

## Early Clinical Outcome of Urgent Coronary Artery Bypass Grafting at the Iraqi Center for Heart Diseases

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### ABSTRACT:

#### BACKGROUND :

Coronary artery bypass grafting (CABG) can be divided according to its timing into: elective, urgent, emergency and salvage. The purpose of urgent CABG is to reperfuse the coronary artery blood flow rapidly, improves areas of myocardial ischemia, repair ventricular dysfunction and prevent the spread of the infarction area. Urgent CABG has a higher morbidity and mortality than elective CABG.

#### OBJECTIVE:

The purpose of this study was to identify preoperative and peroperative risk factors associated with this morbidity and mortality, evaluate clinical outcomes and recommend the possible solutions.

#### MATERIALS AND METHODS:

This is a retrospective study that reviewed the hospital records of 50 patients who underwent urgent CABG at the Iraqi Center for Heart Diseases for three years (2008-2010). The main diagnostic tools were coronary angiography and echocardiography. All underwent conventional CABG on cardiopulmonary bypass with cardioplegic arrest. Variables that may be related to operative risk were analysed.

#### RESULTS :

Forty-three patients underwent isolated CABG, while six patients underwent postinfarction ventricular septal defect repair and one patient underwent mitral valve replacement in addition to CABG. Postoperative mortality was 20%.

#### CONCLUSION:

The most common cause of mortality was Low Cardiac Output Syndrome followed by Acute Renal Failure. Preoperative risk factors for perioperative mortality were age more than 65 years, preoperative cardiogenic shock and low ejection fraction below 40.

**KEYWORDS:** urgent CABG, postinfarction VSD, low cardiac output syndrome.

### INTRODUCTION:

Coronary artery bypass grafting (CABG) is a surgical procedure that uses another artery or vein to reroute blood around a blockage in the coronary arteries that supply the heart with blood and oxygen<sup>(1,2,3)</sup>. CABG can be divided according to its timing into:

- Elective: indicates that the patient can be discharged from hospital after diagnosis, and then operated on within a normal scheduling routine.
- Urgent: Medical factors require patient to stay in hospital to have operation before discharge. The risk of immediate morbidity and death is believed to be low.

- Emergency: Patient's cardiac disease dictates that surgery should be performed within hours to avoid unnecessary morbidity or death. ie ongoing refractory cardiac compromise unresponsive to other therapy except for cardiac surgery.
- Salvage: ongoing cardiopulmonary resuscitation en route to operating room.

#### **Indications of urgent/emergent CABG** <sup>(1,2,3,4,5,6)</sup>

- 1) ACS non responsive to maximal medical therapy
- 2) Failed angioplasty.
- 3) Cardiogenic shock in patients less than 75 years old with ST-segment elevation or left bundle branch block or posterior MI.
- 4) At the time of surgical repair of postinfarction ventricular septal rupture or mitral valve insufficiency.

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5) Life-threatening ventricular arrhythmias in the presence of greater than or equal to 50% left main stenosis and/or triple-vessel disease.

### **MATERIALS & METHODS:**

From January 2008 to January 2011 (three years), 324 patients underwent CABG at the Iraqi Center for Heart Diseases. Fifty patients of them (15%) underwent Urgent CABG within 16 hours to 7 days from the diagnosis (average 3 days). Forty Patients were males (80%) and ten were females (20%) (male/female ratio was 4:1). The age of patients ranged from 35 to 74 years (average 57.18 years).

This retrospective study reviewed patients medical records (which included history, examination, investigation, surgical procedure, ICU records and postoperative records). The patient age at the time of surgery, gender, Body Mass Index, comorbidity risk factors and surgical indications were reviewed. Classical surgical techniques were utilized on conventional cardio-pulmonary bypass with cardioplegic arrest. CABG was performed using mainly great saphenous vein graft, or left internal mammary artery to less extent. When there was ventricular septal defect it was patched by synthetic patch graft (PTFE).

Each patient variables were analyzed including, the surgical method, the site, type and number of grafts used, the duration of aortic cross clamp, bypass time, duration of postoperative mechanical ventilation, duration of intensive care unit (ICU) stay, duration of hospitalization, complications, need for repeat operation and perioperative death. The survival group and surgical mortality group were compared, and risk factors of mortality were analyzed. For statistical analysis a modified form of California CABG Outcome Reporting Program (CCORP) have been used.

### **RESULTS:**

Out of fifty patients who were enrolled in this study, sixteen patients (32%) had three vessels and two vessels disease, twenty six patients (52%) had left main coronary artery stenosis with intractable chest pain and/or cardiogenic shock and/or resistant ventricular arrhythmia unresponsive to maximal medical therapy and not fit for Percutaneous Coronary Intervention (PCI). Six patients (12%) had postinfarction ventricular septal defect, one patient (2%) had ischemic mitral regurgitation and one patient (2%) had failed PCI.

Regarding preoperative risk factors, smoking was the most common risk factor in 38 patients (76%) followed by hypertension (42%), diabetes mellitus (28%) and obesity (10%). Some patients had comorbidities; six patients (12%) had peripheral vascular disease, six patients (12%) had chronic lung disease (chronic bronchitis and bronchial asthma) two of them (4%) on steroid therapy and two patients (4%) had impaired renal function (diabetic nephropathy). Preoperative ejection fraction (EF) ranged from 34%-70% (mean of 50%) as estimated by Echocardiography.

Regarding previous Myocardial Infarction twenty one patients (42%) had already a previous myocardial infarction.

Preoperatively eight patients (16%) had at least one attack of arrhythmias in the form of Atrial Fibrillation, Ventricular Ectopics, Ventricular Tachycardia (VT) and Ventricular Fibrillation (VF) and managed medically or by cardioversion.

Eleven patients (22%) had cardiogenic shock prior to surgery managed medically and by the use of the intra aortic balloon pump, seven patients (14%) already had congestive heart failure.

Regarding New York Heart Association functional classification (NYHA): forty three patients (86%) were in Class IV and seven patients (14%) were in Class III.

As for by-pass grafts, 31 patients (62%) received saphenous vein grafts (SVG), while 19 patients (38%) had left internal mammary artery (LIMA) together with SVG.

The distal anastomosis ranged from 1 to 4 sites; four patients (8%) received one graft (indication for surgery was postinfarction ventricular septal defect), twelve patients (24%) received two grafts, twenty eight patients (56%) received three grafts and six patients (12%) received four grafts.

Regarding postoperative morbidity (Table 1); three patients (6%) were transferred to the ICU with the sternum left open for their unstable hemodynamic status, inability to give protamine sulfate due to low blood pressure or for resuscitation.

Eleven patients (22%) had bleeding of more than 1000 ml in the first 24 hours and required additional blood transfusion, three (6%) of them were re-explored for bleeding.

Three patients (6%) had graft thrombosis, and were re-explored and transverse veinotomy was made to evacuate the thrombus.

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One patient (2%) developed stroke and another patient (2%) had psychosis.

Ten patients (20%) had prolonged ventilation (more than 24 hours).

Four patients (8%) had renal impairment all of whom were diabetic.

One patient (2%) had upper GIT bleeding.

Five patients (10%) had superficial wound infection either at the site of sternotomy or at the site of great saphenous vein harvesting, no mediastinitis were reported.

Postoperative myocardial infarction couldn't be assessed because of the absence of the required investigations.

Low cardiac output syndrome (LCOS) defined as (the need for postoperative IABP or inotropic

support for longer than 30 min in the intensive care unit to maintain the systolic blood pressure greater than 90 mm Hg and the cardiac index greater than 2.2 l/min/m<sup>2</sup> ) could not be assessed correctly because all patients kept on minimal pharmacological support postoperatively, but significant LCOS managed by both IABP and pharmacological support has been reported in 38 patients (76%).

The median duration of mechanical ventilation was 19 hours (6-192 hours).

The median duration of ICU stay was 4 days (2-9 days).

The median duration of postoperative hospital stay was 9 days (5-16 days).

**Table 1 Postoperative Complications.**

Complications	Number of patients	%
LCOS	38	76%
Sternum left open	3	6%
bleeding	11	22%
Re-exploration for bleeding	3	6%
Re-exploration for graft thrombosis	3	6%
Stroke	1	2%
Psychosis	1	2%
Prolonged ventilation	10	20%
Renal impairment	4	8%
GIT bleeding	1	2%
Superficial wound infection	5	10%

Perioperative mortality which is defined as death within thirty days from surgical procedure was ten patients (20%) . Six patients died with low cardiac output syndrome, five of them died within the second postoperative day while the sixth died on the 7<sup>th</sup> postoperative day.

Three patients died due to renal failure at the second and third post operative week all of them were diabetic, two of them had elevated level of serum creatinine level preoperatively. The last patient died due to heart block two weeks postoperatively.

The survival group and surgical mortality group were compared, and risk factors of mortality were analyzed.

For statistical analysis, the SPSS 18.0 for windows (SPSS Inc. Chicago, IL, U.S.A.) program was used. The risk factors of operative mortality were analyzed by univariate analysis, data were analyzed using Student's t-test. The data were considered statistically significant if the *p*-value was less than 0.05. (Table 2 show the two-by-k crosstab analysis).

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Table 2: Urgent CABG mortality risk factors (\*: stastically significant).

Variable	No. of patients	Death	p-value
age			
>65 years	12	6	0.032*
<65 years	38	4	
Sex			
Male	40	9	0.408
female	10	1	
Hypertension			
+	21	4	0.596
-	29	6	
Diabetes			
+	14	4	0.870
-	36	6	
Obesity			
+	5	2	0.988
-	45	3	
Smoking			
+	36	7	0.704
-	14	3	
Chronic lung disease			
+	6	2	0.879
-	44	8	
Renal Failure			
+	2	2	0.113
-	48	8	
EF			
>40	39	3	0.005*
<40	11	7	
Preoperative MI			
+	21	7	0.101
-	29	3	
Preoperative shock			
+	11	6	0.023*
-	39	4	
LMS			
+	26	3	0.178
-	24	7	

### DISCUSSION:

In this study acute Coronary Syndrome non responsive to maximal medical therapy and not fit for PCI with favorable coronary anatomy (either left main stem or multiple vessels disease) was the most common indication for surgery 84% and this is similar to other studies in Asia<sup>(7,8)</sup> and western countries<sup>(9)</sup>, similarly there was a reduction in the number of patients who required urgent CABG for failed PCI.

The mean age in our study was 57.1 years unlike most of the Asian and western studies which was 61-67 years<sup>(7-9)</sup>, this might reflect the nature of our patients, poor health education, smoking and limited percutaneous coronary intervention for selected cases. Male to female ratio in this study was 4:1; yet in all other studies<sup>(7-9)</sup> the ratio was less than this figure, this probably because of the smoking and food habits in our society.

Regarding grafts strategy; Left internal mammary artery was used as a pedicled graft in 38% of patient which is similar to older studies<sup>(7,8)</sup> as the time required to harvest the internal mammary artery is longer than that required to harvest the great saphenous vein which permits rapid going on bypass specially in hemodynamic unstable patient<sup>(9)</sup>, however in more recent studies, it has been reported that the mortality rate did not differ according to the vessel used in urgent CABG<sup>(10,11,12)</sup>. LIMA is still used in urgent CABG reports, yet this study can not compare to others, because LIMA was not used frequently.

Regarding postoperative complications; low cardiac output syndrome is the most common complication postoperatively in 38 patients (76%), unfortunately this figure was double than the highest percentage in other studies enrolling LCOS in urgent CABG<sup>(7,8)</sup>, this might be attributed to the presence of preoperative cardiogenic shock in 11 patients, low ejection fraction in another 11 patients (EF<40%) and unavailability of the facilities for off pump surgery at that time.

Bleeding has been reported in 22% of patients, and three of them had re-exploration. This figure was close to other studies<sup>(7,8)</sup>.

Postoperative renal failure were reported in 4 patients all of whom were diabetic and two of them had impaired renal function preoperatively. In other studies this figure was close to on-pump CABG(7.7%) but slightly higher than the result of studies using off pump CABG (5%)<sup>(13,14)</sup>.

High perioperative mortality (20%) may be comparable with other studies<sup>(7,8)</sup> that reported 9-30% mortality. Only one patient of six with postinfarction ventricular septal defect died and this is lower than other studies which ranged from 19%-50%<sup>(4)</sup>. The other mortality took place in patients with acute coronary syndrome who were non responsive to maximal medical therapy, with age more than 65 year old and low ejection fraction. This is similar to other studies<sup>(7,8)</sup>, where low cardiac output was the most common cause of early mortality in 6 patients (60%), followed by acute renal failure in 3 patients (30%).

### CONCLUSION:

The present study demonstrated risk factors of mortality; including advanced age (>65yr), preoperative shock status, and low ejection fraction (<40%).

The most common cause of early perioperative mortality was Low Cardiac Output Syndrome followed by acute renal failure.

In this study gender, presence or absence of a left main coronary artery lesion, hypertension, diabetes, chronic lung disease and obesity was not associated with mortality risk.

Despite the higher surgical mortality rate (20%) after the urgent CABG, a favorable long-term clinical outcome can be expected if the patients survive.

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