



## A STUDY ON POST COVID MUSCULOSKELETAL MANIFESTATIONS ON MRI

## Radio-Diagnosis

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## ABSTRACT

The Musculoskeletal manifestations of COVID have been well characterized and include bone infarcts, osteonecrosis, osteitis, fasciitis, tenosynovitis, myositis, myonecrosis, and joint effusion. The mechanism for myositis includes immune-mediated damage, ICU-acquired weakness, toxic myopathies, and possibly direct viral muscle destruction. Corticosteroids induced suppression of osteoblasts, apoptosis of osteocytes and reduced blood flow to the bone result in weak bones. Risk factors include male gender, use of multiple type of corticosteroids, higher dose of corticosteroid for prolonged duration, alcohol or tobacco abuse and cardio vascular ailments. We aimed at providing MRI evidence of post-COVID musculoskeletal manifestations. Patients with musculoskeletal symptoms from among the many cases of post-COVID sequelae admitted to the G. G. hospital in Jamnagar based on MRI results were studied along with review of the literature. Most common observation was osteonecrosis with most common site being femoral head. Post diagnosis, most patients with high grade of osteonecrosis were managed surgically, meanwhile, myonecrosis was managed with physiotherapy and medical management.

## KEYWORDS

COVID, MRI, Musculoskeletal Manifestations

## INTRODUCTION

Acute phase and post covid musculoskeletal symptoms are frequent & have been reported in few studies. Less data is available for musculoskeletal manifestations in patients with long Covid syndrome. We, in this study, attempted to determine the prevalence & risk factors associated with long covid syndrome.

## AIMS &amp; OBJECTIVES

To illustrate post covid musculoskeletal manifestations detected on MRI.

## METHODS AND MATERIALS

Literature review and selection of patients with musculoskeletal manifestations admitted in G. G. Hospital Jamnagar between April 2022 to April 2023.

## Inclusion Criteria

1. Patients having previous history of Covid 19 infection
2. Patients having history of corticosteroid intake during illness.
3. Presentation with clinical symptoms and signs of musculoskeletal system.

## Exclusion Criteria

1. Children younger than 10 years of age
2. Previous or recent history of trauma and known musculoskeletal disease condition unrelated to Covid 19 infection.

## OBSERVATION AND RESULTS

|                                       |                                                                                                                                                                                          |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Most common symptoms               | 1. Arthralgia<br>2. Peri-articular pain<br>3. Myalgia                                                                                                                                    |
| 2. Most common sites                  | 1. Femoral head and diaphysis<br>2. Humeral head and diaphysis<br>3. Knee, elbow and hip joint<br>4. Talus and calcaneum                                                                 |
| 3. Most commonly present risk factors | 1. Male gender<br>2. Use of multiple types of corticosteroids<br>3. Higher doses of corticosteroids for prolonged duration.<br>4. Alcohol or tobacco abuse<br>5. Cardio-vascular ailment |

Total patients were selected 38 out of which Male: 21 (Average age 46 years) and Female: 11 (Average age 53 years)

| No. |                          | Male | Female | Total |
|-----|--------------------------|------|--------|-------|
| 1.  | AVN of Hip with effusion | 11   | 4      | 15    |
| 2.  | AVN of talus             | 1    | 0      | 1     |
| 3.  | Bony infarct             | 5    | 3      | 8     |

|    |                            |   |   |   |
|----|----------------------------|---|---|---|
| 4. | Osteitis and Osteomyelitis | 3 | 1 | 4 |
| 5. | Myositis                   | 3 | 2 | 5 |
| 6. | Myonecrosis                | 2 | 1 | 3 |
| 7. | Tenosynovitis              | 1 | 0 | 1 |
| 8. | Neuritis                   | 1 | 0 | 1 |

## DISCUSSION

We studied 38 patients with musculoskeletal manifestations post Covid-19 infection, admitted in G. G. Hospital Jamnagar between April 2022 to April 2023. The most common abnormality found was AVN of hip with effusion which was present in nearly 40% of the individuals.

The proposed mechanism for osseous manifestations is corticosteroid induced apoptosis of osteocytes, suppression of osteoblasts leading to weak bones along with micro-thrombi formation causing vascular stasis and decreased perfusion to bone.

Increased bone resorption occurs secondary to ACE 2 receptors activation by spike antigens of COVID 19. COVID induced systemic inflammation leads to endothelial dysfunction and associated hypercoagulable state.

Proposed mechanism muscular manifestations are immune mediated damage, ICU acquired weakness, toxic myopathies and possibly direct viral damage to muscles.

Typical MRI findings include areas of muscular, fascial and subcutaneous oedema with hyperintense signal on fluid sensitive sequences and post contrast enhancement.

Myonecrosis is of 2 types:

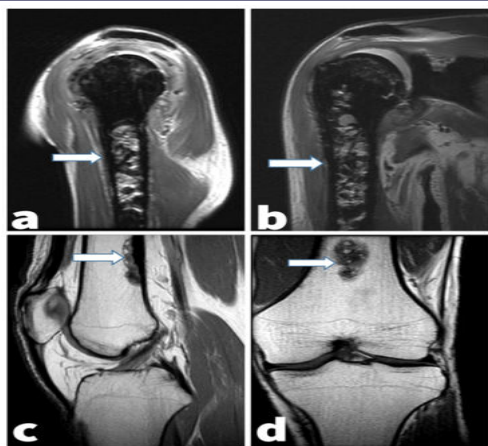
Type 1 – reversible muscle ischemia and on imaging shows diffuse muscle and fascial oedema

Type 2 – irreversible muscular infarction and on imaging shows non enhancing intramuscular areas of variable sizes often with thin parenchymal enhancement.

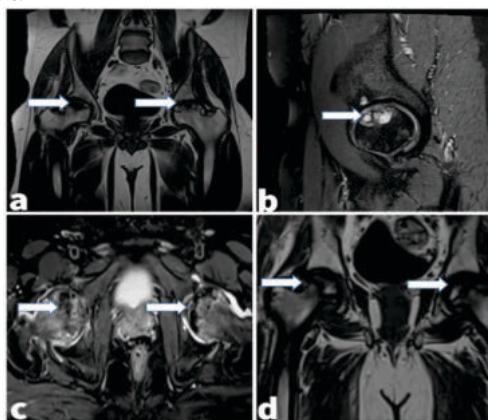
## CONCLUSION

COVID is known to have well documented Musculo-skeletal presentation including bony infarcts, avascular necrosis, fasciitis, tenosynovitis, myositis, myonecrosis and joint effusion with major risk factors associated are male gender; multiple types, higher doses and long duration of corticosteroid administration; smoking and alcohol abuse.

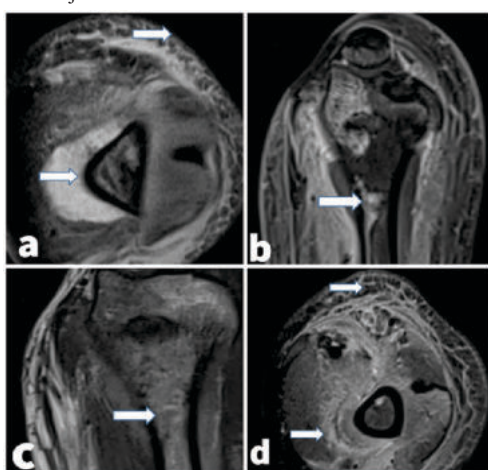
Majority of the above discussed patients had to undergo operative management.



**Figure 1:** (a & b): Ill-defined medullary Hyperintensities on Proton density images involving metaphysis and visible proximal diaphysis of humerus, suggestive of medullary bone infarcts. (c & d): Geographical hypo-intensities on T1W images involving distal femoral diaphysis and metaphysis, suggestive of medullary bone infarcts.

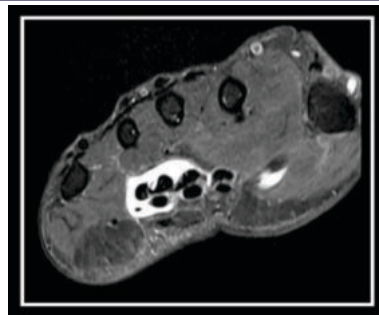


**Figure 2:** (a & b) Geographical T1W hypo intensity and STIR hyper intensity involving bilateral femoral head, suggestive of grade I AVN. (c & d): Left, axial STIR MRI Right, coronal T1W MRI Findings of bilateral femoral head grade II AVN including subchondral fractures, femoral neck, intertrochanteric and metaphyseal marrow edema and bilateral mild joint effusion.

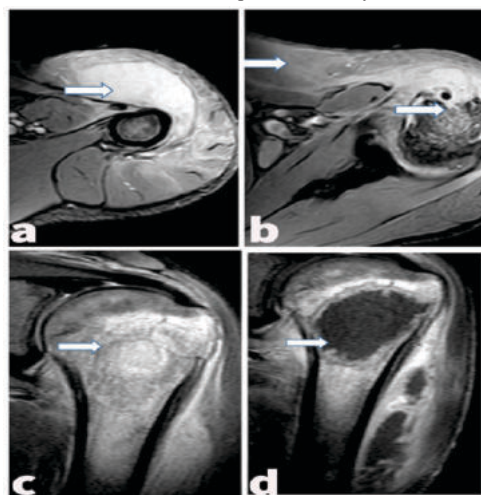


**Figure 3:** (a & b) Eccentric intra medullary and surrounding soft tissue altered signal intensity (isointense on T1WI with intense post contrast enhancement) involving visible diaphysis and distal metaphysis of left humerus consistent with osteomyositis. (c & d): Proton density axial MRI shows generalized subcutaneous, fascial and muscular stranding edema with brachialis myonecrosis

On T1 +C axial MRI eccentric medullary and generalized stranding enhancement, changes of osteomyositis with myonecrosis.



**Figure 4:** Significant flexor compartment tendons bursae (deep>superficial) fluid on proton density fat suppressed MRI images consistent with diffuse flexor compartment tenosynovitis



**Figure 5:** (a & b) Humeral metaphyseal intramedullary collection (hyperintense on T2WI and STIR) communicating with anterior deltoid intramuscular collection through cortical defect, another collection involving left infraclavicular region along with left axillary lymphadenopathy, consistent with osteomyositis with myonecrosis. (c & d): On T1+C coronal MRI humeral metaphyseal and deltoid collection shows peripheral enhancement, suggestive of osteomyonecrosis with peripheral rim enhancement.

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