Long term clinical follow up of patients with double vessel coronary artery disease not involving left anterior descending artery

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Abstract

Background and objectives- Association between flow limiting proximal left anterior descending artery lesion and adverse outcome is well established. However, the impact of combined flow limiting stenosis of circumflex artery and right coronary artery in the absence of significant left anterior descending artery stenosis has not been established conclusively.

Methods – By reviewing cardiac catheterization records performed between 1999 and 2002, 98 patients with two vessel coronary artery disease not involving left anterior descending artery were identified. Follow up data till 2006 was obtained from medical records and reevaluated clinically and with electrocardiography and echocardiography in 2006.

Results- 59.2% patients underwent medical therapy, 36.7% patients underwent percutaneous coronary intervention and 6.1% patients underwent coronary artery bypass grafting. 8.2% patients had left ventricular systolic dysfunction. 7.1 % of patients have significant mitral regurgitation. Two patients died during follow up period.

Conclusion- Left ventricular dysfunction and mitral regurgitation occurs in a significant number of patients with combined disease involving circumflex artery and right coronary artery.

Key words- Double vessel coronary artery disease, mitral regurgitation, left ventricular dysfunction

Introduction

The prognostic importance of left anterior descending artery stenosis in long-term clinical outcome of coronary artery disease is well established. However, the outcome associated with involvement of the other two coronary arteries without involvement of left anterior descending artery and its natural history is not well established. Previous available data showed 35.4% mortality in this subgroup over a period of observation of 6 – 11 years. However the current natural history in this era of revascularization and the incidence and impact of mitral regurgitation on outcome are not clearly established.

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The outcome after inferior wall myocardial infarction is generally favorable over the long term provided these patients survive the acute episode\textsuperscript{2,9,10}. The important predictor of favorable long-term outcome after infarction is left ventricular systolic function, which is usually preserved in these patients, and contributes favorably to the outcome. The major contributor for adverse outcome in these patients would be recurrent ischemic events, the incidence of which would depend upon presence of atherosclerotic disease in other coronary arteries. Ischemic mitral regurgitation and consequent remodeling and left ventricular dysfunction and arrhythmia are the other predictors of adverse outcome.

Natural history studies on two-vessel disease not involving left anterior descending artery are sparse. In the available data, particular aspects such as left ventricular function, mitral regurgitation and influence of revascularization on these aspects and on natural history are not available.

**Materials and methods**

**Study population**

Angiography reports of consecutive patients between 1-1-1999 and 31-12-2002 were reviewed retrospectively. Patients with flow limiting lesions in right coronary artery and circumflex artery (defined as diameter stenosis >70%) without flow limiting lesions in left anterior descending artery were identified. Clinical characteristics of these patients, left ventricular function, presence and severity of mitral regurgitation and treatment modality were obtained from case records.

Based on ECG and echocardiographic findings patients with myocardial infarction were divided into inferior wall myocardial infarction [pathological Q waves in leads II, III, aVF only and no regional wall motion abnormality (RWMA) of lateral wall], inferolateral infarction [pathological Q waves in II, III, aVF and I, aVL or pathological Q waves in II, III, aVF along with T inversions in lateral leads and wall motion abnormality of inferoposterior wall and lateral wall] and lateral wall infarction [pathological Q waves in I, aVL and wall motion abnormality involving only lateral wall].

**Table. 1**

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<th>Pathological Q in II, III, aVF</th>
<th>Pathological Q in I, aVL and/or T inversions in I, aVL, VS, V6</th>
<th>RWMA of Inferior wall</th>
<th>RWMA of lateral wall</th>
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<td>Lateral MI</td>
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Statistical methods
Continuous variables were assessed by students T test. Categorical variables were assessed by chi-square test. P value <0.05 was considered as significant.

Results
Baseline data (Table 2)
Demography
98 patients with double vessel disease not involving left anterior descending artery was identified, 86 males and 12 females. Age at presentation ranged between 35-76 years. 94 patients had at least one major risk factor for atherosclerosis

Clinical presentation
64.3 % patients had ST elevation myocardial infarction, 17.3 % patients presented with stable angina, 13.3 % patients presented with unstable angina/ non-ST elevation myocardial infarction. 5.1 % of patients were not symptomatic. 5.1 % patients experienced multiple acute coronary syndromes in the past.

Location of coronary stenosis
14.3 % patients had disease involving proximal right coronary artery, 37.8 % had mid right coronary artery stenosis and 47.9 % had lesion involving distal right coronary artery or posterior descending artery.

40.8 % patients had involvement of proximal circumflex artery involvement, 37.8 % patients had disease involving distal circumflex artery and 46.9 % patients had disease of major obtuse marginal branch. 5.1 % patients had disease of ramus intermedias artery.

Left ventricular function
91.8 % patients had normal LV function. 8.2 % patients had left ventricular systolic dysfunction noted at first evaluation. 6.1 % patients had mild LV dysfunction and 2 % patients had moderate LV dysfunction. LV systolic dysfunction correlated with presence of inferolateral wall myocardial infarction. No correlation was noticed between location of coronary stenosis and presence of LV dysfunction(r = 0.3). No correlation was observed between presence of significant mitral regurgitation and LV dysfunction.

Mitral regurgitation
50 % patients had some degree of mitral regurgitation. Significant mitral regurgitation was noted in 5 patients (4 patients had moderate mitral regurgitation and 1 patient had severe mitral regurgitation). No patient had papillary muscle or chordal rupture. Presence of significant mitral regurgitation was correlated with infero-lateral infarction. No correlation was noted between mitral regurgitation and coronary lesion location or LV dysfunction.

Treatment modality
36.7 % patients underwent successful percutaneous coronary intervention (PCI). 15.3 % patients underwent PCI to right coronary artery, 11.2 % patients underwent PCI to circumflex artery and 10.1 % patients underwent double vessel PCI. 6.1 % patients underwent coronary artery bypass grafting. 57.1 % patients underwent medical therapy, which included 6.1 % patients where PCI was not successful and 8.2 % patients who declined revascularization. All patients with LV dysfunction and 4 patients with significant mitral regurgitation underwent revascularization. No patient underwent mitral valve surgery.

Follow up data
Follow up data is available for 80 patients. 61 patients came personally for follow-up and 19 patients informed their clinical status via letter or phone call. Mean follow-up duration was 3.96 years (range 2-7 years). Follow-up was complete for patients with LV dysfunction and significant mitral regurgitation.

Left ventricular function
Only one patient with normal LV function at presentation went on to develop LV dysfunction on follow-up related to remodeling. No further deterioration in LV function was noticed in patients.
with LV dysfunction at presentation. All patients with LV dysfunction underwent revascularization. One patient had good improvement in LV function after revascularization.

**Mitral regurgitation**

Reduction in severity of mitral regurgitation was noted in one patient (from moderate to mild) after revascularization. Mitral regurgitation severity remained unchanged in other 4 patients. 2 patients developed worsening of severity of mitral regurgitation from mild to moderate. In one patient it was attributed to in-stent restenosis and mitral regurgitation regressed after repeat revascularization. In the other patient mitral regurgitation worsened subsequent to development of LV dysfunction.

**Recurrent ischemic events**

15 patients developed acute coronary syndrome during follow-up (1 patient sustained ST elevation inferior wall infarction, others had unstable angina/Non ST elevation infarction). In 4 patients, recurrent ischemic event was related to in-stent restenosis.

**Mortality**

Two patients died during follow-up period. One patient had sudden cardiac death and in the other patient death was attributable to coexisting severe aortic stenosis (this patient declined surgery)

**Repeat coronary angiography**

15 patients with recurrent ischemic events underwent coronary angiography on follow-up after a mean interval of 2.73 years. Native lesion progression was observed in only one patient. 4 patients developed in-stent restenosis. 5 patients developed new lesion in left anterior descending artery. Revascularization was performed in 5 patients and 4 patients opted for medical therapy on personal grounds. Medical therapy was advised for the other 6 patients

**Arrhythmia**

Complete heart block requiring pacemaker implantation was observed in 3 patients (in one patient complete heart block occurred along with acute inferior wall myocardial infarction). Permanent atrial fibrillation was observed in only one patient.

**Other observations**

9 patients had atherosclerotic disease involving abdominal aorta and lower limb vessels (3 patients had infra renal aortic aneurysm and 6 had occlusive arterial disease)

**Discussion**

Left ventricular systolic dysfunction and mitral regurgitation are established predictors of adverse outcome in patients with coronary artery disease. This study demonstrated that both these predictors are prevalent in a significant number of patients without disease of left anterior descending artery.

Presence of double vessel disease without involvement of left anterior descending artery and with infarction in one of the vessels identifies a subgroup of the coronary artery disease cohort where left ventricular systolic
dysfunction and mitral regurgitation may be anticipated. These are attributable to the large ischemic myocardium, papillary muscle ischemia and extent of infarcted myocardium. Postero-medial papillary muscle derives its blood supply from posterior descending artery and antero-lateral papillary muscle derives dual supply from left anterior descending artery and circumflex artery. Combined ischemia results in ischemia of both papillary muscles and could result in significant mitral regurgitation. Prompt revascularization in this subgroup may improve the outcome in some of these patients.

LV dysfunction and significant mitral regurgitation was not observed in any of the patients who have not infarcted. These patients can be salvaged from mitral regurgitation and LV dysfunction by prompt revascularization.

Left ventricular dysfunction and significant mitral regurgitation was noted in the susceptible group from the period of initial evaluation onwards, in majority. Only correlate noticed was large infarction involving inferior and lateral walls.

However there was no correlation between significant mitral regurgitation and left ventricular dysfunction, suggesting that pathogenesis of these two complications are different. Mitral regurgitation is attributable to ischemia and papillary muscle dysfunction whereas LV dysfunction may suggest more of infarcted myocardium. This indirectly suggests that revascularization would benefit patients with mitral regurgitation much more compared with patients having LV dysfunction -either regressing or preventing progression of mitral regurgitation.

Paucity of surgical revascularization in this subgroup is notable highlighting the reduced significance given by cardiologists for coronary artery disease not involving left anterior descending artery, which may not be correct.

Mortality associated with double vessel disease over intermediate follow up was less even in the presence of left ventricular dysfunction, which may be attributable to revascularization in this study.

Conclusions

Left ventricular dysfunction and mitral regurgitation occurs in a significant number of patients with combined disease involving circumflex artery and right coronary artery. Coronary revascularization is beneficial in long-term favorable prognosis associated with cohort.

Limitations

Though patients with clinical events were called back and examined clinically, the paper still has the limitations of a retrospective study. Missing follow-up of 18 patients prevented us from an ideal natural history study. Shorter follow-up duration may not be sufficient for the adverse outcomes of left ventricular dysfunction and mitral regurgitation to manifest.

References