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CASE REPORT

# Heart transplant coronary artery disease: Multimodality approach in percutaneous intervention

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**KEYWORDS**
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**Abstract** Coronary artery disease is the most important cause of late morbidity and mortality after heart transplantation. It is usually an immunologic phenomenon termed cardiac allograft vasculopathy, but can also be the result of donor-transmitted atherosclerosis. Routine surveillance by coronary angiography should be complemented by intracoronary imaging, in order to determine the nature of the coronary lesions, and also by assessment of their functional significance to guide the decision whether to perform percutaneous coronary intervention. We report a case of coronary angiography at five-year follow-up after transplantation, using optical coherence tomography and fractional flow reserve to assess and optimize treatment of coronary disease in this challenging population.
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**PALAVRAS-CHAVE**
Transplante cardíaco;
Doença coronária;
Vasculopatia do enxerto;
Tomografia de coerência ótica;

**Doença coronária no transplantado cardíaco: abordagem anatomofuncional na intervenção percutânea**

**Resumo** Doença coronária é a causa mais importante de morbimortalidade tardia após transplantação cardíaca. Habitualmente, representa um fenómeno imunológico designado como vasculopatia do aloenxerto, mas também pode resultar da aterosclerose transmitida pelo dador. A vigilância através de coronariografia de rotina deve ser complementada pela utilização de imagem intracoronária, de forma a determinar a natureza das lesões, e também através

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*Fractional flow reserve*;
Intervenção coronária percutânea

de uma avaliação funcional para tomada da decisão de realizar intervenção coronária percutânea. Apresentamos o caso de uma coronariografia aos cinco anos de seguimento após transplantação, utilizando tomografia de coerência ótica e *fractional flow reserve* para avaliação e otimização do tratamento da doença coronária nesta população desafiante.
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**List of abbreviations**

| | |
|---|---|
| BMS | bare-metal stents |
| CAV | cardiac allograft vasculopathy |
| DES | drug-eluting stents |
| FFR | fractional flow reserve |
| IVUS | intravascular ultrasound |
| LAD | left anterior descending artery |
| LIMA | left internal mammary artery graft |
| OCT | optical coherence tomography |
| OHT | orthotopic heart transplantation |
| PCI | percutaneous coronary intervention |

## Introduction

Orthotopic heart transplantation (OHT) is the current mainstay treatment for end-stage heart failure refractory to other therapies.[1] Heart transplant coronary artery disease is largely an immunologic phenomenon termed cardiac allograft vasculopathy (CAV), and is the most significant cause of late morbidity and mortality after OHT.[2–4] There is an exponential growth in the incidence of CAV after five years following transplantation, and some studies have also shown an approximately 10% increase in disease incidence with every two-year interval after OHT.[5]

Typically, cardiac transplant recipients do not experience angina because of perioperative denervation. However, they may present with left ventricular dysfunction as a consequence of myocardial ischemia. Therefore, routine surveillance for CAV is recommended by the International Society for Heart and Lung Transplantation, for which coronary angiography is considered the modality of choice.[3]

Treatment of CAV remains a clinical challenge. The options are limited and include the use of oral antiproliferative agents, statins, percutaneous coronary intervention (PCI) and/or repeat OHT, all with suboptimal results.[6]

## Case report

We present the case of a 64-year-old male with ischemic cardiomyopathy who received an OHT from a 42-year-old male donor in 2009. The patient had three-vessel disease and had undergone coronary artery bypass grafting in 1998; in the pre-heart transplantation evaluation only the left internal mammary artery (LIMA) to left anterior descending artery (LAD) graft was patent. Two pre-existing non-occlusive (<50%) stenoses in the mid LAD of the donor heart led to the decision to use the patient's LIMA to anastomose to the donor's LAD during the transplantation procedure.

At five-year follow-up after transplantation, the routine coronary angiography (Figure 1) showed progression of the two mid LAD stenoses (50-70%) and revealed that the LIMA–LAD graft was no longer patent.

The functional significance of the LAD lesions was assessed by measurement of fractional flow reserve (FFR) using a 0.014″ pressure guide wire (PressureWire Aeris™, St. Jude Medical, Uppsala, Sweden). The value obtained was 0.78, suggesting the presence of functionally significant lesions.

The pressure guide wire was then replaced by a 2.7F optical coherence tomography (OCT) catheter (Dragonfly Duo™ imaging catheter, St. Jude Medical, St. Paul, MN, USA) and OCT images (Ilumien Optis™ system, St. Jude Medical, St. Paul, MN, USA) were recorded from the mid to proximal portions of the LAD at an automatic pull-back speed of 20 mm/s and a frame rate of 100/s.

OCT images of the mid LAD segment (Figure 2) showed a lipid-rich plaque with atherosclerotic characteristics, and OCT of the proximal LAD segment (Figure 3) demonstrated intimal hyperproliferation compatible with CAV.

Considering these findings, we decided to treat the two lesions with 3.0 mm×15 mm and 3.0 mm×12 mm Ultimaster™ sirolimus-eluting stents. The result was

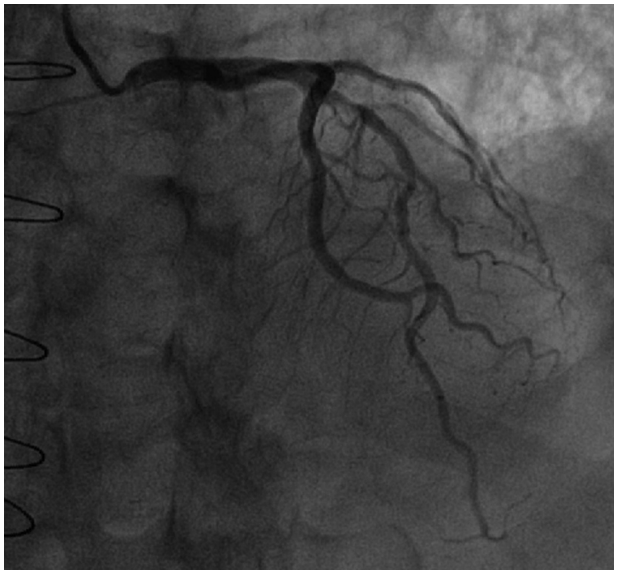

**Figure 1** Coronary angiography: images of the left coronary artery showing two mid left anterior descending artery intermediate stenoses (50-70%).

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