

Mechanistic Study for Heart Valve Replacement

Gregg W. Stone*

Department of Medicine, University of Cape Town, Chad

Letter

Mitral and tricuspidate regurgitation are caused by leaflet malcoaptation and have the potential to cause irreversible structural heart problems together with the dilatation of the atrium and ventricle resulting in ultimate failure. So as to avoid these irreversible effects, surgical correction is desired, specifically minimally invasive techniques that may correct mitral and tricuspidate regurgitation together with valve repair or replacement. However, anchoring strategies for valve repair or replacement devices are difficult as a result of the mitral or tricuspidate annulus consists of soppy tissue that doesn't offer sturdy supporting foundation for these devices. Forces required to support these devices are often within the transversal direction and/or within the longitudinal direction. A transversal force is needed in direct mitral annuloplasty techniques to shrink the annulus by multiple anchors distributed within the mitral annulus like the screws in Cardio Band System (Valtech Cardio LTD, Israel) and needles in arthropod IRIS Transcatheter Annuloplasty Ring. The longitudinal anchoring force within the valve replacement is needed to balance transvalvular pressure force and typically a lot of bigger than the transversal force. The cavity wall or the apexes are higher anchoring sites to supply direct tension forces on the force action line. Associate degree anchor within the left cavity apex has been accustomed tether the Tendyne valve in left atrio ventricular valve replacement, associate degreed an anchor within the cavity body part wall has been accustomed tether the Lux-Valve in right atrio ventricular valve replacement. Valve repair techniques like the plug devices and artificial chords need a longitudinal tethering force from the cavity anchors. The plug techniques embrace Coaptation Plate for the mitral regurgitation

and FORMA device (Edwards Life Sciences LLC, Irvine, CA) for tricuspidate regurgitation. A transcatheter top anchor has been accustomed tether the FORMA device. A transseptal anchor has been tried in left atrio ventricular valve chord repair. These transcatheter anchors are sometimes needed to be deliverable and retractile. There are 2 styles for the cavity anchor: hook and screw (spiral) sorts. The screw anchor isn't employed in the ventricle since it's a risk of detachment within the beating heart and should need a fancy anti-rotation lockup mechanism. The hook-anchor is usually used since it's not simply detachable from the ventricle wall. Until now, the hook-anchor has been accustomed anchor FORMA devices and Micra pacemakers (Medtronic PLC, metropolis, Minnesota) within the heart ventricle and employed in left atrioventricular valve chord repair within the heart ventricle. No screw anchor has been used presumably because of potential risk of detachment. A transcatheter top anchor was tried within the Mitral Spacer technique while not success because of tissue organic phenomenon. Therefore, a cavity anchor style is crucial to those valve repair or replacement techniques.

The hook-anchor is sometimes cut from a Nitinol tube to make straight teeth that are bent into hooks. The hook-anchor must be compressed into a sheath tube and undergoes massive deformation which can cause fracture of the hook teeth in delivery. The massive propulsion force in compression might cause buckling of a sheath tube similarly. Once the hook-anchor is free, it ought to restore its original form and bite the cavity wall or apex firmly and supply adequate supporting anchoring force while not penetrating the serous membrane. Therefore, hook-anchor mechanics warrant investigation. During this paper, a constant quantity study of the hook-anchor was performed to supply steering for the cavity anchor style.

***Address for Correspondence:** Stone WG, Department of Medicine, University of Cape Town, Chad, E-mail: greggstone@mountsinai.org

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