GRADUATE STUDENT RESEARCH SEMINAR SERIES (2019)

RISKS AND BENEFITS OF USING A COMMERCIALLY AVAILABLE VENTRICULAR ASSIST DEVICE FOR FAILING FONTAN CAVOPULMONARY SUPPORT: A MODELING INVESTIGATION

SPEAKER: MASOUD FARAHMAND

Fontan patients often develop circulatory failure and are in desperate need of a therapeutic solution. A blood pump surgically placed in the cavopulmonary pathway can substitute the function of the absent sub-pulmonary ventricle by generating a mild pressure boost. However, there is currently no commercially available device designed for the cavopulmonary application; and the risks and benefits of implanting a ventricular assist device (VAD) originally designed for the left ventricular application on the right circulation of failing Fontan patients is not yet clear. Moreover, further research is needed to compare the hemodynamics between the two clinically-considered surgical configurations (Full Support and IVC Support) for cavopulmonary assist, with Full and IVC Support corresponding to the entire venous return or only the inferior venous return, respectively, being routed through the VAD. In this study, we used a numerical model of the failing Fontan physiology to evaluate the Fontan hemodynamic response to a left VAD during the IVC and Full supports. We observed that during the Full support the VAD improved the cardiac output while maintaining blood pressures within safe ranges, and lowered the IVC pressure to <15mmHg; however, we found a potential risk of lung damage at higher pump speeds due to the excessive pulmonary pressure elevation. IVC support the other hand, did not benefit the hemodynamics of the example failing Fontan patients, resulting in the superior vena cava pressure increasing to an unsafe level of >20 mmHg. The findings in this study may be helpful to surgeons for recognizing the risks of a cavopulmonary VAD and developing coherent clinical strategies for the implementation of cavopulmonary support.

MONDAY, APRIL 8 3:00 PM

EIB 215