Research Article

Cardiology & Vascular Research

Association of Sclerotic Aortic Valve as an Indicator of Obstructive Coronary Artery Disease and its Risk Factors

Suresh V Patted[1], Sanjay C Porwal[2*], Sameer S Ambar[3], Prasad MR[4], Suhasini Atharga[5] and Vishwanath Hesarur[4]

[1]*Professor and HOD, Department of Cardiology, J. N. Medical College, Belgaum, Karnataka, India.*

[2]*Professor, Department of Cardiology, J. N. Medical College, Belgaum, Karnataka, India.*

[3]*Associate Professor, Department of Cardiology, J. N. Medical College, Belgaum, Karnataka, India.*

[4]*Assistant Professor, Department of Cardiology, J. N. Medical College, Belgaum, Karnataka, India.*

[5]*Senior Resident, Department of Cardiology J. N. Medical College, Belgaum, Karnataka, India.*

[*]Correspondence:
Sanjay C Porwal, Professor, Department of Cardiology, J. N. Medical College, Belagavi, 590010, Karnataka, India, E-mail: drsanjayporwal@gmail.com.

Received: 14 April 2018; **Accepted:** 10 May 2018

Citation: Suresh V Patted, Sanjay C Porwal, Sameer S Ambar, et al. Association of Sclerotic Aortic Valve as an Indicator of Obstructive Coronary Artery Disease and its Risk Factors. Cardiol Vasc Res. 2018; 2(2); 1-4.

ABSTRACT

Introduction: *Aortic valve sclerosis (AVS) is defined as calcification, increased thickening of a trileaflet aortic valve in the absence of obstruction of ventricular outflow and the antegrade velocity across the aortic valve less than 2.5 m/s. It is characterized by a gradual progression beginning with calcium deposition that may ultimately transform to aortic stenosis (AS) with obstruction of outflow from the left ventricle. Aortic valve sclerosis (AVS) presence is associated with an increase in cardiovascular mortality and morbidity.*

Aims & Objective: *The aim of this study is to investigate the correlation between AVS with the involvement of coronary arteries and the risk factors.*

Materials and Methods: *The relationship among aortic sclerosis, the presence and severity of CAD and cardiovascular endpoints in patients presenting with chest pain was studied by an observational cross-sectional study.*

A total of 301 Patients were included for the study and all the patients underwent transthoracic echocardiography and diagnostic coronary angiography to assess AVS and to diagnose the extent of coronary artery obstruction respectively.

Results: *Patients aged >60 years with aortic valve sclerosis had higher prevalence of coronary artery disease with p value of <0.05 & AVS is considered as independent predictor of obstructive CAD.*

Conclusion: *Our study predicts that AVS is strongly correlated with the extent of coronary artery obstruction and that echocardiographic evaluation of AVS in patients undergoing coronary angiography may be considered as a substitute marker for the extent of coronary atherosclerosis and thus of CAD.*

Keywords

Aortic valve sclerosis, Coronary artery disease.

Introduction

Aortic valve sclerosis (AVS) is defined as calcification, increased thickening of a trileaflet aortic valve in the absence of obstruction

of ventricular outflow and the antegrade velocity across the aortic valve less than 2.5m/s [1]. Its frequency increases with age, making it a major geriatric problem. The presence of AVS is associated with an approximately 50% rise in cardiovascular mortality and morbidity [2]. Increased prevalence of obstructive coronary lesions and triple vessel coronary artery disease (CAD) has been proved in patients with AVS, but the data till date are limited [3,4]. It has been proposed that CAD is associated with increased carotid intimal thickness, presence of atherosclerotic plaques in aorta and lower limb atherosclerosis [5]. AVS predictive value among cardiovascular findings in these patients is limited. Echocardiography scanning of individuals without CAD symptoms is cost-prohibitive, so finding existing subgroups of cases with AVS at a high risk for heart disease was necessary [6]. Over the last ten years, many other studies evaluated the relationship between AVS and CAD, but research about AVS's importance as a single factor in classification of risk is limited. AVS was also documented as a strong predictor of obstructive CAD and it might be considered in CAD risk stratification [7]. Thus, the ascertainment of the degree of Aortic valve sclerosis is the most obligatory risk for CAD and should be inves¬tigated. The purpose of this study was to evaluate whether the presence and severity of AVS in echocardiographic evalu¬ation could be used as a predictor for obstructive CAD severity. The extent of CAD in patients hospitalized for chest pain is of con¬cern given the number and vital importance of the in¬volved coronary vessels. We are looking to investigate the special im¬plication in risk acceptance for patients who have had a moderate risk for CAD.

Methods

Study population

This cross-sectional study included 301 patients who presented with complaint of chest pain and who were clinically suspected cases of CAD and subjected for coronary angiography between December to October 2017 in JN Medical college Department of cardiology KLE University Hospital, Belagavi, India. Clinical history and laboratory data were collected from all patients. All patients underwent complete transthoracic echocardiography (TTE) prior to considering coronary angiography either on the same day or within 2 days of the procedure. Inclusion criteria were first elective diagnostic coronary angiography and a normal aortic valve on fluoroscopy. Patients with aortic stenosis, aortic regurgitation more than mild, rheumatic valvular heart disease, congenital heart disease, history of prosthetic valve replacement were excluded from the study. An informed consent form was obtained from all patients. All procedures were approved by ethical committee JN medical college.

Clinical data

All patients' demographic data and risk factors were assessed before they were subjected to coronary angiography. Diabetes mellitus, systemic hypertension, hyperlipidemia and renal failure were defined as per follows:- hyperglycemia ≥ 126 mg/dl fasting blood sugar or on anti-hyperglycaemic medications, blood pressure recording of ≥140/90 mmHg or on antihypertensive medications, LDL ≥110mg/dl and total cholesterol level ≥200 mg/dl, and serum creatinine levels more than 1.3 mg/dl, respectively. Smoking was defined as active smoking within the past 1year.

Electrocardiographic (ECG) changes including ischemic ST-T changes, presence of Q-wave, bundle branch block and arrhythmias were evaluated and excluded.

Echocardiographic Evaluation

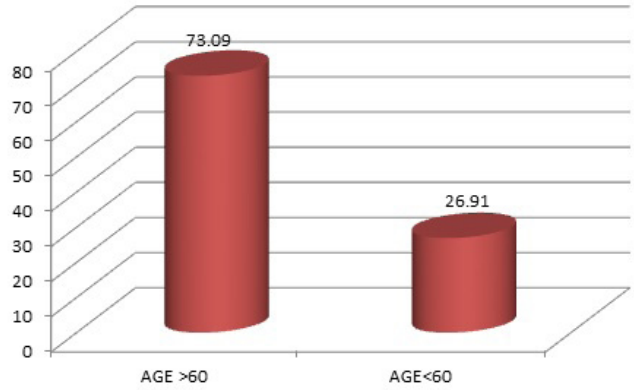
Detail transthoracic echocardiographic studies were performed as per the recent ASE-AHA guidelines for all patients using commercially available system IE33 Philips machine in supine and left lateral positions using S5 transducer. Two dimensional assessments of the aortic valve were made from the parasternal long axis, short axis and apical views with appropriate gain settings. Peak transaortic flow velocity was measured from the apical view by continuous wave Doppler. AVS was defined as a focal area of increased echogenicity and thickening of the aortic valve leaflets without restriction of leaflet motion and a transaortic flow velocity <2.5 m/s on TTE [2,7]. Mild, moderate and severe AVS were categorised as cusp thickness of 2-3mm, 4-6 mm and >6 mm, respectively [8,9]. The thickness of sclerotic aortic cusps were determined from the end diastolic frozen echocardiographic images obtained in either short or long axis.

Coronary angiography

Coronary angiography was performed in multiple views according to Judkins or Sones Standard technique [10]. Minimum of four views for assessement of left main coronary artery (LM), left anterior descending (LAD), left circumflex (LCX) and right coronary artery (RCA) were performed. Results were analysed by angiographer who was blinded to echocardiographic findings. Significant CAD was defined as more than 50% stenosis of at least one coronary artery vessel. The definition of single, double and triple vessel disease was based on the criteria of Coronary Artery Surgery study [11].

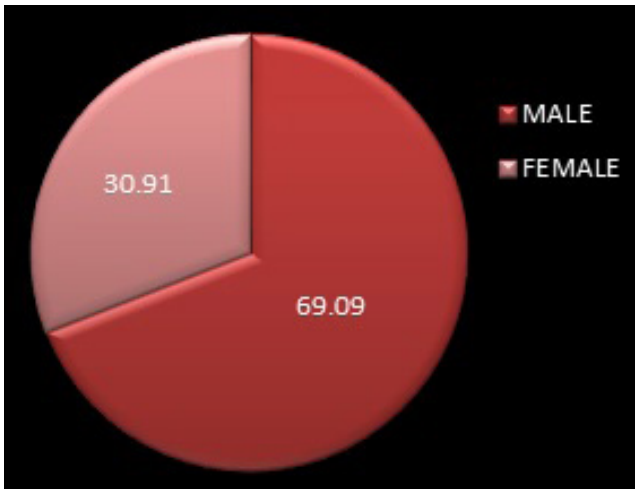
Results

A total of 301 patients who met the inclusion criteria were enrolled in the study. The population with age of >60 years were 220 which comprised of 73.09% & <60 years were 81 which comprised of 26.91%. Females 93 (30.89%) and Males 208 (69.10%) comprised of the study population (Graph 1). Shows Age wise distribution of study population with AVS.



Graph 1: Age wise Distribution of patients with AVS.

Gender wise distribution



Graph 2: Gender Wise Distribution.

Among 301 patients 69.09% were male & 30.91 % were female as shown in graph 2. Patients with diabetes were 212 (70.43%), & with hypertension were 101(33.55%) dyslipedemia were 27(8.97%) & smoking 42(13.95%) respectively.

Characteristics	No CAD	%	CAD	%	Total	%	p-value
Age >=60yrs	41	18.63	179	81.36	220	73.09	0.0001*
HTN	33	32.67	68	67.32	101	33.55	0.0640
DM	47	22.16	165	77.83	212	70.43	0.0640
Smoking	10	23.80	32	76.19	42	13.95	0.7870
Dyslipidemia	6	22.22	21	77.77	27	8.97	0.6690

Table 1: Baseline characteristics of AVS patients with and without CAD. *p<0.05.

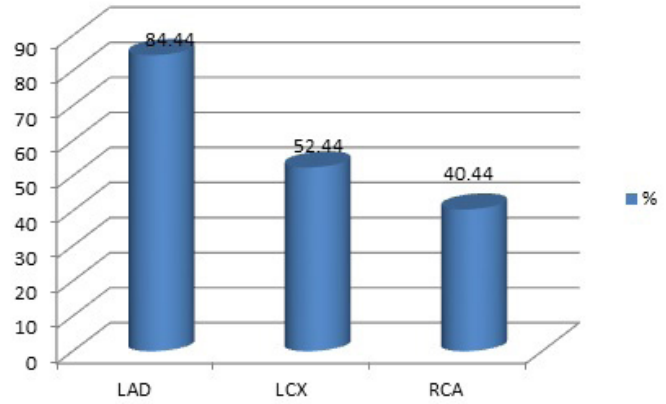
Comparing clinical characteristics of patients with and without CAD (Table 1), age >60 years was significantly associated with coronary artery disease among AVS patients with p<0.0001*.

Among the coronary vessels involved, LAD was most commonly affected 84.44% (GRAPH-3a) and was statistically significant (p < 0.001) (Table 2).

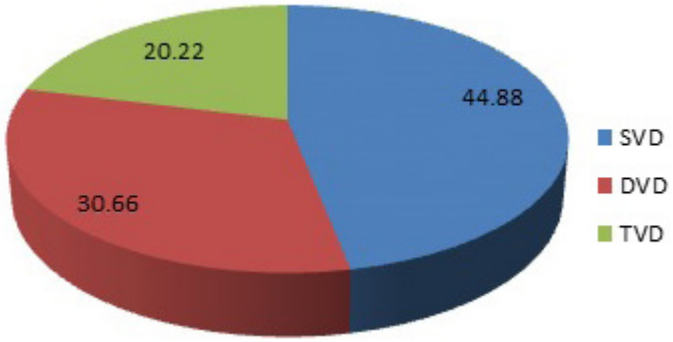
Coronary Artery Involvement	n	%	P-Value
LAD	190	84.44	<0.0001
LCX	118	52.44	>0.5
RCA	91	40.44	>0.5
SVD	101	44.88	<0.0001
DVD	69	30.66	>0.5
TVD	50	20.22	>0.5

Table 2: Coronary Artery Involvement.

Among number of coronary vessel involvement SVD was most commonly involved 44.88% (Graph -3b).



Graph 3a: specific coronary artery involvement.



Graph 3b: Number of obstructive coronary vessel involvement.

Comparing clinical clinical characterstics of patients by multiple logistic regression (Table 3) Age>60 years was significantly associated CAD among AVS patients with p value <0.0001.

Characteristics		%	Unadjusted OR	Adjusted OR	95% CI for OR		P-value
Age	<60yrs	56.79	Ref.				
	>60yrs	81.36	3.2580	3.0520	1.6230	5.6630	0.0001*
Gender	Male	68.08	Ref.				
	Female	78.90	1.6310	2.0420	1.2040	3.8030	0.0330
HTN	No	78.02	Ref.				
	Yes	67.32	0.5820	0.6420	0.3380	1.1690	0.1530
DM	No	63.15	Ref.				
	Yes	70.43	1.6220	1.6320	0.8860	3.0430	0.1210
Smoking	No	74.10	Ref.				
	Yes	76.19	1.2370	1.5550	0.6330	3.5640	0.3630
DYSLP	No	73.19	Ref.				
	Yes	77.77	1.2810	1.4860	0.5010	4.5640	0.4620

Table 3: Multiple logistic regression analysis of CAD by different characteristic.

Comparing clinical clinical characterstics of patients by multiple logistic regression (Table 3).
Age>60 years was significantly associated CAD among AVS patients with p value <0.0001.

Discussion

In the present study, results revealed that Echocardiographic evidence of AVS is strongly associated with coronary artery disease in study population who underwent coronary angiography for cardiac evaluation. And this study demonstrates an increase in the prevalence of AVS with ageing, especially in patients >60yrs. Aortic valve sclerosis is associated with age and is considered a presumptive marker of senile degenerative changes resulting from hemodynamic stress in heart [10-14]. In a study of 160 individuals, Syodinc et al. found that AVS was associated with the presence of triple vessel CAD and was independently associated with Gensini score [13]. In study population of 230 patients Fazlinezhad et al found Aortic valve sclerosis are an independent predictor of obstructive coronary disease12. In group of population, Kirsten and his colleagues in 2002 studied the morphologic classification system for AVS by TEE and correlated the subset of Aortic valve disease with the evidence of cardiovascular disease, and they concluded that it is possible to identify a subgroup of patients with mixed nodular and diffuse sclerosis, were at increased risk for CAD including multivessel disease [14]. In 2006, Serdar et al. [15], studied the association between Aortic valve sclerosis and the extent of coronary atherosclerosis by means of the Gensini score system, and he concluded that Aortic valve sclerosis is more strongly interrelated with the coronary angiographic results. Echocardiographic detection of Aortic valve sclerosis in patients undergoing coronary angiography can predict the extent of coronary atherosclerosis [15]. One more study concluded that pathologic processes that may occur in coronary arteries may be identified more easily in the aortic valve and they suggest that once the diagnosis of Aortic valve sclerosis is made by echo, it should be considered as a potential marker of CAD, and patients who are diagnosed with Aortic valve sclerosis should undergo intensive screening for CAD with aggressive management for modifiable risk factors.

In present study, clinical factors associated with AVS & CAD pathogenesis includes age, sex, hypertension, hyperlipidemia, diabetes mellitus and smoking. Among these only age was significantly associated with AVS & CAD with p value of < 0.001 and the other variables were statistically not significant.

Present study showed extent of coronary artery involvement LAD 84.44% (with significant p value), LCX 52.44%, RCA 40.44% & involvement of SVD 44.88%, DVD & TVD 30.66% 20.22% respectively. None of the other studies have shown the extent of specific coronary vessels involvement.

Conclusion

This study concludes that AVS can be considered as a marker for age related degeneration of the cardiac tissue and increased prevalence of AVS in HTN, Diabetes, and Hyperlipidaemia is mainly due to the progressive ageing process. The present study strongly predicts that Aortic valve sclerosis strongly correlated with the extent of coronary artery obstruction and that echocardiographic evaluation of AVS in patients undergoing coronary angiography may be considered as a substitute marker for the extent of coronary atherosclerosis and thus of CAD.

References

1. Otto CM. Why is aortic sclerosis associated with adverse clinical outcomes? J Am Coll Cardiol. 2004; 43: 176-178.
2. Otto CM, Lind BK, Kitzman DW, et al. Association of aortic valve sclerosis with cardiovascular mortality in the elderly. N Engl J Med 1999; 341:142-147.
3. Fazlinezhad A, Leila Hosseini L, Yousefzadeh H, et al. Correlation between aortic valve sclerosis and coronary artery disease: a cross e sectional study. J Cardio-Thoracic Med. 2013; 1: 20-25.
4. Soydinc S, Davutoglu V, Dundar A, et al. Relationship between aortic valve sclerosis and the extent of coronary artery disease in patients undergoing diagnostic coronary angiography. Cardiology. 2006; 106: 277-282.
5. Belhassen L, Carville C, Pelle G, et al. Evaluation of carotid artery and aortic intima-media thickness measurements for exclusion of significant coronary atherosclerosis in patients scheduled for hea valve surgery. J Am Coll Cardiol. 2002; 39:1139-1144.
6. Conte L, Rossi A, Cicoira M, et al. Aortic valve sclerosis: a marker of significant obstructive coronary artery disease in patients with chest pain? J Am Soc Echocardiogr. 2007; 20: 703-708.
7. Tolstrup K, Crawford MH, Roldan CA. Morphologic characteristics of aortic valve sclerosis by transesophageal echocardiography: importance for the prediction of coronary artery disease. Cardiol. 2002; 98: 154-158.
8. Tolstrup K, Roldan CA, Qualls CR, et al. Aortic valve sclerosis, mitral annular calcium, and aortic root sclerosis as markers of atherosclerosis in men. Am J Cardiol. 2002; 89: 1030-1034.
9. Chandra HR, Goldstein JA, Choudhary N, et al. Adverse outcome in aortic sclerosis is associated with coronary artery disease and inflammation. J Am Coll Cardiol. 2004; 43: 169-175.
10. Otto CM, Kuusisto J, Reichenbach DD, et al. Characterization of the early lesion of 'degenerative' valvular aortic stenosis Histological and immunohistochemical studies. Circulation. 1994; 90: 844-853.
11. Rossi A, Targher G, Zoppini G, et al. Aortic and mitral annular calcifications are predictive of all-cause and cardiovascular mortality in patients with type 2 diabetes. Diabetes Care. 2012; 35: 1781-1786.
12. Soydinc S, Davutoglu V, Dundar A, et al. Relationship between aortic valve sclerosis and the extent of coronary artery disease in patients undergoing diagnostic coronary angiography. Cardiology. 2006; 106: 277-282.
13. Head SJ, Farooq V, Serruys PW, et al. The SYNTAX score and its clinical implications. Heart. 2014; 100: 169-177.
14. Tolstrup K, Crawford M, Roldan CA. Morphologic Characteristics of Aortic Valve Sclerosis by Transesophageal Echocardiography: Importance for the prediction of coronary artery disease. Cardiology. 2002; 98: 154-158.
15. Prasad Y, Bhalodkar NC. Aortic sclerosis – a marker of coronary atherosclerosis. Clin cardiol. 2004; 27: 671-673.