

Left Main Coronary Disease; Clinical Profile and Angiographic Characteristics

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Abstract

Background: To analyze the clinical and angiographic characteristics of patients with left main coronary disease (LMCAD).

Methods: In this descriptive study patients with left main coronary artery disease who underwent angiography were evaluated. Patients with left main coronary artery disease ranging from mild plaque to total obstruction were included. Clinical characteristics, risk factors and angiographic findings were recorded.

Results: A total of 1422 (10.4%) left main disease cases were detected in which 953 (6.99%) were non-obstructive or minimal and 468 (3.43%) were obstructive or significant. Patients with obstructive LMCAD had mean age of 56.32±6.34 years. Male and female were 68.16% and 31.83%, respectively. Diabetes mellitus (33.97%), hypertension (62.82%), dyslipidemia (53.84%) and smoking (36.96%) were main risk factors. Stable angina; FC III & IV was seen in 16.88%, unstable angina in 71.79% and acute MI in 6.83%. On ECG, ST-elevation (>0.05 mV) in lead aVR was the commonest presentation (90.81%). Exercise ECG were positive for early angina in 90.81% and diffuse ischemia in 90.81%. Mean ejection fraction ±SD (%) was 48±8.45.

Ostial, midshaft and distal end bifurcating disease was 20.94%, 11.11% and 67.94%, respectively. In distal bifurcating LMCAD, LAD was involved in 56.40% and circumflex artery in 34.59%. Unprotected LMCAD was present in 3.1% and protected LMCAD in 0.33%.

Conclusion: Age more than 50, unstable angina, diffuse ischemic changes on exercise electrocardiograms and coexistent triple vessels disease were the common denominators. Distal end of left main stem is the most common site affected.

Key Words: Left main coronary disease, Angiography

Introduction

LMCAD is an important subset of coronary artery disease and is of special interest for the interventionists. It is an important risk factor for increased mortality and morbidity at all stages of diagnosis and treatment of coronary artery disease. Its pathology is often silent, with unpredictable presentation. It poses diagnostic and management challenges. Significant LMCA stenosis, angiographically defined as $\geq 50\%$ diameter stenosis

is a consistent predictor of morbidity and mortality after CABG. Low cardiac output states are significantly more common post-CABG in patients with significant LMCA disease. There is a relative risk of perioperative mortality of 1.3 for patients with significant LMCA stenosis, compared with patients without LMCAD. At 5 years post-CABG, the mortality in patients with three-vessel disease is 10.7%, compared with 15.8% in patients with LMCAD.¹⁻⁴

CABG is recommended over PCI for any patient with stable angina, unstable angina, or asymptomatic disease and significant left main or left main equivalent coronary stenosis. CABG is also recommended for patients with poor left ventricular function, acute myocardial infarction (MI) or life-threatening ventricular arrhythmias and significant LMCA or left main equivalent disease. However with the advent of drug-eluting stents, improvements in percutaneous intervention and aggressive interventional centers, the management of left main coronary disease is no longer purely surgical.^{5,6}

Patients and Methods

This study was carried out at the Department of Cardiology, Postgraduate Medical Institute, Lady Reading Hospital Peshawar. A total of 468 patients with significant LMCAD were included in the study, after screening 13,625 angiograms which were done from January 2008 to May 2012. Patients with LMCAD, ranging from mild plaque to total obstruction, were included in the study. Obstructive or significant LMCAD was defined as 50% or more reduction in diameter on angiography while those with less than 50% stenosis were labeled as non-obstructive or minimal LMCAD using standard angiographic views. Unprotected left main was diagnosed when there is no functional GABG graft (eg. LIMA occlusion makes LAD unprotected) or collaterals from right system. Protected left main was diagnosed when there is at least one functional graft to LAD /LCX or left main with total LAD and very good LAD collaterals from RCA /LCX.

Baseline clinical characteristics, along with precipitating risk factors were recorded. Standard 12-

leads ECG obtained from patients record, was looked for 0.05mv or more ST elevation in lead aVR. Exercise ECG was categorized as early positive for angina if chest pain occurred at 3 minutes or less after the start of the test. Diffuse ischemia on exercise ECG was diagnosed when multiple lead territories had down sloping or horizontal ST-depression of more than 0.01mv at 90 milliseconds after the J-point.

Results

A total 13,625 angiographic reports were analysed from the registry of angiography and intervention and 1422 (10.4%) left main disease cases were found. On further analysis, 953(6.99%) had nonobstructive LMCAD and 468(3.43 %) had obstructive LMCAD. Family history for CAD was found in 30.98%. Unstable angina was seen in 71.79%. On ECG ST-elevation (>0.05 mV) in lead aVR was present in 83.97%. Echocardiography showed mean LV ejection fraction of 48±8.45%(Table 1).

On angiography obstructive LMCAD cases, ostial stenosis was present in 20.94%, shaft involvement in 11.11% and distal as bifurcating disease in 67.94%. In distal bifurcating LMCAD, left anterior descending artery was affected in 56.40% and circumflex artery in 34.59%. There was coexistent single vessel disease in 11.32%, double vessel disease in 29.91% and triple vessel disease in 58.76%. (Table 2).

Table 1: Baseline characteristics of patients with obstructive left main stem disease

(n=468)

| Baseline characteristics | No | % | Mean±SD |
|--|-----|-------|-----------|
| Age±SD(years) | | | 56.32±6.3 |
| Male | 319 | 68.16 | |
| Female | 149 | 31.83 | |
| Diabetes Mellitus | 159 | 33.97 | |
| Hypertension | 294 | 62.82 | |
| Dyslipidemia | 252 | 53.84 | |
| Smoking | 173 | 36.96 | |
| Family history | 145 | 30.98 | |
| Obesity(BMI>24.9Kg/m ²) | 149 | 31.83 | |
| Stable angina(FC= III&IV) | 79 | 16.88 | |
| Unstable angina | 336 | 71.79 | |
| Myocardial infarction | 32 | 6.83 | |
| Heart failure | 18 | 3.84 | |
| ST-elevation (>0.05 mV) in lead aVR on ECG | 393 | 83.97 | |
| Angina on low threshold during ETT | 425 | 90.81 | |
| Diffuse ischemic changes on ETT | 425 | 90.81 | |
| Mean ejection fraction ±SD | | | 48±8.45 |

Table 2: Angiographic characteristics of patients with left main stem disease

| Angiographic characteristics | No | % |
|----------------------------------|-------|-------|
| Total angiograms screened | 13625 | |
| Total cases of LMCAD | 1422 | 10.4 |
| Nonobstructive LMCAD | 953 | 6.99 |
| Obstructive LMCAD | 468 | 3.43 |
| Ostial | 98 | 20.94 |
| Shaft | 52 | 11.11 |
| Distal as bifurcating disease | 318 | 67.94 |
| LAD involment in bifurcation | 208 | 56.40 |
| LCX involment in bifurcation | 110 | 34.59 |
| Unprotected | 422 | 3.1 |
| Protected | 40 | 0.33 |
| Coexistent single vessel disease | 53 | 11.32 |
| Coexistent double vessel disease | 140 | 29.91 |
| Coexistent triple vessel disease | 275 | 58.76 |

Discussion

This study demonstrated left main disease as 10.4% in our patient’s population. Obstructive or significant LMCAD was 3.43% while nonobstructive or minimal LMCAD was 6.99%. It is in accordance with published literature. Soleimani A et al. recently reported the incidence of LMCAD in Iran to be 10%. In that study obstructive LMCAD was 3.6% while nonobstructive LMCAD was 6.4%. However our study is in contrast to previous studies on LMCAD in Pakistan in which prevalence of LMCAD was shown to be 16%. But if only obstructive LMCAD is considered from those studies; it is 4.5% which is identical to our results.⁸

Twelve lead electrocardiography and exercise electrocardiography are good noninvasive tools to detect LMCAD. Yamaji H. et al (2001) demonstrated that ST segment elevation in lead aVR, compared with lead V1, is a useful indicator for predicting acute LMCA obstruction⁹ They demonstrated that ST segment elevation (>0.05 mV) occurred in 88% of patients having LMCAD. In our study, ST elevation in lead aVR was present in 83% of patients. Patients having LMS disease have limited exercise tolerance and/or early ST segment depression in stages I and II of exercise ECG test. Multistage treadmill test (TMT) is usually positive (≥ 2 mm ST segment depression) in 70% of patients.¹⁰ In present study, angina occurred on low threshold in 90% of patients and was positive for diffuse ischemia in 90 % of patients. Left ventricular function is depressed in such patients. Tullio Palmerini et al. showed that the median ejection fraction (EF) of patients with LMS disease was 55%.¹¹ In present study mean EF was 48±8.45.

LMS may be affected by atherosclerosis either at its ostium, shaft, distal end as bifurcating disease or

diffusely. According to studies bifurcation stenosis in case of LMCAD is 40%, mid-shaft stenosis 24% and ostial stenosis is 1%.¹² In present study, distal stenosis as bifurcating disease is 67%, shaft involvement 11% and ostial disease 20%. LMCAD may be protected or unprotected. In study by Soleimani A et al. protected LMCAD was 3.45 and unprotected was 0.2%.⁷ In present study, protected LMCAD is 0.33% and unprotected LMCAD is 3.1%. LMCAD is frequently associated with disease in other parts of coronary vasculature. Triple disease is relatively more common.¹³⁻¹⁵

Conclusions

1. Twelve lead and exercise electrocardiograms are good noninvasive tools to identify LMCAD.
2. Distal end, as bifurcating disease, is most commonly affected and it frequently coexists with triple vessel disease

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