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Imaging

THE DOUBLE ENVELOPE TECHNIQUE OVERESTIMATES THE CALCULATED AORTIC VALVE AREA IN PATIENTS WITH SEVERE AORTIC STENOSIS USING TRANSESOPHAGEAL ECHOCARDIOGRAPHY

Poster Contributions
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Authors: *Elrond Teo, Omar Khalique, Elana Koss, Leo Marcoff, Jack Shanewise, Rebecca Hahn, Columbia University, New York, NY, USA*

Background: The Doppler continuity equation (CE) is the accepted method for calculating the aortic valve area (AVA) and requires spectral pulsed wave Doppler of the left ventricular outflow tract (PWLVOT) and a continuous wave Doppler across the AV (CWAV). In contrast, the double envelope (DE) technique uses a single continuous wave profile containing a lower velocity, denser envelope representing flow across the LVOT (DELVOT) and a higher velocity, less dense envelope representing flow across the AV (DEAV). We sought to compare the DE technique with CE technique for calculating AVA in severe aortic stenosis.

Methods: 131 patients entered into the Placement of Aortic Transcatheter Valves (PARTNER) trial were analyzed. Full transesophageal echocardiograms were performed before deployment of the transcatheter aortic valve. Two continuous wave Doppler profiles were obtained from gastric positions. If a DE profile was seen then the velocity time integral measurement of DELVOT and DEAV by were made. A dense continuous wave velocity profile was then obtained by optimally aligning the insonation beam and transaortic jet for the CWAV VTI. A PWLVOT VTI was obtained by positioning the sample volume proximal to the flow convergence and tracing the modal velocity spectral profile. LVOT diameter was measured from an aligned systolic sagittal plane. AVA was then calculated using CE technique (AVACE) and DE technique (AVADE).

Results: The mean age was 84 ± 7yrs with mean LVOT diameter of 21.2 ± 2.0mm. There were 74 females. CWAV VTI was significantly larger than DEAV VTI (100.9 ± 28.4cm vs 97.2 ± 27.1cm, $p<0.001$) but highly correlated ($R = 0.91$, $p < 0.001$, mean bias 3.74 ± 11.8). PWLVOT VTI was significantly lower than DELVOT VTI (17.3 ± 5.6cm vs 21.0 ± 6.8cm, $p < 0.001$) with lower correlation ($R = 0.64$, $p < 0.001$, mean bias 3.75 ± 5.5). AVACE was significantly smaller than AVADE (0.62 ± 0.21cm2 vs 0.79 ± 0.28cm2, $p < 0.001$) with $R = 0.60$, $p < 0.001$, mean bias 0.17 ± 0.23 cm2).

Conclusions: The DELVOT overestimates LVOT flow and DEAV underestimates peak transaortic flow. The AVADE thus significantly overestimates AVACE and should not be utilized for accurate assessment of aortic stenosis severity.