

STUDY OF RELATIONSHIP BETWEEN CAROTID INTIMA-MEDIA THICKNESS AND SYNTAX SCORE IN PATIENTS WITH ACUTE CORONARY SYNDROME WITH EMPHASIS ON SHORT TERM OUTCOMES

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Abstract

Background: The study was conducted to evaluate, the complexity of coronary artery disease in patients with ACS undergoing coronary angiogram by assessing SYNTAX score, the carotid intima-media thickness of patients who underwent coronary angiogram, the relationship between carotid intima-media thickness and SYNTAX score in patients with coronary artery disease along with the in hospital mortality rates in patients with high vs low syntax score. **Materials and Methods:** This was a hospital based study conducted among 80 patients of acute coronary syndrome who underwent coronary angiogram in the Department of Cardiology at Government General Hospital, Guntur, after obtaining clearance from institutional ethics committee and written informed consent from the study participants. **Results:** In distribution of patients according to syntax score, the difference between both means of these groups was found to be statistically significant. The correlation between syntax score and CIMT showed a positive correlation, hence this was found to be statistically significant. **Conclusion:** Low CIMT helps us to negatively predict the presence of complex coronary artery disease. Association with smoking and diabetes is significantly high. In hospital mortality rates are significantly high in intermediate and high syntax score group compared to low syntax score group.

INTRODUCTION

Globally before 1900, death due to cardiovascular disease accounted only less than 10% of all deaths. This period is called as age of pestilence and famine. Instead malnutrition and infections were the most common causes of death. Predominant types of cardiovascular diseases in that period were RHD, cardiomyopathies caused by infection and malnutrition.

Age of the receding Pandemics.^[1]

During the early 20th Century improvements in agricultural production, food supply and industrial revolution led to reduced mortality due to malnutrition. Moreover, improved public health measures reduced infections life expectancy improved. Typical proposition of death due to cardiovascular causes were between 10-35%. Cardiovascular diseases predominant were RHD, Hypertension, CHD, and Stroke.

Degenerative and man-made diseases

During the next phase which occurred in different periods in different parts of the world there is

continuous improvements in economic situation which led to rapid urbanisation and radical changes in the nature of the work related activities. Both of these combined together lead to dramatic changes in the life style of the people in terms of diet, activity levels and behaviors such as smoking. The increased caloric intake combined with reduced caloric expenditure caused by mechanization resulted in high body mass index with in turn led to increased blood pressure, increased level of lipids, increased blood glucose and insulin resistance. This sets the stage for atherosclerotic diseases. Mortality due to cardiovascular causes was 35-65%, mostly due to coronary artery disease and stroke.

Delayed degenerative Phase.^[2]

In the industrialized nations major technological advances such as coronary care units/ Thrombolytic therapy / Bypass surgery/ Percutaneous coronary interventions are available to manage acute manifestations of Cardiovascular diseases and preventive strategies like smoking cessation programs blood pressure management and cholesterol management are widely implemented

age adjusted CV diseases mortality declined. Proportion of deaths caused by cardiovascular diseases is about 40-50% mainly due to CHD, Stroke and Congestive heart failure. The fifth phase is the age of inactivity and obesity even though there is measurable improvements in risk behaviors, especially smoking physical activity continues to decline while caloric intake is increasing dramatically resulting in overweight and obesity. Type II DM and hypertension are on raise especially in children.

In India in 1960 CHD represented only 4% of CVD deaths where as in 1990, the proportion was greater than 50%.^[3] Indians have exaggerated insulin insensitivity towards western life style which differently increased CHD and Stroke. Thus environmental factors have now become globalized. We are well aware that atherosclerosis is the major causes of CVD discussed above. Our understanding about atherosclerosis has improved. Atherosclerosis can affect large and medium arteries. Postmortem and IVUS Studies have revealed wide spread intimal thickening in patients with atherosclerosis. At the same time atherosclerosis is a focal disease affecting certain areas of the vessels more; for example, the branching point of arterial tree. Atherosclerosis is a chronic disease with prolonged incubation period. It begins in the early childhood and progresses gradually over decades. Increasing population awareness about factors causing atherosclerotic progression and CVD and measures to prevent development of these risk factors and their progression to manifest disease is an important step in reducing the burden of CVD. Even though this is an important step at the mass level due to general apathy of the public towards such measures it fails to produce desired effects. It will be more effective and desirable if we adopt an alternative approach of identifying individuals having high risk. Identification of high risk individuals has been traditionally achieved using one of the many global risk assessment algorithms available such as Framingham risk score – FRS.^[4]

Heart systematic coronary risk evaluation project or Heart score. prospective cardiovascular Munster (PROCAM) study.

New Zealand guidelines WHO risk score etc.

Although the value of these algorithms has been established in number of clinical trials there is still a significant variation at every level of risk factor exposure which limits our ability to predict risk at individual level. Many of the algorithms predict only 10-year risk (New Zealand guidelines predicts 5 years' risk) which is relatively meaningless in young individuals, obese persons, patients with metabolic syndrome etc. Patients with extremely high levels of dyslipidemia, such as genetic dyslipidemia may not be adequately classified. In Heart score – Diabetes was not included because it was not reliably measured in cohorts used to develop scores. In view of the above imperfect relationship between CV risk factors and actual

development of disease there has been increasing emphasis of developing tools that can directly detect vascular disease itself at a subclinical stage rather than relying on indirect risk prediction through these risk factors. The prolonged preclinical phase of atherosclerosis helps us to detect it at a stage where it can be potentially reversed with interventions, even if it cannot be reverted its progression can be at least be halted and its transformation in to clinical CV event such as i). Progression to flow limiting lesion causing ischemia. ii). Plaque fissure, rupture/erosion – thrombus formation can be prevented. A number of noninvasive tools have been detected over the past 3 decades to identify the preclinical atherosclerosis. These include carotid – intima media thickness,^[5,6] brachial artery flow mediated dilation, coronary artery calcium score, pulse wave velocity of aorta etc. of these CIMT is easily done, reproducible most extensively evaluated in clinical trials and therefore currently recommended for use in clinical practice. The study of relationship between carotid intima-media thickness and syntax score in patients with coronary artery disease is nothing but a correlative study to show that those with extensive coronary artery disease as assessed by SYNTAX score have high prevalence of carotid intima – media thickness and plaque score. In one pilot study, carotid intima – media thickness <0.55 mm was an excellent predictor of absence of coronary artery disease and obviated the need for invasive coronary angiography before heart valve surgery.^[7]

Aims and Objectives

- To study the complexity of coronary artery disease in patients with ACS undergoing coronary angiogram by assessing SYNTAX score.
- To study the carotid intima- media thickness of patients who underwent coronary angiogram.
- To study the relationship between carotid intima – media thickness and SYNTAX score in patients with coronary artery disease.
- To study the in hospital mortality rates in patients with high vs low syntax score.

MATERIALS AND METHODS

This was a hospital based study conducted among 80 patients of acute coronary syndrome who underwent coronary angiogram in the Department of Cardiology at Government General Hospital, Guntur, after obtaining clearance from institutional ethics committee and written informed consent from the study participants

Inclusion Criteria

- Institutional ethics committee approval was obtained to conduct this study.
- The patients who provided written informed consent in the language known to them before participating in the study.

Exclusion Criteria

- Patients not willing for coronary angiography.
- Patients who were allergic to contrast agents.
- Those who are having underlying chronic kidney disease.

Statistical Methods

The collected data was entered in Microsoft excel spread sheet and analyzed using Statistical Package

for Social Sciences software (SPSS version 17.0). Categorical data are presented as absolute values and percentages, whereas continuous data are summarized as mean value \pm standard deviation. Independent sample 't' test and Chi - square tests were used for comparison of categorical variables as appropriate. Significance was considered if the 'p' value was below 0.05.

RESULTS

Table 1: Sex distribution

S. No.	Age Group	Number of Patients	Percentage
1	21 – 30	6	7.5 %
2	31 – 40	8	10 %
3	41 – 50	20	25 %
4	51 – 60	28	35 %
5	61 – 70	14	17.5 %
6	71 – 80	0	0 %
7	>80	4	5 %
Age distribution			
S. No.	Sex	Number of Patients	Percentage
1	Male	64	80 %
2	Female	16	20 %
Total		80	100 %

6 patients were below the age of 30 years. The most common age group in our study was 51 – 60 years. 4 patients were aged above 80 years. Out of 80 patients 16 patients were females constituting 20 % of the study population.

Table 2: Risk Factors

S. No.	Risk Factors	Number of Patients	Percentage
1	Smokers	56	70 %
2	Hypertension	40	50 %
3	Diabetes	48	60 %
3	Dyslipidemia	8	10 %
4	Post-Menopausal	8	10 %
5	Family H/o of CAD	16	20 %
6	Alcoholism	52	65 %

Alcoholism was prevalent among male population. Of the total 64 males, 52 patients were alcoholic. They constitute about 81.2 % of the male study population.

Table 3: CIMT variations with Syntax score

S. No.	Syntax Score	Number of Patients	Percentage
1	< 22	60	75 %
2	23 – 32	8	10 %
3	\geq 33	12	15 %
Distribution of patients according to syntax score			
S. No	Syntax Score	CIMT	
1	Low	Mean \pm SD	
2	Intermediate & High	1.07 \pm 0.07	
p Value		< 0.0001	

Patients with syntax score < 22 formed the major chunk in the study population. Patients having low syntax score form about 75 % of the population. High syntax score patients are those who are having syntax score more than 33. High syntax score was present in 12 patients in our study population constituting about 15 % of the study population. Intermediate syntax score was seen in 8 patients forming 10 % of the study population. Regarding carotid intima media thickness, the mean intima media thickness in patients with low syntax score was 0.69 mm and in patients of intermediate and high syntax score was 1.07 mm. The difference between both means among the groups was statistically significant. ($p < 0.001$).

Table 4: In hospital mortality variation with Syntax score

Syntax score		In hospital mortality				
High(>32)		4				
Intermediate(22-32)		5				
Low (<22)		0				
In hospital mortality rates in relation to syntax score						
		mortality				P- Value
		No		Yes		
		Count	Column N %	Count	Column N %	
Syntax grade	low	48	67.6%	0	0.0%	
	Intermediate	15	21.1%	5	55.6%	0.005
	High	8	11.3%	4	44.4%	0.002

There is positive correlation between syntax score and carotid intima-media thickness which is statistically significant. (Spearman Coefficient 0.760 with p value < 0.0001)

Out of 80 patients no in hospital deaths reported in low syntax score group and in-hospital mortality in intermediate and high syntax score group were 5 and 4 respectively.

In-hospital mortality rates in ACS patients with intermediate and high syntax score group was statistically more significant than that of low syntax score group.

DISCUSSION

Among 64 males, 56 patients were smokers. Smoking is a major avoidable risk factor for the prevention of coronary artery disease. The prevalence of smoking is dangerously high in Indian men. Recent surveys indicate a prevalence rate of about 30% for smoking among men in India. Smoking ranks third in the health loss for India.

In our study about 20 patients belong to age group of 40 – 50 years and 28 patients belong to age group of 51 – 60 years together constituting 60% of the study population. This shows the increasing incidence of cardiovascular disease in this age group. Dramatic changes in life style such as diet, activity levels and smoking is responsible for this change. The above example shows that the study population is in the age of degenerative and manmade disease phase.

In our group 40 patients had hypertension. Accelerated hypertension was present in one individual. According to World Health Organization Health Statistics.^[8] 2012, the prevalence of hypertension in India was 23.1 % in males and 22.6 % in females. But in our study, the incidence of hypertension is 50 %. This may be probably due to the high risk population we have selected. Moreover it included patients with high burden of atherosclerosis which indicates that the patients have involvement of the peripheral arteries which might lead to increase in systemic vascular resistance which could lead on to hypertension.

The high blood pressure is a high risk factor for stroke and coronary artery disease. The mortality due to stroke increases by about 51% and mortality due to coronary artery disease increases by 45 %. High prevalence of hypertension in low and middle income class are due to increased smoking, high alcohol consumption and stress.

The high prevalence of hypertension in affluent population is due to physical inactivity and dietary changes. In our study population, there is high incidence of smoking and excessive consumption of

alcohol, which might be the reason for the high incidence of systemic hypertension in our study population. Even though alcohol is beneficial in low doses, it has a narrow therapeutic to toxic range.

There are 48 patients in our study with diabetes mellitus which constituted about 60 %. According to International Diabetic Foundation, India is having more diabetic patients than any other country. India has 7.1 % adult population with diabetes mellitus. The high incidence is attributed to a combination of genetic susceptibility and adoption of high calorie, low activity life style by India's growing middle class.

Patients with past history of coronary artery disease, family history of coronary disease and dyslipidemia did not form a significant part of our study.

In our study population 55 patients had baseline STEMI and out of remaining 25 patients, 15 patients had positive troponin levels, 10 patients had negative troponin levels with typical angina of crescendo nature. In our study population 76 patients had right dominance in coronary artery system which constituted 95 %. In the general population, the incidence of right dominance was 85 %. Right dominance in coronary circulation carries a less significance weightage in the syntax scoring system and our population had 10 % excess of right dominant population. Small study sample may be the reason for this observation.

The incidence of total occlusion in our study population is 30 %. The presence of total occlusion increases the complexity of coronary artery disease and thereby increases the syntax score significantly. Total occlusion carries a weightage of X 5 points.

Bifurcation lesions was present in about 14 patients who also increase the complexity of CAD and influence syntax score considerably.

In our study population those with syntax score less than 22 constitute the major chunk. In a study done by Nobutaka et al., low syntax scores was present in 80% of their population. (Syntax score < 22).

In the intermediate syntax score group consisted of 7.5 % of patients (syntax score between 22 and 32),

the high syntax score group consisted of 7.5 % of patients (syntax score > 33). In our study 75 % of patients had low syntax scores, 10 % had intermediate syntax score and 15 % had high syntax score.

Those with low syntax score, the mean carotid intima media thickness was 0.69 mm. In this aspect results of our study resembles the study done in various others parts of world and those with intermediate and high syntax score had mean carotid intima media thickness about 1.07 mm which is also consistent with many other studies.

Thus carotid ultra-sonogram parameters have a significant predictive value for the syntax score. More over the mean intima media thickness and plaque score have excellent negative predictive value for the presence of complex coronary artery disease.

Thus the usage of CIMT and plaque score which can be done easily, with best reproducibility will help us to negatively predict the presence of complex coronary artery disease estimated by the high value of syntax score.

In-hospital mortality rate in our study population is 10% (4 in high SYNTAX score group and 5 in intermediate SYNTAX group) which is significantly high in intermediate and high syntax score group compared to low syntax score group this is in accordance with the several studies showing a positive correlation between syntax score and mortality.

In a study conducted by chia-hung Yang et al. 153 patients of acute STEMI who underwent primary PCI were followed up for over a period of 42 months. Survival rate was 93% in low risk group and 78% in intermediate and high risk group.^[9]

In a study by Choudary Sarita et al. syntax score was determined in 90 consecutive patients of STEMI undergoing primary PCI all-cause mortality at 30 days was significantly more in high syntax score group compared to intermediate and low syntax score group.^[10]

CONCLUSION

- There is a significant correlation between carotid intima media thickness with that of intermediate and high syntax score.
- Those with low CIMT helps us to negatively predict the presence of complex coronary artery disease.
- Smoking and diabetes was significantly high in our study population.
- In-hospital mortality rates are significantly high in intermediate and high syntax score group compared to low syntax score group.

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