



## *Give the sternum a break – endoscopic-assisted atraumatic coronary artery bypass: a case report*

### **Nedotaknjena prsnica – endoskopsko opravljeni obvod koronarnih arterij (prikaz primera)**

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#### **Abstract**

*One of the basic principles of minimally invasive surgery is to minimize surgical trauma caused by incision. Recent reports have demonstrated that the endoscopic-assisted atraumatic coronary artery bypass (endoACAB) involves much less manipulation of the musculoskeletal component of the thoracic cavity, which results in significantly reduced traumatization, less postoperative pain and faster recovery as compared to the standard procedure. Two patients treated by endoACAB are presented. We believe that in appropriately selected patients, endoACAB is a feasible, safe and highly recommendable substitute for classic approach*

**Key words.** Coronary artery bypass, endoscopic, atraumatic, sternum.

#### **Izveček**

Temelj minimalno invazivne kirurgije je zmanjševanje kirurške poškodbe tkiv. Študije so pokazale, da t. i. endoACAB tehnika (endoskopsko opravljeni obvodi koronarnih arterij) vključuje veliko manj manipuliranja z muskuloskeletnim delom prsnega koša, kar pomeni pomembno zmanjšanje medoperativne travme, posledično pa manj bolečin in hitrejše pooperativno okrevanje. V prispevku opisujem dva bolnika, obravnavana po metodi endoACAB. Izkazalo se je, da je ta metoda pri izbrani populaciji bolnikov resnično varna in tehnično izvedljiva, zato je močno priporočljiva alternativa klasični tehniki.

**Ključne besede.** Obvod koronarnih arterij, endoskopski, atravmatski, prsnica.



## Introduction

One of the basic objectives of minimally invasive surgery is minimizing surgical trauma induced by incision. Recent reports have demonstrated that endoACAB (endoscopically assisted atraumatic coronary artery bypass) involves much less manipulation of the musculoskeletal component of the thoracic cavity, which means significantly reduced trauma, less pain and faster postoperative recovery (1,2). The technique utilises the established endoscopic technology and the crucial parts of the procedure are done under direct vision, which makes it relatively simple and very attractive for cardiovascular surgeons.

This report provides our initial experience with the endoACAB technique. We report two patients who had left internal mammary artery (LIMA) to left anterior descending artery (LAD) bypass surgery using the endoACAB approach.

## Patient data

### Patient 1

A 64-year-old male patient was admitted to this Department for elective diagnostic checkup. A history of paroxysms of atrial fibrillation and myocardial infarction in 1999 was elicited. At that time no coronarography was done. While in hospital the patient was evaluated by transthoracic echosonography (TTE), which showed mild systolic dysfunction of the left ventricle and mild-to-moderate mitral insufficiency. Heart catheterization revealed a hypokinetic anterior wall with an ejection fraction of 50 %. Coronarography showed proximal occlusion of the LAD with filling through R-L (right – left) and L-L (left – left) collaterals, and a 50 % stenosis of the left circumflex artery (LCX) and right coronary artery (RCA)

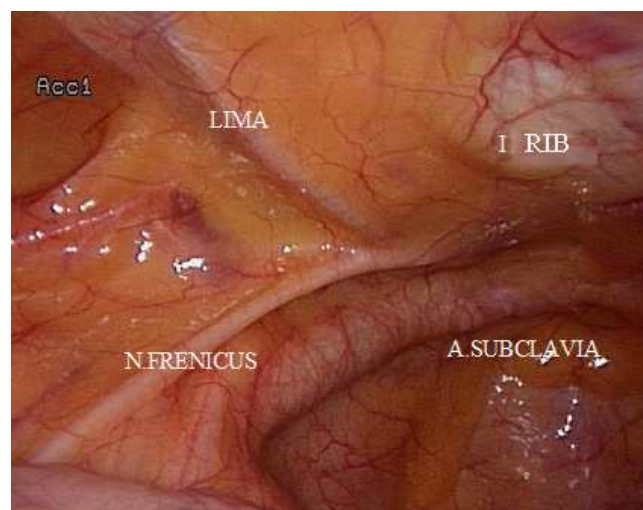
### Patient 2

A 61-year-old male patient, treated for hypertension and hyperlipidemia, was admitted with recurrent chest pain and dyspnea. He had suffered an anteroseptal myocardial infarction in 1999. At that time coronarography showed two-vessel disease, and the patient underwent PTCA (percutaneous transluminal coronary angioplasty) with

insertion of three stents in the RCA. During current hospitalization, TTE showed mild diastolic dysfunction and insignificant aortic regurgitation. Heart catheterization done at the Department revealed occlusion of the LAD and filling of the artery through R-L collaterals.

## Technique

The patient is placed in a 45% left supine position and is intubated using a double-lumen endotracheal tube. Single lung ventilation is utilized to enable the left lung to be deflated during the left internal mammary (LIMA) dissection (Fig. 1).

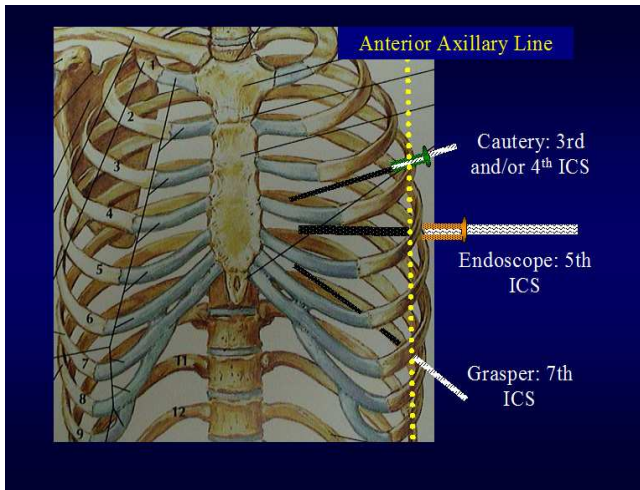
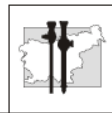


**Figure 1**

Endoscopic view of LIMA.

Ports are placed in the left third (grasper), fifth (8-mm endoscope), and seventh (electrocautery) intercostal spaces between the mid and anterior axillary lines (Fig. 2).

Setting ports in this array enables us to reach the entire bed of LIMA in an easy manner. Carbon dioxide insufflation at pressures ranging from 8 mmHg to 10 mmHg provides additional working space by increasing the distance between the anterior surface of the heart and the sternum up to 4 cm. After a complete LIMA dissection, a 5-6 cm skin incision is made in the fourth intercostal space, slightly medial to the nipple. There follows dissection of the underlying tissues.



**Figure 2a**  
Standard port configuration for LIMA harvesting.



**Figure 2b**  
Schematic view of standard port configuration for LIMA harvesting.

The pericardium is incised longitudinally 6 cm in length. The Octopus vacuum stabilizer (Medtronic, Minneapolis, MN) is applied to the surface of the heart to steady the target coronary artery. LIMA to the left anterior descending artery (LAD) anastomosis is made using an off-pump technique with continuous Prolene 7/0 under direct vision (Fig.3). A chest tube is inserted through the port in the seventh intercostal space previously used. The wound is closed in layers.



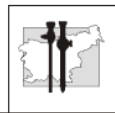
**Figure 3**  
LIMA-LAD anastomosis done under direct vision

### Postoperative course

After the operation, the patients were transferred to the ICU, and the next day back to the ward. The postoperative course was unremarkable; the operative wounds healed by first intention. The patients experienced no pain or discomfort, and had the chest tube removed one day after the procedure. They left the hospital on day 5 post-operatively to continue their postoperative rehabilitation on an outpatient basis. No late complications were reported.

### Discussion

A median sternotomy approach has been considered the »gold standard« for coronary bypass surgery for decades. The approach gives the surgeon an excellent overview of the surgical field, but has several drawbacks, including: painful early postoperative period, significantly longer postoperative rehabilitation and increased probability of serious complications, such as sternal dehiscence or sternal wound infection. In patients with single vessel disease, alternative, less invasive approaches are definitely warranted. In our opinion, the main advantage of endoscopic-assisted ACAB is that it combines the existing endoscopic technology with the previously described surgical techniques. The initial endoscopic phase includes harvesting of the LIMA, and, pro-



vided that the surgical field is sufficiently clear, dissection of the pericardium. The second phase of the procedure, which involves performing an anastomosis, is technically more challenging and is therefore carried out through a small incision under direct vision. Using the endoscopic approach for the less demanding part of the operation obviates the need for sternotomy, whereby surgical trauma during CABG is drastically reduced. Even though skin incision is made, trauma to the chest wall is no greater than in totally endoscopic procedures, since rib spreading, which is the cause of most of the postoperative pain, is usually not required.

We believe that combining endoscopy and conventional surgery makes the procedure less complicated, less complex and therefore more appealing to the emerging generation of cardiovascular surgeons.

## ***Conclusion***

Our initial experience with a novel technique of endo ACAB is reported. Although we have used it in only two patients with one vessel disease, our first impressions are positive, mainly because of the minimal amount of trauma involved and the rapid postoperative rehabilitation of the patients. Today, the majority of patients with a single vessel disease are managed in cath labs, therefore cardiovascular surgeons rarely have the luxury of performing relaxed, straightforward single vessel procedures. Recently, there was a report of extending the endoACAB to patients with multi vessel disease (3). Although the technique is technically challenging, initial experience in these patients is promising.

We believe that endo ACAB, which is contraindicated in severe left ventricular enlargement, low EF and some other abnormalities, is a safe, feasible and highly recommendable substitute for the classic approach in properly selected patients.

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