Non-Invasive Assessment of the VT Substrate Beyond Scar in Non-Ischemic Cardiomyopathy (NIAVAS-2)

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Non-ischemic cardiomyopathy (NICM) is a heterogeneous condition where ventricular tachycardias (VTs) are not fully explained by fibrosis alone, as many patients do not have detectable scar. This study evaluated whether regional activation dispersion (rAD), a functional metric derived from non-invasive electrocardiographic imaging (ECGI) during substrate mapping, identifies invasive deceleration zones (DZs) and the presence of Late Gadolinium Enhancement (LGE), and whether it is associated with arrhythmic risk. A total of 60 patients with NICM, categorized into VT+ (n=29) and VT- (n=31) cohorts, underwent cardiac magnetic resonance (CMR) for structural LGE assessment and ECGI mapping to calculate rAD. Results demonstrated that rAD was significantly higher in regions containing DZs ($p < 0.01$) and identified 72% of these zones (AUC = 0.83), even in the absence of detectable scar. The study specifically investigated the ability of rAD to distinguish LGE+ (scar) from LGE- (healthy) substrate, finding that rAD effectively differentiated these regions in patients with documented VT ($p < 0.001$), though it could not do so in those without arrhythmias ($p = 0.3$). In a multivariate analysis, both scar core burden ($p = 0.045$) and rAD during pacing ($p = 0.002$) were independently associated with VT occurrence. Notably, rAD during right ventricular pacing showed higher discriminatory performance for VT risk compared to scar core burden, with an AUC of 0.81 versus 0.71. These findings suggest that rAD captures functional arrhythmogenic substrate beyond structural imaging and may significantly improve risk stratification in NICM.