THE ROLE OF CORONARY ANGIOGRAPHY IN ASSESING THE CLINICAL SEVERITY OF CORONARY ARTERY DISEASE

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Abstract

Introduction: We can presume that risk factors are predictive of the degree of anatomical impairment on coronary angiography in coronary artery disease. In the present study, an attempt has been made to address whether the coronary angiography alone is potentially be able in assessing the clinical severity of patients with ACS or can we include the risk factors also in this issue.

Methods: 100 Patients with established CAD were divided into 4 groups based on the angiography &clinical severity. Body mass index (B.M.I.), Waist circumference& Waist – hip ratio was calculated. Data collected was then analyzed in relation to the angiographic severity and the clinical presentation using Pearson's chi square test and Analysis of Variance, using SPSS (*Statistical Package for the Social Sciences*). P value of less than 0.05 was considered as statistically significant.

Result: When clinical presentations of coronary artery diseases were compared with angiographic severity clinical presentations did not vary significantly with angiographic severity. But majority of the patients i.e. 80 % had more than 2 risk factors even though the clinical presentations did not vary significantly with the number of risk factors

Conclusion: Angiographic severity could not predict the clinical manifestation with much precision. So clinicians should aggressively manage the clinical manifestations of CAD and also should work on the control of possible risk factors.

Keywords: CAD; angiogram; BMI; W/H ratio; urine albumin

1. Introduction:

The importance of coronary artery disease in contemporary society is attested by the almost epidemic number of persons afflicted. Coronary artery disease is the single most common cause of death in men and women[1] and the economic burden of CAD on any country is tremendous. It is expected that the rate of CAD will only accelerate in the next decade. The WHO estimates that by the year 2020 the global number of deaths from CAD will rise from 7.1 million in 2002 to 11.1million[1].

Chronic coronary artery disease is most commonly due to obstruction of the coronary arteries by atheromatous plaque[2]. Atherosclerosis also plays heterogeneity in time, being a disease with both chronic and acute manifestations. Some of the conventional risk factors for atherothrombotic disease are – smoking, hypertension, diabetes, dyslipidemia, and obesity[3]. Some of the emerging risk factors include – microalbuminuria[4].

The clinical manifestations of atherosclerotic disease of the coronary vessels range from acute presentations like myocardial infarction and unstable angina to the more chronic symptoms of exertional angina seen in chronic stable angina. Not all coronary events occur in individuals with multiple traditional risk factors, and in some individuals' isolated abnormalities of inflammation, haemostasis and thrombosis appear to play critical roles. Although clinical manifestations of acute coronary syndrome do not depend exclusively on the extent of CAD[5], the obstructive impairment and number of vessels affected can interfere with the therapeutic strategy. Therefore, we can presume that if risk factors are predictive of the degree of anatomical impairment on coronary angiography, it will potentially be able to influence the decision of a strategy on invasive investigation in patients with ACS.

Selective coronary angiography remains the clinical gold standard[6] for evaluating the

coronary anatomy. By performing a series of intra-coronary injections of contrast agents in carefully chosen angulated views using current high resolution X –Ray imaging, it is possible to define all portions of the coronary arterial circulation down to vessels as small as 0.3 mm, free of any artifact. Both animal data and human data show that, a stenosis that reduces the lumen diameter by 50 %, hence reducing the cross-sectional area by 75 %, is hemodynamically significant[7].

We can presume that risk factors are predictive of the degree of anatomical impairment on coronary angiography. Not many studies have addressed the entire risk factor profile in relation to their angiographic severity. In the present study, an attempt has been made to address whether the coronary angiography alone is potentially be able in assessing the clinical severity of patients with ACS or can we include the risk factors also in this issue.

2. Materials and methods:
This was a prospective study conducted in a medical college hospital as a dissertation work. It was an interventional study &institution was not particular about the ethical clearance at that time. So this study was done in accordance with the ethical standard laid down in the declaration of Helsinki.The study protocol was fully explained to patients and written informed consent was obtained. 100 patients out of which 82 were males&18 were females were enrolled for our study. Their prior informed consent was taken for the study.

Inclusion criteria: Patients with established coronary artery disease, as diagnosed by coronary angiogram.
Exclusion criteria: Patients with normal coronaries, patients having – 1.Urinary tract infection 2.Fever 3.Ketonuria& Pregnant patients.
2.1 Study protocol: Patients were then divided into 4 groups[8] based on the number of coronary vessels with significant stenosis i.e. more than 50 % block[7]:1.minor coronary artery disease: No vessel had significant stenosis.2.single vessel disease: Only 1 vessel with more than 50 % stenosis.3.double vessel disease: 2 vessels with more than 50 % stenosis.3.triple vessel disease: All 3 vessels with more than 50 % stenosis. Clinical presentation: On the basis of the patient's history of chest pain, they were first divided into typical chest pain (Angina) or atypical chest pain. Typical chest pain was taken as – a heavy pressure or squeezing

sensation with radiation to shoulder, neck or arm and builds over a period of few minutes. All other chest complaints were taken as Atypical Chest Pain (Non angina) non symptomatic cardiac patients (NSCP). In the patients who described typical chest pain it was noted whether the onset of chest discomfort was at rest or during exertion. If it was during exertion, the presentation was taken as Chronic Stable Angina (CSA). Alternatively, if the presentation was at rest it was taken as acute coronary syndrome. The patients of acute coronary syndrome, on the basis of ECG and serum cardiac markers (Qualitative estimation), were then divided into ST Segment Elevation Myocardial Infarction (STEMI), Non ST Segment Elevation Myocardial Infarction (NSTEMI), and Unstable Angina (UA).

Patients were then interviewed and specifically enquired about the past history of diabetes, hypertension and cigarette or beedi smoking. Body mass index (B.M.I.): Patient's weight was recorded, in kilograms, to the nearest whole number. Their height was recorded, in meters. B.M.I. was then calculated as Weight (in kgs)/ Height ^{2} (in mt). Patients having B.M.I>25 are under high risk group of CAD. Waist circumference: In the mid – axillary line, patient's iliac crest and the lowest margin of the costal cartilage was noted. Then the mid point between these two points was marked on the either side, and at this level waist circumference was measured at the end of expiration using a non stretchable measuring tape. On the basis of waist circumference, patients were graded as normal or having central obesity, as per International Guidelines[9], for males: ≥ 90 cm as having central obesity.

Females: ≥ 80 cm as having central obesity were considered in high risk group for CAD.
Waist – hip ratio: Waist circumference was calculated as described. Hip circumference was calculated at the level of greater trochanter of the femur and the most prominent part of the gluteal region using a non stretchable measuring tape. Waist – hip ratio was then calculated by waist circumference / hip circumference. On the basis of waist – hip ratio, patients were divided as normal or altered as follows[10] -
Males: > 0.90 as altered Females: > 0.85 as altered.
Urine albumin estimation: Urine spot sample was sent to ISI accredited laboratory where quantitative estimation of urine albumin was

done by an autoanalyser. On the basis of urine albumin excretion, patients >20 mg/L are under high risk group.

Patients were considered diabetics – if they were already diagnosed as having diabetes and were on anti diabetic medication or if FBS was more than 126 mg/dL after 8 hours of fasting.[11]

An HbA1c level of more than 7 % were considered unsatisfactory glycaemic control[12]. For patients with CAD, a LDL Cholesterol level of over 100 mg/dL was considered high, as per guidelines.[13]

2.2 Statistical analysis: Data collected was then analyzed in relation to the angiographic severity and the clinical presentation using Pearson's chi square test and Analysis of Variance, using SPSS (*Statistical Package for the Social Sciences)*. P value of less than 0.05 was considered as statistically significant.

3. Results:

Table 1.Age group distribution of coronary artery disease patients

Age group(years)	No of patients
31-40	5
41-50	12
51-60	41
61-70	29
>70	13

Total number of cases studied=100

Table II.Clinical severity with angiographic severity

Clinical presentation	No of patients in each angiographic severity			
	Minor [NS]	Single [NS]	Double [NS]	Triple [NS]
CSA(n=10)	2	1	1	6
UA(n=31)	4	12	4	11
NSTEMI(n=21)	3	6	8	4
STEMI(n=30)	1	18	6	5
NSCP(n=8)	1	2	2	3

Sample size in parenthesis; NS= Nonsignificant when coronary artery diseases clinical presentation compared among coronary angiographic severity

Table III. Percentage distribution of patients having different risk factors:

Risk factors	No of patients (%)
BMI	41
WC	
males>9ocm	62
females>80	72
W/H	
Males	94
females	100
LDL>100mg%	42
DM	87
HTN	95
Smoking	20
Urine alb	43

Total number of cases studied are=100

Table IV. Risk factors comparison with angiographic severity:

No of risk factors	No of patients in each angiographic severity			
	Minor [NS]	Single [NS]	Double [NS]	Triple [NS]
Nil (n=0)	0	0	0	0
Up to2(n=20)	2	9	5	4
Up to 3(n=80)	10	30	15	25

Sample size in parenthesis; NS= Nonsignificant when coronary artery angiographic severity compared with number of risk factors

Age group distribution of patients is shown in table1.Most of the patients in our study group were between 50 – 70 years of age with the mean age of the patients being 59 years as shown in Table1.

Clinical presentation, number of patients and their angiographic findings are shown in table11. Unstable Angina (31%) was the most common presentation, closely followed by STEMI (30%).The remaining were NSTEMI, CSA and NSCP.When clinical presentations of coronary artery diseases were compared with angiographic severity (table11) clinical presentations did not vary significantly with angiographic severity. It was noted that majority of the patients presenting as STEM1 had single vessel disease in angiography, though this association did not reach a point of statistical significance (p=012).

Among the study group the different risk factors were noted as shown in table-111. The number of patients having each risk factor is also shown. According to this obesity is the highest common risk factor. Coronary angiographic severity did not vary significantly with total number of risk factors. The incidence of triple vessel disease was more with multiple risk factors, but this observation did not reach a point of statistical significance (p = 0.38).Majority of the patients i.e. 80 %, in study group had more than 2 risk factors and none of them were excluded from the risk factor (table 1V).

4. Discussion:
Coronary artery disease has become a modern epidemic and the incidence is still on a rise. In the present study, Our effort is whether the coronary angiography alone is potentially be able in assessing the clinical severity of patients with ACS or can we include the risk factors also in this issue. The prevalence of risk factors is important to know because primary prevention, early detection, and timely intervention can influence disease outcome.

Age has a dominant influence. In the studies done earlier it was shown that the incidence of coronary artery disease rises consistently with rising age and at an age of 60 years, patients have five fold increase risk of disease manifestation than at the age of 40 years[14]. In our present study, we found that majority of the patients were between 50 – 70 years age group, (table1)which appears to be in accord with the earlier studies. Male gender is a recognized risk factor[14]. The disease is not common in premenstrual females. Between ages of 35 – 55 years, the mortality rates of ischemic heart disease for white women was one – fifth that of white men[14]. After menopause, however, the risk becomes almost equal. In our present study we found that there was male preponderance with a male to female ratio of 4.55:1 and only 1 female out of 18 females was below 50 years of age. These findings appear to be in accord with the previous studies, but a little more male preponderance was observed than expected.

The high percentage of patients with ACS was observed since the hospital, from where the patients were recruited, is a tertiary care centre and hence patients requiring expert management only were referred leading to selection bias. This observation can hence not be extrapolated to community. Another plausible explanation is financial constraints of our population, and hence patients with minor symptoms do not volunteer for expensive investigatory procedures like coronary angiogram. But it was still noteworthy that 8 % of the patients with established CAD actually presented with atypical chest pain. This observation suggests that a clinician should be aware of varied presentations of CAD and the disease should be suspected, especially in patients with multiple risk factors.

Single vessel disease was the most frequently encountered angiographic finding in our study, occurring in 38 % of the patients (TABLE 11).Even though there was no significant difference was observed When angiographic severity was compared with the clinical presentation it was noted that majority of the patients presenting as STEMI had Single vessel

disease on angiogram (18 %). This observation can have an important clinical implication in the form that, patients coming with STEMI may be taken for early invasive reperfusion therapy and stent implantation as that happens to be the therapy of choice in single vessel disease. It was also observed that most of the patients presenting as chronic stable angina had triple vessel disease in angiography (table 11). This observation also has got a valid clinical implication in the form that, even patients with stable angina can undergo elective angiography, since the treatment of choice, at present, for triple vessel disease happens to be Coronary artery bypass grafting.

The prevalence of BMI in a study carried out in Germany was more (45.7%) comparing to our study as shown in table 111.[15] It was also shown that BMI is sufficient to assess cardio vascular risk in patients.[15] But our study population is small comparatively .This should be included a large group of population. In our study 43% of the patients are having urinary albumin excretion. Previous studies have shown that urinary albumin excretion reflects the presence of CVD among patients.[4]Elevated level of LDL signifies the severity of acute coronary syndromes.[5]High levels of serum LDL are seen in our study also. Increased exposure to cigarette smoke was significantly related to carotid artery thickening.[16] In our study, majority of the patients are hypertensives, diabetics& a few of them are smokers. Among men& women aged 45 to 57 years hypertension was associated with a greater risk of cardiovascular diseases.[17]Many of the studies have tried to define the economic burden of diabetes-related CVD & tried to understand risk factors for CVD in those with diabetes.[18]

In the present study, when we analyzed all the risk factors put together, it was observed that a majority of the patients i.e. 80 %, in study group had more than 2 risk factors. Nobody was exempted from the risk factor (table1V).Angiographic severity could not predict the clinical manifestation with much precision. In the present study, we found out that clinicians should give more importance for risk factors in a given coronary disease patient than the invasive coronary angiographic procedure. Clinicians should aggressively manage the clinical manifestations of CAD and also should work on the control of possible risk factors.

Conclusion:
In the present study, we found out that clinicians should give more importance for risk factors in a given coronary disease patient than the invasive coronary angiographic procedure. Clinicians should aggressively manage the clinical manifestations of CAD and also should work on the control of possible risk factors.

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