PRE-VALVE ANGIOGRAPHY

Coronary artery disease prevalence amongst patients undergoing valve replacement surgery: A South African perspective

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ABSTRACT

Background: The prevalence of coronary artery disease (CAD) amongst patients presented for valve surgery has important implications for routine angiography. Information on the frequency of CAD in predominantly black patients presented for valve surgery in South Africa has not been published.

Methods: A retrospective, descriptive study of 116 patients presented for valve surgery that underwent coronary angiography between 2010 and 2011 was performed. CAD was defined as stenosis of 70% or greater in one or more epicardial vessels or ≥50% in the left main coronary artery, as defined by quantitative coronary angiography.

Results: Median age was 57.4 (IQR 43 - 67) years (56.9% females). Black patients represented 66.4%, whites 19.8%, and, coloured and Indian patients 13.8%. Hypertension and smoking were the most common cardiovascular risk factors (26.7% and 16.4% respectively). Diabetes mellitus, dyslipidaemia, chronic kidney disease and prior CAD occurred collectively in 15.5% of study subjects. HIV prevalence was 12%, half of whom were on antiretroviral therapy. An isolated valve lesion occurred in 69% of patients, with the remainder having 2 or more lesions. The most common valve lesion was aortic stenosis (43.1%), followed by mitral stenosis (36.2%), aortic regurgitation (29.3%), mitral regurgitation (25.9%) and tricuspid regurgitation (19%). The predominant aetiology was rheumatic heart disease (58.6%), followed by degenerative valve disease (24.1%). CAD was documented in 10 patients (8.6%), of whom 8 had single vessel disease and 2 had double vessel disease.

Conclusion: The low prevalence of CAD found in younger, asymptomatic black patients without cardiovascular risk factors referred for valve surgery, raises the question of whether routine pre-operative coronary angiography in this sub-group is appropriate.

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INTRODUCTION

Current guidelines on angiography screening are based on the substantial burden of coronary artery disease (CAD) in patients presented for valve surgery seen in industrialised nations – with up to 40% prevalence of CAD, depending on the series and definitions of significant stenosis.[1-3] Screening is done for CAD with the goal of finding either surgically correctable coronary lesions that may be bypassed during the same surgery as the valve replacement or corrected percutaneously before surgery. According to the American College of Cardiology and American Heart Association (ACC/AHA) recommendations, screening coronary angiography to assess associated CAD should be considered in selected patients before cardiac surgery or transcatheter intervention for VHD (valvular heart disease).[2] Invasive selective coronary angiography remains the gold standard for obstructive coronary artery disease diagnosis.

Coronary angiography is indicated before valve intervention in patients with symptoms of angina, objective evidence of ischaemia, decreased LV systolic function, history of CAD, or coronary risk factors (including men age >40 years and post-menopausal women).[2] In a developing country, the following risk factors have been found to correlate with a higher prevalence of CAD: Age ≥55, typical angina, hypertension, diabetes mellitus and dyslipidaemia.[4] There are no published reports regarding prevalence of CAD in patients undergoing valve surgery in South Africa. We suspected that given our younger population with fewer CAD risk factors and predominantly rheumatic VHD, the prevalence of CAD would be low, and that perhaps not all patients with VHD over the age of 40 years

need to undergo routine coronary angiography pre-operatively. Thus, we sought to study the prevalence of CAD in patients undergoing valve surgery at Chris Hani Baragwanath Hospital.

METHODS

A retrospective, descriptive study of all patients presented for valve surgery that underwent coronary angiography at Chris Hani Baragwanath Academic Hospital in South Africa between 2010 and 2011, was performed. In keeping with ACC/AHA guidelines on valve disease, significant coronary artery disease was defined as stenosis of 70% of a major coronary artery or ≥50% diameter left main stenosis on quantitative coronary angiography.[2] Data were subjected to descriptive statistical analysis using Microsoft Excel.

Permission to conduct the study was granted by the University of the Witwatersrand ethics committee (M161163).

RESULTS

One hundred and sixteen patients were included in this study. Median age of the population was 57.4 (IQR 43 - 67) years (56.9% females). Black patients represented 66.4% (77), while whites, coloured and Indian patients represented 19.8% (23), 0.8% (9) and 0.6% (7) respectively. Hypertension and smoking were the most common risk factors (26.7% and 16.4%, respectively). Diabetes mellitus, dyslipidaemia, chronic kidney disease and prior coronary artery disease occurred in 15.5%. The remainder had no known risk factors. Angina was present in 18% (21) patients. All patients were New York Heart Association (NYHA) functional class II or more. NYHA II, III and IV patients were distributed as follows: 54%, 38.8% and 0.7%, respectively. HIV prevalence was 12%; half of whom were on antiretroviral therapy. Mean left ventricular ejection fraction was 53.9 ± 12%. The most common valve lesion was aortic stenosis (43.1%), followed by mitral stenosis (36.2%), aortic regurgitation (29.3%), mitral regurgitation (25.9%) and tricuspid regurgitation (19%). A single valve lesion occurred in 69% of patients – with the remainder having 2 or more lesions. The most common aetiology was rheumatic heart disease (58.6%), followed by degenerative valve disease (24.1%). Congenital valve disease, infective endocarditis and aneurysms of the ascending aorta, accounted for the remainder (17.2%).

CAD was documented in only 10 patients (9%), of whom 8 had single vessel disease and 2 had double vessel disease. All were greater than 55 years of age. None of the patients with rheumatic heart disease had CAD. Nine of the 10 patients had degenerative aortic stenosis. One patient with CAD had prior infective endocarditis of the mitral valve.

None were HIV-positive, only 4 had preceding angina, and 4 patients had no risk factors for CAD. Only 1 black patient, aged 67, had CAD.

DISCUSSION

The main finding of this study was that in a predominantly black population undergoing valve replacement surgery for rheumatic heart disease, the prevalence of CAD was low. Given that invasive diagnostic angiography is not a benign procedure, especially when performed by inexperienced operators, the procedure should be individualised. Age, symptoms and cardiovascular risk factors should be considered when assessing the need for diagnostic coronary angiography prior to valve surgery.

Data to support routine angiography for patients undergoing valve replacement surgery are scant. The AHA/ACC and ESC/EACTS guidelines carry only level of evidence grade 1C.[2,5] There is no objective evidence supporting routine coronary angiography in patients undergoing valve replacements. The addition of coronary artery bypass grafting (CABG) to valve replacement is associated with a higher mortality rate.[2,6] Most data for routine angiography are extrapolated from patients with isolated stable CAD who have undergone coronary angiography.[7] Most of these studies used quantitative coronary angiography with variable cut-off points for severity, and few early studies evaluated target vessel ischaemia by either invasive or non-invasive methods. Further, in stable, low risk CAD optimal medical therapy and surgery have shown equivalent outcomes.[8] Additionally, CT coronary angiography has been shown to be a reliable, cost-effective, non-invasive imaging alternative.[7,8,10] If the expertise exists, CT coronary angiography is preferable to invasive coronary angiography, for screening purposes. An argument is made that the modest additional early post-operative mortality from doing a CABG during aortic valve replacement (AVR) surgery, is offset by an improvement in long-term morbidity and mortality. This is despite the absence of randomised control trials to address this question in AVR patients.[11,12] Furthermore, some studies have shown no difference in outcomes between those who are and are not subjected to a CABG.[12] In summary, subjecting patients to routine coronary angiography has not been shown to improve outcomes in patients undergoing valve replacement surgery.

It has been shown in several series that the prevalence of CAD in valve replacement candidates from developing countries is substantially lower than that in industrialised nations. Rates range from 10% - 19%, depending on the definition of a significant stenosis, and these generally occur at an older age. The lower rates in developing countries are partly due to the greater

contribution of rheumatic valvular heart disease, as noted in the current study.[13-17] Indeed, such series have advocated a more conservative screening policy of asymptomatic, low risk patients, suggesting age cut-offs beyond 55 years. It is also important to note that the morbidity and mortality rates related to both angiography and CABG are generally higher in developing nations, where expertise is not as readily available. Therefore, in developing countries with limited resources, the risk:benefit and cost:benefit ratios do not favour routine coronary angiographic screening.[18]

In our study, the rates of significant stenosis on coronary angiography were exceedingly low as a whole (9%), but especially so in the black population where the rate of comorbid CAD was only 1.3%. In addition, no patient with CAD was younger than 55 years of age. Considering the low prevalence of CAD, questionable benefit of the procedure, high cost and potential harm, it is the authors' opinion that in predominantly black patients from a developing country background, the use of coronary angiographic screening should be restricted to patients with symptoms of coronary artery disease or cardiovascular risk factors.

LIMITATIONS

The main limitations of the study were its retrospective design. We did not systematically document clinical characteristics of all patients that underwent valve surgery who did not undergo coronary angiography. Further, the sample size was too small to do draw any substantial statistical correlations due to the low rate of CAD in the population. The current study uses an angiographic cut-off of 70% as the level to define significant stenosis, whereas many of the quoted studies use more liberal cut-offs of 50% – making comparison more difficult. The findings of this study should not be extrapolated to any population other than developing sub-Saharan Africans, as the genetic diversity of other populations is likely to create differences in CAD incidence.

CONCLUSION

Amongst a predominantly black sub-Saharan African population, the prevalence of CAD in patients presented for valve surgery is exceptionally low. HIV did not appear to play a role in this study. For black patients scheduled to undergo valve replacement surgery in developing countries, we suggest individualising the decision to perform screening coronary angiography, taking into account age, symptoms and cardiovascular risk factors.

Conflict of interest: none declared.

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