

## American Journal of Transplantation Images in Transplantation – Continuing Medical Education (CME)

Each month, the *American Journal of Transplantation* will feature Images in Transplantation, a journal-based CME activity, chosen to educate participants on current developments in the science and imaging of transplantation. Participants can earn 1 AMA PRA Category 1 Credit™ per article at their own pace. This month's feature article is titled: "Evaluation of a deceased donor liver allograft from a COVID-positive donor."

### Accreditation and Designation Statement

This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of John Wiley & Sons, Inc., the American Society of Transplant Surgeons, and the American Society of Transplantation. John Wiley & Sons, Inc. is accredited by the ACCME to provide continuing medical education for physicians, and fulfills the requirements for the American Board of Surgery (ABS) for Maintenance of Certification (MOC).

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### Statement of Need

Coronavirus-19 (COVID) remains a widespread disease within the US population and is also prevalent in potential deceased organ donors. Little evidence and guidance are available on best practices for utilization of COVID-positive donor organs or the complications that can occur with these donors.

### Purpose of Activity

This activity was designed to raise awareness of an uncommon finding in deceased donor liver procurement, and to strategize how best to evaluate organ quality especially when utilizing organs from COVID-positive donors.

### Identification of Practice Gap

There is currently a lack of experience in the transplant community in utilizing organs from COVID-positive donors. We present an unusual finding to heighten surgeon awareness when evaluating COVID-positive organs as well as provide recommendations for early recognition to avoid recipient morbidity and mortality.

### Learning Objectives

Upon completion of this educational activity, participants will be able to:

- Identify a rare finding from a COVID-positive donor liver allograft.
- Describe the evaluation of a COVID-positive organ during the back table preparation
- Demonstrate how to inform potential recipients about the risks associated with COVID-positive organs.
- Recommend appropriate next steps when unexpected findings are identified during back table preparation of donor organs.

### Target Audience

This activity has been designed to meet the educational needs of physicians and surgeons in the field of transplantation.

### Disclosures

No commercial support has been accepted related to the development or publication of this activity. John Wiley & Sons, Inc. has reviewed all disclosures and resolved or managed all identified conflicts of interest, as applicable.

### Editor-in-Chief

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### Instructions on Receiving CME Credit

This activity is designed to be completed within an hour. Physicians should claim only those credits that reflect the time actually spent in the activity. This activity will be available for CME credit for 12 months following its publication date. At that time, it will be reviewed and potentially updated and extended for an additional 12 months.

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- Complete the required evaluation and print your CME certificate.

# Evaluation of a deceased donor liver allograft from a COVID-positive donor

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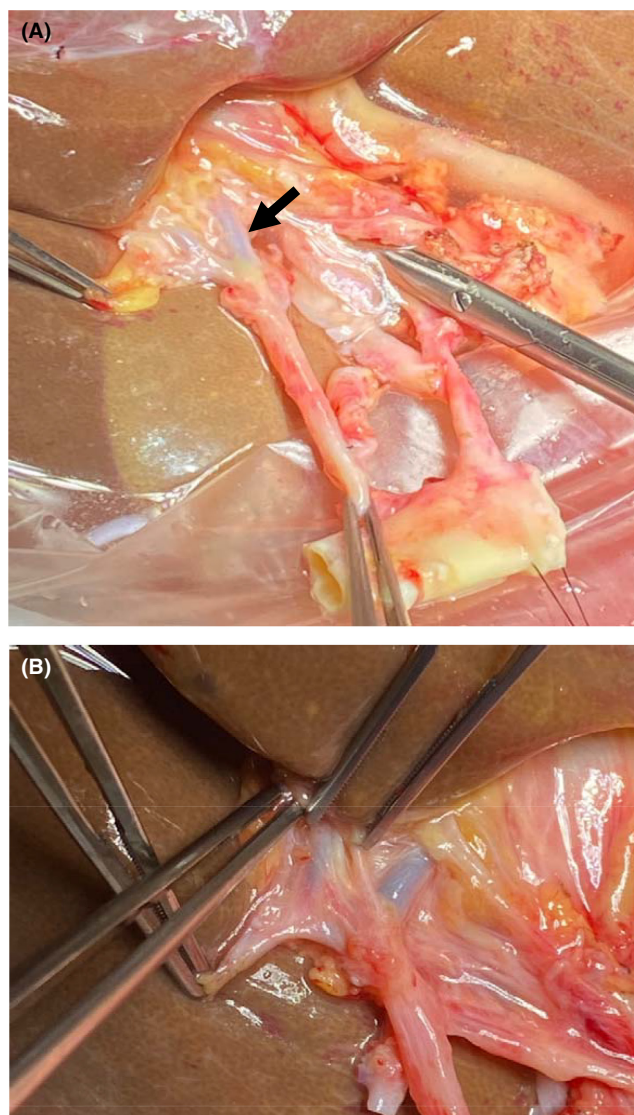
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A 41-year-old female presented to the ER with shortness of breath after a diagnosis of COVID-19 ten days prior. She had a BMI of 32 and a history of hypertension. She was started on therapeutic-dose Lovenox on hospital day two. Seven days into her admission, the patient suffered an extensive right ischemic stroke with herniation. She was declared brain dead one day later and authorized for organ donation. Liver function tests (LFTs) peaked at aspartate aminotransferase 259 u/L, alanine aminotransferase 158 u/L, alkaline phosphatase 73 u/L, and total bilirubin 0.6 mg/dL. Liver enzymes acutely rose and then fell two days prior to donation. Terminal LFTs were aspartate aminotransferase 19 u/L, alanine aminotransferase 34 u/L, alkaline phosphatase 73 u/L, and total bilirubin 0.6 mg/dL. Peak and trough platelet and INR levels were  $282 \times 10^9/L$ ,  $117 \times 10^9/L$ , and 1.1, 1.2, respectively. The patient was hemodynamically stable with no documented vasopressor use or tachyarrhythmias. During the donor operation, the liver was congested initially but improved after diuresis. Biopsy revealed 20% macrosteatosis. There was an accessory/replaced right hepatic artery. The liver flushed well in situ and on the back-table via the portal vein. Both kidneys were procured and transplanted. At the recipient center, the hepatic artery was dissected to the gastroduodenal artery (GDA) to perform reconstruction of the accessory/replaced right hepatic artery. The hepatic artery distal to the GDA appeared discolored (Figure 1) and dissection was continued up to the bifurcation for further evaluation.



**FIGURE 1** Low (A) and high magnification (B) photographs of the bifurcation of the common hepatic artery, the GDA, and the right and left hepatic arteries. Distal to the GDA, a distinct purple hue is visibly appreciated through the arterial walls that demonstrated resistance to arterial flushing on the back-table



**FIGURE 2** Thrombi extracted from the right and left hepatic arteries with a subacute appearance and firmness to tactile sensation

## 1 | QUESTIONS

1. What is the most probable diagnosis based on the findings in [Figure 1A and B](#) and [Figure 2](#)?
  - a. Hepatic artery dissection
  - b. Hepatic artery thrombosis (HAT)
  - c. Intramural hematoma of the hepatic artery

- d. Portal venous thrombosis
- e. Ischemic cholangiopathy

2. What pre-donation modality can best be used to evaluate liver allografts in the setting of COVID-positive donors with a history of thrombosis or elevated liver function tests (LFTs)?
  - a. No additional investigation is required
  - b. Arteriogram with interventional radiology
  - c. CT angiogram abdomen with or without delayed images
  - d. Non-Contrast CT of the abdomen
  - e. Duplex ultrasound of the liver
3. Given the finding during the back table preparation of this donor liver, how should COVID-positive donor livers with a history of thrombosis or elevated LFTs be evaluated during and after recovery?
  - a. Early, thorough back table evaluation of the vessels
  - b. Intra-operative angiography
  - c. Back-bench hepatic arterial vasculature methylene blue infusion
  - d. Retrograde hepatic vein flushing
  - e. Visual assessment of liver flush quality
4. If unable to satisfactorily evaluate the extent of thrombosis, what is the safest next step?
  - a. Split the liver and then use the less affected side for transplant
  - b. Liver biopsy
  - c. Decline the organ and cancel the transplant
  - d. Proceed with transplantation and use intra-arterial tPA
  - e. Attempt to re-flush the hepatic artery and portal vein and proceed with transplantation

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