

# Solving controversial findings in a heart transplant recipient with 3D image fusion

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## IMAGING

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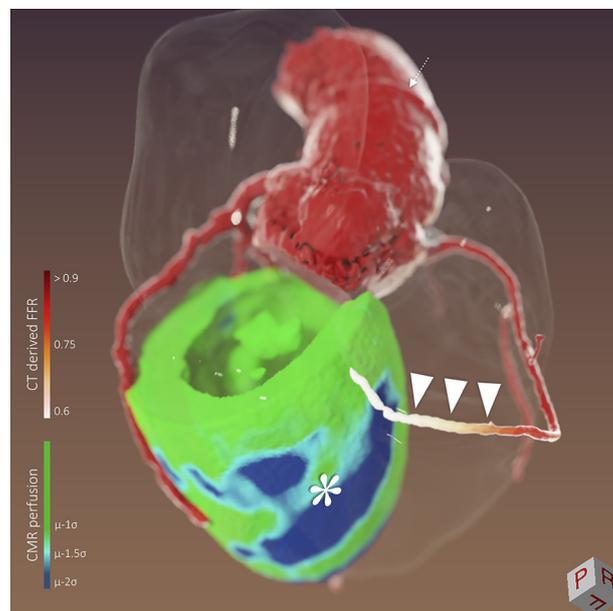
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## IMAGE KIOSK



A 58-year-old male patient presented to our hospital for his yearly routine examination 6 years after orthotopic heart transplantation due to severe ischemic heart disease (the patient was part of a previously published case series 1). The patient was free of symptoms (New York Heart Association, NYHA, I). In ergospirometry, the patient reached 71% of the age-adjusted nominal value. Echocardiography showed a preserved left ventricular function (biplane ejection fraction 63%) without regional wall motion abnormalities. The cyclosporine level was in the target range (123 µg/l, target 100–150 µg/l). Endomyocardial biopsy showed no acute cellular rejection (International Society for Heart and Lung Transplantation, ISHLT, grade 0R, “no evidence of rejection”) after two previous episodes of cellular rejection (ISHLT grade 2R, “moderate rejection”, 24 days and 255 days after transplantation, respectively). Invasive coronary angiography did not show focal coronary artery stenosis. Cardiac magnetic resonance (MR)



*Fig. 1.* 58-year-old male patient 6 years after heart transplantation. Conventional 2D readout of this patient’s image data resulted in incoherent findings. In cardiac MR stress perfusion, an inferior/infero-septal area of hypoperfusion was described – without focal stenosis of the right coronary artery (RCA) in invasive coronary angiography. CT derived fractional flow reserve (FFR<sub>CT</sub>) in combination with 3D image fusion could help: the perfusion deficit in the standard supply territory of the RCA (asterisk) was most likely caused by a long and diffuse concentric lumen narrowing (arrowheads) that also resulted in pathologic FFR<sub>CT</sub> values. Note the aortic suture after orthotopic heart transplantation (dotted arrow).

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adenosine stress perfusion imaging showed a large area of myocardial hypoperfusion of the inferior and infero-septal wall (standard supply territory of the right coronary artery, RCA, ischemic burden 22%).

As shown in Fig. 1, retrospective analysis including calculations of the computed tomography (CT) derived fractional flow reserve ( $FFR_{CT}$ ) and 3D multimodal, multiparametric image fusion [1] explained these controversial findings: the inferior/infero-septal perfusion deficit correlated with a long, thin RCA with pathologic  $FFR_{CT}$  values (0.68, threshold 0.8). The diffuse concentric narrowing of the RCA lumen was most probably caused by cardiac allograft vasculopathy (CAV) – a long term complication of heart transplant recipients [2]. CAV is characterized by fibrotic proliferation and intimal thickening leading to diffuse lumen restriction of the graft coronary arteries. As known from the literature, diffuse lumen narrowing can lead to flow restrictions similar to those resulting from focal stenosis of higher degree [3].

This patient case highlights the importance of using complementary diagnostic tests in order to resolve apparently controversial findings. 3D fusion of CT and MR

imaging can be advantageous for a correct and precise correlation of coronary disease with myocardial ischemia.

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