**ORIFICE ECCENTRICITY ACCENTUATES FLOW DISTURBANCE DUE TO SEVERE MITRAL ANNULAR CALCIFICATION**

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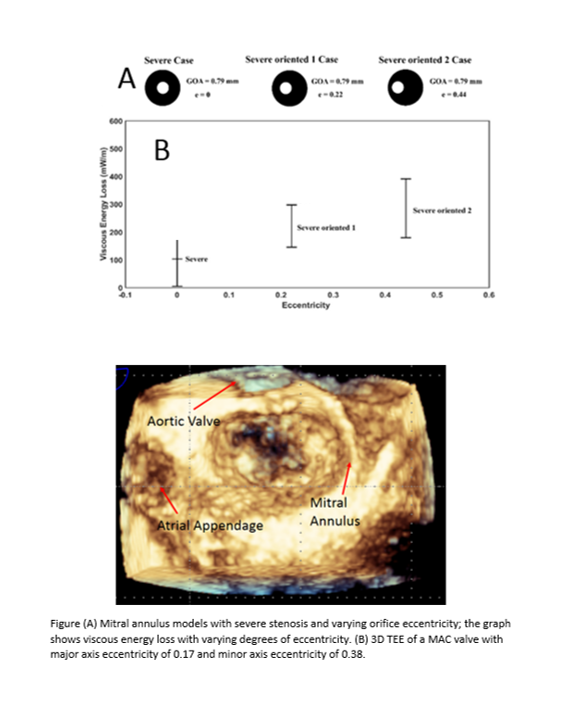
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**Background**: Mitral annular calcification (MAC) deforms the valve reducing its opening. The narrowed orifice may disturb vortex formation in the left ventricle (LV) thus contributing to symptoms of dyspnea and effort intolerance.

**Methods**: Experiments were performed on a cardiac duplicator using simple models of the mitral annulus. Severe stenosis with three orifice eccentricities (e=0; e=0.22, and e=0.44) was simulated. Stroke volume (70 ml), heart rate (70 bpm), and mean aortic pressure (100 mmHg) were held constant. Time-resolved particle image velocimetry was performed. We separately evaluated 3D images from patients with severe MAC to determine degree and range of orifice eccentricity in a clinical sample.

**Results**: Simulated MAC induced significant changes in LV flow patterns: higher shear flow and more complex particle transport. There were significant increases in viscous energy losses, related to MAC severity and orifice eccentricity, up to 5.5 times normal. Vortex formation time was similarly affected by MAC severity and orifice eccentricity, with values up to 14.28 (normal 3.3-5.5). In 13 patients with severe MAC, major axis eccentricity ranged from 0.05-0.25 (median=0.15); minor axis eccentricity ranged from 0.04-0.54 (median=0.22).

**Conclusions**: Severe MAC has significant effects on vortex formation which are accentuated by orifice eccentricity. 3D TEE in a patient sample with severe MAC confirms the presence of orifice eccentricity, making the in-vitro results clinically relevant.

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