

Successful Endovascular Rescue of a Recurrent Hepatic Artery Graft Thrombosis after Liver Retransplantation

Antonio Borzelli¹, Gianluca Cangiano¹, Francesco Pane¹, Milena Coppola¹, Felice D'Antuono¹, Alessandro Punzi¹, Fabio Corvino¹, Antonio Corvino² and Raffaella Niola¹

¹Vascular and Interventional Radiology, AORN "A.Cardarelli," Napoli, Italy

²Motor Science and Wellness Department, University of Naples "Parthenope," Napoli, Italy

Hepatic artery thrombosis (HAT) is a severe and potentially graft-threatening complication after liver transplantation, associated with biliary ischemia, graft failure, and high mortality. We report the case of a 43-year-old woman with primary sclerosing cholangitis who developed early HAT after orthotopic liver transplantation. An initial endovascular recanalization attempt was unsuccessful, and progressive ischemic cholangiopathy required liver color Doppler with aorto-hepatic arterial reconstruction. During follow-up, recurrent hepatic artery graft thrombosis was detected. Given the high surgical risk, an endovascular approach was undertaken. Successful intraluminal recanalization was achieved using percutaneous transluminal angioplasty and balloon-expandable stent placement, resulting in restoration of hepatic arterial flow. Follow-up imaging confirmed sustained graft patency and preserved liver perfusion. This case highlights the role of timely endovascular intervention as a viable graft-saving option in selected patients with complex post-transplant HAT.

Keywords: Hepatic Artery Thrombosis; Liver Transplantation; Endovascular Therapy; Stent; Angioplasty; Graft Rescue

Received: 29 January 2026; Accepted: 4 March 2026

INTRODUCTION

Hepatic artery thrombosis (HAT) is one of the most severe vascular complications following liver transplantation, with reported incidence ranging from 2% to 9% in adult recipients and a well-established association with graft loss and biliary ischemic injury [1–3]. Although early diagnosis and prompt treatment might allow graft salvage, management remains challenging and no standardized therapeutic algorithm has been universally adopted [4]. Retransplantation is traditionally considered the definitive treatment; however, it is frequently limited by organ availability and by the clinical

instability of affected patients [1,5]. In selected cases, surgical revascularization may be attempted, but technical feasibility and outcomes depend on timing and local vascular conditions. Over the last decade, endovascular approaches—including intra-arterial thrombolysis, angioplasty, and stent placement—have emerged as less invasive alternatives with encouraging results in appropriately selected patients [1,4,6]. Patients undergoing liver retransplantation represent a particularly high-risk subgroup for vascular complications owing to previous arterial manipulation, complex anatomy, and the need for alternative inflow strategies such as aorto-hepatic reconstruction. Complications involving aorto-hepatic conduits are uncommon but technically demanding, and published experience remains limited. Isolated reports have described endovascular management of aorto-hepatic bypass thrombosis or conduit-related complications [7,8]; however, data specifically addressing recurrent HAT after retransplantation in the setting of aorto-hepatic reconstruction are exceedingly scarce. Herein, we report a complex case of recurrent HAT occurring after liver retransplantation with aorto-hepatic reconstruction successfully managed by endovascular recanalization. This case highlights the

Corresponding author:

Antonio Borzelli, Vascular and Interventional Radiology, AORN "A.Cardarelli," Via A.Cardarelli, 80137, Napoli, Italy.

Email: antonio.borzelli@libero.it

© 2026 The Author(s)

This is an open access article published under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

technical considerations and clinical decision-making process in an extremely challenging vascular scenario and underscores the potential role of endovascular therapy even in highly selected post-transplant settings [9].

CASE PRESENTATION

A 43-year-old woman with a 15-year history of primary sclerosing cholangitis presented in October 2024 with hepatic decompensation, including elevated serum transaminases, gamma-glutamyl transferase, and alkaline phosphatase. Imaging revealed chronic liver disease with cirrhotic nodular remodeling and progressive cholestasis. The patient underwent orthotopic liver transplantation in November 2024. Anticoagulation post-transplant included oral acetylsalicylic acid 100 mg/day and subcutaneous heparin 4000 IU/day. On postoperative day 5, color-Doppler ultrasound and computed tomography (CT) angiography demonstrated complete thrombosis of the hepatic artery graft; selective digital subtraction angiography (DSA) confirmed the finding (Figure 1*a,b*). An initial endovascular recanalization attempt was unsuccessful, due to complete graft thrombosis, and a conservative observational strategy was adopted. In the following weeks, the patient developed fever and progressive hyperbilirubinemia. CT revealed ischemic cholangiopathy with multiple intrahepatic bilomas and abscesses. Follow-up CT in January 2025 (Figure 2*a–c*) revealed two large bilomas in the left and right hepatic lobes, treated with percutaneous image-guided drainage, along with additional abscessed bilomas in segment VI. Persistent fever, right upper quadrant pain, and septic deterioration led to liver retransplantation in March 2025. During retransplantation, arterial inflow was reconstructed using a donor hepatic artery graft anastomosed to the

anterior abdominal aorta. The postoperative course was initially favorable until September 2025, when follow-up color-Doppler ultrasound and CT angiography (Figure 3*a,b*) demonstrated thrombosis of the hepatic artery graft with minimal opacification of intrahepatic branches. At this stage, anticoagulation included oral acetylsalicylic acid 100 mg/day, with subcutaneous heparin 4000 IU/day added after diagnosis of recurrent graft thrombosis. Given the high surgical risk, endovascular revascularization was performed via right common femoral artery access. DSA confirmed graft occlusion (Figure 4*a*). Using a 0.018-inch guidewire, successful intraluminal recanalization of the graft and intrahepatic branches was achieved. Sequential percutaneous transluminal angioplasty (PTA) (Figure 4*b,c*) and deployment of overlapping balloon-expandable stents restored arterial patency. During the procedure, intravenous heparin 2500 IU was administered. Final post-procedural DSA demonstrated technical success with complete graft revascularization (Figure 4*d*). Post-procedurally, dual antiplatelet therapy with clopidogrel 75 mg/day plus acetylsalicylic acid 100 mg/day was given for 30 days, followed by acetylsalicylic acid 100 mg/day alone from day 31 onwards, which the patient is advised to continue lifelong to prevent stent thrombosis. Early post-procedural CT two weeks after the intervention confirmed stent patency and adequate arterial perfusion. Subsequent color-Doppler ultrasounds (Figure 5*a–c*) at one, two, and three months demonstrated sustained graft patency with normal arterial waveforms. At four-month follow-up, CT angiography (Figure 6*a,b*) confirmed preserved stent and hepatic arterial tree patency, with homogeneous arterial enhancement of the liver parenchyma. The patient remains asymptomatic and in excellent clinical condition at the most recent follow-up.

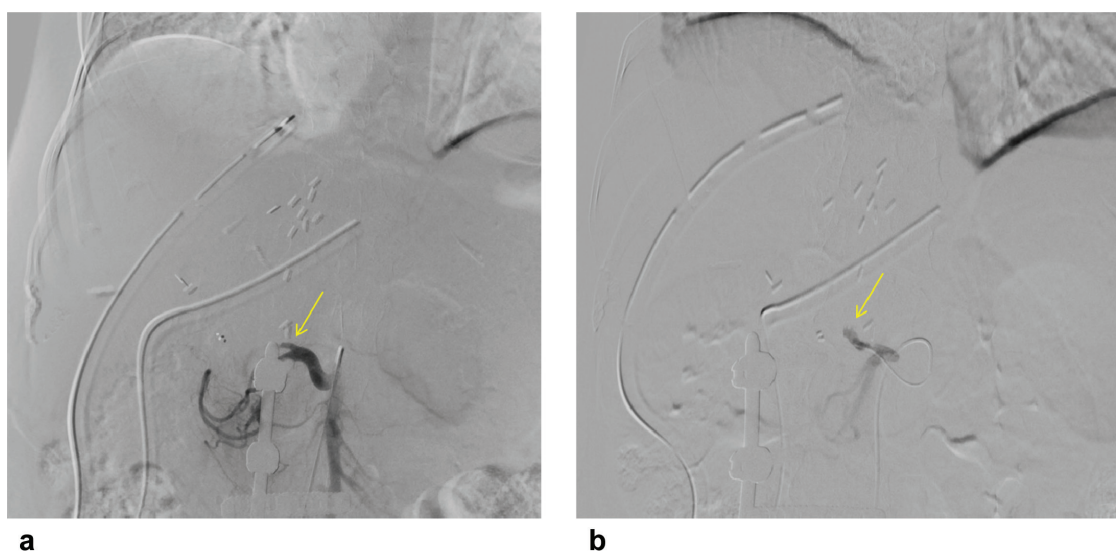


Figure 1 Digital subtraction angiography. Selective catheterization of the superior mesenteric artery (**a**) and super-selective catheterization (**b**) of the graft hepatic artery, after the first liver transplant, showing complete thrombosis (yellow arrows) of the hepatic artery graft.

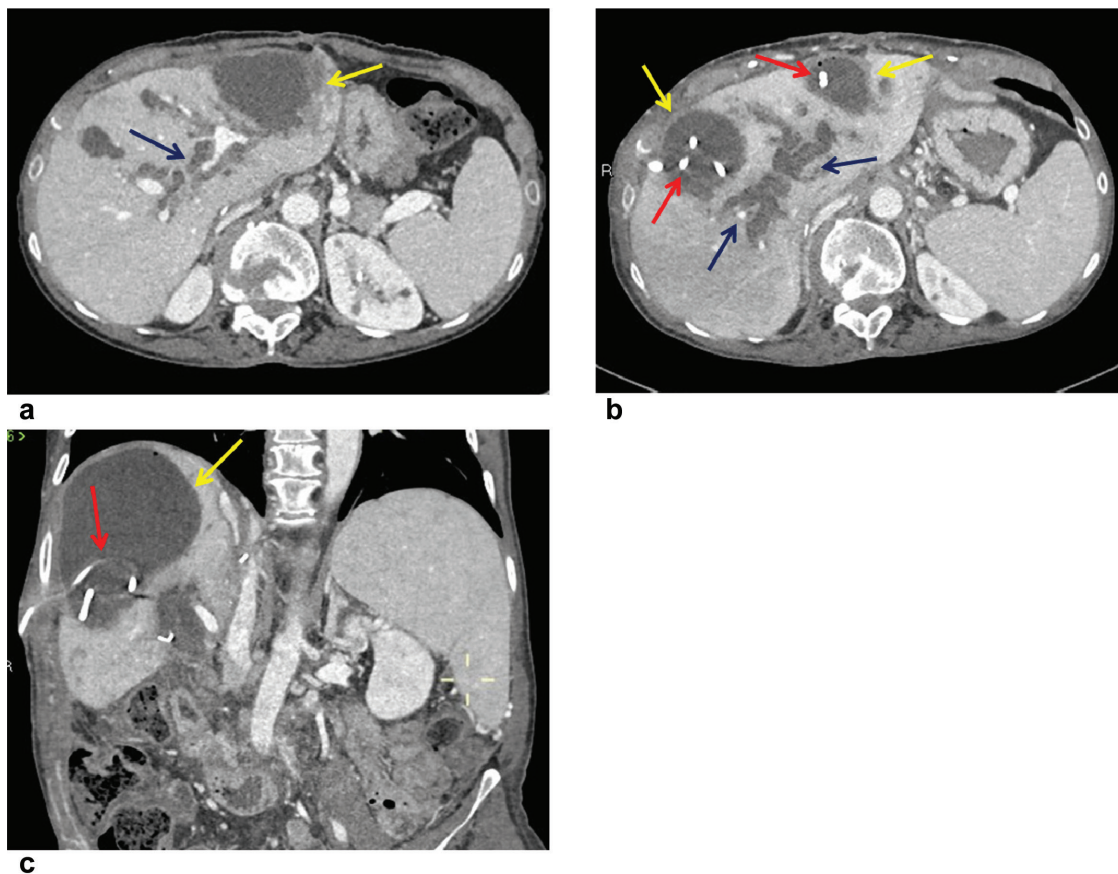


Figure 2 Computed tomography (CT) scan. CT scan showing in axial (**a,b**) and coronal (**c**) reconstruction showing ischemic cholangiopathy after the first liver transplant with evidence of biliary tree dilation (blue arrows) and development of two large bilomas (yellow arrows) measuring 71 mm × 47 mm in the left hepatic lobe and 89 mm × 74 mm in the right hepatic lobe, which were treated with percutaneous image-guided drainage (red arrows).

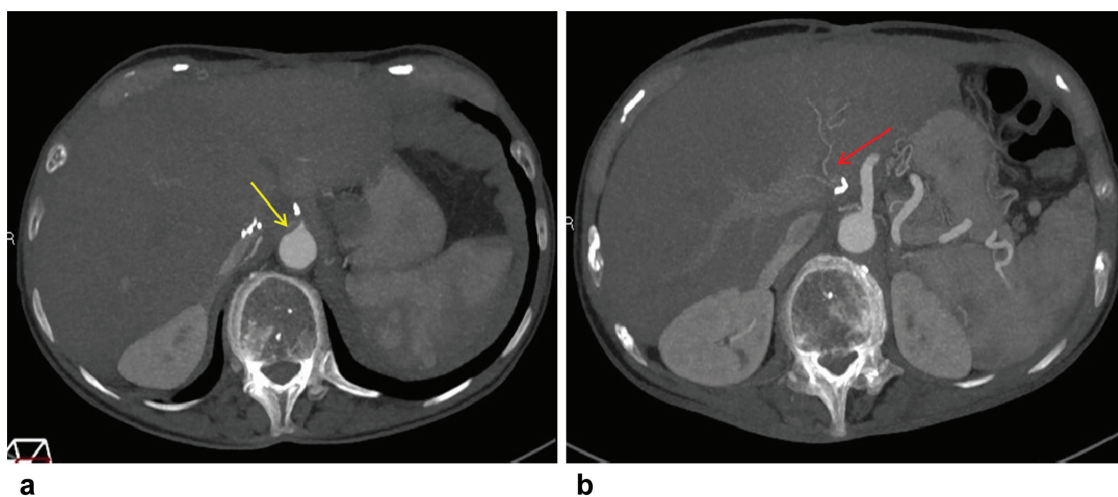


Figure 3 Computed tomography (CT) scan. CT scan after retransplantation showing in axial reconstructions (**a**) the complete thrombosis (yellow arrow) of the new hepatic artery graft anastomosed directly to the anterior wall of the abdominal aorta and (**b**) the faint opacification (red arrow) of the intrahepatic arterial branches.

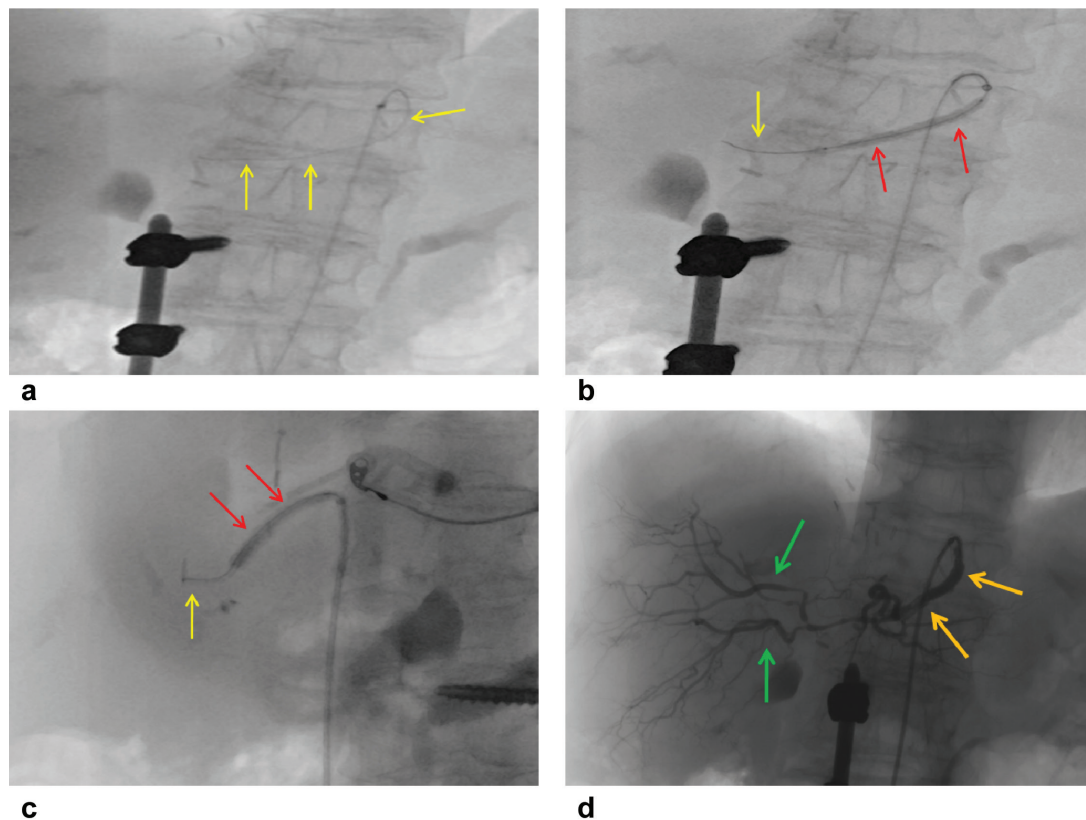


Figure 4 Digital subtraction angiography. Selective catheterization of the hepatic artery graft after retransplantation: recanalization of the lumen (a) employing a 0.018-inch guidewire (yellow arrows) and subsequent (b,c) angioplasty (red arrows) and release of two overlapping monorail balloon-expandable stents (5 mm × 19 mm). Final diagnostic angiography (d) showing patency of the main hepatic artery graft (orange arrows) and opacification of the intrahepatic arterial branches (green arrows).

Ethical Approval and Informed Consent

Ethical approval was not required. Informed consent was not required. The information has been anonymised.

DISCUSSION

HAT is a serious vascular complication following liver transplantation, associated with high rates of graft failure, biliary complications, and mortality, particularly when occurring early [10–12]. The biliary tree relies almost exclusively on arterial blood supply; thus, prolonged or complete hepatic arterial occlusion frequently results in ischemic cholangiopathy, including bile duct necrosis, biloma formation, recurrent infections, and sepsis, often necessitating retransplantation [13,14]. Early HAT is traditionally managed with urgent surgical revision or retransplantation; however, these strategies might be limited by technical complexity, poor patient condition, and donor organ availability [15]. Over the past two decades, endovascular techniques have emerged as alternative or rescue strategies, particularly in late-onset HAT or in patients at high surgical risk [16–18]. Reported endovascular approaches

include catheter-directed thrombolysis, PTA, and stent placement, with variable technical and clinical success depending on timing, vessel anatomy, and extent of thrombosis [19]. In the present case, the initial endovascular recanalization attempt after the first liver transplantation was unsuccessful. DSA demonstrated complete thrombosis of the hepatic arterial tree, which precluded guidewire passage and restoration of antegrade flow [16,19]. The patient subsequently developed severe ischemic cholangiopathy, emphasizing the biliary system's limited tolerance of prolonged arterial ischemia [10,18]. Following retransplantation with an aorto-hepatic arterial reconstruction, recurrent hepatic artery graft thrombosis occurred. CT imaging revealed weak opacification of the distal intrahepatic arterial branches. This distal arterial opacification was interpreted not only as a potential predictor of technical success [15,19] but also as indicative of a partial “filtering” thrombosis, in which the lumen was not completely occluded. This residual channel allowed the guidewire to reach the downstream vascular bed, which then became the target for restoring perfusion through sequential PTA and deployment of overlapping stents. This mechanistic insight provides a physiologic explanation for the

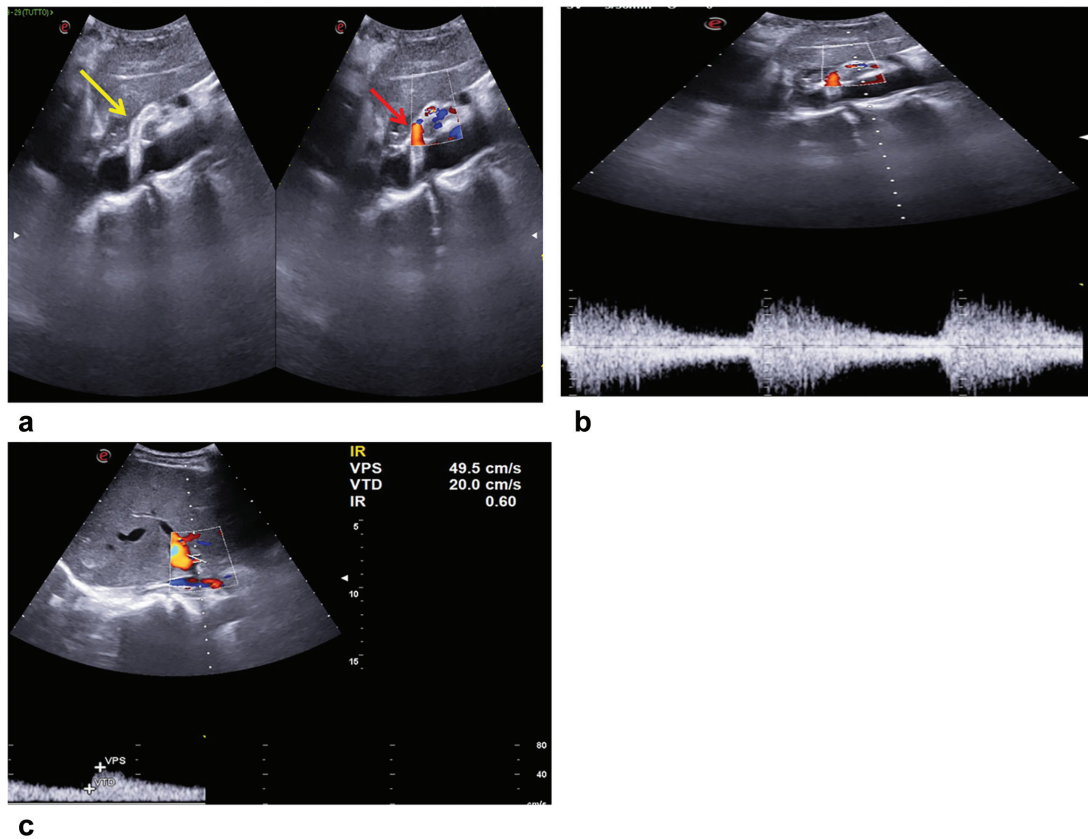


Figure 5 Color-Doppler ultrasound. Follow-up color-Doppler ultrasound after endovascular recanalization showing (a,b) presence of the two overlapping monorail balloon-expandable stents into the hepatic artery graft (yellow arrow), with evidence of regular intra-stent (a,b) (red arrow) and intrahepatic (c) arterial waveforms.

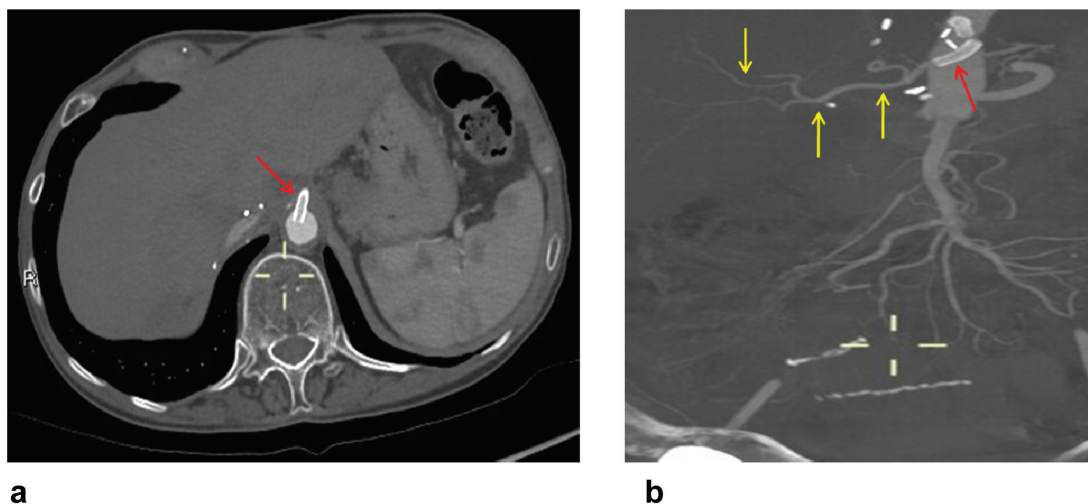


Figure 6 Computed tomography (CT) scan. Follow-up CT scan after endovascular recanalization confirming, in axial (a) and coronal maximum intensity projection (MIP) (b) reconstructions, patency of both the monorail balloon-expandable stents (red arrows) and of the intrahepatic arterial branches (yellow arrows).

angiographic finding and highlights a hypothesis-generating role for distal opacification in guiding endovascular intervention [15,16]. Through a right common femoral artery approach, recanalization of the hepatic

artery graft was achieved using a supportive 0.018-inch guidewire. Sequential PTA and overlapping stent deployment successfully preserved arterial patency and restored intrahepatic perfusion. This experience aligns

with prior reports describing endovascular management of complex hepatic arterial complications, including aorto-hepatic bypass thrombosis [7] and conduit-related stenosis or pseudoaneurysm [8]. Compared with these cases, our patient represents a particularly challenging scenario due to recurrent HAT after retransplantation, emphasizing both technical originality and clinical relevance. The case also underscores the critical role of multimodality imaging—color-Doppler ultrasound, CT angiography, and DSA—in the detection, characterization, and longitudinal monitoring of hepatic arterial complications [20]. Prompt recognition of HAT, careful assessment of distal arterial patency, and timely procedural planning are essential factors influencing both technical and clinical outcomes [21,22]. Sustained stent patency on follow-up imaging confirmed durable arterial perfusion, avoiding further open surgical intervention. Although long-term outcomes and optimal patient selection criteria remain to be fully defined, this case illustrates that endovascular approaches can serve as graft-saving strategies in carefully selected patients. In particular, in the presence of partial distal perfusion, endovascular recanalization may provide a minimally invasive alternative that reduces the need for immediate retransplantation, even after complex aorto-hepatic reconstructions [7,8,22].

CONCLUSION

Endovascular recanalization could represent a safe and effective minimally invasive alternative for managing HAT after liver transplantation, particularly when distal intrahepatic arterial flow is preserved. Careful imaging assessment, procedural planning, and timely intervention are essential to restore arterial perfusion, preserve graft patency, and achieve favorable outcomes. However, these observations are based on a single case, and broader recommendations cannot be drawn. This case illustrates that even complex post-transplant HAT may be successfully managed with minimally invasive endovascular techniques in selected patients.

Ethics Statement

- (1) All the authors mentioned in the manuscript have agreed to authorship, read and approved the manuscript, and given consent for submission and subsequent publication of the manuscript.
- (2) The authors declare that they have read and abided by the JEVTM statement of ethical standards including rules of informed consent and ethical committee approval as stated in the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

Author Contributions

All of the authors substantially contributed to the study and manuscript writing.

Data Availability

The data supporting the findings of this study are not publicly available due to patient privacy and ethical restrictions.

Declaration of the Use of Generative AI and AI-assisted technologies in the writing process

No generative AI or AI-assisted technologies were used during the writing process of this manuscript.

REFERENCES

- [1] Li T, Sun XD, Yu Y, Lv GY. Intra-arterial thrombolysis for early hepatic artery thrombosis after liver transplantation. *World J Clin Cases*. 2021;9(7):1592–99.
- [2] Proposito D, Loinaz Segurolo C, Garcia García I, et al. [Assessment of risk factors in the incidence of hepatic artery thrombosis in a consecutive series of 687 liver transplantations]. *Ann Ital Chir*. 2001;72(2):187–205.
- [3] Abou Ella KA, Al Sebayel MI, Ramirez CB, Rabea HM. Hepatic artery thrombosis after orthotopic liver transplantation. *Saudi Med J*. 2001;22(3):211–4.
- [4] Bekker J, Ploem S, de Jong KP. Early hepatic artery thrombosis after liver transplantation: a systematic review of the incidence, outcome and risk factors. *Am J Transplant*. 2009;9(4):746–57.
- [5] Singhal A, Stokes K, Sebastian A, Wright HI, Kohli V. Endovascular treatment of hepatic artery thrombosis following liver transplantation. *Transpl Int*. 2010;23(3):245–56.
- [6] Kogut MJ, Shin DS, Padia SA, Johnson GE, Hippe DS, Valji K. Intra-arterial thrombolysis for hepatic artery thrombosis following liver transplantation. *J Vasc Interv Radiol*. 2015;26(9):1317–22.
- [7] Ondruška M, Janek J, Kminiak R, Opravil Z. Endovascular treatment of aorto hepatic bypass thrombosis following liver transplantation. *Rozhl Chir*. 2019;98(10):418–21.
- [8] Cooke TM, Harnain C, May B. Management of an aorto hepatic artery conduit pseudoaneurysm and stricture in a patient after a liver transplant. *Cureus*. 2025;17(1):e77720.
- [9] Low G, Alexander GJ, Lomas DJ. Multimodality imaging of liver transplantation complications. *Clin Radiol*. 2011;66:356–66.
- [10] Pareja E, Cortes M, Navarro R, Sanjuan F, López R, Mir J. Vascular complications after orthotopic liver transplantation: hepatic artery thrombosis. *Transplant Proc*. 2010;42(8):2970–72.

- [11] Stange BJ, Glanemann M, Nuessler NC, Settmacher U, Steinmüller T, Neuhaus P. Hepatic artery thrombosis after adult liver transplantation. *Liver Transpl.* 2003;9(6):612–20.
- [12] Silva MA, Jambulingam PS, Gunson BK, et al. Hepatic artery thrombosis following orthotopic liver transplantation: a 10-year experience from a single centre in the United Kingdom. *Liver Transpl.* 2006;12(1):146–51.
- [13] Tian MG, Tso WK, Lo CM, Liu CL, Fan ST. Treatment of hepatic artery thrombosis after orthotopic liver transplantation. *Asian J Surg.* 2004;27(3):213–7.
- [14] Bhattacharjya S, Gunson BK, Mirza DF, et al. Delayed hepatic artery thrombosis in adult orthotopic liver transplantation—a 12-year experience. *Transplantation.* 2001;71(11):1592–6.
- [15] Saad WE, Davies MG, Saad NE, et al. Catheter thrombolysis of thrombosed hepatic arteries in liver transplant recipients: predictors of success and role of thrombolysis. *Vasc Endovascular Surg.* 2007;41(1):19–26.
- [16] Singh AK, Nachiappan AC, Verma HA, et al. Postoperative imaging in liver transplantation: what radiologists should know. *Radiographics.* 2010;30:339–51.
- [17] Abbasoglu O, Levy MF, Vodapally MS, et al. Hepatic artery stenosis after liver transplantation—incidence, presentation, treatment, and long-term outcome. *Transplantation.* 1997;63:250–5.
- [18] Duffy JP, Hong JC, Farmer DG, et al. Vascular complications of orthotopic liver transplantation: experience in more than 4,200 patients. *J Am Coll Surg.* 2009;208:896–905.
- [19] Saad WE, Davies MG, Sahler L, et al. Hepatic artery stenosis in liver transplant recipients: primary treatment with percutaneous transluminal angioplasty. *J Vasc Interv Radiol.* 2005;16:795–805.
- [20] Funaki B, Rosenblum JD, Leef JA, et al. Percutaneous treatment of hepatic artery stenosis in liver transplant recipients: long-term results. *AJR Am J Roentgenol.* 2001;177:381–387.
- [21] Ko GY, Sung KB, Yoon HK, et al. Endovascular treatment of hepatic artery complications after liver transplantation. *J Vasc Interv Radiol.* 2007;18:1323–1332.
- [22] Wu ZY, Chen YF, Wang MQ, et al. Endovascular management of hepatic artery thrombosis after liver transplantation. *CVIR Endovasc.* 2020;3:12.