Coronary Artery Disease in Rheumatic and Non-Rheumatic Valvular Heart Disease

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Abstract

Background:To study the prevalence of coronary artery disease (CAD) in patients undergoing valve surgery for rheumatic and non-rheumatic valvular heart disease.

Methods: In this cross sectional study, 233 patients planned for valvular heart surgery and aged 40 years or more were subjected to preoperative coronary angiogram. Data regarding risk factors and valve pathology were collected. Continuous variables were presented as mean (SD) and categorical variables as frequencies. Logistic regression analysis was used to study predictive factors for CAD in valvular heart disease.

Results: Rheumatic heart disease (RHD) was the commonest etiology; 56% of patients had RHD, while 21% had degenerative valvular heart disease. Mitral stenosis was the most common valve pathology. The overall prevalence of CAD was found to be 31.3% in valvular heart disease (VHD). CAD had a lower prevalence of 18.2% in rheumatic heart disease as compared to a much higher prevalence in degenerative valve disease (62%).

Conclusion: CAD has lower prevalence in rheumatic heart disease as compared to degenerative valve disease.

Key Words: Coronary artery disease, Atherosclerosis, Valvular heart disease, Coronary angiography, Rheumatic heart disease.

Introduction

The prevalence of coronary artery disease (CAD) in valvular heart disease varies between 9-41% in western population, but its prevalence in Pakistan is understudied.

Valvular heart disease is a major health problem particularly in developing countries.[1] Rheumatic heart disease (RHD) is the predominant etiology in developing countries like Pakistan. In Pakistan a high prevalence rate of 5.7/1000 of RHD was reported by echocardiographic diagnosis.[2]The same is a contributor to premature mortality and morbidity in Pakistan.[2]

Untreated coronary artery disease (CAD) in valvular heart disease (VHD) patients undergoing surgery leads to unfavorable perioperative and long-term outcome, thereby mandating identification of CAD before going to surgery.[3,4] However combined valvular and revascularization surgery has much higher mortality and morbidity as compared to valve surgery alone.[5,6]Coronary angiography (CAG) is most commonly used to identify CAD preoperatively. The incidence of CAD in VHD varies from 9% to 41%.[3,7]This means indiscriminately subjecting such patients to CAG before surgery may be posing them to risk at the same time while failure to recognize and treat accompanying CAD will adversely affect the prognosis.

ACCA- AHA guideline for coronary angiography (CAG) in valvular heart disease (VHD) state that CAG be performed in men aged 40 years or older, premenopausal woman aged 40 years or more who have coronary risk factors and post-menopausal women.[8]Guidelines have been based on limited studies on valvular heart disease patients.[9]In addition guidelines are based on studies conducted in western population where the leading cause of valvular heart disease is degenerative.[3,9] However, in developing countries including Pakistan majority of VHD patients have rheumatic etiology.[1,3,10,11]The current study was planned with the aim to investigate the prevalence of coronary artery disease in patients undergoing surgery for VHD and if etiology of VHD has any influence on CAD presence.

Patients and Methods

This cross sectional study was conducted at Rawalpindi Institute of Cardiology, from January to December, 2017. Patients who underwent CAG (n=233) as preoperative workup for valve surgery, were included. Patients less than 18 years of age, with ischemic etiology of valvular lesion, with mild to moderate valvular pathology, with prosthetic valve dysfunction, re-operated cases, with prior balloon valvuloplasty, not planned for surgery and those who did not give consent were excluded. Written informed consent was taken from all patients before undergoing

coronary angiography. Data regarding cardiovascular risk factors was recorded. Transthoracic and transesophageal (where required) echocardiogram was performed in all patients to assess severity of valve lesions, etiology, non-valvular pathology and ventricular function. Coronary angiograms of all patients were reviewed. Coronaries were reported as normal if there was no narrowing (plaque), irregularity in contour or ectasia in epicardial vessels. Coronary artery disease (CAD) was defined as at least one of above. The severity of obstructive CAD was defined as severe if ≥ 70% stenosis in any of three major coronaries or their large (≥ 3mm) branches or ≥ 50% stenosis in left main stem. Mild lesions were classified as < 50% narrowing and moderate stenosis included between 50% and less than 70% narrowing of vessel lumen. Hypertension was defined as systolic blood pressure of ≥ 140mmHg and/or diastolic blood pressure of ≥ 90mmHg or use of antihypertensive medication. Diabetes mellitus was defined as fasting blood glucose of 126mg/dl or use of antidiabetic medication. Dyslipidemia was defined as total cholesterol ≥ 200mg/dl and/or triglycerides ≥ 150mg/dl.The student t-test was used for comparison of numerical variables and chi-square test was used for comparison of categorical variables. A p value of less than 0.05 was considered to be statistically significant.

Results

Rheumatic disease was the leading cause, present in 56.7% (n=132) . Mean age was 50.14 $\pm$ 8.79 years. Valve disease was found in 21.5% (n=50), whereas myxomatous and bicuspid valve were present in 12.4% (n=29) and 9.4% (n=22) respectively. Hypertension was documented in 54%((Table 1)Mitral stenosis was the most common single valve pathology with 75 patients having it, followed by mitral regurgitation (67 patients), aortic stenosis (41 patients) and aortic regurgitation (18 patients). Whereas 32 patients had mixed or double valve pathology (Table 2). Overall 31.3% patients were found to have coronary artery disease. Out of them, majority of patients 80.82% had less than severe obstructive disease CAD including subcritical or minor coronary artery disease while only 13.69% (n=10) had severe CAD. Muscle bridge was present in four patients (5.47%), whereas coronary ectasia was found in one patient only. No patient was found to have triple vessel coronary artery disease in our subset of patients. With respect to valve pathology CAD was most frequent in patients with aortic stenosis (56.1%) followed by aortic regurgitation (44.4%). While it was least frequent in patients with mitral stenosis; affecting only 13.3% of patients with mitral stenosis (Table 3). Coronary artery disease was more likely to be present in patients with atherosclerotic risk factors. Table IV shows the clinical characteristics of patients with and without CAD. Regression analysis showed good correlation of CAD with risk factors (R²=0.76).

Table 1:Baseline characteristics of patients

Characteristic	No(%)
Sex (male	111(47.6)
Hypertension	54(23.2)
Diabetes Mellitus	34(14.6)
Smoking	43(18.5)
Dyslipidemia	50(21.5)

Table 2: Type of VHD

Type	No(%)
Mitral stenosis	75(32.18)
Aortic stenosis	41(17.59)
Mitral regurgitation	67(28.75)
Aortic regurgitation	18(7.73)
Mixed/double	32(13.73)

Table 3: Coronary artery disease in patients with different etiologies of valvular heart disease

Etiology	Coronary artery disease present N(%)	Normal epicardial coronaries N(%)
Rheumatic	24(18.2)	108(81.8)
Degenerative	31(62)	19(38)
Bicuspid	8(36.4)	14(63.6)
Myxomatous	10(34.5)	19(65.5)

Table 4: Clinical characteristics of patients with and without CAD*

Variables	Patients with CAD (n=73)	Patients without CAD(n=160)	p-value
Hypertension	39(53.42)	15 (9.3)	<0.001
Diabetes mellitus	32 (43.83)	2(1.25)	<0.001
Smoking	32(43.83)	11(6.87)	<0.001
Dyslipidemia	36(49.31)	14(8.75)	<0.001
Male sex	40(54.79)	71(44.37)	<0.001

*CAD=Coronary artery disease

CAD was strongly associated with presence of risk factors among patients with valvular heart disease

(p<0.001). CAD was significantly more prevalent in patients aged 50 years or above (40.8% versus 21.2%, p=0.002). In addition, CAD was more prevalent in those with two or more than two risk factors (72.1% versus 7.5%, p<0.001) (Table 4).

Discussion

The current study elaborates the prevalence of CAD in patients with different valvular heart diseases planned for corrective surgery. Bozbas et al in their study showed 18.8% of patients with rheumatic heart disease to have CAD. Not all study patients had undergone coronary angiography.[12]In the study by Chun et al 26% of patients with mitral stenosis were found to have CAD.[13] A much higher prevalence rate of 56% was found in patients with aortic stenosis by some investigators.[13]Shaikh et al evaluated 144 patients undergoing valve surgery and reported severe CAD in 32.9% of mitral valve and 31.9% of aortic valve surgery.[14]Zeynep YE et al reported prevalence of 26.4% in MS, 42% in MR and 57.7% in AS.[13] In our study the overall prevalence of 31.3% was comparable to above studies. Also the prevalence according to the valve pathology followed same pattern i.e. with mitral stenosis 23.3% and with aortic stenosis 43.8%. Prevalence in rheumatic heart disease in our study was 18.2%. Similarly lower prevalence was reported by Marchant et al (14%), Jose et al and Narang et al (12.2 and 11% respectively).[3,15,16]The high prevalence (62%) in degenerative valve disease follows the findings reported in literature. Lacy et al similarly reported 58.9% prevalence of CAD in patients with AS.[13,17] Similar findings were replicated by Sonmez et al.[7]

Atherosclerosis plays role in the pathogenesis of degenerative valve disease (mostly aortic valve) similar to its role in pathogenesis of coronary artery disease.[13]The common pathology is lipid deposition, calcification and inflammation.[18,19] It has been shown that degenerative calcific valve disease is associated with 50% increased risk of myocardial infarction and death even in absence of significant valve dysfunction.[19-21] Patients with degenerative valve disease are more likely to be older and have more risk factors for atherosclerosis than those with other etiologies. In particular patients with rheumatic heart disease are more likely to be younger and with fewer atherosclerotic risk factors.

Our study showed low prevalence of CAD in patients undergoing surgery for valve heart disease. The prevalence was notably lower for rheumatic disease patients, pointing towards need for generating separate guidelines for developing countries where the leading cause for VHD is rheumatic heart disease. The patients with degenerative valve lesions however should be investigated according to the current practices. Furthermore the indication of routine preoperative angiogram has level of evidence C, meaning it has been based on expert opinions and limited studies.[9]This further emphasizes the need for more studies at larger scale. Among those with CAD, there was a low percentage (4.2%) found to have severe (more than 70% stenosis) CAD. Thus the number of patients requiring surgical revascularization at the time of valve surgery was even lower. The rest will only require risk factor modification and medical treatment. Thus probably the search for CAD in these patients is often overdone.

Conclusion

1.Prevalence of coronary artery disease , in valvular heart disease patients, is low in rheumatic heart disease and high in degenerative valve disease.
2.Coronary artery disease is significantly more common in patients more than 50 years of age or in the presence of two or more risk factors.

References

1. Shaikh AH, Hanif B, Hasan K, Adil A,Hashmani S.Coronary artery disease in patients undergoing valve replacement at a tertiary care cardiac centre. JPMA. 2011;61:340-44.
2. Rizvi SF,Khan MA, Kundi A, Marsh DR, Samad A.. Status of rheumatic heart disease in rural Pakistan. Heart. 2004; 90(4): 394–399.
3. Manjunath   CN, Agarwal   A, Bhat   P, Ravindranath KS, Ananthakrishna R, Ravindran R . Coronary artery disease in patients undergoing cardiac surgery for non-coronary lesions in a tertiary care centre. Indian Heart J. 2014;66(1):52-56.
4. T. Rahman, A. Rahman,A. Islam. Prevalence of coronary artery disease in patients undergoing cardiac surgery for non-coronary lesions in a superspecialized centre. Atherosclerosis 2015;241(1):212-15.
5. Dell'Amore A, Aquino TM, Pagliaro M, Lamarra M, Zussa C. Aortic valve replacement with and without combined coronary bypass grafts in very elderly patients: early and long-term results. Eur J Cardiothorac Surg. 2012 r;41(3):491-98.
6. Edwards FH, Peterson ED, Coombs LP, DeLong ER, Jamieson WR, Shroyer ALW. Prediction of operative mortality after valve replacement surgery. J Am Coll Cardiol.2001;37(3):885-92.
7. Sonmez   K, Gencbay   M, Akcay   A, Yilmaz   A, Pala Sl.Prevalence and predictors of significant coronary artery disease in Turkish patients who undergo heart valve surgery. J Heart Valve Dis 2002 ;11(3):431-37.
8. Nishimura RA, Catherine M, Robert O, Carlos E, Blasé AAHA/ACC Valvular Heart Disease Guideline . A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines.Circulation 2014;129:000–000.

9.   Kruczan DD, Albuquerque N,Silva DS, Pereira BD, Romão VA. Coronary artery disease in patients with rheumatic and non-rheumatic valvular heart disease treated at a public hospital in Rio de Janeiro. Arq. Bras. Cardiol 2008;90(3):1590-94.

10. Carapetis. JR Rheumatic Heart Disease in Developing Countries. N Engl J Med 2007; 357:439-41.

11. Seckeler, MD Hoke. TR The worldwide epidemiology of acute rheumatic fever and rheumatic heart disease. Clin Epidemiol. 2011; 3: 67–84.

12. Bozbaş H, Yildirir A, Küçük MA, Ozgül A, Atar I, Sezgin A, et al Prevalence of coronary artery disease in patients undergoing valvular operation due to rheumatic involvement. Anadolu Kardiyol Derg. 2004, 4: 223-26.

13. EmrenZY,EmrenSV,KılıçaslanB,SolmazH,SusamI. Evaluation of the prevalence of coronary artery disease in patients with valvular heart disease. Journal of Cardiothoracic Surgery. 2014;9:153-57.

14. Shaikh AH, Hanif B, Hasan K, Adil A, Hashmani S. Coronary artery disease in patients undergoing valve replacement at a tertiary care cardiac centre. JPMA. 2011, 61: 340-42.

15. Jose V.J., Gupta S.N., Joseph G. Prevalence of coronary artery disease in patients with rheum-atic heart disease in the current era. Indian Heart J. 2004;56:129–31.

16. Rajiv N, Chadha D S, Kashish G. Screening coronary angiography prior to surgery in rheumatic valvular heart disease: a study of 2,188 patients. J Heart Valve Dis. 2009;18:455–62.

17. Lacy J, Godin R, McMartin D: Coronary atherosclerosis in valvular heart disease, The Annals of Thoracic Surgery 1977, 23: 429-35. .

18. O'Brien KD, Shavelle DM, Caulfield MT, McDonald TO, Olin-Lewis K. Association of angiotensin-converting enzyme with low-density lipoprotein in aortic valvular lesions and in human plasma. Circulation. 2002, 106 (17): 2224-30.

19. Freeman RV, Otto CM: Spectrum of calcific aortic valve disease: pathogenesis, disease progression, and treatment strategies. Circulation. 2005, 111 (24): 3316-26.

20. Olsen MH, Wachtell K, Bella JN, Gerdts E, Palmieri V. LIFE substudy. Aortic valve sclerosis relates to cardiovascular events in patients with hypertension . Am J Cardiol. 2005, 95 (1): 132-36.

21. Cazelli JG,Camargo GC,Kruczan DD,Weksler C. Prevalence and prediction of obstructive coronary artery disease in patients undergoing primary heart valve surgery. Arq Bras Cardiol 2017;109(4):5935-39.