Docket #: S19-432

Percutaneous minimally invasive neochordal device for mitral valve repair

Stanford researchers have developed a new transcatheter, minimally invasive neochordal device for repair of mitral regurgitation, which does not require open heart surgery nor cardiopulmonary bypass. As opposed to existing percutaneous neochord devices, which usually utilize a transapical approach via an incision at the apex of the heart, this device is administered percutaneously, entering the venous system and targeting the mitral valve through the atrial septum. This geometry allows for direct positioning of the neochord on the posterior left ventricular myocardium, a surgery known as called posterior ventricular anchoring neochordal repair. Dr. Joseph Woo, renowned chairman and surgeon of Stanford Cardiothoracic Surgery, invented this procedure, which has been shown to provide tremendous repair results and patient outcomes.

Additionally, recent studies have shown that the shorter neochordal length, accomplished with posterior left ventricular targeting, results in reduced forces on the neochord and surrounding existing chordal architecture, translating to very low failure rates, reduced fatigue damage, greater repair durability, and outstanding patient outcomes. This new invention directly addresses some of the largest concerns regarding treatment of one of the most prevalent valvular diseases in the world, and enables a higher quality repair without the trauma of major surgery nor the rare expertise of surgeons from high volume treatment centers, leveraging advanced, minimally invasive transcatheter technologies of the future.

Figure

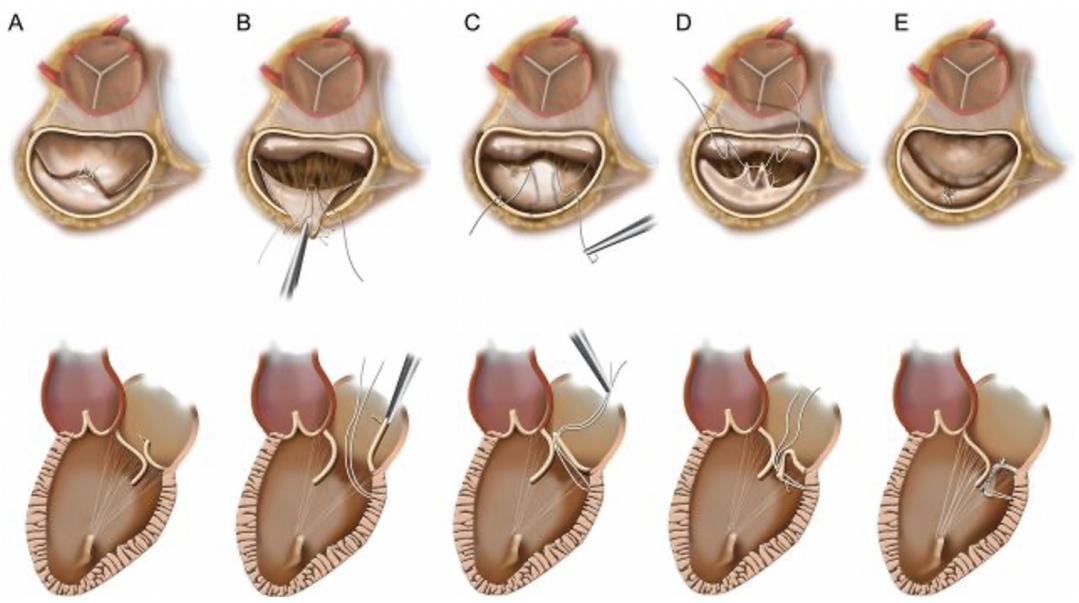

Figure description - Drawings demonstrating the posterior ventricular anchoring neochordal repair procedure. Our device accomplishes the goals of this procedure transcatheter, implanting an anchoring neochord on the posterior left ventricular myocardium. Full descriptions of each panel can be found in the referenced paper. https://doi.org/10.1093/ejcts/ezt092

Stage of Development

- Continued Iterative Prototyping
- In vitro validation
- Planned large animal in vivo studies

Applications

- Transcatheter mitral regurgitation repair in a beating heart

Advantages

- **Minimally invasive**: This device and approach does not require open heart surgery or cardiopulmonary bypass.
- **High quality repair technique**: The device is a repair and not a valve replacement, preserving the native structures and biomechanics as much as

possible.

- **Reduced chordal strains**: Shorter length neochord due to posterior left ventricular positioning results in reduced strain in the neochord and surrounding chordal architecture, translating to reduce fatigue and increased durability of the repair and device, which has been shown in the referenced publication.
- **Low failure rates**: Reduced strains directly result in reduced failure and increased durability.
- **Entirely percutaneous and minimally invasive**: Percutaneous approach facilitates a minimally invasive technique, which improves recovery times and reduces surgical complications.
- **Transcatheter delivery method**: the invention leverages futuristic transcatheter approaches, which allows for wide adoption and clear avenues for robotic integration and manipulation.

Publications

- Imbrie-Moore, Annabel M., Michael J. Paulsen, Akshara D. Thakore, Hanjay Wang, Camille E. Hironaka, Haley J. Lucian, Justin M. Farry et al. "Ex vivo biomechanical study of apical versus papillary neochord anchoring for mitral regurgitation." *The Annals of thoracic surgery* 108, no. 1 (2019): 90-97.
- Woo, YJ and MacArthur, JW. Posterior ventricular anchoring neochordal repair of degenerative mitral regurgitation efficiently remodels and repositions posterior leaflet prolapse. *Eur J Cardiothorac Surg*, 2013. 44(3): 485-489.

Innovators

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