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Case Report

Case report of actinomycotic liver abscess following COVID-19 infection

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ABSTRACT

Introduction and importance: In the last few years, the novel coronavirus, named severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), generated a large health care problem worldwide. Due to the immunomodulation effect of the virus the number of opportunistic infections has also increased.
Case presentation: We present the unique case of a patient who was diagnosed with an actinomycotic liver abscess after coronavirus disease 2019 (COVID-19) without the presence of any chronic disease or mucosal injury.
Clinical discussion: According to the results of the computer tomography (CT scan) and the liver biopsy, the patient was treated with antibiotics and ultrasound-guided drainage.
Conclusion: With this case we would like to draw attention to the possible occurrence of liver abscesses caused by an opportunistic pathogen following COVID-19.

1. Introduction

Coronavirus disease 2019 (COVID-19) is a severe acute respiratory infection, diagnosed in more than 532 million cases worldwide since 2019 [1]. In the course of the infection, the virus binds to angiotensin-converting enzyme 2 (ACE2) [2]. Although the pathophysiology of COVID-19 has been described in the literature, unfortunately the short and long-term effects of the disease have not yet been identified due to the novelty of the virus [3]. One of the major causative concepts of the evolving conditions following COVID-19 is in rapport with the dysfunction of the immune system [4,5]. As described in previous studies, COVID-19 could cause a reduced number of T-lymphocytes due to immune dysregulation, which might lead to opportunistic infections such as actinomycosis [6]. Actinomycosis, as an opportunistic anaerobic bacterium, colonizes naturally in the oropharynx and the gastrointestinal tract, and usually causes a chronic progressive infection. Actinomycosis results in abscesses of the cervicofacial, thoracic, abdominal, and pelvic regions [7]. Although 5% of the cases show liver abscess [8], actinomycosis has not yet been described as an underlying cause of hepatic abscesses following COVID-19 infection. On account of its novelty, here we report the case of a 28-year-old man with actinomycotic liver abscess after COVID-19 infection according to SCARE2020 guideline [9].

2. Presentation of case

A 28-year-old male patient underwent COVID-19 infection with moderate symptoms, such as subfebrility and headache. The patient had a negative family history and was not taking any medication. Therefore no hospitalization or special medication was needed. Few months later the patient was referred to the emergency department with periodic fever (38–40.1 °C), headache, distention, abdominal strain in the right subcostal region, anorexia, nausea, and vomiting. Physical examination showed meteorism and pain in the epigastric and the right subcostal regions of the abdomen. A contrast-enhanced computer tomography (CT) revealed multiple, septated (30–50 mm) lesions in the 7th and 8th segments and a large (123 × 102 mm) cystic lesion between the 1st and 5th segments, which dislocated the portal vein and compressed the inferior vena cava (Fig. 1). In the inferior vena cava under the branch of the right renal vein and in the common and external iliac veins there

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were non-occlusive thromboses. The CT scan showed consecutive hydrothorax (HTX) in the right pleural cavity and pneumonia on either side of the lung.

A liver biopsy was performed for histological and microbiological analysis which proved actinomycotic liver abscess without any sign of neoplasm. The patient received penicillin G (4x6 ampules intravenously (iv.)), clindamycin (4 × 300 mg iv.) and low-molecular-weight heparin (2 × 0.2ml subcutaneously (sc.)), and was referred to our hepato-pancreatico-biliary surgical center. On the basis of the patient condition (fever, pneumonia, and HTX), he was admitted to the intensive care unit. The patient underwent further examinations to exclude any opportunistic infections. His medical history showed neither chronic diseases nor sudden dental treatment. His laboratory test evidenced anemia (Hb: 108 g/L, Hct: 0.33 L/L), leucocytosis (WBC: 13.7 G/l), elevated C-reactive protein (CRP: 161.5 mg/L), and alkaline phosphatase (159 U/L) (Table 1). The nasopharyngeal culture showed normal flora, aerobic and anaerobic hemocultures, and the pleural fluid sample and a sample from the liver abscess showed negative results. The patient tested negative for human immunodeficiency virus (HIV). The serological markers of autoimmune diseases showed an elevated level of antinuclear antibodies. A CT scan and abdominal ultrasound examination revealed thoracic and pericardial effusion and liver abscesses (S1–S5, S7–S8), which had the same size as the previous CT scan showed, without any other sign of abdominal actinomycosis (Fig. 2).

In accordance with the recommendations, the patient received penicillin G and clindamycin antibiotics, and an ultrasound-guided drainage was performed to treat liver abscesses (18F pigtail drains) and thoracic effusion. From the pleural cavity, 200 ml pellucid, yellowish fluid was collected during the first day. Two other drains were placed into the liver, one of them (D1) into the superior (S1–S5) and the other one (D2) into the inferior region (S7–S8). From the larger liver abscess (D1) around 50 ml pus was drained at the time of the drainage, and lavage was performed on a daily basis. One week later, the patient was completely asymptomatic, the parameters of inflammation and the liver enzymes decreased according to the laboratory test, and the control CT scan showed regression of the fluid and abscess both in the chest and the abdomen. Less than 2–3 ml fluid was drained off therefore, the chest, the D1, and the D2 drains were removed after 7/9/12 days, respectively. The patient was in our surgical center for 14 days and was discharged from hospital in a satisfactory condition. One month later, a control CT scan revealed an inhomogeneous liver tissue at the site of the previous abscesses, although the patient had no symptoms. When three months later an abdominal ultrasound examination was performed as a final chckup, the liver size was in normal range, and the tissue was homogeneous (Fig. 3).

3. Discussion

Actinomycosis is a rare, granulomatosus disease caused by Actinomyces spp. which is an opportunistic, Gram-positive anaerobic bacterium, colonizing naturally in the mouth and the intestinal system [10,11]. Although the pathogenesis of actinomycosis is not yet completely understood, studies have shown that local mucosal injury, such as tooth extraction or abdominal surgical interventions could play an important role in its spread [11]. Another major risk factor of opportunistic infections could be an immune compromised condition [10,12,13]. For the successful therapy of actinomycotic liver abscesses, antibiotics are required for a period of at least two months. Penicillin G together with clindamycine, imipenem or fluoroquinolones can be applied, in the case of penicillin allergy chloramphenicol could be an option [12]. An ultrasound-guided drainage has also been proven to be useful in actinomycotic liver abscess. In case complications, e.g., necrosis, occur, surgery may be indicated (oncotomy). Surgery is usually not sufficient enough to cure the condition; therefore, it should be applied along with antibiotic treatment [12].

In this case, we report a young patient who had an actinomycotic liver abscess, although there were no chronic diseases in his medical history. A few months before the development of actinomycotic liver abscess, the patient was diagnosed with COVID-19 infection, which could affect his immune status.

SARS-CoV-2, which is a novel virus in the coronavirus family, can enter cells through ACE2 receptor [14,15]. In the human body ACE2 receptors are present e.g., in the pulmonary alveolar epithelial cells, enterocytes of the small intestine, the arterial and venous endothelial cells, arterial smooth muscle cells, and cholangiocytes [2,16]. A study revealed that related to the COVID-19 infection, the permeability of the vessels increases in the lungs, which can result in pulmonary edema and hypoxic respiratory failure [3]. As SARS-CoV-2 binds to the ACE2-receptor with a great affinity, the activity of ACE2 is decreased. The impairment of ACE2-receptors activates the kallikrein-bradykinin pathway indirectly, which increases the vascular permeability [17]. One may ask whether the inflammation and the vascular damage in the gastrointestinal tract could serve as a conceivable entrance point for the opportunistic (e.g., Actinomyces spp.) and other pathogens. Actinomycosis is a rare complication of abdominal surgeries, and in 2020, a study revealed that the bacterial translocation and permeability increase during a COVID-19 infection, due to the high expression of ACE2-receptors in the small intestine and colon [18]. As ACE2-receptors are expressed in almost all tissues in the human body, this property of the COVID-19 virus could be an explanation for the rare diseases caused by opportunistic pathogens and other post-COVID syndromes.

According to previous theories on the pathomechanism of COVID-19, the immune system is either weakened or it hyperfunctions due to the

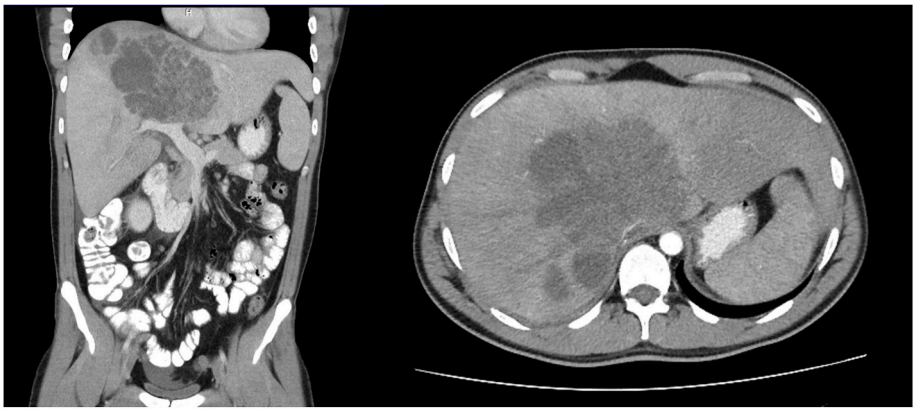

Fig. 1. CT scan showing multiple lesions in the 7th and 8th segments and a large (123 × 102 mm) cystic lesion between the 1st and 5th segments of the liver. The lesions dislocated the portal vein and compressed the inferior cava vena.

Table 1
WBC: White Blood Count, **RBC**: Red Blood Cell, **CRP**: C-Reactive Protein, **INR**: International Normalised Ratio, **GGT**: Gamma-Glutamyl Transferase, **AST**: Aspartate aminotransferase, **ALT**: Alanin aminotransferase, **ALP**: Alkaline phosphatase, **US**: ultrasound.

	At the time of first symptoms	Before US-guided drainage, with antibiotic treatment	After US-guided drainage and antibiotic treatment	At the time of hospital discharge		Normal Range	
WBC count	**28.7**	**13.7**	**9.05**	**9.26**	G/L	4.0	11.0
Neutrophils	**24.8**	**11.14**	**5.94**	**6.10**	G/L	2.5	7.5
Lymph	**0.7**	**1.49**	**2.21**	**2.14**	G/L	1.5	3.5
RBC count	**5.40**	**3.83**	**4.10**	**4.15**	T/L	4.50	6.50
Hemoglobin	**160**	**108**	**116**	**116**	g/L	135	175
Hematocrit	**0.462**	**0.33**	**0.35**	**0.36**	L/L	0.40	0.52
Platelet count	**176**	**510**	**511**	**397**	G/L	150	400
CRP	**149.7**	**161.5**	**41.30**	**14.00**	mg/L		5.0
INR	**1.56**	**1.39**	**1.26**	**1.24**		0.80	1.20
Total bilirubin	-	**13**	**11.1**	**12.2**	µmol/L	5.0	21.0
GGT	-	**187**	**288**	**264**	U/L		55.0
AST	-	**21**	**57**	**29**	U/L		50.0
ALT	-	**11**	**40**	**32**	U/L		50.0
ALP	-	**159**	**183**		U/L	30	120

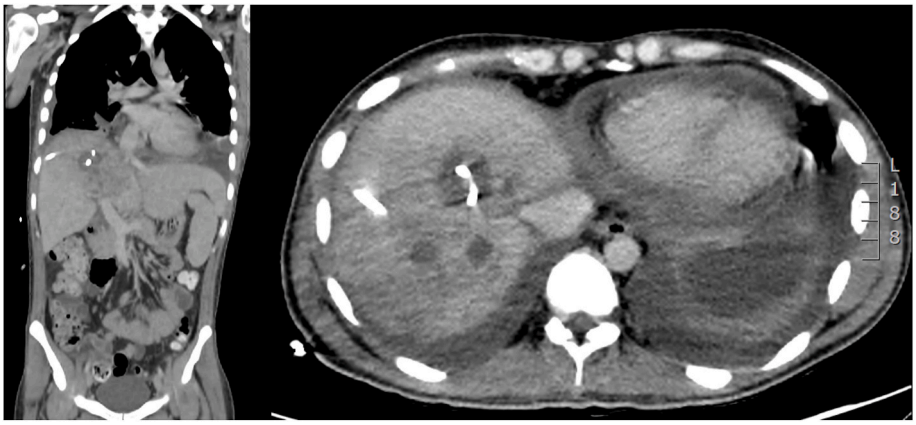

Fig. 2. CT scan showing two drains in the superior and in the inferior part of the liver abscesses. The scan was performed right after the ultrasound-guided drainage.

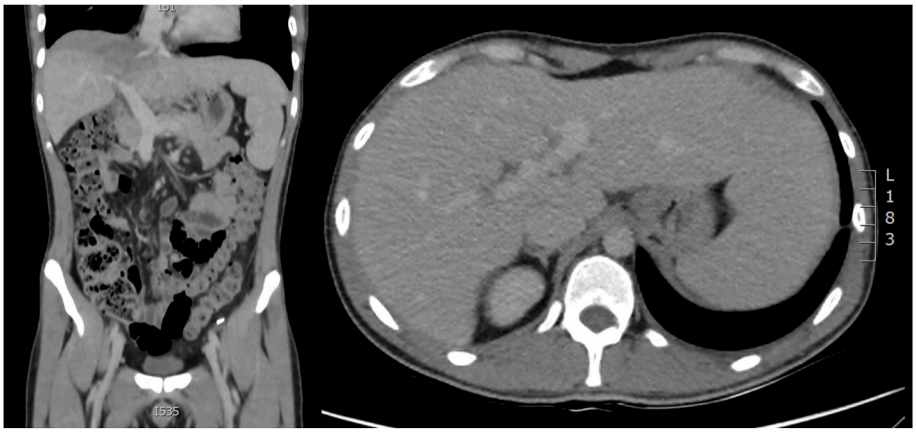

Fig. 3. Control CT scan (at one month) revealing normal liver tissue without any cysts or abscesses.

reduced number of lymphocytes or the 'cytokine storm' [5,6]. Both could result in immune dysregulation, which might lead to a higher risk of opportunistic infections, such as actinomycosis [13]. In this case, the patient had a moderate COVID-19 infection; therefore, glucocorticoids or any other medications were not needed. According to our current knowledge, it is essential to contextualize that the virus does not directly damage the liver; therefore, the infection is probably not the primary cause of the liver abscess [19]. In the literature, there are only a few case reports of actinomycosis related to COVID-19 infection; however, all of them showed cervicofacial location [13,20–22]. Patients in these studies had dental interventions after the COVID-19 infection, which exposed them to a higher risk for opportunistic illnesses [13,20]. So far no actinomycotic liver abscess related to COVID-19 has been reported.

4. Conclusion

In conclusion, we reported the case of a 28-year-old male patient, who had COVID-19 infection, which presumably led to actinomycotic

liver abscess. Although the short- and long-term effects of COVID-19 have not yet been completely elucidated, opportunistic infections as post-COVID syndrome might pose a huge risk for patients. To this end, we recommend to follow up patients with COVID-19 infection, considering that the probability of secondary infections is significant.

Ethical approval

Ethics approval is not required for case reports at our institution.

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Author contribution

KL, ND and AF compiled all relevant information concerning the presented case and did the literature review. AF, ASZ, TH, TK, AO evaluated the whole treatment of the patient. KL and ND prepared the original draft; AF, AO and ASZ reviewed and edited the manuscript.

Registration of research studies

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Guarantor

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Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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Not commissioned, externally peer reviewed.

Declaration of competing interest

The Authors declare that there is no conflict of interest.

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