

CASE REPORT

Infectious Disease

A case of SARS-CoV-2-associated arthritis with detection of viral RNA in synovial fluid

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Funding and support: By *JACEP Open* policy, all authors are required to disclose any and all commercial, financial, and other relationships in any way related to the subject of this article as per ICMJE conflict of interest guidelines (see www.icmje.org). The authors have stated that no such relationships exist.

Abstract

Severe acute respiratory distress syndrome-coronavirus-2 (SARS-CoV-2) provokes symptoms ranging from mild viral illness to a systemic inflammatory syndrome with multi-organ failure and has been associated with cases of arthritis. We report a clinical case of SARS-CoV-2 associated arthritis in which analysis of synovial fluid detected SARS-CoV-2 ribonucleic acid.

KEYWORDS

Arthritis, COVID-19, RNA, SARS-CoV-2, Synovial fluid

1 | INTRODUCTION

Severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) is a ribonucleic acid (RNA) virus that presents with symptoms ranging from asymptomatic carriage or mild viral symptoms to a syndrome characterized by hypoxemic respiratory failure and multi-organ involvement.¹ SARS-CoV-2 infection can be associated with arthritis and arthralgia. SARS-CoV-2 RNA has been detected in sputum, nasopharyngeal secretions, feces, and blood, but not in synovial fluid.^{2,3} Prior analysis of synovial fluid in SARS-CoV-2 arthritis was negative for SARS-CoV-2 RNA with findings consistent with sterile inflammation, and—in 3 case series—crystal arthropathy.^{4–13} We describe a case of monoarthritis of the wrist in a patient with mild SARS-CoV-2 infection in which SARS-CoV-2 RNA was detected in synovial fluid. To the authors' knowledge, this is the first reported case in which SARS-CoV-2 RNA has been detected in synovial fluid.

2 | CASE

A 73-year-old male with a past medical history of hypertension and chronic, intermittent right wrist pain presented with right wrist pain and swelling for 1 day. The pain localized to the wrist, was worse with movement, improved with rest, and differed from his chronic pain in that it was more severe, persistent, and accompanied by localized swelling. This arthritis was preceded by subjective fever, chills, myalgia, and a dry cough not producing sputum that began 16 days before presentation and persisted. At the onset of symptoms, he experienced 3 days of loose, brown, non-bloody stools without frank diarrhea. No fever was measured during his illness. He was evaluated at an outside urgent care facility several days before presenting to our emergency department (ED), where he tested positive for SARS-CoV-2 infection. The patient denied numbness, weakness, paresthesia, rashes or other skin changes, dysuria, genital ulcers, lymphadenopathy, visual changes,

Supervising Editor: Mike Wells, MBBCh, PhD.

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ocular pain or conjunctivitis, oral ulcers, back pain, chest pain, or shortness of breath.

The patient's vitals at presentation were temperature: 98.4°F (36.9°C), heart rate = 78 beats/minute, blood pressure = 163/98 mm Hg, respiratory rate = 18 breaths/minute, and oxygen saturation = 96% on room air. The patient was non-toxic in appearance with normal sclera and conjunctiva and unremarkable oropharyngeal, cardiac, pulmonary, and dermatologic examinations. Swelling was noted over the dorsal right wrist extending across the radial and ulnar aspects without any associated erythema, ecchymosis, or warmth. Movement of the wrist was intact but limited because of pain, and both hands were neurovascularly intact with intact grip strength in all fingers.

Laboratory tests demonstrated a normal white blood cell count of 6780 cells/ μ L with unremarkable differential, hemoglobin of 12.8 g/dL, elevated erythrocyte sedimentation rate of 628 mm/hour, and an elevated C-reactive protein of 43.7 mg/dL. All other laboratory studies were unremarkable. X-ray of the wrist demonstrated only diffuse degenerative changes. The patient reported worsening pain despite analgesia with ibuprofen, so an arthrocentesis was performed to rule out septic arthritis, which yielded 0.5 cc of turbid, yellow-white fluid. Laboratory analysis of synovial fluid was negative for crystals, gram stain demonstrated no organisms, and cultures did not yield growth at 48 hours. Synovial fluid was applied to a nasopharyngeal swab and sent for SARS-CoV-2 reverse transcription polymerase chain reaction (RT-PCR), which was positive. Formal cell count and differential were unable to be performed because of insufficient quantity of sample.

The patient was treated with a 7-day course of a non-steroidal anti-inflammatory medication, naproxen-sodium, and at follow-up, reported full resolution of both pain and swelling after 4 days of therapy. He also reported full resolution of his other viral symptoms and never required hospitalization.

3 | DISCUSSION

Viral arthritis typically presents as a polyarticular articular arthritis that coincides with other viral symptoms, the pathologic mechanism of which may be mediated by local destruction following viral infiltration of tissue or by an immune-mediated response provoked by molecular mimicry.^{14–16} Reactive arthritis occurs days to weeks after initial viral symptoms and is typically mono- or oligoarticular and asymmetric in distribution. It is typically triggered by enteral or genitourinary bacterial infections but it can also be provoked by viruses.¹⁵ The time course of the patient's arthritis and monoarticular pattern are most consistent with reactive arthritis, although the patient demonstrated no extraarticular symptoms. Septic arthritis was unlikely given negative gram stain and culture and not consistent with the patient's clinical course.

Recovery of viral RNA from this patient's synovial fluid demonstrates dissemination of viral genetic material to a site in which it has not previously been described, although the mechanism of inoculation of the joint is unclear. SARS-CoV-2 viremia is rare in mild cases and as such is an unlikely mechanism for dissemination to the joint in

this case.^{2,3,14,17} Alternative possibilities include dissemination of virions by lymphatic spread as occurs in alphavirus infection, or uptake into the joint of loose viral RNA without active synovial infection.¹⁴ Unlike some other cases of SARS-CoV-2 arthritis, no evidence of crystal arthropathy was found in analysis of the patient's synovial fluid.^{8,10} The presence of viral RNA in the joint raises the possibility that this may be the pathologic stimulus for arthritis in SARS-CoV-2.

Unfortunately, the effusion could not be further characterized with cell count and differential because of the small quantity of synovial fluid obtained. Further, the conclusions that can be drawn from a single case are limited. Although the presence of viral RNA in synovial fluid is novel, treatment with non-steroidal anti-inflammatory medication was successful in resolving symptoms and did not differ from first line management of other etiologies of aseptic arthritis. Further studies are indicated to determine the prevalence of synovial SARS-CoV-2 RNA in cases of SARS-CoV-2-associated arthritis and to determine the natural history and optimal treatment of such cases.

4 | CONCLUSION

This case raises the possibility that SARS-CoV-2 RNA can be a pathologic stimulus for local synovial inflammation, which merits further consideration and research. Arthritis in the setting of SARS-CoV-2 infection may be provoked by the presence of SARS-CoV-2 RNA in the joint and—in the absence of findings concerning for septic arthritis or sepsis—first line treatment with NSAIDs is reasonable. Conversely, patients presenting with arthritis during SARS-CoV-2 outbreaks should prompt concern and testing for infection.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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How to cite this article: Kushner Z, Ortega A, and Mukherji P. A case of SARS-CoV-2-associated arthritis with detection of viral RNA in synovial fluid. *JACEP Open*. 2021;2:e12452. <https://doi.org/10.1002/emp2.12452>