Prevalence and time course of arrhythmia-induced cardiomyopathy in patients with newly diagnosed heart failure and concomitant tachyarrhythmia – the TACHY-HF pilot trial

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Background: Arrhythmias may often be a result of heart failure, but they can also cause left-ventricular systolic dysfunction (LVSD), thereby presenting as arrhythmia-induced cardiomyopathy (AIC). AIC-diagnosis is established retrospectively when LVSD normalizes or improves significantly over time following rhythm restoration. However, the prevalence and most importantly the time course of this relevant disease remain unclear and hence merit investigation to enable the correct diagnosis.

Purpose: Therefore, our aim was to evaluate a) the occurrence of AIC in this clinical relevant cohort of patients with newly diagnosed and otherwise unexplainable LVSD and concomitant tachycardia and b) the time needed to fulfill the diagnostic criteria of AIC in order to facilitate a diagnostic algorithm.

Method: We prospectively screened patients hospitalized for newly diagnosed and otherwise unexplainable LVSD (i.e. left ventricular ejection fraction (LVEF) <50%) and coexisting tachyarrhythmia (atrial fibrillation/flutter + heart rate (HR) >100/min) in 3 cardiological centers. Coronary angiography and cardiac magnetic resonance imaging were performed to exclude other causes for LVSD. Patients underwent a rhythm control strategy in accordance to the local clinical pathways. LVEF was assessed by echocardiography at presentation and at follow-up (FU) visits after 2, 4, and 6 months. Patients who lost sinus rhythm (SR) during FU were excluded. Patients with any increase of ≥15% in absolute EF or an EF ≥50% with an improvement of ≥10% after 6 months of FU were assigned to the AIC-group, which is a common definition of AIC. All others were assigned to an idiopathic DCM-group as final comparator.

Results: 68 patients were eligible, 18 of them were excluded: 1 lost to follow-up, 1 PCI, 2 COVID-19, 1 diagnosed cancer, 1 withdraw consent and 12 lost SR. Thus, our sample consists of a total of 50 patients. At presentation, mean±SD HR was 121±17/min. After rhythm therapy, HR normalized (67±10/min) and LVEF increased in both groups, see fig. 1. Surprisingly, only 9 patients did not fulfill the AIC-criteria in this specific collective resulting in a prevalence of 82% (95%-CI: 68% – 92%). This high prevalence of AIC underlines the importance of the disease. 2 and 4 months after rhythm intervention, 58% and 73% of patients fulfilled AIC-criteria (fig. 2). The sensitivity for detection of AIC by echocardiographic LVEF-measurement at months 2 and 4 of FU was 65% and 86% with a specificity of 100%, emphasizing that a FU of 6 months is necessary to certainly distinguish between AIC and idiopathic DCM.

Conclusion: The prevalence of AIC in patients with newly diagnosed and otherwise unexplainable LVSD with concomitant tachycardia is 82%. Analysis of the time course of AIC clearly suggests that the final diagnosis cannot be established before 6 months after successful rhythm restoration. These results may help to improve diagnosis of AIC in daily clinical practice.
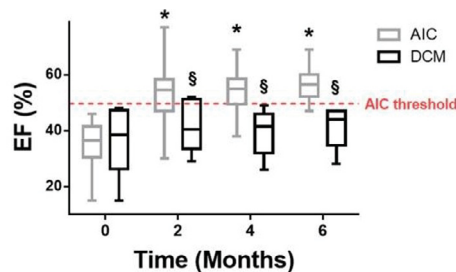
Fig. 1: Box plots of the time course of left ventricular ejection fraction (EF) for patients with arrhythmia-induced cardiomyopathy (AIC) vs. patients with dilated cardiomyopathy (DCM) at admission (month 0) and after 2, 4 and 6 months. The red broken line represents the threshold for AIC. Patients above the AIC threshold in the DCM group showed no absolute EF improvement of at least 10%. * P<0.05 vs. 0 months, § P<0.05 vs. the respective AIC group.
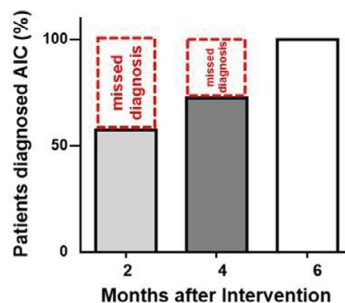

Fig. 2: Bar graph for the proportion of patients diagnosed as arrhythmia-induced cardiomyopathy (AIC) after 2, 4 and 6 months. AIC-criteria are: a) an absolute improvement of left ventricular ejection fraction (LVEF) of at least 15% or b) an LVEF of ≥50% with an absolute improvement of at least 10% after 6 months.