



ROLE OF CT CORONARY ANGIOGRAPHY FOR EARLY TRIAGE OF PATIENT PRESENTING WITH CHEST PAIN IN THE EMERGENCY DEPARTMENT

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ABSTRACT:

OBJECTIVE: To study role of CT coronary angiography for early triage of patient presenting with chest pain in the emergency department of a tertiary care teaching hospital.

MATERIAL AND METHODS: This descriptive cross sectional study was conducted at the department of cardiac imaging, Punjab Institute of Cardiology, Lahore from 1st January 2013 to 30th June 2013. A total of 120 patients fulfilling inclusion and exclusion criteria were included from department of emergency after taking informed consent. Detailed history including risk factors was taken and physical examination was performed. Patients fulfilling inclusion criteria were undergone 64 slices MDCT coronary angiography.

Result: A total 120 consecutive patients with typical acute chest pain and normal electrocardiogram and normal cardiac enzymes were included in the study. Mean age of male (n=91) (75.8%) was 47.82 ± 9.10 and that of female (n=29) (24.2 % of total) was 48.10 ± 8.52 . Out of 29 female only 3(10.34%) have coronary artery disease and that of male 14 (15.35%) had coronary artery disease. Regarding coronary artery disease related four major risk factors, 48 (40.0%) had hypertension. Out of these 48 only 6(12.5%) had coronary artery disease. The family history for ischemic heart disease was positive in 41 (34.2%) patient and 7(17%) had coronary artery disease. 58(48.3) patients were smoker and among them 11(19%) had coronary artery disease. 46 (38.3) were diabetic and only 5(10.9%) had coronary artery disease. Among 120 patients subjected to computed tomography 17 (14.2%) had coronary artery disease. 5(29.4%), 6(35.3%) and 5(29.4%) had single vessel, double vessel and triple vessel disease respectively. Out of 17 coronary artery disease left main stem disease was mild/normal in 12 (70.6%), moderate 3(17.6%) and severe in 2(11.8%).

CONCLUSION: In view of huge burden of patients coming to emergency department and the patients need time consuming process of serial ECG and cardiac enzymes. By doing early CT we can confidently triage patients and thus decrease burden of patients in emergency department.

KEYWORDS: Coronary artery disease, Coronary angiography, Multi-detector computed tomography

INTRODUCTION:

A large number of patients presents with typical chest pain. Unfortunately after doing initial biochemical markers and normal or non diagnostic electrocardiograms, they are discharged home. The question is whether they are safe to be discharged?¹⁻⁶ More than 6 million presentations to emergency departments are with acute chest pain of ischemic origin annually in the United States.⁷ By

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WHO reports this coronary artery disease death will reach a total of 25 million per year by 2020.⁸ The overall prevalence of coronary artery disease in Pakistan was 26.9% (22.3%-32.0%).⁹ In a 10 year study (1995-2004) in lady reading hospital Peshawar, coronary artery disease patients in 1995 were 2053 (out of 5865 total admission), which were 35% of the total admission that increased to 3025 (out of 8245) making 37% of the total admission in 2004.¹⁰ The process of serial cardiac markers and electrocardiograms places a substantial burden on the health care system.¹¹ In Rule Out Myocardial Infarction using Computer Assisted Tomography trial, Among 368 patients (mean age 53 ± 12 years, 61% men), 31 had ACS (8%). By coronary CTA, 50% of these patients were free of coronary artery disease, 31% had non-obstructive disease, and 19% had inconclusive stenosis.¹²

In a study 203 patients with low to intermediate

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risk chest pain were enrolled and out of them Sixty five (32%) patients had no plaque, 107 (53%) had non-obstructive plaque, and 31 (15%) had severe stenosis. Mean emergency department length of stay was lower with cardiac CT angiography (6.62 hours±0.38 after a single troponin level and 9.15 hours±0.30 after serial troponin levels) than with the standard of care approach workup (11.62 hours ±0.47, P, .001).¹³ A recent study done at Massachusetts general hospital, they had included 1000 patient aged 40 to 74 years, from April 2010 to Jan 2012, with typical chest pain, normal troponin levels, of 1000 enrolled patients, 501 were randomly assigned to CCTA and 499 were randomly assigned to a standard evaluation in the emergency department. After early CT angiography the mean length of stay in hospital was reduced by 7.6 hours (P<0.001) as compared to 26.4 hours with standard evaluation and more patients were discharged directly from emergency department (47% vs 12%, P<0.001).¹⁴

Computed tomographic angiography can be a quick method to exclude or include patient with coronary artery disease. In our hospital per day approximately 300 patient used to come in emergency department each day and we use to do ECG and cardiac markers of them there is a chance that we may miss diagnosis and send them home later or they may come with myocardial infarction. By CT angiography we can send home patient without any further investigation like stress thallium or exercise tolerance test.

MATERIAL AND METHODS:

This descriptive cross sectional study was conducted on patients attending the department of cardiac imaging, Punjab institute of cardiology, Lahore 1st January 2013 to 30th June 2013.

Patients with typical chest pain within previous 24 hrs of both sex with age ranging from 30-60 years. Patients with one major risk factor of coronary artery disease i.e diabetes mellitus, smoking, positive history of ischemic heart disease in family and hypertension. Patients with normal ECG with normal troponin levels. Patients with ability to hold breath for 10 to 20 second were included in the study.

Patients with unstable condition i.e (systolic blood pressure <90mmHg, ventricular arrhythmias, persistent chest pain). Allergy to contrast agent, Serum creatinine>1.3 mg/day, History of having CAD, defined as stent implantation or coronary artery, Bypass grafting and patient with clearly non cardiac symptoms were excluded from

the study.

120 patients fulfilling inclusion criteria were selected from the emergency department of Punjab Institute of Cardiology, Lahore after taking informed consent. Detailed history including risk factors was taken and physical examination was performed. Patients fulfilling inclusion criteria underwent 64 slices MDCT coronary angiography.

The Computed Tomography Angiography (CTA) images were acquired with a 64- slice MDCT scanner with a collimation of 64×0.625 mm. After two localization scan, 20ml of non-ionic contrast agent was given IV followed by a saline bolus of 50 ml at a flow rate of 5.0 ml/s. Thereafter scanning was initiated in craniocaudal direction, during a single inspiratory breath hold for an acquisition time of 12-20 sec. For an optimal heart phase selection, ECG gating was used, phase images starting from early systole (10% of the R-R interval) and ending at late diastole (90% of the R-R interval). All images were reconstructed.

RESULTS:

A total 120 consecutive patients with typical acute chest pain and normal electrocardiogram and normal cardiac enzymes were included in the study. Mean age of male (n=91) (75.8%) was 47.82 ± 9.10 and that of female (n=29) (24.2 % of total) was 48.10 ± 8.52). Out of 29 female only 3(10.34%) had coronary artery disease and that of male 14 (15.35%) had coronary artery disease. Regarding coronary artery disease frequency according to four major risk factors, out of 120 patient 48 (40.0%) had hypertension. Out of these 48 only 6(12.5%) had coronary artery disease. The family history for ischemic heart disease was posi-

Table-1: frequency distribution of demographic factors, risk factors and severity of coronary artery disease.

Male	91(75.8%)	
Female	29(24.2 %)	
Mean age of male	47.8242 ± 9.10262	
Mean age of female	48.1034 ± 8.52871	
Hypertension	48 (40.0%)	
History of IHD	41(34.2%)	
Smoker	58(48.3%)	
Diabetic	46 (38.3%)	
Coronary artery disease	17 (14.2%)	
Single vessel disease	5(29.4%)	
Double vessel disease	6(35.3%)	
Triple vessel disease	5(29.4%)	
Left main disease (LMD)	Normal / Mild	12 (70.6%),
	Moderate	3(17.6%)
	Severe	2(11.8%).



Table-2: Frequency and severity of coronary artery disease with relation to risk factors.

		CORONARY ARTERY DISEASE	
		Yes	No
		17 (14.2%)	103 (85.8 %)
Male (91)		14 (15.4%)	77(84.6%)
Female (29)		3(10.34%)	26(89.66%)
Hypertension (48)		6(12.5%)	42(87.5%)
family history for IHD (41)		7(17%)	34(83%)
Smoker (58)		11(19%)	47(81%)
Diabetic (46)		5(10.9%)	41(89.1%)
Single Vessel Disease (SVD)	Yes	5(29.4%)	0(0%)
	No	12(70.6%)	103(100.0%)
Double Vessel Disease (DVD)	Yes	6(35.3%)	0(0%)
	No	11(64.7%)	103(100.0%)

tive in 41 (34.2%) patient out of 120 and among 41 patients only 7(17%) had coronary artery disease. 58(48.3) patients were smoker and among them 11(19%) had coronary artery disease. Out of 120, 46 (38.3) were diabetic and only 5(10.9%) had coronary artery disease among diabetics (Table 1). Among 120 patients subjected to computer tomography 17 (14.2%) had coronary artery disease and rest of them 103 (85.8%) patients had no coronary artery disease, 5(29.4%), 6(35.3%) and 5(29.4%) had single vessel, double vessel and triple vessel disease respectively. Out of 17 coronary artery disease patients, left main stem was normal/mild disease in 12 (70.6%), moderate 3(17.6%) and severe in 2(11.8%).(Table 2)

DISCUSSION:

CT coronary angiography is a new modality, its indications are emerging with passage of time. The hazards of radiations cause its limited use. Computed tomography is an effort to find cost effective and more reliable modality in patients with chest

pain presenting in emergency department and allowing safe discharge of patients. Although an acute coronary syndrome is ultimately diagnosed in only 10 to 15% of patients who present with chest pain, the majority of these patients are admitted to hospitals, at an estimated cost of over \$3 billion annually.¹³ In this study out of 120 patients 103 were discharged home from the emergency department after doing CCTA. This was more than double the rate of discharge among patients in the traditional care group and exceeds typical rates in this patient population. Low-to-intermediate risk patients account for 50 to 70% of presentations with a possible acute coronary syndrome.

Regarding comparison of the results with most recent study by Hoffmann et al¹⁴. Out of 908 patients enrolled, 886 belonged to either black or white race only 11 patients were Asian. Our study contain 120 Asian subjects so it is true representation of Pakistani population. 443 (49%) were male while 464 (51%) were female but our study included more male patients as coronary artery disease is more common in males. Out of 908 patients only 767 truly underwent coronary computed tomography and 640 (83%) were negative for disease and just 80 (10%) were found to have disease. Similar results were found in our study, among 120 patients subjected to computed tomography 17 (14.2%) had coronary artery disease and rest of them 103 (85.8 %) were normal.

CONCLUSION:

Computed tomographic angiography can be a quick method to exclude or include patient with coronary artery disease. By doing early CT angiography we can confidently triage the patients and thus decrease the burden of patients in emergency department.



Author's Contribution

KEA: Conducted the study and wrote the article.
IM: Helped in conducting the study and was research coordinator. MA: Re-analyzed data, reviewed and corrected the article.

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