Coronavirus disease 2019–related hepatic transplant pseudoaneurysm

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ABSTRACT

Coronavirus disease 2019–related transplant hepatic pseudoaneurysms have not been reported but can be life-threatening. They can be either solitary or multiple and can grow rapidly within weeks. They should be classified as mycotic and treated on an emergent basis. Both stenting of the vessel and coil embolization can potentially be viable treatment options of coronavirus disease 2019–related pseudoaneurysms. (J Vasc Surg Cases Innov Tech 2024;10:101469.)

Keywords: COVID-19; Hepatic artery; Liver transplant; Pseudoaneurysm

Coronavirus disease 2019 (COVID-19) is often accompanied by an array of vascular complications such as endothelial injury and thrombosis. There have been several cases detailing pulmonary artery[1,2] and coronary[3] pseudoaneurysms following COVID-19 due to potential multisystem inflammation,[4] immune-mediated inflammation,[5] and vasculitis.[6] Mycotic aneurysms, which arise from arterial wall infections, can potentially result in exsanguination from arterial rupture and systemic sepsis. Untreated aneurysms are often at a risk of rupture and can lead to significant long-term complications for patients. Both viral and bacterial mycotic aneurysms are uncommon and significant complications secondary to atherosclerosis and systemic infection. Solid organ transplant patients, including liver transplant recipients, are at an increased risk of COVID-19 infection due to immunosuppression.[7] Hepatic artery pseudoaneurysms (HAPs) are rare occurrences following upper abdominal intervention or infection and can occur anywhere in the course of the hepatic artery. In this study, we present the cases of two liver transplant patients with active COVID-19 infections within 3 weeks of presenting with HAPs. HAPs secondary to COVID-19 have been scarcely reported[8]; however, to the best of our knowledge, there are no documented cases of HAP in liver transplant patients infected with COVID-19.

METHODS

A retrospective medical record review of patients with vascular abnormalities found on abdominal angiograms performed during the previous 5 years from our institution was conducted. The institutional review board approved this study. All hepatic angiograms, which were performed for a variety of reasons, such as radioembolization, chemoembolization, trauma, post-hepatic transplant–related issues, and spontaneous bleeding events, were reviewed. Two patients were identified as having undergone liver transplant, and both patients had an active COVID-19 infection within the 3 weeks of the period preceding the HPA. Fungal and bacterial cultures were both determined to be negative for both patients. Both patients received sedation for the angiograms due to their infection status. The identified pseudoaneurysms were located in both the main hepatic artery and the distal parenchyma.

RESULTS

Patient 1 is a 53-year-old man who underwent orthotopic liver transplant 4 months previously. He developed signs of biliary obstruction and had an increasing serum bilirubin level. A computed tomography (CT) scan done to evaluate the biliary tree incidentally showed a pseudoaneurysm at the hepatic anastomotic site, which was confirmed by conventional angiography, and measured 4 mm (Fig 1, *A*). A COVID-19 polymerase chain reaction test performed at the time of CT scan was positive. The patient had had multiple negative COVID-19 tests in the past. A 2-week follow-up conventional angiogram performed (Fig 1, *B*) with the intent of treatment showed the aneurysm had grown to 15 mm and was successfully stented. The 2-year follow-up CT scan showed no recurrence of the aneurysm.

Patient 2 was a 61-year-old man who had undergone liver transplant 1 year previously. His aneurysms were incidentally detected on CT imaging. One measured about 4 mm at the anastomotic site and another measured about 3 mm distally in the right hepatic artery. The additional aneurysm that was separate from

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The editors and reviewers of this article have no relevant financial relationships to disclose per the JVS policy that requires reviewers to decline review of any manuscript for which they may have a conflict of interest.
2468-4287

https://doi.org/10.1016/j.jvscit.2024.101469

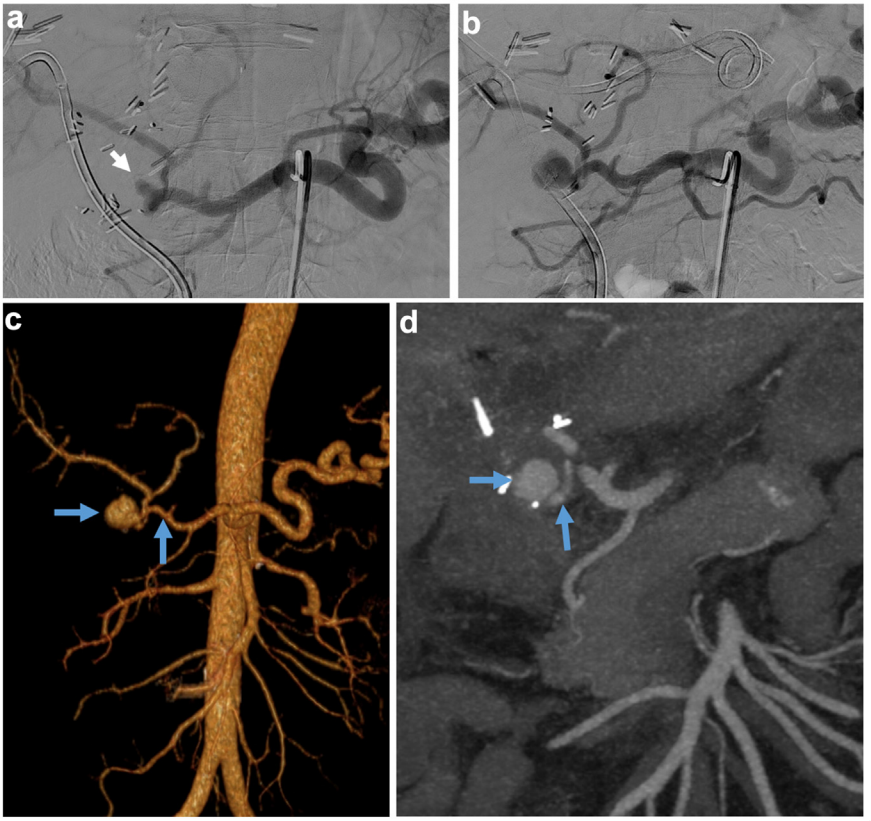

Fig 1. A, Conventional angiogram revealing an outpouching 4-mm aneurysm (*arrow*) from the transplant hepatic artery at the site of anastomosis. **B,** Conventional angiogram performed after 2 weeks showing the aneurysm has increased to 15 mm. **C** and **D,** Computed tomography (CT) angiogram performed after 2 weeks showing the aneurysm has increased in size (*horizontal arrow* indicates the aneurysm; and *vertical arrow,* the tortuous hepatic artery).

the anastomotic site makes anastomotic leakage an unlikely cause of the aneurysm. A COVID-19 test was not done at the time of CT scan; however, a COVID-19 polymerase chain reaction test 1 week before conventional angiography was positive. A follow-up diagnostic angiogram performed 4 weeks later revealed a significant increase in the size of both aneurysms, measuring about 11 × 7mm at the anastomotic site and 12 × 7 mm for the aneurysm in the distal right hepatic artery (Fig 2). The anastomotic aneurysm was successfully stented across, and the distal hepatic artery aneurysm was embolized with coils, with resultant occlusion of the distal artery. Retrograde filling of the right distal branches of the right hepatic artery was noted from the left hepatic artery. The patient showed no signs of recurrence at 3 months. However, the 4-month CT scan showed development of a 3-mm pseudoaneurysm from the left hepatic artery, which remained stable on the 1-month follow-up CT scan.

Neither of the patients were treated with antiviral medications, because they were treated after the period of active infection. Both patients provided written informed consent for the report of their case details and imaging studies.

DISCUSSION

Hepatic artery aneurysms have been reported to be the second most common visceral aneurysms, with an incidence rate of 20%.[9] The mortality rate of hepatic artery aneurysm rupture after liver transplant is reported to be 80% to 100%.[10] HAPs, however, are rare and potentially fatal and rely on early diagnosis and management to improve the prognosis. HAPs are often most commonly attributed to upper abdominal surgery, infection, and trauma. The incidence of HAPs after liver transplant without concurrent COVID-19 infection has been reported to be 0.3% to 2.6%.[11] Although limited literature is available on the anastomosis aneurysm incidence after liver transplantation, one study refers to an incidence of approximately 1.4% in a sample size of 72 patients.[12] HAPs secondary to COVID-19 are not well documented and are thought to be secondary to vasculitis or inflammation. HAPs in liver transplant patients with COVID-19 have not been reported but are a potential result of

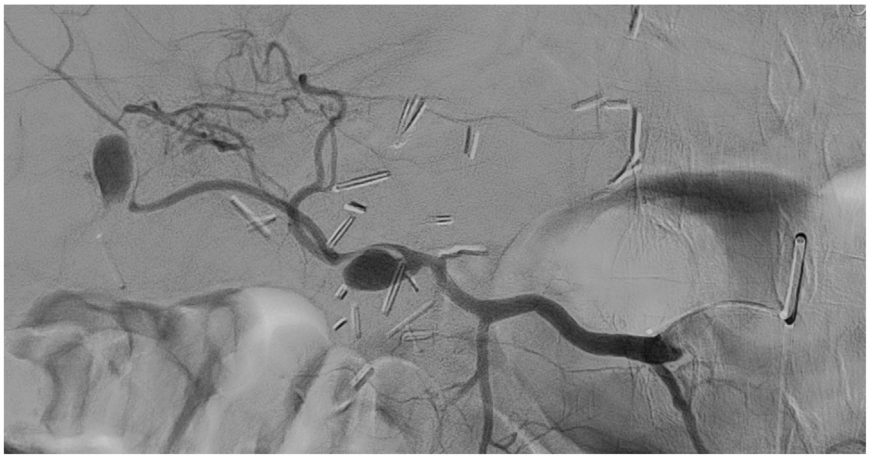

Fig 2. Conventional angiogram performed 4 weeks after computed tomography (CT) scan showing pseudoaneurysms arising at the anastomosis of the transplant hepatic artery and from the right hepatic artery (measuring about 11 × 7 mm and 12 × 7 mm, respectively). Both the aneurysms showed a marked increase in size compared with the initial CT scan.

COVID-19's viral involvement in the liver via endothelial-mediated inflammation. The clinical course of these two patients provides insight into the efficacy of different treatment methods in response to HAPs for liver transplant patients. Both aneurysms were seen to be rapidly expanding in size, which is more likely indicative of a mycotic aneurysm than an anastomotic aneurysm. Because COVID-19–related aneurysms are likely due to vasculitis, they should qualify as mycotic pseudoaneurysms, which can explain the rapid enlargement in size. Immunosuppressive therapy for transplant patients could also contribute to the rapid enlargement of these aneurysms. Although there is no direct relationship between the size of a pseudoaneurysm and incidence of rupture, treatment is the standard for symptomatic and expanding aneurysms >20 mm in diameter.[13,14] Because COVID-19–related pseudoaneurysms qualify as mycotic, we should not follow the stand recommendations regarding treatment related to size; rather, these pseudoaneurysms should be addressed as soon as possible. Although both patients in this study wanted additional time after the diagnosis to consider intervention, we recommend treatment as soon as possible, preferably within 2 weeks of the diagnosis. Following treatment, we recommend imaging after a 1-month interval, with additional imaging at 6 and 12 months. Stenting can serve as an effective form of treatment for HAPs concurrent with COVID-19 infection; however, a larger sample size with long-term follow-up is needed.

CONCLUSIONS

COVID-related pseudoaneurysms of hepatic transplant arteries appears to be rare; however, similar to other infectious or inflammatory pseudoaneurysm, they have the potential to be fatal. The narrow window of time in which pseudoaneurysms were detected after COVID-19 infection makes it difficult to assign a causal relationship between pseudoaneurysm formation and COVID-19 infections in liver transplant patients. The pseudoaneurysms in our small cohort behaved morphologically like mycotic aneurysms and grew rapidly, indicating a role for early intervention. Due to the incidental discovery of pseudoaneurysms in these two patients, we recommend CT angiography surveillance imaging for COVID-19–positive liver transplant patients. Standard endovascular techniques for treating pseudoaneurysms appear to be safe and effective for COVID-19–related pseudoaneurysms.

DISCLOSURES

None.

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Submitted Oct 31, 2023; accepted Feb 22, 2024.