CME

L. Scott Cook, MD

Aortic Stenosis as a Marker for Coronary Atherosclerosis

Key Points

1. Patients with hemodynamically significant aortic stenosis are at increased risk for cardiac events.
2. The presence of coronary artery disease in patients with aortic stenosis worsens their long-term survival.
3. Early coronary artery disease (non-occlusive) is not identified by coronary angiograms.
4. Approximately 90% of patients with aortic stenosis have coronary artery disease; 52% had occlusive disease and 39% had non-occlusive disease.

Introduction

Aortic stenosis (AS) is the most common valvular lesion affecting cardiac surgical patients in East Central Illinois and the United States.[1] AS is now seen to develop as an inflammatory process similar to atherosclerosis.[2] Unfortunately, even today, patients are treated medically until they develop symptoms. As the classic symptoms of angina, syncope or dyspnea develop, one's prognosis worsens without aortic valve replacement (AVR).[3] In general, symptoms can be attributed to AS if valve area is <1.0 cm^2 or if mean transvalvular gradient exceeds 50 mmHg. Today, the diagnosis can easily be made by Doppler echocardiography either by transthoracic or transesophageal routes. All patients with AS have calcified aortic valve leaflets. Ultimately, patients with AS develop left ventricular outflow obstruction and left ventricular hypertrophy to compensate and maintain ejection performance.[4] Even when associated with normal left ventricular systolic function, mild to moderate AS confers a worse prognosis compared to the general population.[5]

Many patients with AS have associated coronary atherosclerosis.[6] In the Veteran's Administration Cooperative Study on Valvular Heart Disease, 429 (48%) of 896 patients had $\geq$ 50% stenosis of one or more coronary arteries; in those with coronary artery disease (CAD), the incidence of one, two and three vessel occlusive disease was 36%, 31% and 33% respectively. The presence of CAD markedly increases the operative mortality from 1.4 to 4.5% and decreased the overall 10-year survival after AVR.[6] Thus the presence of occlusive CAD in patients with AS markedly worsens long-term survival even with AVR.

Even patients with aortic sclerosis have an increased incidence of cardiovascular events. This is associated with CAD and inflammation and not a result of the valvular heart disease per se.[7] Thus, the presence of CAD in patients with valvular AS is very critical in determining their long-term survival after AVR.

Methods and Materials

The idea for this observational clinical study came about three years ago after performing AVR on a young male (47 years-of-age) with severe AS and normal coronary arteries via coronary angiography. In the operating room, all three coronary arteries were noted to have fatty infiltrates and associated calcification. When I informed the primary care physician that the patient needed to be on a statin, the response was that the coronary angiogram showed the arteries were normal. The physician did not understand that coronary angiograms look for occlusive disease and do not evaluate early non-occlusive CAD. The purpose of this study was to determine the incidence of both occlusive and non-occlusive CAD in patients having AVR for AS.

From September 2003 through July 2004, 21 consecutive patients with AS had aortic valve replacement and ligation of left atrial appendage at Carle Foundation Hospital. Their average age was 64 years. Thirteen were female and eight were male. Two patients died following operation in the hospital for a 9% mortality rate. The first cause of death was cardiogenic shock in a redo with prior coronary artery

bypass and the second was a postoperative stroke. All patients were evaluated for CAD, both by cardiac catheterization and intraoperative palpation and visualization of the epicardial coronary arteries. Fifteen patients had tissue AVR and six had mechanical AVR.

Results

Eight of the 21 patients had coronary artery bypass grafting (CABG), in addition to AVR. Three of the 21 had prior CABG. Thus, 11 of the 21 patients (52%) had evidence of occlusive (≥50% stenosis) CAD at the time of AVR. Of the 10 remaining patients, four had evidence of plaque disease (<50% stenosis) or prior stent placement at prior cardiac catheterization. Thus, only six of the 21 patients (28%) had normal coronary arteries by preoperative cardiac catheterization. In the remaining six patients, with presumed normal coronaries, four patients had fatty infiltrates or palpable calcification in the epicardial coronary arteries when evaluated in the operating room. In the end only two patients, 9% did not have angiographic visualization or palpable evidence of CAD. Both of these patients were female and both had congenital bicuspid aortic valve stenosis. Their ages were 58 and 68. Thus, every patient having AVR with a native tricuspid aortic valve had evolving CAD. From a valvular viewpoint, the development of AS is different in patients with bicuspid aortic valves versus patients with tricuspid aortic valves.

Conclusions

This study was undertaken to evaluate the occurrence of both occlusive stenosis (>50%) and non-occlusive (fatty infiltrate and calcification) CAD in patients with severe AS requiring aortic valve replacement. Approximately, 90% of these patients had evidence of CAD, 52% had occlusive disease and 39% had non-occlusive disease. Two patients in this study had a bicuspid aortic valve and neither had findings of CAD. Thus, a bicuspid aortic valve is more prone to earlier obstruction than is a tricuspid aortic valve.

The primary finding of this study is that aortic valve calcification is an early marker for coronary atherosclerosis. Patients with aortic calcification should be on maximal medical therapy for their CAD.

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References

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CME Questions 4a-c

Please answer the following:

4a. A normal coronary angiogram rules out coronary artery disease:
   a. True
   b. False

4b. What percentage of patients with severe aortic stenosis has coronary artery disease at the time of operation?
   a. None
   b. 20%
   c. 50%
   d. 90%

4c. Patients with severe bicuspid aortic stenosis are associated with an increased incidence of coronary artery disease at operation:
   a. True
   b. False