Case Report

Clin Transplant Res 2025;39:169-173
https://doi.org/10.4285/ctr.24.0052

CTR
CLINICAL TRANSPLANTATION AND RESEARCH

pISSN 3022-6783
eISSN 3022-7712

Interventional management of graft hepatic artery dissection in a donor right hepatectomy: a case report

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Received October 23, 2024
Revised December 29, 2024
Accepted January 20, 2025

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Graft hepatic artery dissection (GHAD) is a rare but serious complication in liver transplantation, often leading to graft loss and retransplantation. Treatment typically involves re-establishing arterial flow through primary repair and reanastomosis. We present the case of an 11-year-old female with a history of biliary atresia admitted for decompensation. During back-table preparation following a donor right hepatectomy, GHAD was identified. The dissected segment was excised, but the dissection extended toward the graft. The intima was sutured circumferentially, and anastomosis was completed. Intraoperative ultrasound revealed inadequate arterial flow, prompting perioperative angiography, which identified a narrowed segment at the anastomosis site. An expendable coronary stent was deployed, significantly improving arterial flow. The patient required no further interventions and was discharged on postoperative day 25, with aspirin as the sole antiplatelet agent. This case highlights the effectiveness of stent placement in managing GHAD through an endovascular approach.

Keywords: Hepatic artery; Dissection; Hepatectomy; Interventional radiology; Liver transplantation

INTRODUCTION

Graft hepatic artery dissection (GHAD) is a rare but devastating complication in orthotopic liver transplantation, with an estimated incidence of less than 1%. It can lead to graft loss and the urgent need for retransplantation [1–3]. Graft salvage typically involves restoring arterial flow through primary repair, excision of the dissected area, reanastomosis, and, if necessary, the use of a Fogarty balloon catheter or vascular grafts. We report a rare case of GHAD in living donor liver transplantation (LDLT), successfully managed using a coronary artery stent. This innovative approach, which bypassed the dissection and restored arterial flow, is infrequently documented in the literature. Additionally, we provide a brief review of existing cases of GHAD in LDLT, emphasizing the need for specialized expertise in both surgical and interventional radiology.

CASE REPORT

Institutional Review Board approval was not required for

HIGHLIGHTS

- Graft hepatic artery dissection (GHAD) is a rare but potentially severe complication in liver transplantation.
- If not promptly addressed, it can lead to graft failure and may necessitate retransplantation.
- Timely intervention is critical in managing GHAD, and treatment options include surgical correction or minimally invasive techniques, depending on the specific circumstances.
- The prevention of GHAD begins with meticulous techniques during donor hepatectomy and back-table processing, aimed at protecting the hepatic artery and reducing the risk of injury.
- Interventional radiology plays a pivotal role in the perioperative management of GHAD, demonstrating well-established efficacy in graft preservation and long-term patient outcomes.

this report at our institution. Written informed consent for publication was obtained from the patient's parent.

An 11-year-old female with a history of biliary atresia, previously treated with the Kasai procedure, was referred to our center for complications related to significant portal hypertension. The donor, her mother, had a replaced right hepatic artery identified on imaging. A living donor right hepatectomy was performed without perioperative complications. However, GHAD was noted during back-table preparation. The right lobe liver graft, along with segments 5 and 6 for drainage, was transplanted successfully, and reperfusion was uneventful. The dissected segment of the hepatic artery was excised proximally to identify a nondissected area, but the dissection extended further toward the graft's hepatic artery. The intima was sutured circumferentially to the adventitia with 8-0 polypropylene, and anastomosis was completed using a continuous-interrupted technique. A Roux-en-Y hepaticojejunostomy was performed for biliary reconstruction. Initial Doppler ultrasonography showed adequate arterial flow with normal waveforms, but subsequent intraoperative ultrasound failed to confirm sufficient flow. Perioperative celiac angiography revealed reduced arterial flow, with a narrowed segment approximately 3 mm distal to the anastomosis, extending into the graft (Fig. 1A). A 2 × 15 mm coronary stent was deployed in the dissected graft hepatic artery, significantly improving arterial flow (Fig. 1B). The patient was heparinized and placed on dual antiplatelet therapy with aspirin and clopidogrel. No further interventions were required, and the patient was discharged on postoperative day 25 with acetylsalicylic acid as the sole antiplatelet agent. Postoperative computed tomography angiography confirmed stent patency. Unfortunately, the patient died 2 years posttransplant due to cytomegalovirus (CMV) pneumonia (Fig. 2).

DISCUSSION

Hepatic artery complications in orthotopic liver transplantation, such as thrombosis, stenosis, aneurysms, and dissections, are infrequent but critical. If untreated, they can lead to graft failure, urgent retransplantation, or death [4]. GHAD is rarer than complications involving the recipient's hepatic artery. While most GHAD cases are diagnosed intraoperatively, some are detected postoperatively through

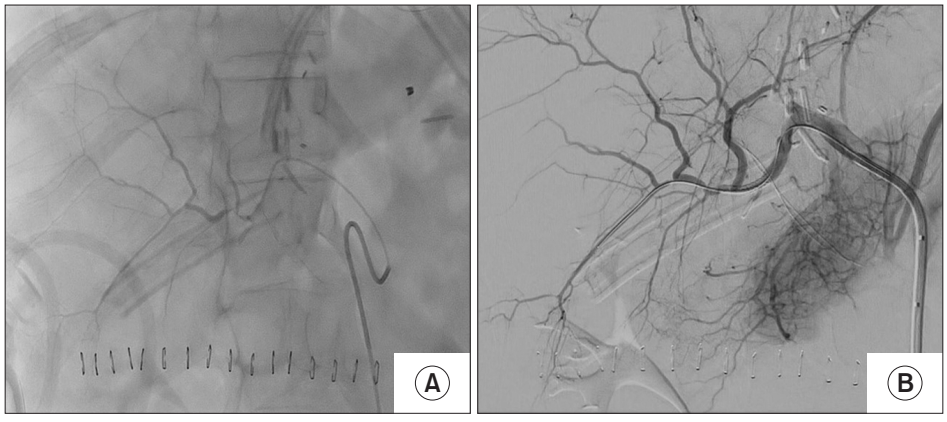


Fig. 1. (A) Before and (B) after placement of the coronary artery stent in the dissected segment.

https://doi.org/10.4285/ctr.24.0052

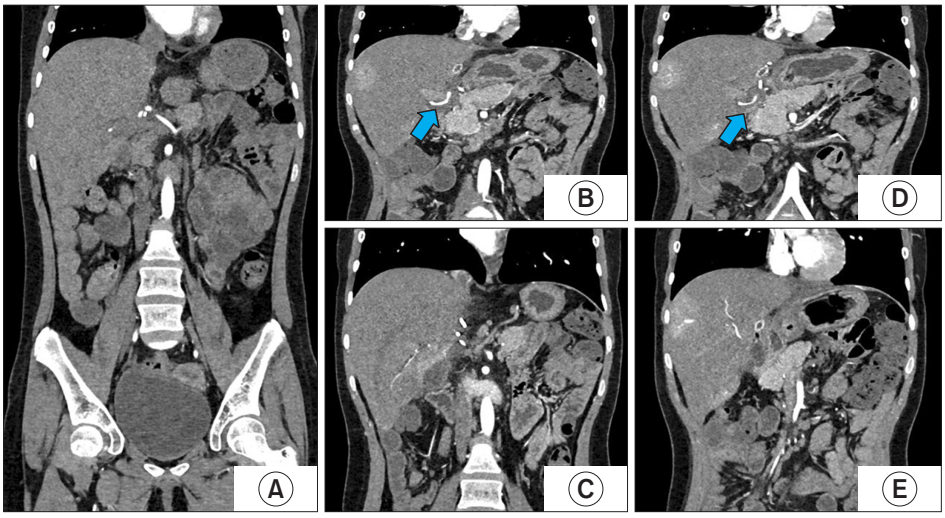


Fig. 2. Postoperative computed tomography angiography showing stent patency. (A) Arterial integrity can be seen prior to stent's location. (B, D) Coronary stent is identified as hyperdense object (indicated by the blue arrow). (C, E) Patency of the stent can be seen by distribution of arterial flow through the graft.

Doppler ultrasonography or radiologic follow-up. Historically, GHAD has been managed with interventions such as Fogarty balloon catheterization, anastomosis reconstruction, or primary repair, with some cases requiring retransplantation. However, recent case reports suggest that endovascular approaches can effectively preserve hepatic artery flow and maintain long-term liver function. For example, Nakamura et al. [5] described a case where GHAD secondary to an aneurysm was treated with reanastomosis of the left hepatic artery using a saphenous vein graft, with an uneventful 13-month follow-up. Sheng et al. [6] reported a case of a dissecting iatrogenic pseudoaneurysm of the allograft artery that required retransplantation. Abdelaziz et al. [7] described a hybrid approach combining microsurgical reanastomosis and endovascular stent placement, which maintained arterial flow during early follow-up, though long-term outcomes remain unreported. Ma et al. [8] reported a case of a late-diagnosed dissecting aneurysm where stenting failed, but coil embolization of the pseudoaneurysm was successful. Despite this, the patient succumbed to complications, including gastrointestinal bleeding and opportunistic infections, underscoring the challenges of managing such complex cases [8].

Due to the rarity of GHAD, there is a lack of extensive comparative studies on its management. Most research has focused on hepatic artery stenosis or complications from oncological surgeries (Table 1). Emerging treatment options increasingly favor interventional radiology over traditional surgical repair. Rostambeigi et al. [9] and Molvar et al. [10] concluded that endovascular approaches—whether through balloon dilation or stenting—have shown comparable outcomes in managing hepatic artery stenosis and dissection. In a retrospective analysis of pediatric liver transplant recipients with hepatic artery complications, Wakiya et al. [11] reported higher success rates, shorter procedural times, and lower posttreatment aspartate aminotransferase and alanine aminotransferase levels with endovascular approaches compared to surgical interventions. These findings suggest that endovascular techniques may offer superior outcomes in this patient population [11]. While more experience is needed to establish their broader use, these methods should be considered essential in the transplantation team's toolkit to mitigate catastrophic vascular complications. In our case, decreased hepatic arterial flow was detected intraoperatively, and a retrograde dissection was suspected. Unlike previous reports, we employed an innovative approach by deploying a coronary artery stent entirely through interventional radiology, successfully maintaining arterial patency with a single anticoagulant and avoiding reoperation or retransplantation. Unfortunately, the patient passed away 2 years posttransplant due to CMV pneumonia.

We emphasize that interventional radiology should be considered a viable option when surgical methods are insufficient to address complications during hepatic artery anastomosis, a critical and delicate stage of liver transplantation. This approach offers a less invasive solution, potentially improving outcomes in challenging cases where conventional surgery is not feasible.

Table 1. Summary of publications on interventional management for hepatic artery dissection and stenosis in liver transplantation

Study	Patient demographics	Cause of GHAD	Detection method	Interventional approach	Outcome
Nakamura et al. (1998) [5]	Adult, male, 51 years old	Hepatic artery aneurysm (dissection)	Preoperative enhanced CT scan, hepatic angiography	Left hepatic artery reconstruction with autogenous saphenous vein graft	• Patent anastomosis, patient alive 13 months postoperation with no recurrence of carcinoma
Rostambeigi et al. (2013) [9]	Mixed age and sex (257 patients)	Hepatic artery stenosis	Postoperative Doppler ultrasound, angiography	Percutaneous balloon angioplasty and stent placement	• Procedural success similar, comparable outcomes, reduced retransplantation rates over time
Molvar et al. (2019) [10]	Adult, mixed age (37-year-old male and 64-year-old male)	Hepatic artery stenosis	Screening Doppler ultrasound, CT angiography, conventional angiography	Balloon angioplasty±stent placement	• Case 1: mild improvement after angioplasty, surgical reanastomosis required due to arterial dehiscence • Case 2: postangioplasty complications led to occlusion, retransplantation required, patient died due to multiorgan failure and infection
Wakiya et al. (2013) [11]	Pediatric (n=14)	Hepatic artery stenosis	Doppler ultrasound, angiography	Endovascular intervention vs. open surgery	• Endovascular group: 5/6 technically successful, 3 had recurrent stenosis (60%) • Open surgery group: 3/8 had recurrent stenosis (37.5%) • Endovascular intervention was less invasive, shorter operative time (160 vs. 428 min), and lower posttreatment AST/ALT levels (P=0.04/0.05) • Recurrence rates were higher in both groups, suggesting need for further study
Duffy et al. (2009) [3]	4,234 Orthotopic liver transplant patients (mixed age and sex)	Hepatic artery thrombosis, portal vein thrombosis	Intraoperative Doppler ultrasonography, CT angiography	Anastomotic revision, thrombolysis, retransplantation, early common hepatic artery occlusion	• Graft survival significantly reduced by hepatic artery thrombosis and portal vein thrombosis • Retransplantation provided superior short-term survival
Moray et al. (2005) [12]	Pediatric patients (n=21)	Hepatic artery thrombosis, hepatic artery stenosis	Doppler ultrasound, angiography	Thrombectomy, reanastomosis, balloon angioplasty, stent placement	• No vascular-related deaths • 14.1% Mortality overall • Long-term patency achieved in most cases
Iwaki et al. (2017) [13]	Adult, female, 48 years old	Isolated spontaneous celiac trunk dissection	Doppler ultrasound, CT angiography	Conservative therapy with antiplatelet agents	• Arterial flow maintained, liver function preserved, no retransplantation, patient well after 18 months
Tannuri et al. (2006) [14]	Pediatric, male, 6 years old	Hepatic artery insufficiency due to intima dissection	Intraoperative Doppler, angiography	Right gastroepiploic artery used for arterial reconstruction	• Arterial flow maintained, no retransplantation, patient alive and well 4 months posttransplantation
Boyvat et al. (2006) [15]	Pediatric patients (n=5)	Hepatic artery thrombosis, hepatic artery stenosis	Postoperative Doppler ultrasound, angiography	Endovascular stenting	• Arterial flow restored, no retransplantation, good long-term survival
Asonuma et al. (2004) [1]	Mixed adult patients	Hepatic artery complications (pseudoaneurysm, intimal dissection)	Doppler ultrasound, CT angiography	Autologous inferior mesenteric artery graft for revascularization	• Successful revascularization with good long-term outcomes
Maksoud-Filho et al. (2008) [4]	Pediatric, male	Hepatic artery thrombosis	Doppler ultrasound, angiography	Thrombectomy with Fogarty balloon catheter, reanastomosis	• Intimal dissection occurred post-thrombectomy, leading to graft loss and retransplantation
Shimata et al. (2020) [16]	Adult (n=2)	Hepatic artery dissection	Postoperative CT, Doppler ultrasound	Interventional radiology, coil embolization (case 1), conservative management (case 2)	• Asymptomatic in both cases • Good long-term survival • Case 1 had successful embolization, case 2 managed conservatively
Current study	Pediatric, female, 11 years old	Hepatic artery dissection	Intraoperative Doppler ultrasound	Coronary artery stent placement, no reoperation	• Maintained arterial flow, cytomegalovirus pneumonia at 2 years posttransplantation

GHAD, graft hepatic artery dissection; CT, computed tomography; AST, aspartate aminotransferase; ALT; alanine aminotransferase.

https://doi.org/10.4285/ctr.24.0052

ARTICLE INFORMATION

Conflict of Interest
No potential conflict of interest relevant to this article was reported.

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