

**Video Article / Video Makalesi**

## Multivessel coronary artery revascularization through left mini-anterior thoracotomy

*Sol mini-anterior torakotomi ile çoklu damar koroner arter revaskülarizasyonu*

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Over decades, median sternotomy has been a gold-standard approach for the treatment of isolated multivessel coronary artery disease; however, this traditional approach has been associated with sternal wound healing complications, leading to remarkable morbidity and mortality rates. Nowadays, on the other hand, various minimal invasive techniques have been described as alternative methods for the treatment of coronary lesions.<sup>[1-3]</sup> Due to difficulty of these procedures and long learning curve, hybrid approaches have been also described.<sup>[4,5]</sup>

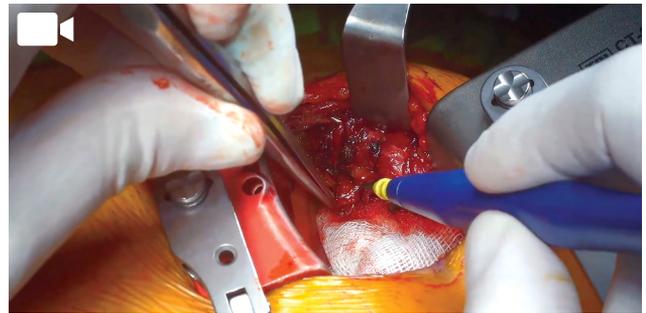
In this article, we describe our novel technique of left anterior mini-thoracotomy through the fourth intercostal space for the treatment of all groups of patients with multivessel coronary lesions which we have been routinely applying to our patients recently.

### Operative Technique (Video 1)

Our experience includes 62 consecutive patients who were operated with the same surgical team between July 2019 and December 2019 at two different medical centers. The study protocol was approved by the Ethics Committee of our hospital and a written informed consent was obtained from each patient. The left internal thoracic artery was harvested in all patients by the aid of a rib retractor. All patients were operated under cardiopulmonary bypass (CPB) through left mini-anterior thoracotomy of 5 to 7 cm. All saphenous vein grafts were harvested endoscopically.

Patients indicated for isolated coronary artery bypass grafting (CABG) are suitable to be operated under this technical procedure. Even patients requiring

emergency surgery or having deformities (kyphosis), and pericardial or pleural adhesions can be operated under this novel technique. Only redo patients who are candidates for isolated CABG cannot be operated under this technique. Patients with porcelain ascending aorta or peripheral artery disease whereby cannulation may be challenging are relative contraindications for this technique. All patients are operated under general anesthesia. Double-lumen endotracheal intubation is performed, allowing single-lung ventilation. Patients are positioned in the supine position with the left chest anteriorly elevated (Figure 1a). Jugular venous cannulation using a 17F or 19F venous cannula is usually performed in patients weighting more than 80 kg to facilitate venous drainage during CPB. All incisions are marked including thoracotomy incision (the fourth intercostal space), sternum, and cannulation site (i.e., saphenous incision port for endoscopic saphenous vein harvesting; ESVH) (Figure 1b). Defibrillation patch pads are positioned in place.



**Video 1.** Operative technique

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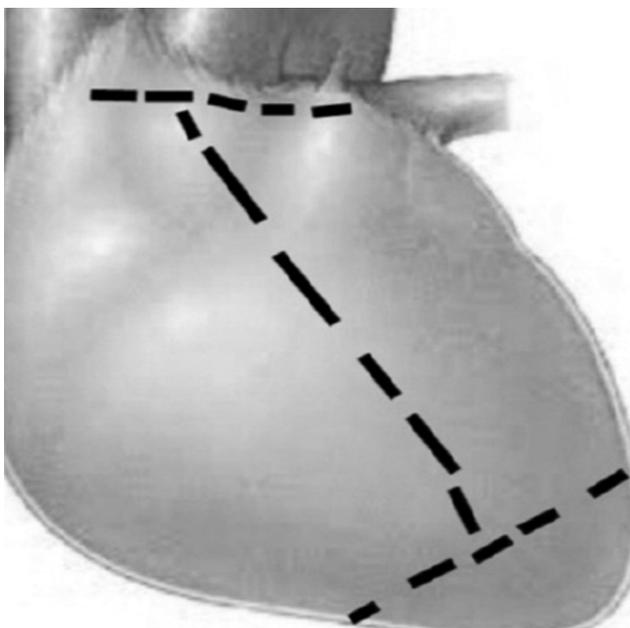
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**Figure 1.** (a) Perioperative patient positioning showing chest positioning. (b) Perioperative patient positioning showing femoral access for cannulation and endoscopic saphenous port.

Suitable sites for cannulation are exposed with a small incision of about 2 cm (femoral artery, femoral vein, or subclavian artery). A left anterior thoracotomy incision of about 5 to 7 cm through the fourth intercostal space is performed, while a submammary incision is made to reach the fourth intercostal space in female patients. Pectoral muscles are split, and no costal bones are resected and soft tissue retractor is not used. Single-lung ventilation is initiated and the left thoracic artery is identified ready for harvesting. Standard instruments used in traditional sternotomy are used during harvesting. A special rib retractor (Midcab retractor [Medtronic Inc., Minneapolis, MN]

or Delacroix-Chevalier, Sternal ThorAccess MIS Retractor [Delacroix-Chevalier, Paris, France]) is used for the left internal thoracic artery (LITA) harvesting. The LITA is harvested in skeletonized manner under direct vision. After harvesting the distal part of the LITA, cannulation is performed and CPB is initiated. The proximal LITA is skeletonized harvested under CPB to obtain its full length. All saphenous veins are harvested endoscopically and marked to avoid twisting during proximal anastomosis. Pericardiectomy is performed in double T-shape to allow herniation of the heart to the left side (Figure 2). Herniation of the heart to the left allows the aorta to be easily manipulated, particularly in patients with a right-deviated aorta. A 6-mm thin silk tape is encircled around the ascending aorta and the aorta is gently pulled to the left side to allow its access whereby antegrade cardioplegia circuit is secured with pulse string sutures. A Chitwood DeBakey Clamp (Scanlan® International Inc., Saint Paul, Minnesota, USA) cross-clamp is introduced through the anterior axillary line of the second intercostal space for clamping of ascending aorta where isothermic cardioplegia solution is given to allow diastolic cardiac arrest. To facilitate the exposure of target lesion for CABG, both left pulmonary veins and inferior vena cava are separately encircled with a thin 6-mm silk tape. Exposure of the right coronary vessel (RCA) and its branches is done by pulling the encircled tapes of inferior vena cava and pulmonary vein in the direction of patient's lower extremities. Exposure of the circumflex artery (Cx), left descending artery (LAD), and their branches is performed by pulling the encircled tapes around vena cava and left pulmonary veins to the left side. All anastomoses are performed with standard anastomosis suturing instrument. The



**Figure 2.** Opening of pericardium.

Chitwood® clamp is released and the heart is allowed to beat spontaneously. During placement of a partial side biting clamp on ascending aorta, the ascending aorta is gently pulled to the left and the right lung is ventilated allowing its positive end-expiratory pressure (PEEP) to push the aorta to the left side ready for proximal anastomosis. Proximal anastomosis is performed with standard instrument used during conventional CABG. The patients are weaned safely from CPB. The lower part of pericardium is closed. A single left chest tube is placed in position. Usually, rib approximation is not required and thoracotomy is closed in layers.

### Comments

To date, only few articles on multivessel coronary revascularization under CPB through left anterior mini-thoracotomy have been reported. Babliak *et al.*<sup>[3]</sup> reported a series of 170 patients with successful results. Our clinical experience of more than 62 non-selective consecutive patients yielded promising and encouraging results in our routine practice of CABG (total revascularization) via left anterior mini-thoracotomy. Total coronary artery revascularization via CABG in patients with multivessel lesion is superior over percutaneous coronary intervention and has been associated with low mortality and less redo revascularization.<sup>[6]</sup> Of note, CABG through a traditional procedure of sternotomy is widely performed; however, it has been associated with significant morbidity and mortality.<sup>[7]</sup> Therefore, CABG via left anterior thoracotomy is equally effective as traditional sternotomy, but less invasive with rapid recovery and promising morbidity and mortality rates. Moreover, for the patient satisfaction for cosmetic outcomes, it may be an alternative to sternotomy incision and percutaneous techniques. Robotic-assisted internal thoracic artery harvesting can be an alternative, particularly in right internal thoracic artery harvesting.

In conclusion, this technique seems to be safe and reproducible to prevent sternal complications and provide early recovery in the postoperative period.

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