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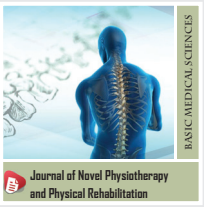

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Case Report

A Case of Postoperative Physiotherapy Management after Uncemented Total Hip Arthroplasty in an Individual with Bilateral Avascular Necrosis: A Study of Functional Recovery using Harris Hip Score

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Keywords: Total hip arthroplasty; Avascular necrosis; Physiotherapy rehabilitation; Functional recovery; Harris hip score; Postoperative management; Case report

Abstract

Background: Avascular necrosis (AVN) of the femoral head is a progressive condition that often leads to severe functional limitation and necessitates Total Hip Arthroplasty (THA). While surgical techniques continue to advance in bilateral involvement of young patients, postoperative physiotherapy remains the cornerstone of optimal functional recovery. This case report evaluates the effectiveness of an intensive, structured four-week physiotherapy program following bilateral uncemented THA in a young adult with advanced bilateral AVN.

Case presentation: A 31-year-old male chef with a 14-year history of bilateral hip pain underwent bilateral uncemented THA via a bikini incision. Postoperative physiotherapy commenced on day 7 and continued for four weeks, focusing on progressive mobility training, strengthening, gait retraining, balance restoration, and functional task practice. Baseline assessments revealed antalgic gait, limited range of motion, tenderness, and reduced Harris Hip Score (HHS = 37).

Results: The patient demonstrated significant clinical and functional improvements over four weeks. Clinically important differences were seen in - *Pain* decreased from 7/10 to 4/10, and hip *range of motion* (ROM) increased appreciably across all planes. Muscle strength, balance, and gait mechanics improved substantially, reflected by a rise in the *Harris Hip Score* from 37 to 77. The patient achieved near-independent ambulation and improved performance of activities of daily living.

Conclusion: Early, structured physiotherapy significantly accelerates recovery after uncemented THA, improving mobility, pain, gait, and functional independence. Continued rehabilitation is recommended to achieve full functional recovery.

Introduction

The surgical procedure known as total hip arthroplasty (THA), also called total hip replacement, involves replacing the injured femoral head and acetabulum with prosthetic parts. The prosthetic acetabulum is often composed of polyethene, a very durable plastic; the neck is composed of sturdy metal, typically titanium, and the artificial head of the femur is made of ceramic [1]. One of the most popular and effective surgical procedures is total hip replacement. The purpose of the procedure is to reduce discomfort and enhance the functional capacity of patients with advanced hip joint arthritis [2].

Although severe osteoarthritis is the most prevalent reason for total hip replacement (THR), other causes include rheumatoid arthritis, avascular necrosis of the femoral head, and post- traumatic arthritis following fractures or dislocations [3]. THR is usually advised for people experiencing intense pain in the hip joint, which is usually referred to as a dull ache that is persistent and is worsened with physical activity,

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causing functional disability. Avascular necrosis has been reported in young patients with asymptomatic pathologies [4]. These people often complain about stiffness, gait disorders and inability to use stairs, because of the joint deformity and capsular contractions, the hip's range of motion is reduced. Moreover, the radiographic results are usually reflective of the level of disability of the patient. All these are indications of the need to carry on with the total hip replacement surgery [5].

Contraindications of total hip arthroplasty (THA) are the local hip infection or sepsis and the existence of systemic infection. Moreover, it is possible that some acute or uncontrolled chronic comorbidities make the procedure unsafe. BMI of 40 kg/m^2 or more is also considered a significant contraindication due to the increased perioperative and worse postoperative outcomes [3,6].

Over time, two main fixation methods have been developed: cemented and uncemented total hip replacements. Cemented THR, introduced by Sir John Charnley, uses polymethyl methacrylate (PMMA) to secure the implant and has shown excellent long-term results, especially in older patients. Uncemented THR, developed to avoid cement-related complications, relies on bone growth into porous implant surfaces for fixation. Cemented implants provide dependable fixation, but uncemented prostheses that use hydroxyapatite coatings and other bioactive materials are often chosen for younger and physically active patients because they allow better natural bone integration and may last longer [7]. However, surgical technique is not the only factor that determines the success of THR. Physiotherapy aims to restore joint mobility, muscle strength, and functional independence while minimising complications such as dislocation, stiffness, and thromboembolism [8].

AVN of the femur head, sometimes referred to as osteonecrosis, is a severe orthopaedic condition marked by the death of the osseous tissue due to reduced blood flow [9]. More than 75% of instances of avascular necrosis affect the femoral head; it usually affects those under 50 and typically leads to femoral head collapse and subsequent hip arthritis [10]. AVN can develop when the blood supply to the bone is disrupted, and this disruption may occur in both injury-related and non-injury-related situations [11]. AVN has a complex aetiology that is currently unknown. Over 80% of cases are linked to heavy alcohol consumption and corticosteroid use [12]. A combination of medical and surgical treatment, supported by physiotherapy, can be beneficial for managing this condition. Physiotherapy interventions can help lessen symptoms and improve mobility, functional ability, and overall quality of life in affected individuals [13].

A well-structured physiotherapy protocol helps patients regain strength, stability, range of motion and confidence in walking, and will also reduce the risk of dislocation of the prosthetics and long-term disability. Rehabilitation with physiotherapy can increase the strength of hip abductors, gait speed, and step rate in an individual who has undergone discharge after a THR [14]. However, postoperative rehabilitation practices differ widely between centres, highlighting the need to assess how a unified physiotherapy program performs in real clinical environments. Many agreements and disagreements are provided by Eulnberg, et al. 2015 [15]. This study aims to determine how a structured physiotherapy regimen after Total Hip Replacement contributes to better functional recovery, lowers the risk of complications, and improves the patient's general well-being.

Case details

1. Patient information

Age: 31 years / **Sex:** Male **Height:** 157 cm / **Weight:** 55 kg / **BMI:** 22.3 kg/m^2

Diagnosis: B/L Avascular Necrosis (AVN) of femoral heads, status post B/L THR

2. Subjective

Chief complaint: Bilateral hip pain with walking difficulty, poor weight-bearing, and reduced function.

HOPI: A 31-year-old male, 157 cm tall and weighing 55 kg (BMI: 22.3 kg/m^2), presented with a long-standing history of bilateral hip pain. The patient, a right-hand dominant, Chef by occupation, reported that he was apparently asymptomatic 14 years ago when he first experienced pain in his right hip, which gradually involved the left hip as well. Over the years, he noted increasing challenges with ambulation and found it difficult to support his body weight on either leg. The pain developed slowly and progressively, worsening during walking, standing for long durations, and other weight-bearing tasks. Partial relief was obtained through rest and prescribed medication. Despite taking analgesics for pain relief, the symptoms continued to worsen, leading to significant functional limitation in daily activities. Subsequent medical evaluation and radiographic imaging revealed bilateral avascular necrosis (AVN) affecting the femoral heads. Based on these findings, surgical management was recommended. The patient subsequently underwent bilateral uncemented Total Hip Replacement (THR) via bikini incision on 4th June 2025 at CK Birla Hospital, Delhi. In the immediate postoperative period, the patient received physiotherapy for 1 week at a nearby clinic, focusing on early mobilisation and the initiation of basic strengthening exercises. On 12th June 2025, he reported to the Department of Physiotherapy, Sharda Hospital, to begin a structured postoperative rehabilitation program designed to enhance functional mobility, increase muscular strength, and retrain gait patterns.

Occupation: Chef / **Past Medical History:** No relevant history

Drug History: Analgesics for pain relief / **Surgical History**: Bilateral THR on 4th June, 2025

Personal History: Non-alcoholic, non-smoker, sleep cycle is normal, vegetarian diet.

Family History: Not relevant / **Socio-economic History:** Middle-class (Affordable)

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3. Objective

Built: Ectomorph/ **Attitude of limbs**: Right leg externally rotated in the standing position

Scar: Present bilaterally over the anterior aspect of the hip joint. **Deformity**: Genu valgus (Knock Knee) and pelvic obliquity (R<L) **Swelling**: Not present / **Assistive device**: None / **Gait pattern**: Antalgic Gait/ **Posture**: Lateral pelvic tilt(R<L) in anterior and posterior view/ **Tenderness**: Grade 2 over both hips (Figure 1).

Limb length measurement:

	Right (In cm)	Left (In cm)
True LLD	85cm	83cm

Figure 1: An AP radiograph revealing a flattening of femoral heads, reduction of joint spaces and osteophytes. The right hip looks more.

Procedure

Before beginning the assessment, informed consent was taken from the patient. He was then placed comfortably in a supine position for the physical examination. During the general assessment, the patient appeared alert, cooperative, and appropriately oriented to time, place, and person. His vital signs were within normal limits; he was afebrile and maintained stable hemodynamic status, with a blood pressure of 110/70 mmHg, a pulse rate of 81 beats per minute, and a respiratory rate of 20 breaths per minute. His body type was ectomorphic, and his calculated BMI was 22.3 kg/m^2.

During observation, he displayed an antalgic gait pattern characterised by compensatory movements secondary to pain and limb length discrepancy. The left lower limb appeared shorter than the right, with a true limb length of 85 cm on the right and 83 cm on the left. Additionally, a mild genu valgus deformity (knock-knee) was observed. Inspection further revealed a well-healed surgical scar on the front (anterior aspect) of the hip region. On palpation, there was no rise in local

WEEK/PHASE	GOALS	THERAPEUTIC INTERVENTION	REPETITIONS/TIME
Phase 1 (Day 1-7)	• Prevent pulmonary, circulatory complications • Reduce pain and swelling • Initiate gentle mobility and muscle activation • Educate patient on hip precautions	• Ankle pumps/circles • Hip abduction in side lying • Heel slide • Isometric Exercise of quadriceps, glutes • Bridging • Deep breathing exercises • Gait training with walker	• 10 reps × 3 sets daily (ankle pump, heel slide. Isometric) • Breathing = 5min per session • Bridging 10 reps with 5 sec Hold • Hip abduction: 10 reps × 2 sets • Gait training: 5min/session
Phase 2 (Second week)	• Increase ROM and muscle strength • Improve sitting and standing balance • Stretch the shortened muscle	• Continue previous exercise • Active-assisted hip abduction/ adduction • Quadricep chair exercise • Pelvic tilt on a Swiss ball • Mini-squat and partial weight- bearing exercise • Stretching of hamstring, hip adductors • Side stepping • Stool stepping	• AAROM hip abduction/adduction: 10–12 reps × 2 sets • Quadriceps chair exercise: 10 reps × 3 sets • Pelvic tilts: 10 reps × 2 sets • Mini-squat: 8–10 reps × 2 sets • Hamstring/adductor stretching: 20–30 sec × 3 reps • Side stepping: 2–3 minutes • Stool stepping: 1–2 minutes
Phase 3 (Third week)	• Increase ROM, muscle strength • To improve balance and proprioception • Enhance functional mobility	• Resistance exercise with TheraBand • Single leg standing • Tandem standing • Standing and squatting on a balance board • Gluteal sets- bridging, partial lunges, forward lateral step ups • Core activation exercise • Heel raise • Hall ambulation	• TheraBand strengthening: 10–12 reps × 2–3 sets • Single-leg standing: 20–30 sec × 3 reps • Tandem standing: 30 • sec × 3 reps • Balance board squats: 10 reps × 2-3 sets • Bridging and lunges: 10 reps × 2-3 sets • Core activation: 5–7 minutes/session • Heel raise:15 reps × 2 sets • Ambulation: 5 • minutes
Phase 4 (Fourth week)	• Restore function and endurance • Regain ADL independence • Normalize gait pattern • Prepare for home activities	• Continue the 3rd week exercise • Progressive strengthening (resistance band or light weights) • Step-ups and functional reach tasks • Gluteal sets- bridging, partial lunges, squatting • Tandem walking, side walking, back walking and cross walking	• Strengthening:10-15 reps × 2–3 sets • Step-ups: 1–2 minutes • Squats/lunges: 10– • 12 reps × 2 sets • Functional reach tasks: 2–3 minutes • Gait training: 10 minutes

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temperature. However, grade 2 tenderness was elicited over both hips. Assessment of hip joint mobility revealed a marked reduction in all planes, with movements being restricted and painful on both sides (Figures 2,3).

Physiotherapy interventions

The main purpose of physiotherapy after a THR was to provide optimal functioning of the joint and improve the level of mobility of patients and, therefore, decrease complications. The details of his treatment plan and progress during weeks 1 to 4 are presented below. The rationale of interventions are derived from Alabed M. 2021 [6]; Coulter 2013 [15]; Al Sebai M. 2024 [5]; Aprisunadi, et al. 2023 [16] and Eulnberg, et al. 2015 [14] mainly (Figures 4-8).

Home Exercise Program

- Heel slides
- Mini squats
- Bridging
- Stationary cycle/ cycling
- Side-lying hip abduction
- Weight transfer on the heel while walking
- Wall-supported leg swing

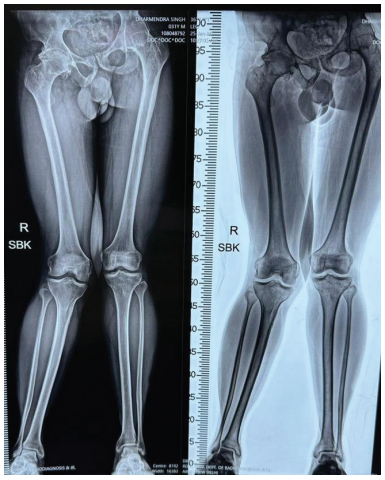

Figure 2: An anteroposterior radiograph illustrating genu valgus.

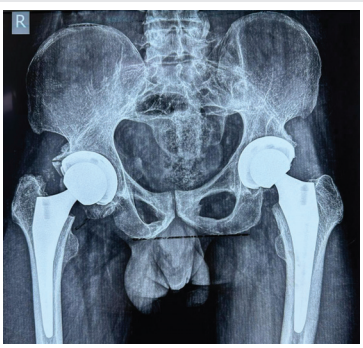

Figure 3: An anteroposterior radiograph illustrating Bilateral total hip arthroplasty.

Figure 4: Isometric exercise for quadriceps with towel.

Figure 5: Assisted hip abduction exercise.

Figure 6: Mini squats with walker.

Figure 7: Bridging Exercise.

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Figure 8: Thera Band Exercises.

Outcomes measures

Pain (NPRS)

First week	07/10
Second week	06/10
Third week	06/10
Fourth Week	04/10

Harris Hip score (HHS)

First week	37
Second week	50
Third week	68
Fourth Week	77

Range of Motion (ROM)

Hip movement	AROM-week 1		AROM-week 2		AROM-week 3		AROM-week 4	
	Rt	Lt	Rt	Lt	Rt	Lt	Rt	Lt
Flexion (Rt/Lt)	40°	44°	55°	62°	75°	68°	80°	85°
Extension (Rt/Lt)	3°	3°	5°	6°	8°	10°	15°	15°
Abduction (Rt/Lt)	8°	10°	15°	15°	20°	22°	22°	25°
Adduction (Rt/Lt)	0°	0°	5°	5°	8°	8°	10°	10°
Internal Rotation (Rt/Lt)	3°	3°	5°	6°	10°	10°	15°	20°
External Rotation (Rt/Lt)	6°	8°	10°	15°	18°	18°	20°	22°

Discussion

This study evaluated the effectiveness of a structured four-week physiotherapy protocol in promoting functional recovery following total hip replacement (THR). The results demonstrated significant gains in pain relief, joint range of motion, muscle strength, and independence in day-to-day activities. The Harris Hip Score increased from 37 at week one to 77 at week four, demonstrating a notable improvement in hip function.

In the early post-operative phase (week 0-2), physiotherapy should emphasise gentle isometric contractions, ankle pumps (to reduce risk of deep venous thrombosis), weight bearing, bed- mobility training, and hip precautions (depending on approach) to protect the newly implanted prosthesis. According to [16], early mobilisation is safe and successful in lowering the likelihood of complications and unfavourable occurrences in postoperative patients. A correctly positioned pillow should be placed between both legs to prevent hip adduction, and this positioning should be maintained while the patient is lying or in a long- sitting position on the bed [17].

By the 4-week mark, progressive gait training and closed-chain strengthening (mini-squats, step-ups) are introduced to promote proprioception and stability. According to Dominguez-Navarro, et al. [18] balance and proprioceptive deficiencies often persist following complete joint replacement, resulting in lower functional capacity and changed movement patterns that influence walking and postural stability. Consequently, including proprioceptive and balance training is a crucial aspect of recovery.

Proprioceptive Neuromuscular Facilitation methods can be used to restore the range of the movement and improve the pattern of the gait when carrying out every day functional activities [19]. Evidence also suggests that hydrotherapy supports better postural stability and coordination, which aligns with findings reported in postoperative recovery literature [20]. together, these interventions support treatment progression and enhance the results of therapeutic procedures, with a significant net effect on the overall functional condition of patients identified in gait efficiency.

In AVN cases, where preoperative muscle atrophy and altered gait mechanics are common, focused abductor strengthening (gluteus medius) and core stability training are especially vital to restore pelvic control and prevent compensatory movement patterns. Postoperative total hip arthroplasty (THA) rehabilitation may also include the use of water-based therapeutic activities, as this is a harmless and effective form of rehabilitation. They have been shown to enhance patient-reported functional ability, reduce discomfort, boost overall well-being, and increase muscular endurance, making them a valuable alternative within the rehabilitation process [21]. Patient education about home exercises, correct posture, and avoidance of high-impact activities remains central to long-term joint protection.

Clinical significance: A structured program focusing on the recovery from the THR includes exercises from early phase, including the basic exercises, theraband exercises and neuromuscular facilitation methods and they has a important role for the mile –stones in gait training and independent ambulation. Present study serves as a reference for further studies.

Harris hip score has been used to show the effectiveness on a minimal detected clinical level (MCID) of surgical and rehabilitative protocols Li, et al. 2021 [22].

As it is a single case study more robust evidence may be gathered using a double blind randomized controlled trail of B/L AVN case treated with THR.

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Conclusion

The findings of this case demonstrated that a structured, progressive physiotherapy program conducted in the post-operative period of a total hip replacement is important to complement functional recovery in the initial postoperative period of hip replacement. Noticeable improvements were achieved during the first four weeks of rehabilitation, including reductions in pain, enhanced joint mobility, increased muscle strength, better Harris Hip Scores, greater independence in daily activities, and overall improved quality of life. Although full recovery was not yet achieved, most of the rehabilitation goals were met, which confirms the effectiveness of early progressive physiotherapy. Continued rehabilitation beyond the initial weeks is recommended to attain complete functional recovery. Overall, the results emphasise the essential contribution of physiotherapy in post–hip replacement management, facilitating faster recovery and promoting greater functional independence.

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