CLINICAL OUTCOME OF CABG IN EGYPTIAN SEPTUAGENARIAN POPULATION

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ABSTRACT

Background: CABG is one of the most common surgical procedures performed *worldwide. The operation improves survival as well as the quality of life of patients with coronary artery heart disease. The use of the internal mammary artery (IMA) graft has become increasingly popular in CABG operations due to its demonstrated better long-term patency as compared with that of the saphenous vein graft.*

Aim of the Work: *To determine the clinical outcome of GABG in Egyptian Septuagenarian population and to identify risk factors that may adversely affect morbidities and mortality.*

Patients and Methods: *This nonrandomized, comparative, and prospective with propensity score matching study was conducted in department of cardiothoracic surgery Nasser Institute Hospital (NIH) and Department of cardiothoracic surgery Ain Shams University (ASU on 100 patients diagnosed to coronary artery diseases divided into 2 groups according to their age at time of operation either patient aged 70 years to 79 years or patient less than 70 years.*

Results: *Current study results showed that there was statistically significant increase in the percentage of patients with arrhythmia, low cardiac output, reoperation, neurological complications, pulmonary complications, mediastinitis and rewiring and renal impairment in died patients than alive patients. Also, the percentage of total morbidity was found higher in died patients than alive patients. The median mechanical ventilation hours, stay on ITU hours and nights was found higher in died patients than alive patients while no statistically significant relation found between total hospital stay and mortality among patients of group B. Also, the percentage of patients with poor ejection fraction post discharge was found higher in died patients than alive patients with p-value <0.001.*

Conclusion: *Advanced age impacts surgical outcomes after CABG with Septuagenarians having worse postoperative outcomes including higher complications and mortality than younger cases. Additionally, in Septuagenarians, females had a higher mortality than their male counterparts did. An explanation for the worse outcome in the female group is most likely multifactorial and requires additional explanation. Taken together, our results demonstrate that a careful assessment of older patients must take place to determine the best management strategy to provide coronary revascularization, we recommend versal study for more accurate analysis of the regional blood flow supply to the papillary muscle system, mitral valve and mitral apparatus by Cardiac MRI.*

Keywords: *CABG; internal mammary artery Septuagenarian*

INTRODUCTION:

Elderly patients pose a significant challenge as they have a greater incidence of comorbidities impacting adversely on outcomes and thus experience higher morbidity and mortality. Coupled with the unprecedented rise in the number of elderly patients presenting as potential surgical candidates, recent advances in operative techniques and perioperative care have resulted in an increasing number of elderly patients undergoing CABG procedures [1].

Our study will assess the clinical outcome of isolated CABG surgery in septuagenarian population and in the younger age patient supports continued performance of CABG in septuagenarians. The increase in age only wouldn't deter the surgeon from offering such a potentially beneficial intervention [2].

Coronary artery bypass grafting (CABG) is the definitive surgical treatment of the coronary artery disease and can be performed with a low incidence of morbidity and mortality [3].

CABG is a technique that involves using an artery or vein from elsewhere in the body to bypass the blocked vessels, restoring adequate blood flow to the heart. The artery or vein is attached around the blockage, so that there is a new pathway for oxygenated blood to reach the heart muscle [4].

Several patient characteristics have been associated with adverse outcomes after CABG, including advanced age, fewer years of education, limited social support, cerebro-vascular or peripheral vascular disease, hypertension, diabetes, and depression [5].

Traditional outcome measures assessing the quality of CABG have been morbidity and mortality. However, with improvements in perioperative care, cardiopulmonary bypass and surgical techniques, the overall mortality associated with CABG has declined despite an increasingly elderly and sicker patient cohort [6].

As with any type of surgery, CABG has risks in both short and long-term results. The risks of CABG include wound infection and bleeding, reactions to anaesthesia, fever, pain, stroke, heart attack, or even death [7].

Coronary artery surgery is now safer than ever before, owing to modern surgical techniques and pharmacological breakthroughs. Elderly patients, compared with patients of a younger age group, present for surgery with a greater burden of risk factors and reduced functional levels [8].

A study carried out to identify the predictors of outcomes in patients undergoing CABG. It was found that the preoperative risk factors were history of heart failure, increasing age, history of peripheral vascular disease and receiving aspirin before coronary artery bypass grafting; which was protective [9].

As elderly populations grow larger, cardiac surgeons are faced challenges of intervention in those elderly with coronary artery diseases. Elderly patients have face higher surgical risks and associated with increased mortality and morbidity rates as well as greater length of hospital stays [10].

AIM OF THE WORK:

Constant negotiation of surgical intervention in elderly patient with coronary artery disease is still be existed between cardiac surgeon, so our study will determine the clinical outcome of GABG in Egyptian Septuagenarian population and to identify risk factors that may adversely affect morbidities and mortality.

PATIENTS AND METHODS:

This nonrandomized, comparative, and prospective with propensity score matching

study was conducted in department of cardiothoracic surgery Nasser Institute Hospital (NIH) and Department of cardiothoracic surgery Ain Shams University (ASU). This study was conducted on 100 patients diagnosed to coronary artery diseases. Patients were divided into 2 groups according to their age at time of operation either patient aged 70 years to 79 years or patient less than 70 years (Group A: patient aged 70 years to 79 years and Group B: patient less than 70 years).

Patients with isolated CABG, on cardiopulmonary bypass (CPB) and patients who are able to provide informed consent were enrolled in the study while patients have CABG with valvular surgery, CABG off pump, Redo CABG or refused to provide informed consent were excluded from the study.

From the data of these patients were prospectively collected in a dedicated database. The following preoperative, operative and postoperative assessment were included so as their effect could be studied on the proposed findings.

Preoperatively, all patients were subjected to complete full history taking, clinical examination focusing on general examination cardiovascular examination and examination of blood pressure; laboratory investigation with special emphases on complete blood picture (CBC), Renal function test, liver Test Profile, lipid profile and cardiac biomarkers; ECG, radiological examination, echocardiography (Echo), coronary angiography and preoperative counseling.

Ethical consideration:

This study was approved by ethical committee of Ain Shams University on May 2022

Anesthesia protocol of GABG:

Premedication and preparation:

Patients will be premeditated with oral diazepam 5 mg the evening before surgery. Upon arrival at the pre-induction room, the patients will receive supplementary oxygen via nasal cannula. Patients will be monitored with five-lead ECG, pulse oximetry and non-invasive arterial blood pressure. After local infiltration of lidocaine 1%, a peripheral venous cannula (14 or 16 Gauge) will be inserted, and 1-2 mg of midazolam I.V. will be administered. A 20-gauge arterial cannula will be inserted into the radial artery of the non-dominant hand after local infiltration with lidocaine 1% and under complete aseptic conditions. Allen's test will be performed before insertion to ensure the adequacy of collateral circulation.

Induction:

Induction of anesthesia will be achieved by intravenous (IV) propofol (0.5-1 mg/kg), fentanyl (1-2 μg/kg), and rocuronium (0.6mg/kg) to facilitate endotracheal intubation. A triple-lumen central venous catheter will be inserted via the right internal jugular vein with ultrasound guidance under complete aseptic conditions. A temperature probe will be inserted in the nasopharynx.

Maintenance:

All the patients will be mechanically ventilated with 80%oxygen/air and respiratory rate and tidal volumes will be adjusted to ensure adequate oxygenation (PO2 200–300 mmHg) and CO2 elimination (Pa CO2 35-45 mmHg). Anesthesia will be maintained with sevoflurane 1 to 2 percent, as well as fentanyl infusion of (1-2μg/kg/hr) to achieve an adequate level of anesthesia and hemodynamic stability. Muscle relaxation will be maintained by rocuronium infusion (5-15 μg/kg/min). In all patients, the central venous pressure will be kept between 6 and 9 cm H2O by the administration of intravenous fluids (colloids and crystalloids).

Hypotension, defined as mean blood pressure ≤ 60 mmHg, will be treated with incremental boluses of norepinephrine (4 mics), while hypertension, defined as a mean blood pressure > 100 mmHg will be treated

by administering an additional bolus dose of fentanyl (1 mic/kg), increasing the concentration of sevoflurane by 1%, or administering a bolus dose of propofol (50 mg).

Heparin will be administered in a dose of 400 IU/kg. Five minutes later, activated clotting time (ACT) will be measured (Helena, Actalyke XL). ACT > 450 seconds will be targeted before aortic and right heart cannulation, then CPB will be instituted using a Stockert S5heart-lung machine. The CPB circuit will be primed with 2,000 ml of Ringer's acetate solution containing 10,000 units of heparin. The average flow rate will range from 2.2 to 2.4 L/min/m2, andα-stat correction will be used to manage (ABG) during the operation. Core body temperature during CPB will be maintained between 32-33 °C. Warm blood antegrade cardioplegia will be administered by the perfusionist, to be repeated every 15-20 minutes.

During CPB, anesthesia will be maintained by intravenous infusion of propofol (0.1 mg/kg/min), fentanyl (1-2μg/kg/hour) and Rocuronium infusion (5-15 μg/kg/min). During rewarming of the patient, levosimendan will be started in group L at a dose of 0.1 mics/kg/min, while in group A, adrenaline will be started at a dose of 0.05 mic/kg/min. Norepinephrine 0.05-0.1 mic/kg/min will be administered in both groups if hemodynamics are unsatisfactory (MAP<60 mmHg) despite optimization of CVP. After successful weaning from CPB, protamine will be administered (4 mg/kg) to reverse the action of heparin. ACT will be used to confirm reversal of the anticoagulation state by returning to the baseline values.

CABG Procedure:

Traditional coronary artery bypass grafting involves thoracotomy via a midline (median) sternotomy. A heart-lung machine is used to establish cardiopulmonary bypass (CPB), allowing the heart to be stopped and emptied of blood to maximize operative exposure and facilitate vessel anastomosis; stopping the heart also markedly decreases myocardial oxygen demand. Before initiation of CPB, the patient is given a very high dose of heparin to prevent clotting in the bypass circuit. Then the aorta is cross-clamped, and the heart is stopped by injection of a cardioplegic solution (crystalloid or more commonly blood-based) that also contains substances that help myocardial cells tolerate ischemia and reperfusion. The cardioplegic solution and the heart are sometimes cooled slightly to enhance tolerance of ischemia; the patient's body is cooled via the CPB machine for similar reasons. The left internal mammary artery is typically used as a pedicled graft to the left anterior descending coronary artery. Other grafts consist of segments of saphenous vein removed from the leg. Occasionally, the right internal mammary artery or radial artery from the nondominant arm can be used. On completion of the vascular anastomoses, the aorta is unclamped, allowing the coronary arteries to be perfused by oxygenated blood, which typically restores cardiac activity. Heparin anticoagulation is reversed by giving protamine. Despite cardioprotective measures, stopping the heart is not without consequences. During reperfusion, myocardial dysfunction is common and can lead to bradycardia, arrhythmias (eg, ventricular fibrillation), and low cardiac output; these events are treated by standard measures, such as pacing, defibrillation, and inotropic drugs. Typically, hospital stays are 4 to 5 days unless prolonged by complications or concomitant illnesses.

Administrative and Ethical Design:

An Official permission was obtained from Faculty of Medicine, Ain Shams University. The study was approved from the Ethical committee of the department of cardiothoracic surgery, Faculty of Medicine, Ain Shams University. Approval from

ethical committee in the faculty of medicine (Institutional Research Board IRB).

Data management and Statistical Analysis:

All data were collected, tabulated and statistically analyzed using statistical package of special science SPSS version 22 (SPSS Inc. Chicago, IL, U.S.A). Quantitative data were expressed as mean ± SD (standard deviation) for parametric data median and range for non- parametric data. Qualitative data were expressed as frequencies and relative percentage. Then the appropriate statistical analyses were applied. All statistical comparison were two tailed with significance level of p-value $\leq$ 0.05 indicates significant, p- value <0.001 indicates highly significant difference while p-value > 0.05 indicates non-significant difference.

RESULTS:

Table (1): Comparison between group A and group B regarding demographic data and risk factors of the studied patients

Demographic Data		Group A No. = 300	Group B No. = 300	Test value	P-value	Sig.
Sex	Female	34 (11.3%)	34 (11.3%)	0.000*	1.000	NS
	Male	266 (88.7%)	266 (88.7%)			
Angina Status	CCS1 (Asymptomatic)	2 (0.7%)	4 (1.3%)	37.232*	0.000	HS
	CCS 2	65 (21.7%)	125 (41.7%)			
	CCS 3	233 (77.7%)	165 (55.0%)			
	CCS 4	0 (0.0%)	6 (2.0%)			
Dyspnea Status	NYHA1 (Asymptomatic)	4 (1.3%)	4 (1.3%)	28.258*	0.000	HS
	NYHA2	71 (23.7%)	126 (42.0%)			
	NYHA3	225 (75.0%)	166 (55.3%)			
	NYHA4	0 (0.0%)	4 (1.3%)			
Diabetes	No	152 (50.7%)	177 (59.0%)	8.407*	0.038	S
	Oral therapy	89 (29.7%)	77 (25.7%)			
	Insulin	54 (18.0%)	46 (15.3%)			
	Diet controlled	5 (1.7%)	0 (0.0%)			
Hypercholesterolemia	No	256 (85.6%)	186 (62.4%)	41.801*	0.000	HS
	Yes	43 (14.4%)	112 (37.6%)			
Hypertension	No	151 (50.3%)	136 (45.5%)	1.411*	0.235	NS
	Yes	149 (49.7%)	163 (54.5%)			
Hypothyroidism	No	300 (100.0%)	300 (100.0%)	NA	NA	NA
	Yes	0 (0.0%)	0 (0.0%)			
Smoking	Non-smoker	137 (45.7%)	140 (46.7%)	0.243*	0.885	NS
	Ex-smoker	148 (49.3%)	143 (47.7%)			
	Still smoking	15 (5.0%)	17 (5.7%)			
Renal	No	297 (99.3%)	290 (96.7%)	5.415*	0.020	S
	Yes	2 (0.7%)	10 (3.3%)			
Respiratory	No	297 (99.0%)	294 (98.0%)	1.015*	0.314	NS
	Yes	3 (1.0%)	6 (2.0%)			
Cerebrovascular Disease	No	299 (99.7%)	299 (99.7%)	0.000*	1.000	NS
	Yes	1 (0.3%)	1 (0.3%)			
Peripheral Vascular Disease	No	298 (99.3%)	300 (100.0%)	2.007*	0.157	NS
	Peripheral VD	2 (0.7%)	0 (0.0%)			

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS)
*:Chi-square test; •: Independent t-test

Table (1) shows that there was no statistically significant difference found between both studied groups regarding sex of the studied patients with p-value = 1.000. Also, the table shows that there was statistically significant difference found between both groups regarding angina status, dyspnea status, diabetes,

hypercholesterolemia and renal with p-value <0.001, <0.001, 0.038, <0.001 and 0.020; respectively while no statistically significant difference found between both groups regarding the other risk factors.

Table (2): Comparison between group A and group B regarding ejection fraction and euro score

Preoperative data		Group A	Group B	Test value	P-value	Sig.
		No. = 300	No. = 300			
Ejection Fraction (%)	Poor (<30%)	2 (0.7%)	2 (0.7%)	1.085	0.581	NS
	Fair (30-49%)	52 (17.3%)	62 (20.7%)			
	Good (>50%)	246 (82.0%)	236 (78.7%)			
Ejection Fraction (death)	Good	246 (82.0%)	236 (78.7%)	1.055	0.304	NS
	Poor + fair	54 (18.0%)	64 (21.3%)			
Euro score II	Median (IQR)	0.98 (0.82 – 1.27)	1.25 (0.99 – 1.46)	-7.335‡	0.000	HS
	Range	0.55 – 2.55	0.72 – 2.99			

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS) *:Chi-square test; ‡: Mann Whitney test

Table (2) shows that there was no statistically significant difference found between both studied groups regarding ejection fraction of the studied patients with p-value = 0.581. Also, the table shows that there was statistically significant increase in euro score II in patients with age ≥70 years than those with age <70 years with p-value <0.001.

Table (3): Comparison between group A and group B regarding operative data.

Operative data		Group A	Group B	Test value	P-value	Sig.
		No. = 300	No. = 300			
Graft Conduit	LIMA	19 (6.3%)	7 (2.3%)	34.726*	0.000	HS
	LIMA & SVG	279 (93.0%)	259 (86.3%)			
	SVG	2 (0.7%)	34 (11.3%)			
Anastomosis						
LAD		298 (99.3%)	300 (100.0%)	2.007*	0.157	NS
OM1		175 (58.3%)	96 (32.0%)	41.999*	0.000	HS
PDA		108 (36.0%)	127 (42.3%)	2.525*	0.112	NS
Diagonal		98 (32.7%)	126 (42.0%)	5.585*	0.018	S
RCA		97 (32.3%)	70 (23.3%)	6.049*	0.014	S
OM2		64 (21.3%)	61 (20.3%)	0.091*	0.763	NS
PL		7 (2.3%)	5 (1.7%)	0.340*	0.560	NS
RAMUS		2 (0.7%)	9 (3.0%)	4.538*	0.033	S
Number of distal	Median (IQR)	3 (2 – 3)	3 (2 – 3)	-2.633‡	0.008	HS
	Mean±SD	2.84 ± 0.85	2.66 ± 0.857			
	Range	1 – 5	1 – 5			
Cardioplegia	Warm	64 (21.3%)	92 (30.7%)	9.960*	0.007	HS
	Cold	224 (74.7%)	204 (68.0%)			
	Custodiol	12 (4.0%)	4 (1.3%)			
Bypass Time	Median (IQR)	90 (70 – 110)	83.5 (60.5 – 110)	-1.809‡	0.070	NS
	Range	30 – 217	23 – 320			
XC Time (min)	Median (IQR)	50 (40 – 63)	50 (35.5 – 65)	-1.466‡	0.143	NS
	Range	11 – 150	14 – 120			

Coming of bypass	No support	145 (48.3%)	256 (85.3%)	94.443*	0.000	HS
	Minimal support	105 (35.0%)	24 (8.0%)			
	High inotropic support	50 (16.7%)	20 (6.7%)			

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS) *:Chi-square test; ‡: Mann Whitney test

Table (3) shows that there was statistically significant difference found between the two studied groups regarding graft conduit with p-value <0.001 the percentage of LIMA only and LIMA with SVG was found higher in group A than group B; also according to anastomosis, there was statistically significant increase in the percentage of patients with OM1 and RCA in group A with p-value <0.001 and 0.014; respectively while there was statistically significant increase in the percentage of patients with diagonal and RAMUS in group B than group A with p-value = 0.018 and 0.033; respectively. Also, there was statistically significant increase in the number of distal in group A than group B with p-value =0.008; also the percentage of patients with cold cardioplegia was found higher in group A than group B with p-value 0.007. Finally, the percentage of patients with minimal support and high inotropic support was found higher in group A with p-value <0.001 while no statistically significant difference found between both groups regarding the other studied parameters.

Table (4): Comparison between group A and group B regarding postoperative data

Postoperative data		Group A No. = 300	Group B No. = 300	Test value	P-value	Sig.
Complications						
Arrhythmias		14 (4.7%)	21 (7.0%)	1.487*	0.223	NS
Low cardiac output		84 (28.0%)	31 (10.3%)	30.218*	0.000	HS
IABP		7 (2.3%)	18 (6.0%)	5.050*	0.025	S
Re-operation		13 (4.3%)	19 (6.3%)	1.188*	0.276	NS
Neurological complication		2 (0.7%)	13 (4.3%)	8.274*	0.004	HS
pulmonary complications		3 (1.0%)	11 (3.7%)	4.681*	0.031	S
mediastintis and rewiring		4 (1.3%)	32 (10.7%)	23.168*	0.000	HS
Renal impairment (Dialysis)		1 (0.3%)	9 (3.0%)	6.508*	0.011	S
Total morbidity	No	203 (67.7%)	197 (65.7%)	0.270*	0.603	NS
	Yes	97 (32.3%)	103 (34.3%)			
Stay on ICU						
Mechanical ventilations (MV) Hrs	Median (IQR)	8 (6 – 11)	12 (9 – 17)	-8.026‡	0.000	HS
	Range	0 – 200	3 – 180			
Stay on ITU (Hours)	Median (IQR)	48 (24 – 72)	48 (24 – 60)	-0.093‡	0.926	NS
	Range	0 – 264	24 – 288			
Stay on ITU (Nights)	Median (IQR)	2 (1 – 3)	2 (1 – 3)	-0.079‡	0.937	NS
	Range	1 – 24	1 – 12			
Total Hospital stay	Median (IQR)	7 (7 – 9)	8 (7 – 11)	-3.074‡	0.002	HS
	Range	3 – 29	2 – 91			
Mortality	Alive	292 (97.3%)	283 (94.3%)	3.381*	0.066	NS
	Died in hospital	8 (2.7%)	17 (5.7%)			
Echo post discharge EF%	Poor (<30%)	8 (2.7%)	19 (6.3%)	5.109*	0.078	NS
	Fair (30-49%)	85 (28.3%)	75 (25.0%)			
	Good (>50%)	207 (69.0%)	206 (68.7%)			
Echo post discharge EF%	Good	207 (69.0%)	206 (68.7%)	0.008	0.928	NS
	Poor +fair	93 (31.0%)	94 (31.3%)			

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS) *:Chi-square test; ‡: Mann Whitney test

Table (4) shows that, according to postoperative complications, there was statistically significant increase in the percentage of patients with low cardiac output in group A than group B with p-value <0.001 and also statistically significant increase in the percentage of IABP, re-reoperation, neurological complications, pulmonary complications, mediastinitis and rewiring and renal impairment in group B than group A with p-value = 0.025, 0.004, 0.004, 0.031, <0.001 and 0.011; respectively. Also, the table shows that there was no statistically significant difference found between both groups regarding total morbidity. Also, according to stay on ICU, the mechanical ventilation hours and total hospital stay was found higher in group B than group A with p-value <0.001 and 0.002; respectively, while no statistically significant difference found between both groups regarding the other parameters.

Table (5): Logistic regression analysis for predictors of morbidity among group A patients

	Univariate				Multivariate			
	P-value	Odds ratio (OR)	95% C.I. for OR		P-value	Odds ratio (OR)	95% C.I. for OR	
			Lower	Upper			Lower	Upper
RCA	0.000	2.513	1.511	4.178	0.000	2.857	1.613	5.062
OM2	0.046	0.516	0.269	0.989	0.011	0.391	0.189	0.808
Bypass time >100	0.028	1.777	1.064	2.968	0.915	0.963	0.483	1.921
XC Time >58	0.010	1.933	1.172	3.186	0.067	1.878	0.957	3.685
Coming of bypass	0.000	3.353	1.993	5.639	0.000	4.123	2.308	7.366

The previous univariate logistic regression analysis shows that there was statistically significant association found between occurrence of morbidities and RCA, OM2, bypass time >100, XC time >58 and coming of bypass. Also, the multivariate logistic regression analysis shows that the most important factors associated with occurrence of morbidities among group A patients was found coming of bypass with p-value <0.001 and OR (95% CI) of 4.123 (2.308 – 7.366) followed by RCA anastomosis with p-value <0.001 and OR (95% CI) of 2.857 (1.613 – 5.062) and lastly OM2 anastomosis with p-value = 0.011 and OR (95% CI) of 0.391 (0.189 – 0.808) (Table 5).

Table (6): Logistic regression analysis for predictors of mortality among group A patients

	Univariate				Multivariate			
	P-value	Odds ratio (OR)	95% C.I. for OR		P-value	Odds ratio (OR)	95% C.I. for OR	
			Lower	Upper			Lower	Upper
Sex (Female)	0.032	0.198	0.045	0.869	--	--	--	--
Respiratory	0.018	20.714	1.675	256.114	--	--	--	--
Peripheral Vascular Disease	0.011	41.571	2.354	734.218	--	--	--	--
LIMA & SVG	0.065	0.209	0.039	1.105	--	--	--	--
Coming of bypass	0.074	6.811	0.828	56.054	--	--	--	--
Total morbidity	0.022	6.626	1.312	33.462	--	--	--	--
Stay on ITU (>164hrs)	0.000	24.429	4.854	122.931	0.022	29.517	1.632	533.949
Stay on ITU (>2 night)	0.004	21.389	2.588	176.795	--	--	--	--
Poor post discharge EF%	0.009	16.767	2.032	138.350	0.000	46.370	15.329	58.788

The previous univariate logistic regression analysis shows that female sex, respiratory, peripheral vascular disease, total morbidity, stay on ITU >164 hours, stay on

ITU >2 nights and low post discharge EF% was found significantly associated with mortality among patients of group A. Also, the multivariate logistic regression analysis shows that the most important factors associated with mortality was found poor post discharge ejection fraction with p-value <0.001 and OR (95% CI) of 46.370 (15.329 – 58.788) followed by stay on ITU > 164 hrs. with p-value = 0.022 and OR (95% CI) of 29.517 – 1.632 – 533.949) (Table 6).

DISCUSSION:

The study aimed to determine to the clinical outcome of CABG in Egyptian Septuagenarian population and to identify risk factors that may adversely affect morbidities and mortality.

In this study we demonstrated that there was no statistically significant difference found between both studied groups regarding sex of the studied patients with p-value = 1.000.

In study to assess Age influences outcomes in 70-year or older patients undergoing isolated coronary artery bypass graft surgery. ***Rocha et al.*** [11] found that there was no difference between the two groups of patients related to the following: gender, DM, systemic hypertension, routine diagnostic tests of stable or unstable angina, or myocardial infarction less than three months of CABG.

Our results are supported by previous study by ***Lemaire et al.*** [12] with similar findings that there was insignificant difference between older patients compared to younger patients as regards gender (p>0.05).

In this study we found that there was statistically significant difference found between both groups regarding angina status, dyspnea status, diabetes, hypercholesterolemia and renal with p-value <0.001, <0.001, 0.038, <0.001 and 0.020; respectively.

Smith et al. [13] found that the mean urgency rating scores at referral differed significantly between the groups: the young septuagenarians were at significantly lower risk than the old septuagenarians (p = 0.02) and the octogenarians (p = 0.02); there were no significant differences between the old septuagenarians and the octogenarians (p = 0.32). The 3 groups differed significantly with regard to combined cardiac risk factors (p = 0.02) and history of hyperlipidemia (p = 0.006). Differences in preoperative atrial fibrillation approached significance (p = 0.09). More of the octogenarians than of the young septuagenarians had severe angina (69.0% v. 50.8%, p = 0.02).

Engoren et al. [14] found that Octogenarians were more likely to have had preoperative angina and dyspnea (p = 0.05) but were less likely to have diabetes mellitus (p < 0.001).

In this thesis we found that there was statistically significant increase in euro score II in patients with age ≥70 years than those with age <70 years with p-value <0.001.

Rocha et al. [11] found that compared to patients in G2, patients in G1 had a higher prevalence of peripheral vascular disease (PVD) (18.3% vs. 10.7%, P = 0.002), more impairment of the left main coronary artery (37.7% vs 26.8%, P = 0.001), and high-risk EuroSCORE (36.2% vs. 8.4%, P <0.001).

Nicolini et al. [15] found that older patients presented at surgery more often with higher EuroSCORE, due to the higher incidence of systemic comorbidities.

In this thesis we cleared that there was statistically significant difference found between the two studied groups regarding graft conduit with p-value <0.001 the percentage of LIMA only and LIMA with SVG was found higher in group A than group B; also according to anastomosis, there was statistically significant increase in

the percentage of patients with OM1 and RCA in group A with p-value <0.001 and 0.014; respectively while there was statistically significant increase in the percentage of patients with diagonal and RAMUS in group B than group A with p-value = 0.018 and 0.033; respectively. Also, there was statistically significant increase in the number of distal in group A than group B with p-value =0.008

Rocha et al. [11] found that the number of anastomoses per patient was significantly higher in G2 than in G1 [4 (95% CI = 1-5) vs. 2 (95% CI = 1-3), *P* = 0.017]. However, the number of internal thoracic artery grafts used was similar (95.5% vs. 93.0%, respectively, *P* = 0.713).

Alves Júnior et al.[16] found that as with the CABG surgeries, he noted that the use of the left internal thoracic artery was significantly greater in the younger group (86% versus 70% in the older group, P<0.001), as well as right internal thoracic artery (11% versus in the younger group vs. 1% in the older group, P<0.001) and left radial artery (48% in the younger group versus 32% in the older group, P=0002). The use of the saphenous vein grafts was predominant among the older group (81% versus 70% in the younger group, P=0.017). Considering all surgeries involving CABG, he noted that the mean number of distal anastomoses was 2.7±0.9 anastomoses for younger group and 2.6±0.9 anastomoses for the older group (P=0.468, Mann-Whitney test). When he considered only isolated CABG, the mean number of distal anastomoses was 2.8± 0.9 for the younger group and 2.7±0.9 for the older group (P=0.766, Mann-Whitney test). In the older group, 22% of isolated CABG procedures were performed without CPB, but in the younger group, the proportion of off-pump CABG was 15% (P=0.118).

In this thesis we illustrated that according to postoperative complications, there was statistically significant increase in the percentage of patients with low cardiac output in group A than group B with p-value <0.001 and also statistically significant increase in the percentage of IABP, re-reoperation, neurological complications, pulmonary complications, mediastinitis and rewiring and renal impairment in group B than group A with p-value = 0.025, 0.004, 0.004, 0.031, <0.001 and 0.011; respectively. Also, according to stay on ICU, the mechanical ventilation hours and total hospital stay was found higher in group B than group A with p-value <0.001 and 0.002; respectively.

Rocha et al. [11] found that the mortality rate was higher in G1 than in G2 (8.9% vs. 3.6%, *P* = 0.001). The incidence of postoperative AMI was similar between the two groups of patients (5.8% vs 5.5%, *P* = 0.876). Compared to patients in G2, a greater number of patients in G1 required reoperation for hemostasis review (12.1% vs. 6.1%, *P* = 0.003) and developed more respiratory complications (21.4% vs. 9.1%, *P* <0.001), mediastinitis (5.1% vs. 1.9%, *P* = 0.013), stroke (CVA) (3.9% vs. 1.3%, *P* = 0.016), AKI (7.8% vs. 1.3%, *P*<0.001), sepsis (3.9% vs. 1.9%, *P* = 0.003), AF (15.6% vs. 9.8%, *P* = 0.016), and CAVb postoperatively (3.5% vs. 1 2%, *P* = 0.023).

In a Canadian study reported by ***Fruitman and colleagues*** [17] found that octogenarians had a median postoperative length of stay of 10 days (range 8–13), which was significantly longer than that for patients under 80. In our study, the mean length of stay in the oldest group was 9.6 days; however, this did not differ significantly from the mean lengths of stay in the younger groups (9.4 and 10.8 in the young and old septuagenarian groups respectively).

Lemaire et al. [18] found that patients who were octogenarians had worse results. Specifically, compared to the Septuagenarians, the Octogenarians were

more likely to develop more cardiac complications (OR [odds ratio] =1.20, 95% CI [confidence interval] 1.12–1.23. They were also more likely to develop more renal complications (OR 1.54 95% CI 1.48–1.61, $P < 0001$), respiratory complications (OR 1.2, 95% CI 1.2–2.1, $P < 0001$), and infectious complications (OR = 1.41, 95% CI 1.34–1.48, $P < 0001$). These complications lead to poor surgical outcomes.

In a multivariate analysis, ***Johnson et al.*** [19] demonstrated that 522 aged 80 years or older undergoing CABG had a higher risk of death, longer length of hospital stays, neurological complications, and need for reoperation to treat bleeding than non-octogenarians.

Similarly, ***Alves et al.*** [16] in a study involving 197 patients' septuagenarians or elderly patients undergoing CABG and valve operations observed operative mortality of isolated CABG in septuagenarians compared to younger patients (19% versus 6%, respectively). These authors also demonstrated that septuagenarians had more postoperative bleeding, pulmonary complications, mediastinitis, kidney dysfunction, and stroke (CVA). They also required more vasopressors than patients < 70 years of age.

In another study by ***Filsoufi et al.*** [20] at the Mount Sinai School of Medicine, Mount Sinai, New York, data from 2,985 patients undergoing CABG were prospectively collected. It was found that the operative mortality in patients of age = or > 80 years was 4.6%, in septuagenarians it was 2.2%, and in patients < 70 years of age it was 2.4%.

Naughton et al. [21] also compared the results in patients aged ≥ 75 years and aged 60-74 years undergoing CABG. Operative mortality (30 days) in the patients aged > 75 years was 5% compared to 1.8% in the younger patients (aged 60-74 years). The logistic regression analysis showed that an age > 75 years was an independent factor for operative mortality.

Peterson et al. [22] have analyzed the outcomes of CABG performed in 24,461 patients registered in the Medicare program in the United States. They found that the operative mortality was 11.5% in patients of age ≥ 80 years versus 4.4% in patients of age 65 to 70 years.

In study in our hands, we found that there was statistically significant relation found between morbidity and SVG graft conduit which was found with higher percentage in patients with morbidity than those without with p-value = 0.040. Also, according to anastomosis, the percentage of RCA was found significantly higher in those with morbidities with p-value <0.001 while the OM2 was found higher in those without morbidity than patients with morbidity with p-value = 0.044. The bypass time and XC time was found also higher in patients with morbidities than those without with p-value = 0.040 and 0.002 and also the percentage of patients with high inotropic support was found higher in patients with morbidities than those without with p-value <0.001.

Piatek et al. [23] reported left internal mammary artery graft implantation decreased mortality, while RCA was found significantly higher in those with morbidities with p-value <0.001

Craver et al. [24] found that Octogenarians who had CABG with LIMA (virtually always in combination with one or more saphenous vein grafts) had a significantly lower operative mortality (2.3%) than octogenarians having elective CABG with saphenous vein grafts alone (8.2%).

In this thesis we found that the mechanical ventilation hours, stay on ITU hours and nights, total hospital stay and the percentage of mortality was found higher in patients with morbidities than those without

with p-value <0.001, <0.001, <0.001, 0.027 and 0.009; respectively,

Filsoufi et al. [20] revealed that mechanical ventilation hours, previous cardiac operation, peripheral vascular disease, aortic calcification, total hospital stay, and congestive heart failure were predictors of mortality during follow-up in octogenarians

In this study we found that there was statistically significant association found between occurrence of morbidities and RCA, OM2, bypass time >100, XC time >58 and coming of bypass. Also, the multivariate logistic regression analysis shows that the most important factors associated with occurrence of morbidities among group A patients was found coming of bypass with p-value <0.001 and OR (95% CI) of 4.123 (2.308 – 7.366) followed by RCA anastomosis with p-value <0.001 and OR (95% CI) of 2.857 (1.613 – 5.062) and lastly OM2 anastomosis with p-value = 0.011 and OR (95% CI) of 0.391 (0.189 – 0.808).

Rocha et al. [11] found that the factors associated with mediastinitis were age ≥ 70 years (*P* = 0.016), unstable angina (*P* = 0.004), and CKD (*P* = 0.026). The factors associated with postoperative stroke were age ≥ 70 years (*P* = 0.029), diabetes (*P* = 0.048), COPD (*P* = 0.002), and previous stroke (CVA) (*P* = 0.001). AKI in the postoperative period was associated with age ≥ 70 years (*P* <0.001), CKD (P = 0.006, OR = 12.91), and MI < three months after CABG (*P* = 0.001). Factors associated with postoperative FA were age ≥ 70 years (*P* = 0.021), DM (*P* = 0.006), and PVD (*P* = 0.009). Factors associated with postoperative CAVb were age ≥ 70 years (*P* = 0.031), and CRF (*P* = 0.014)

Our results showed that the mechanical ventilation hours, stay on ITU hours and nights, total hospital stay and the percentage of mortality was found higher in patients with morbidities than those without with p-value =0.004, <0.001, <0.001, <0.001 and <0.001; respectively, and also the percentage of patients with poor ejection fraction by echo post discharge was found higher in patients with morbidities than those without with p-value <0.001.

In this study we demonstrated that there was statistically significant relation found between mortality and female gender with p-value = 0.018, also, the percentage of patients with renal, respiratory and peripheral vascular diseases was found higher in died patients than alive patients with p-value <0.001, 0.001 and <0.001; respectively

Arif et al. [25] found that female gender, logistic EuroSCORE, peripheral artery disease (PAD), abnormal left ventricular (LV) function, postoperative pneumonia, perioperative myocardial infarction (MI), previous heart surgery and the non-use of the left internal thoracic artery (LIMA) as a bypass graft were significant predictors of 30-day mortality in septuagenarians.

Lemaire et al. [12] found that the female octogenarians had a higher mortality (OR 1.25 95% CI 1.07–1.46) compared to males in the same age group. The gender difference in the Octogenarians is a critical finding not previously reported in the literature. These worse outcomes for female Octogenarians extended to more postoperative complications including bleeding, respiratory complications, and infections

In an assessment of CABG in 1303 patients, ***Miskowiec et al.*** [26] reported females undergoing CABG were significantly older (67.3 vs. 62.8 years, $p < 0.001$) than males and were subject to higher 30-day mortality (7.6% vs. 2.8% $p < 0.001$). Based on their analysis, they determined that female sex was an independent risk factor for death after isolated CABG, which supports our findings

of higher mortality in females compared to males.

In this thesis we cleared that there was statistically significant decrease in ejection fraction and increase in euro score in died patients than alive patients preoperatively with p-value <0.001 and <0.001; respectively.

Piatek et al. [27] reported that higher LVEF (Left Ventricular Ejection Fraction) and decrease in euro score were found to decrease in-hospital mortality.

In a prospective observational study by ***Yau et al***. [28] among over 8600 patients undergoing CABG, the operative mortality was less than 2% with a LVEF >40%, 3.5 to 4% with an LVEF between 20 and 40%, and approximately 8% with an LVEF <20%. LVEF must be considered in the decision to operate. A low LVEF, especially irreversible, can negate the benefits of surgery.

In this study we found that there was statistically significant increase in the percentage of patients with arrhythmia, low cardiac output, reoperation, neurological complications, pulmonary complications, mediastinitis and rewiring and renal impairement in died patients than alive patients. Also, the percentage of total morbidity was found higher in died patients than alive patients. The median mechanical ventilation hours, stay on ITU hours and nights was found higher in died patients than alive patients.

Rocha et al. [11] found that age ^{3} 70 years (P = 0.004), and the presence of PVD (P = 0.007) were factors associated with increased hospital mortality. Age ^{3} 70 years was the only factor associated requiring reoperation for hemostasis review (P = 0.002) and postoperative sepsis (P = 0.002). The main variables associated with postoperative respiratory complications after surgeries were as follows: Age ^{3} 70 years (P <0.001), PVD (P = 0.006), myocardial infarction < three months after CABG (P = 0.001), and lesion of the left main coronary artery (P = 0.020).

Piatek et al. [27] reported a mortality of 7% in octogenarians compared to 3.4% for all CABG procedures at their institution. Prolonged mechanical ventilation, thoracotomy, and longer duration of procedure are described as risk factors for in-hospital mortality in this group.

The study presented here in has clear limitations, especially due to its retrospective nature and the limited size of the sample, which limits our ability to provide prediction models. However, although the logistic regression has provided a model whose accuracy is not large, the model can be used for exploratory analysis. Thus, these results help to indicate which comorbidities deserve attention in future research and evaluation of surgical risk. Moreover, although all models of risk stratification commonly used in heart surgery include age as a predictive factor, it would be interesting see the elderly as a special population, and not as individuals who have age as an additional risk factor.

Conclusion:

Advanced age impacts surgical outcomes after CABG with Septuagenarians having worse postoperative outcomes including higher complications and mortality than younger cases. Additionally, in Septuagenarians, females had a higher mortality than their male counterparts did. An explanation for the worse outcome in the female group is most likely multifactorial and requires additional explanation. Taken together, our results demonstrate that a careful assessment of older patients must take place to determine the best management strategy to provide coronary revascularize-tion, we recommend versal study for more accurate analysis of the regional blood flow supply to the papillary muscle system, mitral valve and mitral apparatus by Cardiac MRI.

Conflict Of Interest

No conflict of interest for this study

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النتائج السريرية لتحويل مسار الشريان التاجي في سكان السبعينيات المصريين

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المقدمة: فى الفترة الأخيرة يشهد العالم عامة ومصر خاصة تقدم فى المستوى العمرى للسكان وزيادة ملحوظة فى الشريحة السكانية اللذين تبلغ أعمارهم سبعين عاما فأكثر, وهم أكثر عرضة للأصابة بأمراض القلب وذلك يشكل تحديا لجراحى القلب مع تزايد المرضى المحتاجين لجراحة القلب لتوصيل الشرايين التاجية من هذه الشريحة. الدراسات السابقة تبين ان المرضى ذوى السبعين عاما فأكثر أكثر عرضة للأصابة بالمضاعفات بعد الجراحة وزيادة ملحوظة فى معدل الوفيات والأطول فى معدل الاقامة بالرعاية المركزة وبالمستشفى. هذا يضعنا أمام تساؤل من جدوى الجراحة فى هذه السن المتقدمة.

الهدف من الدراسة: دأبت دراستنا على فحص ومقارنة نتائج جراحة القلب المفتوح لتوصيل الشرايين التاجية فى المرضى ذوى السبعين عاما فأكثر ومن هم دون ذلك, للتعرف على عوامل الخطورة ذات التأثير على حدوث مضاعفات ووفيات بعد الجراحة بهدف السيطرة عليها مستقبلا لتحسين النتائج وتقليل فترة الاقامة بالمستشفى وبالتالى تقليل التكاليف.

المرضى وطرق البحث: استعنا فى دراستنا بقاعدة بيانات قسم جراحة القلب بمستشفى معهد ناصر للبحوث والعلاج للحصول على بيانات المرضى الذين تم لهم إجراء جراحة قلب مفتوح لتوصيل الشرايين التاجية فى الفترة من يناير 2009 الى ديسمبر 2011 وبعد استبعاد المرضى اللذين لم تكتمل بياناتهم من الدراسة, تم تقسيم المرضى الى مجموعتين كل يضم 110 مريض. المجوعة الاولى المرضى ذوى السبعين عاما فأكثر أما المجموعة الثانية المرضى أقل من سبعين عاما. تم دراسة العديد من العوامل بالمرضى من المجموعتين قبل واثناء وبعد الجراحة ومدي تباينها فى المجموعتين وتأثيرها على النتائج ومدة الاقامة بالمستشفى.

النتائج: اظهرت الدراسة ان التقدم فى السن يؤثر على النتائج الجراحية بعد تحويل مسار الشريان التاجى بما فى ذلك مضاعفات اعلى و معدل وفيات من الحالات الاصغر سنا , بالاضافى الى ذلك كان معدل الوفيات بين الاناث اعلى من نظائرهن من الذكورومن المرجح ان يكون تفسير النتيجة الاسوأ فى المجموعة النسائية متعدد العوامل ويتطلب تفسيرا اضافيا , وتظهر نتائجنا انه يجب اجراء تقييم دقيق للمرضى الاكبر سنا لتحديد افضل استراتيجية ادارة لتوفير اعادة التةعية لجراحة القلب المفتوح لتوصيل الشرايين التاجية .

اتفقت نتائج دراستنا مع دراسات دولية حديثة فى ذات مجال البحث فى الكثير من النقاط ذات الأهمية وفى الاستنتاج النهائى, وتمتاز على الدراسات القديمة من حيث تحسن النتائج. ويرجع ذلك للتحسن الملموس فى التقنيات المستخدمة فى الجراحات وكذا تحسن مستوى الرعاية الصحية بعد الجراحة.

الخلاصة: جراحة القلب المفتوح لتوصيل الشرايين التاجية فى المرضى ذوى السبعين عاما فأكثر أصبحت أكثر أمانا وأفضل نتائجا من ذى قبل, لذا تقدم العمر لن يحول دون إجراء الجراحة.