

A dual approach to re-do coronary artery bypass graft (CABG) using midline sternotomy and left anterior thoracotomy

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Introduction

Re-do coronary artery bypass surgery (CABG) is a high-risk surgery when there are dense adhesions which can result in damage to the heart, great vessels and patent coronary artery grafts when opening the sternum. In some patients where the only graft to be done is the left internal mammary artery (LIMA) to the distal left anterior descending artery (LAD), a thoracotomy approach has been used. However, in patients in whom severe adhesions are expected, this may not be an option. In this case report we present a patient with very dense adhesions who needed a LAD graft. A midline sternotomy was performed, the right internal mammary artery (RIMA) was harvested, and then a thoracotomy was performed for the RIMA to distal LAD artery anastomosis.

Case report

A 49-year-old male patient who had a CABG for triple vessel disease nine years ago (in 2011) presented with unstable angina. A coronary angiogram showed a LIMA to LAD graft totally occluded at the site of anastomosis. The saphenous venous grafts (SVG)s to the Diagonal (D1) and Posterior Left Ventricular (PLV) arteries were patent. Percutaneous coronary angioplasty (PCA) to the LAD was attempted but failed as the lesion could not be crossed with the guide wire. The patient was referred for CABG.

A postero-anterior chest radiograph (CXR) (Fig 1) showed a globular heart with a segmental collapse of the left lingular lobe of the lung.



Fig 1 : Postero-anterior chest radiograph



Fig 2 : Lateral chest radiograph

A lateral CXR (Fig. 2) showed that the heart was densely adhered to the chest wall with hardly any

space left between the sternum and anterior surface of the heart.

A CT scan (Fig. 3) of the chest showed an atelectatic band in the lingular lobe with an area of pleural thickening. It was thought that the abnormal positioning of the heart was due to the left lung anatomy. The CT scan did not suggest the severity of adhesions or any other pathology.

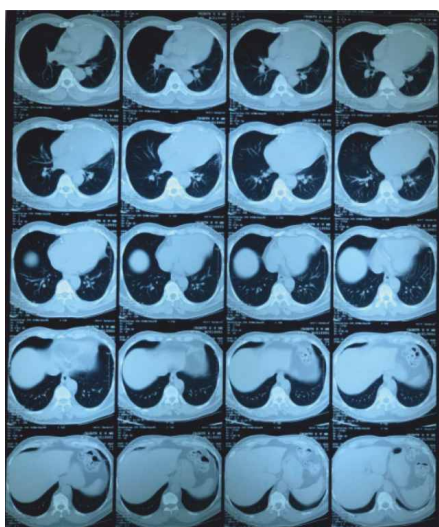
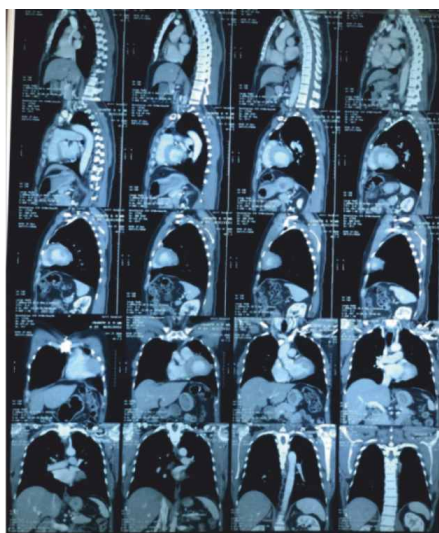


Fig 3 : CT chest

Patient did not have any other significant comorbidities and was clinically stable. His blood investigations were within the normal range and ejection fraction was 60% on echocardiography. Urgent Re Do CABG was planned because of his symptoms (Angina Class II). Routine preoperative

preparations were done, eight units of blood, FFP and platelets were crossmatched.

General anesthesia was induced after insertion of a right radial cannula, pulmonary artery catheter and left femoral arterial cannula. A right groin incision was performed, femoral vessels were identified, and vessel loops were placed. (As a precaution in case emergency femoral bypass was required)

A midline sternal incision was made through the previous incision and sternal wires were identified. The oscillating saw was used for sternotomy.

The anterior surface of the heart was dissected and separated slowly and carefully from the anterior chest wall. The right ventricle was densely adherent to the chest wall and the lung. The LAD territory was significantly shifted to the left close to the chest wall due to these adhesions.

Further dissection and mobilization of the heart to perform the anastomosis through the midline sternotomy carried a significant danger of damaging the heart or the lateral graft.

After weighing the risks, it was decided to perform a left anterior thoracotomy to complete the anastomosis to LAD (Fig 4).

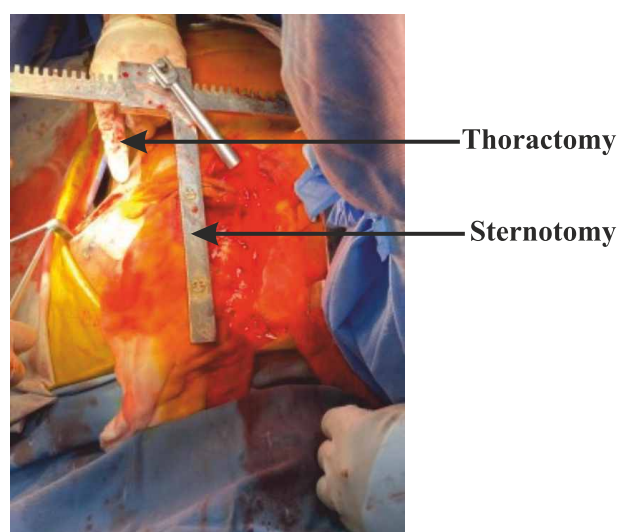


Fig 4 : Midline sternotomy and subsequent thoractomy

The RIMA was harvested and lengthened with a segment of vein from the right leg. (It was decided to use a RIMA to avoid clamping the aorta due to the patent venous grafts.)

The left anterior thoracotomy incision was made through 5th intercostal space. The distal LAD was identified without even collapsing the lung. The extended RIMA was grafted to the distal LAD on the beating heart through the thoracotomy with minimal inotropic support to maintain the haemodynamics (Fig. 5, 6).

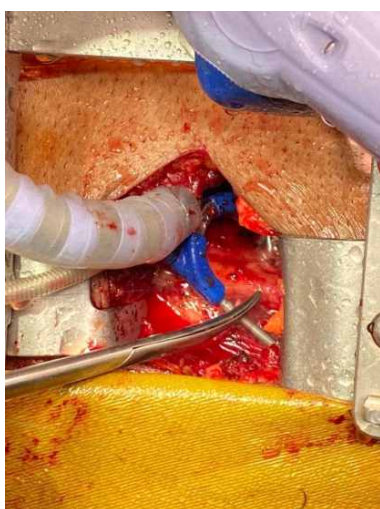
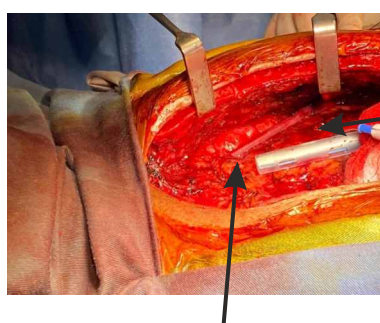


Fig. 5 : Anastomosis viewed through thoracotomy



Distal end of the conduit going down along the chest wall to LAD

Proximal end of the RIMA

Fig. 6 : Intra-operative images

Heparin was reversed and haemostasis was achieved. Routine closure of the sternotomy and thoracotomy was done, and the patient was transferred for intensive care.

He was on minimal inotropic support, weaned off

from ventilation and extubated the next morning. The patient recovered well without any major complications (fig.7)



Fig 7 : CXR on day 05 and well healed skin incisions on day seven post-surgery

Discussion

As CABG patients are getting older and living longer, redo CABG surgery has become an integral part of cardiothoracic practice, and thereby presenting significant challenges in technical and decision-making aspects.

For re-do CABG patients who have a patent graft to LAD, it is important to try and avoid midline re sternotomy to avoid injury to the patent graft [1]. Studies have shown that redo off-pump CABG via a left posterolateral thoracotomy provided a safe and effective surgical approach with lower rates of postoperative morbidity and mortality in patients who required revascularization of the circumflex artery and its branches [2]. This was true especially in patients with intact LIMA-to-LAD grafts.

With the technical and surgical training improvements, off pump redo revascularization of circumflex targets through a posterolateral thoracotomy is an excellent approach in patients with accessible targets to avoid re-sternotomy and cardiopulmonary bypass.

The in-hospital death rate (1.8%) compares very well with the EuroSCORE-predicted mortality (14.2%) [3]. Conduits and a proximal anastomosis

should be selected according to the circumstances.

In cases with very dense adhesions on the left side, it would be impossible to access the heart through thoracotomy. These patients will need re-do surgery through sternotomy even if it carries high risk.

This patient's lateral CXR showed evidence of anterior adhesions but there was no direct evidence to show dense adhesions laterally and posteriorly. Thoracotomy was not planned initially due to the need for RIMA harvesting.

The decision to complete the anastomosis through thoracotomy was easy because the surgical team is experienced with MICS (Minimally Invasive Cardiac Surgery) which is performed regularly in our center mainly for single grafts, occasionally for two grafts.

The required expertise and equipment are always available in the unit, so converting to thoracotomy was not a difficult task.

When MICS is done electively, the left lung needs to be collapsed to access the LIMA, anterior or lateral wall of the heart. It is done usually by using double lumen tube or bronchial blockers which are inserted at the time of induction. This patient was intubated with normal 8.5mm endotracheal tube and it would have been difficult to collapse the left lung if it was

needed. However, in this patient the lateral wall of the heart was very close to chest wall. Therefore, there was no need to collapse the left lung completely to get the access to the heart. In any case, there was no LIMA to harvest.

Combining a sternotomy with a thoracotomy for a re- do CABG is rare and this dual approach was unplanned in this instance. However, it is a viable option when the expertise and equipment is available.

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