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Post-operative physiotherapeutic rehabilitation of 32-year sickle cell anemia patient with avascular necrosis of femoral head - a case study

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ABSTRACT

Genetic diseases include sickle cell anemia (SCA) which is autosomal recessive and results in decreased blood supply to bones and tissues. Avascular necrosis is a condition in which there is reduction in the blood supplied to the bones. Avascular necrosis mostly occurs at joints with commonly at femoral head. In this case report, 32-year female patient having SCA is presented, since last 4 years patient is having bilateral hip pain and from last one month family members and she noticed right side limping. She received a minor injury to her right hip while exercising a month ago, and she began limping as a result. With these concerns, the patient was referred to the AVBRH hospital, where he underwent different examinations. On examination, the patient was found to have a right-side sub capital neck femur fracture and avascular necrosis related to SCA-SS type and Arthritis of both hips. Following that, the patient underwent a complete hip replacement on the right side. Post-operative physiotherapy treatment was started and it shows significant improvement and used to prevent secondary complications.

Keywords: Avascular necrosis (AVN), Total hip replacement (THR), Sickle Cell Anemia, Case study

1. INTRODUCTION

Avascular necrosis is a condition caused by a reduction of blood supply tothe bone, which can be transient or permanent. When blood supply of bones stopped then there will be bone tissue death occurs and there will be increase chances of fractures. In patients with sickle cell disease, femoral head involvement for avascular necrosis is more common (Smith et al., 2015; Ganesh et al., 2022). The orthopedic goal of treatment is to relieve discomfort while keeping the joint movable. Providing immobility to the joint,

pharmaceutical drugs for pain management, various surgical procedures such as total joint replacement are various options of treatment.

In sickle cell anemia, patients are more prone to necrosis of femoral head caused by interruption in blood supply. 50% of patients with SCD are affected by reduction in blood supply to the bones (Darware and Naqvi, 2020; Seth et al., 2022). The total hip arthroplasty (THA) procedure isthe most premium and routinely performed orthopedic procedures. The goal of this operation is to providerelief of pain, rehabilitation of functional activities, and an overall better life. In this process prosthetic head is placed at the femoral head of femur and acetabulum of hip is also replaced with artificial material of joint (Bhamra et al., 2020). THA is performed mostly in avascular necrosis, osteoarthritis, congenital hip disorders, post traumatic arthritis etc.

After a replacement of hip joint or knee joint, physiotherapy rehabilitation is considered a routine as well asmuch needed process. Its goal isenhancing usefulness and self-ability while reducing consequences such wound infection, DVT, pulmonary embolism, and hip dislocation. Physiotherapy rehabilitation can be given at various times following surgery, especially just after surgeryand during the hospital and home (Johnson and Silberman, 2022).

After THA, physiotherapy treatment can be given to the patient in inpatient physiotherapy and after discharge physiotherapy in out-patient department. Physiotherapy treatment in hospital when patient is admitted and during home program. Follow up is taken on out -patient department unit (Bawiskar et al., 2020). In this case study, we have described, the effectiveness of physiotherapeutic interventions in patientwith THA.

2. MATERIALS AND METHODS

Patient Information

We present the case of 32-year female, patient was apparently alright, 4 years back patient started complaining of both side hip pain, with that she has complaints of limping over right side in the last 1 month. Patient gives alleged history of trivial trauma to right hip while doing exercise 1 month ago following which she developed limping.

Pain over both hips more in right and onset was insidious and progresses gradually. Dull aching nature of pain used to get relieved mostly by rest, and pain-relieving drugs and aggravates by activities. Up to the period of 4 months, patient experienced difficulty in activities such as sitting on floor and squatting. Patient also has history of fever since last 3 years. Fever was more in afternoon and evening. Fever was not associated with shivering, cold or cough. There is no history of constitutional symptoms, swelling, and trauma. Patient is also a known case of Sickle Cell Disease- SS Pattern since birth.Patient gives history of blood transfusion 2-3 times during cesarian section in 2017. Patient also gives history of Pneumonia in July 2021.

With these complaints patient visited to AVBRH hospital and was undergone with various investigations, on examination patient was diagnosed with Sub capital neck of femur fracture right side, and Arthritis of both hip secondary to Avascular necrosis secondary to sickle cell disease- SS pattern. For these complaints, patient undergone Total Hip Replacement Right side.

3. CLINICAL FINDINGS

CBC, LFT, KFT, RBS, Blood grouping

X-Ray: pelvis with both hips AP view shows- loss of contour of femoral head on both side with sub capital neck of femur right side (figure 1 and 2)

MRI Review of Pelvis with both hip:

Bilateral AVN of femoral heads grade 3 on both side

Mild subarticular collapse of both femoral head with crescent sign

Sub capital neck of femur fracture right side.

X-Ray Investigation

Figure 1 Pre-operative x-ray

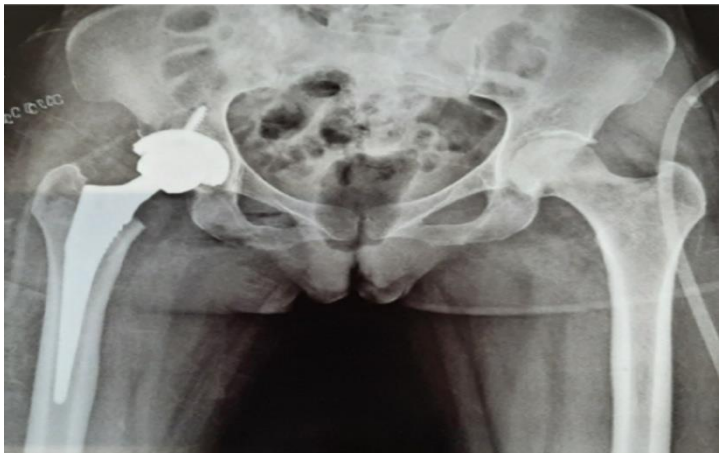

Figure 2 Post-operative x-ray

Timeline (table 1)

Table 1 Timeline of event

Date of admission	15-11-2021
Date of surgery	17-11-2021
Date of post-op day 1 (physiotherapy treatment day 1)	18-11-2021
Follow up (after 8 weeks)	18-01-2022

Therapeutic interventions

Physiotherapy goals of management were as follow

To prevent secondary complications which includes pulmonary and vascular complications.

To prevent dislocation or subluxation of the operated hip.

To achieve functional mobility before discharge from hospital setup.

To improve and maintain strength and endurance of non-affected extremities.

To prevent contracture of the operated hip.

Physiotherapy management for patient with THA

Phase 1: week 1-2

Patient education: Ankle pumping exercises with 10 repetitions thrice a day was given to the patient for preventing thrombus formation and venous stasis. Deep breathing exercises was given to the patient to prevent post-operative complications such as pneumonia or atelectasis. Static quadriceps and hamstring exercises was given to the patient with 10 repetitions thrice a day. Bed side siting and ambulation was taught to the patient. Full weight bearing walking was started during this phase with walker (figure 3 and 4). Active movements of unaffected extremities were performed by patient.

Figure 3 Ambulation with walker

Figure 4 Patient performing Heel slides

Phase 2: week 3-4

Ankle pumping exercises with 15 repetitions thrice a day was given to the patient for preventing thrombus formation and venous stasis. Deep breathing exercises was given to the patient to prevent post-operative complications such as pneumonia or atelectasis. Static quadriceps and hamstring exercises was given to the patient with 15 repetitions thrice a day. Bed side siting and ambulation with assistive devices was continued during this phase.With continuation of phase 1 protocol, additional strengthening exercises of upper limb and unaffected lower limb was started with resistance band.

Phase 3: week 4-8

For regaining strength and muscular endurance, open chain and bilateral closed-chain exercises were performed. Mini squats with elastic resistance (light grade) were taught to the patient for strengthening of hip and knee extensors (table 2). For improving postural stability, balance and gait, progressive balance activities in standing were performed by patient. Patient was made to practice walking on soft surfaces as well as uneven surface to challenge balance system.

Table 2 Follow up

Variable	Movement	Post-op Day 1 (Date: 18-11-21)	Post-op Week 8 Date: 18-01-22)
Pain (on NPRS)		9/10	1/10
Range of Motion (in degrees)	1. Hip flexion 2. Hip extension 3. Hip adduction 4. Hip abduction 5. Hip internal rotation 6. Hip external rotation 7. Knee flexion 8. Knee extension	10 0 0 15 10 10 90 0	110 0 40 40 42 40 130 0
Manual Muscle Testing (Grade 0-5)	1. Hip flexors 2. Hip extensors 3. Hip adductors 4. Hip abductors 5. Knee flexors 6. Knee extensors	1/5 1/5 1/5 1/5 3/5 3/5	5/5 5/5 5/5 5/5 5/5 5/5

4. DISCUSSION

Sickle cell disease patients are more prone to orthopedic diseases and they require surgical interventions. In sickle cell anemia patients, Avascular Necrosis (AVN) is still a prevalent consequence and a major source of morbidity. The patients with AVN presents with hip, limp and restricted range of motion. There are various treatment options for avascular necrosis. Conservative management includes joint immobilization and medicines etc. (Yang et al., 2017). Operative management includes decompression, vascularized grafting and arthroplasty.

This case is being reported to illustrate the incidence of AVN of head of femur in sickle cell anemia patient, as well as surgical process such as total hip replacement for correction of it. Post-operative physiotherapy management of patient was described in this case.

Avascular necrosis with sickle cell anemia, is generally managed by surgical procedures such as total joint replacement, but there are various secondary complications after surgery (Booth et al., 2012). According to the previous findings, preoperative hip joint alignment has a considerable impact on functional outcomes in sickle cell disease patients who have THR). Post-operative physiotherapy management in total hip replacement is important for preventing secondary complications.

5. CONCLUSION

Avascular necrosis is common in sickle cell anemia patients due to interruption of blood supply to the bones. In this case study, we have given a systematic week vise physiotherapy management for patient who had undergone total hip arthroplasty of right hip. Physiotherapy management shows significant improvement in patients' quality of life and was useful for preventing secondary complications post-operatively.

Author's Contributions

SW came up with the idea of writing manuscript. SW did the assessment. PP planned treatment protocol of the patient. NC and PF helped in writing the manuscript and kept the follow up of the patient. All the author's read the manuscript before submission.

Informed Consent

Patient was informed about the procedure and written consent was taken from the patient.

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Conflict of interest

The authors declare that there is no conflict of interests

Data and materials availability

All data associated with this study are present in the paper.

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