Original Article

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Evaluation of Coronary Artery Status by Coronary Angiography after First Survival of Acute Myocardial Infarction

Internal Medicine Section

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ABSTRACT

Introduction: Acute Myocardial Infarction (AMI) is a life threatening medical emergency which needs urgent medical attention. It is one of the major cause of mortality and morbidity throughout the world.

Aim: The aim of the present study was to assess the coronary artery status by Coronary Angiography (CAG) after first survival of the Acute Myocardial Infarction (AMI) and to correlate the CAG findings with Coronary Artery Disease (CAD) Risk Factor (RF) and effect of early thrombolysis.

Materials and Methods: CAG was done on 870 patients consecutively from June 2013 to May 2015. Age, Gender, Body Mass Index (BMI), CAD risk factors (RF) such as Type 2 diabetes mellitus (T2 DM), hypertension, dyslipidaemia, smoking status and history of thrombolyctic status were recorded. The correlation between the CAD risk factors (RF) and the CAG findings were statistically analyzed.

Results: Coronary heart disease risk factors analysis revealed ≥ three RF in 23.88%, two RF in 29.88% and one RFin 45.86% of patients. CAG showed Single Vessel Disease (SVD) in 236 (27.1%) patients, double vessel disease (DVD) in 220 (25.2%) patients, Triple Vessel Disease (TVD) in 252 (28.9%) patients. Multiple coronary artery involvement were found in the high risk group patients, which was found statistically significant (p-value<0.0001). A total of 348/870 (40%) patients were thrombolysed amongst them 80 (22.9%) revealed minimal and/or normal coronary artery which was found statistically significant (p-value<0.0001).

Conclusion: Higher the coronary risk factors, more the chance of the multiple coronary arteries involvement. All AMI patients should be thrombolysed as early as possible to get the benefit of recanalization of the culprit vessel.

Keywords: Coronary artery disease, Risk factor, Thrombolysis

INTRODUCTION

Acute myocardial infarction (AMI) is one of the leading causes of death and disease burden throughout the world. Communicable diseases have been concurred by various preventive measure such as public health care, immunization and invention of various antibiotics but metabolic diseases specially Cardiovascular Disease (CVD) is the major concern which is yet to be concurred adequately and uniformly worldwide. Current global death toll due to CVD is 17.3million per year [1,2]. It is apprehended that death toll will be mounted to 33.6 million by 2030 of which 20% deaths will be shared by high income group of countries, 8% by upper middle income group of countries, 37% by lower middle income countries and 35% by low income group of countries including India. In India CVD is in the form of epidemic [1-4]. There are 30 million CVD patients in India in the term of absolute number. AMI death toll is 31.7% of all death and enhancement of death rate from 2% in the year 1970 to 4.5% in the year 2000. CVD is a major health and economical burden in a developing country like India. According to the recent epidemiological studies, it is apprehended that Indian subcontinent will have to bear more than half of the burden of risk and eventuality of CVD in the coming days [5-9].

MATERIALS AND METHODS

We have consecutively performed CAG on 870 amongst first AMI survival conservatively managed patients after proper stabilization from 1st June 2013 to 30th May 2015 at Sri Aurobindo Medical College and PG Institute (Super specialty tertiary care hospital), Indore (M.P.). Formal consent of the patients and ethical committee approval were taken. Our inclusion criteria were: Non thrombolysed/failed thrombolysed (<50% ST segment reduction), history of post MI angina/recurrent angina, heart failure, haemodynamic instability and LVEF <40% patients were taken directly for CAG. In asymptomatic patients after AMI with LVEF >40%, Treadmill Test (TMT) was done by modified bruce protocol with target work load 5 Metabolic Equivalent (MET) /symptoms of angina/electrocardiography (ECG) changes during exercise and inadequate BP response were noted. If TMT was found positive then they were taken for CAG. Age, gender, BMI, CAD conventional risk factors such as hypertension, Type 2 diabetes mellitus (T2DM), lipid profile, smoking habit were noted and retrospectively analysed. Clinical status and history of thrombolysis were noted. Dyslipidaemia was defined according to the report of National Cholesterol Education Program (NCEP) Adult treatment panels II & III. Obesity was defined if Body Mass Index (BMI) ≥25 kg/m^2. Patients who smoke one pack year were classified as current smokers whereas who have left smoking for five years were classified as past smokers. Patients who never smoked in their life time were classified as nonsmoker.

Significant CAD was noted when ≥50 reduction of the diameter of epicardial coronary artery was revealed. Patients visited within 24 hours of AMI were thrombolysed by 1.5 million IU of Streptokinase in 100 ml of 0.9M NaCl in a peripheral intravenous line by constant infusion pump over 45 min.

STATISTICAL ANALYSIS

Statistical analysis was descriptive pointing to conventional risk factors and CAG findings. One-way ANOVA test was applied to see the significant difference in mean of quantitative data in between groups. Chi-square test was used to see the difference in frequency of discrete data in between groups. A p-value of less than 0.05 was considered significant.

RESULTS

Findings of Evaluation of Risk Factors

Their mean age was 54.96 yrs and mean BMI was 25.93 kg/m^2. 246/870(28.27%) patients were diabetic, 274/870(31.49%) were hypertensive, 327/870 (37.58%) were dyslipidaemic, 391/870 (44.94%) were current smoker whereas 315/870 (36.20%) subjects

have left smoking 5 years back and 164/870 (18.85%) patients were nonsmoker [Table/Fig-1].

Total number of patients	870
Male /Female	765 (76.4%)/105(23.6%)
Mean age	54.96 Yrs (56% ≥ 60 yrs)
DM	246(28.27%)
HTN	274(31.49%)
Dys. Lipid	327(37.58%)
Current Smoker	391(44.94%)
Past Smoker	315(36.20%)
Non smoker	164(18.85%)
Mean Cho	194
Mean HDL	41.90
Mean LDL	118.45
Mean TG	203.40
Mean BMI	25.93
≥3 RF	202(23.21%)
2RF	260(29.88%)
1RF	399(45.86%)
Thrombolysed	348(40%)
TVD	252(28.9%)
DVD	220(25.2%)
SVD	236(27.1%)
LMC	78(8.96%)
Minimal Lesion	52(5.97%)
Normal	32(3.68%)

[Table/Fig-1]: CAD risk factors and CAG profile
Absolute number with % in the parenthesis

Number of Risk Factor

Coronary Risk Factors (RF) analysis showed ≥3 RF in 23.21%, 2 RF in 29.88% and 1RF in 45.86% of patients. Single vessel disease (SVD), Double Vessel Disease (DVD) and Triple Vessel Disease (TVD) were observed in 236 (27.13%), 220 (25.28%), 252 (28.97%) patients by CAG respectively [Table/Fig-2]. The higher the risk factor, the mores chance of multiple coronary artery involvement and it was found statistically significant (p-value<0.0001). 348/870(40%) patients were thrombolysed amongst them 80 (22.98%) patients revealed recanalization of infract related coronary artery which was found statistically significant (p-value<0.0001).

Finding of Coronary Angiographic Profile

CAG showed TVD in 252/870(28.9%) patients among them 102(40.74%) had >three RF, 96 (38.09%) had two RF and 54 (21.42%) had only one RF. 220/870(25.8%) patients showed DVD amongst them 40 (18%) had >three RF, 46 (20%) had two RF and 134 (60%) had one RF. 236/870(27.13%) revealed SVD amongst them 20(8.47%) patients had three RF, 92(17.79%) patients had two RF and 174(54.35%) patients had one RF. 78/870(8.96%) patients revealed left main coronary (LMC) artery lesion amongst them 32 (41.1%) had > three RF, 20 (25%) had two RF and 26 (33.33%) showed one RF. 52/870(5.97%) patients revealed minimal lesion of which 8 patients had > three RF, 6 (11%) patient had two RF and 10 (19%) patients had one RF. 32/870(3.68%)patients revealed normal CAG who had one RF (present smoker). The aforesaid findings correlate the risk factor with CAG findings. The more the risk factor, the more number of coronary arteries involvement and it was found statistically significant (p<0.0001).

Evaluation of Thrombolytic Status

A total of 348/870 (40%) patients were thrombolised amongst them 50 (14.3%) have TVD, 70 (20.1%) have DVD, 112 (32.1%) patients were having SVD, whereas 36 (10.3%) had LMC and 48 (13.7%) had minimal lesion and 32 (9.1%) patients had normal CAG and got the benefit of thrombolysis. The aforesaid finding pointer to the fact that early thrombolytic patients had fair chance of revealing minimal and /or normal coronary artery after AMI with less number of CAD risk factor and it was found statistically significant (p-value <0.0001).

Patients with multiple vessels were older in age as compared to patients with minimal and/or normal vessel (p<0.0001). Occurrence of TVD was higher in subject with BMI > 25kg/m^2 as compared to subjects with lower BMI p-value 0.0005.

DISCUSSION

Coronary artery disease puts significant impact on health of both urban as well as rural population. Its incidence is increasing day by day due to changes in lifestyle especially sedentary habits and lack of exercise. Other modifiable risk factors for CAD included smoking, high BMI, hypertension, presence of diabetes mellitus and older

CAG finding	TVD 252 (28.97%)	DVD 220 (25.28%)	SVD 236 (27.13%)	LMC 78 (8.96%)	Min. Lesion 52 (5.97%)	Normal 32 (3.68%)	p-value
Age (Years)	58.4 ±6.4	56.2 ±0.5	54.6 ±6.0	55 ±4.5	50 ±5.0	30 ±5.5	<0.0001
Male/Female	220/32	205/15	204/32	62/16	44/8	30/2	0.2131
Diabetes	94(37.38%)	72(32.72%)	52(22.03%)	20(25.69%)	8(15.38%)	00	0.0004
Hypertension	120(47.61%)	82(32.27%)	40(16.87%)	26(33.33%)	6(11.53%)	00	<0.0001
Dys. Lipid	125(49.60%)	90(40.90%)	60(25.31%)	36(46.15)	10(19.23%)	00	<0.0001
BMI(Kg/m^2)	26 ± 2.6	26 ± 3.2	25 ± 4.6	26 ± 3.0	25 ± 4.2	24 ± 2.0	0.0005
Current smoker	114(45.24%)	98(44.54%)	96(40.67%)	29(37%)	22(42. 30%)	100%	<0.00001
Past Smoker	80(31.74%)	92(41.18%)	96(40.68%)	31(39.74%)	16(30.77%)	100%	<0.0001
Non smoker	58(23.02%)	30(13.63%)	44(18.64%)	18(23.08%)	14(26.92%)	100%	
>3RF	102(40.74%)	40(18%)	20(8.47%)	32(41%)	8(15%)	00	<0.0001
2RF	96(38.09%)	46(20%)	92(17.79%)	20(25%)	6(11%)	00	<0.0001
1RF	54(21.42%)	134(60%)	174(54.35%)	26(33.33%)	10(19%)	01	<0.0001
Thrombolysed	50(19.84%)	70(31.81%)	112(47.45%)	36(46.15%)	48(92.30%)	32(100%)	<0.0001
Total CHO	198 ±40.4	200 ± 36	196 ± 41	209 ± 32	180 ±20	160 ±10	<0.0001
HDL	40 ± 10	41 ± 6	44 ± 9	39 ± 10	46 ± 10	48 ± 8	<0.0001
LDL	126 ±32.4	120 ± 30	114 ± 36	118 ± 34	110 ± 12	96 ± 10	<0.0001
TG	208 ±132	201 ± 119	220 ± 122	196 ± 98	160 ± 40	150 ± 20	<0.0017

[Table/Fig-2]: CAD risk factor and CAG profile.
Total Post MI Patients 870: Absolute number with % in the parenthesis.TVD: Triple vessel disease, DVD: Double vessel disease. SVD: Single vessel disease. LMC: Left main coronary artery. RF: Risk factor. BMI: Body mass index. CHO: Cholesterol. HDL: High density lipoprotein. LDL: Low density lipoprotein. TG: Triglyceride

age [10-12]. Our study revealed that higher the number of CAD risk factors, more the chance of coronary arteries involvement.

Coronary angiography showed normal coronary artery in 32 AMI patients. The exact aetiology and pathogenesis of such conduction is a source of controversy. Various mechanisms has been proposed such as coronary vasospasm, concealed atherosclerosis, thrombosis in situ, embolization with spontaneous lysis, viral myocarditis vasculitis, hypercoagulable states, aortic dissection, cocaine abuse and carbon monoxide poisoning. But our patients had no such aforesaid clinical presentation. Prolonged coronary vasospasm may be the causative factor for AMI. Vasospasm for prolonged period may cause blood stagnation, platelet aggregation, thrombin generation and fibrin formation. This phenomenon may form irreversible red thrombus formation which leads to persistent coronary occlusion and AMI. Younger patients without conventional CAD risk factors except smoking and early thrombolysis has fair chance of recanalization of infarct related coronary artery [13-16].

AMI is a life threatening disease and needs urgent medical attention. It is one of the mortality and morbidity worldwide. Coronary atherosclerotic plaque fissuring and rupture is the primary event of the acute MI. Underlying subendothelial matrix is exposed by fissuring and rupturing leading to activation of platelets thereby activating coagulation cascade, which lead to the thrombus formation. The advent of Coronary Care Unit (CCU), fibrinolytic therapy and primary percutaneous coronary intervention (PCI) has made progress in lowering mortality after AMI, immediate CAG and primary PCI including stenting of the infarct related artery is superior to the thrombolysis if door to balloon time is ≤90 minutes [17-20]. Most of the patients in our country take long time to reach hospital and fail to take the benefit of fibrinolytic therapy and primary PCI. Fibrinolytic therapy should be given in all patients of ST-Elevation Myocardial Infarction (STEMI) patients within 24 hours of onset of the AMI. Primary PCI is therapy of choice for AMI but in our country a few center is available in big cities which is far away from the rural area. So primary PCI strategy is not suitable in most part of our country because of timely transportation to available primary PCI center is lacking. Fibrinolytic therapy therefore remains the most practicable reperfusion strategy. But large number of patients does not have ready access to the hospital within 24 hours thus failed to get the benefit of fibrinolytic therapy. More over increased incidence of AMI in older age group and added coronary risk factors in including diabetes, hypertension, dyslipidaemia, and smoking habit are major drawback of adequate recanalization or partial recanalization of the culprit vessel [21-23]. A total of 348/870 (40%) got the opportunity of thrombolysis and 80 (22.87%) patients revealed recanalization of the infarct related artery and found statistically significant (p-value <0.0001).

CONCLUSION

Fibrinolytic therapy should be given to all patients of STEMI patients within 24 hours of onset of the AMI before sending the patient to tertiary care center. This is a cross-sectional study which represent both urban and rural area of Madhya Pradesh, and may not represent the whole population of the country. Larger cohort studies are needed to find out the modifiable risk factors and suitable action plan should be taken to modify the risk factor so that CAD can be prevented.

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