Coronary Angiographic Profile of Left Ventricular Systolic Dysfunction of Unknown Causes in Kashmir

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ABSTRACT

Introduction: Coronary artery disease (CAD) contributes significantly to the development of Heart failure in both developed and developing countries. Recognition of CAD in these patients significantly alters the management strategy. This study was aimed at assessing the prevalence of coronary disease in the patient with Left Ventricular systolic dysfunction of unknown cause

Material and Methods: This prospective study enrolled all the consecutive patients with LV systolic dysfunction of unknown cause and Status of coronary arteries of eligible patients was assessed with coronary angiogram.

Results: A total of 145 patients were enrolled in this study. Mean age of the patients was 53.4±7.43 years. There were 91(62.8%) males and 54(37.2%) females. Dyspnea on exertion (DOE) was presenting symptom in 71(51.7%), Angina on exertion (AOE) in 15(10.3%), DOE & AOE in 47(32%), and Unstable angina (UA) in 08(5.5%) of cases. Hypertension was the risk factor in 88(60.7%), diabetes in 35(24.13%), smoking in 60(41.4%) and dyslipidemia in 32(22.06%) cases. Echocardiography of study patients revealed, mild LV dysfunction (EF=40%-49%) in 57 (39.7%) patients, moderate LV dysfunction (EF=30%-39%) in 71 (49%) patients and sever LV dysfunction (EF<30%) in 17 (11.7%) patients.

Conclusion: coronary artery disease contributes significantly to development of LV systolic dysfunction of unknown cause and its presence significantly alters the management and prognosis in these patients.

Keywords: LV systolic dysfunction, coronary angiography, Coronary artery disease.

INTRODUCTION

A variety of cardiac disorders culminate finally by various cascade into Left ventricular systolic (LV) dysfunction with subsequent congestive heart failure (CHF). Luminal narrowing of Coronary arteries leading to ischemic heart disease is the dominant cause of heart failure and is often associated with acute or prior myocardial infarction (MI). The other causes of LV dysfunction leading to heart failure include cardiomyopathy, hypertension, valvular heart disease and myocarditis.[1]

Ischemic heart disease (IHD) accounts for approximately two thirds of cases of patients with heart failure with reduced ejection fraction in US.[2] IHD is currently the second most common etiology after rheumatic heart disease in India.[3] The term ischemic cardiomyopathy has been used to describe significantly impaired left ventricular function that results from coronary artery disease. There are two main pathogenetic mechanisms, which are importantly distinguished by the possibility of corrective therapy: First the Irreversible loss of myocardium due to prior myocardial infarction with ventricular remodeling. Recovery of myocardial function in such patients cannot be achieved by coronary revascularization since the infarcted tissue is not viable. Second, at least partially reversible loss of contractility due to reduced function of ischemic but still viable myocardium, which can be detected on imaging studies. Hibernating myocardium is typically used interchangeably with viable myocardium. However, by strict definition, the term hibernating myocardium refers to contractile dysfunction in viable myocardium that improves after revascularization or perhaps medical therapy.[4,5]

The etiological differentiation of LV dysfunction into ischemic cardiomyopathy and non-ischemic cardiomyopathy (DCM) is crucial in clinical practice for several reasons. Patients with heart failure of ischemic origin have a poorer prognosis when compared to other etiologies.[6,7,8] The potential benefit of myocardial revascularization procedures and pharmacotherapy in the secondary prevention of cardiovascular disease is also a key factor that should be considered in therapeutic decision-making. In many centers, coronary angiography is routinely performed for this task. In those patients with unobstructed coronary arteries and no other etiological factor, the diagnosis of DCM is usually made. Patients with heart failure are considered as having ischemic etiology when they have a history of myocardial infarction, revascularization procedure, or angiographic evidence of obstructive coronary artery disease.[9] Noninvasive methods to assess myocardial ischemia in this population are of limited use, as the presence of perfusion deficits and alterations in segmental mobility are often present in patients with non-ischemic heart disease.[10,11] Thus, the assessment of the coronary anatomy by means of cardiac catheterization

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is considered the procedure of choice for the investigation of ischemic heart disease in patients with heart failure with reduced ejection fraction of unknown etiology.[12]

Current study aimed to study the incidence of coronary artery disease (CAD) in patients of LV dysfunction of unknown etiology and to assess distribution and severity of CAD visa-vis possible etiological role in the genesis of LV dysfunction.

MATERIAL AND METHODS

This prospective, observational and non-randomized study was conducted in the Department of Cardiology at Sher-i-Kashmir Institute of Medical Sciences (SKIMS) Soura, Srinagar, Jammu & Kashmir. Study subjects were recruited from July 2016, for a period of 2 years.

Study population

This study included 145 consecutive patients of diagnosed LV systolic dysfunction (EF<50%), without known etiology, who full filled the eligibility criteria described below.

Inclusion criteria

1. Patients with age > 18 years.
2. Asymptomatic / symptomatic patients with LV systolic dysfunction (EF<50%) of unknown etiology.
3. Patients with no known contraindication to invasive CAG.
4. Patients willing to undergo invasive CAG.

Exclusion criteria

1. Patients who are known cases of CAD [CAG documented CAD, previous myocardial infarction (MI) or revascularization].
2. Patients with valvular and congenital heart disease.
3. Drug / toxin induced LV dysfunction.
4. Peripartum cardiomyopathy.
5. Patients with previous documented myocarditis.
6. Patients with known contraindication to invasive CAG.
7. Patients who did not consented for invasive CAG.

After obtaining informed consent, coronary angiography (CAG) was performed in all cases. CAG was performed by using femoral or radial route depending upon the operator preference. All coronary arteriograms were assessed by two expert interventional cardiologists, who were blinded to the clinical details of the patient. Coronary artery disease (CAD) was defined as the presence of any atherosclerotic plaque in major epicardial coronary artery or its first order branches. Significant CAD was defined as ≥ 50% diameter stenosis of left main coronary artery (LMCA) or ≥ 70% diameter stenosis of other epicardial coronary arteries, when compared with the adjacent normal part of the coronary artery. CAD was classified as single vessel disease (SVD), double vessel disease (DVD) and triple vessel disease (TVD) depending upon the number of major epicardial arteries with significant involvement (≥50% diameter stenosis). CAD with <50% diameter stenosis of one or more major epicardial vessels was classified as non-obstructive CAD. In patients with intermediate stenosis (50%-70%) FFR (fractional flow reserve) was performed where ever possible. Patients with significant LMCA disease, SVD / DVD involving proximal LAD and TVD were considered to have LV dysfunction secondary to CAD.[9,13,14] Statistical analysis was done using SPSS Version 23.

RESULTS

In this study we enrolled 145 consecutive patients with LV dysfunction of unknown etiology. Mean age of patients was 53.4±7.43 years. Out of 145 patients of LV dysfunction of unclear etiology, 91 (62.8%) were males and 54 (37.2%) were females. Male to female ratio in our study was 1.7:1. Most of the study patients (71%) belonged to rural areas while 29% were from urban areas.

Presenting symptoms in study patients of LV systolic dysfunction were dyspnea on exertion (D.O.E), angina on exertion (A.O.E), both D.O.E and A.O.E, unstable angina (U.A) as shown in table 01.Overall D.O.E was most common presenting symptoms in 84.1% of study patients, followed by A.O.E in 42.7% patients

Hypertension was noted as the most common risk factor with 88(60.7%) patients having this risk factor for coronary artery disease. Smoking was the second most common risk factor followed by diabetes and dyslipidemia. There was no patient with family history of coronary heart disease as shown in table 02.

Most common ECG abnormality was left bundle branch block (LBBB), was present in 75 (51.7%) patients. 44 (30.3%) patients had normal ECG, 10 (6.9%) had poor R wave progression (RWP), 6 (4.1%) had atrial fibrillation (AF), 5 (3.4%) had Q waves, 3 (2.1%) had PM rhythm and 2 (1.4%) had bifascicular block as primary ECG abnormality.

Echocardiography of study patients revealed, mild LV dysfunction (EF=40%-49%) in 57 (39.7%) patients, moderate LV dysfunction (EF=30%-39%) in 71 (49%) patients and sever LV dysfunction (EF<30%) in 17 (11.7%) patients. Mean EF±SD was 32.3±8.4.

Angiographic characteristics of the study population is depicted in the table 03. Out of 145 patients coronary artery disease was found in 38(26.2%) of cases. Significant coronary artery disease to cause LV systolic dysfunction was seen in 15(10.3%) of the study population. Single vessel disease (SVD) was the most common pattern of involvement and left anterior descending coronary artery(LAD) was the most common artery involved in the case with coronary artery disease.

Analyzing the severity LAD lesion in CAD patients, the study found <50% diameter stenosis in 4 (10.5%) patients, 50-69% diameter stenosis in 3 (7.9%) patients and ≥70% diameter stenosis in 23 (60.5%) patients. Severity of LCX lesion in CAD patients was: <50% in 6 (15.8%) patients, 50-69% in 1

Symptom	N (%)
DOE	75(51.7)
AOE	15(10.3)
DOE&AOE	47(32.4)
UA	08(5.5)
Total	145(100)

Table-1: Presenting symptom

Risk factor	Hypertension	Diabetes	Smoking	Dyslipidemia	Family history
N (%)	88(60.7%)	35(24.13%)	60(41.4%)	32(22.06)	0(0.0%)

Table-2: Risk factors for CAD

N (%)		
Coronary artery disease(CAD)		
	Present	38(26.2)
	Absent	107(73.8)
	Total	145(100)
Significant CAD		
	Present	15(10.3)
	Absent	130(89.7)
	Total	145(100)
Number of vessels involved		
	SVD	20(52.6)
	DVD	5(13.1)
	TVD	8(21.0)
	Total	38(100)
Coronary artery involved		
	LAD	30(78.9)
	LCX	19(50)
	RCA	16(42)
	LM	0(0)

Table-3: Angiographic Profile of the Study Population

(2.6%) patient and ≥70% in 12 (31.6%) patients. RCA lesion severity in CAD patients was: <50% in 1 (2.6%) patient, 50-69% in 6 (15.8%) patients and ≥70% in 9 (23.7%) patients.

DISCUSSION

In this study 145 consecutive patients were enrolled with LV systolic dysfunction (EF<50%) of unknown etiology. Out of 145 patients included in the study, 91 were male and 54 were females with mean age of 53.4±7.43. Of them 88 (60.7%) were hypertensive, 60 (41.4%) were smokers, 28 (19.3%) were diabetic. Dyslipidemia (LDL>130 mg/dl)(39) was present in 13 (9%) and 15 (10.3%) were hypothyroid. Most common presenting symptom was dyspnea on exertion (84.1%) followed by

angina on exertion (42.7%). Most common primary ECG abnormality was LBBB (51.7%) and mean ejection fraction of study patients was 32.3±8.4%. Coronary angiography was performed in all study patients.

The main findings in this study were,

1. CAD was present in 38 (26.2%) study patients.
2. CAD significant to cause LV systolic dysfunction was present in 15 (10.3%) study patients.
3. Most of CAD patients 20 (52.6%) had single vessel disease.
4. Most common vessel affected was LAD [30 (78.9%) CAD Patients]. Of them 23 (76.6%) had ≥70% diameter stenosis of LAD.

In many patients with LV systolic dysfunction, the etiology is apparent such as previous known CAD or valvular heart disease. CAD is the most common cause of LV systolic dysfunction both in developed and developing countries. However a substantial number of patients have LV systolic dysfunction of uncertain etiology.[7] In these patients identifying the ischemic disease (CAD) as primary etiology, not only has treatment and prognostic implications but is also associated with worse long term outcomes.[7,8] In these patients cardiovascular risk factors or ongoing typical angina is not enough to diagnose an ischemic etiology. Because many patients with significant CAD might not report angina nor have a clear history of previous MI especially diabetics and females and many patients with LV systolic dysfunction due to non-ischemic cardiomyopathy experience angina.[15] In these patients coronary angiography is the procedure of choice for detection of CAD.[10]

Our study showed CAD was present 26.2% patients with LV dysfunction of unknown etiology and 10.3% patients had significant CAD to cause LV systolic dysfunction. This justifies use of CAG and CAD may have a role in causing LV systolic dysfunction in this patient population. Western studies have shown, nearly one fourth to one third patients of LV dysfunction of unknown etiology had CAD (31% by Filipa Silva et al[17], 28.2% by Jeremias Bayon et al.[18]) Similar observations were shown in India (27% by Ramachandra Barik et al[19], 30% by S. Saraf et al.[20]).

Our study showed results that were consistent with these studies that CAD was present in 26.2% patients of LV dysfunction of unknown etiology.

Our study showed that significant CAD was present in 10.3% study patients (39.5% CAD patients). Similar observations were shown by other studies (9.3% by Rodrigo M Orel de Melo et al[21], 23.1% of 31% CAD patients by Filipa Silva et al[17], 15% by Rami Doukky et al[22], 13% by Figulla H R et al[23], 16% by Ramachandra Barik et al[19], 20% by S. Saraf et al.[20]) The differences noted in study results were attributed to use of more or less rigid criteria for patient selection and non uniformity of the definition of significant CAD used in these studies.

In our study out of 38 CAD patients, 20 (52.6%) patients had SVD, 5 (13.1%) had DVD, 8 (21%) had TVD and 5 (13.1%) had nonobstructive CAD. Most of the CAD patients had SVD (52.6%). Similar angiographic data was shown by Jeremias Bayon et al[18], 44.4% patients had SVD (most common), 26.4% had DVD and 29.2% had TVD. The differences noted between results of these studies were attributed to <50% diameter stenosis was grouped as non-obstructive CAD in our study.

While analysing lesion distribution in patients having CAD, our study showed LAD lesion in 78.9% patients (most common vessel affected), LCX in 50% and RCA in 42.1%. Similar angiographic data was shown by Jeremias Bayon et al[18], LAD lesion in 66.3% patients (most common vessel affected), LCX in 53%, RCA in 63.2% and LMCA in 5.9%. The difference noted was absence of LMCA involvement in our study.

CONCLUSION

This study shows presence of coronary artery disease in significant proportions in patients with LV dysfunction without prior history ischemic heart disease. The incidence of angiographically significant CAD was high, suggesting that routine CAG should be considered in patients of LV systolic dysfunction of unknown etiology.

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