中文題目：訊號強度係數預測主動脈瓣狹窄誘發心肌纖維化患者之長期預後

英文題目：Signal Intensity Coefficient Predicted the Long Term Outcome in Patients with Aortic Stenosis Induced Myocardial Fibrosis

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Introduction

Despite the advanced techniques of aortic valve replacement nowadays, the aortic stenosis (AS) induced irreversible myocardial fibrosis remains contributing to the worse outcomes. Therefore, in addition to the early diagnosis of AS, the detection of myocardial fibrosis is crucial for physicians to determine when to perform the surgery. Herein, using Signal Intensity Coefficient (SIC), a computational imaging modality, we investigated its applicability in detection of the cardiac fibrosis in patients with AS and also the predictive value to post aortic valve replacement (AVR) complications. We aim to investigate the applicability of SIC in both human and murine hearts under pressure overload. Also, the correlation between long term major cardiovascular adverse events (MACE) and peri-operative SIC will be studied.

Methods

In this retrospective study, we collected the clinical information and echocardiography images of 65 patients receiving AVR for severe AS during 2009-2013. Echocardiographic parameters including SIC were calculated within three months prior to and post AVR. Among them, 15 patients were excluded owing to previous myocardial infarction, LVEF less than 50%, loss of follow-up, poor image quality and dysfunction of the replaced valve. The primary end-point was MACE including mortality and the hospitalization due to heart failure or myocardial infarction. Also, using aortic banding, we developed pressure overload model in 8-10 week old male C57BL/6 mice. Post 7 days, the debanding was performed to mimic AVR surgery.

From a parasternal long axis view, SIC was obtained at the specific region of interest, defined as the pericardium adjacent and parallel to the mid-to-basal section of the inferolateral segment of the myocardium. Using ImageJ software platform SIC was calculated as (1-p/256), where p is the 25th percentile of pericardial signal intensity distribution.

Results

1. Our result indicated a significant decline of SIC post AVR, similar in aortic banded mice receiving debanding.
2. Also, age, e' (by tissue Doppler), the baseline and the peri-operative changes of SIC were significantly associated with major outcomes. In contrast, the changes of left ventricular ejection fraction (LVEF), left ventricular mass index and left ventricular volume failed to predict outcomes at the post-operative early stage.
3. Using 0.34 as the cut-off value of SIC, AS patients with SIC above 0.34 prior to AVR resulted in higher MACE.
4. In the multivariate Cox regression, compared with age, systolic blood pressure (SBP), e', isovolumic relaxation time (IVRT), SIC above 0.34 represented higher risk of MACE (odd ratio: 1.82, confidence interval: 1.24-2.8, p=0.01)

Conclusions

SIC can detect early changes in myocardial microstructure in patients with AS and correlate to the clinical outcomes. Using 0.34 as the cut-off value of SIC, MACE in AS patients receiving AVR can be predicted**.**

Abbreviations

AS= aortic stenosis; AVR= aortic valve replacement; DT= deceleration time; E/A= trans-mitral valve E to A velocity ratio; E/e'= mitral early filling velocity to early diastolic mitral annular velocity ratio; IVRT= isovolumic relaxation time; LCA= left coronary artery; LVMI= left ventricular mass index; LVIDd = left ventricular interior dimention at end diastole; LVIDs= left ventricular interior dimention at end systole; LVEF= left ventricular ejection fraction; SIC= Signal Intensity Coefficient