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Treatment Strategies for Patients with Obstructive Coronary Artery Disease (Limited Mansoura University Experience) in 2021

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ABSTRACT

Background: Heart attacks are the main cause of mortality globally and coronary artery disease (CAD) is a major contributor. One-third of deaths in both poor and industrialized countries among adults over the age of 35 can be attributed to coronary artery disease, with the number reaching close to 50% in western countries (according to some estimates). **Objective:** to evaluate treatment strategies for patients with obstructive CAD

Patients and Methods: This was single center observational research evaluating 1283 patients admitted for elective coronary angiography for evaluation of patients with chronic coronary syndromes (CCS) in catheter (cath) Lab. in Cardiology Department in Mansoura Medical Specialized Hospital in the period between 01/10/2021 and 30/09/2022.

Results: Mean age 57.9 and mean body mass index 30.07 and among the cases 972 of them were males with percentage (75.8%) and 311 females (24.2%) 807 were smokers (62.9%) and 897(69.9%) were hypertensive patients and 651(50.7%) diabetic and 421(32.8%) cases with dyslipidemia. Positive family history was seen in 287(22.4%) and 334 (26%) have heart failure.

Regarding the treatment modality in the included cases, 80 of them treated with extensive medical treatment 6.2%, 935 treated with PCI 72.9% and 268 for CABG 20.9%.

The study shows that the most affected artery was LAD followed by RCA then LCX and finally LM.

The majority showed no LM affection 1106(86.2%) while 94(7.3%) with no significant stenosis and 83(6.5%) with significant stenosis.

The study showed significant lower between medical group and CABG group in(BMI-Dyslipidemia–heart failure)

The study showed significant lower between medical group and PCI group in (BMI)

The study showed significant higher between CABG group and PCI group in (Age-Hypertension-Dyslipidemia-Heart failure). There are significantly higher among patients ≥ 65 Y more than group <65 in (sex female-hypertension-diabetes mellitus-dyslipidemia-heart failure) and significant lower in (sex male- family history)

The study showed that SYNTAX score is directly proportional with Age , Male sex- Diabetes mellitus – hyper tension – heart failure).

The study showed significant higher in Age and BMI and hypertension.

Conclusions: In terms of death and disability-adjusted life years (DALYs) lost, CAD is by far the leading cause worldwide. In our study we had 1283 patients with obstructive coronary artery disease. Our treatment strategies were 935 patients in PCI, 268 patients in CABG and 80 patients in medical treatment. There was difference in number of vessels, SYNTAX score, presence of diabetes or not, symptoms and echocardiography finding. Percent of PCI in cases with obstructive CAD was 72.9%, percent of medical treatment was 6.2% and CABG percent was 20.9%.The study showed that SYNTAX score is directly proportional with Age ,Male sex- diabetes mellitus – hyper tension – heart failure). There was significant lower between medical group and CABG group in(BMI-Dyslipidemia–heart failure

Keywords: Treatment Strategies, Obstructive Coronary Artery, Coronary Heart Disease.

INTRODUCTION

Heart disease is the most common cause of death and disability globally, responsible for over 31% of all deaths each year [(1-3)]. Among the greatest global killers is coronary artery disease. One-third of deaths in both developing and developed countries in adults over the age of 35 can be attributed to CAD, with the number reaching close to 50% in western countries (according to certain estimations). By 2030, the number of DALYs (years of life lost due to disability, disease, or death) across the globe is expected to rise to 47 million.) [(4)] .

The prevalence of CAD in Egypt was calculated to be 8.3% after adjustment by the National Hypertension Project (NHP). There are several hypotheses as to why this is the case, but some of them include: CAD's increasing prevalence in developing nations; CAD's high prevalence; CAD's high costs associated with surgical and other treatment modalities; CAD's negative effects; and CAD's inability to be effectively treated [(5)] . Coronary artery bypass graft (CABG), percutaneous coronary intervention (PCI), medicinal therapy (MT), and combinations of these treatments are all options for patients with symptoms due to flow-limiting atherosclerotic coronary artery constriction [(6)].This work aimed to evaluate treatment strategies for patients with obstructive CAD

PATIENTS AND METHODS

This was single center observational research evaluating 1283 cases admitted for elective coronary angiography for evaluation of patients with CCS in cath. Lab. in Cardiology Department in Mansoura Medical Specialized Hospital in the period between 01/10/2021 and 30/09/2022.

Inclusion criteria: cases with obstructive CAD admitted for elective coronary angiography in cath. Lab.

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in Cardiology Department in Mansoura Medical Specialized Hospital.

Exclusion criteria: patients with non-obstructive CAD, patients indicated for coronary angiography for preoperative evaluation and patients refused to participate in the research.

Patients were classified into 3 main groups: Group 1: Obstructive coronary artery disease (OCAD) treated by intensive medical treatment. Group 2: obstructive coronary artery disease (OCAD) treated by CABG and Group 3: obstructive coronary artery disease (OCAD) treated by angioplasty <PCI>.

Methods

All cases were subjected to: Demographic data, history taking, clinical examination, clinical presentation and investigations.

Ethical consideration: The research was performed according to the guideline of Helsinki declaration; verbal consent was be obtained from all cases, seeking the benefit of cases over study in risk-benefit ratio and respect of patient's privacy. Besides, the research is approved by Mansoura Faculty of Medicine Ethics Committee; ID number in IRB: MS.21.09.1675.

Statistical analysis

The Statistical Package for the Social Sciences (SPSS), Standard Version 21, was used to analyze the data collected. A one-sample Kolmogorov-Smirnov test was performed to check for data normality. Quantitative continuous data were presented as mean and standard deviation and qualitative data were presented as frequency and percentage.

RESULTS

The study contains 1283 patients with mean age 57.9 and mean body mass index 30.07 and among the cases 972 of them were males with percentage (75.8%) and 311 females (24.2%) 807 were smokers (62.9%) and 897(69.9%) were hypertensive patients and 651(50.7%) diabetic and 421(32.8%) cases with dyslipidemia. Positive family history was seen in 287(22.4%) and 334 (26%) have heart failure.. The demographic data of the studied patients are shown in table 1

Table 1: Demographic characteristics and medical history of the studied cases

All patients (n= 1283)		**Mean & SD**
Age		**57.92 ± 8.441**
Body Mass Index		**30.07 ± 3.105**
Gender	**Male**	**972(75.8%)**
	Female	**311(24.2%)**
Smoking		**807(62.9%)**
Hypertension		**897(69.9%)**
Diabetes Mellitus		**651(50.7%)**
Dyslipidemia		**421(32.8%)**
Family history		**287(22.4%)**
Heart failure		**334(26.0%)**

(Table 2) The study show significant lower between Medical TTT group and CABG group in (LVESD – RWMA)

The study shows significant lower between Medical TTT group and PCI group in (RSWMA)

The study show significance higher between PCI group and CABG group in (EF – RSWMA) and lower in (LVESD)

Table 2: Echocardiography findings of the studied patients according to the outcome

All patients (n= 1283)		**Medical TTT**	**For CABG**	**PCI**	**P1**	**P2**	**P3**
LA		3.66 ± 0.537	3.65 ± 0.475	3.59 ± 0.488	0.861	0.243	0.101
Aorta		3.30 ± 0.455	3.33 ± 0.343	3.33 ± 0.391	0.474	0.463	0.935
IVSD		1.13 ± 0.102	1.14 ± 0.116	1.14 ± 0.103	0.434	0.268	0.671
PWD		1.34 ± 0.190	1.32 ± 0.176	1.33 ± 0.177	0.237	0.576	0.217
LVEDD		5.32 ± 0.388	5.37 ± 0.383	5.36 ± 0.395	0.305	0.368	0.710
LVESD		3.56 ± 0.495	3.72 ± 0.510	3.64 ± 0.518	**0.012**	0.202	**0.014**
EF		57.38 ± 9.576	53.76 ± 9.379	57.48 ± 8.770	0.002	0.923	**< 0.001**
RWMA	**Absent**	57 (71.3%)	110 (41.0%)	531 (56.8%)	**< 0.05**	**< 0.05**	**< 0.05**
	LAD territories	10 (12.5%)	38 (14.2%)	187 (20.0%)			
	LCX territories	3 (3.8%)	2 (0.7%)	18 (1.9%)			
	RCA territories	2 (2.5%)	4 (1.5%)	66 (7.1%)			
	Global	8 (10.0%)	114 (42.5%)	133 (14.2%)			

LA=left atrium, IVSD=inter ventricular septum diameter, PWD= posterior wall diameter, LVEDD=left ventricular end diastolic diameter. LVESD= left ventricular end systolic diameter, EF=ejection fraction, RWMA=resting wall motion abnormality, LAD=left anterior descending artery, LCX=left circumflex artery, RCA= right coronary artery, Medical TTT=medical treatment, CABG=coronary artery bypass graft, PCI=percutaneous coronary intervention. P1=between Medical TTT group and CABG group, P2=between Medical TTT group and PCI group, P3=between CABG group and PCI. EF is lower in CABG group than PCI group.

The research showed that history of MI was insignificantly more in group patients with one vessel affected > group with 2 vessels affected > group with 3 vessels affected. AF was more in 3 vessels group > 2 vessels group >1 vessel group. There was significant higher in 3 vesseles group than 2 vessels group. **(Table 3)**

Table 3: Myocardial infarction history, angina class and ECG findings of the studied cases according to the number of vessels

All patients (n= 1283)		**One vessel (n= 565)**	**Two vessels (n= 349)**	**Three ormore (n= 369)**	**P1**	**P2**	**P3**
MI	**Anterior STEMI**	61 (10.8%)	29 (8.3%)	21 (5.7%)	0.05	> 0.05	> 0.05
	Inferior STEMI	30 (5.3%)	16 (4.6%)	19 (5.1%)			
Angina class	**1**	64(11.3%)	38(10.8%)	43(11.6%)	> 0.05	> 0.05	> 0.05
	2	96 (17%)	61 (17.4%)	67 (18.1%)			
	3	405(71.6%)	251 (71.9 %)	257 (69.6%)			
	4	0 (0.0%)	1 (0.3%)	2 (0.5%)			
ECG	**Normal**	85(15%)	42(12%)	21(5.6%)	> 0.05	> 0.05	>0.05
	ST-T changes	372(65.8%)	245 (70.2)%	275 (74.5%)			
	Pathological Q	82 (14.5%)	50 (14.3%)	54 (14.6%)			
	LBBB	26 (4.6%)	12 (3.4%)	19 (5.1%)			
Atrial Fibrillation		11 (1.9%)	14 (4.0%)	19 (5.1%)	>0.05	**<0.05**	>0.05

P1=between group with one vessel affected and 2 vessels affected P2=between group with one vessel affected and 3 vessels affected P3=between group with 2 vessels affected and 3vessels affected
ECG = electrocardiogram MI = Myocardial infarction LBBB = Left bundle branch block

The role of Medical TTT decreased with increased number of vessels while the role of CABG increased with increased number of vessels. The study showed significant difference between each group when compared with each other group **(Table 4)**.

Table 4: Treatment strategies for the studied participants according to number of vessels

All patients(n= 1283)	**One vessel(n= 565)**	**Two vessels(n= 349)**	**Three or more (n= 369)**	**P1**	**P2**	**P3**
Medical TTT	33 (5.8%)	30 (8.6%)	17 (4.6%)	**<0.05**	**<0.05**	**<0.05**
CABG	7 (1.2%)	14 (4.0%)	247 (66.9%)			
PCI	525 (92.9%)	305 (87.4%)	105 (28.5%)			

Medical TTT=medical treatment, CABG=coronary artery bypass graft, PCI=percutaneous coronary intervention.
P1=between group with one vessel affected and 2 vessels affected P2=between group with one vessel affected and 3 vessels affected P3=between group with 2 vessels affected and 3vessels affected.

There are significant lower between group which SYNTAX score<22 & group with SYNTAX score 22-32 in (EF) while significant higher in Less RWMA
There are significant higher between group which SYNTAX score<22 & group with SYNTAX score >32 in (Less RWMA –EF) while significant lower in LVESD **(Table 5)**.

Table 5: Echocardiography findings of the studied cases according to the SYNTAX score

All patients (n= 1283)		<22 (n= 997)	22-32(n= 125)	> 32 (n= 161)	P1	P2	P3
LA		3.60 ± 0.491	3.62 ± 0.457	3.66 ± 0.496	0.753	0.140	0.423
Aorta		3.33 ± 0.398	3.31 ± 0.298	3.36 ± 0.364	0.561	0.361	0.266
IVSD		1.14 ± 0.103	1.15 ± 0.113	1.13 ± 0.116	0.350	0.195	0.096
PWD		1.33 ± 0.179	1.31 ± 0.160	1.31 ± 0.181	0.144	0.163	0.864
LVEDD		5.35 ± 0.397	5.37 ± 0.402	5.37 ± 0.359	0.738	0.534	0.859
LVESD		3.63 ± 0.517	3.69 ± 0.487	3.76 ± 0.515	0.196	**0.003**	0.284
EF		57.58 ± 8.796	54.34 ± 9.562	53.06 ± 9.184	**<0.001**	**<0.001**	0.226
RWMA	**Absent**	582 (58.4%	53 (42.4%)	63 (39.1%)	**<0.05**	**<0.05**	>0.05
	LAD territories	201 (20.2%)	16 (12.8%)	18 (11.2%)			
	LCX territories	21 (2.1%)	1 (0.8%)	1 (0.6%)			
	RCA territories	67 (6.7%)	4 (3.2%)	1 (0.6%)			
	Global	126 12.6%)	51 (40.8%)	78 (48.4%)			

P1=between group which SYNTAX score<22 and group with SYNTAX score 22-32
P2= between group which SYNTAX score<22 and group with SYNTAX score >32
P3= between group which SYNTAX score 22-32 and group with SYNTAX score >32
LA = left atrium IVSD = interventricular septum thickness PWD = P-wave dispersion LVEDD = Left ventricular end-diastolic diameter LVESD = Left ventricular end-systolic diameter RWMA = Regional wall motion abnormality
LAD = left anterior descending artery LCX = left circumflex coronary artery RCA = Right coronary artery

The study showed that with increasing SYNTAX score the role of PCI decreased while CABG was increasing. The majority of patient for CABG the SYNTAX score was > 32. The study showed that with increasing SYNTAX score the role of PCI decrease while CABG is increasing.
The majority of patient for CABG the SYNTAX score was > 32 **(Table 6)**.

Table 6: Treatment strategies for the studied patients according to SYNTAX score

All Patients n=1283	<22 (n=997)	22-32 (n=125)	>32(n= 161)	P1	P2	P3
Medical TTT	80 (8.0%)	0 (0.0%)	0 (0.0%)	**< 0.05**	**< 0.05**	**< 0.05**
For CABG	12 (1.2%)	97 (77.6%)	159 (98.8%)			
PCI	905 (90.8%)	28 (22.4%)	2 (1.2%)			

Medical TTT=medical treatment
P1=between group which SYNTAX score<22 and group with SYNTAX score 22-32
P2= between group which SYNTAX score<22 and group with SYNTAX score >32
P3= between group which SYNTAX score 22-32 and group with SYNTAX score >32
CABG = coronary artery bypass graft

The study showed that for the majority of cases who underwent CABG, the EF was <50. There was significant difference between cases with ejection fraction <40 and patients with ejection fraction >50 and between cases with ejection fraction 40-50 and cases with ejection fraction >50, while there was no significant difference between cases with ejection fraction <40 and cases with ejection fraction 40-50. **(Table 7)**

Table 7: Treatment of the studied patients according to the ejection fraction

All patients (n= 1283)	< 40 (n=72)	40-49(n= 261)	≥50 (n=950)	P1	P2	P3
Medical TTT	6 (8.3%)	11 (4.2%)	63(6.6%)	> 0.05	**< 0.05**	**< 0.05**
For CABG	21 (29.2%)	84 (32.2%)	163 (17.2%)			
PCI	45(62.5%)	166 (63.6%)	724 (76.2%)			

P1=between participants with ejection fraction <40 and patients with ejection fraction 40-50
P2=between participants with ejection fraction <40 and patiets with ejection fraction ≥ 50
P3=between participants with ejection fraction 40-50 and patients with ejection fraction ≥ 50
CABG = coronary artery bypass graft

DISCUSSION

The majority of the participants in this study (78.1%) were 65 and older with the mean age being 57.92 years. Lower rates in Egyptian patients older than 60 with CAD were reported by **Bahnasawy *et al.*** (35.4%) and **Ibrahim *et al.*** (26%). They also noted that the average age of those with CAD was 55.95 ± 11.04 and 54 years old, respectively [7,8]. **Hassanein *et al*.** [4] observed that seventy-three percent of Egyptians with CAD were over the age of thirty-five [9]. The average age of patients was 54 ± 10.50 years, as reported by **Rohit V and Trivedi**; 40.0% of patients were between the ages of 51 and 60[10]. Furthermore, **Kasper *et al.*** found that the prevalence of CAD increased between the ages of 51 and 60 [11] .

Males made up 75.8% of the participants in this analysis. This followed findings by **Al-Shorbagy *et al***. showing men are disproportionately affected, since 74% of all cases involved were males[12].

The average body mass index (BMI) of the participants in this analysis was 30.07 ± 3.105 kg/m^2. The relative risk (RR) of being obese for developing CAD was 1.2 (95% CI: 1.07-1.36) in men and 1.19 (95% CI: 1.04-0.37) in women, as explained by **Schnohr *et al.*** [13]. Population-based surveys estimate that roughly 1.3 billion adults around the world are overweight. Overweight and obesity are also to blame for 23.0% of the cardiac arrhythmia burden [5].

Hassanein *et al*. [9] (39.2%) and **Taha** [14] (38.5%), found results comparable to those seen here. However, 25.8% of Egyptian patients with CAD were found to be overweight or obese by **Ibrahim et al.** [8] However, **Bahnasawy *et al***. discovered that 96.5 percent of their patients with CAD were overweight or obese [7]. Twenty-two percent of the participants in our study had a positive family history of heart illness. **Wahrenberg and colleagues** found a similar range, with 8.2% reporting a family history of premature CAD and 32.4% reporting a history of chronic CAD in their families [15]. Patients with a positive family history of CAD were also found by **Bahnasawy *et al.*** (46.9%) and **Foroughi *et al.*** (38.0%)[7,16].

Our findings revealed that the majority showed no RWMA (54.4%), global hypokinesia 19.9% > LAD territories 18.3% > RCA territories 5.6% > LCX territories 1.8 %. **Jo *et al.*** agreed with our findings as LAD was the most common culprit lesion (51.3%), followed by RCA (27.8%) and LCX (20.9%) [17].

In the current study, the role of medical TTT decreased with increased number of vessels while the role of CABG increased with increased number of vessels. The study showed significant difference between the 3 groups with each other.

Among 3041 patients presenting with AMI, 491 (16%) were found to have multi-vessel coronary artery disease (MVD) on coronary angiogram, which was consistent with the findings of **Khaled *et al.*** Patients with MVD were shown to have a lower indication for severe anti-ischemic treatment (thrombus aspiration, glycoprotein IIb/IIIa inhibitors, and primary percutaneous coronary intervention; PPCI) and to have more frequently presented with non-anterior STEMI [18].

Hawranek *et al.* enrolled 1213 patients, 761 in the CABG group and 452 in the PCI group, all from institutional databases. Three-vessel disease was more common in the CABG group, but it was present in all patients included in the analysis [19].

By using the SYNTAX angiographic grading system, the complexity of CAD can be evaluated using ICA. The SYNTAX Trial is the source of SS. It addresses several angiographic classifications of the complexity of CAD based on the location and kind of obstructive coronary lesions, provides a thorough risk assessment, and suggests the most effective coronary revascularization procedures now available [20].

The SS was developed to help the heart team decide between PCI and coronary artery bypass grafting (CABG) for patients with multi-vessel disease [21].The results of the current study confirmed this where the study showed significant difference between group with SYNTAX score<22 and group with SYNTAX score 22-32 and between group with SYNTAX score<22 and group with SYNTAX score >32 and between group with SYNTAX score 22-32 and group with SYNTAX score >32. This agreed with the findings of **Boyraz and Peker**, who analyzed data from 476 individuals who did not have ST-elevation myocardial infarction but did have three-vessel disease. In situations when CABG surgery was performed, they found that the average Syntax score was much higher [22].

In the present research, the mean Gensini score was greater in the patients that underwent CABG than in the cases that got PCI, and both groups' scores were higher than in the cases who did not get medical therapy. The study demonstrated a statistically significant difference between the three groups based on Gensini score, with the role of PCI was diminishing with rising Gensini score and the function of CABG was increasing. This agreed with the findings of **Boyraz and Peker**, who analyzed data from 476 individuals who did not have ST-elevation myocardial infarction but did have three-vessel disease. Those who underwent CABG surgery had statistically higher mean Gensini scores, as they reported [22].

Angiographically diagnosing the degree of coronary artery disease, demonstrating prognosis, and forecasting prospective advantages from therapies may all be attainable with the help of the Gensini score, according to a study by **Charach *et al.*** [23]. According to a study by **Wang *et al.*,** the Gensini score is a strong predictor of long-term unfavorable outcomes in patients with CAD who underwent PCI, especially in the diabetic group [24].

CONCLOSION

By a considerable margin, CAD is the biggest global cause of death and disability-adjusted life years (DALYs) lost. Doctors typically recommend "optimized medical therapy," or OMT, an increase in

prescribed drugs in addition to behavioral modifications, to alleviate symptoms and prevent future episodes. Once a definitive diagnosis and risk for CAD have been established, OMT should be initiated and the dosage adjusted. In our study we had 1283 patients with obstructive coronary artery disease. Our treatment strategies were 935 patients in PCI, 268 patients in CABG and 80 patients in medical treatment. There was a difference in number of vessels, SYNTAX score, presence of diabetes or not, symptoms and echocardiography. Percent of PCI in patients with obstructive coronary artery disease was 72.9%, percent of medical treatment was 6.2% and CABG percent was 20.9%

DECLARATIONS

- **Consent for publication:** I attest that all authors have agreed to submit the work.
- **Availability of data and material:** Available
- **Competing interests:** None
- **Funding:** No fund
- **Conflicts of interest:** no conflicts of interest.

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