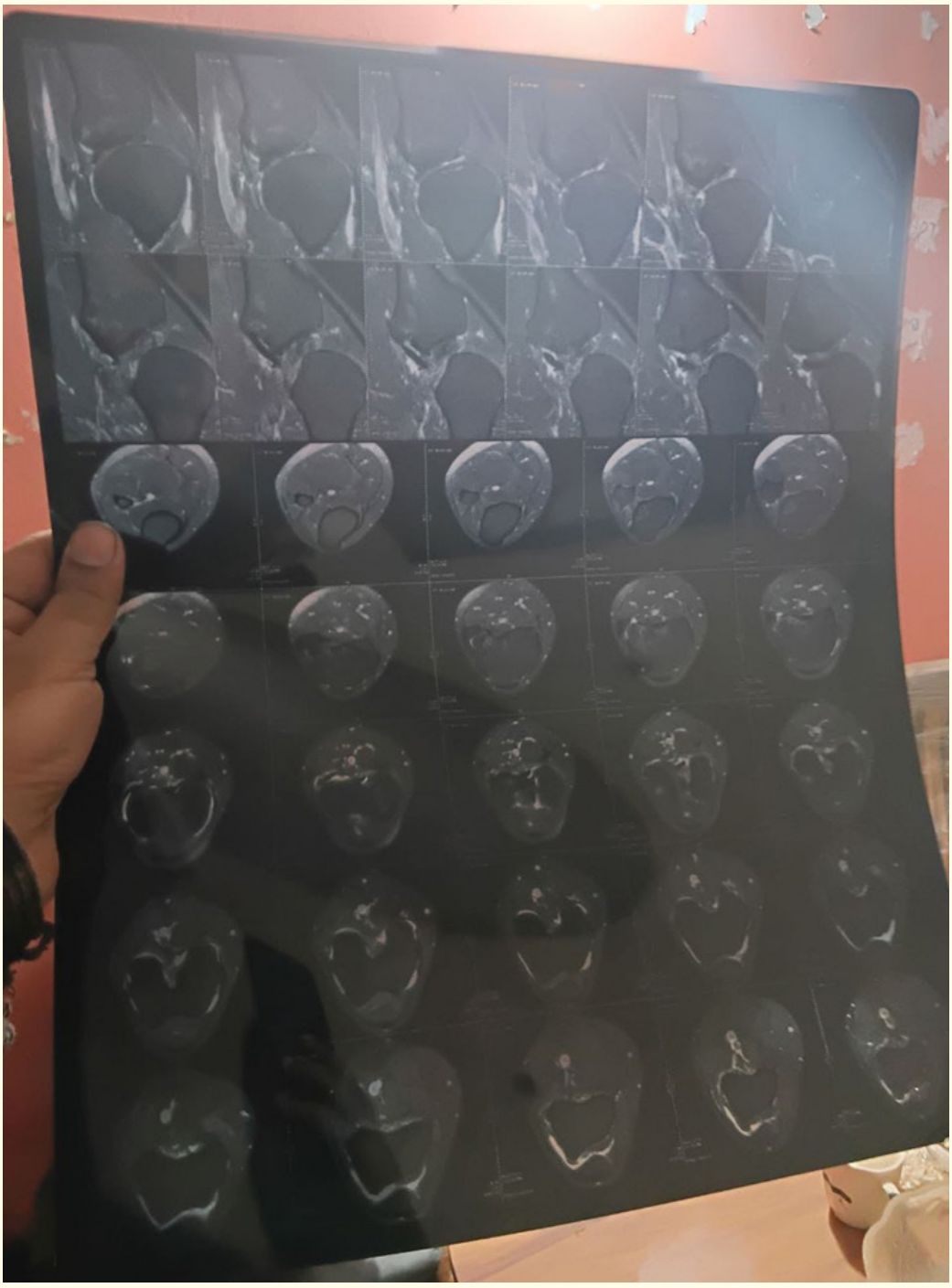

Image 2

Image 3

Image 4

Discussion

This case report highlights the potential for functional recovery following ACL reconstruction in a middle-aged, physically active adult. The patient is a 38-year-old male cricket coach from the outskirts of Jabalpur, who sustained a left ACL injury while playing cricket. ACL reconstruction was performed using semitendinosus and gracilis autografts. The postoperative course was initially uncomplicated, and the patient was discharged with a rehabilitation plan involving isometric exercises, ankle-toe movements, and non-weight bearing ambulation using a walker. However, his rehabilitation faced challenges. Due to logistical limitations, the patient was only able to access formal physiotherapy intermittently.

He presented to a physiotherapy center eight weeks after surgery with moderate effusion, and at that time, he reported extension lag and restricted mobility. Despite self-directed efforts to continue exercises, eight weeks into rehabilitation, he still had difficulty achieving full knee flexion and extension and reported pain during walking and an inability to sit with the knee bent. This case demonstrates that while ACL reconstruction in active adults can result in good outcomes, recovery depends significantly on access to continuous rehabilitation services. Unlike cases where patients have unrestricted access to physiotherapy and resources, this patient faced delays and limitations that may have contributed to slower recovery. Swelling and effusion, in particular, are known to delay recovery by inhibiting muscle recruitment [5].

Moreover, although this individual was motivated and physically active before surgery, his recovery may have been further influenced by logistical factors, relocation, and delayed physiotherapy access—underscoring that psychological readiness and early functional support are just as critical as surgical success [6]. We followed a structured rehabilitation protocol focusing on restoring knee extension, managing swelling, improving gait, and progressively strengthening the quadriceps. Muscle recovery was approached using isometric, isotonic, and isokinetic exercises, aligned with progressive loading principles [7]. While studies have shown that long-term outcomes between different surgical techniques are comparable [8], this case illustrates how real-world factors—such as geography, finances, and availability of care—play a critical role in recovery.

Additionally, most foundational studies in ACL graft biology are outdated and do not reflect current rehabilitative challenges faced by patients in rural or resource-limited settings [9]. Ultimately, this case emphasizes the need for individualized rehabilitation plans and more research into how patient-specific factors affect recovery outcomes following ACL reconstruction.

Conclusion

This case shows that a well-executed surgical technique combined with a personalized, progressive rehabilitation plan—including home exercises and strength monitoring—allowed the patient to return to work 10 weeks after ACL reconstruction. Factors such as good pre-surgery health, strong psychological commitment, an uncomplicated injury, and gradual exercise progression contributed to this success. Although this rapid recovery may not be typical, the principles of individualized planning, objective progress tracking, and fitness maintenance are applicable to all patients. This case represents an ideal, rather than average, recovery timeline.

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