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Global Longitudinal Strain is a Strong Independent Predictor of All-Cause Mortality in Patients with Aortic Stenosis

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Background: Global longitudinal strain (GLS), measured with speckle tracking echocardiography, is a sensitive marker of LV systolic function, however its prognostic capacity in patients with aortic stenosis (AS) is uncertain. We hypothesised that in patients with AS, GLS would predict: (1) All-cause mortality and (2) Major adverse cardiac events (MACE: death or hospitalisation due to cardiac causes).

Methods: Subjects with AS ($n = 146$) and controls ($n = 10$) underwent baseline echocardiography to assess AS severity and GLS. Global longitudinal strain was graded as: normal function (GLS $< -20\%$), mild dysfunction (GLS: -15 to -19.9%), moderate dysfunction (GLS: -10 to -14.9%) and severe dysfunction (GLS $> -10\%$). Baseline demographics, symptom severity class (composite of angina/dyspnoea/syncope) and comorbidities were recorded. Outcomes were identified via hospital record review.

Results: The age (mean $\pm$ SD) of subjects was 75 ± 11, 62% were male. Baseline aortic valve area (AVA) was $1.0 \pm 0.4\,cm^2$ and LVEF was $59 \pm 11\%$. Subjects with AS had lower GLS ($-15 \pm 4\%$) than controls ($-21 \pm 2\%$) ($p < 0.001$) and GLS was associated with symptom severity ($p < 0.001$). During a mean follow-up of 1.4 ± 0.4 years, there were 14 deaths and 90 MACE. Unadjusted hazard ratios for GLS were: all-cause mortality (HR 6.4 (per grade) (2.8–14.3), $p < 0.001$) and MACE (HR 1.5 (per grade) (1.2–2.0), $p = 0.002$). With multivariate analysis, GLS (HR 6.2 (2.1–17.9), $p = 0.001$) was a stronger predictor of all-cause mortality than AVA (per cm^2) (HR 0.19, $p = 0.053$), symptom class (HR 1.69, $p = 0.07$) and LVEF (1.01, $p = 0.84$).

Conclusion: Global longitudinal strain independently predicts all-cause mortality in AS and its incorporation into risk stratification models may enable better identification of the optimal timing for aortic valve replacement.

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The Index of Microcirculatory Resistance Predicts Myocardial Infarction Related to Percutaneous Coronary Intervention

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Background: Periprocedural myocardial infarction (PMI) related to percutaneous coronary intervention (PCI) is prevalent and portends poor outcomes. There is currently no clinically applicable method to predict PMI in the cardiac catheterisation laboratory before it occurs. We hypothesised that impaired baseline coronary microcirculatory reserve, by reducing ability to tolerate ischaemic insults, predisposes to PMI, and that the index of microcirculatory resistance (IMR) measured before PCI can predict occurrence of PMI.

Methods: Fifty consecutive patients undergoing elective PCI of a single lesion in the left anterior descending artery without prior target territory infarction were recruited. A pressure-temperature sensor wire was used to measure IMR, coronary and fractional flow reserve prior to PCI. Cardiac enzymes were collected 18.0 ± 2.8 h after PCI. PMI was defined as post-PCI troponin levels $>3 \times$ 99th percentile.

Results: Of 50 patients studied, 10 developed PMI. From binary logistic regression analyses of all clinical, procedural and physiological parameters, univariable predictors of PMI were pre-PCI IMR ($P = 0.003$) and the number of stents used ($P = 0.039$). Pre-PCI IMR was the only independent multivariable predictor (odds ratio = 1.25, 95%CI = 1.08–1.43). Using receiver-operating-characteristic analysis, pre-PCI IMR $\geq$27 U had 80.0% sensitivity and 85.0% specificity of predicting PMI (c-statistic = 0.80, $P = 0.003$). Pre-PCI IMR $\geq$27 U was independently associated with a 23-fold risk of developing PMI ($P = 0.001$).

Conclusions: We report for the first time that the status of the coronary microcirculation has a crucial role in determining susceptibility towards myocardial infarction. IMR, a simple guidewire-based measurement performed at the time of PCI, can predict subsequent risk of developing PMI, and may serve to guide adjunctive prevention strategies.

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