

PREDICTION OF CORONARY ANGIOGRAPHIC FEATURES IN DIFFERENT CLINICAL PRESENTATIONS OF UNSTABLE ANGINA

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Abstract:

Background: The clinical syndrome of unstable angina can be manifested in different ways. There are three principal presentations of unstable angina like prolonged angina at rest, new onset angina and accelerated angina. Clinical characteristics can be correlated with morphological features of coronary artery assessed by coronary angiogram.

Objective: The prospective observational study was conducted to compare angiographic findings with different clinical presentations of unstable angina.

Methods: The study was carried out in the Department of Cardiology of Bangabandhu Sheikh Mujib Medical University (BSMMU) from January 2005 to December 2006. Total 75 patients with different clinical scenarios of unstable angina were included in this study.

Results: Patients with rest angina showed triple vessel disease in comparison to other groups (40% vs. 8% and 24%). Regarding lesion characteristic, more complex lesions (type B and C) are common in cases with rest angina in comparison to new onset angina and accelerated angina. (76% vs. 48% and 40%) Vessel score and stenosis score are also high in rest angina in comparison to other types. (2.53 ± 0.76 vs. 1.56 ± 0.92). Patients with rest angina also present more proximal and ostial lesions. The incidence of long intracoronary lesions were high in patients with rest angina (20% vs. 4%)

Conclusion: This study shows that coronary angiographic morphology was not same in unstable angina patients who presented with different clinical scenario. So, complexity of angiographic lesion morphology can be predicted from clinical presentation.

Introduction

Unstable angina lies in the spectrum of clinical conditions caused by myocardial ischaemia, which ranges from chronic stable angina to the acute coronary syndrome. Unstable angina and the closely related Non-ST segment elevation myocardial infarction (NSTEMI) are the two very common manifestations of coronary artery disease. Every year in the United States approximately 1.3 million patients are admitted in hospital with Unstable angina (UA) or NSTEMI compared with approximately 350000 patients with ST segment elevation myocardial infarction (STEMI). Another data shows that UA occurs in approximately 6 out of 10000 people. Though no definite prevalence data is available about the incidence of UA in Bangladesh but in recent times,

UA has emerged as a dominant cause of hospital admission morbidity and mortality due to CAD in our country.¹

With progressive evolution in the field of cardiac catheterization, diagnostic selective coronary angiography has become safe and widely practiced procedure for the detection of coronary artery disease. First performed by Sones in 1959, coronary angiography (CAG) has become one of the most widely performed and accurate test in cardiovascular medicine. The noninvasive diagnostic tests in current use are not 100% sensitive or specific. Now CAG is the method of choice for establishing the presence or absence of coronary artery disease and for providing the most reliable information for making decisions about the need for medical therapy, angioplasty or bypass surgery

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Selective CAG is also satisfactory technique in the study of the distribution and severity of atherosclerosis in the patients with IHD. Quantitative CAG has been shown to be useful in assessing the extent of coronary artery disease, its functional significance, and its response to therapeutic interventions.² CAG findings showed various types of lesions in different types of IHD.

The clinical syndrome of unstable angina (UA) encompasses a variety of clinical presentations of transient episodes of myocardial ischaemia. These episodes are caused by obstruction of coronary flow by different pathophysiologic mechanisms including intracoronary atheromatous plaque rupture, platelet aggregation, thrombus formation and increased vasomotor tone.³

Unstable angina may be clinically manifested in different ways. There are three principal presentation of unstable angina. Rest angina can be defined as angina that occurs at rest or minimal exertion usually lasting more than 20 minutes.⁴ New onset severe angina usually defined as severe angina within last month and accelerated angina, also known as crescendo angina can be defined as previously diagnosed angina that has become distinctly more frequent, longer in duration, or more severe in nature.⁵

Clinical evaluation of the patients can help to predict the severity, extent and outcome of the patients. In this study attempt was made to correlate and compare the coronary angiographic lesion morphology in different clinical presentations of unstable angina and risk factors, electrocardiographic (ECG) and echocardiographic changes were also considered. This insight may be of tremendous clinical value particularly in prediction of angiographic severity and prevention of adverse events analysis of presentation, risk factor distribution and ECG changes.

Materials and Methods

The prospective observational study was conducted in the Department of Cardiology of Bangabandhu Sheikh Mujib Medical University between January 2005 to December 2006 to compare angiographic finding of intracoronary lesion in different clinical presentation of unstable angina and also to recognize the presentation of unstable angina of high risk. A total 75 patients presented with different clinical presentation of unstable angina were included as case and were grouped into three category according to their presentation like with prolonged rest angina (group A), with new onset angina (group B) and accelerated angina (group C). Any patients presented

with evidences of necrosis with elevated Troponin I and CK MB level, Secondary or post infarction angina, post CABG or PTCA patients were excluded from the study. After selection all study subjects were interviewed and relevant investigations were done, finally coronary angiogram was performed. Angiographic severity of coronary artery disease was assessed by Vessel score, ranging from 1 to 4, depending on the number of vessels involved with a significant stenosis,⁶ stenosis score, which is related to the percentage reduction in the diameter of the vessel, lesion morphology like Type A (simple lesion) and Type B and C (complex lesion),⁷ culprit artery TIMI score, Collateral grading, extent of lesion and presence of intracoronary thrombus.

Continuous variables were summarized as groups or as mean \pm standard deviation (SD) and categorical data as frequencies and percentages. For continuous variable difference between three groups were analyzed by Analysis of Variance (ANOVA) test. The Chi-square test was applied to compare difference between discrete variables. The whole analysis was performed with the help of computer using SPSS (Statistical package for social science) program version 10. For multiple comparison a p value <0.05 was considered statistically significant.

Results

Among the 75 patients, the mean age of the study population in three groups were as follows, 55.5 ± 8.1 , 52.7 ± 7.4 and 54.3 ± 9.8 years, respectively.

Regarding risk factor of coronary artery disease, in Group A prevalence of smoking & dyslipidaemia were found to be significantly higher (88% & 80% res.) compared to the other groups ($p < 0.05$). Dyslipidaemia was more common in Group C. Other risk factors did not bear any significant association with the other groups ($p > 0.05$) (Table-I).

Table-I

Distribution of the subjects by risk factors (n = 75)

| Risk factors | Group A n = 25 No. (%) | Group B n = 25 no. (%) | Group C no. (%) n = 25 | p value |
|-------------------------|------------------------------|------------------------------|------------------------------|---------------------|
| Smoking (N=45) | 22(88) | 12(48) | 11(44) | 0.022* |
| HTN (N=31) | 7(28) | 15(60) | 9(36) | 0.654 ^{ns} |
| DM (N=27) | 13(52) | 10(40) | 4(16) | 0.741 ^{ns} |
| Dyslipidaemia (N=55) | 20(80) | 13(52) | 22 (88) | 0.048* |
| F/H (N=24) | 9(36) | 4(16) | 11(44) | 0.416 ^{ns} |

The ECG T wave changes in different groups were compared. Patients presented with rest angina showed

more T wave change in comparison to other groups. Comparison of ECG ST change among the groups was also performed. Group A with rest angina showed ST change in 68% patients, 32% revealed normal ECG. On the other hand Group B with new onset angina and Group C with accelerated angina showed T wave change in 28% and 36% cases respectively. From both the ECG findings it appears that patients presented with prolonged chest pain has got significant ECG change.

Echocardiographic findings in three groups were also compared. Regarding wall motion abnormality both Group A & C has shown predominant wall motion abnormally (40% and 36% respectively) but 60% and 64% cases respectively showed normal wall motion.

In this study angiographic lesion morphology and severity in relation to clinical pattern was observed. Angiographic coronary lesion morphology was assessed by vessel score, stenosis score, lesion morphology (ACC/AHA), TIMI flow grading, extent of disease, collateral grading, Modified Ambrose Classification (whether lesions were concentric/eccentric or mixed), presence or absence of intra coronary thrombus.

Morphology of lesion (according to ACC/AHA guidelines) was compared among the study groups and found predominance of type C morphology (complex lesion) in Group A presented with prolonged rest pain. Group A also showed type B lesion in 36% cases and type A (simple lesion) lesion in 12% cases. In Group B new onset angina type A lesion were common (40%), whereas type C lesion present is only 8% cases. On the other hand Group C also predominantly showed type A lesion in 36% cases, type B in 24% and type C also in 24% cases. So, this study indicates presence of complex lesions commonly associated with rest pain and new onset angina showed comparatively less complex lesions. The difference among the groups with respect to morphology of lesion was found to statistically significant. (Table-II).

Table-II

Distribution of the subjects by lesion morphology (n = 75)

| Lesion morphology | Group A n = 25 no. (%) | Group B n = 25 no. (%) | Group C n = 25 no. (%) | p value |
|-------------------|------------------------------|------------------------------|------------------------------|---------|
| Type A | 3(12) | 10(40) | 9(36) | 0.038* |
| Type B | 9(36) | 8(32) | 6(24) | |
| Type C | 10(40) | 2(8) | 6(24) | |
| Normal | 3 (12) | 5 (20) | 4(16) | |

When extent of disease among the study groups were considered it was found that triple vessel disease were more common in patients with rest angina i.e.

group A (40%), it was only 8% in group B and 24% in group C. Single vessel disease was more common in group B and C (56% and 40% respectively), on the other hand double vessel disease dominated in group A. Lesion character was also compared among the groups. Modified Ambrose classification was used to assess the angiographic profile of unstable angina patients where it was found simple lesion in 37 subjects (49%), in which concentric type was 29% and eccentric type was 29% and complex lesions (eccentric, irregular, ulcerated) in 26 subjects (34%) indicating the dominance of eccentric and complex lesions over simple lesion.(Table-III).

Table-III

Distribution of the subjects by extent of disease (n = 75)

| Extent of disease | Group A n = 25 no. (%) | Group B n = 25 no. (%) | Group C n = 25 no. (%) | p value |
|-------------------|------------------------------|------------------------------|------------------------------|--------------------|
| SVD | 5(20) | 14(56) | 10(40) | 0.61 ^{ns} |
| DVD | 7(28) | 5(20) | 5(20) | |
| TVD | 10(40) | 2(8) | 6(24) | |
| Normal | 3 (12) | 5 (20) | 4(16) | |

When comparison of characteristics of lesions were looked at among the study groups, predominance of concentric type of lesion in group B (44%) and combination of both types were common in group A and C (60% and 52% respectively) with dominance in cases with rest angina. The difference was statistically significant. (Table-IV)

Table-IV

Distribution of the subjects by lesion character (n = 75)

| Lesion character | Group A n = 25 no. (%) | Group B n = 25 no. (%) | Group C n = 25 no. (%) | p value |
|------------------|------------------------------|------------------------------|------------------------------|---------|
| Concentric | 3(12) | 11(44) | 5(20) | 0.045* |
| Eccentric | 4(16) | 0 | 3(12) | |
| Both | 15(60) | 9(36) | 13(52) | |
| Normal | 3 (12) | 5 (20) | 4 (16) | |

χ²test was performed for statistical analysis

Group A: Rest angina

Group B: New onset angina

Group C: Accelerated angina

* = Significant at less than 0.05

n = Total number of subjects

The vessel score and stenosis score were also compared between the three groups. The mean vessel score was increased with presence of prolonged rest pain. So it was 2.53 ±0.76 in group A, whereas in group B it was 1.56±0.92. Stenosis score also revealed the similar pattern; group A presented a high stenosis score than other groups. (Table-V).

Table-V

Distribution of the subjects by vessel score & stenosis score (n = 75)

| | Group A n = 25 | Group B n = 25 | Group C n = 25 | p value |
|----------------|-------------------|-------------------|-------------------|------------|
| Vessel score | 2.53 ± 0.76 | 1.56 ± 0.92 | 2.04 ± 0.71 | 0.0093** |
| Stenosis score | 29.2 ± 17.3 | 18.7 ± 12.1 | 22 ± 16.1 | |

ANOVA test was performed for statistical analysis

Group A: Rest angina

Group B: New onset angina

Group C: Accelerated angina

** = Significant at less than 0.01

n = Total number of subjects

Regarding TIMI flow grading in the culprit lesion, three major vessels were considered i.e. LAD, LCX, and RCA. TIMI flow in LAD of study population showed complete reperfusion TIMI flow grade III was mostly seen in group B (80%) whereas it is half cases in group A and 64% in group C. TIMI flow grade II (partial reperfusion) were common in group C (24%) followed by 12% in group A and 16% in group B. TIMI flow grade I (penetration with minimal perfusion) predominate in group A (28%). However the difference among the groups was found to be statistically not significant. TIMI flow in LCX among the study groups revealed complete reperfusion TIMI grade III was predominant in all study groups. In group A, B, C; it was 52%, 72%, and 76% respectively. Grade II TIMI was present in 20% cases in group A, 28% in group B and 16% in group C. Group A also showed 24% cases with TIMI grade I. TIMI flow in RCA also observed among the study groups. Grade III TIMI flow was predominated in all three groups i.e. 64%, 88%, 56% in group A, B, C, respectively. Grade II TIMI flow was seen in both group A and C (16% and 32% respectively). Group A presented 8% grade I TIMI flow. The difference was statistically significant. TIMI flow in the study population indicating the predominance of TIMI flow grade less than three in group A with rest angina than groups presented with new onset angina or accelerated angina.

Site of lesions was also considered in three major vessels. Site of lesion in LAD among the study groups showed that, in group A, proximal and mid lesions were common (24% and 28% respectively). In group B, there was no ostial lesion, mid lesion was present in 36% cases. Group C showed lesion commonly present in mid LAD (40%). When site of lesion in LCX among study groups was observed, it revealed that, in group A proximal lesion were common (40%). Group B showed no ostial lesion and 28% lesion in proximal LCX. Group C showed predominant proximal lesion (44%). Site of lesion in RCA among study groups were also noticed. Ostial lesions were common in group A and B (20% each), whereas proximal lesions were common in group C (44%). Group A showed proximal, mid and distal lesion in 24%, 16% and 12% cases respectively. Group B showed lesions commonly in mid RCA. (Figure 1,2)

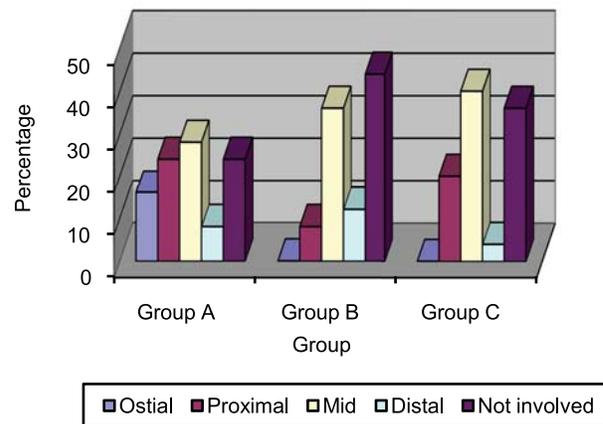


Fig.-1: Site of lesion in LAD (n =75)

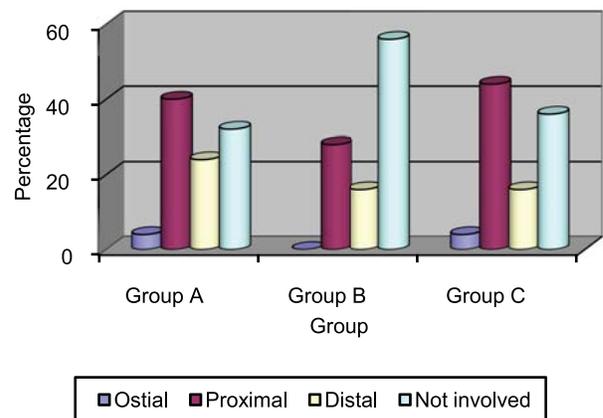


Fig.-2: Site of lesion in LCX (n = 75)

Length of lesions was also considered in similar way. Regarding length of lesion in LAD among the study groups, lesion less than 10 mm was predominant in group B (40%). Whereas it is 32% in group A and group C. Group A also showed 28% lesion between 10 to 20

mm. Lesions more than 20 mm long were present in 16 % cases in group A, 4% in group B and 8% in group C. Length of lesion in LCX among the study groups was seen. Less than 10 mm long lesions were common in all the three groups, i.e. 56%, 40%, and 40% in group A, B, C respectively. Lesion between 10 to 20 mm were only present in 12% cases in group B. Lesion more than 20 mm were present in 8% cases in group B and 12% in group C. In RCA group A most of the patients showed lesions less than 10 mm (36%). Group B and C also showed predominance of this type of lesion (60% and 32% respectively). Between 10 to 20 mm long lesions were mostly seen in group C (24%). Long lesions (>20 mm) were present in 20% cases in group A and 4% in group C.

Presence of intracoronary thrombus was looked for. In group A, highest no of cases i.e. 3 patients out of 25 (12%) were revealed intracoronary thrombus, whereas only 1 patient in group C and no patient in group B showed intracoronary thrombus

Discussion

The clinical syndrome of unstable angina encompasses a variety of clinical presentation of transient episode of myocardial ischaemia. As a clinical diagnosis unstable angina incorporates a diverse group of clinical presentations. There are three principal manifestations of unstable angina and this prospective study was carried out to evaluate and compare the coronary artery lesion morphology between the subjects with unstable angina presented with rest angina, new onset angina and accelerated angina.

The study population was total 75, were taken consecutively which were divided into three equal groups namely A, B & C according to their clinical presentation. All patients were interviewed clinically & underwent CAG.

In this study, the mean age of the study population was 55.5 ± 8.1 , 52.7 ± 7.4 and 54.3 ± 9.8 in Group A, Group B and Group C, respectively with a clear male predominance (92%). All the major risk factors were found to be associated in all groups but in Group A, smoking and dyslipidaemia was found to be significantly higher (88%) & 80% in comparison to other groups. Dyslipidaemia was also common in Group C. Other risk factors did not bear any significant association with other groups ($p > 0.05$).

ECG & echocardiographic changes were considered & revealed predominant ST segment and T wave change in group A (ST change total 68% and T wave change 44%) indicating a significant statistical difference with other groups.

Regarding echocardiographic findings –regional wall motion abnormality was mostly seen in group A (40%) & in group C (36%). Three fourth of the cases in group B showed normal wall motion. This difference was not statistically significant. When ejection fraction was measure, it was best preserved in group B (72%), while ejection fraction less than 50% was commonly seen in group A (44%). A study by De Servi et. al and Weber at. al. showed the similar result.^{8,9}

This study observed & correlated the angiographic severity with clinical pattern. When lesion morphology was observed, type B and C (complex) lesions were common in group A and C, whereas type A (simple) lesion was common on Group B (40%). Total 12 cases revealed normal coronary arteries. So this observation as signified the association of critical lesion with subjects presented with prolonged rest angina. This observation has got similarity with the study done by De Servi at.al., Ambros at.al and Dangus at.al.,^{8,10,11}. When extent of the disease was considered, it showed the triple vessel disease to be common in Group A with prolonged rest pain(40%). Double vessel disease was common in all groups and the difference was not significant.

Regarding lesion characteristics, concentric lesion was predominant on Group B (44%). Combination of both concentric and eccentric type was significantly higher in Group A and C (60% & 52%). Patients with prolonged rest angina also presented high vessel score & stenosis score.

When TIMI flow grading in culprit lesion was measured, three major vessels were considered namely LAD, LCX & RCA. Group A generally showed poor distal perfusion. The difference in LCX was only found statistically significant. Difference in other vessels was not significant. Dangus at.al and haque at.al also found the similar result .^{11, 12}

Assessment of collateral flow was also observed and Grade-III collateral was most commonly found in accelerated angina Group C (36%). Grade-II was predominant in Group A & B (12% in both group). Similar type of observation was found in the study done by Waqer at.al.¹³

Site & length of lesions were also considered in three major vessels. Patients with rest angina presented more ostial, proximal and mid lesions and the difference was statistically significant. Regarding length, Group A has shown lesions commonly more than 10mm long whereas lesion less than 10mm was found more commonly in Group B.

The presence of intracoronary thrombus was also noticed. Group A shows that 3 out of 25 patients

(12%) have got intracoronary thrombus. Group B showed no patient and Group C showed 1 patient (4%) with intracoronary thrombus indicating the association of presence of intracoronary thrombus in cases with rest angina, although the difference among the groups was not statistically significant and not consistent with the study done by Dangus et al and Freeman et al,^{11, 14}. It was found that patients with rest pain with angiogram done within 48 hours has got high incidence of thrombus. In our study cases with rest angina underwent angiogram within 2 to 7 days after getting optimum treatment, so incidence of intracoronary thrombus was marked reduced.

This study shows that coronary angiographic morphology was not the same in the unstable angina patients who presented with different clinical scenario. So complexity of angiographic lesion morphology can be predicted from clinical presentation, observation of risk factors and assessment of ECG findings. From the whole observation it was found that the results of this study support the hypothesis.

Conclusion

Clinical presentation of unstable angina can act as a powerful independent predictor of complex and thrombotic coronary artery lesion morphology. Therefore, the clinical evaluation helps to predict the angiographic severity, extent and pattern of disease. So, from the prediction, patients presenting with clinical features indicating higher risk association derive increased benefit from early plan for revascularization or from use of newer antithrombotic or antiplatelet agents, such as the direct antithrombotics or the IIb/IIIa Inhibitors.

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