

Abstract Submitted
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Effects of bileaflet mechanical heart valve orientation on coronary flow¹ LAURA HAYA, STAVROS TAVOULARIS, University of Ottawa — The aortic sinus is approximately tri-radially symmetric, but bileaflet mechanical heart valves (BMHVs), which are commonly used to replace diseased aortic valves, are bilaterally symmetric. This mismatch in symmetry suggests that the orientation in which a BMHV is implanted within the aortic sinus affects the flow characteristics downstream of it. This study examines the effect of BMHV orientation on the flow in the coronary arteries, which originate in the aortic sinus and supply the heart tissue with blood. Planar particle image velocimetry measurements were made past a BMHV mounted at the inlet of an anatomical aorta model under physiological flow conditions. The complex interactions between the valve jets, the sinus vortex and the flow in the right coronary artery were elucidated for three valve orientations. The coronary flow rate was directly affected by the size, orientation, and time evolution of the vortex in the sinus, all of which were sensitive to the valve's orientation. The total flow through the artery was highest when the valve was oriented with its axis of symmetry intersecting the artery's opening. The findings of this research may assist surgeons in choosing the best orientation for BMHV implantation.

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