Indications for Valve Surgery in Asymptomatic Patients With Aortic and Mitral Stenosis*

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In the past 15 years there have been striking improvements in the results of valvular surgery. Operative mortality has been greatly reduced, and long-term survival has improved substantially. Many of these advances accrue from operating earlier in the course of the patient’s disease. In aortic regurgitation for instance, surgery used to be deferred until symptoms were so severe they could no longer be managed medically. Now asymptomatic patients with aortic regurgitation undergo aortic valve replacement if noninvasive studies demonstrate that left ventricular dysfunction is beginning to develop. The issue addressed further on in this article is whether these principles of early intervention also are applicable to patients with aortic and mitral stenosis and whether asymptomatic patients should undergo valve surgery. This issue recently has been heightened by the advent of Doppler echocardiography, which when performed properly can estimate the severity of valvular stenosis quite precisely. Knowledge that an asymptomatic patient has severe aortic or mitral stenosis may make both the physician and patient uncomfortable with the strategy of watchful waiting. For example, an asymptomatic patient with the physical findings of aortic stenosis is evaluated by his doctor who refers him for a cardiac ultrasonic examination. A transvalvular pressure gradient of 80 mm Hg is found indicating that the patient has severe aortic stenosis. The knowledge of the high gradient may heighten anxiety about the potential for sudden death or other unwanted sequelae. Several studies help to clarify the issue of how to manage patients with asymptomatic valvular stenosis.

ASYMPTOMATIC AORTIC STENOSIS

What Is the Risk of Delaying Surgery?

Figure 1 displays the natural history of aortic stenosis as compiled by Ross and Braunwald1 in 1968. It demonstrates only a slight decline in survival during the asymptomatic phase of the disease. However, once symptoms develop, there is a precipitous fall in survival unless surgery is performed. These data were compiled before noninvasive studies, which can precisely iden-

tify which asymptomatic patients have significant aortic stenosis, were available. However, more recent studies employing Doppler examination confirm the utility of the data of Ross and Braunwald.1 Kelly et al2 examined the survival of symptomatic and asymptomatic patients with aortic stenosis who were known to have a transaortic valve gradient of at least 50 mm Hg quantified by Doppler echocardiography. In these patients with significant outflow obstruction there were no deaths in the asymptomatic group during the 2 years of observation. Although two patients in this group did die suddenly of cardiac causes, they had become symptomatic for at least 3 months prior to death. In a similar study by Pellikka et al,3 patients had a peak transvalvular gradient of at least 64 mm Hg. There were no deaths in asymptomatic patients. Two patients did suffer death from cardiac causes but as in the study cited previously,2 both had become symptomatic for at least 3 months prior to their deaths. Thus, truly asymptomatic patients with adult acquired aortic stenosis are at very low risk for sudden cardiac death. It must be emphasized that these data do not apply to patients with congenital aortic stenosis where sudden death in asymptomatic patients is more common.4 However, a problem brought out by the studies cited above is that a few asymptomatic patients may progress very rapidly to develop symptoms and then to die suddenly. As shown in Figure 2, taken from the study of Pellikka et al3 where asymptomatic patients had an average mean gradient of 47 mm Hg, 70% developed symptoms (and thus required surgery) within 3 years. It could be argued that avoiding a valve prosthesis for only 3 years saves little of the potential morbidity and mortality of valve replacement and that prophylactic surgery might be justified to prevent a rare sudden death. This might particularly be true if one could predict which patients would progress to symptoms allowing operation on high-risk patients while sparing low-risk patients the risks of a prosthesis. Unfortunately, lack of predictability of progression is one of the major problems of managing asymptomatic patients with aortic stenosis. Otto and colleagues5 followed 42 patients with asymptomatic aortic stenosis for a period of 6 to 43 months. During follow-up, the mean pressure gradient increased by an average of 8 mm Hg per year, but in some patients the increase was as high as 23 mm Hg per year. Fifty percent of these asymptomatic patients became symptomatic. Unfortunately, there were no demographic or hemodynamic factors at baseline which predicted the eventual change to
symptomatic status. Thus, while prophylactic surgery would protect a few patients from progressing rapidly from asymptomatic status to symptomatic status to death, it would also cause many patients to be operated on needlessly and would generate many additional patient-years with a valve prosthesis in place. Such surgery could only be justified if the risk of death from waiting exceeded the risk of surgery.

What Is the Risk of Surgery?

Although there has been recent gratifying success in repairing and preserving the native valve in many patients with mitral regurgitation and in some patients with aortic regurgitation, the degenerative nature of acquired adult aortic stenosis precludes preserving the native valve in almost every case. Thus, it must be anticipated that every case of adult aortic stenosis will be treated surgically by inserting a prosthetic valve. A prosthetic valve generates multiple risks which include operative mortality, thromboembolism, hemorrhage from anticoagulation used to reduce thromboembolic risk, valve failure, and endocarditis. The problem of prosthesis-related complications is well typified in the study of Pellikka et al\(^9\) noted previously. While 3 of 113 (2.7%) asymptomatic patients developed symptoms and died of cardiac causes in the unoperated group, 1 of 30 patients (3.3%) who had an operation prior to the development of symptoms died as a result of complications from aortic valve replacement. That study is probably the largest study reporting surgical results in asymptomatic patients. In other recent reports of surgical outcome listed in Table 1, operative mortality for aortic stenosis ranged between 3 and 12%. Factors adversely affecting operative mortality include age, the presence of coronary disease, and the presence of congestive heart failure. Considering that the average asymptomatic patient is probably younger, free of heart failure (by definition), and more often free of significant coronary disease, this asymptomatic group should be at low risk. However, even in this ideal low-risk group the operative mortality is at least 2 to 3%. Once the prosthesis is inserted, patients then become candidates for prosthesis-related complications. The incidence of these complications is also listed in Table 1. On average, the risk of a serious valve-related complication is about 1 to 2% per patient year.

In the final analysis of the patient with severe asymptomatic aortic stenosis, the risk of rapid progression to symptoms and sudden death must be weighed against the operative mortality and subsequent risks of the prosthesis. The risk of rapid progression to sudden death is 2 to 3%. The risk of a prosthesis-related complication during the 3-year average waiting period from when there is an asymptomatic gradient of more than 50 mm Hg to the onset of symptoms is approximately 6%. Thus, the total operative and postoperative risks of aortic valve replacement in asymptomatic patients outweigh the risks of delay. Additionally, the philosophical issues of intervening in a totally asymptomatic patient must be addressed. While such intervention in patients with aortic regurgitation who are manifesting left ventricular dysfunction can be justified because it ultimately improves survival and cardiac function, there is no such evidence for aortic stenosis. Thus, it becomes difficult to reconcile any postoperative com-

![Figure 1. The natural history of aortic stenosis compiled by Ross and Braunwald\(^1\) demonstrates that survival is nearly normal until the onset of symptoms. At that inflection point, there is a sharp drop in survival such that 50% of the patients who develop angina will die within 5 years, 50% of the patients who develop syncope will die in 3 years, and 50% of the patients who develop the symptoms of congestive heart failure will die in 2 years unless treated with aortic valve replacement. Reproduced with permission from Ross and Braunwald.\(^1\)](http://journal.publications.chestnet.org/pdfaccess.ashx?url=/data/journals/chest/21725/ on 06/25/2017)
plications which could occur in an otherwise asymptomatic patient since it is hard to prove that the risk of those complications was justified by the potential benefit.

Exercise Testing in Patients With Aortic Stenosis

Frequently, the distinction between asymptomatic vs symptomatic status is unclear. Some patients may complain of vague symptoms which do not qualify them as specifically having angina, syncope, or congestive heart failure. While exercise testing in patients with the classic symptoms of aortic stenosis may have an increased risk of complications, the risk of exercise testing in asymptomatic or nearly asymptomatic patients with aortic stenosis is lower and it is often justified by the importance of the data obtained. This subject remains controversial and is viewed differently on different sides of the Atlantic Ocean. In Europe, exercise testing in asymptomatic patients with aortic stenosis is common and routinely performed without complications. Linderholm et al reported over 500 consecutive exercise tests in patients with moderate to severe aortic stenosis. No significant complications were reported. Smaller studies reported in this country also have been free of complications, but occasional reports of significant sequelae have dampened the enthusiasm for this procedure in the United States. While it seems imprudent to push patients with aortic stenosis to the limits of exhaustion during testing, moderate exercise in mildly symptomatic patients can be performed safely and can prove valuable in clinical decision-making. If exercise testing confirms that the patient has normal exercise tolerance and is truly asymptomatic, continued medical follow-up is appropriate. On the other hand, an unanticipated severe limitation in exercise tolerance is a good indication that the patient is not truly asymptomatic and militates for further workup with an eye toward surgery.

In summary, the risk of sudden death in patients with asymptomatic aortic stenosis is extremely low. Although an occasional patient progresses rapidly from asymptomatic status to develop symptoms and sudden death, such patients are rare and do not justify the risks of prophylactic aortic valve replacement.

Mitral Stenosis

Because sudden death in asymptomatic patients with mitral stenosis is extremely rare, there has been little impetus for operating on asymptomatic patients. As shown in Figure 3, patients with advanced symptomatic mitral stenosis have better survival following surgery than severely symptomatic patients treated medically. However, there is no obvious benefit to surgery in asymptomatic or mildly symptomatic patients. Thus, until recently, standard practice has been to treat patients medically with diuretics and if in atrial fibrillation with diuretics, warfarin, and digoxin until the symptomatic status progressed past New York Heart Association classification II. However, the advent of percutaneous mitral balloon valvotomy offers an effective nonsurgical method of achieving excellent long-term relief from mitral stenosis in patients whose valve anatomy is suitable for this procedure. Because compared to surgery, it is substantially less invasive and can be performed at a very low mortality, there is a natural tendency toward performing this procedure early in the course of the disease in less symptomatic patients.
Valvotomy or Surgery in Asymptomatic Patients: Should Either Ever Be Performed?

Valvotomy: Using a combination of parameters of valve anatomy which include (1) calcification, (2) leaflet thickening, (3) leaflet mobility, and (4) disease of the subvalvular apparatus, a reasonable prognostication of the success of valvotomy can be made using preoperative echocardiography. One could argue that valvotomy should be performed in patients with anatomy favorable for a successful procedure before the onset of symptoms. However there are substantial drawbacks to this philosophy. First, it is unlikely that valvotomy will achieve a valve area greater than 2.0 cm². Thus valvotomy performed in patients who are asymptomatic because the stenosis is mild (valve area 1.7 to 2.0 cm²) would show little improvement in valve area or hemodynamics after valvotomy and therefore there is no indication to perform the procedure in such patients. In asymptomatic patients with more severely stenosed valves, it must be emphasized that although balloon valvotomy is performed with a low operative mortality and complication rate, this rate is not zero. The most unpredictable complication of valvotomy is procedurally induced severe mitral regurgitation, which usually occurs when the subvalvular apparatus is avulsed during balloon inflation. When this occurs, mitral valve replacement is necessary. Should this complication befall an asymptomatic patient, the patient would be committed to a prosthesis valve insertion and its attendant risks, which should have been avoided by not performing the valvotomy.

While it is generally ill-advised to perform mitral valvotomy on asymptomatic patients with mitral stenosis, two conditions in the asymptomatic patient do deserve consideration for valvotomy. These two conditions are the patient with asymptomatic pulmonary hypertension and the patient with new-onset atrial fibrillation who is otherwise asymptomatic. Older and newer studies indicate that the risk of mitral valve surgery in patients with pulmonary hypertension is increased. However, the presence of pulmonary hypertension has not increased the risk of mitral valvotomy. Thus, for the asymptomatic patient who is developing the clinical signs of pulmonary hypertension, which is confirmed by tricuspid Doppler echocardiography, it is possible that the risk of balloon valvotomy performed early is less than the risk of surgery if it were eventually required after valve anatomy has worsened. Further, mitral stenosis patients with pulmonary hypertension are likely to become symptomatic in the near future. With regard to atrial fibrillation, the ability to convert the patient to sinus rhythm decreases indirectly proportionally to the duration of the arrhythmia and perhaps to left atrial size. Since atrial fibrillation has its own long-term sequelae, it seems reasonable to perform valvotomy in those otherwise asymptomatic patients with moderately severe to severe mitral stenosis who have anatomy favorable for a successful valvotomy in the hope that valvotomy will allow for cardioversion and for maintenance of sinus rhythm.

Surgery: Surgery will eventually be performed in those patients with severe symptomatic mitral stenosis who are not suitable candidates for balloon mitral valvotomy. One operation available is open commissurotomy during which the surgeon may be able to affect a good result even though anatomy was not favorable for closed-balloon commissurotomy. Alternatively, mitral valve replacement may be required. Usually it is impossible to know preoperatively which of these two operations ultimately will be performed and therefore the clinician should assume the worst case: a mitral valve replacement will ultimately occur incurring all the risks of a mitral prosthesis. Since there is a negligible risk of sudden death in asymptomatic patients with mitral stenosis, it is generally considered unjustifiable to perform mitral valve surgery with all its attendant risks in the asymptomatic individual. The one exception to this rule is an otherwise asymptomatic patient who presents with a systemic embolus. The likelihood of a second embolus following adequate anticoagulation is controversial but may be increased. Data obtained before the era when transesophageal echocardiography could detect atrial thrombus suggested that a recurrent embolus was a likely event and therefore that surgery should be performed to prevent it. Now that transesophageal echocardiography with its high sensitivity for left atrial thrombus is available, a reasonable although unproven strategy is to perform transesophageal echocardiography in the patient who presents with a systemic embolus to see if any residual clot remains following the event. Whether clot is or is not present, the patient should be anticoagulated. A subsequent transesophageal echocardiography several months after warfarin anticoagulation probably should be performed to check for resolution of old clot or recurrence of new thrombosis. If the clot persists, one might then consider surgery to prevent further embolization although there is no evidence that this is necessary. If thrombus is now absent, the risk of a repeat embolus should be low and surgery is not warranted.

In summary, asymptomatic patients with mitral stenosis do not die suddenly, and thus there is no justification for prophylactic mitral valve surgery in such patients nor is balloon valvotomy indicated. However, balloon valvotomy should be considered for otherwise asymptomatic patients who develop pulmonary hypertension or persistent atrial fibrillation if valve anatomy is suitable for this procedure.
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