

Long-term Side Effect of COVID-19 Infection; Osteonecrosis of the Femoral Head in SPECT/CT Bone Scintigraphy

Abstract

Avascular necrosis (AVN) of the femoral head is a condition characterized by limited mobility, discomfort, and changes in walking patterns due to insufficient blood supply in this region. Our objective is to investigate the possible connection between COVID-19 and AVN. In this study, we detail the case of a 41-year-old male patient who developed AVN in both femoral heads after contracting COVID-19. The mere occurrence of a COVID-19 infection and the use of corticosteroids for its treatment may increase the probability of AVN in the femoral head. Hence, post the COVID-19 pandemic, it is crucial to consider AVN vigilantly for timely detection and treatment.

Keywords: Avascular necrosis, coronavirus, COVID-19, femoral head, osteonecrosis, single-photon emission computed tomography/computed tomography bone scintigraphy

Introduction

Individuals infected with the severe acute respiratory syndrome coronavirus 2 “COVID-19” may exhibit a range of symptoms, including fatigue, fever, muscle pain, sore throat, diarrhea, headache, dry cough, and shortness of breath. The systemic hyperinflammation induced by the virus can result in severe complications such as sepsis, acute respiratory distress syndrome, acute renal failure, thrombotic events, cerebrovascular disease, acute myocardial infarction, cardiomyopathy, and cardiac arrhythmias.^[1] Avascular necrosis (AVN) of the femoral head is a condition characterized by bone marrow necrosis and loss of osteocytes due to inadequate blood supply to the bone tissue.

During the healing process, increased osteoclastic activity leads to the clearance of necrotic trabeculae, causing the weakening of the trabecular bone. Subsequently, subchondral collapse occurs due to the fracture of the weakened bone tissue under the body’s weight, resulting in hip pain, limited range of motion, and gait disturbance.^[2] It is estimated that about 30,000 cases of AVN are diagnosed annually in the United States, with

5%–12% of total hip arthroplasties being performed for this diagnosis.^[3] This case presentation aims to highlight the potential association between COVID-19 and AVN, emphasizing the significance of early detection.

Case Report

A 41-year-old male patient presented at our center with complaints of pain and restricted movement in the right hip for the past year and in the left hip for approximately 2 months. The patient had previously undergone magnetic resonance imaging due to hip pain, which suggested the possibility of femoral head necrosis. Although the right hip pain had somewhat improved, the patient experienced renewed pain and limited movement in the left hip, prompting a referral to the center for a comprehensive whole-body bone scan with single-photon emission computed tomography-computed tomography of the hip joints [Figures 1-3]. The patient exhibited no pain during the movement of other joints.

The patient did not possess any identifiable risk factors associated with AVN of the femoral head, such as trauma, smoking, alcohol consumption, steroid use, sickle cell disease, or systemic lupus erythematosus. However, approximately 9 months before

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the onset of right hip pain, the patient had contracted COVID-19, experiencing mild-to-moderate symptoms, and did not receive any corticosteroid therapy.

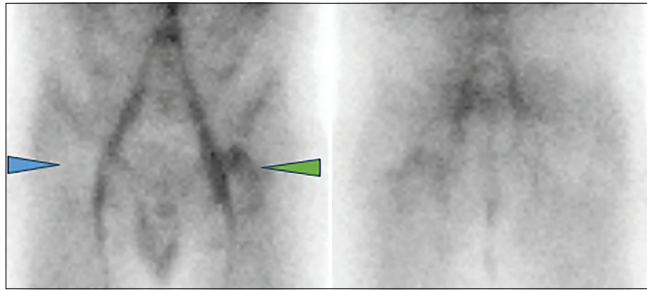


Figure 1: Anterior and posterior spot views of the 10-min delayed blood pool phase showed mild photopenic area (decreased radiotracer uptake) in the region of the right femoral head (blue arrow) and increased radiotracer uptake in the left side (green arrow)

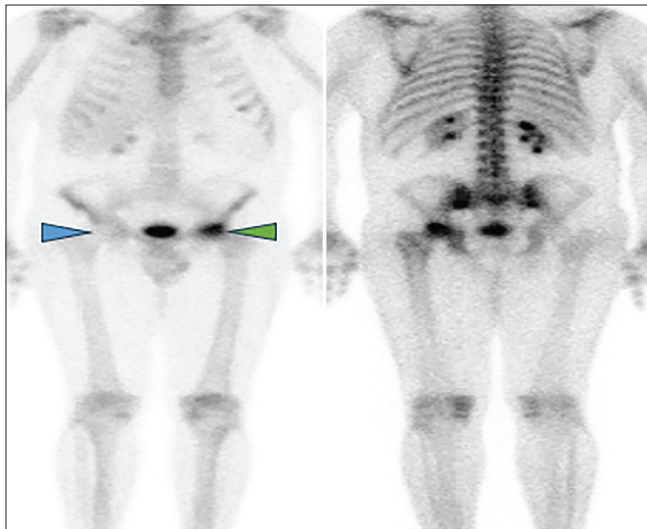


Figure 2: Anterior and posterior views of the 3 h delayed images revealed mild photopenic area in the right femoral head (avascular necrosis [AVN]) (blue arrow) and increased activity in the left side (reparative phase of AVN) (green arrow)

Discussion

The risk factors for AVN can be categorized into traumatic and nontraumatic factors. Traumatic risk factors include dislocations, fractures, burns, and vascular trauma. Nontraumatic factors include hemoglobinopathies such as sickle cell anemia and thalassemia, lipid emboli, systemic lupus erythematosus, smoking, alcohol consumption, radiation, corticosteroids, and pregnancy.^[4] Corticosteroids, a major risk factor for AVN, are commonly used in the treatment of severe COVID-19 patients.^[5] The pandemic of COVID-19 and the increased use of corticosteroids may lead to a rise in the number of AVN cases globally. Agarwala *et al.* demonstrated AVN of the femoral head in three COVID-19 patients treated with corticosteroids, with an average prednisone dose of 750 mg, lower than the average dose of 2000 mg known to cause AVN.^[6] The literature suggests that AVN typically occurs 6 months to 1 year after corticosteroid therapy.^[4,7] Daltro *et al.* evaluated 23 patients who developed AVN after COVID-19, with 66% had moderate-to-severe COVID-19, and received corticosteroid therapy. The remaining 33% had a mild COVID-19 history without corticosteroid use. The mean time between COVID-19 infection and the onset of AVN was found to be about 130 days.^[8] AVN following steroid use in COVID-19 treatment appears to occur earlier and with lower steroid doses compared to AVN related to other causes. AVN can develop after COVID-19 with or without corticosteroid use, suggesting COVID-19 is a potential new risk factor for AVN.^[9] Various mechanisms have been proposed to affect bone tissue by COVID-19, including the virus's impact on the angiotensin-converting enzyme 2 receptor, leading to decreased bone mass and increased osteoclasts.^[10] In addition, cytokine levels and hypercoagulability induced by hypoxia and bed rest in COVID-19 patients may contribute to osteoclastogenesis.^[11]

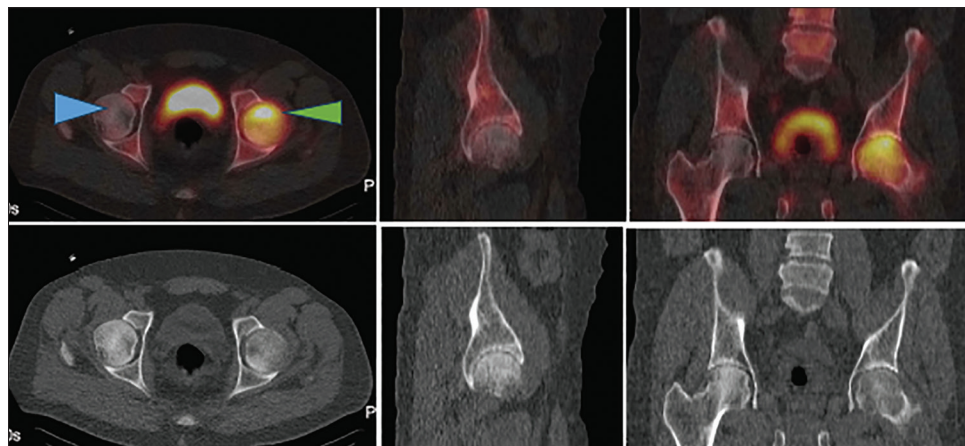


Figure 3: Fused single-photon emission computed tomography/computed tomography images of the pelvis, revealed decreased tracer uptake in the right femoral head (avascular necrosis [AVN]) (blue arrow) and an area of increased uptake in the superolateral aspect of the left femoral head (reparative phase of AVN) (green arrow)

Conclusion

Early diagnosis and treatment of AVN in patients with hip and groin pain are achieved by considering the fact that the COVID-19 infection alone and in relation to corticosteroid therapy can increase the possibility of AVN.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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