Abstract: 522
CMR quantification of mitral regurgitation is more reliable than PISA

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Background:
Guidelines recommend using regurgitant volume (RVol) calculated using the proximal isovelocity surface area (PISA) method to assess mitral regurgitation (MR) severity by transthoracic (TTE) and transesophageal (TEE) echocardiography. However, there are several limitations to PISA, which are especially relevant in patients with constrained PISA due to an eccentric jet or multiple regurgitant jets. Firstly, geometric assumptions are made, such as a circular orifice and hemispheric isovelocity area shape. Secondly, the multifactorial formula makes it prone to inter- and intraobserver variability, as a small difference in the measurement of the radius can lead to a larger difference when squared and a constrained PISA introduces the angle correction as a forth user calculated parameter in the formula.

Purpose:
We sought to assess whether cardiac magnetic resonance (CMR) quantification of RVol has better reproducibility than PISA RVol in TTE and TEE.

Methods:
50 consecutive MR patients in sinus rhythm were included and underwent TTE, TEE and cMR. RVol calculation was performed in all 50 patients by 2 independent blinded observers using TTE and TEE PISA, as well as CMR left ventricular short axis and aortic phase contrast images. One observer reperformed the calculations at approximately 2 months afterwards. Inter- and intraobserver reproducibility for each method was calculated using Pearson’s r and interclass correlation coefficient. Interobserver agreement on MR severity was calculated using Bland-Altman and Kappa analysis.

Results:
Mean age of the population was 63 ± 16 and 36 (70%) were men. The mechanism of MR was: annular dilation in 5, prolapsed in 37 and leaflet restriction in 9, while eccentric regurgitant jet was present in 37 and 14 had multiple regurgitant jets. Average RVol (mean between the 2 observers) was: 61 ± 26 ml for TTE, 71 ± 33 ml for TEE and 60 ± 31 ml for CMR. Interobserver correlation and bias was better for cMR (r= 0.96, p<0.001; ICC= 0.96, p<0.001; bias= -1, LOA ± 25 ml) than TTE (r= 0.70, p<0.001; ICC= 0.66, p<0.001; bias= 8, LOA ± 45 ml) and TEE (r= 0.59, p<0.001; ICC= 0.57, p<0.001; bias= 8; LOA ± 68 ml). Defining severe MR as a RVol>60 ml, interobserver agreement on severity was: k=0.30, p=0.29 for TTE, k=0.55, p<0.001 for TEE, and k=0.88, p<0.001 for CMR. Intraobserver correlation was also higher for CMR (r= 0.96, p<0.001; ICC= 0.66, p<0.001) as compared to TTE (r= 0.57, p=0.02; ICC= 0.56, p=0.06) and TEE (r= 0.85, p<0.001; ICC= 0.94, p<0.001).

Conclusion:
CMR has considerably better inter- and intraobserver reproducibility for quantifying MR than the PISA method, regardless of the type of MR mechanism. CMR should be relied on especially in cases where the limitations of the PISA method are more poignant.
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