Echo Doppler Assessment of Left Sided Filling Performance in Severe Aortic Stenosis

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Background: Transcatheter aortic valve implantation (TAVI) has become treatment option for elderly patients with severe aortic stenosis (AS). Non invasive estimation of left sided filling performance may facilitate assessment of potential risk and benefit of TAVI. We evaluated association between echo-Doppler variables and invasive pulmonary capillary wedge pressure (PCWP) in patients with severe AS.

Methods: Fifty consecutive, severe AS patients underwent cardiac catheterization and echocardiography within 24 hour. Echo-Doppler parameters of AS severity, left ventricular systolic and diastolic function, and right sided hemodynamics were obtained. We evaluated: 1.correlation of noninvasive variables with PCWP, 2. ability to estimate PCWP, and 3. Prediction of hemodynamic decompensation (PCWP>20mmHg) and normal filling performance (PCWP <12mmHg).

Results: The ratio of early mitral inflow velocity to early diastolic velocity of lateral annulus (E/E'lat) showed a highest correlation with PCWP ($r=0.63$, $p<0.05$). By multivariate analysis we created mathematical equation that closely estimated PCWP ($r2=0.93$). In this equation maximal velocity (Vmax) and mean trans aortic pressure gradients (MPG), LV ejection fraction, E/E' of septal and lateral annulus, and tricuspid regurgitation time velocity integral were estimates of PCWP to various extent:
PCWP=15.39-23.59 x LVEF-0.48 x E/E' sept+0.79 x E/E' lat+0.16 x TR VTI+0.02 x Vmax-0.15 x MP.
In logistic regression E/E'lat was the only significant predictor of hemodynamic decompensation (odds ratio 1.43 (1.06-1.93), $p=0.018$). There was no echo-Doppler predictor of normal PCWP.

Conclusions: The E/E' of lateral annulus correlates well with PCWP and is the best echo-Doppler predictor of hemodynamic decompensation. Noninvasive estimation of PCWP in severe AS appears feasible by incorporation of multiple echo-Doppler variables.