Clinical And Angiographic Characteristics Of Left Main Coronary Artery Disease, A Retrospective Study

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Summary:

Background : *Left main coronary artery (LMCA) disease represents important and serious portion of coronary artery disease(CAD).*
Aim: *The aim of this study is to estimate the incidence of LMCA disease among patients with CAD undergoing coronary artery angiography and to evaluate clinical characteristics of patients with LMCA disease.*
Methods: *The study involved review of clinical notes and coronary angiography of 1020 patients with CAD in Ibin Al Bitar hospital for cardiac surgery between April and September 2004.This review included evaluation of electrocardiogram (ECG), echocardiogram(ECHO), ECG exercise test (EET) and coronary angiography.*
Results: *Among 56 patients proved to have left main coronary artery (LMCA) disease,40 patients had complete data available which were studied.*
Mean age of patients with LMCA disease was 60 ± 8.07 years, 82% of them were males, 62% were smokers, 40% were diabetics and 55% were hypertensive.
In this group 62.5% of patients with LMCA disease presented as acute coronary syndrome (ACS) and 37.5% as chronic stable angina (CSA),normal left ventricular (LV) function was found in 75% of patients and 40% have normal electrocardiogram (ECG).
Patients with LMCA disease who have distal involvement represent 75%,15% have diffusely diseased LMCA, right coronary artery (RCA) was involved in 80% of patients and those with RCA involvement were more commonly presented with ACS (78%), while those without RCA involvement presented more as CSA.
Those patients who underwent ECG exercise test had poor functional Capacity, with mean exercise duration of 3.7 ± 2.3 minutes and mean metabolic equivalents (METs) of 4.5 ± 2.46.
The tests were positive in 76.9% of patients inconclusive in the rest but no negative tests were recorded.
No significant differences were observed between those patients with ACS and those with CSA in regard to patients' characteristics.
Conclusion: *LMCA disease is not uncommon among those with CAD, it occurs in patients with multiple cardiovascular risk factors. Patients with LMCA disease usually have poor functional capacity and their ETTs are commonly positive and of high risk score. Involvements of right coronary artery (RCA) in addition to LMCA render the patients more unstable.*
Key words: *Ischemic heart disease, Left main coronary artery disease.*

Introduction:

Among patients with CAD, those with significant stenosis in LMCA represent a special challenge, as their prognosis is usually poor without appropriate intervention (1).

About 5--10% of patients with ACS had significant LMCA disease (2, 3). In addition patients with LMCA disease may be presented as CSA.

Patients with LMCA disease usually have ST-T wave abnormalities on resting ECG (4) and they usually have high-risk positive exercise ECG findings (5).

The aims of this study are to estimate the incidence of LMCA disease among those with CAD undergoing coronary angiography, to evaluate the clinical characteristics of patients with LMCA disease and to asses the left ventricular function and characters of ECG exercise test among them.

Patients And Methods:

Between April 2004 and September 2004, 1020 patients with CAD underwent coronary angiography at Ibn Al Bitar hospital for cardiac surgery, 56 patients documented to have significant LMCA disease, complete data were available for 40 patients .The case sheets of those 40 patients were evaluated carefully, including evaluation of ECG, echocardiography (ECHO), ECG exercise test and the blood investigations.

The coronary angiography films for those 56 patients were reviewed carefully by two qualified

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cardiologists and the assessment of coronary lesions were done by Quantitative Coronary Angiography (QCA).

Coronary artery lesions were considered significant if more than 70% luminal diameter narrowing and for LMCA 50% or more of luminal diameter narrowing were detected (6).

Normal LV function (as assessed by ECHO or left ventriculography) was defined as ejection fraction of 50% or more, mild LV dysfunction (LVD) 40-50%, moderate LVD 30-40% and severe LVD <30% (7) .All data were given as mean ± standard deviation, chi square and student- t tests were used for statistical analysis, with p value of <0.05 regarded as significant (8).

Results:

56 patients proved to have LMCA disease among 1020 patients with CAD who underwent coronary angiography at Ibn Al Bitar hospital for cardiac surgery from April 2004 to September 2004 with an incidence of 5.49% .

Table (1) baseline characteristics of 40 patients with LMCA disease.

Variables	Number(percentage)
Mean age (year)	60±8.07
Male sex	33 (82%)
Female sex	7(18%)
Hypertension	22 (55%)
Diabetes mellitus	16 (40%)
Smoking	25(62%)
Total cholesterol (mg/dl)	215 ±44.26
LDL cholesterol (mg/dl)	137.8±33.75
HDL cholesterol (mg/dl)	42.7±6.82
ACS	25(62.5%)
CSA	15(37.5%)

Table (2) Echocardiographic characteristics of 40 patients with LMCA disease

Variables	Number(percentage)
Normal left ventricular function	30(75%)
Mild LVD	4(10%)
Moderate LVD	4(10%)
Severe LVD	2(5%)

Table (3) Electrocardiographic characteristics of 40 patients with LMCA disease

Variables	Number(percentage)
Inferior Q wave	3(7.5%)
Anterior Q wave	6(15%)
Non specific ECG	15(37.5%)
Normal	16(40%)

Table (4) cardiac catheterization data of 40 patients with LMCA disease

Lesion site	Number(percentage)
Proximal LMCA lesion	3 (7.5%)
Mid LMCA lesion	1 (2.5%)
Distal LMCA lesion	30 (75%)
Diffuse LMCA lesion	6 (15%)

Table (5) cardiac catheterization data of 40 patients with other coronary artery lesions

Lesion site	Number(percentage)
LAD lesion	37(92%)
LCX lesion	22(55%)
RCA lesion	32(80%)

Table (6) comparison in clinical characteristics between patients with LMCA lesion and those with LMCA +RCA lesions

	LMCA lesion	LMCA+RCA	P
	(Number =8)	(Number =32)	Value
Age (year)	58±6.54	60.5±8.35	NS
Male	6(75%)	27(84%)	NS
D.M	3(37.5%)	14(43.7%)	NS
ACS	2(25%)	25(78%)	<0.005
CSA	6(75%)	7(22%)	<0.01
L.V.Dysfunction	0	10(31%)	NS
Q Wave inferior	0	3(9%)	NS
Q Wave anterior	2(25%)	4(12%)	NS
Non specific ECG	4(50%)	11(34.4%)	NS
S-T depression	2(25%)	14(43%)	NS

Table (7) treadmill test characteristics of 13 patients with CSA and LMCA disease.

Treadmill characteristics	Number and percentage
Duration (minutes)	3.7±2.3
Functional capacity (METs)	4.5±2.46
Positive test	10(76.9%)
Significant S-T depression	9(69%)
Significant S-T elevation	1(7.69%)
Chest pain	11(84.6%)
With significant ECG changes	10(76.9%)
Without significant ECG	1(7.69%)

changes	
Ventricular bigeminy	1(7.69%)
Negative test	0
Non conclusive test (suggestive of IHD)	3

Table (8) comparison between those with ACS and those with CSA in 40 Patients with LMCA disease.

	CSA (Number=15)	ACS (Number =25)	P value
Age (year)	58.38±8.80	60.36±7.44	NS
Male	12 (80%)	23 (92%)	NS
LMCA lesion diffuse	1 (6.6%)	4 (16%)	NS
Distal LMCA	13(86.6%)	19 (76%)	NS
Proximal LMCA	1(6.6%)	2(8%)	NS
L.V. dysfunction	3(20%)	8(32%)	NS
DM	5(33%)	10(40%)	NS
Hypertension	10(66%)	12(48%)	NS
Smoking	9(60%)	15(60%)	NS

Base line characteristics are shown in table (1), mean age was 60 ±8 years, most patients were males (82%), more than half of those patients were hypertensive and 62% of them were smokers.

Three fourth of patients have normal L.V.function (table2) and 40% of them have normal ECG (table3). Table (4) showed that three fourth of those patients have distal LMCA disease, most patients have additional left anterior descending (LAD) and or left circumflex (LCX) disease .RCA was critically diseased in 80% of patients.

Table (6) showed comparison between those with LMCA disease and those with LMCA and RCA disease.

The incidence of ACS among those with LMCA and RCA disease is significantly higher than that in patients with LMCA disease only (with or with out LAD and LCX lesions). However those patients with LMCA disease only were commonly presented with CSA in comparison with those with combined LMCA and RCA lesions .In addition no significant difference in age, gender, the presence of diabetes mellitus, L.V. dysfunction, or ECG changes between the two groups were noted.

Table (7) shows the results of exercise ECG tests in 13 patients with CSA and LMCA disease, the tests were positive in 76.9% of patients, they have poor functional capacity with mean exercise duration of 3.7 ±2.3 minutes and they could only achieve 4.5 ±2.4 METs.

The tests were non conclusive in 3 patients, one developed chest pain without significant ECG changes, the second developed ventricular bigeminy without chest pain or significant ECG changes and the third developed fatigue early in the test necessitating cessation of the test at second minutes prior to the achievement of the targeted heart rate .No one among the 13 patients developed hypotension or failure of the blood pressure to increase appropriately with exercise.

Table (8) shows comparison between those patients who have LMCA and ACS and those with LMCA and CSA.

No significant differences were found between the two groups in regard to age, gender, lesion characteristics, involvement of RCA, L.V. dysfunction and the incidence of diabetes mellitus, hypertension, or smoking.

Discussion:

This is a retrospective study assessing the characteristics of patients with LMCA disease.

In this study the mean age of patients was 60±8 years and was in concordance with study done at cardiothoracic unit in St., Maryis hospital in London, UK (9) on patients with significant LMCA disease. In this study the mean age of patients with LMCA disease was 61.3 years, another study done by Pope JH, et al (10) showed that high risk patients with unstable angina were more prevalent among patients 60 years and older.

82% of patients with significant LMCA disease were males. Several studies done by Cannon CP, et al, Goldman L et al and Haines DE, et al (2,11,12) showed that high grade CAD including significant LMCA disease were more prevalent among men below age of 65 years than women by at least three folds, because women under 65 years were still under the protective effect of estrogen.

62.5% of patients with significant LMCA disease presented with ACS, while 37.5% with CSA. This reflect the high risk score of such group of patients on one hand and that the majority of patients were referred to our hospital (tertiary care center), were unstable patients, and LMCA disease may reflect a higher atherosclerotic burden render them to present as ACS.

75% of patients with significant LMCA disease were having normal left ventricular function, where as in a study done by Cartier R, et al (13), on 130 patients with significant LMCA disease requiring CABG up to 50% of patients having normal left ventricular function.

In about 75% of patients the site of the lesion were distal LMCA, a study conducted in the interventional cardiology unit, clinique Pasteur Toulouse, France (14) showed that the distal part of the LMCA were involved in more than 50% of the lesions in patients with significant LMCA disease and this is probably attributed to increased turbulent flow at the bifurcation of the LMCA leading to increased atherosclerotic process.

In more than three fourth of patients, the LAD and RCA vessels were involved and in more than half the LCX was involved as well, which probably

reflect the diffuse atherosclerotic process in such high risk group of patients.

ACS was more prevalent in the group of patients with combined LMCA and RCA lesions than in group without RCA involvement and the reverse was true for CSA. Which my be owing to the fact that patients with combined LMCA and RCA group having more diffuse atherosclerotic processes than patients in the other group, and the fact that in patients with combined LMCA and RCA disease the myocardial perfusion is impaired to the whole of the cardiac muscles which render them less stable than those with healthy RCA.

The majority of patients with LMCA disease (76.9%) who presented with CSA were having high risk treadmill test with poor functional capacity, which is characteristic for such high risk group of patients, Froelicher et al (15), found a sensitivity of more than 80% for treadmill test in patients with significant LMCA disease, also Weiner and colleagues found that high risk patients can not pass stage 1 Bruce protocol (< 4 METs) (16).

There was no significant difference between patients with ACS and CSA who have significant LMCA in regard to age, gender, lesion position, L.V. dysfunction and cardiovascular risk factors. Involvement of LMCA by significant atherosclerotic process renders the patients a high-risk category whether they present with CSA or ACS. In addition, those with LMCA lesion and CSA have high-risk features of treadmill test and this may explain the non difference in baseline characteristics between the two groups of patients.

There were no mortality or acute myocardial infarction as a complication of cardiac catheterization, Johnson LW, et al reported 0.94 percent mortality in patients with significant LMCA disease as a complication during cardiac catheterization (17), our results may be explained by the limited number of patients in our study and that most of the high risk patients were catheterized by the most senior cardiologist available in the catheterization laboratory.

Conclusion:

LMCA disease is not uncommon among those with ischemic heart disease.

Patients with LMCA disease are usually men at their sixties with multiple cardiovascular risk factors.

Patients with LMCA disease, usually have poor functional capacity and their exercise test are commonly positive and of high risk score.

Involvement of RCA in addition to LMCA renders the patients more unstable.

References

(1) Caracciolo EA, Davis KB, Sopoko G, et al: Comparison of medical and surgical groups survival in patients with left main stem equivalent coronary artery disease, long term CASS experience, Circulation 1995,91:2335.

(2) Cannon CP, McCabe CH,Stone PH, et al:The electrocardiogram predict one-year out come of patients wiyh unstable angina and non-Q wave myocardial infarction :Results of the TIMI III Registry ECG Ancillary Study .J Am Cardiol 1997, 30:133-140.

(3) The TIMI IIIB Investigator: Effects of tissue plasminogen activator and a comparison of early invasive and conservative strategies in unstable angina and non-Q-wave myocardial infarction: Results of TIMI IIIB Trail. Circulation 1994, 89:1545-1556.

(4) Miranda CP, LehmannKG, and Froelicher VF: correlation between resting ST segment depression, exercise testing, coronary angiography, and long term prognosis. Am H J 1991, 122:1617.

(5) Bogaty P, Guidmond J, Robitaille NM, et al: A reappraisal of exercise ECG indexes of the severity of ischemic heart disease: Angiographic and scintigraphic correlates J Am Coll. Cardiol 1998,313:582.

(6) Nico HJ, Pijls NH, Debruyne B, Peels K, Pepijm H, Voort VD, et al; measurement of fractional flow reserve to assess the fractional severity of coronary artery stenosis, N Engl. J Med. 1996,334:1703.

(7) Little WC, Assessment of normal and abnormal cardiac function .In: Braunwald E, Zipes DP, Libby P editors. Heart disease, A textbook of cardiovascular medicine .6th ed. Philadelphia: W.B. Saunders company: 2001,P479_502.

(8) Daniel WW. Biostatistics: A foundation for analysis in the health sciences. Third edition. . New York: John Wiley & Sons; 1998.

(9) Andrson RE, Hansson LO, VaageJ.Release of S100B during CABG is reduced by off-pump surgery .Ann Thorac Surg1999, 67(6): 1721-5.

(10) Pope JH, Ruthazer R, Beshansky JR, et al: Clinical feature of emergency department patients presenting with symptoms suggestive of acute cardiac ischemia. A multicenter study J Thromb Thrombolysis 1998,6:63-74.

(11) Goldman L, Cook EF, Brand DA, et al: A computer protocol to predict myocardial infarction in emergency department patients with chest pain. N Engl J Med. 1998, 318:797-803.

(12) Haines DE, Raabe DS, Gundle WD, Wackers FJ: Anatomic and prognostic significance of new T-wave inversion in unstable angina .Am J Cardiol 1983, 52:14-18.

(13) Cartier R, Braun S, Martineau R, et al. LMCA stenosis and revascularization in beating heart, short and long term experience .Ann Chir 1999, 53(8): 701-5.

(14) Karam C, fajadet J, cassagueau B, Laurent JP, Jordan C, labored JC, et al. Results of stenting of un protected LMCA in patients at high surgical risk .Am J Cardiol 1998,82: 975.

(15)Froelicher VF,Myers J:Exercise and the heart 3ed ed.Philadelphia W.B,Saunders 1999.

(16)Weiner DH,Ryan T,McCabe CH,et al:prognostic importance of a clinical profile and exercise test in medically treated patients with coronary artery disease .J Am Coll Cardiol 1984, 3:772.

(17)Johnson LW,Lozner EC,Johnson S et al :coronary angiography .1984-1987.Areport of the registry of the society for the cardiac Angiography and intervention Results and Complication .Cathet Cardiovasc Diagn 1989, 17:5