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Research In-Progress

Device and Method to Facilitate a Guidewire to Cross the Aortic Valve in Difficult Situations

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Introduction: Many cardiac diagnostic and therapeutic procedures require a guidewire to cross the aortic valve. The physician inserts a guidewire from the femoral artery towards the ascending aorta, to cross the aortic valve. This guidewire will serve as a conduit for placement of other devices into the left ventricle. Common procedures such as transcatheter aortic valve replacement, balloon aortic valvuloplasty and implantation of axial assist device, are dependent on accurately crossed guidewire. The process of aortic valve crossing is done by visualization under fluoroscopy, however, it is a random event achieved by try-and-error process, occasionally very challenging, time consuming with potential risk of perforation etc.

Methods: We designed a catheter to facilitate crossing the valve with a guidewire especially in difficult situations. This catheter has a modular shape with expandable flanges that stabilizes its position in the centerline of aorta, preventing the free movement of the guidewire due to blood flow and heart beats. Once the catheter is placed in the aorta, its flanges are expanded and the 1mm guidewire is positioned in the center of the aorta, aligning and directing the tip of the guidewire to the midpoint or center of the valve. With this positioning, the free-floating position of the wire is eliminated and the only movement that is allowed will be the coaxial movement through the valve.

Preliminary Results: A proof-of-concept model was built to test the functionality of this idea and to determine the ideal length and proportions of the flanges. Of three tested flanges configurations: cone, orbit and cylinder, the cylinder shape provided the best stability for the desired function.

Next Steps: The first working prototype is undergoing design optimization and will be constructed soon. It will be tested in the bench 3D printed models of aorta for further optimization prior to animal testing.