

# Off-pump coronary artery bypass surgery by left anterolateral thoracotomy versus median sternotomy: A matched comparison

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## Abstract

**Background.** Off-pump coronary artery bypass (OPCAB) surgery is an established technique for the management of three-vessel coronary artery disease. This study compared the clinical results of two different surgical approaches: median sternotomy and left anterolateral thoracotomy in patients undergoing OPCAB surgery. **Methods.** The study included two groups of 50 patients each with multivessel coronary artery disease matched for age, gender, extent of coronary disease, diabetes, hypertension and ejection fraction. **Results.** Preoperative characteristics were similar in the two groups. There were no deaths, or stroke. Patients undergoing median sternotomy received more grafts than those undergoing left anterolateral thoracotomy (3.30±0.8 vs 2.48±0.8 p<.001). The only difference in early hospital morbidity was the need for greater transfusion in the sternotomy than the thoracotomy group (p<.031). Hemoglobin levels (24 hours post-operatively) were also higher in the thoracotomy group (p<.001). **Conclusion.** The anterolateral thoracotomy is a safe surgical approach and a reliable alternative to median sternotomy in patients undergoing OPCAB surgery.

## INTRODUCTION

Off-pump coronary artery bypass (OPCAB) surgery via a median sternotomy is an established surgical technique for patients undergoing coronary revascularization. Recently the left anterolateral thoracotomy has been proposed as an alternative approach (1). Advantages of this technique have been reported including less surgical trauma, quicker recovery and improved cosmesis. This study compares the clinical outcomes of Anterolateral Thoracotomy Coronary Artery Bypass (ALTCAB) vs. Median Sternotomy Coronary Artery Bypass (MSCAB) on the beating heart in patients with multivessel disease.

## PATIENTS AND METHODS

The study includes 100 patients with multivessel coronary artery disease who underwent OPCAB between 2005 and 2006 in a multiethnic single cardiac surgical unit in Trinidad and Tobago. Two surgeons according to their preferred technique performed each 50 cases using the ALTCABs or MSCABs procedure. The two groups were matched for age,

gender, and extent of coronary disease, diabetes, hypertension and ejection fraction. Clinical notes were reviewed retrospectively.

## SURGICAL TECHNIQUE

### LEFT ANTEROLATERAL THORACOTOMY

The technique proposed by Guida et al. was used as previously described (1.) Briefly the chest was entered via the 4th or 5th intercostal space and the left internal thoracic artery harvested under direct vision in a skeletonized fashion using a Finocchietto retractor. The pericardium was incised and traction sutures placed to facilitate exposure of the ascending aorta and then the posterior and lateral wall vessels of the heart. The proximal graft anastomoses (long saphenous vein or radial artery) when required were performed first. The distal anastomoses were performed on the beating heart using the Octopus stabilizer and intracoronary shunts. To facilitate grafting of the circumflex and right coronary artery territory, an apical suction device (Starfish) was used. All patients were extubated in the

operating theater and postoperative pain relief was obtained by direct injection of local anesthetic into the intercostal space above and below the incision. In addition an extrapleural catheter was placed posteriorly for continuous bupivacaine infusion in the first 24 hours.

## MEDIAN STERNOTOMY

The distal anastomoses were all performed first using a stabilizer and intracoronary shunts as previously described (2). Extubation occurred in the intensive care unit and pain relief was via intramuscular Tramadol and oral analgesia.

## RESULTS

### PATIENT DEMOGRAPHICS

The two groups showed similar demographics. Table 1.

**Figure 1**

Table 1

Variables	ALTCAB	MSCAB
Age Range, years (mean)	35-74 (57.3)	46-73 (59.0)
Male (%)	34 (68)	28 (56)
Extent of Coronary Disease	3 vessel	3 vessel
Diabetes (%)	28 (56)	38 (76)
Hypertension (%)	36 (72)	36 (72)
EF %	51.74 ± 13.3	54.24 ± 13.4

There were no conversions to median sternotomy from the anterolateral thoracotomy group and no conversions to cardiopulmonary bypass in either group. There were no deaths or stroke. Patients undergoing sternotomy received more grafts than those undergoing left anterolateral thoracotomy ( $p < 0.001$ ). One patient in the sternotomy group required postoperative dialysis. The only difference in early hospital morbidity was the need for greater transfusion in the sternotomy than the thoracotomy group ( $p < 0.031$ ). Postoperative hemoglobin levels were also higher in the thoracotomy group at 24 hours post-operatively ( $p < 0.001$ ) (Table 2.)

**Figure 2**

Table 2. Results (values are expressed as mean ± SD)

Variables	ALTCAB	MSCAB	P Value
Pre op Hb (g/dl)	13.304 ± 1.56	12.862 ± 1.57	NS
Post op Hb (g/dl)	11.91 ± 1.77	10.30 ± 1.60	$P < 0.001$
Blood Units Transfused	0.14 ± 0.45	0.41 ± 0.737	$P = 0.031$
Pre op Creatinine (mmol/l)	1.174 ± 1.00	1.326 ± 0.89	NS
Number of grafts	2.48 ± 0.8	3.30 ± 0.8	$P < 0.001$

## DISCUSSION

Coronary artery bypass surgery on the beating heart allows

multivessel revascularization while avoiding the deleterious effects of CPB. These include bleeding, fluid retention, arrhythmias and organ dysfunction (3). Several randomized studies have reported reduced morbidity with OPCAB compared to conventional CABG with CPB (2,4,5). MIDCAB has been used for limited single vessel grafting, redo surgery and valve surgery with good results, thereby avoiding the potential complications of sternotomy (6,7).

The ALTCAB technique offers the possibility of avoiding both CPB and sternotomy and their potential adverse effects while allowing complete multiple revascularizations (1).

No obvious differences were found in our study with the exception of transfusion.

Both surgeons in our series were very experienced and the one performing the ALTCAB has already published a personal series of 255 consecutive patients (1). The ALTCAB approach has a demanding learning curve, as it is a more difficult technique compared to the familiar median sternotomy.

The limitations of our study are the small numbers and its retrospective nature. A full randomized prospective controlled trial is at present recruiting at the Bristol Heart Institute.

## CONCLUSION

The anterolateral thoracotomy is a safe surgical approach and a reliable alternative to median sternotomy in patients undergoing off-pump CABG.

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