



## Short Term Outcomes of Coronary Artery Bypass Grafting and Concomitant Valve Procedure: A Retrospective Review

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### Introduction

Rheumatic heart disease is the most common etiology for valve replacements in India. Elderly patients presenting for valve replacements may have concomitant coronary artery disease. Various studies have reported an estimated 20-40% prevalence of CAD in patients undergoing valve replacements. Patients for valve replacement with concomitant CAD if left untreated reduces survival<sup>[1]</sup>. Lytle *et al.*,<sup>[2]</sup> observed operative mortality of patients with both CAD and valvular lesion was higher if CAD was left untreated. Karp *et.al*<sup>[1]</sup> recommend that complete revascularization is superior to no revascularization in patients with valvular heart disease and CAD. Previous reports have shown higher risk of combined valve and bypass procedures<sup>[3]</sup> but with the improvements in surgical techniques and myocardial protection strategies, perioperative mortalities have shown a declining trend<sup>[4]</sup>. In this study, we retrospectively analyzed outcomes of combined procedures done in our institute.

### Materials and Methods

As per our institutional protocol all patients above 40 years of age underwent coronary angiography routinely to rule out concomitant CAD. Additional coronary artery bypass grafting (CABG) was done in patients with significant stenosis (>70%) of any of the major arteries. Between January 2014 to December 2018, all the patients who underwent valve replacements with concomitant CABG were included in the study. Data were collected retrospectively from the medical records. Twenty-five (n=25) patients underwent combined valve replacement and CABG. The mitral valve was replaced in 15 patients, the aortic valve in 8, and both mitral and aortic valves were replaced in 2. Patient characteristics are mentioned in table 1.

### Clinical Data

In our study population, 64% were male and 36% were female with a mean age of  $58.33 \pm 4.7$  years. Preoperatively 76% were in NYHA class III-IV with 12 % presenting with congestive failure. Atrial fibrillation was present in 52% of patients.

Most common mitral valve lesion was mitral stenosis due to rheumatic heart disease. Severe pulmonary hypertension was more commonly associated with mitral lesions. Diabetes and hypertension were more common in patients presenting with triple vessel disease. One patient had chronic empyema and 2 patients had Chronic obstructive pulmonary disease. Single vessel disease was present in 32% of cases, double vessel in 52% of cases and triple vessel disease was present in 16% of cases. We did not encounter any patient with significant left main stenosis. Mitral valve was involved alone in 60% (n=15) of cases whereas aortic valve was involved in 32% (n=8) of cases and combined lesions were present in 8% (n=2) of cases

**Table 1** Patient Characteristics (n=25)

Female	9(36%)
Male	16(64%)
Mean age	58.33+/- 4.87
NYHA 1-2	6(24%)
NYHA 3-4	19(76%)
LVEF≤40%	11(44%)
LVEF>40%	14(56%)
Type2 Diabetes	7(28%)
Hypertension	5(20)
Atrial Fibrillation	13(52%)
Severe Pulmonary Hypertension	6(24%)
CHF	4(16%)
Comorbidities	3(12%)

**Operative Data**

	No of pts
CABG+MVR	15
CABG+AVR	8
CABG+DVR	2
MEAN NO OF GRAFTS	1.91±0.69
Mean cross clamp time	116.1±23.3min
Mean bypass time	163±37.2 min

**Results**

Mortality	3(12%)
CABG+MVR	1(6.6%)
CABG+AVR	1(12%)
CABG+DVR	1(50%)
Low Cardiac output syndrome	4(16%)
Re- exploration	1(4%)
Wound infection/sepsis	3(9%)
Renaldysfunction	2(8%)

LESION	No of patients
Mitral valve	15
Stenosis	7
Regurgitation	2
Mixed	6
Aortic valve	8
Stenosis	5
Regurgitation	1
Mixed	2
Combined lesion	2
SVD	8
DVD	13
TVD	4

**Operative Technique**

All operations were done via median sternotomy approach. standard cardiopulmonary bypass techniques with moderate hypothermia and cardioplegic arrest were used. Distal coronary anastomosis was done using either internal mammary artery or saphenous vein grafts. All except two valve replacements were performed using St Jude Medical regent valve (SJM) (St Jude Medical, St Paul, Minn) with pledgetted interrupted sutures. Carpentiers-Edwards Perimount Magna EaseBioprosthesis (Edwards Life sciences, Irvine, CA, USA) was implanted in one patient and Hancock II valve (Medtronic Inc, Minneapolis, MN) in rest of the patients. Proximal grafts were applied on beating heart with aorta clamped partially. Patients were shifted to intensive care with or without inotropic support as and when required. They were extubated as early as possible and anticoagulation was started with ecosprin and warfarin.

**Results**

Most common surgical procedure performed was CABG+MVR (60%) followed by CABG+AVR (32%) and CABG+DVR (8%). Total no of grafts applied were 46(1.91±0.69). LIMA was used to anastomose LAD in 19 cases (41.3% of grafts). Right coronary was bypassed in 14 cases (30.4% Of grafts) and left circumflex was bypassed in 13 cases (28.2% of grafts). Mean cross clamp time was 116.1±23.3 mins and mean bypass time was 163±37.2 mins.

Overall perioperative mortality was 12% (n=3). Mortality in patients who underwent CABG+MVR was (n=1;6.6%), CABG +AVR was(n=1; 12%) and CABG+DVR was(n=1; 50%). All three patients who did not survive showed features of low cardiac output. Preoperatively these patients had severe pulmonary artery hypertension (n=1), congestive heart failure(n=2) and triple vessel coronary artery disease with type 2 diabetes mellitus(n=1).

### Discussion

Bozbas et al performed angiography in all patients above 40 years of age and also in patients with clinical suspicion of CAD. They reported angina pectoris was present only in seven patients out of 41 in less than 50 years of age where the youngest patient was a 40-year-old male. Hence, they concluded that CAG can be omitted in patients below the age of 40 if there is no angina or coronary risk factors. They also reported that patients with CAD have significantly increased prevalence of diabetes, hypertension, history of smoking, and family history of CAD.<sup>[5]</sup>

In 1980, Morrison et al performed elective CAG in adult patients and concluded that asymptomatic significant coronary lesion exists in 33% of patients who were of more than 45 years of age group scheduled for valve replacement. The peri-operative mortality (within 4 weeks of valve replacement) with combined CABG was higher (20%) as compared with valve replacement alone (5.9%). They concluded that as there are no adequate clinical markers of CAD in patients with valvular heart disease, routine CAG should be a part of the pre-operative investigation, but there was no data to recommend the lower age limit<sup>[6]</sup>. In our institute we routinely do elective coronary angiography in all the patients of valvular heart disease who are above 40 years of age or who have symptoms of coronary artery disease.

The operative mortality of patients undergoing MVR and CABG has been higher than those undergoing AVR and CABG. In early days, the mortality has been reported to be as high as 19%<sup>[7]</sup>

in patients undergoing MVR (rheumatic and degenerative) and 30%<sup>[8]</sup> in patients with ischemic MR. This has been explained on the basis of poor functional class, severe MR-related volume overloaded ventricle and its failure to resume adequate function after a prolonged combined procedure, unstable ischemia, extensive CAD, compromised left ventricular function, and an elevated pulmonary vascular resistance. In combined AVR and CABG, LV dysfunction has been reported to be a risk factor<sup>[9]</sup>. The increase in mortality in the AS group could be related to a smaller aortic valve size, higher mean age, female patients, and that the AS group may have increased subendocardial ischemia rates related to CAD with LV hypertrophy.

With improvements in myocardial protection techniques results have improved significantly. Recent studies reported an early mortality of 2- 11% for concomitant AVR and CABG<sup>[10-13]</sup> and 8- 11% for concomitant MVR and CABG<sup>[13,14]</sup>. In the latest study by Nassir and colleagues, perioperative mortality of concomitant AVR and CABG was almost equal to AVR alone but 5 years survival of valve plus CABG patients were significantly higher than that of AVR alone<sup>[15]</sup>. In our study overall mortality was 12% which is comparable to the previously published results.

In 2018 ESC/EACTS guidelines, CABG is a class I recommendation for patients with primary indication of aortic/mitral valve surgery and coronary artery diameter stenosis >70% and class IIa recommendation for coronary artery diameter stenosis 50-70%.

It has been reported that the short-term mortality of concomitant DVR is considerable and concomitant CABG has adverse effects on the survival of patients with valve replacement surgery. The overall survival predictors in most studies were age, cerebrovascular accident and balloon pump insertion, while the independent predictors of overall survival were cigarette smoking, age, chronic kidney diseases and balloon pump insertion in our multivariate analysis. Age,

NYHA class III–IV, congestive cardiac failure, paroxysmal nocturnal dyspnoea, pulmonary artery hypertension, preoperative left ventricular ejection fraction < 50%, left atrial size, cardiomegaly, associated surgeries, renal dysfunction, mean right atrial pressure >14 mmHg and mean pulmonary artery wedge pressure >24 mmHg were the independent predictors of late survival after DVR<sup>[16]</sup>. In the latest study of CABG plus DVR done by Davarpassand and colleagues, the in hospital mortality was 7% which is much lower than mortality of DVR in our series (50%).<sup>[17]</sup> But this may be attributed to very few patients of DVR (n=2) in our study sample. Out of the 2 patients, one was critically ill with triple vessel diseases, type2 diabetes with low ejection fraction and NYHA IV.

Pulmonary artery hemodynamic, especially pulmonary vascular resistance, can affect early mortality and late survival after combined MVR and CABG. Rheumatic mitral disease is a chronic condition and most patients have extremely high pulmonary artery pressure and pulmonary vascular resistance. Preoperative High pulmonary vascular resistance and higher NYHA class with poor left ventricular function have been established risk factors for early mortality<sup>[18,19]</sup>. In our study, the patients with the above risk factors also had similar poor outcome. All the patients who died or developed postoperative complications were NYHA III-IV or presented with features of congestive heart failure.

Gender, number of grafts and type of prosthesis did not affect survival but patients with adverse outcome had significantly higher cross-clamp and bypass time in our study. But as we had very few cases in our study it was difficult to conclude on the effect of these factors.

Hence among patients who undergo concomitant CABG and valve surgery, especially those who have severe Aortic stenosis (hypertrophied Left Ventricle), the prognosis in terms of mortality can be alarming and that the myocardial protection during the procedure should be taken care of (by way of inclusion of warm cardioplegia, retrograde

cardioplegia, continuous perfusion, and the inclusion of various additives that aim at reducing Ca<sup>2+</sup> overload, provide energy substrates, and remove harmful reactive oxygen species).

### Limitation of the Study

The sample size was small in our study, therefore multiple confounding factors could not be eliminated to establish the outcomes of surgery.

### Conclusion

All patients above 40 years of age should be screened for coronary artery disease by an angiogram. CABG should be performed whenever graftable lesions are present in a patient with primary indication of aortic/mitral valve. Adequate myocardial preservation should be done during the procedure.

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