Minimally Invasive Redo Coronary Bypass Graft To The Left Anterior Descending Artery: A Novel Approach To A Hostile Sternum

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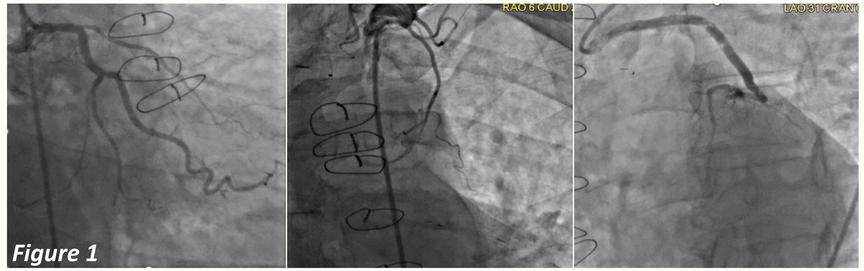
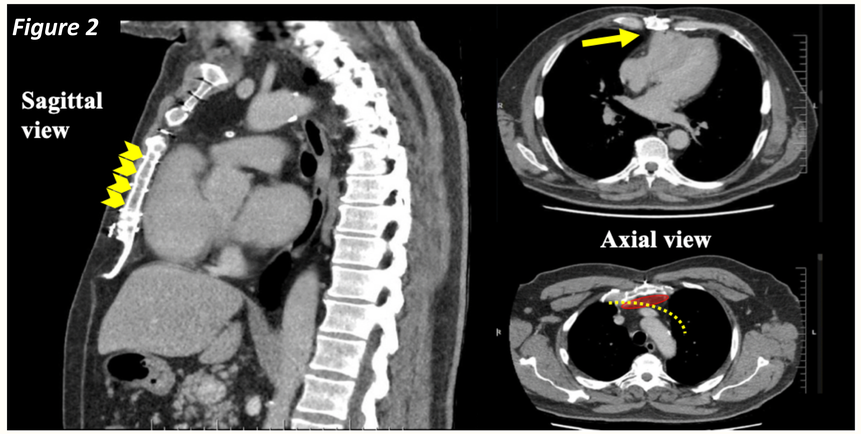
PREOPERATIVE FACTORS

- **71-year-old male with exertional angina** (CCS III/IV)
- **Prior CABG (~30 years ago):** LITA-LAD and Vein graft-Diagonal branch
- **CV risk factors:** Hypertension, Type 2 Diabetes, Prior stroke
- **Transthoracic Echocardiogram:** Normal biventricular function, LVID(s/d) 3.1/4.6 cm
- **Coronary angiogram:** Proximal LAD occlusion, atretic LITA and multiple tandem lesions in vein graft-Diagonal branch ***(Figure 1)***
- **CT Chest:** High-risk features for re-sternotomy – RV and PA root adherent and even engrained at one point to posterior sternal table ***(Figure 2 - yellow arrows)***
- **Patient wish:** Avoid a re-sternotomy
- **Therapy plan:** Minimally invasive CABG through bilateral mini-thoracotomies, thereby, avoiding a re-sternotomy in a hostile sternum and ensuring arterial revascularization with an ITA based graft for the LAD (composite RITA/RA I-graft)



Occluded LAD | Atretic LITA | Vein graft lesions

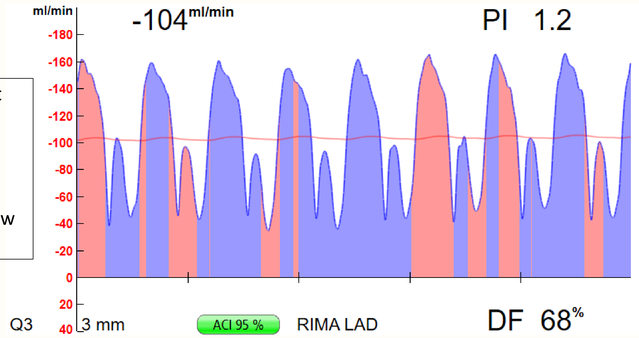


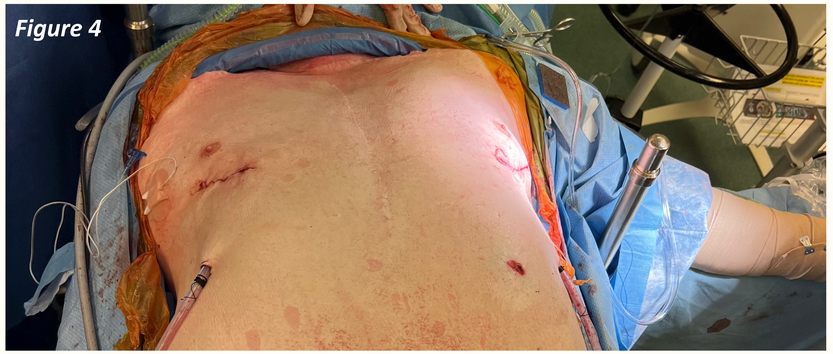
INTRAOPERATIVE STEPS

- **Position:** Supine with a horizontal shoulder pack
- **Intubation:** Double-lumen endotracheal tube to allow intermittent selective ventilation bilaterally and a brief period of apnoea for cross-over of composite graft from the right to left thoracic cavity
- **Incisions:** Bilateral mini-thoracotomies for assessment of feasibility of procedure – RITA harvest, passage of the composite graft across the mediastinum ***(Figure 2 - red circle & hatched curve)*** and LAD anastomosis
- **Conduit harvest:** Simultaneous harvest of RITA and left radial artery
- **Proximal anastomosis:** End-side anastomosis between end of RITA and left radial artery
- **Distal anastomosis:** Passage of composite I-graft through anterior superior mediastinum to left thoracic cavity followed by end-side anastomosis between Radial artery and LAD
- **Chest closure:** bilateral intercostal extra-pleural catheters for pain control and bilateral pleural chest tubes

Figure 3

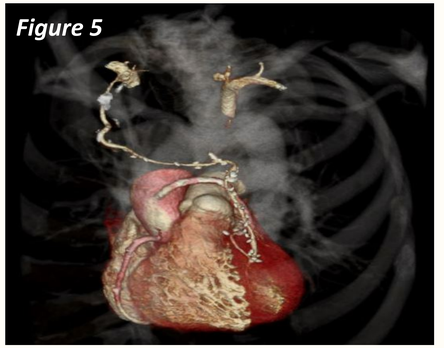
- Excellent transit time flow
- Excellent pulsatility index and diastolic flow fraction





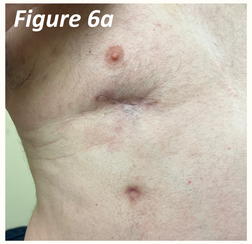
POSTOPERATIVE CARE

- **CVICU:** Hemodynamically stable without need for any inotropic support
- **Analgesia:** Multimodal including continuous Ropivacaine infusion through bilateral extra-pleural catheters and patient-controlled analgesia (PCA)
- **Extubation:** 48 hrs postoperatively, due to pre-existing COPD
- **Ward:** On Postoperative day 4
- **Pre-discharge CTCA:** Patent composite I-graft with no kinks/stenoses ***(Figure 5)***
- **Discharge medications:** Dual antiplatelet therapy and calcium channel blocker (Amlodipine) in addition to preoperative medications.



- 3D-CT coronary angiogram (CTCA) reconstruction illustrating the lie of the composite RITA/RA I-graft
- No demonstrable kinking apparent in new graft
- Prior vein grafts from the ascending aorta can also be appreciated

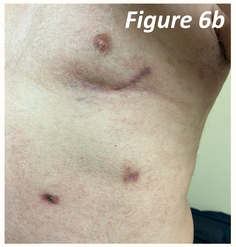
FOLLOW-UP



3-month follow-up:

- No anginal symptoms or shortness of breath
- No limitation to daily activities
- All surgical sites healed well without any concerns

(Figure 6)



Conclusions

This approach achieved ITA-based arterial revascularization of the LAD without the need for re-sternotomy and its potential complications in a hostile sternum without cardiopulmonary bypass and aortic manipulation.

References [1] Kindzelski BA, Bakaeen FG, Tong MZ, Roselli EE, Soltesz EG, Johnston DR *et al. Modern practice and outcomes of reoperative cardiac surgery*. J Thorac Cardiovasc Surg 2022;**164**:1755-66 e16. [2] Elbadawi A, Hamed M, Elgendy IY, Omer MA, Ogunbayo GO, Megaly M *et al. Outcomes of Reoperative Coronary Artery Bypass Graft Surgery in the United States*. Journal of the American Heart Association 2020;**9**.