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## Case Report

# Endoscope Assisted Coronary Artery Bypass Grafting – a New Viewpoint on Coronary Revascularization – Case Report

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**Abstract**

*Considering the prolonged recovery time, less cosmesis, chronic post-sternotomy pain, sternal instability, delayed wound and bone healing, wound infection associated with conventional coronary Artery Bypass Grafting (CABG), minimally invasive surgery has been being tried for decades. Endoscope assisted CABG (Endo-CAB) is a newer development. This reported case is the first one of our series of Endo-CABG, where two grafts were done successfully.*

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**Introduction:**

Coronary Artery Bypass Grafting (CABG) done through median sternotomy, remains the primary way of surgical revascularization in patients with significant coronary artery disease. Although median sternotomy provides excellent exposure to the surgical field, it is associated with some major disadvantages like prolonged recovery time, less cosmesis, chronic post-sternotomy pain, sternal instability, delayed wound and bone healing, wound infection etc.[1] Diabetes, obesity, female sex (larger breast size) are also considered as the potential risk factors for sternal wound complications. Consequently, less invasive access to the heart, including mini-thoracotomy or partial sternotomy has been introduced. Over the last few years this minimal invasive procedures (especially mini-thoracotomy) have evolved and gained enormous popularity, primarily due to early patient recovery after surgery, a better cosmesis with an almost similar surgical outcome.

At present, sternal sparing CABG includes minimally invasive direct vision bypass and video or robotically assisted techniques.[2] Endoscope assisted CABG (Endo-CAB) is a newer development combining thoracoscopic ports (three ports, ~5mm) and a mini-thoracotomy (3-4 cm) through intercostal space. [1] Our team has been doing minimally invasive CABG for years together with similar clinical results (in comparison to OPCAB) and superior patient satisfaction. After couple of failed endoscopic attempts, we have completed few Endo-CABG on beating heart. This reported case is the first one of our series where two grafts were done successfully, and to our best knowledge this is the first case of its kind in our country.

**Case report:**

Mr. X, 54 years old, gentleman with hypertension and history of recent non-STEMI, came to us with the symptoms of compressive chest pain for two months. His biochemical investigations showed only raised ESR (33 mm at the end of 1$^{st}$ hour) and CRP (7.7 mg/L). Echocardiogram revealed ischemic heart disease with regional wall motion abnormality, mild mitral regurgitation, left

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ventricular ejection fraction (LVEF) was 45%. His coronary angiogram showed significant Left main coronary artery stenosis with total occlusion of proximal LAD and good retrograde filling from the contra-lateral collaterals and $OM_2$ was having significant coronary artery stenosis. His pre-operative serum creatinine was 1.0 mg/dl and EuroSCORE-II for operative mortality was 1.03%. Patient has no history of cerebrovascular disease, chronic kidney disease, chronic obstructive pulmonary disease or any others systemic illness.

On August, 2024 after optimization of patient's conditions patient was taken to OR and all necessary lines (arterial - radial, and left femoral, one CVP catheter, one peripheral line) were established. Patient was put on mechanical ventilation with double lumen endotracheal tube, and was ventilated with single lung ventilation.

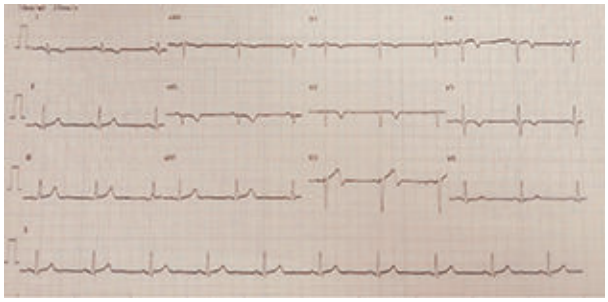

**Figure 1:** *Pre-operative ECG of the patient*

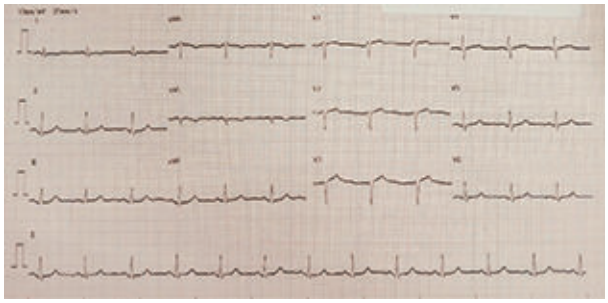

**Figure 2:** *Post-operative ECG of the patient*

A 2.5 cm working port was created at the left 5$^{th}$ intercostal space just between the mid-clavicular and anterior axillary lines and Fehling MNU retractor blade was introduced. Another port was created at left 3$^{rd}$ space at the anterior axillary line for camera (7.7mm, 0°, rigid). We started left IMA harvesting after giving 5000 IU intravenous heparin, and started from most visible part, at a skeletonized fashion by harmonic® hook blade. The branches of mammary artery were sealed with

**Figure 3:** *Endoscopic harvesting of Left Internal Mammary Artery through only two ports (white arrow),*

harmonic scalpel and upon completion of mammary harvesting, adequate heparin (300 units /kg body weight) were given to achieve the desired ACT. We converted the working port to a mini-thoracotomy (6.5 cm) to complete the anastomosis. Pericardiotomy was done then and stays taken. Proximal anastomosis was done on flexible side-biting clamp (CYGNET® VITALITEC) with 6-0 polypropylene. LIMA to LAD distal anastomosis was done with 8-0 polypropylene on octopus® suction stabilizer. RSV to $OM_1$, distal anastomosis was done with 7-0 polypropylene on octopus® suction stabilizer. Hemostasis was achieved and

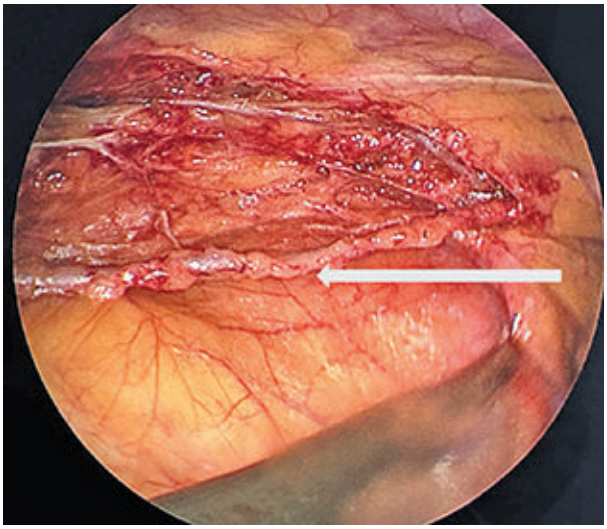

**Figure 4:** *Harvested IMA seen at monitor (white arrow) through Endoscope,*

wound was closed in layers leaving single chest tube in situ. Patient was extubated after 6 hours without major issues and bleeding.

Patient had usual (<300 ml in 1st POD) blood loss post-operatively and he was extubated subsequently like any other OPCAB (MICS or Sternotomy) patient without any residual difficulty.

**Figure 5:** *After skin closure chest wound site*

**Discussion:**

This technique lowers the procedural cost, time, training time than robotic procedures, additionally patient selection in not mandatory.[1,3,4] Yilmaz A, et al. introduced this technique and used three thoracoscopic ports (~5mm), whereas we only used one (~10 mm) for the camera. Moreover, we used the mini-thoracotomy (~2.5cm) for insertion of LIMA harvesting forceps along with harmonic scalpel and converted it to 6.5 cm for coronary anastomosis, but Yilmaz A, et al; used a mini-thoracotomy (3-4 cm) for coronary anastomosis. They harvested LIMA with VATS cautery but from our daily practice we observed better LIMA quality,[5] if harvested with harmonic scalpel, so we took LIMA with harmonic scalpel. Besides the addition of extra-cost, one drawback of harmonic scalpel is that, it cannot seal any branch if torn during harvesting, which may create a havoc during mammary takedown.

Most of the previous authors used carbon-di-oxide ($CO_2$) insufflation to create an effective pneumothorax but we haven't used $CO_2$ as we had single lung ventilation which effectively eliminated glitches related to lung movements. Yilmaz A, et al; has done all the cases on arrested heart, whereas, from our long experiences of OPCAB (thanks to the dedicated anesthetists) we performed our case on beating heart without much hemodynamic instability.

Post-operative ECG showed immediate improvement and echocardiogram showed improved left ventricular function (LVEF-50%). Patient was discharged on 5th post-operative day without any residual myocardial ischemic symptoms.

**Conclusion:**

Endo-CAB is a promising option for multi-vessel coronary revascularization in the indicated patients. A certain learning curve for conduit harvesting and coronary anastomosis is there, and cost for endoscopic vein harvesting as well as harmonic scalpel will be added but patient satisfaction is worthy. Although, this technique is a bit costly than direct vision minimal invasive techniques, it is actually cheaper than the robotic procedures, with almost similar results. We're planning to launch a larger sample study to see the outcomes in comparison to minimal invasive CABG.

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**Conflict of Interest - None.**

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