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COMPARISON OF RIGHT CORONARY ARTERY AND LEFT CIRCUMFLEX RELATED ACUTE INFERIOR WALL MYOCARDIAL INFARCTION IN PATIENTS UNDERGOING PRIMARY PERCUTANEOUS CORONARY INTERVENTION

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ABSTRACT

Objective: To compare right coronary artery and left circumflex related acute inferior wall MI in terms of clinical characteristics, severity markers, complications and mortality.

Study Design: Descriptive cross sectional study.

Place and Duration of Study: This study was carried out at Armed Forces Institute of Cardiology Rawalpindi, from July 2015 to June 2016.

Material and Methods: All the patients presenting to AFIC Emergency department with a history of chest pain for less than 12 hours and diagnosed as acute inferior wall MI on ECG are included in the study.

Results: A total of 250 patients were included in the study. About 148 (59.2%) patients had Right Coronary Artery (RCA) as culprit artery lesion whereas 102 (41.1%) patients had left circumflex (LCX) as culprit artery. Cardiogenic shock was seen in 10 (6.8%) patients with RCA as culprit artery lesion and 23 (25.6%) patients with LCX as culprit artery lesion. Multivessel involvement was seen in 50 (33.8%) patients with RCA and 48 (47.1%) patients with LCX as culprit artery. Heart failurekillip class III and IV was seen in 8 (5.4%) patients with RCA and 10 (9.8%) patients with LCX as culprit artery lesion. Complete heart block was seen in 36 (24.1%) patients with RCA related acute inferior wall MI and 3 (2.9%) patients with LCX related acute inferior wall MI. In-hospital mortality was more prevalent and was seen in 9 (8.8%) patients with LCX as culprit artery and 4 (2.7%) patients with RCA as culprit artery.

Conclusion: This study shows that patients of acute inferior wall MI undergoing primary percutaneous coronary intervention (PCI) who have left circumflex artery as culprit vessel have a poor prognostic outcome as compared to patients having right coronary artery as culprit vessel.

Keywords: Inferior wall MI, Cardiogenic shock, LCX, Primary PCI, RCA.

INTRODUCTION

Acute myocardial infarction is one of the leading causes of morbidity and mortality worldwide, despite significant developments in prognosis over the past decade[1]. The 2016 heart disease and stroke statistics update of American heart association AHA reported that more than 15.5 million people in US suffer from coronary artery disease. Acute myocardial infarction is responsible for almost one third of all deaths in people aged more than 35 years[2].

Acute inferior wall myocardial infarction represents 40% to 50 % of all myocardial infarctions. The culprit artery in inferior wall MI is either right coronary artery or left circumflex artery[3]. Comparison between anterior and inferior wall MI has been extensively studied and results show a better outcome of inferior wall MI both in short and long term. The degree of myocardial injury in cases of acute left anterior descending artery (LAD) occlusion is much larger as compared to acute right coronary (RCA) or left circumflex (LCX) artery occlusion because LAD supplies a large myocardial area. However there is limited data regarding comparison between inferior wall MI caused by either RCA or LCX occlusion[4].

Myocardial infarction due to left circumflex artery LCx occlusion has been less studied in

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trials regarding ST elevation MI; this is mainly due to the absence of significant ST segment elevation on ECG. Therefore the outcome of these patients is less known. Most of studies show less than 20% of patients have left circumflex artery as the culprit lesion. Little is known about the characteristics of LCX related inferior wall MI[5].

The purpose of this study was to compare RCA and LCX related acute inferior wall MI in terms of prognostic outcome in patients undergoing primary PCI.

MATERIAL AND METHODS

This was a cross sectional study, conducted at Armed Forces Institute of Cardiology Rawalpindi. Permission was taken from hospital

Table-I: Baseline characteristics of both groups.

Clinical characteristics	RCA as culprit vessel group 1	LCx as culprit vessel group 2	*p*-value
Diabetes mellitus	29 (19.6%)	14 (13.7%)	0.22
Hypertension	43 (29.1%)	27 (26.5%)	0.66
Smoking	34 (24.4%)	25 (26.6%)	0.31
Chest pain	94 (71.8%)	72 (75.8)	0.49
Age in years Mean ± SD	61.12 ± 10.0	63.23 ± 10.0	0.66
Age in groups <20 yrs 21-39 40-59 60-75 76+	 0 3 (2%) 39 (26.4%) 86 (58.1%) 30 (13.5%)	 0 3 (3%) 20 (19.6%) 67 (65.6%) 12 (11.8%)	0.18
Gender Males Females	 134 (90.5%) 14 (9.5%)	 91 (89.2%) 11 (10.8%)	0.73
Total	148	102	

Table-II: Comparison of prognostic determinants of right coronary artery and left circumflex related acute inferior wall myocardial infarction.

Prognostic Determinants	RCA Culprit Vessel Group 1 (n=148)	LCx Culprit Vessel Group 2 (n=102)	*p*-value
Cardiogenic shock	10(6.8%)	23(22.5%)	0.00
Heart failure Killip class I Killip class II Killip class III Killip class IV	 121 (81.76%) 6 (4.1%) 8 (5.4%) 0	 74 (72.5%) 14 (13.7%) 8 (7.8%) 2 (2%)	0.01
Complete heart block	36 (24.3%)	3 (2.9%)	0.00
Cardiacenzymes(mean) CPK CKMB	 482 70	 663 89	 0.79 0.26
Ejection fraction(mean)	48.46%	41.8%	0.15
Creatinine mg/dl(mean)	1.2	1.4	0.62
Arrhythmias VT VF	 3 (2.02%) 2 (1.4%)	 2 (1.96%) 1 (1.0%)	0.85
Multi vessel involvement	50 (33.8%)	48 (47.1%)	0.03
In-hospital mortality	4 (2.7%)	9 (8.8%)	0.03

ethical committee before conducting the study. Informed consent was taken from all the patients. All patients diagnosed with acute inferior wall MI on ECG basis with history of chest pain not exceeding 12 hours, enrolled for primary PCI were included in the study. Using WHO sample size calculator, confidence interval (CI) was 95%, sample size calculated was 250 patients. Of these patients with acute inferior wall MI caused by RCA occlusion were categorized as group 1 and those with LCx occlusion were categorized as group 2. Primary PCI was performed in cath lab by interventional cardiologist, after angiography all patients with stenosis of greater than 70% in infarct related artery underwent PCI. Baseline characteristics, culprit artery, multiple vessel disease, TPM requirement were documented. Determinants of prognostic outcomes like peak CPK, CKMB, Ejection fraction, serum Creatinine, cardiac failure, Cardiogenic shock (at presentation), in-hospital mortality in two groups was collected and documented.

Data analysis were done using SPSS version 24, frequency and analysis were carried out for qualitative variables that are gender, clinical characteristics, angiographic findings for culprit artery lesions, multiple vessel disease, and TPM requirement. Mean and standard deviations were calculated for quantitative variables such as age, ejection fraction, serum creatinine and cardiac enzymes.

RESULTS

A total of 250 patients were included in the study. About 148 (59.2%) patients had RCA as culprit artery lesion whereas 102 (41.1%) patients had LCx as culprit artery lesion. (Fig-1) Baseline characteristics including age, gender, and co morbid including DM, HTN smoking and symptoms at presentation were similar in both groups as shown in table-I. Cardiogenic shock and heart failure was more predominant in group 2 LCx related acute inferior wall MI. Prognostic determinants including Multivessel involvement, lower ejection fraction and increase release of cardiac biomarkers and in-hospital mortality were more prevalent in LCx related acute inferior wall MI. Ventricular arrhythmias were equally seen in both groups as shown in table-II. Cardiac enzymes were more raised in patients with left circumflex related acute inferior wall MI with a mean CPK of 663 (U/L) and CKMB of 89 (U/L), whereas in patients with RCA related acute inferior wall MI, CPK was 482 (U/L) and CKMB was 70 (U/L). Ejection fraction was reduced in patients with LCX as culprit artery lesion with a mean of 41.8% whereas in RCA related inferior wall MI means EF was 49.0% (fig).

DISCUSSION

Prognostic outcomes of patients with acute myocardial infarction due to left anterior descending artery LAD and right coronary artery RCA has been well studied but prognostic outcome of left circumflex artery LCx related acute inferior wall MI is not much clear. Acute MI due to left circumflex artery has been less studied in large randomized trials on STEMI[5,10]. Most probable reason is that LCx related acute inferior wall MI presents with subtle ECG changes that are mostly under diagnosed. Very few studies

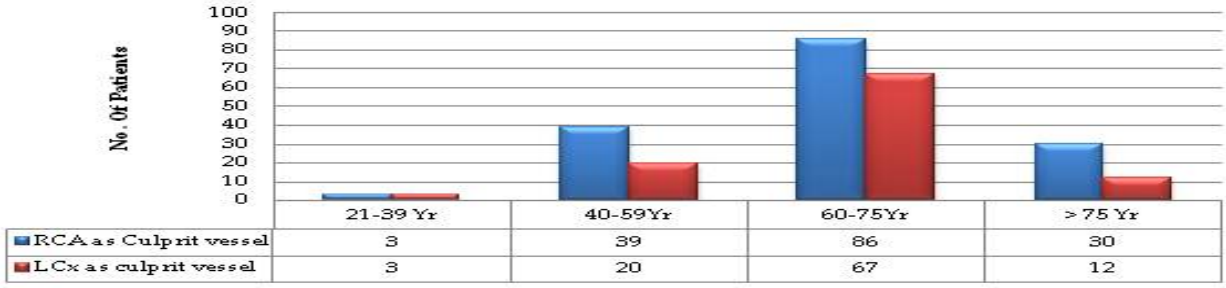

Figure: Showing comparison of age groups with culprit vessels.

have been done on clinical characteristics of patients with LCx related inferior wall MI[6,11].

Inferior wall myocardial infarction is caused by either occlusion of RCA or LCx artery. Comparison in terms of prognostic outcome between Anterior and inferior wall MI has been studied extensively. But there are not many studies in literature comparing prognostic outcome of RCA and LCX artery related acute inferior wall MI[12].

Studies have shown that there is not much significant difference in RCA and LCx related acute inferior wall MI in terms of baseline characteristics[7]. Age, gender risk factors such as diabetes mellitus, hypertension, and smoking were similar in both groups of our study.

A large prospective, single center study was carried out from 1991 to 2004 in Zwolle (Netherlands) it included all patients who underwent primary PCI and studied the association between prognostic impact of CK, LVEF and infarct location on 1 year outcome of these patients. Mortality within 1 year was high in patients who had an anterior infarct and those with a high CK levels and low LVEF[8]. *Rasoul et al* study published in 2007 indicated that enzymatic infarct size was greater and LV ejection fraction was low (less than 45%) in LCx related acute inferior wall MI as compared to RCA related inferior wall MI. Also Cardiac mortality was significantly higher in patients with LCx as the culprit vessel[5].

In our study, mean CPK and CKMB was high for LCx related inferior wall MI as compared to RCA related acute inferior wall MI, with a value of 482/70 for group 1patients with RCA as culprit vessel and a value of 663/90 for group 2 LCx as culprit vessel.

Left ventricular ejection fraction was low in LCx related group with a mean of 42.0% however in RCA related MI it was 48%. In hospital death was higher in group 2 LCx related inferior wall MI. A total of 9 (8.8%) patients died in group 2 having LCx as culprit vessel whereas in pateints with RCA as culprit vessel mortality was seen in 4 (2.7%) patients.

Yip et al conducted a study Between May 1993 to October 2000, a total of 819 patients with acute MI were studied. The study showed that LCx related acute MI has unique clinical features. The presence of dominant LCx, cardiogenic shock, triple vessel involvement was seen more commonly in LCx related inferior wall MI and all were independent predictors of increased mortality at 30 days[9,13]. In our study multivessel involvement was seen in 50 (33.8%) patients with RCA as culprit artery and 48 (47.1%) patients with LCX as culprit vessel.

Chen et al conducted a study from 2003 to 2009 demonstrated increased frequency of congestive heart failure, respiratory failure requiring mechanical ventilation in patients having left circumflex related MI however RV infarct and complete heart block was more prevalent in patients with RCA as culprit vessel. Prognostic outcome at 30 days was less favorable in LCx related inferior wall MI as compared to RCA related MI in patients who underwent primary PCI[7,14], in our study cardiogenic shock was seen in 23 (22.5%) of patients with LCx realted MI and 10(6.8%) patients with RCA related MI. hence being more prevalent in patients with LCX as culprit vessel. Complete heart block was seen in 3 (2.9%) patients with LCX as culprit vessel and 36 (24.3%) patients with RCA as culprit vessel. Hence more frequent in RCA related acute inferior wall MI[15].

CONCLUSION

Patients with acute inferior wall MI having ECG findings suggestive of LCx involvement should be considered as high risk and should be treated with an aggressive approach, in order to improve the outcome of patients with acute inferior wall MI.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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