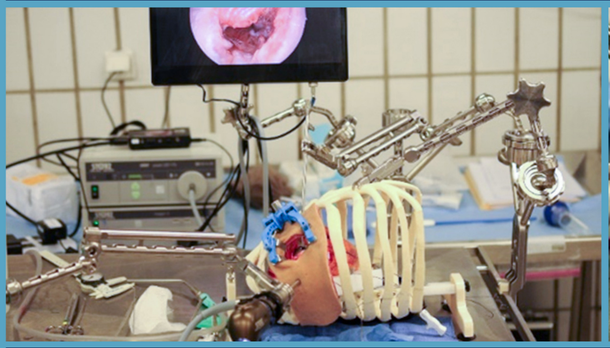
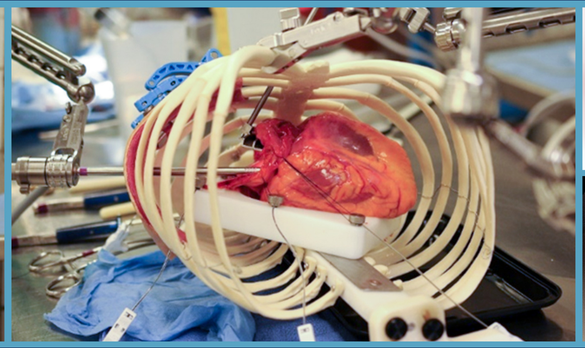
# Novel Automated Suturing Technology for Minimally Invasive Mitral Chord Implantation: A Pre-clinical Evaluation Study

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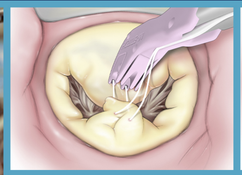
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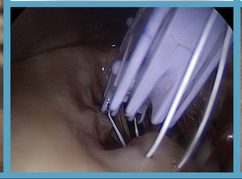


*1A: Custom MICS simulator setup*

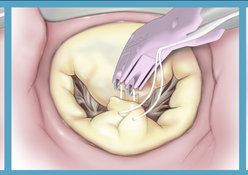


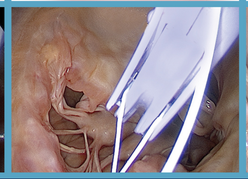
*1B: Human heart specimen used in study*



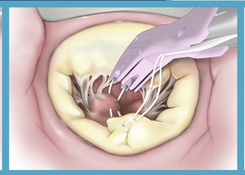


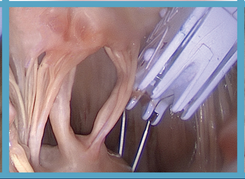
*2A: Leaflet bite*



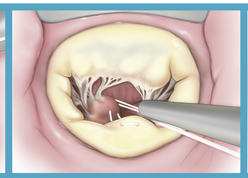


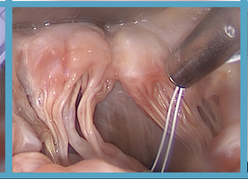
*2B: Rearm*



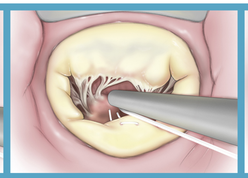


*2C: Pap bite*



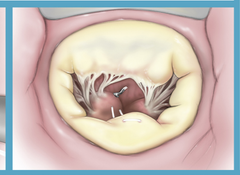


*2D: Fastener device*





*2E: Set length*





*2F: ePTFE chord*

## OBJECTIVE

While minimally invasive surgery for mitral valve repair can provide excellent results, outcomes are correlated with center volumes and expertise. This study evaluated the ergonomics and time requirements of using a novel automated suturing and titanium fastener deployment technology for chordal replacement in human heart specimens in open and MICS simulators.

## METHODS

Five practicing heart surgeons used novel manually powered ePTFE suturing devices to automate suture placement between mitral leaflets and papillary muscles in explanted cadaver hearts, along with customized titanium fastener delivery devices to secure suture and trim suture tails. This mitral chordal replacement test was conducted using surgical models simulating open and MICS mitral repair access. The study was approved by the institutional ethical board (number 1229/2020).

Disclosures:
Dr. Sauer is the president and CEO of LSI SOLUTIONS®
Dr. Andreas received institutional research grants from LSI SOLUTIONS® for the conduct of this research.




*Fig 3: Suturing device tip*



*Fig 4: Titanium fastener on ePTFE suture*

## RESULTS

After a brief introduction to this technique using plastic models, study surgeons performed 48 chordal replacements in human mitral valves, placing 18 in an open and 30 in a right minithoracotomy model. The time range to complete chordal replacement was between 55 sec to 8 min with an overall mean duration of 3.60±1.5 min and no significant difference between the access models. Good control of suture delivery was reported in 95.8% (n=46) of leaflet sutures and 100% (n=48) of papillary sutures.

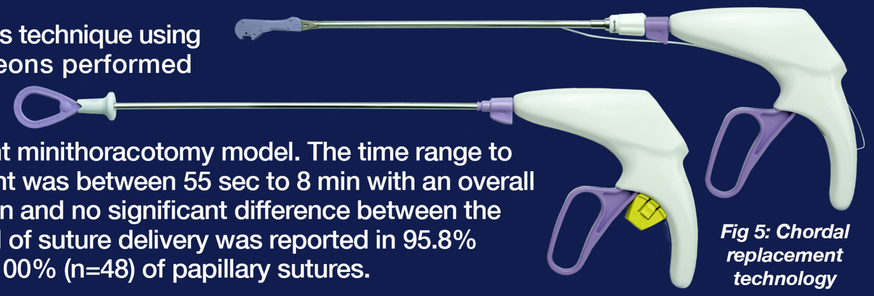


*Fig 5: Chordal replacement technology*

## CONCLUSIONS

Automated mitral chordal ePTFE suturing simulated through open and MICS access in this study demonstrated practical handling and accurate placement of sutures in human heart specimens. The initial clinical trial using this technology is currently ongoing. This innovation may present an important advance facilitating enhanced minimally invasive mitral valve repair procedures.