J Cardiovasc Imaging. 2022 Oct;30(4):276-278
https://doi.org/10.4250/jcvi.2022.0069
pISSN 2586-7210·eISSN 2586-7296

Journal of Cardiovascular Imaging JCVI

Editorial

Multiparametric Cardiac Magnetic Resonance Imaging for Diagnosing Cardiac Allograft Vasculopathy

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▸ See the article "Multiparametric Cardiac Magnetic Resonance Imaging Detects Altered Myocardial Tissue and Function in Heart Transplantation Recipients Monitored for Cardiac Allograft Vasculopathy" in volume 30 on page 263.

Received: Jun 1, 2022
Revised: Jul 3, 2022
Accepted: Jul 6, 2022
Published online: Jul 19, 2022

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Conflict of Interest
The author has no financial conflicts of interest.

Cardiac allograft vasculopathy (CAV) is a late complication of heart transplantation and is characterized by concentric proliferation of intima along the length of coronary vessels.[1] It is a multifactorial process involving immune and nonimmune mechanisms.[2] According to the registry of the International Society for Heart and Lung Transplantation (ISHLT),[3] prevalence of CAV is 8% and 47% by 1- and 10-years post-transplant, respectively. Considering the adverse long-term outcomes in CAV patients,[3][4] early diagnosis is important.

Invasive coronary angiography (ICA) has been used as a gold standard for diagnosis of CAV, especially when combined with intravascular ultrasound (IVUS) and optical coherence tomography.[5] However, ICA can have potential complications, including allergic reactions to contrast, contrast-induced nephropathy, and procedure-related vascular complication.[6] Although sensitivity of ICA is as low as 30% because of the diffuse nature of CAV with a lack of normal reference segments, use of intravascular imaging in clinical practice is limited.[7] Therefore, non-invasive imaging techniques including cardiac magnetic resonance (CMR) for detection of CAV have been investigated recently.

Most studies using CMR have focused on myocardial perfusion imaging and strain imaging.[8][9] Korosoglou and colleagues[9] demonstrated reduced myocardial perfusion reserve (MPR) in transplant recipients with mild CAV (< 50% stenosis in at least one coronary vessel), severe CAV (≥ 50% stenosis in at least one coronary vessel), and those of angiographically normal arteries compared with age-matched controls. MPR allows differentiation between grades of CAV. Diastolic strain rate also was reduced in CAV patients.

Although several studies have shown that elevated native T1, T2, and extracellular volume fraction (ECV) may be markers of acute rejection,[10][11] few studies have focused on the relationships between these parameters and CAV. In this issue of *Journal of Cardiovascular Imaging*, Abbasi and colleagues[12] demonstrated structural (T1, T2, and ECV values) and functional parameters of CMR in patients monitored for CAV beyond the first-year post heart transplantation. The study included 77 heart transplantation recipients and 18 matched controls who underwent CMR. All patients underwent ICA for diagnosis and grading of CAV. A total of 73% of heart transplantation recipients presented with CAV. In the results,

global T2 (50.6 ± 3.4 ms vs. 45.5 ± 2.1 ms, p < 0.001) and ECV (27.6 ± 3.7% vs. 25.1 ± 3.4%, p = 0.004) values were significantly elevated in transplant recipients compared to controls. This result is compatible with previous studies that compared CMR parameters among transplant recipient and controls.[13] Those studies hypothesized that myocardial fibrosis as well as myocardial edema are associated with increased ECV. Increased T2 value suggests myocardial edema.[13] Higher global T2 value (53.6 ± 3.2 vs. 50.6 ± 2.9, p = 0.02) and lower left ventricular ejection fraction (54 ± 9% vs. 59 ± 9%, p = 0.02) were observed in CAV grade 2/3 compared to CAV grade 1. The authors explained that differences between CAV grade 1 and CAV grade 2/3 demonstrate the progressive nature of the disease, with greater degrees of stenosis causing significant myocardial disease detectable by T2 mapping.

One limitation of this study is that it did not include myocardial perfusion imaging for assessing microvascular disease. Also, it did not include late gadolinium enhancement image analysis. Last, ICA was conducted without the use of IVUS as a standard reference. Therefore, intimal thickening in the angiographically normal coronary arteries may have remained undetected. Nevertheless, this study is noteworthy because it demonstrates and reinforces the potential utility of structural and functional parameters from multiparametric CMR imaging to noninvasively detect and grade CAV.

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