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Myocardial extracellular volume in patients with aortic stenosis undergoing valve intervention - A multicentre T1 mapping study

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On behalf of ECV440 Investigators

Background: The development of myocardial fibrosis is a key mechanism in the transition from compensated hypertrophy to heart failure in aortic stenosis (AS). Focal and diffuse fibrosis can be quantified using cardiac magnetic resonance (CMR) imaging late gadolinium-enhanced (LGE) and T1 mapping techniques.

Purpose: To assess T1 mapping measures of fibrosis in patients with severe AS referred for aortic valve intervention, and determine their associations with clinical characteristics, disease severity and long-term clinical outcome.

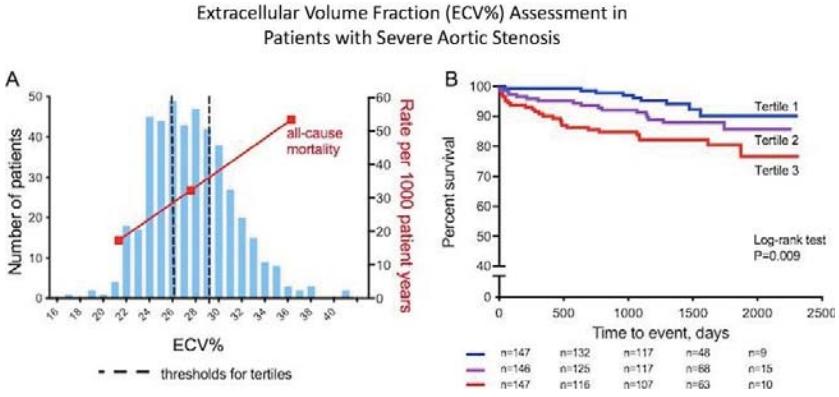
Methods: In this international prospective cohort study, patients with severe AS underwent contrast enhanced CMR with T1 mapping and LGE prior to aortic valve intervention. Image analysis was performed by a single core laboratory and the extracellular volume fraction [ECV%] calculated from T1 mapping images. The presence of LGE was determined visually and quantified using the full-width-at-half-maximum technique.

Results: Four-hundred and forty patients (70±10 years, 59% male) from ten international centres were enrolled. Aortic valve intervention was performed 15 [4 to 58] days following CMR. Within a follow-up of 3.8 [2.8 to 4.6] years, 52 patients died.

ECV% (mean 27.7±3.6%) correlated with increasing age, Society of Thoracic Surgeons Predicted Risk of Mortality score, known coronary artery disease, lower peak aortic-jet velocity, larger left ventricular (LV) mass, lower LV ejection fraction, and presence of LGE ($P<0.05$ for all). Following adjustment for all demographic and clinical variables, ECV% remained associated with age (P=0.028), LV ejection fraction ($P<0.001$) and presence of LGE (P=0.035).

Univariable predictors of all-cause mortality included age, male sex, impaired LV ejection fraction and presence of LGE (all $P<0.05$). A progressive increase in all-cause mortality was seen across tertiles of ECV% (17.3, 31.6 and 52.7 deaths per 1000 patient-years; log-rank test, P=0.009). ECV% was independently associated with all-cause mortality following adjustment for age, sex, impaired LV ejection fraction and presence of LGE (HR per unit increase in ECV: 1.10, 95%, (1.02–1.19), P=0.013).

Conclusion: In patients with severe aortic stenosis scheduled for aortic valve intervention, extracellular volume-based T1 mapping correlates with LV decompensation. ECV% is a strong independent predictor of late all-cause mortality and is a potential therapeutic target.



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