Original Article

SYNTAX Score on Procedural Outcome among Patient Undergoing Primary Percutaneous Coronary Intervention

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Abstract:

Background: Limited contemporary data exist regarding the impact of SYNTAX score on procedural outcomes undergoing primary percutaneous coronary intervention(PCI) in acute STEMI patients.

Objectives: To evaluate the significance of the SYNTAX score for predicting procedural outcome after primary PCI in patient with acute STEMI.

Methods: This perspective observational study was conducted in the department of cardiology, National Institute of Cardiovascular Diseases, Dhaka, Bangladesh from September, 2015 to September, 2016. 42 patients with acute STEMI who underwent primary PCI were considered for the study. But 2 patients were excluded from the study due to failure of primary PCI. The patients were divided into two groups: Group I (low Syntax score d"22) and Group II (high Syntax score > 22). The Syntax score of all patients were calculated from an initial coronary angiogram before primary PCI. Procedural outcome was observed in between two groups.

Results: Among study patients 57.5% were in SYNTAX score d"22 (Group I) and 42.5% were in SYNTAX score >22 (Group II). Among traditional cardiovascular risk factors diabetes was significantly more prevalent in the Group II than Group I (82.4% vs 34.8%, p Â 0.003). Angiographic profile revealed maximum (69.6% vs 17.6%) culprit lesion in LAD artery in Group I and maximum culprit lesion (64.7% vs 21.7%) in RCA in Group II, these were the statistically significant between Group I and Group II (P<0.05). The high SYNTAX score group had lower ejection fraction (47.8±5.1 vs. 54.4±4.3, p= 0.04), lower TIMI flow 3 rate (76.47% vs 91.3%, p= 0.03) greater rate of MACE (29.4% vs. 4.3%, p=0.041), lower procedural success rate (76.47 vs. 91.3%, p= 0.046) compared to the low SYNTAX score group. ROC curve showed 77% sensitivity and 32% specificity for SYNTAX score when cut off value was 22 Performance test of SYNTEX score in the setting of Primary PCI outcome showed positive predictive value 83%.

Conclusions: SYNTAX score was an independent variable that can predict procedural outcomes of patients with acute STEMI undergoing primary PCI.

Key wards : SYNTAX score, Primary PCI, STEMI

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Introduction:

Cardiovascular diseases account for more than 17 million deaths globally each year. This figure is to grow to 23.6 million by the year 2030.[1] Estimates from the global burden of disease study suggests that by the year 2020 the South Asian part of the world (India, Pakistan, Bangladesh, Nepal) will have more individuals with atherosclerotic cardiovascular diseases than any other region.[2]

Primary PCI reduces the risk for mortality and subsequent myocardial infarction when compared with medical therapy in patients with acute coronary syndromes. However, the invasive mechanical reperfusion strategies have their own complications. Major complications include death, MI, or stroke, and minor complications include transient ischemic attacks, vascular complications, contrast induced nephropathy, and angiographic complications.

Originally, the SYNTAX score was designed to grade the complexity of stable coronary artery disease. Higher values of this score, reflecting a more challenging coronary anatomy for the interventional cardiologist, also predict a worse prognosis after acute STEMI.[3] Patients with very low predicted mortality could benefit from early discharge from the intensive care unit and from the hospital, resulting in better clinical care and optimization of health resources. In contrast, morbidity and mortality after STEMI are still high in other subgroups.[4]

The aim of the study is to investigate the usefulness of SYNTAX score in predicting outcome of primary PCI in acute STEMI patients in terms of severity and complexity of CAD.

Methods:

This prospective observational study was conducted in the Department of Cardiology, National Institute of Cardiovascular Diseases, Dhaka, Bangladesh from September, 2015 to September, 2016. The study included patients with acute STEMI who undergone primary PCI during the study period. Patients with valvular heart diseases, congenital heart diseases, prior MI, PCI or CABG and severe comorbidities were excluded.

Proper medications was given in CCU. After adequate explanation Coronary angiogram (CA) was done by conventional method. Angiographic pattern and CAD severity assessment was done   by visual estimation.

The SYNTAX scores of all patients were calculated by 2 independent experienced interventional cardiologists, using online version of SYNTAX calculator who were blinded to the identities. The patients were divided into 2 groups, those with low SYNTAX scores ≤ 22 (Group I) and those with intermediate to high SYNTAX scores ≥ 22 (Group II).[5]

Data analysis was performed using SPSS version 16. Categorical variables were expressed as frequency and percentage and continuous variables as mean and standard deviation. Data was analyzed by student's t-test, chi-square test and Fisher exact test. Multivariate logistic regression analysis was done to assess the effect of independent variable and adjustment was done for confounding variable.

Results:

Total 42 patients with acute STEMI who underwent primary PCI were enrolled in this study. The main objective of the study was to determine impact of SYNTAX score for predicting In-hospital outcome after primary PCI in patients with acute STEMI. Two patients were excluded from this study due to primary PCI failure. In our study

Table-I
Base line characteristics of study patients. (n=40)

|	Group I(n=23)		Group II(n=17)		Total (n=40)		p value
Mean age±SD	51.40±13.20		46.00±13.56				0.397ns
Risk factors	No	%	No	%	No	%	
Smoking	13	56.5	14	82.4	27	67.5	0.085ns
Hypertension	14	60.9	11	64.7	25	62.5	0.804 ns
DM	8	34.8	14	82.4	22	75.0	0.003 s
Dyslipidemia	11	47.8	13	76.5	24	60.0	0.068 ns
Family history of IHD	5	21.7	6	35.3	11	27.5	0.343 ns
Culprit vessel							
LAD	16	69.6	3	17.6	19	47.5	
LCX	2	8.7	3	17.6	5	12.5	0.014s
RCA	5	21.7	11	64.7	16	40.0	
TIMI flow							
1	0	0	2	11.76			0.14ns
2	2	8.7	2	11.76			0.8ns
3	21	91.3	13	76.47			0.03s

Data were analysis using t text, chi-square and Fisher exact test
Group I= SYNTAX score ≤ 22; Group II: SYNTAX score >22;
ns-not significant; s- significant

57.5% were in SYNTAX score ≤22 (Group I) and 42.5% were in SYNTAX score >22 (Group II).

The mean age ± SD was 51.40±13.20 years in Group I and 46.00±13.56 years in Group II (Table I). The difference was not statistically significant. There are no significant difference of traditional cardiovascular risk factors among the Group I and Group II except DM which was statistically significant different in between two group. Angiographic profile (Table I) revealed maximum (69.6% vs 17.6%) culprit lesion in LAD artery in Group I and maximum culprit lesion (64.7% vs 21.7%) in RCA in Group II, these were the statistically significant between Group I and Group II (P<0.05). Angiographic outcome showed that 91.3% patient in Group I and 76.47% in Group II achieved TIMI flow 3 and the difference was statistically significant (p= 0.03). In Group I 8.7% patients and 11.76% patient in Group II achieved TIMI flow 2 and the difference was not statistically significant (p= 0.8). No patient in Group I and 11.76% patient in Group II achieved TIMI flow 1 and the difference was not statistically significant (p= 0.14).
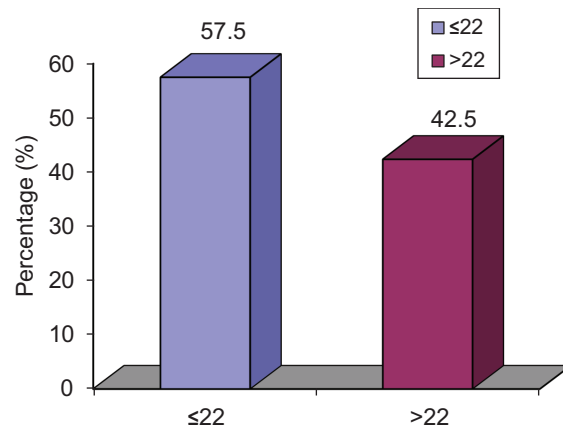
Fig. 1: *Distributing of SYNTAX sore among the study patients*

The above bar diagram shows 57.5% were SYNTAX score ≤22 (Group I) and 42.5% were SYNTAX score >22 (Group II).

Table-II
Comparison of LVEF between two group of patients after primary PCI (%) (n=40)

LVEF (%)	Group In=23		Group IIn=17		P value
	No	%	No	%	
<30(Severe)	0		0		0.001^s
30-39(Moderate)	0	0	0	0	
40-49(Mild)	6		5		0.001^s
≥50(Normal)	17		12		
Mean±SD(Range)	56.4=4.3		53.8=3.145-60/40-55		

Data were analysis using chi-square test and Fisher exact test
Group I= SYNTAX score ≤22; Group II: SYNTAX score >22
s- significant

The above table shows that mean LVEF was 54.4±4.3 in Group I and 47.8±5.1 in Group II and the difference was statistically significant (p= 0.04).

Table-III
Comparison between two group of patients according to MACE (n=40)

Outcome(MACE)	Group In=23		Group IIn=17		P value
	No	%	No	%	
Present	1	4.3	5	29.4	0.041^s
Absent	22	95.7	12	71.4	

Data were analyzed using chi-square test and Fisher exact test
Group I= SYNTAX score <22
Group II=SYNTAX score >22
s-significant

Table shows that 4.3% patients experienced adverse in-hospital outcome in group I, on the contrary 29.4% patients had such experience in group II. So the table revealed that in hospital outcome significantly more in Group I than Group II. Adverse in-hospital outcome included death, re-infarction, cardiogenic shock, acute heart failure and significant arrhythmia.

Table-IV

Complications of study patients according to SYNTAX score (n=40)

Outcome	Group I (n=23)		Group II (n=17)		Total		p value
	No	%	No	%	No	%	
Acute heart failure	1	2.5%	1	2.5	2	5.0	0.863 ns
Cardiogenic shock	0	00	1	2.5	1	2,5	0.453 ns
Significant arrhythmia	0	00	1	2.5	1	2.5	0.453 ns
Death	0	00	2	5.0	2	5.0	0.371 ns

Data were analysis using chi-square test and Fisher exact test Group I= SYNTAX score ≤22; Group II: SYNTAX score >22ns- not significant

Complications of primary PCI in Group I Vs Group II: acute heart failure 2.5. % Vs 2.5% cardiogenic shock 00 % Vs 2.5% significant arrhythmia 00 % Vs 2.5% and death 00 % Vs 5% and total in-hospital outcome: acute heart failure 5%, cardiogenic shock 2.5%, significant arrhythmia 2.5% and death 5%.

Table-V

Relationship between SYNTAX score and primary PCI success in two group of   patients (n=40)

| Outcome	Group In=23		Group IIn=17		P value
	no	%	No	%	
Successful	23	100	14	92.5	0.046s
Not successful	0	0	3	7.5	

Data were analyzed using chi-square test and Fisher exact test
Group I= SYNTAX score ≤22
Group II=SYNTAX score >22
s-significant

Table shows that primary PCI was successful in 100% patients in Group I, on the contrary 92.5% in Group II. So the table revealed that successful primary PCI was significantly more in Group I than Group II.
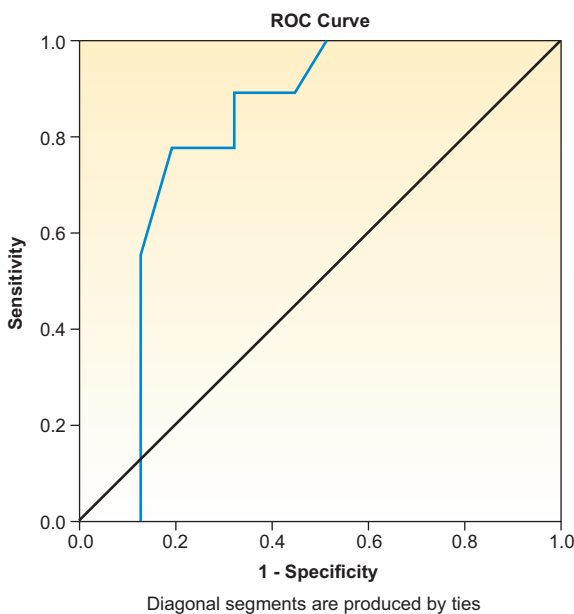
Fig.-2: *Receiver-operator characteristic curves SYNTAX score*

The area under the receiver-operator characteristic (ROC) curves for prediction of SYNTAX Score area under curve(AUC) 0.803, which gave a cut off value of d"22 with 77% sensitivity and 32% specificity for prediction of significant (p=0.006).

Discussion:

The present study has a few literatures regarding the usefulness of the SYNTAX score for predicting procedural outcome after primary percutaneous coronary intervention in patient with acute STEMI.

We found diabetes to increase the risk of MACE in patients who received primary PCI for acute STEMI. In other words, diabetes was significantly more prevalent in the Group II. Various studies have also highlighted the short term (during hospitalization and the first year after the disease) and long term effects of diabetes on the MACE.[6,7] Diabetes can thus be considered as a risk factor for MACE after primary PCI.

In this study, smoking did not have any negative effects on MACE. However, a previous research reported better

reperfusion rate after primary PCI in smokers.[8] High arterial blood pressure is a risk factor for coronary artery disease and increases the risk of complications after acute coronary syndrome.[9,10] However, we did not find significant differences in level of blood pressure between the two groups. Hyperlipidemia is a risk factor for coronary artery disease, it has no significant effects on the incidence of MACE in our study. Some studies have identified high levels of lipoprotein (a) to be associated with poor outcome in patients with acute myocardial infarction.[11]

Angiographic profile in our study showed that left anterior descending (LAD) artery was the most common (47.5%) culprit vessel followed by right coronary artery (RCA) was 40% and left circumflex artery (LCX) was 12.5%. These were similar to the finding (LAD 51.2%, RCA 38.5% and LCX 10.2%).[12]

The post procedural that mean LVEF was 54.4±4.3 in Group I and 47.8±5.1 in Group II which was similar to the finding of mean LVEF 44.6 ± 8.8% and 38.2±7.5%[12]. Systolic function of the left ventricle after AMI is one of the most important predictors of long term outcomes.[13] In our study, patients with high SYNTAX score had lower EF. Patients with high SYNTAX score had more multivessel disease, chronic total occlusion and LAD occlusion, so the myocardium of these patients had a greater ischemic area and subsequently lower ejection fraction.

Our study showed that the patient presented with acute STEMI and having SYNTAX score >22 are associated with a higher rate of MACE. Tobbia, et al. showed that MACE was 28.2%. In the high SYNTAX score group, the presence of complex coronary anatomy was abundant and this had been associated with more no-reflow, systolic dysfunction and higher rates of re-infarction. In addition, more diabetic patients were in the high SYNTAX score group.[14]

On the other hand failed primary PCI was 5% in our study. The overall PCI failure rate was 5.4%.[15] They concluded that independent predictor of primary PCI failure included age >65 years, procedure time, calcification, lower preprocedural TIMI flow. Barbash, et al. showed that female gender, cardiogenic shock, previous PCI and type C lesion are independent predictors of primacy PCI failure[16]. In our study we observed that PCI failure due to high SYNTAX score, heavily calcification and type C lesion.

Though the small number of failed primary PCI in our study, we hardly concluded that failed primary PCI is

associated with high SYNTAX score. Finally ROC curve revealed that cut off value 22 for SYNTAX score in our study showed 77% sensitivity and 32% specificity and positive predictive value was 83%.

Conclusion:

This study demonstrates that a high SYNTAX appeared reproducible, feasible and prognostic information with regards to procedural outcome. In our acute STEMI cohort, risk of cardiovascular event was notably increased during index hospitalization. So we proposed that the SYNTAX score can be used for risk stratification in patients undergoing primary PCI.

Limitations:

Interpretation of angiograms and assessment of the SYNTAX score was not performed by QCA. Although the result of the study supports the hypothesis, during study we face several limitations such as coronary angiogram was evaluated by visual estimation. So there was chance of interobserver and intraobserver variation to calculate the SYNTAX score. The study was carried out only in single centre, study period was short sample size was small it was a non randomized study.

Conflict of interest- None

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