

Case Report

Hong Kong J Orthop Res
ISSN (e): 2663-8231
ISSN (p): 2663-8223
2020; 3(3): 49-51
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Absence of SARS-CoV-2 in Synovial Fluid of COVID-19 Positive Patient: A Case Report

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Abstract

Emergence of the SARS-CoV-2 virus has led to the COVID-19 pandemic. The extent of spread of the virus throughout body fluids is an exposure hazard to healthcare workers. The presence of virus particles has been well established in the lung, nasopharyngeal and oropharyngeal tissue. Its presence in more immunologically privileged areas such as synovial joints is not well established. We investigated a COVID-19 positive patient with knee pain and effusion. Knee synovial joint fluid PCR revealed absence of SARS-CoV-2 virus particles. We encourage further synovial fluid analysis in patients with COVID-19 to give a better understanding of the virus's tropism.

Keywords: SARS-CoV-2, COVID-19, Synovial Fluid.

INTRODUCTION

In the COVID-19 Pandemic as of June 5th 2020, the WHO has reported 6,515,796 confirmed SARS-CoV-2 cases and 387,298 deaths involving 216 countries, areas or territories [1]. The extent of spread of the virus throughout body fluids is an exposure hazard to healthcare workers. The presence of viral particles has been well established in the lung, nasopharyngeal and oropharyngeal tissue. There have been several reports showing presence of SARS-CoV-2 in stool and semen [2, 3]. Its presence in more immunologically privileged areas such as in synovial joint fluid is not well established. We investigated a COVID-19 positive patient with knee pain and effusion. Knee synovial joint fluid polymerase chain reaction (PCR) revealed absence of SARS-CoV-2 viral particles.

The patient was informed that data concerning the case would be submitted for publication, and he provided consent.

CASE REPORT

A previously healthy 31-year-old Indian construction worker, residing in a dormitory of a known COVID-19 cluster was admitted to Changi General Hospital, Singapore on May 28th, 2020 after having two days of atraumatic right knee pain and swelling associated with fever. He declared no sexual history and had no history of gout.

Clinically he had swelling and erythema of his right knee with mild tenderness. Active range of motion was 30 degrees of knee flexion. He presented with a fever of 37.8 degrees Celsius (100.0 Fahrenheit), with a heart rate of 124. Blood pressure was 149/96. Other vital signs were stable with a respiratory rate of 17 and oxygen saturation of 100% on room air.

He presented with a leucocytosis, neutrophilia, lymphocytosis and monocytosis. His full laboratory investigations are presented in Table 1. Blood cultures taken on the day of his admission revealed no bacterial growth.

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Table 1: Laboratory Investigations

| | May 28 th | May 30 th | May 31 st |
|-----------------------------------------------|----------------------|----------------------|----------------------|
| Haemoglobin (g/dL) | 14.3 | 13.6 | 12.9L |
| White blood cell count (x10 ³ /μL) | 17.6H | 9.9 | 7.5 |
| -Neutrophil (x10 ³ /μL) | 11.6H | 4.3 | 5.3 |
| -Lymphocyte (x10 ³ /μL) | 3.6H | 4.1 | 1.1 |
| -Monocyte (x10 ³ /μL) | 2.4H | 1.0 | 0.8 |
| Platelets (x10 ³ /μL) | 381 | 316 | 317 |
| Uric acid (μmol/L) | 617 | 626 | 598 |
| C-reactive protein (mg/L) | 41.3 | 68.2 | 33.0 |
| Urea, creatinine and electrolytes | Normal | Normal | Normal |
| Liver function tests | - | - | Normal |

Imaging investigations with right knee x-rays were performed which showed a moderate suprapatellar effusion. In view of his fever and risk for COVID-19, a chest x-ray was performed which showed no infective changes and was otherwise unremarkable.

His first nasopharyngeal and oropharyngeal COVID-19 viral test swab performed at his dormitory on the night before his admission came back with an inconclusive result. He had a repeat COVID-19 swab performed on May 28th which returned a positive test result for SARS-CoV-2 E gene and N gene. Another repeat swab performed on May 29th confirmed the same positive test result. He was admitted under the Orthopaedic Surgery unit in the hospital’s COVID-19 isolation ward for management of his right knee pain and swelling.

The clinical impression was gout and the patient was started on first line therapy with colchicine and non-steroidal anti-inflammatory drugs [4]. His diet consisted of a low-moderate purine and high fat intake. He drank 2 cans of beer occasionally before bed but had stopped this for 2 months prior to admission. He denied any trigger foods. He was educated to eat a low purine diet by our dietician. The patient was offered a right knee aspiration for diagnostic and therapeutic purposes, however he declined due to trypanophobia (fear of needles).

On day 2 he was referred to the Internal Medicine unit whose impression was likely a gout flare and less likely septic arthritis. He was also seen by the Infectious Diseases unit who did not think that septic arthritis was definitively ruled out. Urinary Neisseria Gonorrhoeae and Chlamydia Trachomatis PCR were performed, which were both negative.

On day 3 the option of knee aspiration was re-explored with the patient to rule out septic arthritis. This time he was agreeable. He underwent arthrocentesis of his right knee in the emergency operating theatre under local anaesthesia in sterile conditions. Due to his positive COVID-19 status, full personal protective equipment (PPE) with N95 mask and powered air purifying respirator (PAPR) was worn, which is the standard of care for invasive and potentially aerosol generating procedures in COVID-19 infected patients in Singapore (Fig. 1) [5, 6]. His aspiration was performed on day 4 of admission, which is reported to be the time for peak load of viral shedding [7]. 32ml of cloudy amber fluid was aspirated which showed gout crystals under microscopy (Fig. 2). SARS-CoV-2 was not detected in the synovial fluid PCR. Full synovial joint aspiration results are shown in Table 2.

Table 2: Knee synovial joint fluid investigations

| | |
|-----------------|--------------------------------|
| Cell Count | 6144 |
| Neutrophils | 70% |
| Lymphocytes | 30% |
| Gram Stain | No organisms seen |
| Crystals | Monosodium urate crystals seen |
| Aerobic culture | No bacterial growth |
| SARS-CoV-2 PCR | Not detected |



Figure 1: Right knee aspiration was performed in the emergency operating theatre under local anaesthesia in sterile conditions. Due to COVID-19 status, full personal protective equipment with N95 mask and powered air purifying respirator was worn.



Figure 2: 32ml of cloudy amber fluid was aspirated from the knee.

The patient clinically improved, reporting subjective decrease in pain and increased active range of knee motion to 45 degrees flexion. He was able to ambulate independently. He remained afebrile throughout the rest of his inpatient stay and was discharged on day 5 of admission.

DISCUSSION

The presence of viral particles in body fluids poses an exposure risk for healthcare workers during patient contact and procedures, especially when there is a risk of aerosolization of particles. Our report shows that patient’s synovial joint fluid may be absent of SARS-CoV-2 viral particles even when positive on nasopharyngeal and oropharyngeal viral swabs. Whether SARS-CoV-2 is present in synovial joint fluid may depend on severity of the disease and degree of the synovial tropism of the virus.

There are several reports about viral tropism in body fluids outside the respiratory system. Moriguchi *et al.* reported a case of a patient with meningitis where SARS-CoV-2 was not detected on nasopharyngeal swab but was detected in the cerebrospinal fluid (CSF) [8]. He encouraged vigilance to consider that the symptoms of encephalitis or cerebropathia may be the first indication, as well as respiratory symptoms, for hidden SARS-CoV-2 in patients. Al Saiegh *et al.* investigated the CSF of a 31 year old man and a 62 year old woman with haemorrhagic strokes, and found that they were devoid of SARS-CoV-2 viral particles [1]. They suggested whether SARS-CoV-2 is present in CSF may depend on the systemic severity of disease and the degree of the virus' nervous tissue tropism should be examined in future studies. However, Huang *et al.* reported a 40 year old woman with meningoencephalitis without respiratory failure with a positive SARS-CoV-2 in the patient's CSF on reverse transcriptase PCR testing [10]. She was started on hydroxychloroquine and subsequently her mental status improved to baseline without neurological defects by day 12.

Ngaserin *et al.* found that COVID-19 was not detected in the peritoneal fluid and washings in a COVID-19 infected patient with acute appendicitis [11]. Whereas Wu *et al.* found the presence of SARS-CoV-2 viral particles in faeces in 41 of 74 (55%) patients who had positive respiratory swabs [2]. Their data suggested the possibility of an extended duration of viral shedding in faeces, for nearly 5 weeks after the patient's respiratory samples tested negative. They suggested further research into the viability and infectivity of SARS-CoV-2 in faeces is required.

Song *et al.* found that SARS-CoV-2 RNA was absent from the semen in 12 men infected by COVID-19 in both acute and recovery phases [12]. However, Li *et al.* found that 6 of 38 male participants with laboratory confirmed COVID-19 had positive results for SARS-CoV-2 in their semen sample, of whom 60.5% had achieved clinical recovery from acute infection.³ They suggested that if SARS-CoV-2 could be proven to be sexually transmitted in future studies, this could prove to be a critical part of the prevention of transmission, especially considering that the virus was detected in the semen of recovering patients.

CONCLUSION

Our study found the absence of SARS-CoV-2 in knee joint synovial fluid. This provides preliminary data in the investigation of its transmission in synovial joint fluid. We encourage further synovial fluid analysis in patients with COVID-19 to give a better understanding of the virus's tropism in synovial joints.

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