Masters of Cardiothoracic Surgery

Total endoscopic coronary artery bypass on a DaVinci Xi platform without an EndoWrist stabilizer combining the technology of GelPOINT Mini, AirSeal, and Octopus Nuvo

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Keywords: Coronary artery bypass grafting (CABG); totally endoscopic coronary artery bypass (TECAB); robotic surgery; heart stabilization

Submitted Jul 27, 2024. Accepted for publication Aug 20, 2024. Published online: Sep 09, 2024.
doi: 10.21037/acs-2024-rcabg-0112
View this article at: https://dx.doi.org/10.21037/acs-2024-rcabg-0112

Clinical vignette

We present the case of a 60-year-old gentleman with a family history of coronary artery disease (CAD), and a longstanding history of hypertension and hyperlipidemia, who recently developed symptoms of shortness of breath and chest pain on exertion. He underwent a computed tomography (CT) coronary artery calcium score which was significant for CAD. Subsequent cardiac catheterization showed a significant left anterior descending artery (LAD) stenosis of 99% with minimal luminal irregularities of the remaining coronaries. He was admitted for coronary revascularization, and after multidisciplinary discussion the decision was to offer the patient totally endoscopic coronary artery bypass (TECAB) with left internal thoracic artery (LITA) to LAD anastomosis.

Surgical technique

Preparation

The GelPOINT Mini (Applied Medical, Santa Margarita, CA, USA) package includes a gel platform that attaches to the provided Alexis retractor (Applied Medical). In cases with smaller chest cavities, the Alexis XXS retractor can be modified to fit the GelPOINT Mini. Using the introducer and trocars, three punctures are made at the center of the gel membrane. The longest trocar is inserted first, followed by the two shorter trocars, all positioned close together centrally.

Thereafter, the Octopus Nuvo (Medtronic Inc., Minneapolis, MN, USA), without its stabilizing tip, is inserted through the longest trocar, and only then it is secured in its final position. A pediatric-size enteral feeding tube is passed through the second trocar, trimmed at the tip, and tied with silk to one arm of the stabilizer for saline circulation. Another silk is tied on the other arm to clip the LITA for exposure during the anastomosis. Two additional enteral tubes are prepared and inserted into the 3rd trocar, trimmed at the tip, and tied to the stabilizer. These tubes assist in flushing saline to help the surgeon visualize the target area.

Operation

The robotic harvest of an internal thoracic artery (ITA) begins by positioning the right arm, camera port, and left arm at the 2nd, 4th, and 6th intercostal spaces between the mid-clavicular and anterior-axillary lines. After entering the chest cavity and opening the pericardium, the LAD is visualized and the LITA is harvested in a skeletonized fashion as previously described by our team (1). Thereafter, an AirSeal (CONMED Corporation, Utica, NY, USA) 12 mm working port is inserted in the 2nd intercostal space along the para-sternal line, and the Nuvo retractor connected to the GelPOINT Mini is advanced in the chest cavity via a subxiphoid 1.8 cm incision. After proper

stabilization of the LAD target, the camera is switched to a 30° downward angle to improve visibility and preparation of the coronary target. The harvested LITA is secured to the stabilizer, and the LAD is snared with a SaddleLoop (Quest Medical Inc., Allen, TX, USA). Full heparinization is administered, and the LITA is prepared using Potts scissors. The LAD is then opened, and a coronary shunt is placed to maintain flow during suturing. Using a 7/0 Pronova suture (Ethicon Inc., Raritan, NJ, USA), the anastomosis is performed with the tableside assistant, ensuring clear visibility by flushing through the enteral feeding tubes. A second small shunt is used to prevent LITA back-walling during stitching.

Completion

Once the anastomosis is complete, the coronary shunt is removed, and the suture is tied. Hemostasis is tested, and the flow is checked using a flow soft probe (Medistim, Oslo, Norway). Once satisfactory flow is confirmed, all instruments are removed from the chest cavity.

Comments

Clinical results

The patient underwent TECAB with LITA to LAD anastomosis and Cryo Nerve (AtriCure, Inc., Mason, OH, USA) ablation of the left intercostals. He was extubated in the operating room and taken to the intensive care unit in a stable condition and minimal oxygen support. All his invasive lines were removed on post-operative day (POD) 1, while his chest tubes on POD 2, after which he was discharged home on the same day. In our experience, TECAB patients have been discharged in POD 1 or 2 and get back to normal life within the first week of surgery.

Advantages

The benefits of sternal-sparing robotic approaches for coronary procedures include reduced morbidity, early discharge, faster return to normal activities, and favorable outcomes (2,3). While many surgeons achieve excellent outcomes with robotic minimally invasive direct coronary artery bypass grafting (MIDCABG), which involves taking down the LITA robotically and performing the anastomosis via a small thoracotomy, TECAB offers significant advantages including the elimination for any thoracotomy, improving cosmesis and reducing pain. Most importantly, TECAB facilitates easier deployment of grafts to the lateral wall. In robotic MIDCABG, accessing the lateral wall requires either intensive manipulation of the heart or extending the thoracotomy, thereby diminishing the benefits of minimally invasive surgery. TECAB is the ultimate coronary revascularization strategy, enhancing the use of bilateral ITA grafts. However, the steep learning curve for robotic anastomosis has limited TECAB adoption. Additionally, the lack of industry support for robotic TECAB, with the discontinuation of a robotic stabilizer, and an automatic coronary anastomotic connector, has reduced the adoption of this technique. Nevertheless, recent years have seen increased interest and successful use in robotic procedures (4,5).

Caveats

The present technique is an easy and effective solution to this issue by combining various tools to achieve efficient stabilization for endoscopic anastomosis. We hope this serves as a temporary measure until new robotic-specific devices are launched.

Acknowledgments

Funding: None.

Footnote

Conflicts of Interest: G.T. reports consulting fee for Peters Surgical. The other authors have no conflicts of interest to declare.

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Cite this article as: Torregrossa G, Yakobitis A, Murray C, Baudo M. Total endoscopic coronary artery bypass on a DaVinci Xi platform without an EndoWrist stabilizer combining the technology of GelPOINT Mini, AirSeal, and Octopus Nuvo. Ann Cardiothorac Surg 2024;13(5):461-463. doi: 10.21037/acs-2024-rcabg-0112

