JACC: CASE REPORTS VOL. 30, NO. 11, 2025

CORONARY, PERIPHERAL, AND STRUCTURAL INTERVENTIONS

CLINICAL CASE

Ischemic Heart Disease in Liver Transplant Candidates With High Bleeding Risk

Any Way Out?

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ABSTRACT

Coronary artery disease in candidates for liver transplantation is a real challenge because of the need to balance the risks of bleeding and thrombosis. Antiplatelet therapy, essential to prevent thrombotic events, may increase the risk of hemorrhagic complications, especially in the context of hepatic surgery. A 71-year-old woman with end-stage liver disease (ESLD) presented for a pretransplantation evaluation. She received a diagnosis of significant coronary artery disease (CAD), and a multidisciplinary discussion resulted in the option for an invasive treatment with several precautions to minimize her bleeding risk. Because of the intricacy of underlying comorbidities and the elevated perioperative risk, managing CAD in patients with ESLD is particularly challenging. More research and evidence are needed on treating CAD in this patient group. Patients with ESLD who are waiting for liver transplantation should have CAD actively screened. Multidisciplinary treatment is crucial to maximizing the results. (JACC Case Rep. 2025;30:103303) © 2025 Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

A 71-year-old woman with a history of nonalcoholic steatohepatits (NASH) experienced decompensated cirrhosis (Child-Pugh class B, 9 points) complicated by refractory ascites, portal hypertension with esophageal varices, congestive gastropathy, and persistent hyponatremia. For these reasons, liver transplantation (LT) was proposed.

She was a former smoker (30 packs/year until 2015), had no previous cardiologic history, and was asymptomatic. Blood analyses revealed anemia and thrombocytopenia, likely secondary to her liver disease. The results of cardiac physical examination

TAKE-HOME MESSAGES

- Because of the high prevalence of cardiovascular problems and comorbidities in this population, patients with ESLD awaiting liver transplantation should have their CAD actively tested and monitored.
- A multidisciplinary strategy is necessary to maximize patient outcomes and reduce risks in this population because of the intricate interactions among liver disease, cardiovascular risk, and the possibility of perioperative complications.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

Manuscript received December 2, 2024; accepted December 16, 2024.

ISSN 2666-0849 https://doi.org/10.1016/j.jaccas.2025.103303

ABBREVIATIONS AND ACRONYMS

CAD = coronary artery disease

CT = computed tomography

DAPT = dual antiplatelet therapy

ESLD = end-stage liver disease

IHD = ischemic heart disease

LT = liver transplantation

NASH = nonalcoholic steatohepatits

PCI = percutaneous coronary intervention

were unremarkable, whereas her abdomen was swollen because of ascites.

Echocardiography showed normal biventricular function (ejection fraction 57%, tricuspid annular plane systolic excursion 22 mm), mild aortic stenosis (average transvalvular pressure gradient 18 mm Hg), and mild to moderate mitral valve regurgitation.

INVESTIGATIONS

On the basis of her risk factors (age, NASH, metabolic disease), despite being asymptomatic, she was referred for computed tomography (CT) coronary angiography. Exercise stress tests were not performed because of the presence of varices.

The scan showed diffuse calcified atherosclerotic disease with a 70% stenosis of the left anterior descending artery, along with nonsignificant stenoses of the right coronary and circumflex arteries. Her calcium score was 1832 Agatston. On the basis of these findings, she was hospitalized to undergo invasive coronary angiography.

Her blood test results at admission were normal except for hemoglobin 8.9 g/dL, platelets 100,000/mcL, high-sensitivity troponin T 15.25 ng/L, N-terminal pro B-type natriuretic peptide (NT-proBNP) 407 ng/L. Of note, the patient had anemia in the absence of any antithrombotic therapy; she also had a history of spontaneous gastrointestinal bleeding. Coronary angiography confirmed the CT findings, the most important being significant stenosis of the mid-left anterior descending coronary artery.

MANAGEMENT

A multidisciplinary consultation, involving various key figures, clinical and interventional cardiologists, heart surgeons, anesthesiologists, hepatologists, and general surgeon was crucial in deciding how to treat the patient's ischemic heart disease (IHD). Several issues were discussed, ranging from the exclusion of coronary artery bypass surgery because of prohibitive

VISUAL SUMMARY Careful Evaluation of the Patient as a Whole for a Proper Patient-Tailored Approach

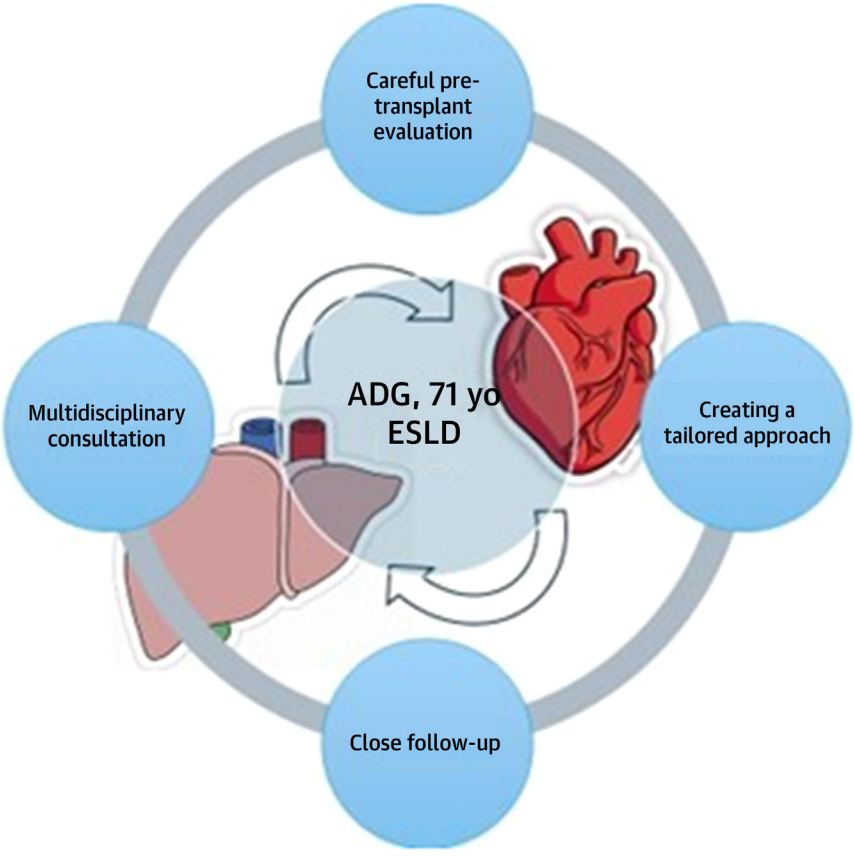
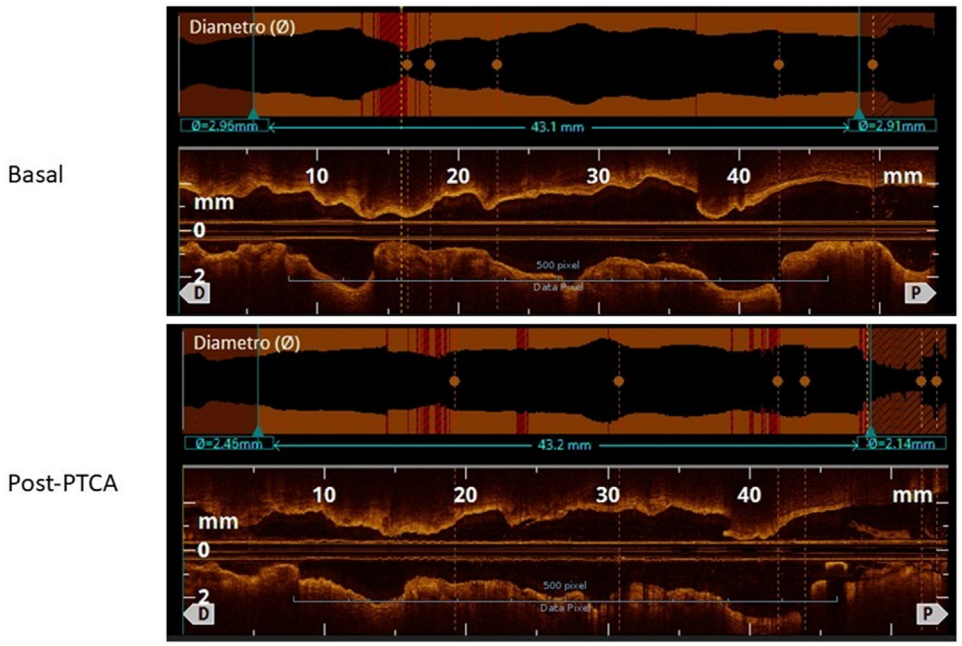


FIGURE 1 **Preprocedural and Postprocedural Images of Anterior Descending Coronary Artery Obtained With Optical Coherence Tomography**



bleeding risk, the high bleeding risk of stenting, and the anesthesiologic risk of LT in the presence of untreated IHD. In the end, the decision to treat the patient with percutaneous coronary intervention (PCI) was made.

In the days preceding the procedure, dual antiplatelet therapy (DAPT) with acetylsalicyclic acid 100 mg and clopidogrel 75 mg was started. The therapy was well tolerated, apart from 1 episode of self-limiting melena that required emo-transfusion. Before initiating the treatment, abdominal drainage was placed to avoid paracentesis while the patient was receiving DAPT. From an interventional standpoint, balloon angioplasty, not stenting, was performed to shorten the duration of DAPT to 1 month. In this respect, a drug-eluting balloon was chosen to reduce the risk of recurrent stenosis. To further optimize the procedure, optical coherence tomography was used to decide the dimensions of the balloon and verify the immediate procedural outcome. The lesion was prepared with a 2.5-mm semicompliant balloon followed by dilation with a 3.5-mm paclitaxel-eluting balloon. Coronary angiography showed almost complete resolution of the stenosis. At intracoronary imaging, the minimal lumen diameter increased from 1.7 to 5.5 mm^2, in the absence of any significant dissection, thus avoiding the need for stent implantation. (Figures 1 and 2).

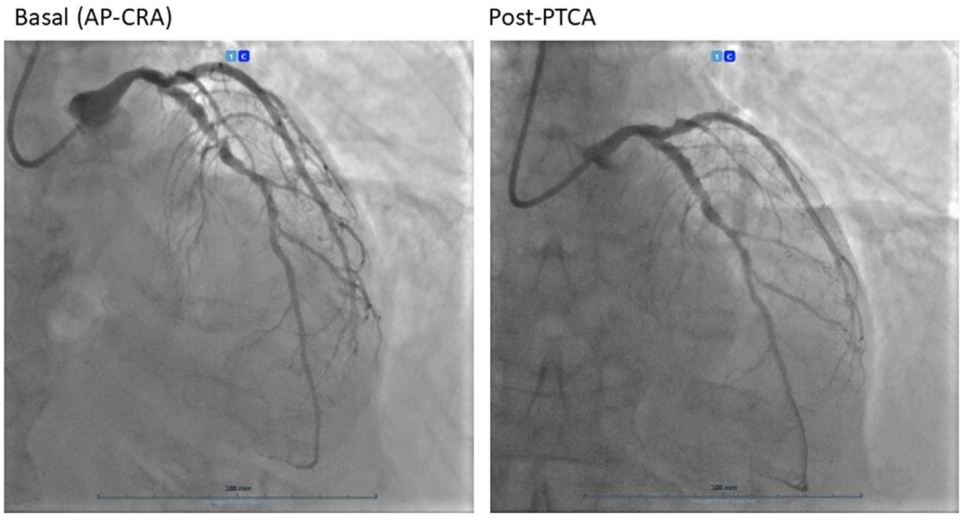
OUTCOME AND FOLLOW-UP

The rest of the hospital stay was uneventful, and the patient was discharged. After 1 month, she experienced severe melena, after which she required 5 blood transfusions. For this reason, clopidogrel therapy was stopped, and only acetylsalicyclic acid 100 mg was continued. The patient was then placed on the LT waiting list with high priority. After 2 weeks, the patient underwent orthotopic LT without any hemorrhagic or thrombotic complication in the postoperative hospitalization; she was then discharged after 3 weeks.

DISCUSSION

IHD is a frequent finding in patients with NASH largely because of common risk factors. Studies show that ≤50% of patients with liver disease are affected also by heart disease.[1] The dramatic increase in the prevalence of NASH in recent years has led to an increase in liver transplantation (LT), a trend further aggravated by the expansion of LT to elderly patients (aged >65 years).[2]

FIGURE 2 Coronary Angiography Images of Left Anterior Descending Artery



Moreover, approximately 15% to 20% of patients who have undergone transplantation experience cardiovascular complications in the postoperative period, which further emphasizes the importance of a targeted therapeutic strategy.

In LT candidates, challenges begin during pretransplantation screening. To assess the potential risks and benefits, patients undergo multidisciplinary evaluation in accordance with recent statements and guidelines. This includes laboratory testing, screening for occult infections and tumors, cardiopulmonary assessment, and psychosocial evaluation (Table 1). From a cardiologic standpoint, it is fundamental to exclude IHD, valvular heart disease, hepatopulmonary syndrome, and pulmonary hypertension.[3] There is no global consensus on the proper cardiac assessment before LT. However, the American Heart Association published a statement in 2022 recommending a risk-based approach in asymptomatic candidates. If an electrocardiogram or transthoracic echocardiogram shows features highly suggestive of chronic heart disease, or if the patient has NASH or ≥2 cardiovascular risk factors, cardiac CT is recommended. Conversely, if the patient has no significant risk factors but is ≥40 years old or has some limitations in his or her physical activity (ie, unable to achieve ≥4 METs), pharmacologic stress echocardiography is indicated.[4]

On the basis of these factors, our patient underwent cardiac CT, an examination characterized by a high negative predictive value (>95%) for the exclusion of significant IHD in patients with ESLD.[5]

Stress echocardiography has an important role in the risk stratification of IHD. Still, many studies have demonstrated its low overall sensitivity in LT as well as its limited ability to identify patients with poor outcomes.[6] In addition, stress echocardiography has various contraindications, such as the presence of esophageal varices, as in our case, or its susceptibility to confounding factors that limit its sensitivity, such as the use of β-blockers as prophylaxis against variceal bleeding.

TABLE 1 Pretransplantation Evaluation

Laboratory testing
Complete blood testing (complete blood count, liver and renal function)
Electrolytes
Serology for hepatotropic viruses and HIV
Urinalysis and urine drug screen
Cardiopulmonary evaluation
Electrocardiogram and echocardiogram
Cardiac stress test: age >40 years or multiple risk factors for coronary artery disease
Cardiac computed tomography
Pulse oximetry and/or analysis of arterial blood gases
Chest x-ray or computed tomography
Pulmonary function in patient with chronic obstructive pulmonary disease
Cancer screening
Accurate search for worrying symptoms
Targeted diagnostic tests
Infectious disease screening
Psychosocial evaluation
Psychiatric and social evaluation
Proper treatment in case of history of abuse

The second challenge in our patient, following the diagnosis of IHD, was how to manage it. LT could not be performed without treating the stenosis of the left anterior descending artery. On the other hand, a typical procedure with stenting had to be avoided to limit the duration of DAPT. Moreover, the patient had a history of spontaneous bleeding in the absence of any antiplatelet therapy. For all these reasons, the decision was made to perform simple angioplasty with a drug-eluting balloon, which offers a low incidence of recurrent stenosis (similar to that of drug-eluting stents) while reducing the need for prolonged antiplatelet therapy and, as a result, reducing bleeding risk. Indeed, drug-eluting stents ideally require 3 to 6 months of antiplatelet therapy, compared with 1 to 3 months for drug-eluting balloons. In our patient, we also performed intracoronary imaging, which is known to improve the outcomes of PCI and for which the indication has been recently upgraded in clinical guidelines for chronic IHD.[7] Further studies are necessary to define the optimal management in this clinical context. However, it is already clear that procedural planning is fundamental to minimize the bleeding risks associated with DAPT and, on the other hand, to avoid recurrent stenosis or thrombosis.[8]

CONCLUSIONS

Balancing bleeding risk and thrombosis in patients who need LT and have IHD is a real challenge. A multidisciplinary examination is necessary to address the unique demands of each patient because of the mix of cardiac and hepatic issues. The post-transplantation results can be considerably enhanced by thorough preoperative planning, optimization of medical therapy, and ultimately PCI. Consequently, it is essential to create personalized protocols that consider the patient's overall condition in order to enhance quality of life and provide improved therapeutic results.

FUNDING SUPPORT AND AUTHOR DISCLOSURES

The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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KEY WORDS antiplatelet, drug-coated balloon, myocardial revascularization, percutaneous coronary intervention