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Original Research Article

Electrocardiographic and Angiographic Profile of Isolated Left Circumflex Coronary Artery Disease in Tertiary Care Centre of Bihar

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Abstract

Introduction: Isolated left circumflex coronary artery disease is uncommon and occurs in a small percentage of patients undergoing coronary angiogram. Because of the rarity of isolated coronary artery disease not many studies involving isolated coronary artery disease are available in literature. Clinical, electrocardiographic, Echocardiographic and angiographic features of these patients with isolated left circumflex coronary artery disease is therefore, poorly characterised.

Aim and Objective: To determine the specific electrocardiographic changes as well as angiographic findings in isolated left circumflex coronary artery diseases.

Methodology: This study was conducted in the department of cardiology, Narayan medical college, Jamuhar, Rohtas, Bihar. This study is a Descriptive observational study involving 55 patients. Institutional ethics committee clearance was obtained to conduct this study in our hospital. All study subjects fulfilling the inclusion and exclusion criteria were included in the present study

Observation: 30 patients (54.5%) showed Q waves in the resting ECG. Q waves were seen in inferior leads in 20 patients, lateral leads in 6 patients and both in inferior and lateral leads in 4 patients. Ischemic ST-T changes were noted in 40 patients (72%). Ischemic ST-T changes were seen in inferior leads in 28 patients, lateral leads in 7 patients and both in inferior and lateral leads in 5 patients. RV pattern of ECG changes was noted in 15 patients (27.3%) among the study population. RV pattern was noted in inferior leads in 14 patients and both in inferior and lateral leads in 1 patient.

Conclusion: On the basis of our study we can conclude that Single stenosis is the most common finding in the coronary angiogram of the patients with isolated LCX disease. Central stenosis involving proximal left circumflex coronary artery is more common than peripheral stenosis involving distal LCX. Central stenosis involving proximal LCX is more common in patients with documented evidence of MI. Most of the patients with isolated LCX disease have normal leftventricular function.

Keywords: LCX, ECG, Angiography, ST Elevation

Background

Coronary artery disease (CAD) is a significant cause of mortality and morbidity in women, representing 1 out of 3 deaths in women without race or ethnicity bias [1,2]. From 1960 to 1995, the prevalence of CAD in Indian women has risen from 3% to 10% in the urban population, whereas 2%–4% in the rural population [3]. Acute coronary syndrome (ACS), a subcategory of CAD, involves myocardial injury and myocardial infarction (MI) presented with an extensive range of clinical conditions which include unstable angina, ST-elevation myocardial infarction (STEMI), and non–ST-elevation myocardial infarction (NSTEMI) [4].

Isolated left circumflex coronary artery disease is uncommon and occurs in a small percentage of patients undergoing coronary angiogram. Because of the rarity of isolated coronary artery disease not many studies involving isolated coronary artery disease are available in literature. Clinical, electrocardiographic, Echocardiographic and angiographic features of these patients with isolated left circumflex coronary artery disease is therefore, poorly characterized. Occlusion of LCX may be associated with an electrocardiographic pattern of inferior myocardial infarction, similar to the feature of right coronary artery occlusion.

Patients with isolated LCx-related infarction have different patterns of myocardial damage. As the amount of myocardium in jeopardy is proportional to the sum of the amount of myocardium distal to each lesion in the coronary artery tree, and the effectiveness of interventional therapy appears to be more significant in larger than in smaller myocardial injuries independent of the site of infarction, it is pertinent to assess the relation of ECG patterns to the site of coronary stenosis and the status of left ventricular function in patients with isolated LCx disease with or without myocardial infarction.

Posterior MI (PMI) is infarction of posterior wall resulting from occlusion of left circumflex artery (LCX) or right coronary artery (RCA) and is occurred in 15-20% of acute MIs [5]. It is hard to diagnose PMI and it is associated with a high 6 months mortality rate, especially if present with other myocardial wall ischemia [6,7]. With the above background we had conducted this study to determine the specific electrocardiographic changes as well as angiographic findings in isolated left circumflex coronary artery diseases.

Methodology

This study was conducted in the department of cardiology, Narayan medical college, Jamuhar, Rohtas, Bihar. This study is a Descriptive observational study involving 55 patients. Institutional ethics committee clearance was obtained to conduct this study in our hospital. All study subjects fulfilling the inclusion and exclusion criteria were included in the present study

Inclusion criteria

Patients whose coronary angiogram showed isolated left circumflex coronary artery disease.

Exclusion criteria

1. Patients with multi vessel coronary artery disease.
2. Patients with left anterior descending coronary artery disease.
3. Patients with right coronary artery disease.
4. Patients with advanced heart failure

The mode of clinical presentation of the study population was assessed with respect to presentation as effort angina, unstable angina, NSTEMI and STEMI. Rhythm disturbance during acute presentation as STEMI was also assessed. Hemodynamic parameters were

specifically looked for in patients presented with STEMI.

Electrocardiographic findings

ECGs of the study population was scrutinised with respect to presence or absence of Q waves, presence or absence of ischemic ST- T changes. The location and magnitude of ST-T changes were also analysed. Combination of Q waves and ST-T changes were specifically looked for especially in patients presented with STEMI. The location of ECG changeswith respect to leads were analysed.

These ECG changes were then correlated with the location of the lesion in LCX. Patterns of high lateral MI and RV MI were also analysed. Posterior MI was assessed by posterior leads in addition to standard ECG leads. RVMI was assessed by right sided chest leads in addition to standard chest leads. The pattern of ECG changes with respect to various location of stenosis in LCX was also studied. Other associated features such as LBBB, RBBB and LVH were also analysed.

Angiographic analysis

The diagnostic coronary angiograms of the study population was collected and assessed. The location and severity of stenosis in LCx was studied in detail in multiple angiographic views. The number of stenosis in LCX was also analysed. Significant stenosis was defined as stenosis more than or equal to 70% in LAD, LCX and RCA. Significant stenosis in LMCA was defined as stenosis severity more than or equal to 50%. Presence of nonsignificant stenosis in RCA and LAD (stenosis severity less than 50%) were also studied. Nonsignificant stenosis in LMCA was defined as stenosis severity less than 30%.

The dominance of the coronary artery was assessed. For the sack of analysis, LCX was divided into proximal and disal segments.

The portion of LCX above the origin of OM1 was considered proximal. The distal segment was defined as portion of LCX below the origin of OM1. Presence of stenosis in OMs was specifically looked for in patients presented with high lateral MI. Collateral circulation was also assessed in patients showing total or near total occlusion of LCX.

Observation

Only 55 patients who fulfilled the eligibility criteria were included in the study. Out of 55 patients selected for the study, 50 were male (91%) and 5 were female (9%). Mean age of the study population was 52.5 years. Range (34 – 70 years). Out of 55 patients, 35 patients (64%) underwent diagnostic coronary angiogram for documented myocardial infarction. Remaining 20 patients (36%) had angina on effort as the indication for coronary angiogram

30 patients (54.5%) showed Q waves in the resting ECG. Q waves were seen in inferior leads in 20 patients, lateral leads in 6 patients and both in inferior and lateral leads in 4 patients. Ischemic ST-T changes were noted in 40 patients (72%). Ischemic ST-T changes were seen in inferior leads in 28 patients, lateral leads in 7 patients and both in inferior and lateral leads in 5 patients. RV pattern of ECG changes was noted in 15 patients (27.3%) among the study population.

RV pattern was noted in inferior leads in 14 patients and both in inferior and lateral leads in 1 patient. In the resting ECG, 12 patients (21.8%) had normal ECG. LBBB was noted in 1 patient (2%) of study population. RBBB was noted in 3 patients (5.4%). LVH was noted in 7 patients (12.7%). 27 patients (49%) showed both Q waves and ischemic ST-T changes in their resting ECG. 13 patients (23.6%) showed only ischemic ST-T changes in the resting ECG.

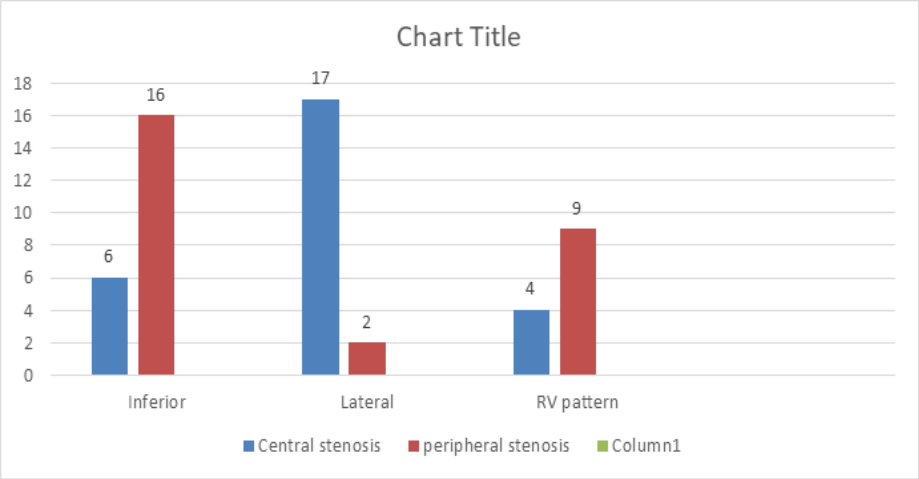

Figure 1: ECG abnormality in Inferior and lateral patterns in patients withsolitary stenoses in segments of the left circumflex coronary artery

43 patients (78%) among the study population showed single stenosis in left circumflex coronary artery and its branches. Out of 43 stenosis, 23 were central and 20 were peripheral. Out of 23 central stenosis,13 were noted in proximal left circumflex coronary artery and 10 were noted in obtuse marginal branches. Out of 20 peripheral stenosis, 19 stenosis were noted in distal LCx and 1 in Posterolateral branches.

On angiography Total number of stenosis noted in left circumflex coronary artery and its branches among the study population was 68. Out of 68 stenosis, 36 (53%) were central and 32 (47%) were periphery. The distribution of central stenosis was proximal LCx 20 (29%), obtuse marginal branches 14(21%), intermediate 2 (3%). The distribution of peripheral stenosis was distal LCx 30 (44%) and Posterolateral branches 2 (3%).

Single stenosis in left circumflex coronary artery and its branches was seen in 43 patients (78%) among the study population. 11 patients (20%) showed double stenosis. Triple stenosis was noted in one patient (2%).

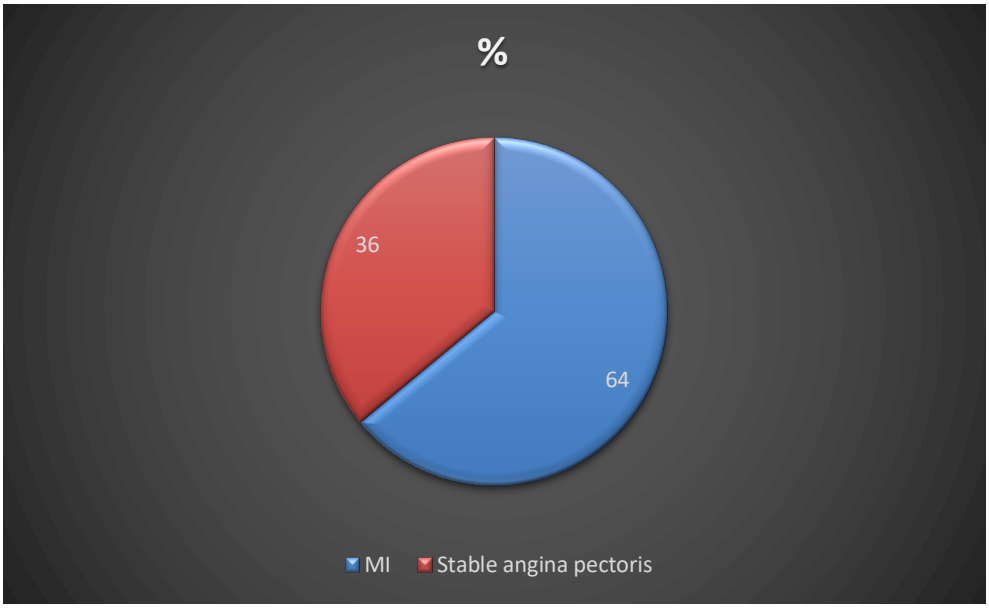

Figure 2: Distribution of study subjects as per indication of angiography

Table 1: Inferior and Lateral Patterns of ECG Abnormalities in Patients with Solitary Stenoses in Segments of the Left Circumflex CoronaryArter

Location of stenosis	No. of patients	ECG Pattern		
		Inferior	Lateral	RV pattern
Central	23	6	17	4
Proximal LCx	13	4	10	2
Obtuse marginal	10	2	7	2
Intermediate	0	0	0	0
Peripheral	20	16	2	9
Distal LCx	19	15	2	9
Posterolateral	1	1	0	0
Total	43	22	19	13

43 patients (78%) among the study population showed single stenosis in left circumflex coronary artery and its branches. Out of 43 stenosis, 23 were central and 20 were peripheral. Out of 23 central stenosis,13 were noted in proximal left circumflex coronary artery and 10 were noted in obtuse marginal branches. Out of 20 peripheral stenosis, 19 stenosis were noted in distal LCx and 1 in Posterolateral branches.

Table 2: ECG Changes With Respect To Leads

	Electrocardiographic changes			
	Total	Inferior	Lateral	Inferior &Lateral
Q waves	30	20	6	4
Ischemic ST-T changes	40	28	7	5
RV pattern	15	14	0	1
LBBB	1	-	-	-
RBBB	3	-	-	-
LVH	6	-	-	-

Discussion

Isolated left circumflex coronary disease is infrequently shown at angiography. Majority of the patients in this study had documented evidence of myocardial infarction and underwent coronary angiogram as a result of higher risk stratification scores. This may have accounted for the lower incidence of TMT positive effort angina in the study population. Isolated disease of the left circumflex coronary artery does not appear to cause severe left ventricular dysfunction, as the mean ejection fraction in our patients was 53.16% and this is in accord with previous reports [8]. Electrocardiographic abnormalities occurred in the inferolateral leads (inferior pattern in leads II, III, aVF, V5. and V6,) anterolateral leads (lateral pattern in leads I, aVL, V5, and V6), and right precordial leads (RV pattern in leads V1 and V2) in patients with solitary stenosis of left circumflex coronary artery disease. The lateral pattern and RV pattern are more specific for circumflex disease [9]. Left circumflex coronary artery was basically divided into proximal and distal segments to determine whether these more specific patterns of ECG changes correlated with disease in specific segments of the circumflex coronary artery. Inferior electrocardiographic changes can also occur in patients with isolated right. Coronary artery disease and are not specific for left circumflex coronary artery disease. Gensini *et al* [10] suggested that most stenoses are proximal. In our study also, the sites of stenoses

reflect the sites of predilection for atherosclerosis in patients with isolated circumflex disease and include proximal and distal circumflex segments and proximal portions of the major branches. The portions of the branches of circumflex coronary artery beyond the major bifurcation were usually free of segmental stenosis.

In contrast to the findings of Gensini *et al* [10], no ostial or ostioproximal lesion involving left circumflex coronary artery were noted in our study. The electrocardiographic data were based on information obtained from 43 patients with solitary stenosis in the circumflex coronary artery [11] so that the patterns of electrocardiographic abnormalities could be related to stenosis inindividual segments of the circumflex coronary artery. A stenosis in the obtuse marginal branch of the circumflex was associated with the lateral pattern of electrocardiographic abnormalities. This is predictable because the obtuse marginal branch of the circumflex usually supplies the posterolateral myocardium. Disease in the proximal segment of the circumflex was predominantly associated with lateral electrocardiographic pattern. This association may reflect the fact that the proximal circumflex supplies both the posterolateral and posteroinferior myocardium. A peripheral stenosis distal to the takeoff of the obtuse marginal branch was predominatly associated with the inferior pattern of electrocardiographic abnormalities. This is consistent with the fact that the distal circumflex supplies blood to the posteroinferior myocardium. The posterolateral branch contributes to the blood supply of the posterior myocardium, and stenosis of the posterolateral branch is associated with inferior electrocardiographic changes. Braat *et al* [12] have shown that the recording of lead V4R in the acute phase of an inferior myocardial infarction may be useful in predicting coronary artery occlusion. Patients with ST-segment elevation of >l mm in lead V4R often had a proximal occlusion of the right coronary artery and those who had no ST-segment elevation in lead V4R developed a distal occluded right coronary artery. Negative T wave in lead V4R is associated with occlusion of left circumflex coronary artery disease.ST-segment elevation of >1 mm in leads aVL and lead I predicted a circumflex artery occ1usion.

The incidence of an abnormal R wave in lead V1 occurred more frequently in patients with proximal stenosis than in those with distal lesion of the LCx. An abnormal R wave in lead V1was often associated with inferior and/or lateral Q waves, reflecting thefact that the proximal LCx supplies both posterolateral and posteroinferior myocardium, and a single occlusion in such a vessel could readily cause simultaneous infarction of the lateral and inferior walls. Brembilla-Parrot *et al* [13] found that in some patients a tall R wave in lead V1**,** during posterior myocardial infarction may also be caused by conduction disturbance in the His- Purkinje system rather than just mirroring loss of activation forces at the posterolateral region.

Only 4 patients among the study population had mitral regurgitation. Mitral regurgitation occurred in patients with LV dysfunction. This correlates with the observation that most of the patients with isolated left circumflex coronary artery disease have normal left ventricular function. Isolated circumflex disease may be suspected by applying the clinical and electrocardiographic criteria, but cannot be definitely diagnosed. The left ventricular function is patients with isolated left circumflex coronary artery disease are relatively preserved. Most of the patients have normal ejection fraction and normal left ventricular function.

Conclusions

On the basis of our study we can conclude that Single stenosis is the most common finding in the coronary angiogram of the patients with isolated LCX disease.

Central stenosis involving proximal left circumflex coronary artery is more common than peripheral stenosis involving distal LCX. Central stenosis involving proximal LCX is more common in patients with documented evidence of MI. Most of the patients with isolated LCX disease have normal left ventricular function. ECG changes in lateral leads are common is patients with stenosis inproximal LCX. ECG changes in inferior leads are common in patients with stenosisin distal LCX.

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