

Results of Coronary Artery Bypass Graft Surgery in Sharq Elmadina Hospital, Alexandria

El Husseiny E. Gamil¹, Ali R. Mahmoud², Mohamed E. Mahmoud¹, Mohamed A. Mohamed

Departments of ¹Cardiothoracic Surgery and ²General Surgery

Faculty of Medicine, Al-Azhar University

*Corresponding author: Mohamed A. Abd El Badie; Mobile: 01012972837, E-Mail: badi388@gmail.com

ABSTRACT

Background: coronary artery bypass graft (CABG) surgery has been shown to be an effective method for treating angina pectoris and prolonging life in patients with severe coronary artery disease.

Aim of the Work: to assess postoperative short-term results of coronary artery bypass graft surgery in Shark Elmedina hospital, Alexandria. **Patients and Methods:** This retrospective study was conducted on 170 patients with isolated ischemic heart disease admitted to Shark Elmadina hospital from January 2016 to January 2017. In the current study, pre-operative data were collected to identify the risk factors that may affect the outcome of surgery and intraoperative data and post-operative complications. **Results:** The most common risk factors were dyslipidemia (64.7%), hypertension (57.1%), diabetes mellitus which represents 50%, smoking which represents 37,6%, peripheral vascular disease which represents 31,7%. Other risk factors which had a low percent were history of chronic hepatic disease, previous stroke or myocardial infarction or lung disease or renal disease. What is worth to mention that echo preoperative affects the outcome of surgery as in our study EF of patients' ranges from 40% to 75%. Intraoperative data also affects the outcome of surgery as number of grafts as there was one patient had done 5 grafts and 34 patients have done 4 grafts. Another important event was LLIMA dissection as there were 9 patients have dissected LIMA during harvesting. Another event was endartrectomy as there were 11 patients have LAD endartrectomy, 6 patients have RCA endartrectomy. Long bypass time and clamp time affects the results of surgery maximum bypass time 200 minute and maximum clamp time 120 minute. Post-operative ICU and ward stay affects the results as maximum ICU or ward stay was 9 days. The most common complication was wound infection which had an incidence 7% and the second complication was renal impairment which had an incidence 5.2%, reopening (2.9%), elevated liver enzymes which represents 2,3% and other complications which had low incidence as pleural effusion, lung atelectasis and stoke. Finally, mortality was 1.1%. **Conclusion:** CABG surgery is safe and the risk of major complications is low. Although major complications occur rarely they pose a great challenge to the patient and the surgeon. Early recognition and management of major complications are paramount to long term outcome.

Keywords: coronary artery bypass graft surgery, postoperative short-term outcome.

INTRODUCTION

Coronary artery disease (CAD) is the leading cause of death globally, and is expected to account for 14.2% of all death by 2030 ⁽¹⁾. According to the statistics from the American Heart Association (AHA), mortality data show that cardiovascular disease, as the underlying or accounted for 34.3% of all (1 of every 2.9) deaths⁽²⁾.

Several alternative treatments exist for (CAD), including medical therapy, percutaneous coronary intervention (PCI) or balloon angioplasty, and coronary artery bypass graft surgery (CABG). Depending on the severity, number and position of atherosclerotic lesions and the clinical history of the patient, any of the abovementioned treatment may be chosen. For high- risk patients, such as those with left main coronary artery disease, severe three- coronary vessel disease, severe ventricular dysfunction (low ejection fraction EF), and diabetes mellitus(DM), CABG is preferred treatment⁽³⁾.

CABG is a surgical procedure to use the own patient conduit to bypass the atherosclerotic narrowing and improve blood supply to the coronary circulation, for nourishing the myocardium⁽⁴⁾.

Myocardial revascularization has been an established mainstay in the treatment of coronary artery disease for almost half a century, used in clinical practice since 1960s. It is the most intensively studied surgical procedure ever undertaken⁽⁵⁾.

Despite the novel other alternatives for coronary artery revascularization, CABG is still one of the most durable and effective means of revascularization for patients with coronary heart disease either on pump or Off pump coronary artery bypass (OPCAB), using left internal mammary artery, right internal mammary artery, radial artery and saphenous venous grafts in addition to other grafts options ⁽⁶⁾. Each year, 600,000 patients in USA undergo myocardial

revascularization with cardiopulmonary bypass and sustain profound physiologic perturbations that precipitate ischemia and infarction in several organ systems.⁽⁷⁾ Although the conduct of CABG with cardiopulmonary bypass (CPB) has evolved with continual improvement in morbidity and mortality, cardiopulmonary bypass is known to induce a proinflammatory state with several adverse consequences⁽⁸⁾. Clinically, the manifestations of cardiopulmonary bypass associated with morbidity include neurological dysfunction,⁽⁹⁾ pulmonary dysfunction,⁽¹⁰⁾ renal dysfunction,⁽¹¹⁾ and possibly infectious-related complications⁽¹²⁾.

AIM OF THE WORK

The aim of this study is to assess postoperative short term results of coronary artery bypass graft surgery in Shark Elmedina hospital, Alexandria.

PATIENTS AND METHODS

Patients:

This study was carried on 170 patients admitted to Shark Elmadina Hospital from January 2016 to January 2017. **The study was approved by the Ethics Board of Al-Azhar University.**

Inclusion Criteria:

Patients with isolated ischemic heart disease.

Exclusion Criteria:

Patients with compound heart disease, severe comorbidities, advanced old age.

Methods:

In the present study, the following data was retrospectively collected for the patients who had done CABG.

All patients in this study were subjected to the following:

A. Preoperative assessment:

1. History taking (age, sex, weight, history of chronic disease, surgical history, medical history).
2. General examination (heart, chest, abdomen, lower limbs, any neurological deficits).
3. Routine preoperative labs (complete blood count, bleeding profile, kidney function test, liver function test, urine analysis, viral markers).
 - 1) Routine preoperative investigations;
 - Chest X ray: mediastinum, costophrenic angles, lung opacity or hypertranslucency, cardiothoracic ratio.
 - Electrocardiogram «ECG»: rhythm, rate, old ischemic changes.
 - Echocardiography: EF, dimensions, resting regional wall motion abnormality, any valvular lesions.
 - Coronary angiography: left main lesion, single vessel disease or multiple vessel disease. Lesions).

B. Intra-operative data:

All patients underwent CABG; the procedure was done under general anaesthesia in supine position. The following step is skin incision, mediansternotomy, harvesting of left internal mammary artery & saphenous vein graft from the leg then opening of pericardium and aorto-venous cannulation then going on bypass, putting cross clamp on the aorta give cardioplegia, distal end anastomosis of the grafts on the heart, cross clamp off, starting rewarming, then putting C clamp on the aorta, grafting of proximal end of the grafts to the aorta; then removal of C clamp, starting reperfusion time according to the time of cross clamp then starting weaning from bypass, after smooth weaning off bypass aorto-venosdecannulation, good haemostasis to suture lines, closure of chest wall in layers after putting chest tubes for drainage. The following data was collected:

1. Number of graft (single or multiple grafts).
2. Type of graft: single mammary versus double mammary and/or total venous graft (arterial, venous).
3. Operative time, bypass time, cross clamp time.
4. Number of dissected LIMA.
5. Vessels that have endarterectomy.
6. Probe that had used.

C. Postoperative assessment:

1. Data of ICU monitoring (pulse, invasive and non-invasive blood pressure, central venous pressures and urine output, balance).
2. ICU medications and need for inotropic support.
3. Postoperative complications:
 - Postoperative Bleeding and blood transfusion.
 - Postoperative myocardial Infarction and Low Cardiac Output manifestations.
 - Postoperative Renal Dysfunction.
 - Neurological Complications.
 - Arrhythmias.
 - Wound Infection.
 - Mortality (early, intermediate, late).
 - Post-operative laboratory follow up.
4. Hospital stay.
5. Early postoperative echocardiography before discharge from hospital.
6. Six month follow up by clinical examination, postoperative chest X ray, postoperative echocardiography, postoperative ECG.

Statistical analysis of the data:

Data were fed to the computer and analyzed using IBM SPSS software package

version 20.0 (Armonk, NY: IBM Corp). Qualitative data were described using number and percent. The Kolmogorov-Smirnov test was used to verify the normality of distribution. Quantitative data were described using range (minimum and maximum), mean, standard deviation and median. Significance of the obtained results was judged at the 5% level ⁽⁹⁵⁾.

The used tests were

1- Chi-square test:

It was used for categorical variables, to compare between different groups.

2- Fisher’s Exact or Monte Carlo correction:

Correction for chi-square when more than 20% of the cells have expected count less than 5.

3 - McNemar:

It was used to analyze the significance between the different stages.

4 - Student t-test:

For normally distributed quantitative variables, to compare between two studied groups.

5 - Paired t-test:

For normally distributed quantitative variables, to compare between two periods.

6- Mann Whitney test:

For abnormally distributed quantitative variables, to compare between two studied groups.

7 –Wilcoxon signed ranks test:

For abnormally distributed quantitative variables, to compare between two periods ⁽⁹⁶⁾.

RESULTS

Demographic data (Age, sex, weight):

This study included 170 patients, one hundred twenty-seven (74.7%) males and forty-three females (25.3%). The minimum age recorded in this study

was 45 years old and the maximum age was 70years old with a median age of (52.50) and mean±SD (57.43 ± 8.79). The minimum weight recorded in this study was 56 kg and the maximum weight was 155 kg with a median weight of (88.50) and Mean ± SD (89.68 ± 16.28).

Table (1): Distribution of the studied cases according to age, sex and weight

| | No. | % |
|--------------------|---------------|------|
| Sex | | |
| Male | 127 | 74.7 |
| Female | 43 | 25.3 |
| Age (years) | | |
| Min. – Max. | 45.0 – 70.0 | |
| Mean ± SD. | 57.43 ± 8.79 | |
| Median | 52.50 | |
| Weight | | |
| Min. – Max. | 56.0 – 155.0 | |
| Mean ± SD. | 89.68 ± 16.28 | |
| Median | 88.50 | |

Past history

The eighty-five (50%) of patients were diabetic, ninety-seven (57%) were hypertensive, eight patients (4,7%) were hepatic, sixty-four(37,6%) were smoker, tow patients (1%) had lung disease, ten (5,9%)had renal stone, tow patients (1%) were had stroke, sex patients (3,5%) had myocardial infarction, one hundred and ten patients (64,7%) had dyslipidemia, fifty four patients (31,7%) had Peripheral vascular disease, twenty nine patients (17%) had carotid artery disease, twenty five patients (14,7%) had lower limb disease.

Table (2): Distribution of the studied cases according to past history

| Past history variables | No. | % |
|-----------------------------|-----|------|
| DM | 85 | 50.0 |
| HTN | 97 | 57.1 |
| Hepatitis c virus | 8 | 4.7 |
| Smoker | 64 | 37.6 |
| Lung disease | 2 | 1.2 |
| Renal disease | 10 | 5.9 |
| Stroke | 2 | 1.2 |
| MI | 6 | 3.5 |
| Dyslipidemia | 110 | 64.7 |
| Peripheral vascular disease | 54 | 31.7 |
| carotid artery disease | 29 | 17 |
| ll disease | 25 | 14.7 |

Pre-operative echo

In our study there were minimum EF recorded (40%), maximum EF recorded (75 %), median EF recorded (60%), Mean ± SD (58.92 ± 8.98). Minimum end systolic diameter (2, 6 cm), maximum (6, 1cm),Mean ± SD(3.4±0.84), median (3.6cm).Minimum end diastolic diameter (3cm), Maximum (8,2 cm), Mean ± SD(4.8±1.07), median (5,05 cm) . Minimum left atrial diameter (2,6 cm), maximum (4,9 cm), Mean ± SD(3.4±0.6), median(3,7cm).

Table (3): Descriptive analysis of the studied cases according to Pre-operative echo

| | Min. – Max. | Mean ± SD. | Median |
|----|-------------|------------|--------|
| EF | 40.0 – 75.0 | 58.92±8.98 | 60.0 |
| ES | 2.5-6.1 | 3.4±0.84 | 3.6 |
| ED | 3-8.2 | 4.8±1.07 | 5.05 |
| LA | 2.6-4.9 | 3.4±0.6 | 3.7 |

In our study there were forty seven patients (27,6%) had mild mitral regurge, thirty tow patients (18,8%) had diastolic dysfunction, seventy tow patients (42,4%) had Resting regional wall motion abnormalities.

Table (4): Descriptive analysis of the studied cases according to another data of Pre-operative echo.

| | No. | % |
|--|-----|------|
| Mild mitral regurge | 47 | 27.6 |
| Diastolic dysfunction | 32 | 18.8 |
| Resting regional wall motion abnormalities | 72 | 42.4 |

Pre-operative coronary angiography

In our study there were twenty-three patients (13, 5%) had left main disease, eighteen patients (10,6) had single vessel disease one hundred twenty-nine(75,9) had multivessele disease.

Table (5): Descriptive analysis of the studied cases according to Pre-operative coronary angiography.

| | No. | % |
|--------------------------|-----|------|
| Left Maia lesion | 23 | 13.5 |
| Single vessel diseases | 18 | 10.6 |
| Multiple vessel diseases | 129 | 75.9 |

Dissected LIMA & end artrectomy

In our study there were nine patients (5, 29%) had dissected LIMA, eleven patients (6, 4%) had LADendartrectomy, six patients (3, 5%) had RCA endartrectomy

Table (6): Descriptive analysis of the studied cases according to dissected LIMA & end artrectomy.

| | No. | % |
|---------------------------------------|-----|------|
| Number of dissectedLIMA | 9 | 5.29 |
| Number f LAD which had endartrectomy | 11 | 6.4 |
| Number of RCA which had endartrectomy | 6 | 3.5 |

Probe used with LAD

In our study there were only one hundred and thirty patients (76, 4%) thatthat had LAD which had passedprobe 1,5 cm, forty patients (23,5%)thatthat had LAD which had passedprobe 1 cm.

Table (7): Descriptive analysis of the studied cases according to probe used with LAD

| | No. | % |
|---|-----|------|
| Number of LAD that had passed probe 1,5mm | 130 | 76,4 |
| Number of LAD that had passed probe 1mm | 40 | 23,5 |

Number of grafts

In our study there weretwenty-five patients (14,7%) had single graft,fourty–six patients (27%) had two grafts, sixty-four patients (37,6%) had three grafts, thirty-four patients(20%) had four grafts, one patient (1%) had five graft.

Table (8): Distribution of the studied cases according to number of grafts .

| | No. | % |
|-------------------------|-------------|------|
| Number of grafts | | |
| 1 | 25 | 14.7 |
| 2 | 46 | 27.1 |
| 3 | 64 | 37.6 |
| 4 | 34 | 20.0 |
| 5 | 1 | 0.6 |
| Min. – Max. | 1.0 – 5.0 | |
| Mean ± SD. | 2.65 ± 0.98 | |
| Median | 3.03 | |

Bypass time & cross clamp time

According to results, the bypass time of the studied cases were between (40 mint) and (200 mint) with a Mean± SD (80.79 ± 38.50) and median(80), but cross clamp time of the studied cases were between (20 mint) and (120 mint) with a Mean± SD (38.65 ± 18.87) and median(35)

Table (9): Descriptive analysis of the studied cases according bypass time & cross clamp time

| | Min. – Max. | Mean ± SD. | Median |
|---------------------------|--------------|---------------|--------|
| Bypass time (min.) | 40.0 – 200.0 | 80.79 ± 38.50 | 80.0 |
| Clamp time (min.) | 20.0 – 120.0 | 38.65 ± 18.87 | 35.0 |

Inotropes & in zero & first day

In our study the recorded patients that had received inotrpes were one hundred and three (60,6%)in zero day &fifty three (31,17%) in first day but in contralateral side there weresexty-seven(39,4%) in zero day &one hundred fourty-three (84%) not received inotropes.

Table (10): Distribution of the studied cases according to inotropes in zero & first day

| | Zero day | | 1 st day | |
|-------------------|----------|------|---------------------|-------|
| | No. | % | No. | % |
| Ionotropes | | | | |
| No | 67 | 39.4 | 143 | 84.1 |
| Yes | 103 | 60.6 | 53 | 31.17 |

ICU stay & ward stay

In our study we recorded that staying of patients in ICU between two days(2) and nine days (9) with mean±SD(6,94±3,18) and median tow (2).But stauing inthe ward was between one day(2) and nine days (9) with mean±SD(6,94±3,11) and median tow (2) .

Ejection fraction postoperative

In our stydy there were minimum ejection fraction (25%), maximum(70%), Mean ± SD(8,51±51.30), median (50%).

Table (11): Descriptive analysis of the studied cases according to Ejection fraction postoperative

| EF Post-operative | No. | % |
|-------------------|--------------|------|
| <50 | 48 | 42.1 |
| 50 – 60 | 53 | 46.5 |
| >60 – 70 | 12 | 10.5 |
| Min. – Max. | 25.0 – 70.0 | |
| Mean ± SD. | 51.30 ± 8.51 | |
| Median | 50.0 | |

Postoperative complications:

1. Immediate: IAB

- The present study revealed that one patient (0,5%) required IAB, and this done early intra-operative after 3 grafts was done (LIMA-LAD, SVG-D, SVG-distal RCA). Due to distention of the heart after weaning from CPB, SVG anastomosis was done to LAD but we could not wean from bypass so finally this problem has been resolved by IAB . IAB was connected for 2 days in ICU and then was separated.
2. **Early:** ICU (renal impairment, elevated liver enzymes, reopening, chestinfection, atrial fibrillation, lung atelectasis,heart failure, stroke, mortality) WARD (wound infection, Lt pleural chylothorax)
- In the current study, we found that there were 8 patients had superficial wound infection, according to culture & sensitivity antibiotics was taken and frequent dressing was done and there were good results. Another 4 patients had deep sternal wound infection and vacuum dressing was done after good debridement and antibiotics according to culture and sensitivity was taken and there were good results.
4. **Late:** Lt pleural effusion

Table (13): Descriptive analysis of studied cases according to postoperative complications

| Number of cases | Percentage % | Complications |
|-----------------|--------------|--------------------------|
| 129 | 75, 8% | unrecorded complications |
| 12 | 7% | wound infecting |
| 9 | 5, 2% | renal impairment |
| 4 | 2, 3% | Elevated liver enzyme |
| 5 | 2, 9% | Reopening |
| 3 | 1, 7% | chest infection |
| 3 | 1, 7% | Lt Pleural effusion |
| 2 | 1, 1% | Atrial fibrillation |
| 2 | 1, 1% | lung atelectasis |
| 1 | 0, 5% | Lt Pleural chylothorax |
| 1 | 0, 5% | IAB |
| 1 | 0, 5% | Heart failure |
| 1 | 0, 5% | Stroke |
| 2 | 1, 1% | Mortality |

DISCUSSION

Age is a significant risk factor for poor outcome after cardiac procedures and is included in all risk stratification scores. In our study, we found that the minimum age recorded was (45) years old and the maximum age was (70) years old with a median age of (52.50) and mean \pm SD (57.43 \pm 8.79). *Arif et al* in 2016 found that mean age was (82.4 \pm 2.3) years old ⁽¹³⁾.

Sex is one of risk factors and in the present study, we found that 127 (74,7%) patients were males and 43 (25, 3%) patients were females. *Nashef et al.* found that male sex was 264(68%) patients and females was 124(31, 9%) patients of total 388patients ⁽¹⁴⁾.

Weight is one of the most important risk factors and in the current study, we found that the minimum weight recorded was 56 kg and the maximum weight was 155 kg with a median weight of (88.50) and Mean \pm SD (89.68 \pm 16.28). *Nashef et al.* found that normal weight were 119 (30, 7%) patients, underweight were 5(1,3%) patients, over weight were 179(46,1%)of total 388 patients ⁽¹⁴⁾.

DM is one of the most important risk factor and in the present study, we found that diabetic patients were 85(50%) patients. *Weisel et al.* in

2014found that there were 127(32, 7%) diabetic patients of total 388 patients ⁽¹⁵⁾.

Hypertension is one of the most important risk factors and in the present study, We found that there were 97 (57, 1%) hypertensive patients. *Nashef et al* reported that there were 333(85, 8%) hypertensive patients of total 388Patients⁽¹⁴⁾.

Hepatitis cvirus is one of risk factors pre CABG & in the present study, We found that there were 8 (4, 7%) patients. *Klemperer et al.* found that total 26 (0, 5%) patients out of 4952 patients with liver cirrhosis were identifiedand etiologies of liver cirrhosis were predominantly infective hepatitis (hepatitis c n=13 & hepatitis b n=5 and alcohol inducedn=8) ⁽¹⁶⁾.

Smoking is one of the most important risk factors and in the present study, we found that there were 64 (37, 6%) patients were heavy smokers. *Weisz et al.* ⁽¹⁷⁾ in 2005found that all2587 consecutive patients underwent isolated CABG between February 2000 and June 2007. Of these 475(18,3%) patients were current smokers.

Preoperative **lung disease** is another important risk factors and in the present study, we found that there were 2 (1, 2%).These 2 patients were suffering from bronchial asthma. *Weisel et al*

⁽¹⁵⁾ found that there were 23(5, 7%) patients had chronic lung disease off total 388 patients.

Kidney disease before CABG is one of most important risk factors and in the present study, there were 5 (5, 9%) patients had renal disease as renal stone. A similar result was reported by *Weisel et al.* in 2014. They found that there were 10 patients (5.9%) had kidney disease ⁽¹⁵⁾.

As regards **stroke** we found that there were 2 (1.2%) patients had history of stroke. *F Lloyd-Jones et al.* found that there were 29 (9, 3%) patients had history of stroke pre-operatively ⁽²⁾.

Myocardial infarction is an important risk factor pre-operatively and we found that there were 6 (3,5%) patients had history of MI. *Estafanous et al.* found that there were 246 patients (63,4%) had previous MI ⁽¹⁸⁾.

Dyslipidemia is an important risk factor pre-operatively and we found that there were 110 (64,7%) patients had history of dyslipidemia. Previous studies ^(18,19) found that there were 54 (13, 9%) patients had history of hyperlipidemia.

Peripheral vascular disease is an important risk preoperatively as carotid artery stenosis or varicose veins or varicosities at lower limbs and in the present study, we found that there 54(31.7%) patients had history of Peripheral vascular disease. *Smetana et al. Leonard et al.* ^(19,20) found that there were 22 (7.1%) patients had peripheral vascular disease.

Preoperative echo is a very important investigation pre-operatively and my results in this study as compared with other studies there were: *Douglas et al.* ⁽²¹⁾ of total number 667 patients recorded that:

- EF <30% ...38 patients (5, 7%)
- 30-49%...149 patients (5, 7%)
- 50-69%.....427 patients (64%)
- >70%.....53 patients (8%)
- End systolic diameter 3, 9±0, 25
- End diastolic diameter 5, 3±1, 83
- Left atrial dimensions 3,8±0,6
- Diastolic dysfunction 225 patients (33, 7%)
- Ischemic mitral regurge trivial 392 patients (58, 8%), mild 222 patients (33, 3%)
- Regional wall motion abnormality 310 patients (31, 6%)⁽²¹⁾

Coronary angiography preoperative is the most important pre-operative investigation and we found in the present study, there were 23(13, 5%) patients had left main disease, 18(10, 6%) patients had single vessel disease, 129(75, 9%) patients had multivessel disease. *Estafanous et al.* in 2006 found that LM disease 179(62,6%) patients, single vessel disease 72 (18,6%) patients, two

vessel disease 69 (17,8 %) patients, three vessel disease 243(62,6%) patients of total 388 patients. ⁽¹⁸⁾

Wound infection:

Despite efforts to reduce the incidence of surgical site infections, they remain a significant source of postoperative morbidity. Among 170 coronary bypass procedures performed there were 12 total SSIs for an overall incidence of 7%. *Vida Vet al* in 2003 found that among 4004 coronary bypass procedures performed between January 1996 and May 2003, there were 160 total surgical site infections SSIs for an overall incidence of 4.0%. ⁽²²⁾.

Renal impairment

Renal impairment is a potential complication of CABG that can arise from a variety of causes including preoperative, intraoperative, and postoperative. Among 170 coronary bypass procedures performed there were 9 cases developed renal impairment (presented by elevated kidney function & oliguria) with an overall incidence of 5%. While some studies said that the incidence of acute renal failure described by *Andersson et al* ⁽²³⁾ was (16.4%) and *Zanardo et al.* ⁽²⁴⁾ (15.1%).

Elevated liver enzyme:

Despite demonstrable advances in all aspects of operative and perioperative management over the last decade, early jaundice and transient liver damage after modern extracorporeal circulation surgery is still occurs frequently ⁽²⁵⁾. Among 170 coronary bypass procedures performed there were 4 cases total for an overall incidence of 2, 4%. *Leal-Noval et al.* in 2011 had found that it has long been recognized that early jaundice and transient liver damage could occur after extracorporeal circulation surgery ⁽²⁶⁾.

Reopening:

When excessive mediastinal bleeding occurs, regardless the cause, re-sternotomy and exploration is highly indicated. Early exploration for persistent bleeding may reduce the requirement for homologous transfusions, risk of respiratory insufficiency and infection. ⁽¹³⁴⁾ Among 170 coronary bypass procedures performed there were 4 cases total for an overall incidence of 2, 4%. *Mastoraki et al.* found that Overall, of the 2,898 patients in the study, 89 (3.1%) patients required re-exploration for bleeding after isolated CABG). Of the 89 patients re-explored, the primary indication for re-exploration was bleeding (n =75) other indications included 10 cases of tamponade, 2 cardiac arrests with bleeding, and 2 others. The major sites of bleeding were as follows: 42 graft/anastomoses, 23 sternal/left internal mammary artery bed, 6 extra-pericardial, 2 cannulation sites, and 16 unspecified ⁽²⁵⁾.

Chest infection:

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Chest infection following cardiac coronary artery bypass graft surgery is often associated with significant morbidity and mortality. Among 170 coronary bypass procedures performed 3 cases developed chest infection with an overall incidence of 1, 7%. In about 50–70% of cases the responsible organisms are gram negative bacilli. The most important causative gram negative organisms include *Klebsiella* species, *Escherichia coli* and *Pseudomonas Aeruginosa*⁽²⁶⁾. Prolonged postoperative intubation and mechanical ventilation may lead to VAP, as can reintubation for reoperation, respiratory insufficiency, or cardiac failure. VAP has an incidence of 9% to 21% among patients with respiratory failure⁽²⁷⁾.

Pleural effusion:

Pleural effusion is a common occurrence following heart surgery, but in most cases the fluid collection is small and not clinically significant. Some patients however, develop a significant effusion during the initial hospitalization or after hospital discharge, which requires drainage to relieve respiratory symptoms. Among 170 coronary bypass procedures performed there were 3 cases total for an overall incidence of 1, 7%. **Myers et al.**⁽²⁸⁾ said that the overall incidence of symptomatic pleural effusion in the study was 9.8% (45 of 460), approximately two-thirds of the effusions occurred during the initial hospitalization but another one-third occurred after hospital discharge⁽²⁸⁾.

Atrial fibrillation:

Arrhythmias are common phenomenon after CABG. Among 170 coronary bypass procedures performed there were 3 cases total for an overall incidence of 1, 7%. **Pires et al.**⁽²⁹⁾ found that AF is usually of benign nature and is said to occur in about 25 % of patients postoperatively after CABG. They found that postoperative causes of arrhythmias include ongoing myocardial ischemia, hypoxia, infections (e.g., pneumonia, wound infection), pericardial Collections / tamponade, electrolyte disturbances, coronary spasm, hypervolemia, pulmonary artery catheter irritation, and drug withdrawal/toxicity (e.g., beta-blockers, digoxin, and alcohol).⁽²⁹⁾

Lung atelectasis:

Atelectasis is the most common postoperative complication which emerges more in patients with pulmonary and underlying diseases than other patients. Among 170 coronary bypass procedures performed there were 2 cases that developed atelectasis with an overall incidence of 1, 1%. The most frequently observed radiologic abnormality was left lower-lobe atelectasis. It occurred in 73% of patients after internal mammary artery grafting and in 54% when only vein grafts were used⁽³⁰⁾.

Lt pleural chylothorax:

Chylothorax is the result of leakage from the thoracic duct or one of its main tributaries, is a rare complication of CABG. Among 170 coronary bypass procedures performed there was one reported case for an overall incidence of 0, 5%. A similar result was shown by **Cevese et al.**⁽³¹⁾ in 2001 said that chylothorax is a recognized complication of intrathoracic surgery, with an incidence of 0.25% to 0.5%.

Intra-aortic balloon pump:

IABP is the most usable tool of temporary mechanical circulatory support for cardiac surgical patients suffered from low cardiac output in the early postoperative phase. Among 170 coronary bypass procedures performed one patient (0,5%) required IAB. Other study as Christenson et al in 2010 found that twenty-four patients (17.6%) needed intra-aortic balloon inserted due to low Cardiac output syndrome. The incidence of patients needed IABP support per year was between 4.2 and 5% with a mean incidence of 4.3 ±0, 6⁽³²⁾. The need for increased use of IABP during cardiac surgery in the recent years has been reported by many groups. This is mainly due to the fact that the patient population has changed and now includes older patients with multi-vessel disease and more impaired ventricles. On the other hand, there is a lower threshold for IABP use due to improve technology and lower rate of complications.

Heart failure:

Heart failure is a highly prevalent syndrome with a poor prognosis, resulting in substantial morbidity and reduced quality of life despite recent advances in treatment. Among 170 coronary bypass procedures performed one patient (0, 5%) developed heart failure which is a complex clinical syndrome that results from any structural or functional impairment of ventricular filling or ejection of blood. In most cases, acute HF arises because of deterioration in patients with previous diagnosis of HF (either HF-reduced EF or HF-preserved EF). Acute HF may occur in patients before (e.g., because of preoperative infarction), during (failure to wean), and after (mechanical complications and pericardial tamponade must be excluded). The durability of CABG results has increased with the use of arterial grafts and ischemia stems mainly from saphenous vein graft SVG⁽³³⁾.

Stroke:

Stroke is defined as any focal or global neurological deficit lasting for >24 h. Among 170 coronary bypass procedures performed, one case developed stroke. **Ricotta et al.**⁽³⁴⁾ reported that Perioperative stroke is rare and affects 1–2 % of patients undergoing CABG surgery.

Mortality:

Among 170 coronary bypass procedures performed, two (1,1%) mortality cases were reported. In the present study, we found that one patient died at zero day and another patient died at first day and the cause of death in both patients was myocardial ischemia as they had very bad targets. **Adelborg *et al.*** ⁽³⁵⁾ in 2009 found that at 30 days, the mortality rate was 3.2% for patients who underwent isolated CABG surgery, causes of death showed that CABG patients had died from myocardial infarction, heart failure, or stroke.

CONCLUSION

CABG surgery has become increasingly safe and the risk of major complications is low. Although major complications occur rarely they pose a great challenge to the patient and the surgeon. Early recognition and management of major complications are paramount to long term outcome.

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