

# Analysis of variability and reproducibility of echocardiography measurements in valvular aortic valve stenosis

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## Abstract

### Background

Doppler echocardiography is the most frequent method for detecting and evaluating the severity of valvular aortic stenosis. The aim of this study was to assess the variability and reproducibility of echocardiographic parameters including aortic valve area (AVA), peak aortic jet velocity (Vmax), velocity ratio (VLVOT/Vmax), peak gradient (Gmax) and mean gradient (Gmean) in aortic stenosis (AS) patients.

### Methods

Doppler echocardiograms were obtained from 150 randomly selected patients (56.7% male; mean age 73±9 years) with asymptomatic moderate aortic valve stenosis. The echocardiographic measurements were performed by two independent level III (expert) blinded observers. To assess intra-observer variability, we evaluated parameters of AS progression at two different times (mean of two weeks after the first examination).

### Results

For intra-observer variability (observer 1), the variation and reproducibility coefficients were, respectively, 1.88% and 0.16 m/s for Vmax, 2.08% and 0.14 for VLVOT/Vmax, 2.05% and 0.18 cm<sup>2</sup> for AVA, 3.89% and 5.18 mmHg for Gmax and 7.87% and 6.30 mmHg for Gmean. For inter-observer variability, the variation and reproducibility coefficients were, respectively, 2.00% and 0.14 m/s for Vmax, 2.91% and 0.14 for VLVOT/Vmax, 7.67% and 0.16 cm<sup>2</sup> for AVA, 8.53% and 7.06 mmHg for Gmean and 3.90% and 5.58 mmHg for Gmax. Both intra- and inter-observer studies showed excellent intraclass correlation coefficients (ICC) for all echocardiographic parameters (ICC ranged from 0.943 to 0.990 for intra-observer variability and from 0.955 to 0.992 for interobserver variability).

### Conclusion

Doppler echocardiographic measurements of AVA, Vmax, Gmax and Gmean are highly reproducible when performed by expert observers. Of all echocardiographic parameters, Vmax and VLVOT/Vmax showed the best variability and reproducibility, and thus constitute reliable tools for clinical and research purposes in aortic stenosis diagnosis and follow-up.

## Keywords

Aortic stenosis; Echocardiography; Variability and reproducibility; Bland-Altman; RAAVE;  
Follow-up