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Original Research Paper

Physiotherapy

SECONDARY OSTEONECROSIS OF THE DISTAL FEMUR FOLLOWED BY HIP AVN AS A PART OF LONG-TERM COVID-19: A CASE REPORT

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ABSTRACT Avascular necrosis (AVN) is a degenerative bone condition characterized by cellular death and bone collapse from compromised subchondral blood circulation. COVID-19, the clinical syndrome produced by infection with SARS-CoV-2, can result in multisystem organ dysfunction, including respiratory failure and hypercoagulability, which can lead to critical illness and death. Musculoskeletal (MSK) manifestations of COVID-19 are common but have been relatively underreported, possibly because of the severity of manifestations in other organ systems. Although corticosteroids are frequently used to treat acute COVID-19 infections, patients are prone to its side effects, particularly AVN. We report a case who developed osteonecrosis of the knee (distal end of the femur) after being treated for COVID-19 infection secondary to hip AVN. To the best of our knowledge, osteonecrosis of the knee as a part of long COVID-19 syndrome has not been explored much.

KEYWORDS : Osteonecrosis, post-COVID AVN, Distal femur necrosis.

INTRODUCTION

Osteonecrosis is a disease caused by reduced intraosseous blood flow to bones in the joints, which will rapidly induce joint destruction. SARS-CoV-2 is an RNA virus belonging to the Coronavirus family, which became a pandemic in March 2020, causing COVID-19 disease. There is a roughly 4:1 sex ratio for this illness, with men being more prone than women. Men aged 25 to 44 and women aged 55 to 75 had the highest incidence. Approximately one-third of patients with severe acute respiratory syndrome (SARS) who had received high cumulative doses and also long treatment durations of glucocorticoids occurred osteonecrosis [1]. The most common factor of exposure to osteonecrosis of the femoral head can be the use of corticosteroids during COVID-19 treatment [2]. Other causes include congenital disorders, coagulopathy, long-term use of steroids or alcohol, fractures, and dislocations. The femoral head is most usually affected by this illness. The musculoskeletal system may also be involved [3]. Different musculoskeletal manifestations can occur several weeks or months after SARS-CoV-2 infection among which osteonecrosis (ON) of the knee has been described. Musculoskeletal system involvement was the least addressed one since it was not life-threatening in the initial scenario, because of this there are very few studies related to the post-COVID effect of corticosteroids on the view of mobility and morbidity of survivors [4,5,6,7]. The present study will be helpful in the correlation between COVID-19 and osteonecrosis of the long end of the femur bone followed by the neck of the femur bone.

Patient Information- A 24-year-old male resident of Ahmednagar with a past medical history of covid 19 infection 2 years prior, presented to the orthopedic department referred to the physiotherapy department with complaints of difficulty in walking due to pain in the left knee joint for one and a half years. The patient had steroid injections for 7 days and steroid medications for 14 days during the course of treatment for covid 19 infection when he was admitted. In the last 7 months, the pain was relatively worsening in nature without any history of trauma. The patient was on medications and rest but the pain was persistent and worsening. So, the patient then came to VPMH hospital where after investigations he was diagnosed with osteonecrosis of the distal end of the femur bone post-COVID-19.

Clinical Findings: After taking proper informed consent patient was examined in a lying position.

MRI Findings-IMPRESSION: osteonecrosis of the right knee involving the distal femur. Small altered signal intensity is seen in the lateral condyle of the femur suggestive of edema / early osteochondritis desiccations. Hyperintensity is seen in the ACL suggestive of the sprain. Trace joint effusion seen.

Figure 1: MRI Of A Patient Confirming AVN

Table – 1 ROM (range Of Motion) In Degrees

Joint	Movement	Right	Left
Hip	Flexion	0-110	60-67
Hip	Extension	Can not be assessed	Can not be assessed
Hip	Abduction	0-30	0-24
Hip	Medial rotation	0-35	0-20
Hip	Lateral rotation	0-30	0-22
Knee	Flexion	0-126	5-85
Knee	Extension	126-0	85-5
Ankle	Plantarflexion	0-20	0-22
Ankle	Dorsiflexion	0-25	0-25

Figure 2: Altered Patellar Position In Weight-bearing And Non-weight-bearing Positions

Evaluation GAIT: Antalgic gait is present due to pain. The stance phase is reduced on left side compared to the right. The

swing phase increased on the left side. Swelling of the knee joint -Fig of 2 measurements -103 cm left, 100cm right, Q angle left 21 degrees- left 19 degrees – right, Patellar mobility reduced to grade 2 bilaterally

Therapeutic Intervention- exercise intervention given to the patient involved strengthening of hip, knee, and ankle muscles. For pain control ultrasound therapy was given with 0.6 W/cm^2 for 6 min around the anterolateral aspect of the knee joint. Ergonomic advice was given to the patient.

DISCUSSION

Our study was an observational case report and an attempt was made to reflect the knowledge of secondary osteonecrosis of the distal femur following hip AVN in post-COVID patients.

The hips and knees are the two joints that are most commonly affected by osteonecrosis.[8] Ahlbäck et al. first described osteonecrosis of the knee in 1968, and it can be divided into three types: (1) spontaneous osteonecrosis of the knee (also known as primary osteonecrosis), which typically affects the elderly and only affects one condyle; (2) secondary osteonecrosis (also known as atraumatic osteonecrosis), which typically affects younger people and both condyles and is typically linked to corticosteroids use, renal disease, hematological disorders, etc; and (3) post-arthroscopy usually affects a single condyle.[2,8,9,10,11]

The theory for the pathophysiology of osteonecrosis includes vascular obstruction, fat cell hypertrophy, fat emboli, hypercoagulability, and vascular endothelial dysfunction. Cortical bone is a potential site of direct infection by SARS-CoV-2 owing to its expression of ACE2 receptors. The mechanism for this is due to excessive use of corticosteroids there is an increase in cytokines level which will in turn lead to increased blood coagulation and will result in reduced blood supply to bone and necrosis will occur. [11,12,13,14]

The patients in one study experienced a mean cumulative corticosteroid dosage of 758 mg, and they began to experience AVN at 58th days, which is earlier than the average time for AVN to manifest after steroid administration (6–12 months).[15,16]This implies that, in comparison to corticosteroid treatment alone in patients without COVID-19, the use of corticosteroids in combination with COVID-19 may expedite the start of AVN. Additionally, COVID-19 is known to cause coagulopathies, notably hypercoagulability, in patients, which may exacerbate AVN and venous thrombosis. [16] Therefore, patients treated with corticosteroids for COVID-19 may be more likely to develop AVN than patients treated with corticosteroids for different conditions.

Multiple treatment options exist in the form of conservative, medical, and surgical management; however, no standard therapeutic management protocols exist.[14] The primary objective for treating osteonecrosis of the knee is to address pain, slow the disease progression, and prevent bone collapse and joint arthritis. Physiotherapy treatment includes patient education, to optimize range of motion and strength active and active assisted ROM exercises and strengthening respectively.[2]

The study done by Anna et al. proved that pre-operative physical therapy which includes strengthening of the hip and knee along with electrotherapy improves some musculoskeletal system status markers and patients' overall function with hip osteoarthritis who are waiting for surgery quality of life.[17]thus the study also focuses on the importance of preoperative physiotherapy which will help the patients to improve their functional status.

Within a year of a total hip replacement, patients are not typically sent to physiotherapy. In our case study, one patient had AVN of the hip together with osteonecrosis of the knee. Due to the sensory distribution of the obturator and femoral nerves, patients with osteonecrosis of the hip frequently have referred pain in the thigh and knee.[13] Therefore, for diagnosis and treatment, a comprehensive clinical examination of the knee joint is required, along with a high degree of suspicion for the presence of concurrent osteonecrosis of the knee.

CONCLUSION

This study highlights the importance of early diagnosis of secondary osteonecrosis of the distal femur followed by hip AVN as a part of long-term COVID-19 plays an important role in the management of the condition, hence the study will contribute an important aspect in early management and rehabilitation of patients.

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