

Robotic mitral valve repair, left atrial appendage exclusion, and CryoMAZE in pectus excavatum



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Read at *The American Association for Thoracic Surgery Mitral Conclave Workshop, New York, New York, May 4-5, 2023.*

Read at *the 103rd Annual Meeting of The American Association for Thoracic Surgery, Los Angeles, California, May 6-9, 2023.*

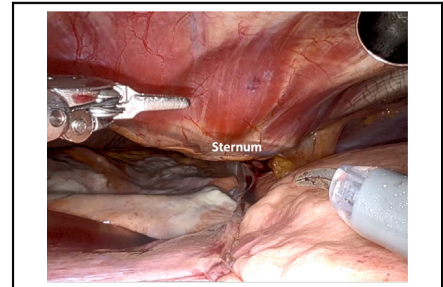
Received for publication Aug 2, 2023; revisions received Sept 20, 2023; accepted for publication Sept 24, 2023; available ahead of print Oct 7, 2023.

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JTCVS Techniques 2023;22:101-2
2666-2507

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<https://doi.org/10.1016/j.xjtc.2023.09.031>



Initial port placement showing very narrow operative window due to depressed sternum.

CENTRAL MESSAGE

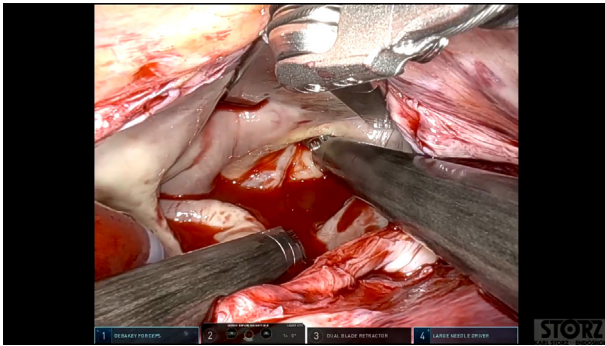
Robotic mitral valve repair is safe and feasible in select patients with pectus excavatum.

Video clip is available online.

Severe pectus excavatum is considered a relative contraindication to robotic cardiac surgery. In these patients, open surgery can also be challenging due to altered chest and mediastinal anatomy. Compared with endoscopic minithoracotomy approaches, a key advantage of the robotic approach is the freedom of instrumentation in a 3-dimensional plane. This is limited in endoscopic approaches, where movements are restricted by the arms of the endoscope. We demonstrate the feasibility and advantages of the robotic approach to the mitral valve in patients with severe pectus excavatum (institutional review board #2000020356, October 19, 2021). Written consent was obtained for publication of study data.

We present the case of a 69-year-old man with severely restricting chest anatomy due to pectus excavatum referred for dyspnea on exertion and paroxysmal atrial fibrillation. Preoperative imaging showed thickened leaflets with anterior leaflet prolapse, causing severe posteriorly directed mitral regurgitation jet (regurgitant volume 68 mL, effective regurgitant orifice area 0.44 cm², proximal isovelocity surface area 1.2 cm). Preoperative computed tomography was performed to assess thoracic anatomy and peripheral vasculature for robotic access planning and percutaneous cannulation, respectively. Percutaneous cannulation with

21-Fr arterial cannula and 23-Fr venous cannula was performed, and an endoaortic balloon pump was deployed into the aorta. One-inch access incision was placed in the third intercostal space with a camera port placed medial to it in the same intercostal space, a left arm port in the second intercostal space, and the right arm port in the fifth intercostal space. An additional retractor port was placed in the fourth intercostal space more medially under direct vision. Exposure was challenging due to the depressed sternum. The low chest height in our patient would have made a nonrobotic approach very challenging, and the advantage of the robotic approach in this kind of anatomy can be appreciated in [Video 1](#). After opening of the pericardium, we entered the left atrium through the interatrial groove and used the retractor to expose the mitral valve. The mitral valve was noted to have myxomatous degenerative changes and prolapse of A1 and A2. A left-sided CryoMAZE (epicardial coronary sinus, mitral line, bilateral pulmonary veins, and base of left atrial appendage) was performed with 2-minute freezes. The mitral valve was repaired by placing 3 separate neochords to A2x2, A1x1. We then placed a 32-mm annuloplasty band. Height adjustment of the neochords was performed and the leaflets appeared to coapt nicely on saline testing (coaptation length 12 mm). There was no mitral regurgitation at the end of the operation, with a mean gradient of 1 mm Hg. The patient came off bypass without issues, and the percutaneous cannulation sites



VIDEO 1. Narrated case video. Video available at: [https://www.jtcvs.org/article/S2666-2507\(23\)00378-4/fulltext](https://www.jtcvs.org/article/S2666-2507(23)00378-4/fulltext).

were closed by deployment of ProGlide sutures (Abbott Cardiovascular) at 90° angles followed by manual pressure. Hemostasis was confirmed and pedal pulses were examined to confirm distal perfusion. Complete exclusion of the left atrial appendage was confirmed by verifying absence of flow on transesophageal echocardiography.

In conclusion, a robotic-assisted approach in selected patients with pectus excavatum can lead to satisfactory outcomes,^{1,2} with superior exposure of the mitral valve and avoidance of sternotomy-related postoperative complications.

Conflict of Interest Statement

Dr Amabile receives consulting fees from JOMDD/Sanamedi. M. LaLonde receives consulting fees from Edwards Lifesciences and Intuitive Surgical. Dr Krane is a physician proctor and a member of the medical advisory board for JOMDD/Sanamedi, a physician proctor for Peter Duschek, is a medical consultant for EVOTEC and Moderna, and has received speakers' honoraria from Medtronic and Terumo. Dr Geirsson receives consulting fees for being a member of the Medtronic Strategic Surgical Advisory Board and from Edwards Lifesciences. All other authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

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