



# A COMPARATION OF CORONARY ARTERY BYPASS GRAFTING WITH AND WITHOUT CARDIOPULMONARY BYPASS IN EUROSCORE HIGH RISK PATIENTS

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## ABSTRACT

Angiotensin converting enzyme (ACE) and nitric oxide (NO) have been suggested to be in-  
The objective of this study is to compare outcomes of coronary artery bypass grafting (CABG)  
in high-risk patients performed with- (ONCAB) and without -(OPCAB) use of cardiopulmo-  
nary bypass. From October 2001 till October 2005, 210 high-risk patients classified according  
to European System for Cardiac Operative Risk Evaluation (EuroSCORE) (score  $\geq 5$ ) under-  
went CABG in Cardiovascular Clinic, University Clinical Centre Tuzla, Bosnia and Herze-  
govina. 138 patients operated as OPCAB were compared to 72 patients operated as ONCAB.  
All data were entered in a patient database (DATACOR) and analyzed in SPSS. OPCAB pa-  
tients received insignificantly less number of grafts than those treated by ONCAB (3,0 vs. 3,2)  
( $p=0,071$ ). Stroke was significantly more common in ONCAB group (2,9 vs. 11,1%) ( $p=0,034$ )  
while the incidence of other postoperative complications and mortality were similar. The ven-  
tilation time (4,3 vs. 6,7 hours) ( $p=0,007$ ), retransfusion volume (392,7 vs. 633,7 ml) ( $p=0,041$ )  
and hospital stay (8,2 vs. 10,1 days) ( $p=0,031$ ) was significantly less in OPCAB group. OPCAB  
is safe and effective in treatment of high-risk patients. Avoidance of cardiopulmonary bypass  
is associated with reduced incidence of neurologic complications, lower intubation time,  
retransfusion rate and shorter hospital stay, and in our experience the preferred operative  
method in such patients.

KEY WORDS: coronary artery bypass grafting-EuroSCORE-high risk

## INTRODUCTION

Coronary artery bypass grafting (CABG) became the accepted method of revascularization for coronary artery disease (CAD) in the 1970s. Today, it is one of the most common surgical procedures in USA and Western Europe with more than 500 -1000 procedures performed per million population (1). Results of CABG in general have slowly improved over time in spite of a worsening risk profile. Most of the procedures are still performed on the arrested heart supported by cardiopulmonary bypass (CPB)-ONCAB, although it has become increasingly common to perform the procedures without use of CPB-OPCAB, using regional myocardial stabilization during grafting. OPCAB has been reported to have superior results especially in certain subgroups of patients (2,3). Refinements in technology and clinical experience have resulted in greater acceptance of OPCAB among cardiovascular surgeons (4,5,6). A European System for Cardiac Operative Risk Evaluation (EuroSCORE) value of  $\geq 5$  represents a high level of risk in patients with coronary artery disease (7). In such patients CABG often produced poor results leading to significant morbidity and mortality. Recent trials demonstrated that OPCAB is associated with reduced morbidity and better perioperative results in this group of patients which is related to avoidance of CPB and the inflammatory response. The present study was designed to compare the early and late clinical outcomes of OPCAB with ONCAB in the treatment of high risk patients.

## MATERIALS AND METHODS

From October 2001 till October 2005, 210 high-risk patients classified according to EuroSCORE (score  $\geq 5$ ) underwent CABG in Cardiovascular Clinic, University Clinical Centre Tuzla, Bosnia and Herzegovina. 138 patients who underwent OPCAB were compared to 72 patients operated as ONCAB. Preoperative and postoperative data were reviewed using the computer based patient data program (DATACOR). Selection of operative technique was based on surgeon preference. ONCAB was carried out through median sternotomy. CPB was instituted using ascending aortic cannulation and two stage venous cannulation. Myocardial protection was achieved by intermittent antegrade and/ or retrograde cold blood cardioplegia. After completion of distal anastomoses on the arrested heart, the aortic cross-clamp was removed and the proximal anastomoses performed with partial occlusion of the aorta. OPCAB was also done through median sternotomy. To

achieve adequate exposure of the heart a deep pericardial LIMA stitch (8) was placed in the oblique sinus of the posterior pericardium. By manipulating this stitch positioning of the heart was safe and effective. The target vessel was exposed and snared above and/or below the anastomotic site using a 4-0 pledgetted Prolene suture and soft rubber tourniquet to avoid injury to the coronary artery (9). An intra coronary shunt was frequently used to prevent bleeding during grafting and distal ischaemia (10). Visualization of the anastomotic site was improved by a surgical blower. The CPB machine was kept in the immediate vicinity with the circuit mounted but without priming. Left anterior descending artery (LAD) was revascularized first prior to major manipulation of the heart. Heparin was given in doses of 3 mg/kg in ONCAB to keep the activated clotting time (ACT) above 400 sec. and in OPCAB 2 mg/kg to keep ACT above 300 sec. Intraoperative flow verification with Transit Time Flow Measurement (TTFM) (Cardiomed Flowmeter, Medistim AS, Oslo, Norway) was used in all grafts as a quality assurance measure. When no reversible cause of poor TTFM results were identified the graft was revised (11). In the OPCAB group flow measurements were obtained with the proximal snare on and off to assess distal patency. For every graft flow curves and waves were standardly recorded. If mean or diastolic flow was low, grafts were in general revised according to standard criteria (12).

## RESULTS

Preoperative patient characteristics are shown in Table 1. Patients in OPCAB group were significantly older than those in ONCAB group ( $p=0,027$ ). There was no significant difference in other preoperative risk factors between the groups. Table 2 shows postoperative complications and mortality for the two group of patients. The incidence of stroke was significantly higher in the ONCAB group. The incidence of reoperation for bleeding, myocardial infraction (MI), renal dysfunction, atrial fibrillation, wound infection, pneumonia and organ failure were comparable between the groups. 30-days mortality was higher in ONCAB group (2,9% vs. 6,9%) but with no significant difference ( $p=0,310$ ). Patients in ONCAB group received insignificantly more grafts than those in OPCAB group (3,0 vs. 3,2;  $p=0,071$ ). All patients however had complete revascularisation in the judgement of the surgeon. Intubation time, retransfusion volume and hospital stay were significantly less in OPCAB group (Table 3).

Variable	OPCAB (n=138)		ONCAB (n=72)		p
	N	%	N	%	
Female gender	46	33,3	21	29,1	0,646
Hypeholestolemia	79	57,2	46	63,9	0,434
Hypertension	114	82,6	56	77,8	0,508
Pulmonary disease	20	14,5	14	19,4	0,467
Cerebrovascular disease	15	10,9	5	6,9	0,501
Peripheral arterial disease	28	20,3	8	11,1	0,138
Diabetes	40	29,0	20	27,8	0,981
Recent myocardial infarction	84	60,9	38	52,8	0,326
Previous cardiac surgery	12	8,7	4	5,6	0,589
Age	Mean	SD	Mean	SD	
	66,6	±7,79	64,0	±8,21	0,027
Ejection fraction	Mean	SD	Mean	SD	
	41,6	±13,41	38,5	±14,96	0,132
EUROSCORE	Mean	SD	Mean	SD	
	6,0	±1,51	6,3	±1,97	0,254

TABLE 1. Preoperative characteristics

Complications	OPCAB (n=138)		ONCAB (n=72)		p
	N	%	N	%	
Reoperation for bleeding	2	1,4	2	2,8	0,891
Myocardial infraction	2	1,4	3	4,2	0,453
Renal disfunction	1	0,7	0	0,0	0,740
Atrial fibrilation	31	22,5	14	19,4	0,742
Wound infection	7	5,0	5	6,9	0,809
Pneumonia	1	0,7	2	2,8	0,563
Stroke	4	2,9	8	11,1	0,034
Organ failure	1	0,7	4	5,6	0,089
30-day mortality	4	2,9	5	6,9	0,310

TABLE 2. Complications and mortality

	OPCAB		ONCAB		p
	Mean	SD	Mean	SD	
Distal anastomoses	3,0	±0,59	3,2	±0,79	0,071
Ventilation (hours)	4,3	±4,81	6,7	±6,01	0,007
Bleeding (ml)	615,2	±322,82	807,4	±1037,50	0,066
Retransfusion (ml)	392,7	±180,64	633,7	±813,83	0,041
ICU stay (days)	1,7	±0,83	1,9	±0,92	0,092
Hospital stay (days)	8,2	±3,56	10,1	±8,84	0,031

ICU-intensive care unit

TABLE 3. Perioperative results

## DISCUSSION

Results of CABG in general have slowly improved over time in spite of a worsening risk profile. Data from European and US institutions demonstrated that patients undergoing CABG are progressively older with higher incidence of co-morbidities and it seems that this group will represent a greater proportion of patients undergoing CABG. Optimal management of high-risk patients therefore has become increasingly challenging. OPCAB has become increasingly common since there is evidence that this technique is less likely to cause major complications. The initially use of OPCAB was mainly performed in low risk patients. However as results were analyzed more carefully the main benefit seemed to occur in higher risk patients (13). Complete coro-

nary revascularisation through OPCAB was frequently considered impossible in patients with more disease than two vessels. In our study there was no significant difference in the average number of grafts (3,0 vs. 3,2;  $p=0,071$ ) demonstrating our ability to revascularize all walls of the heart even in high risk patients. One of the crucial issues in our technique is the initial grafting of the LAD while the heart is minimally displaced. After securing adequate flow to the LAD using intraoperative graft patency verification by TTFM the heart can almost always be manipulated for complete revascularization. The main benefits of avoiding CPB in high risk patients probably involves avoidance of global ischemia and reduction of a general inflammatory state and minimalization of micro and macro emboli.

## CONCLUSION

The results of this study suggests that OPCAB is safe and effective in treatment of high-risk patients. Avoidance of cardiopulmonary bypass is associated with reduced incidence of neurologic complications, shortening of respirator time, reduction of retransfusion volume and length of hospital stay. We consider OPCAB the treatment of choice in high risk patients.

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