CASE REPORT

Case Report: Reinfection of COVID-19, with second infection less severe [version 1; peer review: 1 approved]

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Abstract

There is concern that an individual may contract COVID-19 twice, either as a result of being a viral carrier that was not entirely cleared from the body in the first instance or as a result of reinfection. The recurrent infection may be qRT-PCR positive, which must be distinguished from post-COVID-19 symptoms that are qRT-PCR negative. Although it is known that recovered patients of viral diseases can be immune for the next infection, recurrent infections of COVID-19 have been recorded in Brazilian healthcare workers. We report a case of recurrent COVID-19 infection in a 34-year-old man working in the Gynecology and Children Hospital in Al-Muthanna Province, south of Iraq. The patient suffered from a sharp and noticeable rise in the body temperature at 39 °C and cough on the 16th of July 2020. Then, the patient was symptomized with another course of COVID-19 on the 27th of August 2020, which was contracted from the patient's workmate. Nose swab PCR test and CT scan were performed to confirm the second infection. The clinical signs of repeated infection with coronavirus were obviously less than the first infection of the same patient. It is clear that the first infection symptoms of COVID-19 are more severe than the signs of recurrent disease.

Keywords

COVID-19, reinfection, PCR, CT scan, Real-time PCR

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1

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Introduction

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was the cause of the global COVID-19 pandemic, which began in Wuhan, China, in December 2019 and has since spread throughout the world.¹ The virus may infect a wide range of systems, including the respiratory, gastrointestinal, hepatic, and central neurological systems, with severe symptoms that may need hospitalization.² According to recent studies, around 4–5 days is the typical incubation time from SARS-CoV-2 exposure to the beginning of symptoms, with 97.5% of symptomatic individuals showing symptoms within 11.5 days.³ Although most cases are asymptomatic or moderate, advanced age, cardiovascular disorders, chronic lung illness, systemic arterial hypertension, diabetes, obesity, and Black and minority ethnicity are the main risky factors of the pandemic.⁴ At a time when millions of first-wave infections have occurred and many communities are suffering from a second wave, there is worry over whether the sickness may continue, whether by the recurrence of a viral reservoir that was not completely removed from the body in the first place or by reinfection.² The common symptom of recurrent COVID-19 syndrome occurs again after the first appearance of the initial pandemic infection and can be qRT-PCR positive, which needs to be differentiated from the post-COVID-19 symptoms, typically negative on qRT-PCR.⁴ Recurrent infection is far from the more serious “chronic post-viral syndrome”, or long-term symptoms that persist despite no viral activity. While certain viral sequences can be identified by sequencing, and thus whether a patient has a new infection can be determined, there are other circumstances in which a patient is known to have an infection, but we do not have information on their exact viral sequence. To account for these situations, the phrase ‘recurrence’ instead of ‘persistence’ should be used.^{5–8} The importance of considering recurrent infection relates to the immune interactions and the ability of the immune system to stop subsequent viral infections. It is known that during the viral infections, immunity can be developed after the first infection and provides a strong defense against subsequent SARS-Cov-2 exposure.⁹

In this case report, we present a patient with recurrence of COVID-19 symptoms, qRT-PCR positive, whom was diagnosed as having COVID-19 recurrence.

Case description

A 34-year-old man working in the Gynecology and Children Hospital in Al-Muthanna Province, south Iraq, suffered from a sharp and noticeable rise in body temperature of 39°C and cough on 16th of July 2020. The patient also suffered from congestion in the tonsils and pharynx, difficulty swallowing, severe fatigue, emaciation, joint pain, persistent sweating, pain along the spinal cord, in addition to choking and pain in the chest area, and difficulty breathing. On 19th July, the patient visited a doctor who ran various laboratory tests and a complete blood count (Tables 1 and 2). Due to suspicion of COVID-19, the patient was on mandatory vacation for a month. One week later, the patient lost his sense of smell for two days. These symptoms continued for eight days, after which the patient recovered from his symptoms and returned to normal.

Nasopharyngeal swabs, which had been collected on 23rd of July 2020 to detect the nucleic acid of SARS-CoV2, were tested by reverse transcriptase-polymerase chain reaction in real time, with positive results to IgM of COVID-19. On 26th July 2020, complete blood count was returned as normal. The patient was given a COVID-19 diagnosis.

The patient underwent the recommended treatment involved using bronchium syrup (three times per day), TAVANIC tablets 500MG, co-codamol tablets 500MG (three times per a day), Heparin (two times per a day) at dose of 18 units/kg/hr IV for five days, and desloratadine tablets 10mg (one time per a day).

Table 1. Patient's laboratory results on 19th July.

Laboratory parameter	Result	Normal range
Rapid test of COVID-19	Positive IgG	NA
C-reactive protein	15.2 mg/L	< 10 mg/L
D-dimer	0.29 ng/ml	0-500 ng/ml
Lactate dehydrogenase	210 U/L	140-280 U/L
Serum ferritin	537.2 ng/ml	Men 30-400 ng/ml Women 13-130 ng/ml
Vitamin D3	76 ng/ml	<10 ng/ml Deficiency 10-30 ng/ml Insufficiency 30-100 ng/ml Sufficiency > ng/ml Toxicity

Table 2. First complete blood count analysis of the patient on 19th July 2020.

Parameter	Result	Normal range	Status
White blood cell	6.0 x10 ⁹ /L	4.0-10.0	Normal
Lymphocyte %	17.0%	20.0-40.0	Low
MID%	9.0%	1.0-15.0	Normal
Neutrophil %	74.0%	50.0-70.0	High
Lymphocyte number	1.0 x10 ⁹ /L	0.6-4.1	Normal
MID number	0.5 x10 ⁹ /L	0.1-1.8	Normal
Neutrophil number	4.5 x10 ⁹ /L	2.0-7.8	Normal
Red blood cell	4.4 x10 ¹² /L	3.50-5.50	Normal
Hemoglobin	12.9 g/dL	11.0-16.0	Normal
Hematocrit	37.3%	36.0-48.0	Normal
Mean corpuscular volume	84.8 fL	80.0-99.0	Normal
Mean corpuscular hemoglobin	29.3 pg	26.0-32.0	Normal
Mean corpuscular hemoglobin concentration	34.5 g/dL	32.0-36.0	Normal
Red blood cell distribution width-SD	50.2 fL	37.0-54.0	Normal
Red blood cell distribution width-CV	12.8%	11.5-14.5	Normal
Platelet	198 x10 ⁹ /L	100-450	Normal
Mean platelet volume	11.6 fL	7.4-10.4	High
Platelet distribution width	17.7%	10.0-17.0	High
Procalcitonin	0.22%	0.10-0.28	Normal
Platelet large cell ratio	43.3%	13.0-43.0	High

The PCR test of COVID-19 was done again on 19th of August 2020, which showed a negative result. Other tests performed on the same date included C-reactive protein (CRP), D-dimer and serum ferritin were 0.42 mg/L, 181 ng/ml and 97.5 ng/ml, respectively. These tests showed that the patient was completely recovered.

The patient resumed his work on 19th of August 2020 in the microbiology laboratory of the hospital. Five days later (23rd August), the patient's workmate tested positive to COVID-19 after PCR test and CT scan. Our patient was suspected to be COVID-19 positive on 27th of August 2020, due to the following symptoms: intermittent fever, pain in tonsil and pharynx, and intermittent diarrhea. Nasopharyngeal swab was taken again on the same day and was confirmed as COVID-19 positive by PCR. A CT scan was performed to confirm the second infection and this showed bilateral consolidation and linear opacities (Figure 1), indicative of COVID-19 infection.

After five days of second appearance of symptoms in the patient, the patient's cough was continuous and dry without sputum with suffocation (SpO₂ dropped to 85%), which continued for two days. The patient started to use medicinal oxygen to compensate the lost oxygen. Treatment provided to the patient was as follows: Heparin (twice per a day) at dose of 18 units/kg/hr IV for five days; Livofloxacin 500 mg once daily; Panadol tablets 500 mg thrice daily; Desloratadine 10 ml (5 mg) oral solution once a day; Dexamethasone 4 mg used only in case of severe hypoxia (the patient used it twice); and multivitamins (C, D, and zinc) once daily. After two days, the patient reported feeling more normal. A week later, the patient's symptoms had disappeared except coughing and pharyngitis.

A complete blood count taken on 3rd September showed that there was a smaller number of lymphocytes than normal and higher than normal number of neutrophils (Table 3). CRP was positive (42 mg/dl) while D-dimer and serum ferritin were normal (181 ng/ml and 97.5 ng/ml, respectively). The status of the patient became more stable and he gradually started to recover. However, the patient still reports feeling tired and not having the ability to do normal activities compared to his abilities before the recurrent infection.

Discussion

Our patient suffered from a rapid increase in body temperature, which reached a peak of 39°C with congestions of the tonsils and pharynx, difficulty swallowing, and coughing and discomfort in the chest. Following these symptoms, the

Figure 1. CT scan image of patient's lung exposed to repeated infection of COVID-19 showing significant consolidation and linear opacities.

patient's sense of smell was lost. Rapid test showed that the patient was IgG positive to COVID-19. Blood work showed that the patient had a small elevation in D-Dimer. In COVID-19 patients, higher values of D-Dimer could occur as a sequelae of SARS-CoV-2 or a secondary complication of a systemic inflammatory response syndrome which can be considered as an indicator for incidence of acute pulmonary embolism.¹⁰ CRP was also elevated, which is expected to increase due to pulmonary injuries during SARS-CoV-2 infection. Increased CRP might indicate the seriousness of the disease.¹¹ In addition, serum ferritin was moderately increased. Ferritin can be considered as a biomarker for COVID-19 prognosis.¹² It is recommended to use these three parameters during hospitalization to track the prognosis of COVID-19 patients.¹³

The role of acquired immunity and SARS-CoV-2 antibodies in patient protection against further COVID-19 infection is still under debate.^{14,15} It was reported that acquired immunity could help in preventing further infection.^{16–19} However, Bentivegna *et al.*¹¹ presented a case of a recovered positive serological pneumonia COVID-19 patient, accompanied by six negative PCR tests. A month later, and after exposure to the virus, another positive PCR test and seroconversion of IgM were performed.

The coronavirus infection might cause a thrombosis that can induce severe symptoms that could lead to death. Complete blood testing in our patient showed a significant elevation in the mean platelet volume, which could increase the probability of thrombosis.^{21,22}

A previous COVID-19 positive patient was shown to have a high level of peptide precursor of calcitonin hormone [procalcitonin (PCT)].^{23,24} In our case, both blood tests of the patient showed an increase in serum levels of PCT, which could indicate serious infection with pathological bacteria associated with bronchiolitis.²⁵ Another increased marker in both of our patient's blood tests was lymphopenia, which declined in the first and second COVID-19 infection. The low level of lymphocytes in the blood stream is usually associated with COVID-19 patients, resulting in immune

Table 3. Second complete blood count analysis of the patient on 3rd of September 2020.

Parameter	Result	Normal range	Status
White blood cell	9.4 x10 ⁹ /L	4.0-10.0	Normal
Lymphocyte %	19.7%	20.0-40.0	Low
MID%	7.3%	1.0-15.0	Normal
Neutrophil %	73.0%	50.0-70.0	High
Lymphocyte number	1.9 x10 ⁹ /L	0.6-4.1	Normal
MID number	0.7 x10 ⁹ /L	0.1-1.8	Normal
Neutrophil number	6.8 x10 ⁹ /L	2.0-7.8	Normal
Red blood cell	5.42 x10 ¹² /L	3.50-5.50	Normal
Hemoglobin	13.2 g/dL	11.0-16.0	Normal
Hematocrit	45.3%	36.0-48.0	Normal
Mean corpuscular volume	83.6 fL	80.0-99.0	Normal
Mean corpuscular hemoglobin	29.3 pg	26.0-32.0	Low
Mean corpuscular hemoglobin concentration	24.3 g/dL	32.0-36.0	Low
Red blood cell distribution width-SD	48.3 fL	37.0-54.0	Normal
Red blood cell distribution width-CV	12.6%	11.5-14.5	Normal
Platelet	294 x10 ⁹ /L	100-450	Normal
Mean platelet volume	11.1 fL	7.4-10.4	High
Platelet distribution width	16.9%	10.0-17.0	Normal
Procalcitonin	0.32%	0.10-0.28	High
Platelet large cell ratio	39.3%	13.0-43.0	Normal

suppression.²⁶ An increase in neutrophils (as seen in our patient) can happen during a severe infection or exposure to stress, seen in COVID-19 infection.²⁷

During our patient's second infection, a CT scan was ordered to confirm the second infection. The scan results showed consolidation and opacities in different sites of both lungs, indicating that the patient has a second COVID-19 infection, although he was infected before.

In conclusion, all the above tests strongly indicate that the patient had a recurrent infection with SARS-CoV-2 virus. However, the symptoms and severity of COVID-19 were less during the second infection than the first one.

Consent

Written informed consent was obtained from the patient for the publication of the report and any associated images.

Data availability

All data underlying the results are available as part of the article and no additional source data are required.

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This research is greatly needed in order to get a better understanding of this new pandemic. The details of the clinical signs and case history are clearly explained. In addition, the clinical diagnostic steps and treatment are both properly illustrated.

However, more research is needed to better understand the disease process, diagnosis, and treatment since it is a new pandemic and scientists have not fully understood it. For instance, the effect of age, sex, other illnesses, and the environment on the susceptibility of infection. Additionally, there is no evidence that refers that the virus persists after infection.

Is the background of the case's history and progression described in sufficient detail?

Yes

Are enough details provided of any physical examination and diagnostic tests, treatment given and outcomes?

Yes

Is sufficient discussion included of the importance of the findings and their relevance to future understanding of disease processes, diagnosis or treatment?

Partly

Is the case presented with sufficient detail to be useful for other practitioners?

Yes

Competing Interests: No competing interests were disclosed.

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