Routine Use of Energy Loss Index to Correct for Pressure Recovery May Overestimate Aortic Valve Area

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Background: Pressure recovery phenomenon can potentially cause underestimation of effective aortic valve area (AVA) by transthoracic echocardiography (TTE). It was therefore recommended to use the energy loss index (ELI) for assessment of aortic stenosis (AS). ELI=AVA×AA/(AA-AVA, AA=proximal aortic area. The aim of this study was to compare ELI and AVA using TTE and cardiac computed tomography angiography (CCTA).

Methods: We prospectively studied 25 patients (72±14y, 11 males) with AS. AVA was estimated using: 1) TTE and the continuity equation assuming a circular left ventricular outflow tract (LVOT) 2) TTE using CCTA measured LVOT area (LVOTa) in the continuity equation, since in most cases the LVOT is oval and not circular ($AVA_{CCTA\text{-}LVOTa}$) 3) ELI using CCTA measured AA and $AVA_{CCTA\text{-}LVOTa}$ in the equation 4) CCTA planimetry AVA. TTE estimated AVA and ELI were correlated with CCTA AVA.

Results: TTE AVA (assuming a circular LVOT) was 0.92±0.44 cm 2. AVA CCTA-LVOTa was 1.08±0.54 cm 2, which was very similar to CCTA AVA (1.14±0.68 cm 2,p=0.3). There was excellent correlation between AVA CCTA-LVOTa and CCTA AVA (r=0.94). ELI was 1.35±0.83 cm 2, and although there was still a good correlation with CCTA AVA (r=0.91), it significantly overestimated AVA compared to CCTA (p=0.0004, Figure). Sixteen patients (64%) had a small proximal aorta (<3 cm). Even in this group, ELI overestimated AVA (+0.22±0.26 cm 2, p=0.003).

Conclusions: Routine use of ELI in patients with AS to compensate for pressure recovery may cause overestimation of TTE AVA when using the correct LVOTa measurement in the continuity equation. In cases with small proximal aorta in whom underestimation of AVA by TTE is suspected, invasive hemodynamic assessment is indicated.