

Novel Technology for Automated Mitral Valve Replacement – An Initial Experience Report

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Background

Surgical mitral valve replacement (MVR) is an excellent treatment option for patients with various diseases of the mitral valve. Automated suturing technology may enhance the reliability and ergonomics of MVR procedures, potentially providing improved patient outcomes. Herein we report initial experience using automated suturing technology for MVR.

Methods

The technology platform comprises 2 devices (LSI SOLUTIONS®, Victor, New York, USA): the RAM® Device, for automated horizontal mattress suture placement through the annulus; and the SEW-EASY® Device, for automated suture placement through the prosthetic valve sewing cuff. Data was prospectively collected regarding operative times, valve function, adverse events, and perioperative and 30 day mortality.

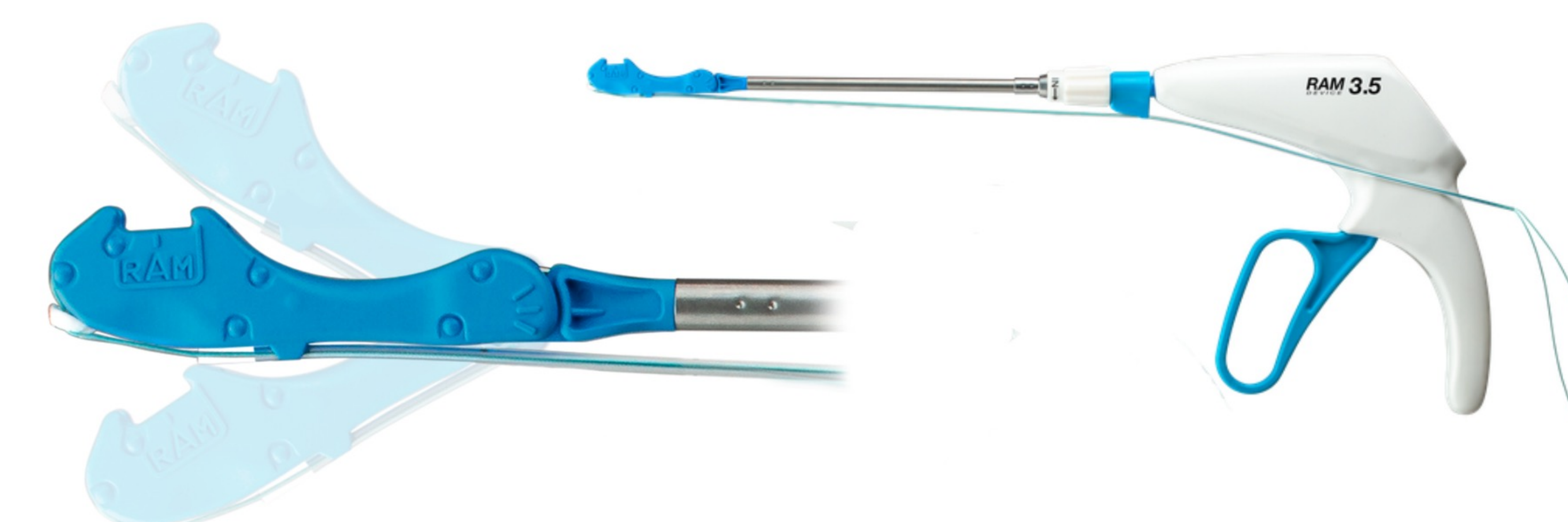
Results

Eight patients (68 ± 13 years, 1 male, BMI 26.0 ± 2.7 kg/m², EuroSCORE II 3.7 ± 1.7 %) underwent MVR with either a biological (n=5) or mechanical (n=3) prosthesis via full sternotomy. All patients underwent concomitant procedures (including aortic valve replacement, tricuspid valve repair, pulmonary vein isolation, left atrial appendage occlusion, ASD closure, coronary artery bypass, and biatrial MAZE).

Mean aortic cross-clamp and cardiopulmonary bypass times were 111 ± 39 min (n=7) and 136 ± 51 min, respectively. Note: One patient's procedure was conducted without an aortic cross-clamp using rapid pacing due to a severely calcified aorta. The placement of annular and prosthetic sutures with the automated suturing technology was reported to be easy and ergonomic. Note: One patient's first replacement valve was unfavorably oriented, with its struts protruding into the LVOT; that valve was removed and replaced, for a total of 9 mitral valves placed using the technology. The total time for valve replacement (n=9) was 44:34 ± 15:03 min, with 19:33 ± 08:35 min for annular suture placement (RAM® Device) and 10:32 ± 03:04 min for prosthetic suturing (SEW-EASY® Device). The mean number of annular stitches was 17 ± 2. A mean of 4 ± 4 annular sutures were placed manually, primarily due to severe annular calcification. No second aortic cross-clamp was required in any patient to complete valve replacement. No device-related serious adverse events were observed, and 30 day survival was 100%.

Conclusion

Novel automated suturing technology represents a safe and effective method for suture placement during MVR. The devices provide enhanced ergonomics for both annular and prosthetic suturing. This technology may also enable minimally invasive MVR through remote suture placement.



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