Aortic Stenosis

Why Do Cardiologists Fail to Follow the Surgical Guidelines for Severe Aortic Stenosis?

Benjamin H Freed, MD, Lissa Sugeng, MD, Kathleen Furlong, BSN, Victor Mor-Avi, PhD, Jaishankar Raman, MD, PhD, Valluvan Jeevanandam, MD and Roberto M Lang, MD

Sections of Cardiology and Cardiothoracic Surgery, University of Chicago Medical Center

Abstract

Many patients with symptomatic severe aortic stenosis (AS) do not receive aortic valve replacement (AVR) even though the American College of Cardiology/American Heart Association/American Society of Echocardiography guidelines give a class I indication for this type of management. We determined the proportion of patients with severe AS who did not undergo AVR in a university hospital setting and identified the reasons for lack of surgical referrals despite the presence of a class I guideline indication. We studied consecutive patients with severe AS by echocardiographic criteria (aortic valve area <1.0 cm², aortic valve gradient ≥40 mmHg). Of the 106 patients with severe AS, 33 (31%) underwent AVR while 73 (69%) did not proceed to surgery. Of those patients without AVR, 31 (42%) were symptomatic. The most common reason patients with symptomatic severe AS did not receive AVR was that the symptoms were thought to be unrelated to AS. After 15 months, 15 patients (14%) who did not undergo AVR had died. In patients with severe AS, physicians commonly under-recognize symptoms and overestimate operative risk. As a result, many patients with a class I indication for AVR do not receive it.

Keywords

Aortic valve, aortic stenosis, aortic valve replacement

Disclosure: The authors have no conflicts of interest to declare.

Received: July 2, 2010 Accepted: July 16, 2010 Citation: US Cardiology, 2010;7(2):42–5

Correspondence: Roberto M Lang, MD, University of Chicago Medical Center, 5084–5841 S Maryland Ave, Chicago, IL 60637. E: rlang@bsd.uchicago.edu

Aortic stenosis (AS) is the most common valvular disease in the western hemisphere. Currently, 4% of the North American population above 75 years of age has AS, and approximately 50% of patients with mild to moderate AS will progress to hemodynamically severe AS in their lifetime.1

The natural history of the disease, which is largely unchanged since its initial description by Braunwald and Ross in 1968, includes a ‘latent period’ in which progressing aortic valvular obstruction leads to myocardial pressure overload followed by an abrupt and precipitous decline in survival after the onset of symptoms is manifested.2 The classic symptoms include angina, syncope, and heart failure, which develop primarily from the inability of the cardiac output to meet peripheral demands. The severity of the valvular stenosis at which these symptoms occur varies from patient to patient.

Despite several trials examining medical therapy for these patients, the only proven and accepted therapy is surgical replacement of the aortic valve.3,4 The operative mortality rate for aortic valve replacement (AVR) is around 4%, with long-term survival of 80% at three years.5 Although the operative mortality rate is relatively low, the American College of Cardiology (ACC)/American Heart Association (AHA)/American Society of Echocardiography (ASE) guidelines provide a class I indication for AVR in patients with severe AS only after the onset of symptoms.6 This recommendation is based on observational studies that demonstrate that patients with severe AS who are truly asymptomatic have only a 1% risk for undergoing sudden death.7

In this study we sought to ascertain the reasons why patients with severe AS were not referred for AVR in a university hospital setting. The study population included all patients who received a transthoracic echocardiogram at the University of Chicago Medical Center during calendar year 2007 and who met echocardiographic criteria for severe AS. We followed the ACC/AHA/ASE criteria for classifying severe AS, including all patients with an aortic valve area <1.0 cm², an aortic valve gradient ≥40 mmHg, and an aortic jet velocity ≥4 m/s.

Medical records were reviewed and test results for exercise stress and coronary computed tomography (CT) were collected when performed. Clinic notes and hospitalization summaries were reviewed for presence of symptoms including chest pain, dyspnea, heart failure, dizziness, and syncope. It was noted whether or not the physician attributed the symptoms to AS. Referral to surgery and subsequent date of AVR was also recorded. Operative risk was calculated using the online Society of Thoracic Surgeons (STS) Risk Calculator and logistic EuroSCORE, both of which are validated risk assessment tools.8,9

Medical records for all patients were reviewed every month for the occurrence of symptoms, symptom progression, AVR, and death.
of death was recorded and confirmed by the social security death index (SSDI). Cause of death was collected whenever possible. The last follow-up for all patients took place in March 2009. The study protocol was approved by the institutional review board. A detailed version of this study has been previously reported in a recent issue of the American Journal of Cardiology.3

Results
A total of 11,000 transthoracic echocardiograms were performed between January and December 2007. Of these echocardiograms, 106 patients met the pre-specified echocardiographic criteria for severe AS and were included in the study. Of the 106 patients with severe AS, 33 (31%) underwent AVR, while 73 (69%) did not. The baseline characteristics of the patients who underwent surgery included 58% female patients with a mean age of 73 years (range 25–90 years). Forty-six percent of patients in this group had left ventricular (LV) dysfunction with a mean ejection fraction of 36% (range 4–54%). Every patient who underwent surgery had a minimum of one comorbidity. Of the patients who did not undergo AVR, 75% were female with a mean age of 76 years (range 45–108 years). Only 21% of the patients in this group had LV dysfunction, with a mean ejection fraction of 38% (range 24–53%). Eighty-nine percent of patients who did not have surgery also had a minimum of one comorbidity (see Table 1).

The most common comorbidity in the group of patients who had AVR was hypertension (88%), followed by coronary artery disease (64%), congestive heart failure (48%), diabetes (36%), chronic kidney disease (21%), and cancer (18%). In the group of patients who did not receive AVR, hypertension was also the most common comorbidity (76%), followed by coronary artery disease (36%), chronic kidney disease (31%), diabetes (24%), cancer (21%), and congestive heart failure (19%).

Among the different types of physician taking care of these patients, cardiologists were the subspecialty most likely not to refer patients with severe AS for AVR (64%), followed by generalists (22%) and vascular surgeons (3%). The specialty of 11% of the physicians was unknown. By stark contrast, all patients who were evaluated by cardiothoracic surgeons received AVR.

Symptoms such as chest pain, dizziness, syncope, dyspnea, and heart failure were prevalent both in patients who underwent surgery and in those who did not. Ninety-four percent of patients who underwent AVR were symptomatic. Of the patients who were not referred for surgery, 42% were found to be symptomatic (see Figure 1).

In symptomatic patients with severe AS, the most common reason for not performing AVR was the treating physician not attributing the symptoms to AS (29%). High operative risk was the reason in 15%, although the calculated STS risk and EuroSCORE were high in only 10% of the patients. The remaining reasons included patient refusal (15%), AS not being considered truly severe (11%), limited life expectancy (11%), advanced age (6%), the patient being transferred to another hospital (3%), the symptoms not being recognized by the physician (6%), and pseudo-AS (3%) (see Figure 2).

| Table 1: Baseline Patient Characteristics |
|------------------------------------------|
|                                         |
| Aortic Valve Replacement                  |
| No (n=73)                                 |
| Yes (n=33)                                |
| Female                                    |
| 55 (75%)                                  |
| 19 (58%)                                  |
| Age                                       |
| Mean (years)                              |
| 76                                        |
| 73                                        |
| Range (years)                             |
| 45–108                                    |
| 25–90                                     |
| Patients >65 years of age (n)             |
| 55 (75%)                                  |
| 26 (79%)                                  |
| Left ventricular dysfunction (n)          |
| 15 (21%)                                  |
| 15 (46%)                                  |
| Left ventricular ejection fraction        |
| Mean (%)                                  |
| 38                                        |
| 36                                        |
| Range (%)                                 |
| 24–53                                     |
| 8–54                                      |
| Transvalvular peak pressure gradient (mmHg)|
| 63                                        |
| 68                                        |
| Transvalvular mean pressure gradient (mmHg)|
| 40                                        |
| 42                                        |
| Aortic valve index area (cm²)             |
| 0.82                                      |
| 0.75                                      |
| Comorbidities (n)                         |
| Hypertension (89%)                        |
| 65 (99%)                                  |
| 33 (100%)                                 |
| Diabetes (24%)                            |
| 18 (24%)                                  |
| 12 (36%)                                  |
| Coronary artery disease (36%)             |
| 26 (36%)                                  |
| 21 (64%)                                  |
| Chronic kidney disease (31%)              |
| 23 (31%)                                  |
| 7 (21%)                                   |
| Cancer                                    |
| 15 (21%)                                  |
| 6 (18%)                                   |

Figure 1: Number of Patients with Symptomatic or Asymptomatic Severe Aortic Stenosis Referred to Cardiothoracic Surgery for Aortic Valve Replacement

For the patients who were thought to be asymptomatic and accordingly not referred for AVR, the most common reason for not undergoing AVR was the lack of symptoms (70%), followed by the presence of comorbidities (7%), AS not being considered truly severe (4%), and high operative risk (2%) (see Figure 3). The calculated STS risk and EuroSCORE for the patients who were assumed to be at high operative risk was low to moderate due to age only. Seventeen percent of the reasons were not specified. Only 4% of these patients had an exercise stress test to determine whether or not they were objectively symptomatic.

Twenty-one percent of the patients have died since their echocardiography study in 2007. Six of these patients (6%) underwent AVR and 15 (15%) did not. Of the six patients who underwent AVR, three died from bacteremia within two months of AVR. Of the 15 patients...
Aortic Stenosis

The majority of patients in both groups had at least one comorbidity. A high percentage of patients in the group who did not undergo surgery had cancer and chronic kidney disease. The presence of these comorbidities was commonly the reason the patients were not ultimately referred for AVR.

Although the presence of symptoms in patients with severe AS signals worsening disease and the need for surgery, we found that almost half of the patients with symptoms were not referred for surgery. Certainly, there are legitimate reasons why some patients with symptomatic severe AS should not undergo surgery. However, the most common reason in this study was that symptoms, including dyspnea, chest pain, and syncope, were attributed to reasons other than severe AS. High operative risk was another frequent reason for not referring a subset of symptomatic patients with severe AS for surgery. However, using the STS risk and EuroSCORE, several of these patients were actually in the low to moderate operative risk range primarily because of advanced age.

Several studies have examined decision-making among physicians in referring elderly patients for valvular surgery. One study in particular reviewed the records of 216 patients over 75 years of age with severe symptomatic AS and found that 33% were not referred for AVR. In multivariable analysis, LV dysfunction and older age were the two most significant reasons patients did not undergo valve replacement. Although older age and LV dysfunction do increase operative risk, the natural history of AS indicates that these are the patients who would most benefit from AVR.

While it was not surprising that over 70% of patients who were asymptomatic did not undergo surgery because, according to the physician, no symptoms were present, only two patients (4%) underwent exercise stress testing. For these two patients, the stress test was positive and each subsequently underwent surgery. At the time of the last follow-up, both patients were alive and well.

The initial symptoms of AS can be subtle and are notoriously difficult to identify with certainty. Because exercise provokes greater peripheral demand, symptoms should manifest themselves during stress testing. Amato et al. showed that in asymptomatic patients with severe AS, the estimated risk for developing symptoms or sudden death was eight times higher over two years in patients with a positive stress test. Currently, the ACC/AHA has given a class IIb indication and the European Society of Cardiology (ESC) has given a class I indication for the use of exercise stress tests to objectively assess for symptoms.

Our study shows a significant underutilization of objective testing such as exercise stress tests. When exercise stress testing was performed in our study, the patients thought to be asymptomatic were, indeed, symptomatic and appropriately referred for successful AVR. Although no complications were reported in any of the studies using exercise stress tests in patients with severe AS, one explanation of why so few objective tests are performed is that referring physicians might worry about having their patients exert...
Why Do Cardiologists Fail to Follow the Surgical Guidelines for Severe Aortic Stenosis?

Our study has several limitations. First, the study was retrospective and thus inherent biases are impossible to rule out. In addition, the study population came from a single academic center and it is therefore difficult to generalize the results to other medical institutions, including private centers. However, one might expect that in centers where referral to cardiothoracic surgery is more difficult, the percentage of patients with severe AS requiring surgery but not receiving it would be even higher. While this study followed patients for an average of 15 months, further follow-up of these patients would likely show a significant difference in mortality between those patients who received AVR and those who did not.

Conclusion

In summary, despite a class I indication to perform AVR in patients with severe symptomatic AS, the majority of these patients do not undergo surgery. Although not every one of these patients is a suitable candidate for surgery, many patients are refused potentially life-saving therapy because symptoms are thought not to be directly caused by AS, or patients are thought to be a high operative risk based on age or comorbidities.

Multiple studies examining the natural history of AS have repeatedly shown that the failure to recognize symptoms that are directly attributable to severe AS is costly. The mean survival in symptomatic patients with severe AS is 23±5 months, with a five-year probability of survival of 18%. Physicians frequently overestimate the operative risk of AVR (as they did in our study), but with an operative mortality of 4%, the chance of surviving surgery is much better than the survival rate if the valve is not replaced. Furthermore, with the recently reported successes of percutaneous AVR in higher-risk patients with severe AS, referring physicians need to re-consider surgery for many of their patients.

1. Dal-Bianco JP, Khandheria BK, Management of asymptomatic severe aortic stenosis, J Am Coll Cardiol, 2008;52:1279–92.
2. Frank S, Braunwald E, idiopathic hypertrophic subaortic stenosis: Clinical analysis of 126 patients with emphasis on the natural history, Circulation, 1968;37(3):759–88.
3. Cowell SI, Newby DE, Prescott RI, et al; Scottish Aortic Stenosis and Lipid Lowering Trial, Impact on Regression (SALTRE) Investigators. A randomized trial of intensive lipid-lowering therapy in calcific aortic stenosis, N Engl J Med, 2005;352(23):2389–97.
4. Rossolini GL, Pedersen TR, Boman K, et al; SEAS Investigators, Intensive lipid lowering with simvastatin and ezetimibe in aortic stenosis, N Engl J Med, 2008;359(18):1543–56.
5. Edwards FH, Peterson ED, Coombs LP, et al., Prediction of operative mortality after valve replacement surgery, J Am Coll Cardiol, 2001;37:885–92.
6. Nishimura RA, Carabello BA, Faxon DP, et al., American College of Cardiology/American Heart Association 2008 guideline update on valvular heart disease: focused update on infective endocarditis, Circulation, 2008:118:887–96.
7. Otto CM, Burwash IG, Legget ML, et al., Prospective study of asymptomatic valvular aortic stenosis: clinical, echocardiographic, and exercise predictors of outcome, Circulation, 1997;95:2262–70.
8. Nashef SA, Roques F, Hammill BG, et al.; EuroSCORE Project Group, Validation of European system for cardiac operative risk evaluation (EuroSCORE) in North American cardiac surgery, Eur J Cardiothorac Surg, 2002;21(1):101–5.
9. Edwards FH, Grover FL, Shroyer AL, et al., The society of thoracic surgeons national cardiac surgical database: current risk assessment, Ann Thorac Surg, 1997;63:903–8.
10. Freed BH, Sujenga L, Furlong K, et al., Reasons for nonadherence to guidelines for aortic valve replacement in patients with severe aortic stenosis and potential solutions, Am J Cardiol, 2010;105:1339–42.
11. Jung B, Cacheri A, Baron G, et al., Decision-making in elderly patients with severe aortic stenosis: why are so many denied surgery?, Eur Heart J, 2005;26:2714–20.
12. Amato MC, Moffa PJ, Werner KE, Ramires JA, Treatment decision in asymptomatic aortic valve stenosis: role of exercise testing, Circulation, 2001;86:381–6.
13. Vahanian A, Baumgartner H, Bax J, et al., Task force on the management of valvular heart disease of the European Society of Cardiology, EEC committee for practice guidelines, Guidelines on the management of valvular heart disease, Eur Heart J, 2007;28(2):230–68.
14. Iung B, Baron G, Butchart EG, et al., A prospective survey of patients with valvular heart disease in Europe: The EuroHeart Survey on Valvular Heart Disease, Eur Heart J, 2003;24:1213–19.
15. Bach DS, Cirino N, Deeb GM, Unoperated patients with severe aortic stenosis, J Am Coll Cardiol, 2007;50:2018–19.
16. Krayenbuehl HP, Hess OM, Ritter M, et al., Left ventricular systolic function in aortic stenosis, Eur Heart J, 1984;15(Suppl. E):19–22.