Reduction of cardiac allograft vasculopathy by PCI: Quantification and correlation with outcome after heart transplantation

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Background: Percutaneous coronary intervention (PCI) might improve outcome of heart transplanted (HTx) patients at severe stages of cardiac allograft vasculopathy (CAV). Yet, risk stratification of HTx patients after PCI remains challenging. The International Society for Heart and Lung Transplantation (ISHLT) provides a nomenclature for CAV classification that does not include patients after PCI (1). It is unclear how to define an individual optimal CAV reduction and how to stratify patients with CAV after PCI. Besides, whether risk-stratification tools of non-transplanted patients apply to HTx patients with CAV is uncertain.

Purpose: To assess whether the ISHLT CAV classification remains prognostic after PCI, and whether risk stratification models of non-transplanted patients can be applied to HTx patients with CAV.

Methods: At two European academic centers, 203 patients were stratified according to CAV severity and PCI history, and patients were assigned to only one cohort: cohort 1 (ISHLT CAV grade 1, without PCI, n=126) or cohort 2 (ISHLT CAV grades 2&3, with PCI). At first diagnosis of CAV or first PCI, respectively, ISHLT CAV grades, SYNTAX scores I and II (SXS-I and SXS-II) were used to quantify baseline and residual CAV (rISHLT, rSXS-I, rSXS-II). A rSXS-I > 0 defined incomplete revascularization (IR). Five-year mortality was assessed. For cohort 2, first reintervention was a secondary outcome. Baseline parameters were also included into analysis.

Results: SXS-II predicted mortality in cohort 1 (Hazard ratio [HR] 2.5 [1.4–4.8], p=0.004), whereas SXS-I (HR 4.2 [1.4–12.2], p=0.009) and SXS-II (HR 7.1 [2.0–24.5], p=0.002) predicted mortality in cohort 2. Post-PCI, IR (HR 5.4 [1.7–17.0], p=0.004), high rISHLT (HR 3.6 [1.3–10.2], p=0.02) and highest tertile of rSXS-II (HR 5.1 [1.6–15.9], p=0.006) were associated with higher mortality. In cohort 2, post-transplant interval and KDIGO category of renal function at timepoint 0 were also predictors of 5-year mortality after first PCI (HR 1.1 [1.0–1.2], p=0.004 and HR 4.5 [1.8–11.3], p=0.01, respectively). In bivariable Cox analysis, baseline SXS-II, IR, rSXS-II, post-transplant interval and KDIGO category of renal function remained predictors of 5-year mortality. The interval to first reintervention was inversely related to baseline SXS-I (r=-0.55, p<0.001) and rSXS-I (r=-0.50, p=0.003).

Conclusion: A higher reduction of stenotic CAV was associated with improved 5-year survival rate after first PCI. ISHLT CAV classification could apply for risk stratification after PCI and SYNTAX-scores could be complementary for risk stratification and individualization of invasive follow-up of HTx patients with CAV.
Figure 1. Study flow chart.

CABG, coronary artery bypass graft; CAV, cardiac allograft vasculopathy; HTx, heart transplantation; ISHLT, International Society for Heart and Lung Transplantation.
A. Freedom of mortality according to residual ISHLT CAV grades.

B. Freedom of mortality according to dichotomization in complete vs. incomplete revascularization (residual SYNTAX Score I = 0 vs. residual SYNTAX Score I > 0).

C. Freedom of mortality according to the tertiles of residual SYNTAX Score II.

*P*-values of log-rank tests are shown.

CAV, cardiac allograft vasculopathy; ISHLT, International Society for Heart and Lung Transplantation; rISHLT CAV, residual CAV grade according to ISHLT nomenclature; rSXS, SYNTAX Score; rSXS, residual SYNTAX Score; PCI, percutaneous coronary intervention.

Figure 2. Kaplan-Meier curves (cohort 2)