

Clinical and Angiographic Findings in Patients with Significant Left Main Coronary Artery Stenosis

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Objective: To evaluate the clinical and angiographic features of patients with significant (>50%) left main coronary artery (LMCA) stenosis. **Study design & settings:** In this prospective descriptive study, we evaluated clinical and angiographic features of 100 consecutive patients with significant LMCA stenosis, which were selected from 1284 patients undergoing coronary angiography at Punjab Institute of Cardiology, Lahore. **Results:** Significant LMCA stenosis was seen in 7.7% patients. There were 83 males (83%) and 17 females (17%). Age of the patients ranged from 35 to 72 with mean age of male patients 55.84 ± 9.99 years and that of female patients 54.12 ± 9.89 years. Severe angina (NYHA class III-IV) was the most common finding. 54% of the patients had ST depression in resting ECG while ECG was found to be normal in 19 (19%) patients. Hypercholesterolemia was the most commonly found risk factor. 94% patients had disease in other coronary arteries and left anterior descending artery (LAD) was the most commonly involved vessel. Majority of the patients (>70%) had preserved left ventricular (LV) systolic function. All patients underwent coronary angiography safely without any serious complication. **Conclusions:** Among patients undergoing routine coronary angiography about 8% had significant LMCA stenosis. Most of these had disease in other coronary arteries, especially in males. Severe angina along with diffuse ST depression in multiple ECG leads and strongly positive exercise test were common findings in patients with LMCA stenosis. However no specific clinical features were found which could distinguish the patients with LMCA stenosis from other patients with coronary artery disease (CAD).

Key words: Coronary artery disease. Left main coronary artery stenosis. Coronary angiography

Significant (>50%) left main coronary artery (LMCA) stenosis has been found prognostically the most critical lesion in natural history of CAD¹. Prevalence of LMCA stenosis varies from 2.5 to 10%^{2,3}. Significant LMCA stenosis is usually associated with disease in two or three of the major epicardial arteries, and middle or distal segments are more commonly involved. Isolated lesions, mostly ostial, are rare coronary angiographic findings⁴.

Clinically significant LMCA stenosis is usually associated with severe forms of angina, especially crescendo angina and unstable angina of relatively short duration. Chest pain at rest, ST-T changes on resting electrocardiogram (ECG), cardiomegaly on chest roentgenogram, a history of heart failure, and finding of left ventricular (LV) dysfunction at cardiac catheterization, are documented predictors of poor prognosis in patients with significant LMCA stenosis^{5,6}.

Coronary angiography is essential for establishing the diagnosis and guiding the appropriate treatment. In patients with LMCA stenosis, extra caution is recommended during and after the procedure due to higher incidence of serious complications during coronary angiography.⁷ In this study, we will evaluate the clinical and angiographic features of patients with significant (>50%) LMCA stenosis.

Materials and methods

This study was conducted at Department of Cardiac Catheterization and Interventional Cardiology, Punjab Institute of Cardiology, Lahore. This was a hospital-based descriptive study of 100 cases. During coronary angiography of consecutive 1284 patients, 100 patients

found to have more than 50% stenosis of LMCA and were included in this study. Patients having LMCA stenosis less than 50% and those who already had Coronary Artery Bypass Grafting or Angioplasty were excluded

Left ventriculography was done by Pigtail catheter or right Judkin catheter in RAO projection. However in patients who were hemodynamically unstable or had very severe LMCA stenosis, left ventriculography was not performed. LV function was then assessed on echocardiography. Consultant Cardiologists interpreted all coronary angiograms visually for severity of stenotic lesions in coronary arteries. Fifty percent or more narrowing of LMCA was regarded as significant stenosis. Similarly single vessel, two vessels or three-vessels coronary artery disease was diagnosed when there was 50% or more stenosis in LAD, left circumflex (LCX) or right coronary artery (RCA) in addition to LMCA stenosis. Patient having LMCA stenosis were shifted to coronary care unit after manual haemostasis of puncture site, and were monitored closely for next 12-hours for any complications.

Data collection: A semi structured data collection instrument based on open and close-ended questions was designed to collect data about the clinical and coronary angiographic findings of the patients under study. A data entry program was developed and all the numerical data regarding the study was entered in the computer system. Final analysis was performed with the help of SPSS.

Results

The study included 100 consecutive patients with significant LMCA stenosis, which were selected from

1284 consecutive patients undergoing coronary angiography. Age of the patients ranged from 35 to 72 years. The mean age of the patients was 55.24±9.94 (S.D) years. The mean age of male patients was 55.84 ± 9.99 and that of female patients was 54.12 ± 9.89. There were 83 males (83%) and 17 females (17%). Significant LMCA stenosis was seen in 7.7 % patients. Two most common indications for coronary angiography were chronic stable angina (71%) and unstable angina (23%).

Hypercholesterolemia (53%) was the most common risk factor. Diabetes mellitus, family history of CAD, smoking, and hypertension were found in 50%, 42%, 41%, and 34% of the patients respectively. No risk factor was found in 8 (8%) patients. Frequency distribution of CAD risk factors is shown in Table 1.

Most common symptom was chest pain (92%). Next common complaint was shortness of breath (69%). Among those having chest pain, 71 (77.1%) were having chest pain on exertion, 21(22.8%) at rest, and 60(65%) patients reported postprandial chest pain. Sixty percent of the patients reported to have anginal symptoms of more than 6 months duration. Severity of anginal symptoms was assessed by the Canadian Cardiovascular Society Classification (CCS) and is shown in Table 2. Majority of the patients were found to have severe angina, CCS class III (54%) and CCS class IV (26%).

Coronary angiographic findings: Isolated LMCA stenosis was found in 6 patients, of which 3 were males and 3 were females. Pattern of lesion location in LMCA stenosis is shown in Table 4. Stenosis of distal segment of LMCA was the most common finding. LMCA was diffusely diseased in one patient. Table 5 shows the pattern of involvement of other coronary arteries. In 94 (94%) patients other coronary arteries were also involved in addition to LMCA stenosis. LAD was the most commonly (80.8%) involved coronary artery. Left ventriculography was performed in 32 patients to assess the LV function during coronary angiography while in rest of the patients the LV function was assessed on echocardiography. LV systolic function was preserved in 70 % patients.

Table 1: Coronary artery disease risk factors in patients with significant LMCA stenosis

Risk factor	=n	%age
Diabetes Mellitus	50	50%
Smoking	41	41%
Family History	42	42%
Hypertension	34	34%
Hypercholesterolemia	53	53%
None	8	8%

Table 2: Severity of anginal symptoms according to Canadian Cardiovascular Society Classification

Angina class	=n	%age
II	20	20%
III	54	54%
IV	26	26%

Table 3: ECG findings in patients with significant LMCA stenosis

ECG findings	=n	%age
Normal ECG	19	19%
ST depression	54	54%
T wave inversion	32	32%
Q waves	33	33%
Conduction defects	3	3%

Table 4: Location of lesion in left main coronary artery

Location of lesions	=n	%age
Ostial	28	28%
Proximal	3	3%
Mid	12	12%
Distal	56	56%
Diffuse	1	1%

Table 5: Pattern of involvement of other coronary arteries in patients with significant LMCA stenosis

Coronary artery	=n	%age
LAD	76	80.80%
LCX	64	68%
RCA	73	77.60%
SVD	15	16%
DVD	23	24.50%
TVD	54	57.40%

LAD = Left Anterior Descending artery, LCX = Left Circumflex artery
RCA= Right Coronary Artery, SVD = Single Vessel Disease,
DVD = Double Vessel Disease, TVD = Triple Vessel Disease

Discussion

In this study LMCA stenosis was found in 7.7% patients, which is similar to that already reported in national and international studies^{3,8}. In the present study, 94 patients (94%) had stenosis of other coronary arteries in addition to LMCA stenosis. Similar to our study, Samad et al reported 24.8% double vessel disease and 75.2% triple vessel disease in patients with LMCA disease³.

Coronary angiography was performed from femoral or radial approach under local anesthesia with 6 French left and right Judkin catheters. Ionic or non-ionic contrast agent was used depending upon the affordability of patient and discretion of Consultant Cardiologist. Patient's ECG and arterial pressure were monitored during the procedure. Before engagement of LMCA ostium, a non-selective injection was given in left aortic sinus in antero- posterior projection to evaluate the LMCA. If LMCA stenosis was seen, a left anterior oblique 10-degree with cranial 10-degree projection was performed first. Pressure damping on pressure tracing was carefully recorded on engagement of LMCA ostium. After diagnosis of LMCA stenosis was made, additional angiographic views were limited, usually LAO cranial and RAO caudal views were sufficient to illustrate completely the extent of disease in left coronary system and LAO for right coronary system.

All patients included in the study were clinically evaluated in detail by history, relevant physical examination and laboratory investigations. Anginal

symptoms including chest pain, shortness of breath or palpitations were noted with their severity and duration. Anginal symptoms were graded according to the Canadian Cardiovascular Society Classification (CCS). Risk factors for CAD including diabetes mellitus, hypertension, smoking, family history of CAD and dyslipidemia were noted. Moreover relevant previous medical record was reviewed for evidence of previous myocardial infarction or heart failure, and findings in resting ECG and Chest X-Ray were noted. Similarly results of exercise electrocardiography, stress myocardial perfusion imaging and echocardiography, if available, were also noted. All the clinical and angiographic findings were recorded on a proforma.

The most common ECG abnormality was ST depression in multiple leads (54%) while 19% of the patients had normal ECG as shown in Table 3. Chest X rays revealed increased cardio-thoracic ratio in 18% patients, while it was within normal limits in 82% of the patients.

The isolated LMCA stenosis⁹ is a rare angiographic finding. Salem et al¹⁰ has described 0.07% incidence of isolated LMCA stenosis. Tommaso et al¹¹ reported three (0.2%) patients with an isolated LMCA stenosis among 2053 cases, while Samad et al³ did not find any case with isolated LMCA in their 81 cases with LMCA stenosis. In the present study, out of 100 patients with significant LMCA stenosis, 6 patients were found to have isolated LMCA stenosis. Although it is documented that isolated stenosis of LMCA exists primarily in females^{12, 13} in the present study isolated LMCA stenosis was seen in similar numbers of males and females. As in our study, 83% patients were males, the prevalence of isolated LMCA stenosis is indeed higher in females.

Patients with LMCA stenosis have high incidence of complications during coronary angiography¹³⁻¹⁵. The Registry of the Society for Cardiac angiography and Interventions¹³ have reported 0.55% mortality for coronary angiography in the presence of more than 50% LMCA stenosis. However Samad et al³ in their study of 81 patients with left main disease did not report any mortality. In the present study all patients underwent coronary angiography without any major complications. Our low complication rate is due to careful technique, early management of ischemia, bradycardia and hypotension during the procedure. Other factors in addition to atherosclerosis have also been described in the etiology of LMCA stenosis including, emboli from vegetations, arteritis, dissection, inflammation, syphilis, tumors, radiations, damage from aortic valve replacement, after angioplasty of proximal LAD. But in the present study, none of the above etiological factor was observed. Ishaque et al¹⁶ have reported similar findings in their study. However the possibility of other etiologic factors could not be confidently ruled out in some of our patients because specific diagnostic tests were not available.

Although there are no precise clinical features described that should invariably suggest the diagnosis of LMCA stenosis^{17, 18} however, some reports suggest that the presence of severe form of angina¹⁹ or crescendo angina pectoris, a strongly positive exercise test and calcification in the area of left main coronary artery may be suggestive of LMCA disease¹⁷. As reported by Lavine et al¹⁷, Topaz O et al⁴ and Banim et al¹⁸ moderate to severe angina (class III-IV) was a predominant finding. In the present study, 77% of the patients had CCS class III - IV angina.

Resting ECG can be normal or can show variable forms of ischemia in patients with LMCA stenosis^{18, 20}. In a recent report by Sclarovsky et al²¹, an important manifestation of LMCA stenosis was diffuse ST depression in inferior and precordial leads on resting ECG. In the present study we also found ST depression as the commonest finding on resting ECG.

It is concluded that among patients undergoing routine coronary angiography about eight percent had significant LMCA stenosis. Most of these had disease in other coronary arteries, especially in males. Severe angina along with diffuse ST depression in multiple ECG leads and strongly positive exercise test are common findings in patients with LMCA stenosis. However no specific clinical features could be found to distinguish the patients with LMCA stenosis, from other patients with coronary artery disease. Coronary angiography can be performed safely in patients with LMCA disease if necessary precautions are observed during and after the coronary angiography

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