

# Prevalence of coronary artery disease in patients with isolated aortic valve stenosis

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**SUMMARY** The prevalence of significant coronary artery disease (reduction in luminal diameter by more than 50%) among 88 consecutive patients with aortic stenosis requiring aortic valve replacement at Hammersmith Hospital was examined. Twenty two (34%) patients had significant coronary disease. Nineteen of 42 (45%) patients with typical angina had coronary disease; three of 20 (15%) patients with atypical chest pain had coronary disease, while none of 26 patients free of chest pain had significant coronary disease. Risk factors for coronary disease were equally distributed among patients with and without significant luminal obstruction.

Because of the small, but definite, hazard of coronary arteriography and in the interest of cost containment it is suggested that patients with aortic stenosis who are free of chest pain do not require routine coronary arteriography. This applies particularly to patients requiring urgent aortic valve replacement.

It has been recommended that routine preoperative coronary arteriography should be performed before valve replacement in patients with valvar aortic stenosis.<sup>1-4</sup> This recommendation is based on the observation that coronary artery disease may be an appreciable cause of morbidity and mortality after valve replacement.<sup>5-7</sup> The low risk of prosthetic valve replacement combined with myocardial revascularisation procedures<sup>3,8-14</sup> has lent further support to the argument in favour of routine coronary angiography. Such recommendations do not consider the risks and expense of routine angiography<sup>15,16</sup> and the risk to the patient of delaying an urgently needed operation. The present study was performed to determine whether or not the absence of a history of chest pain in patients with aortic stenosis precluded significant coronary artery disease, thereby obviating the need for coronary arteriography in such patients. A secondary objective was to find out how often the development of coronary disease seemed to have determined the onset of angina in previously asymptomatic aortic stenosis.

## Patients and methods

Eighty eight patients with isolated aortic valve

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stenosis seen at the Hammersmith Hospital between January 1975 and December 1982 were included in the study. All patients underwent subsequent aortic valve replacement. Patients with multiple valve disease; those less than 35 years of age; those with a peak systolic aortic valve gradient less than 40 mm Hg; those with aortic insufficiency defined by root aortography as being greater than grade one on a scale of four,<sup>17</sup> and those in whom it was not possible to intubate the coronary arteries were excluded. Left heart catheterisation was performed retrogradely or by the transseptal technique using the femoral approach. Left ventriculography and ascending aortography were performed in each patient. Coronary arteriography was performed in multiple projections using the Judkins technique.<sup>18</sup> A significant coronary lesion was defined as a 50% or more reduction in luminal diameter seen in two projections. Patients were classified into groups depending on the presence or absence of chest pain. Group 1 consisted of patients with typical angina pectoris defined as substernal left precordial pain, pressure, or tightness precipitated by exertion, emotional stress, or cold and promptly relieved by rest or glyceryl trinitrate. Group 2 consisted of patients with atypical pain defined as chest pain not typical of angina and without obvious cause. Group 3 consisted of patients free of chest pain. Statistical analysis was performed using the paired *t* test or  $\chi^2$  test.

Table 1 Clinical and coronary angiographic findings in 88 patients with aortic stenosis

	Male/female ratio	Age (yr)		No (%) of patients with coronary artery disease	No of diseased vessels		
		Mean	Range		One	Two	Three
Group 1: typical angina (n=42)	29/13	61	39-74	19 (45)	12	4	3
Group 2: atypical chest pain (n=20)	15/5	57	38-77	3 (15)	1	2	0
Group 3: no chest pain (n=26)	20/6	59	43-72	0 (0)			
Total	64/24	58	38-77	22 (25)	13	6	3

Table 2 Symptoms and coronary risk factors in relation to coronary anatomy among patients with aortic stenosis

	Aortic stenosis		Statistical significance
	With CAD (n=22)	Without CAD (n=66)	
No (%) of patients with:			
Dyspnoea	17 (77)	45 (68)	NS
Syncope	0	17 (26)	p<0.01
Hypertension (diastolic pressure >90 mm Hg)	7 (32)	15 (23)	NS
Serum cholesterol concentration (mmol/l, mean ± SD)	6.7 ± 2.8	5.9 ± 1.9	NS
Fasting glucose concentration (mmol/l, mean ± SD)	5.6 ± 0.9	5.2 ± 1.1	NS

CAD, coronary artery disease.

Table 3 Relation between coronary artery disease and chest pain in patients with aortic stenosis (present and published series)

Author	Patients with chest pain				Patients without chest pain with CAD	
	With CAD		Without CAD		No	%
	No	%	No	%		
Linhart <i>et al.</i> (1968) <sup>4</sup>	19/26	73	7/26	27	7/33	20
Gross <i>et al.</i> (1975) <sup>26</sup> (abstract only)	13/32	41	19/32	59	3/16	19
Hancock (1975) <sup>27</sup> (abstract only)	82/128	64	46/128	36	15/45	33
Basta <i>et al.</i> (1975) <sup>25</sup>	10/41	24	31/41	56	0/19	0
Harris <i>et al.</i> (1975) <sup>28</sup>	13/40	32.5	27/40	67.5	3/29	10
Mandal and Gray (1976) <sup>29</sup>	14/28	50	14/28	50	2/28	7
Paquay <i>et al.</i> (1976) <sup>30</sup>	20/36	55.5	16/35	44.5	11/12	8
Graboyes and Cohn (1977) <sup>31</sup>	4/12	33	8/12	66	0/7	0
Storstein and Enge (1979) <sup>32</sup>	13/40	32.5	27/40	67.5	5/20	25
Present series (1983)	22/62	35.5	40/62	64.5	0/26	0
Total	210/445	47	235/445	53	36/235	15

## Results

A total of 22 patients (34%) had coronary disease. Forty two (49%) patients had typical angina (group 1), and of these 19 (45%) had coronary artery disease. Twenty patients had atypical chest pains; of these three had coronary artery disease (15%) (group 2). None of 26 patients free of chest pain had coronary disease (group 3) (Table 1). Of patients less than 60 years old, 14% had coronary artery disease while 31% of patients over 60 years of age had coronary disease. The youngest patient with documented coronary artery disease was aged 44 years. No patient in the series had a left main stem stenosis. Syncope occurred more commonly in patients free of significant coronary disease ( $p<0.01$ ). Risk factors for coronary disease were equally distributed among patients with and without coronary disease (Table 2).

## Discussion

The reported prevalence of angina in patients with aortic stenosis has varied from 40% to 70%.<sup>19-21</sup> Early necropsy studies suggested that patients with aortic stenosis had a lower than expected incidence of coronary artery disease, and the concept of a protective effect of aortic stenosis on the coronary arteries evolved.<sup>22,23</sup> Subsequent angiographic studies have shown that the prevalence of significant coronary disease in patients with aortic stenosis varies from 20% to 60%.<sup>10,24,25</sup> The incidence in our series was 34%. Table 3 summarises the reported incidence of coronary disease in patients with isolated aortic valve stenosis with and without chest pain. By combining the results of previously published series and those of the present study it would appear that among patients with aortic stenosis and chest pain there is an equal

chance of having significant coronary artery disease and having "clean" coronary arteries. None of the patients free of chest pain in the present series had significant coronary artery disease. This observation is in accord with most, though not all, of the published data (Table 3). A possible explanation for the differences between our findings and those of others must be conjectural: Linhart's paper was published in 1968 at a time when the quality of coronary arteriograms was greatly inferior to modern ones, and Gross's (1975) and Hancock's (1975) findings were published only in abstract form but never later in full. Although a significant coronary lesion is usually defined as 75% or more narrowing seen in two views at right angles to each other, the site of the lesion, whether it is proximally placed or more distal in the coronary tree, is almost always omitted as is the size of the affected vessel. A single lesion, distally placed in a non-dominant right coronary artery, might be included by definition though having little relevance either to symptoms or prognosis. Furthermore, a distinction between typical and atypical pain was made in only one series.<sup>30</sup> The inclusion of patients with chest pain and aortic valve gradients as small as 10 mm Hg<sup>29</sup> inevitably selects patients who are likely to have severe coronary artery disease. The converse is seen in our series in which no patients with syncope had significant coronary disease (Table 2).

A useful prognostic index for predicting significant coronary disease has been established using multiple logistic regression analysis of clinical data from a large series of patients with valvular disease who had undergone coronary arteriography before valve replacement,<sup>33</sup> but a distinction between typical and atypical pain was not made and since the number of patients with particular valve lesions was not stated the data cannot be compared with our own. The other apparently discrepant findings were also not comparable for those reasons<sup>10 34</sup> or because only the patients with chest pain underwent coronary arteriography.<sup>24</sup>

Severe coronary narrowing may be important prognostically in patients with aortic stenosis. Coronary occlusive disease may interfere with adequate myocardial perfusion during valve surgery, and the presence of coronary disease correlates with the post-operative mortality and the probability of lack of improvement after valve replacement.<sup>2 6 34</sup> In view of the equal chance of there being significant coronary disease in patients with aortic stenosis and chest pain few would doubt the wisdom of performing routine coronary angiography in this group. The situation was less clear cut, however, in patients with aortic stenosis who are free of chest pain. Conflicting recommendations have been made. Some have recommended routine coronary angiography in all patients with aor-

tic valve disease irrespective of the presence or absence of chest pain.<sup>34 35</sup> Others have recommended coronary arteriography only in patients with aortic stenosis and angina,<sup>10 12 36</sup> while Hutchinson *et al.*<sup>37</sup> recommended angiography in all patients over 35 years. The issue has become more important in recent years because of the frequency of combined aortic valve replacement and coronary bypass surgery.<sup>3 4 8 14 38</sup> Early results had shown a high operative mortality (85%)<sup>2</sup> for the combined procedures, but the operative mortality in recent series has been no greater than that for aortic valve replacement alone. The longest published follow up period for patients who have had a combined procedure is, however, short (three years).<sup>14 38</sup> Furthermore, there is no information available on the importance of bypassing asymptomatic coronary stenoses in patients with aortic valve disease possibly because of their rarity. In the absence of this information we suggest that routine coronary angiography in patients with aortic valve disease should be confined to those with chest pain or electrocardiographic evidence of myocardial infarction. We believe that the hazards of coronary angiography outweigh the potential for generating important information in patients with severe aortic stenosis who are free of chest pain. Some require emergency valve replacement, and all patients with severe aortic stenosis should be regarded as urgent cases. Even the delay engendered by routine coronary angiography could be fatal in these cases.

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