The Relationship between Rheumatic Heart Disease and Coronary Artery Disease and its Implications

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Abstract

Aim: This is a retrospective observational study from one institution. Between January 2011 and December 2017, it was observed that nearly all patients undergoing valve surgery for Rheumatic Heart Disease had normal coronaries. Through this study, we aim to identify the relationship between Rheumatic heart disease and Coronary Artery Disease. Patients and methods: One hundred and seventy two patients with confirmed Rheumatic heart disease (Group A) were included in the study. All patients underwent coronary angiography. Significant coronary artery disease of any major coronary artery or branch was noted. Between January 2017 and December 2017, 710 patients (Group B) undergoing coronary angiography for suspected/symptomatic coronary artery disease were included as controls and compared to Group A patients. In group A the mean age of patients was 58.17 years. In-group B the mean age of patients was 59.4 years. Risk factors for coronary artery disease were comparable between both the groups. Significant coronary artery disease was observed in 12 (6.98

Index terms—

1 Introduction

ardiovascular diseases are the leading cause of death worldwide accounting for more than 17 million deaths annually. World Health Organization (WHO) estimates that India accounts for more than 20% of these deaths. In India, cardiovascular deaths amounted to 2.1 million in 2015, out of which 0.9 million (68.4%) were due to Ischemic heart disease. 1 Rheumatic heart disease (RHD) is another major cause of morbidity and mortality in developing countries like India2 and it led to 47000 (3.5%) of all deaths in 2015. 1 Author: e-mail: varunglbansal@gmail.com

The non-modifiable risk factors for coronary heart disease are age, gender, family history; and the modifiable factors are smoking or tobacco use in any form, known history of diabetes or hypertension or both, dyslipidemia and lifestyle habits such as obesity and physical inactivity. 3 However, due to changing demographics and economics, the risk factors and natural history of subclinical RHD are not well known. 2 Comparative studies on the incidence of coronary artery disease (CAD) in patients undergoing surgery for RHD are very few. Although there have been a few studies in which attempts were made to analyze the association of CAD with RHD from India, [4][5][6] Chile, 7 Nepal, 8 Rio de Janeiro; 9 the effect of RHD pathophysiology on the development of CAD has not been clearly understood so far. Many of these studies do not confirm the presence of RHD nor do they compare with the incidence of CAD. This study aims to analyze if and how RHD is related to CAD.

2 II.

3 Patients and methods

All patients admitted for elective surgery for RHD at our hospital between 1st January 2011 and 31st December 2017 were included and compared with a larger cohort of patients undergoing elective coronary angiography (CAG) for suspected or symptomatic CAD, between 1st January 2017 and 31st December 2017.

4 a) Inclusion criteria for the study

For the patients to be included in either of the study groups, age more than 40 years and New York Heart Association (NYHA) functional classification stage III or IV with symptoms of angina, breathlessness, palpitations or fatigue were mandatory. Patients with congenital abnormalities like bicuspid aortic valve, those with degenerative valve disease, infective endocarditis, ischemic mitral regurgitation or myxomatous mitral valve were excluded from the study.

Diagnosis of RHD was made on the basis of involvement of mitral valve, with thickening and fusion, which in India is diagnostic of RHD in adult patients. Patients who previously underwent balloon mitral valvotomy (BMV), closed mitral valvotomy (CMV), mitral valve repair for RHD were also included. Patients who underwent Aortic valve surgery were included if surgical findings were suggestive of a tricuspid aortic valve and histopathological examination (HPE) was suggestive of thickening, fibrosis and inflammation of valve leaflets characteristic of RHD.

All patients underwent transthoracic echocardiography (TTE) for assessment of ventricular function and dimensions, valve morphology and function with quantification of gradients or regurgitation across the heart valves and presence/absence of any intra-cardiac lesion including left atrial (LA) or left atrial appendage (LAA) thrombus. Subsequently, all patients underwent elective CAG for screening for CAD before surgery for RHD or for suspected/ symptomatic CAD. Presence of significant CAD (percentage obstruction of luminal diameter more than 50% in any major or branch coronary artery of diameter more than 1.5mm10) was noted.

Patients were divided into two groups. Group A consisted of patients with RHD undergoing valve surgery and Group B consisted of patients undergoing elective CAG for symptomatic/suspected CAD. Presence of risk factors for CAD in the form of age, gender, history of smoking (more than 10 pack years of smoking history), history of DM, history of hypertension, family history of DM and family history of hypertension were noted for all the patients. All patients were of the same ethnicity.

Out of 318 patients who underwent elective surgery for RHD between the study period, 172 could meet the inclusion criteria of the study. They constituted group A of the study population. The mean age of group A patients was 58.17 + 9.58 years. 101 (58.72%) were males and 26 (15.12%) had a positive history of smoking. 56 (32.56%) patients had DM, and 67 (38.95%) had hypertension. In group A, 60 (34.88%) patients had a positive family history for DM and 76 (44.19%) patients had a positive family history for hypertension. Mean LVEF for Group A patients was 46.9 + 8.4%.

Trans Esophageal Echocardiography (TEE) was performed under anesthesia for all patients to re-assess morphology of the valves, quantification of regurgitant lesions, calcification, and presence/absence of LA or LAA thrombus. Surgery was performed under cardiopulmonary bypass (CPB) with normothermic perfusion and cold blood cardioplegia by a single surgeon. The excised valve specimen was sent for HPE. The respective involvement of valves and surgeries done on patients in Group A is as depicted in Table 1. All patients with significant CAD in-group A underwent concomitant coronary artery revascularization in the form of CABG along with surgery for RHD. Reversed saphenous vein grafts were used for all these patients. Distal anastomoses of grafts to coronary arteries were performed on CPB after delivering cardioplegia. Valve repair and/or replacement were done after distal anastomoses were performed. Proximal anastomoses of vein grafts to ascending aorta were performed on empty beating heart after removal of aortic cross-clamp. Patients were gradually weaned off CPB after valve surgery and coronary revascularization.

Between Group A patients were further compared with the epidemiological studies on the incidence of coronary artery disease in the general population in India.

5 c) Statistical analysis

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean ± SD and median. Normality of data was tested by Kolmogorov-Smirnov test. If the normality was rejected then the non-parametric test was used. Statistical tests applied were:

1. Quantitative variables were compared using the Mann-Whitney Test (as the data sets were not normally distributed) between the two groups. 2. Qualitative variables were correlated using the Chi-Square test. p-value of <0.05 was considered statistically significant. The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0.

6 III.

7 Results

The risk factors and demographic data between both the groups were comparable (Table 2). The number of patients with significant coronary artery disease was 12 (6.98%) in Group A and 550 (77.46%) in Group B (p 0.0001). In Group A, 160 (93.02%) patients, and in Group B 160 (22.54%) patients had normal coronary arteries.

Within group A, 81 patients underwent surgery for isolated mitral valve disease and significant CAD was found in 4 patients (4.9%), and 51 patients underwent surgery for isolated aortic valve disease, significant CAD was found in 7 patients (13.7%). Out of 39 patients who underwent double valve replacement, 1 (2.5%) patient had significant CAD.

The distribution of CAD in arteries in both groups and the statistical comparison is depicted in Table 3.

8 Discussion

It is a retrospective observational study from a single center in India comparing incidence of CAD in symptomatic patients with or without RHD. In our study the incidence of CAD in symptomatic patients of RHD was 6.98%.

We believe it is necessary to have a demographically comparable group as a control in order to remove any bias. It may be argued that the two pathologies may be a coincidence rather than a pathologic relation. As mentioned in our limitations only further studies will throw a light on this, since both RHD and CAD are inflammatory in nature.

Various studies from India have found a similar incidence of CAD amongst RHD patients. Jadhav et al 4 studied 757 patients undergoing intervention for valvular heart disease (not confirmed RHD) and found the overall incidence of CAD to be 9.1%. Thiyagarajan et al 5 studied 101 patients undergoing preoperative CAG before undergoing valvular heart surgery for rheumatic mitral and aortic valve disease and found that 4 out of 43 (9.3%) patients undergoing surgery for mitral valve disease had significant CAD. However, they did not compare with the overall incidence of CAD. Jose et al 6 studied 376 patients with RHD and found an overall incidence of CAD to be 12.2% amongst RHD patients. A few studies published in English literature have also reported similarly. Merchant et al 7 from Chile studied 100 patients with RHD who underwent CAG and observed significant CAD in 3 patients (6.9%) out of 43 in patients with Rheumatic mitral valve disease. Sahi et al 8 from Nepal studied 97 patients with RHD and nonrheumatic valvular heart disease (VHD). They observed the incidence of CAD to be 12.2% in RHD patients and 37.5% in non-rheumatic VHD patients. Kruczan et al 9 from Rio de Janeiro studied 294 patients and found the incidence of CAD to be 4% in RHD patients versus 33.61% in patients with non-rheumatic VHD (Table 5).

Incidence of coronary artery disease in India as reported by epidemiological studies was compared with the incidence of CAD in group A patients, and the comparison is as depicted in Table 4.1 D D D D © 2020 Global Journals

The Relationship between Rheumatic Heart Disease and Coronary Artery Disease and its Implications It was noted that out of all the above, Jadhav et al 4 and Kruczan et al 9 have considered TTE findings of valve morphology as the diagnostic feature of RHD, however none of the other studies have mentioned how they have confirmed RHD in their patients. We have used TTE, TEE as well as HPE findings for the confirmation of RHD. This is one of the highlights of this study The results of our study when compared with multicentric epidemiological study in general Indian population by Krishnan at al 12 in which 5167 adults of mean age 51 years were studied, showed a significant difference in the incidence of CAD (6.98% versus 12.5%, p 0.04).

The observation made is that, for reasons not yet known, there is a significant reduction in the incidence of CAD in patients with RHD especially mitral valve disease. Although not conclusive in this small group of RHD patients, this study gives some evidence and it appears that RHD reduces the incidence of CAD. Further prospective study on a larger cohort of patients might be helpful in rewriting the guidelines for preoperative coronary angiography in patients undergoing heart surgery for rheumatic heart disease.

V.

9 Limitations of the Study

This is a retrospective study where hospital based population of symptomatic patients have been included and the number of RHD patients is not large. A prospective comparative study with larger number of RHD patients would probably confirm this observation. I that greatly assisted the research. We sincerely thank Dr Gaurav Minocha and Dr Amit Malik for their contribution in treatment and care of the patients including performing coronary angiography and coronary angioplasty for the patients. We would also like to show our gratitude to the Ms Bhavana Gupta for her contribution towards statistical analysis and compilation of results.

1

Valve affected	Surgery	Number of patients	Total number of pa each valve
Mitral valve	Mitral valve replacement	49	81
	Mitral valve repair	15	
	Redo-mitral valve replacement	17	
Aortic valve	Aortic valve replacement	50	51
	Redo-aortic valve replacement	1	
Mitral+ Aortic valve	Double valve replacement	29	39
	Redo-double valve replacement	10	
Mitral + Aortic + Tricuspid valve	Double valve replacement with TV repair	1	1

Figure 1: Table 1 :

and 111 patients 1st January 2017 and 31 st December 2017, 1054 patients underwent CAG for suspected/symptomatic CAD. In-group B, 439 patients underwent percutaneous coronary angioplasty using coronary stent

Figure 2:

2

	Group A	Group B	p
Mean age	58.21	59.4	0.073
Males	112(59.57%)	440(61.97%)	0.548
Mean LVEF	46.84	47.57	0.077
Smokers	29(15.43%)	149(20.99%)	0.089
DM	60	274	0.092
HTN	71(37.77%)	314(44.23%)	0.112
Family -DM	65(34.57%)	297(41.83%)	0.071
Family -HTN	81(43.09%)	348(49.01%)	0.148

Figure 3: Table 2 :

3

	LAD	LCx	RCA	LAD +LCx	LAD +RCA	LCx +RCA	TVD	Total patients with CAD	p
Group A	3	0	1	2	3	1	2	12	<.0001
Group B	96	65	82	59	52	36	160	550	

Figure 4: Table 3 :

4

Author	Study site	Year reported	Sample size	Known CAD	Known CAD in Group A	p
11 Chadha SL	Delhi	1990	13723	9.67%	6.98%	0.29
Krishnan MN 12 IV.	Multisite	2016	5167	12.5%	6.98%	0.04

Figure 5: Table 4 :

5

Author	Published year	City/ Country	Study type	Number of patients	Patients with RHD	Incidence of CAD in MV	Incidence in RHD	Incidence in no RI
Jadhav et al 4	2016	Ahmedabad/ India	Retrospective observational	757	757	7/69 (10.1%)	69 (9.1%) No	with Non RHD
Thiyagarajan et al 5	2018	India	Cross-sectional observational	101	101	4/43 (9.3%)	23 (22%) No	co with non RHD
Jose et al 6	2004	Vellore/ India	Prospective observational	376	376	13/96 (13.5%)	46 (12.2%)	No with non R
Marchant et al 7	1983	Santiago/ Chile	Prospetive observational	100	100	3/43 (7%)	14 (14%) No	co with non RHD
Sahi R et al 8	2018	Nepal Kath-mandu/	comparative Retrospective	97	57	checked Not	(12.2%) 7/57	15/40 (37.5%)
Kruczan et al	2008	Janeiro/ Rio de Brazil	sectional Cross-	294	175	checked Not	(4%) 7/175	40/119 (33.61%

Figure 6: Table 5 :

.1 Acknowledgements

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.2 Abbreviations

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