Case Report

COVID-19 reduces immune competence and precipitates superinfections

Josef Finsterer[1], Fulvio A. Scorza[2]

[1]Department of Neurology, Neurology and Neurophysiology Center, Vienna, Austria, [2]Disciplina de Neurociência, Universidade Federal de São Paulo/Escola Paulista de Medicina (UNIFESP/EPM), São Paulo, Brasil

Abstract

Objectives: Whether infection with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) can be complicated by immune suppression is under debate, but the following case suggests decreased immune competence during and after a SARS-CoV-2 infection. **Case Report:** The patient is a 50-year-old woman with a previous history of transient hyperthyroidism, allergy against ambrosia, and burn-out syndrome, who experienced a mild infection with SARS-CoV-2 during which she developed candida pharyngitis, which was successfully treated with miconazole. Twenty-eight days after clinical recovery from the SARS-CoV-2 infection, she developed right-sided zoster oticus with vestibular neuronitis and was successfully treated with acyclovir. **Conclusions:** The case suggests that infection with SARS-CoV-2 can weaken immune competence and precipitate the development of candidiasis and focal infection with the zoster virus. Even mild infections with SARS-CoV-2 may be complicated by immune-compromise and immune-concomitant superinfections, which is why coronavirus disease 2019 (COVID-19) patients should strengthen their immune system not only during but also after the infection.

Keywords: Candidiasis, COVID-19, immune system, SARS-CoV-2, zoster

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) may not only be harmful due to the direct invasion of cells expressing the angiotensin-converting enzyme 2 (ACE2) receptor on their surface but also due to the individual immune response against the virus.[1,2] Whether the infection also weakens the immune response toward infectious agents other than SARS-CoV-2 is unknown, but superinfections in SARS-CoV-2-infected patients suggest that the immune competence of an infected individual is generally impaired. Whether the diminished immune competence of SARS-CoV-2-infected patients is associated with an increased risk of superinfections is unknown, but the following case suggests such a link. The paper is relevant to the practice of primary care physicians, as they are commonly the first to see such patients. The patient consented to the publication, and the study was approved by the institutional review board.

Address for correspondence: Prof. Josef Finsterer, Postfach 20, 1180 Vienna, Austria.
E-mail: fifigs1@yahoo.de

Received: 30-08-2023 **Revised:** 03-01-2024
Accepted: 09-01-2024 **Published:** 28-06-2024

Access this article online

Quick Response Code:

Website: http://journals.lww.com/JFMPC

DOI: 10.4103/jfmpc.jfmpc_1432_23

Case Report

The patient is a 50-year-old Caucasian woman, with a height of 160 cm and a weight of 63 kg, with a previous history of transient hyperthyroidism, allergy against ambrosia, and burn-out syndrome, who experienced chills without fever (hospital day (hd)-54) followed by tiredness and exhaustibility 1 day later. Swab polymerase chain reaction (PCR) test for SARS-CoV-2 on hd-53 was negative, but otorhinolaryngological investigation revealed candida pharyngitis, successfully treated with miconazole gel for 5 days. Another day later (hd-52), she experienced nausea for 1 h after eating for 3 days. On hd-50, anosmia without impairment of taste occurred. On hd-47, the second PCR test for SARS-CoV-2 turned out positive. Another 2 days later (hd-45), scratching of the throat and painful swallowing developed. Under self-treatment with dried blueberries,

How to cite this article: Finsterer J, Scorza FA. COVID-19 reduces immune competence and precipitates superinfections. J Family Med Prim Care 2024;13:2787-8.

these symptoms disappeared by hd-37. A third PCR test for SARS-CoV-2 on hd-36 turned out negative. On hd-8, she newly experienced panging in the right ear. The otorhinolaryngological investigation on hd-3 was non-informative. On hd-2, the patient noted liquid running out of the right ear. She started with the self-medication acyclovir ointment. On hd-1, she noted blisters in the right external ear canal, swelling of the right auricle, and migraine-like headache, which explains why acyclovir (3000 mg/d) was prescribed by her general practitioner (GP). She was hospitalized 1 day later because of an increasing headache, sensitivity to light, and vertigo. On hd1, acyclovir intravenously was started for 14 days, and clinical neurologic examination on hd2 excluded meningitis. Brain magnetic resonance imaging (MRI) with contrast medium was non-informative. Headache, ear swelling, and ear pain declined, but vertigo slightly increased. A clinical neurologic examination on hd5 only revealed an unsafe treadmill test. Clinical neurologic examination on hd13 revealed an insecure Romberg test, and the treadmill test had to be stopped because of a propensity to fall. Nonetheless, the patient was discharged on hd14 and recommended to use a walker until vestibular neuronitis had completely resolved.

Discussion

The presented patient is intersting for candida pharyngitis during a mildly manifesting SARS-CoV-2 infection and unilateral zoster oticus and vestibular neuronitis 28d after recovery from the SARS-CoV-2 infection. Fungal co-infection in patients with coronavirus disease 2019 (COVID-19) has been previously reported.[3] Even oropharyngeal candidiasis has been previously communicated.[4,5] Not only candidiasis may develop but also aspergillosis, pneumocystosis, mucormycosis, or cryptococcosis.[3,6] Superinfection by the herpes zoster virus has been occasionally also reported as a complication of COVID-19.[7,8] To explain fungal or viral superinfection in COVID-19, it can be speculated that SARS-CoV-2 is complicated by a general immune compromise, as substantiated by lymphopenia, eosinopenia, and reduction in cluster of differentiation (CD4) and CD8 T cells, B cells, and natural killer cells.[9] Critically ill COVID-19 patients additionally have elevated pro-inflammatory (interleukin (IL)-1, IL-2, IL-6, and tumor necrosis alpha) and anti-inflammatory (IL-4 and IL-10) cytokine levels and less CD4 interferon-gamma expression.[10] This is why antifungal treatment was recommended as a prophylaxis in critically ill COVID-19 patients.[10] An argument against a reduction in immune competence by SARS-CoV-2, however, could be that the frequency of varicella zoster, measles, and rubella infections declined during the first COVID-19 wave in China.[11] However, the reduced frequency of these superinfections is no argument against decreased immune competence as to why the frequency of viral superinfections in COVID-19 patients should be compared with a non-COVID-19 cohort.

SARS-CoV-2 may weaken the immune competence and precipitate fungal and viral superinfections. Even mild infections with SARS-CoV-2 may be complicated by immune-compromise and immune-concomitant superinfections, which is why COVID-19 patients should strengthen their immune system not only during but also after the infection.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Shinu P, Morsy MA, Deb PK, Nair AB, Goyal M, Shah J, *et al.* SARS CoV-2 organotropism associated pathogenic relationship of gut-brain axis and illness. Front Mol Biosci 2020;7:606779. doi: 10.3389/fmolb.2020.606779.
2. Ortega MA, Fraile-Martínez O, García-Montero C, García-Gallego S, Sánchez-Trujillo L, Torres-Carranza D, *et al.* An integrative look at SARSCoV2 (Review). Int J Mol Med 2021;47:415-34. doi: 10.3892/ijmm.2020.4828.
3. De Francesco MA, Piva S, Pellizzeri S, Signorini L, Fumarola B, Corbellini S, *et al.* Response to the Letter to the Editor on "Bacterial and fungal superinfections are detected at higher frequency in critically ill patients affected by SARS-CoV-2 infection than negative patients and are associated to a worse outcome". J Med Virol 2023;95:e29192. doi: 10.1002/jmv.29192.
4. Kozlova O, Burygina E, Khostelidi S, Shadrivova O, Saturnov A, Gusev D, *et al.* Invasive candidiasis in adult patients with COVID-19: Results of a multicenter Study in St. Petersburg, Russia. J Fungi (Basel) 2023;9:927. doi: 10.3390/jof9090927.
5. Lee H, Davoudi J, Vistoso A, Khalifeh M, Sedghizadeh P. Reactivated herpetic gingivostomatitis with secondary herpes-associated erythema multiforme and oral candidiasis post-COVID infection: A case report. Clin Case Rep 2023;11:e7175. doi: 10.1002/ccr3.7175.
6. Yassin Z, Farid A, Ahmadi S, Emamikhah M, Motamedi O, Jafari M, *et al.* Coronavirus disease 2019 (COVID-19)-associated brain abscesses caused by Pseudomonas aeruginosa and Aspergillus fumigatus: Two case and a review of the literature. J Med Case Rep 2023;17:520. doi: 10.1186/s13256-023-04206-3.
7. Narasimhan M, Ramakrishnan R, Durai PCT, Sneha B. Association between COVID-19 infection and herpes zoster: A case series. J Family Med Prim Care 2023;12:2516-9. doi: 10.4103/jfmpc.jfmpc_2112_22.
8. Ayoub WAR, Lizzeik D, Berro J, Faddoul S, El Dassouki M, Shatila AR, *et al.* Ramsay Hunt Syndrome in Asymptomatic COVID-19 Infection: A Case Report and a Literature Review. J Clin Med 2023;12:7407. doi: 10.3390/jcm12237407.
9. Anka AU, Tahir MI, Abubakar SD, Alsabbagh M, Zian Z, Hamedifar H, *et al.* Coronavirus disease 2019 (COVID-19): An overview of the immunopathology, serological diagnosis and management. Scand J Immunol 2021;93:e12998. doi: 10.1111/sji.12998.
10. Pemán J, Ruiz-Gaitán A, García-Vidal C, Salavert M, Ramírez P, Puchades F, *et al.* Fungal co-infection in COVID-19 patients: Should we be concerned? Rev Iberoam Micol 2020;37:41-6. doi: 10.1016/j.riam.2020.07.001.
11. Wu D, Liu Q, Wu T, Wang D, Lu J. The impact of COVID-19 control measures on the morbidity of varicella, herpes zoster, rubella and measles in Guangzhou, China. Immun Inflamm Dis 2020;8:844-6. doi: 10.1002/iid3.352.