

Clinical Outcomes after Triple Vessel Angioplasty in Diabetic Patients with Triple Vessel Coronary Artery Disease

Ashraf Safiya Manzil

Department of Cardiology, Pariyaram Medical College, Kannur, Kerala, INDIA.

ABSTRACT

Background: This study was intended to evaluate clinical outcomes in diabetic patients who underwent triple vessel angioplasty for treatment of triple vessel coronary artery disease. **Methods:** This was an observational, single centred study, which included a total of 27 diabetic patients who underwent triple vessel angioplasty at a tertiary care hospital from May 2010 to July 2012. The study describes the clinical profile of the patients and a moderate term clinical follow-up to reassess the symptoms, functional status and left ventricular function by history, electrocardiogram, echocardiogram, and treadmill test. Mortality and morbidity were considered as end-points of the study. **Results:** Of 27 patients, 18 were males, and 55.6% were hypertensive. 70.4% of patients had normal left ventricular function. Total number lesions were 97 and the total stents implanted were 85. Event-free survival rate was 92.6% at a mean follow-up of 20.3 months. Overall 100% continued success was obtained with triple vessel angioplasty. **Conclusion:** Triple vessel angioplasty can be applied as favourable therapy as an alternative to surgical revascularization in selected diabetic patients. However, larger studies with long-term follow-up would warrant the effectiveness of triple vessel angioplasty in such patients.

Key words: Angioplasty, Coronary Artery Disease, Diabetes, Multivessel Disease, Stents.

Correspondence

Dr. Ashraf Safiya Manzil

DM, Professor & Head, Pariyaram Medical College, Pariyaram, Kannur, Kerala 670503, INDIA.

Ph.no: +91 9447486033

E-mail address: ashsmfz@yahoo.com

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INTRODUCTION

Globally, the prevalence of diabetes mellitus has been escalating since decades in affecting millions of people.¹ Diabetes poses to be a risk factor for cardiovascular disease, contributing to higher rates of myocardial infarction and cardiovascular mortality.^{2,3} Coexistence of diabetes and coronary artery disease (CAD) has been associated with increased mortality and morbidity, because diabetic patients have allied with larger burden of atherogenic risk factors, like hypertension, obesity, dyslipidemia, insulin resistance, elevated levels of plasma fibrinogen,⁴ enhanced platelet reactivity and reduced responsiveness to antiplatelet agents.^{5,6} Moreover, literature suggests that diabetics have smaller coronary vessel diameter, diffused lesions, and probably a dissimilar restenotic cascade than non-diabetic patients, thus being highly liable to atherosclerosis and having a greater requirement for undergoing repeat revascularizations,^{7,8,9} thus leading to poor prognosis in such patients.^{3,4,5,6,7,8,9,10}

Optimal approach for treating multivessel coronary disease has been controversial¹¹ and triple vessel stenosis in diabetic patients make the matter worse. Though coronary artery bypass surgery (CABG) had been the conventional treatment for triple vessel disease,^{12,13,14} due to presence of some limitations like angiographic features related to the extent, location, and nature of CAD, as well as geographic, demographic and clinical factors; preference of approach shifts to percutaneous coronary intervention (PCI) instead of CABG.¹⁵ In addition, some patients have been poor candidates for CABG, like those with disease in distal vessel, severe systemic illness, severe left ventricular dysfunction and previous bypass surgeries.¹⁶

The dispute on consideration of PCI or CABG had been ongoing, but the advent of DES has been promising since it has exhibited reduction in restenosis rates in diabetic patients.^{17,18} Thus, in this study we intended to evaluate clinical outcomes in diabetic patients who underwent triple vessel angioplasty for treatment of triple vessel coronary artery disease.

MATERIALS AND METHODS

This was an observational, single centred study, which included a total of 27 diabetic patients who underwent triple vessel angioplasty at a ter-

tiary care hospital from May 2010 to July 2012. Patients with presence of $\geq 50\%$ stenosis in each of the three major vessels i.e., the left anterior descending artery (LAD), the left circumflex artery (LCX) and the right coronary artery (RCA) and angiographically determined lesions suitable for angioplasty were included in the study.

The patients were excluded if they had multiple chronic total occlusions (CTO) and severe diffuse disease, wherein surgery was considered to offer a more complete revascularisation at a lower risk or if they refused to give consent for follow-up and data release.

Details pertaining to the patient's history prior to revascularisation, the coronary risk factors, left ventricular function (LVF), and severity of the lesions and details of the procedure were taken from the hospital records. These patients were followed-up to reassess their functional status and LVF by history, electrocardiogram, and echocardiogram and treadmill test. Any case of mortality was considered to be due to cardiac cause and hence a procedural failure if there was no other obvious cause like accidents. Mortality and morbidity were considered as end-points of the study.

Statistical analysis: Continuous variables were presented as mean \pm standard deviation (SD) and categorical variables as counts and percentages. All data were analysed using the Statistical Package for Social Sciences (SPSS; Chicago, IL, USA) program, version 15.

RESULTS

Of 27 patients who underwent triple vessel angioplasty, 18 were males and mean age of patients was 55 years. About 55.6% (n = 15) patients were hypertensives and 33.3% had hypercholesterolemia. Majority of patients had ST-elevation myocardial infarction (STEMI) (40.7%; n=11). Normal LVF (EF>60%) was observed in 70.4% of patients. Table 1 outlines demographic characteristics of patients. All patients had flow limiting stenosis of the RCA, LAD, and LCX. Total 81.5% (n =22/27) patients underwent PCI with stenting to all the three major vessels but the rest 5 (18.5%) patients had PCI with stenting in two vessels and plain old balloon angioplasty (POBA) in one. The mean SYNTAX score was 17.5

(range 9 to 29). The average number of lesions per patient was 3.6 and total number of stents were 85 (Table 2). The percentage of lesions successfully treated by angioplasty were 94.8% (n = 92/97). A drug eluting stent was implanted in 94.1% (n = 80/85) of instances and the rest were bare metal stents (n = 5/85). Baseline angioplasty results are outlined in Table 3.

The average time of follow-up was 20.3 months. Twenty-five (92.6%) patients had improved symptomatically or were event free. Table 4 details clinical outcomes of the patients at follow-up. Two patients (7.4%) had clinical recurrence. Two patient developed recurrent, event-free angina after 13 and 27 months of the procedure. Two patients who survived following clinical recurrence were managed medically and are at present symptom free. Thus, there was a 100% continued success with triple vessel angioplasty in diabetic patients in our study.

DISCUSSION

In various studies, PCI has demonstrated favourable outcomes in patients with multivessel CAD.^{19,20,21,22} However, the amalgamation of multivessel disease with diabetes fans the flames, leading to wrangle on selection of appropriate treatment modality. In this study, the diabetic patients with triple vessel coronary artery disease underwent PCI with either bare metal stents or drug eluting stents, or underwent balloon angioplasty and were followed up clinically. Of 27 patients, 18 were males, and 55.6% were hypertensive. Total number lesions were 97 and the total

stents implanted were 85. At an average follow-up of 20.3 months, 25 patients were event free or improved symptomatically, while 2 patients experienced angina and were managed medically. There was no mortality during this follow-up period. There have been many studies that have compared the outcomes in diabetic patients after CABG and PCI.^{23,24} Most of these studies did not indicate a compromise in survival of diabetic patients after DES implantation; stating equivalence in mortality rates among diabetic patients with multivessel disease who underwent CABG or PCI with either BMS or DES.^{25,26,27,28,29} Moreover, ARTS-II trial, at 3-year follow-up, demonstrated lower death/cerebrovascular events/MI rates in diabetic patients treated with sirolimus-eluting stents (9.4%) than those treated with CABG (13.5%) or BMS (18.8%).¹⁸ Literature suggests that diabetes has been an independent risk factor for development of stroke in patients undergoing CABG.³⁰ In accordance to this, various studies also favour PCI with DES over CABG in terms of occurrence of cerebrovascular events in such patients (OR [95%CI] = 2.15[0.99–4.68]).²⁴ Additionally, a prospective study has reported that 42% of patients who underwent CABG have subtle cognitive impairment 5 years after surgery.³¹ On contrary, many studies reveal favour towards CABG than PCI in diabetic patients with multivessel disease in terms of repeat revascularisation (OR [95%CI] = 0.30 [0.25, 0.36]), probably occurring due to diffused lesions and more vulnerable plaque in such patients.²³ However, on the bright side, PCI presents perceptible advantages of lack of operative complications like repeat thoracotomy for bleeding, postoperative pneumonia, permanent pacemaker implantation, pleural

Table 1: Baseline Characteristics of Patients

Characteristics	N = 27 patients
Age (mean ± SD, yrs)	55 ± 10
Male, n (%)	18 (66.7%)
Cardiovascular risk	
Diabetes mellitus, n (%)	27 (100%)
Hypertension, n (%)	15 (55.6%)
Hypercholesterolemia, n (%)	9 (33.3%)
Smoking or tobacco use, n (%)	4 (14.8%)
Family history of CAD, n (%)	5 (18.5%)
Cerebrovascular accident, n (%)	1 (3.7%)
Clinical presentation	
Stable angina, n (%)	3 (11.1%)
Unstable angina, n (%)	6 (22.2%)
ST-elevated myocardial infarction, n (%)	11 (40.7%)
Non ST-elevated myocardial infarction, n (%)	6 (22.2%)
Silent ischemia, n (%)	1 (3.7%)
NYHA class	
Class II, n (%)	2 (7.4%)
Class III, n (%)	8 (29.6%)
Class IV, n (%)	17 (63.0%)
LV Systolic Function	
Normal, n (%)	19 (70.4%)
Borderline, n (%)	2 (7.4%)
Mild dysfunction, n (%)	3 (11.1%)
Moderate dysfunction, n (%)	3 (11.1%)

Table 2: Lesion Characteristics of Patients

Characteristics	Patients = 27 / Lesions = 97
Lesion location	
Left anterior descending, n (%)	27 (100%)
Right coronary artery, n (%)	27 (100%)
Left circumflex, n (%)	27 (100%)
Left main, n (%)	1 (3.7%)
Ramus intermedius, n (%)	1 (3.7%)
Syntax score, (mean (range))	17.5 (9-29)
Total no. of stents	85
Average stent length, (mean ± SD, mm)	24.9 ± 7.9
Average stent diameter, (mean ± SD, mm)	3.0 ± 0.4

Table 3: Baseline Results of Angioplasty

No. of lesions	No. of patients	Total no. of lesions	No. of angioplasties attempted successfully
3	15	45	45
4	8	32	30
5	4	20	17
Total	27	97	92 (94.8%)

Table 4: Clinical Outcomes after Successful Angioplasty

Variables	N = 27 patients
Mean follow-up (mean ± SD, months)	20.3 ± 7.0
Event-free, improved, n (%)	25 (92.6%)
Clinical recurrence, n (%)	2 (7.4%)
Medical therapy, improved, n (%)	1 (3.7%)
Death, n (%)	0 (0.0%)
Continued success, n (%)	27 (100%)

effusions, renal failure requiring hemodialysis, atrial fibrillation, and ventricular tachycardia or ventricular fibrillation, which affects more than 50% of diabetic patients who underwent CABG.³² Nevertheless, the comparisons between applicability of PCI and CABG in diabetic patients have been majorly limited by the subgroup analysis of larger trials, leading to underpowered results.¹ The choice of revascularisation in diabetic patients with triple vessel disease involves a multidisciplinary approach with cardiologists and cardiac surgeons.²⁴ The decision regarding the type of treatment modality must be individualised based on patient's clinical condition, pertaining to various criteria like patient demographics, extent of myocardial jeopardy, anatomy of lesion and vessel, and angiographic findings. Thus, the apt selection of treatment strategy increases the favourability of outcomes in such patients.

Study limitations

The study suffers a limitation of small sample size and of being a single arm study without a comparator group.

CONCLUSION

Triple vessel angioplasty can be applied as favourable therapy as an alternative to surgical revascularization in selected diabetic patients. However, larger studies with long-term follow-up would warrant the effectiveness of triple vessel angioplasty in such patients.

CONFLICTING INTEREST

None

ABBREVIATION USED

CAD: Coronary artery disease; **CABG:** Coronary artery bypass surgery; **PCI:** Percutaneous coronary intervention; **LAD:** Left anterior descending artery; **LCX:** Left circumflex artery; **RCA:** Right coronary artery; **CTO:** Chronic total occlusions; **LVF:** Left ventricular function; **SD:** Standard deviation; **STEMI:** ST-elevation myocardial infarction; **POBA:** Plain old balloon angioplasty.

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