SYNTAX Scoring In Patients with Coronary Artery Disease and Its Effect on Mode of Revascularization, Single Center Experience.

Hilal B. Al Saffar*   CABM, FRCP, FACC
Saad M. Zedan**   CABM,DIC.

Summary:

Background: Revascularization therapy for patients with left main (LM) and/or three vessels coronary disease is a matter of argument for long a time whether bypercutaneous coronary angioplasty or coronary artery bypass grafting. SYNTAX trial was designed to assess the optimal revascularization strategy between percutaneous coronary intervention and coronary artery bypass grafting, for patients with left main stem coronary artery disease and/or 3-vessel coronary disease.

Objectives: To estimate the complexity of coronary artery disease in patients referred to a tertiary cardiac center and its effect on mode of revascularization.

Method: Ninety nine patients who were referred to Iraqi center for heart disease from July to December 2010 with the diagnosis of coronary artery disease were included. Full history, clinical examination, biochemical tests (blood sugar ,total cholesterol , blood urea and serum creatinine) were checked, electrocardiographic and echocardiographic characteristics were analyzed .All patients underwent diagnostic angiography and SYNTAX score calculator was applied and the SYNTAX score was recorded. Patients were divided into two groups: group A , those who were planned for PCI and group B who were planned for CABG .

Results: Mean age of the patients was 57.6±10.6, ranging 19-80 year, male were more than female (75.8% vs. 24.6%). Risk factors diabetes mellitus (42.6%), high blood pressure (52.8 %), smoking (42.4%), hypercholesterolemia (43.4%) and prior MI (32.3%).Mean age of group A was 54.22±11.27 while group B was 62.37±7.47 (P value 0.0001) . There was no significant difference in risk factors prevalence between group A and B (DM 36.2% vs.51.2% p=0.31), hypertension(53.4% vs.53.3% p=0.98), smoking (41.3% vs.43.9% p=0.8), hypercholestoemia (31% vs. 60.9%),ejection fraction<50% (20.6% vs. 24.3%) (p=0.66). All patient with left main steam disease 13 (31.7%) passed to CABG group. Mean total SYNTAX score for all patients was 16.7±6.5. Mean SYNTAX score were (10.24±6, 26.01±7.7) for group A and B respectively (P value 0.00001).

Conclusion: Patients with lower SYNTAX score were managed by PCI. Patients treated with PCI have lower syntax score than that in SYNTAX study, while those who were treated by CABG, were comparable to that in SYNTAX study.

Key words: CAD, SYNTAX score, revascularization

Introduction:

The SYNTAX trial is a prospective, clinical trial conducted in eighty-five sites and approved by the institutional review board at each participating center. The study had an "all-comers" design involving the consecutive enrollment of all eligible patients with three-vessel or left main coronary artery disease at sites in 17 countries in Europe and the United State. the results of the trial show that CABG, as compared with PCI, is associated with a lower rate of major adverse cardiac events at 1 year among patients with three-vessel or left main coronary artery disease (or both) and should therefore remain the standard of care for such patients. The SYNTAX Score is an angiographic tool grading the complexity of coronary artery disease

1. **Dominance**
2. **Number of lesions**
3. **Segments involved per lesion**
Lesion Characteristics
4. **Total occlusion**

The SYNTAX score has been developed to characterize the coronary vasculature with respect to the number of lesions and their functional impact, location, and complexity. Higher SYNTAX scores, indicative of more disease that is complex are hypothesized to represent a bigger therapeutic challenge and tohave potentially worse prognosis. The SYNTAX score has been developed based on the following: The AHA[1] classification of the coronary tree segments modified for the arterial revascularization therapy study [2],The Leaman score [3],The ACC/AHA lesions classification system [4], The total occlusion classification system [5],The Duke[6] and ICPS [7]classification systems for bifurcation lesion.

Dept. of cardiology, college of Medicine, University of Baghdad.
**Iraqi Center for the heart disease.*

SYNTAX score algorithm

 i. Number of segments involved
ii. Age of the total occlusion (>3 months)
iii. Blunt Stump
iv. Bridging collaterals
v. First segment beyond the occlusion visible by antegrade or retrograde filling
vi. Side branch involvement

5. Trifurcation
i. Number of segments diseased

6. Bifurcation
i. Type
ii. Angulation between the distal main vessel and the side branch <70°

7. Aorto-ostial lesion
8. Severe tortuosity
9. Length >20mm
10. Heavy calcification
11. Thrombus
12. Diffuse disease/small vessels
i. Number of segments with diffuse disease/small vessels

Patients and Method:

 In this prospective study, Ninety-nine patients with CAD who were referred to the Iraqi center of heart diseases from July to December 2010 for further assessment were included.

All patients were evaluated and variable data were collected including: age, gender, risk factors (diabetes, high blood pressure, smoking and hypercholesterolemia).Blood samples were taken for all patients and sent for: blood sugar, urea and creatinine, cholesterol. Patient was considered to be hypertensive if blood pressure ≥140/90 mm Hg on two occasions[8] or on antihypertensive medication, diabetic if fasting blood sugar ≥126 mg/dl, random blood sugar ≥160 mg/dl or patient on antidaibetic medication.[9]Patient is regarded as hypercholesterolemic if serum cholesterol >200 mg/dl.[10] Electrocardiographic and echocardiographic assessments were done for all patients. ECG feature of STEMI (ST elevation and pathological q wave), for NSTEMI (ST depression and/or T inversion) and left bundle branch block. Previous MI denoted by presence of pathological Q wave.

Left ventricle dysfunction if ejection fraction <50%.patients with LV dysfunction further subdivided according to severity of LV dysfunction in to Patients with EF40-49 %, Patients with EF30-39 %, Patients with EF<30 %.

 All patients underwent diagnostic angiography after informed consent were taken and under local anesthesia, the transfemoral approach, Judkine technique and coronary angiography for both left and right coronary arteries with multiple projection was taken. The coronary angiography film was reviewed and SYNTAX scoring for each patient was done. Patients were divided into two groups: Group A: those who referred to PCI, Group B: those who referred to CABG.

SYNTAX score were calculated for each group. The mode of coronary revascularization weather PCI or CABG was the interventional cardiologist choice. Exclusion criteria were Co-dominant coronary artery, previous coronary intervention, because both were excluded by the original study.

Statistical analysis: data were analyzed by using Statistical Package for Social Sciences (SPSS 14), categorical variable were compared using chi- square test. Continuous variable were compared using t-test, P≤ 0.05 considered to be significant

Results:

Total no. of patients was Ninety-nine with age range 19-80 year, mean 57.6±10.6. Male were more than female in this study 75 vs. 24(75.8% vs. 24.6%). Table (1).

Mean age of group A was 54.22±11.27 while group B was 62.37±7.47 (P value 0.0001). Diabetes was present in 42 patients (42.6%), high blood pressure in 52 patients (52.8 %), smoking in 42 patients (42.4%), and hypercholesterolemia in 43 patients (43.4%). Previous MI present in 32 patients (32.3%). table 2

ECG features, q Wave in 39 patient (39.4%), ST elevation in10 (10.1%), ST depression and /or inversion 21(21.2%), LBBB in nine (9.09%) and normal in 30 (30.3%) patient. LV function with EF >50 in 77 patients (77.2%), and EF <50 in 22 patients (22.8%). EF40-49 %(54.5%), EF30-39 %(31.8%) and <30 %(4%).table 3.

 Coronary revascularization was by PCI in 58 patients (58.6%) and by CABG in 41 patients (41.4%). Mean total SYNTAX score was 16.7±6.5. Mean SYNTAX score of group A was 10.24±6 while mean SYNTAX score of group B was 26.01±7.7 (P value 0.00001).

Total male patients were 75, 44 patients were treated by PCI and 31 patients treated by CABG. female were 24, 14 were treated by PCI and 10patients were treated by CABG. Among hypertensive patients (total 31) ,53.4% were planned for PCI and 22(53.6%) for CABG , diabetic (total 21) ,(36.2%) patient planned for PCI , 21(51.2%) planned to CABG . Regarding smoking, 24(41.3%) patient planned for PCI AND 18 (43.9%) planned to CABG, hypercholesterolemia patients, 18(30%) planned for PCI and 24(60.9%) for CABG group. Table 4.

Thirty-two patients had previous MI, 18 (31.0%) were in group A and 14 (24.1%) in group B. and patients with EF <50, 12(20.6 %) planned for PCI and 10(17.2%)   planned to CABG group. Finally all patient with left main steam disease 13 (31.7%) passed to group B.

Table (1): gender distribution

Gender	No.	Percent
Male	75	75.8%
Female	24	24.2%

Table (2): Risk factors demonstration

Risk factor	Total No.	Percent
DM	42	(42.6%),
High blood pressure	52	(52.8 %)
Smoking	43	(43.4%),
Hypercholesterolemia	42	(42.4%)
Previous MI	32	(32.3%).

SYNTAX Scoring In Patients with Coronary Artery Disease and Its Effect on Modeof Revascularization , Single Center Experience.

Hilal B. Al Saffar

Table (3) showing ECG and echo features:

		Total No.	Percent
ECG	**Q wave**	39	39.4%
	STelevation	10	10.1%
	ST depression	21	21.2%
	LBBB	9	9.09%
	NORMAL	30	30.3%
EF	**>50%**	77	77.2%
	<50%	22	22.8%
	40-49%	12	54.5%
	30-39%	9	31.8%
	<30%	1	4%

Table(4) group A and B characteristics

Variable	Group A (n=58)	Group B (n=41)	P value
Mean age± SD	**54.22±11.27**	**62.37±7.47**	**<0.001**
gender Male	**44 (75.8%)**	**31 (75.6%)**	**0.97**
Female	**14(24.1%)**	**10 (24.3%)**	
DM	**21(36.2%)**	**21(51.2%)**	**0.31**
High blood pressure	**31(53.4%)**	**22(53.6%)**	**0.98**
Smoking	**24(41.3%)**	**18(43.9%)**	**0.8**
Cholesterol >200	**18(31%)**	**24(60.9%)**	**0.7**
Previous MI	**18 (31.0%)**	**14 (34.1%)**	**0.74**
EF <50%	**12 (20.6%)**	**10 (24.3%)**	**0.66**
EF > 50%	**46 (79.3%)**	**31 (75.7 %)**	
LMS	**0 (0.0 %)**	**13 (31.7%)**	**<0.001**
SYNTAX Score	**10.24±6**	**26.01±7.7**	**<0.001**
EF<50 SYNTAX SCORE	**12.2±5**	**30,5±6**	**<0.001**

Discussion:

In this observational study the mean age of patients was 57.6+10.6 .while that in SYNTAX study was 65.2±9.7 .This demonstrate that our patient were younger than in patients in SYNTAX study by more than 8 yr., probably due to unhealthy dietary habit, poor education about importance of control of risk factors and lack of regular exercise. Coronary artery disease affects male more than female and male tend to be affected at younger age. In the current study, Male patients constitute 78.8% of the total sample; in SYNTAX study male constitute 70.3 %. There was no rule of gender on deciding on the mode of revascularization (male 75.8% in-group A and 75.6% in-group B) while female (24.1% of group A and 23.3 of group B). DM is important risk factors for the ischemic heart disease and affects the morbidity and mortality as well as DM is important factor in choosing the mode of revascularization by either PCI or CABG in patient with 3-vessel disease and LMS. [11]. In the Arterial Revascularization Therapy Study (ARTS), 208 patients with diabetes who underwent percutaneous revascularization had a lower 1-year survival (63 percent) than those undergoing CABG (84 percent).[12] in the current study DM was present in (42.6%),while in SYNTAX study was 30.2%. In the current study, we noticed that DM was

not an important factors in choosing the mode of revascularization as it was equally divided between group A and group B, possible explanation may be presence other risk factors in non diabetic patients and we not consider duration and control of DM in our study. High blood pressure often confers silent cardiovascular risk, and its prevalence is steadily increasing. In this study high blood pressure present in 52.8%, which is comparable to SYNTAX, study was 68.5%

Smoking is the single most important risk factor for coronary artery disease [13]. History of Cigarette smoking in this study was present in 42.4% vs.16.2 in SYNTAX trial because in this study both current and previous smoker were included. In this study, high cholesterol was present in 39.4%. all patients (99) who were referred to ICHD with presumptive diagnosis of CAD were on statin and in spite of that, high cholesterol level found in about 40% of patients this reflect poor secondary preventive measures. In this study, we found that high blood pressure, smoking and high cholesterol level play no rule in choosing the mode of revascularization therapy, this is same as the results in SYNTAX trail. In this study, previous MI, which is documented by Q wave with or without ST elevation, was observed in 39.4%. In SYNTAX

SYNTAX Scoring In Patients with Coronary Artery Disease and Its Effect on Modeof Revascularization , Single Center Experience.

Hilal B. Al Saffar

study prior MI was present in 40.4%. There is no impact of having previous MI on planning to specific mode of revascularization, as (31.0%) patients with previous MI were in-group A compared to (34.1%) patients with previous MI were in group B. This finding is similar to that obtained to SYNTEX study as Prior MI, present in 33.5% of CABG patient vs. 40.4% in PCI patients

Age of group A patients was significantly younger than the age of group B (Mean age54.22±11.27 vs.62.37±7.47, P0.0001) this may reflect increase in complexity of coronary lesion and increase in atherosclerotic burden with increase age. Mean SYNTAX score of group A in this study was 10.24±6 while that in SYNTAX study was 28.4±11.5. The lower SYNTAX score in our study compared with SYNTAX study may be attributed to some logistic factors like use of bare metal stents (which was only available), which is less suitable for long and complex lesions than drug eluting stents that used in SYNTAX study, operator experience in dealing with complex and high risk lesion like LMS and to lack of more devices that deal with chronic total occlusion lesion. Mean SYNTAX score of CABG patients in our study was comparable to that in SYNTAX study (26.01±7.7, 29.9±11) respectively. The wide difference in mean PCI SYNTAX score in two studies mean more patients with lower score in our study passed to CABG group. According AHA/ACC guideline left ventricular dysfunction defined as EF<50percentage. Left ventricular dysfunction is the single most important predictor of mortality following MI. [14]In our study patients with LV dysfunction (EF <50%) were distributed equally between group A and B (54.5 %vs. 45.5%), p value not significant. This means that the complexity of lesion is the main factor in deciding mode of revascularization. We have two observations: First mean SYNTAX score of patients with EF<50 in-group A was 12.2 while mean SYNTAX score in-group B was 30.05.Second those patients with EF<50% who referred to PCI, 91% of them was single vessel and suitable for PCI. This mean that patients with multi vessel and complex lesions passed to group B and this is coincide with guidelines as CABG is preferred in multi vessels disease with LV dysfunction as it improves survival. All patient with left main steam disease 13 (31.7%) passed to group B. this because we still now work in previous guidelines that consider LMS PCI as class III recommendation and lower operator experience in LMS PCI.

Conclusion:
Patients with lower SYNTAX score were treated by PCI as compared to those with higher SYNTAX score, Patients treated by PCI had lower score than with SYNTAX study, those who had CABG comparable to SYNTAX study, Those treated by PCI had lower syntax score as compared with SYNTAX trial may be due to lack of facilities and the need for better experience.

References:
1. American Heart Association Grading Committee. Coronary ArteryDisease Reporting System. Circulation 1975;51:31-3.
2. Serruys PW, Unger F, van Hout BA et al. The ARTS study (Arterial Revascularization Therapies Study). Semin Interv Cardiol. 1999; 4(4):209-19.
3. Leaman DM, Brower RW, Meester GT et al .Coronary artery atherosclerosis: severity of the disease, severity of angina pectoris and compromised left ventricular function. Circulation.1981; 63(2):285-99.
4. Ryan TJ, Faxon DP, Gunnar RM et al. Guidelines for percutaneous transluminal coronary angioplasty.A report of the American College of Cardiology/American Heart Association Task Force on assessment of diagnostic and therapeutic cardiovascular procedures (subcommittee on percutaneous transluminal coronary angioplasty). Circulation1988; 78:486-502.
5. Hamburger JN, Serruys PW, Scabra-Gomes R et al. Recanalization of total coronary occlusions using a laser guide wire (the European TOTAL Surveillance Study). Am J Cardiol.1997; 80:1419-23.
6. Topol EJ. Textbook of interventional cardiology, 3rd Ed.Philadelphia: WB Saunders Co.; 1998.
p 728.
7. Lefevre T, Louvard Y, Morice MC et al. Stenting of bifurcation lesions: classification, treatments, and results. Catheter Cardiovasc Interv.2000; 49:274-283.
8. Chobanian AV, Bakris GL, Black HR, et al: The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: The JNC 7 report. JAMA 2003; 289:2560.
9.American Diabetes Association: Diagnosis and classification of diabetes mellitus.Diabetes Care 2010; 33(Suppl 1):S62.
10. Durrington, P (2003). "Dyslipidaemia".The Lancet362 (9385): 717–31.
11. David A. Morrow, Bernard J. Gersh: Chronic Coronary Artery Disease.Braunwald's 8th edition, vol1, chapter 54, Saunders, 2008.
12. Flaherty JD, Davidson CJ: Diabetes and coronary revascularization. JAMA 2005; 293:1501.
13. Centers for Disease Control and Prevention (CDC) : Annual smoking-attributable mortality, years of potential life lost, and economic costs—United States, 1995-1999. MMWR Morb Mortal Wkly Rep 2002; 51:300.
14. Pitt B: Aldosterone blockade in patients with systolic left ventricular dysfunction. Circulation 2003; 108:1790-1794.