VALVULAR AORTIC STENOSIS AND CORONARY ARTERY DISEASE

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Coronary artery disease in patients with symptomatic valvular aortic stenosis is well known to be a diagnostic problem. Since the advent of coronary artery bypass, the diagnosis of associated coronary artery disease is essential in the management of patients with valvular aortic stenosis. This study discusses the incidence and the effects of coronary artery disease on the symptomatology and hemodynamics of valvular aortic stenosis.

METHODS

Sixty-six symptomatic patients with valvular aortic stenosis who underwent right and left heart catheterization and selective coronary arteriography by the Sones' technique (Sones and Shirey, 1962) are reported. Associated lesions were mild valvular aortic insufficiency in fourteen patients and mild mitral insufficiency in nine patients.

In this series, fifty-eight patients randomly studied from 1967 to 1971 were used, with eight patients with coronary artery disease selectively added. Forty-two were male and twenty-four were female, ranging in age from 39 to 74 years, with an average age of 60 years.

Catheterization techniques and methods of calculation were the same for each patient. The mean systolic gradient across the aortic valve was measured planimetrically after superimposing the aortic pressure curve over the left ventricular pressure curve. Both curves were obtained by withdrawal tracings across the aortic valve prior to any angiographic studies. The aortic valve area was calculated by the hydraulic formula described by Gorlin and Gorlin (1951). The cardiac output and index were calculated by the indicator-dilution technique using Indocyanine green dye.

Patients were considered to have significant coronary artery disease if the angiographic intraluminal narrowing of any major branch was more than 50% of the vessel diameter. The patients were divided into two groups based on the coronary arteriographic evidence of coronary artery disease. Group A consisted of forty-four patients with normal coronary arteries and group B of twenty-two patients with coronary artery disease. Each group was further sub-divided into those experiencing and those not experiencing angina pectoris.

The age, mean systolic gradient across the aortic valve, aortic valve area, left ventricular end diastolic pressure, and cardiac index were statistically compared in the two groups and their respective subgroups, using

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an IBM CCLRES 40 computer. The results of the data analysis are shown in Table 1.

RESULTS

Fourteen of the randomly selected fifty-eight patients with valvular aortic stenosis had associated coronary artery disease of a significant degree. Twenty-four patients (54%) from group A and seventeen patients (77%) from group B experienced anginal pain. A comparison of those patients experiencing anginal pain and those not experiencing it revealed only one disparity—the age of patients with angina was lower in those with associated coronary artery disease.

The mean systolic gradient across the aortic valve was higher (73.8 mm Hg versus 62.9 mm Hg) and the valve area was smaller ($P<0.02$) in the forty-four patients in group A with normal coronary arteries than in

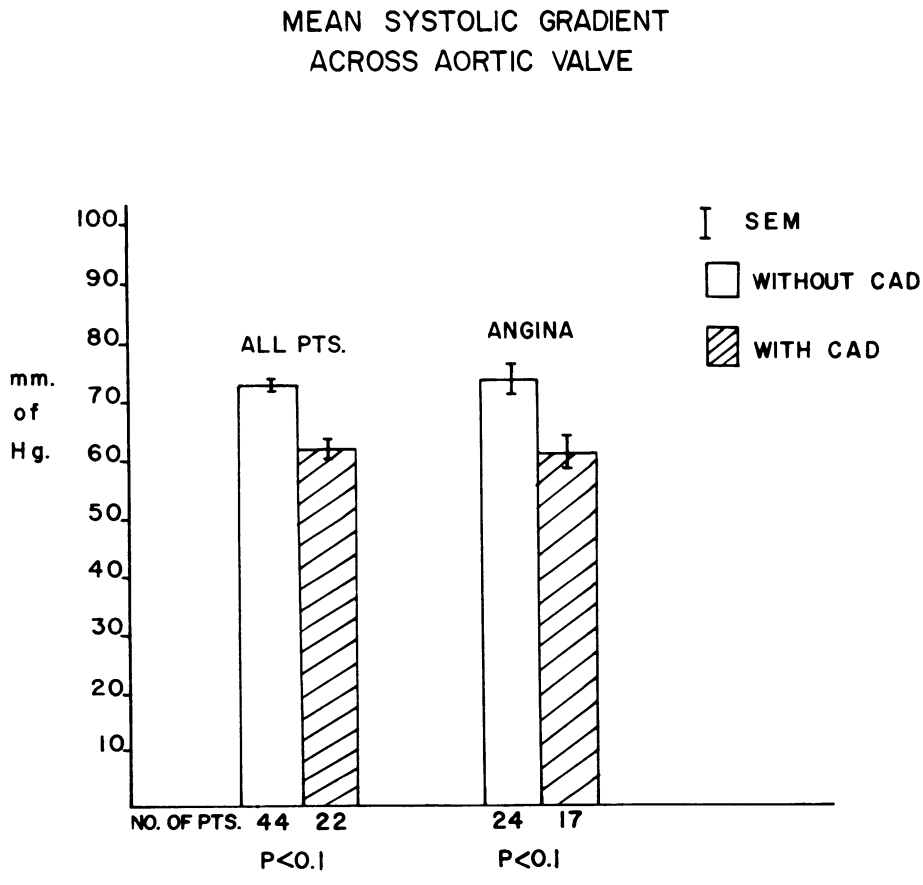

Fig. 1. Mean systolic gradient across aortic valve in patients with and without coronary artery disease.

the twenty-two patients of group B who had coronary artery disease (Figs. 1 and 2). Similarly, the mean systolic gradient across the aortic valve was higher (74.6 mm Hg versus 62.2 mm Hg) and the aortic valve area was smaller ($P<0.02$) in patients who complained of angina but had only valvular aortic stenosis than in those complaining of angina in whom coronary arteriography demonstrated associated coronary artery disease. No significant differences were found in left ventricular end diastolic pressures or cardiac indices.

DISCUSSION

Angina pectoris, left ventricular failure, and syncope are cardinal features in patients with severe valvular aortic stenosis (Wood, 1958). When patients with valvular aortic stenosis complain of angina pectoris, the presence or absence of coronary artery disease represents a challenge for the diagnostician. Since myocardial ischemia is the end result of a disturbance in myocardial oxygen consumption, nitroglycerin does not help in the differentiation (Perloff et al, 1965). Prior to selective coronary cine-angiography, classic angina in valvular aortic stenosis was considered a sign of well developed disease (Mitchell et al, 1954, and Wood, 1958).

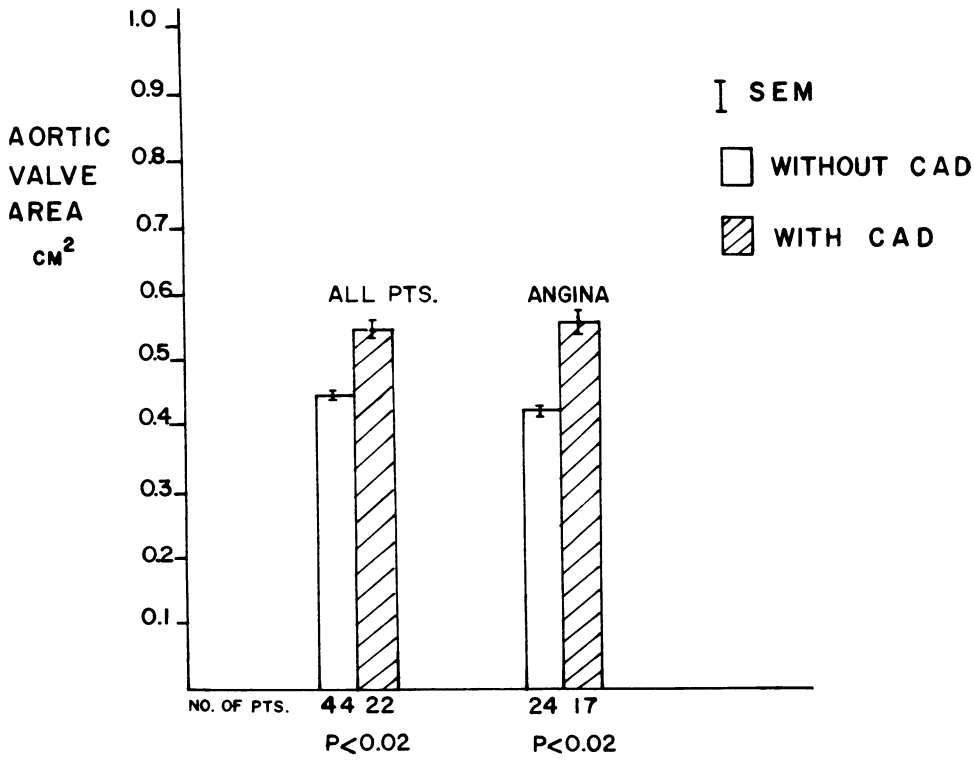

Fig. 2. Aortic valve area in patients with and without coronary artery disease.

Edwards (1962) stated that both coronary artery disease and valvular aortic stenosis may be advanced by the same process. Selective coronary cine-angiography has shown that coronary artery disease is frequently associated with valvular aortic stenosis (Segal and Blanco, 1963, and Linhart and Wheat, 1967). Lewis and associates (1970) have reported a high incidence of angina pectoris in patients with pure or predominant valvular aortic stenosis. In the same report it was found that a large number of patients did have significant obstructive coronary artery disease.

In our study, the incidence of significant coronary artery disease was 20.7% in a randomly selected fifty-eight patients with symptomatic valvular aortic stenosis. No significant differences were found in regard to left ventricular end diastolic pressure and cardiac index in patients with and in those without coronary artery disease. Patients with valvular aortic stenosis without coronary artery disease developed angina earlier in the history of the disease and had a higher aortic systolic gradient and a smaller aortic valve area than patients with coronary artery disease. The mean aortic systolic gradient and aortic valve area in our study were consistent with those reported by Fallen and associates (1967) in patients with angina and aortic valvular stenosis without coronary artery disease.

It has been suggested that coronary artery disease increases the risk of patients undergoing aortic valve replacement and diminishes the likelihood of postoperative symptomatic recovery (Braunwald and Morrow, 1963, and Hurst and Logue, 1970). There is, nevertheless, opinion to the contrary and Boyle and associates (1966) did not find a difference in risk.

The advent of aorto-coronary saphenous vein bypass surgery may change the outlook for patients with valvular aortic stenosis associated with coronary artery disease. There is not yet enough data collected to substantiate this speculation; however, in view of the high incidence of coronary artery disease and difficulty in diagnosing it, selective coronary angiography is essential in the evaluation of patients with valvular aortic stenosis.

SUMMARY

This study compares symptomatically and hemodynamically forty-four patients having valvular aortic stenosis and normal coronary arteries to twenty-two patients having valvular aortic stenosis with coronary artery disease. The incidence of coronary artery disease in a random sample of fifty-eight patients having valvular aortic stenosis was 24.1%. The patients without associated coronary artery disease had higher mean systolic gradients across the aortic valve and significantly smaller aortic valve areas. Twenty-four of the forty-four patients without coronary artery disease (54.5%) and seventeen of the twenty-two patients with coronary artery dihease (77.2%) complained of anginal pain. The patients without associated coronary artery disease who complained of anginal pain were older, had higher mean systolic gradients across the aortic valve, and significantly smaller aortic valve areas. No significant differences were found in left ventricular end diastolic pressures or cardiac indices in the different groups. In view of the high incidence of coronary artery

disease and the difficulty in diagnosing it, selective coronary angiography is essential in evaluation of patients with valvular aortic stenosis.

REFERENCES

1. Boyle D, McDonald L, Resnekov L, and Ross D: Experience with by-pass surgery in coronary arterial disease complicating aortic valvular disease. Br Heart J 28:428, 1966
2. Braunwald E, and Morrow AG: Obstruction of left ventricular outflow: current criteria for the selection of patients for operation. Am J Cardiol 12:47, 1963
3. Edwards JE: The etiology of calcific aortic stenosis. Circulation 26:817, 1962
4. Fallen EL, Elliot WK, and Gorlin R: Mechanisms of angina in aortic stenosis. Circulation 36:488, 1967
5. Gorlin R, and Gorlin SG: Hydraulic formula for calculation of the area of the stenotic mitral valve, other cardiac valves and central circulatory shunts. Am Heart J 41:1, 1951
6. Hurst WJ, and Logue BR: *The Heart*, McGraw-Hill, New York, 1970, page 839
7. Linhart, JW, and Wheat MW: Myocardial dysfunction following aortic valve replacement: The significance of coronary artery disease. J Thorac Cardiovasc Surg 54:259, 1967
8. Mitchell AM, Sackett CM, Hanzicker WJ, and Levine SA: The clinical features of aortic stenosis. Am Heart J 48:684, 1954
9. Perloff JG, Ronan, JA, and DeLeon AC: The effect of nitroglycerin on left ventricular wall tension in fixed orifice aortic stenosis. Circulation 32:204, 1965
10. Segal BL, and Blanco G: Criteria of open heart surgery for acquired aortic valvular disease. Am J Cardiol 12:47, 1963
11. Sones FM and Shirey EK: Cinecoronary arteriography. Mod Concepts Cardiovasc Dis 31:735, 1962
12. Wood P: Aortic stenosis. Am J Cardiol 1:553, 1958