

Aortic valve replacement

Aortic stenosis (AS) is the most frequent heart valve disease in developed countries and prevalence sharply increases with age. Aortic valve replacement is the reference treatment for severe symptomatic AS. However decision making regarding surgery is often difficult in older patients. The literature below discusses the feasibility of doing aortic valve replacement in older people in the light of current evidence.

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Aortic stenosis (AS) is the most frequent heart valve disease in the developed world and its prevalence sharply increases with age.^{1,2} With the lengthening of life expectancy, the population of older patients with AS is expected to grow in the future.

Aortic valve replacement remains the reference treatment for severe symptomatic AS and there are no restrictions related to age itself according to guidelines.^{3,4} However, decision making for intervention is often difficult in older patients in whom it may not be obvious whether the benefit of surgery, as compared to spontaneous outcome, outweighs the risk of intervention.

Symptoms

The principle symptoms are angina, syncope and dyspnoea. The onset of severe symptoms is an important landmark in the progression of the disease as it is associated with a shortening of median survival to five years with death occurring at an average age of 63 years (see table 1). These findings remain the basis of the recommendation to operate on patients with severe symptomatic AS.^{3,4}

A wide range of survival rates have been observed in a series of elderly non-operated patients with AS. The three predictive factors of poor spontaneous outcome were New York Heart Association (NYHA) class III or IV, associated mitral regurgitation, and left ventricular systolic dysfunction.⁵ The combination of these three factors identified a subgroup at particularly high risk, with a three-year survival rate of only 20%. On the other hand, three-year survival was over 80% in patients who did not have any of these three factors.

Treatment

Medical management

The benefit of statins is seen only in early mild disease where it can slow the progression of stenosis severity and is most effective in patients with high-low density lipoprotein (LDL) concentrations. There is no medical management which is effective in chronic disease.

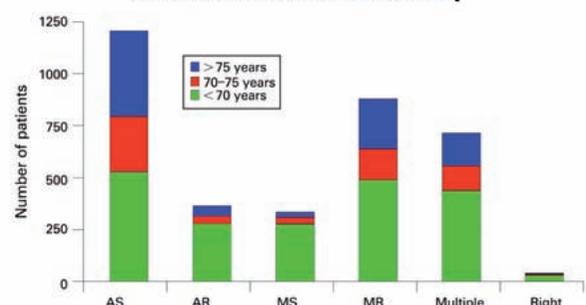
Surgical treatment

The definitive treatment of symptomatic severe AS remains open aortic valve replacement. Other options include:

- Closed balloon valvotomy which lacks mortality benefit in adults
- Percutaneous balloon valvuloplasty which is essentially a palliative procedure that may

Table 1: Age distribution

Age distribution according to the type of valvular heart disease in 3547 patients with native valve disease in the Euro heart study



be undertaken in very ill patients who cannot survive surgery

- Transcatheter aortic valve implantation (TAVI) has been undertaken in patients in whom conventional aortic valve replacement would carry a high mortality risk due to advanced age and/or the presence of concomitant illnesses.

Transcatheter aortic valve replacement may be carried out under general anaesthesia or under local anaesthesia with sedation. Access to the aortic valve can be achieved transluminally, via the femoral artery or vein (percutaneous or endovascular approach), or surgically, via a minithoracotomy and apical puncture of the left ventricle (transapical or transventricular approach). When the femoral vein is used for a transluminal approach, the interatrial septum is punctured in order to gain access to the left ventricle via the left atrium and mitral valve. When the femoral artery is used, surgical exposure and closure may also be required. The method chosen for catheter access to the aortic valve may be dictated by the presence of peripheral arterial disease, as the transluminal approach may not be feasible in these patients. Whichever approach is used, a balloon catheter is advanced into the left ventricle over a guidewire and positioned within the opening of the aortic valve. The existing aortic valve is dilated in order to make room for the prosthetic valve. The new valve, mounted on a metal stent, is manipulated into position and is either self-expanding or deployed using balloon inflation. Deployment leads to obliteration of the existing aortic valve.

The main results from the recently concluded PARTNER Trial⁶ show that in patients with severe aortic stenosis who were not suitable candidates for surgery, balloon-expandable TAVI with Edwards SAPIEN valve, as compared with standard therapy (including balloon aortic valvuloplasty), significantly reduced the rates of death from any cause, the composite endpoint of death from any cause or repeat hospitalisation, and cardiac symptoms, despite the higher incidence of major strokes and major vascular events.

Results of surgery

Operative mortality

The operative mortality for aortic valve replacement in octogenarians is reported to be around 10% in most series. A large series of trials have shown a strong

link between operative mortality and the following predictive factors:

- Advanced stage of heart disease, whether attested by heart failure, NYHA class IV, decreased left ventricular ejection fraction, or atrial fibrillation
- Comorbidities, in particular chronic obstructive pulmonary disease, renal insufficiency, or associated atherosclerosis of coronary or peripheral arteries
- Need for urgent surgery.

Impact of comorbidities with operative risk

Comorbidities are frequent in the elderly patient with AS. This is obviously related to the increased frequency of comorbidities with age in the general population. The high frequency of comorbidities related to atherosclerosis is also explained by the fact that AS shares a number of common pathophysiological features and clinical risk factors with atherosclerosis.⁷

Significant coronary artery disease is present in approximately half of patients with AS after the age of 75 years.⁸ There is also a higher operative morbidity seen in older people especially as regards the frequency of stroke, which is more frequent when aortic valve replacement is done as a combined procedure with coronary artery bypass grafting (CABG), which illustrates the impact of associated atherosclerosis. The probable explanation of this are the increased complexity and duration of intervention and also the fact that patients with coronary artery disease frequently have other locations of atherosclerotic disease that may cause complications. In particular, patients with coronary artery disease have a higher frequency of postoperative stroke, which has an important impact on operative mortality.

Individual risk stratification using scores

A number of predictive risk scores have been developed and validated to estimate operative mortality in cardiac surgery according to cardiac and non-cardiac patient characteristics. Validated multivariate scores aiming to assess operative mortality and life expectancy do represent a useful aid to decision making. One such score is the Euroscore, which has been evaluated in general cardiac surgery; however, it has been proven to have a good discriminant power in patients with heart valve disease.⁹⁻¹⁰ Other scores have been specifically developed for heart valve diseases, which would theoretically

ensure better discrimination.¹¹⁻¹³ In practice, different scores seem to have relatively close predictive abilities when tested in large populations of patients with heart valve disease.

Late results of aortic valve replacement

After the postoperative period, late results of aortic valve replacement are good in the elderly. Five-year survival rates are estimated at between 50 and 70% after aortic valve replacement in the octogenarian. Of course, survival rates are lower than in younger patients, but they favourably compare with life expectancy in a general population of the same age. Related survival—that is, compared to the expected survival—is particularly good in the elderly.¹⁴

As with operative mortality, late mortality after aortic valve replacement is related to the evolution of heart disease before surgery (heart failure) and comorbidities.

Surgery also gives good results for quality of life. Elderly patients derive at least the same benefits as younger patients as regards physical activity, depression, and global indices of quality of life. The wide use of bioprostheses in this age range contributes to the absence of constraints directly related to valve surgery.

Patient management

Patient evaluation

Thorough assessment of older patients is needed to ensure good patient selection for surgery. It is necessary to spend time on the analysis of case history. Symptom onset, which is the main factor in deciding surgery risk benefit ratio, is often difficult to determine in the elderly since patients may have reduced their activity by themselves or because of associated diseases. Fatigue, rather than dyspnoea, can be the sign of limited effort tolerance. Case history also enables comorbidities, lifestyle, and the patient's wishes to be assessed.

Cardiac auscultation should pay attention to the abolition of the second heart sound, which is specific to severe AS and is particularly helpful when the murmur is of low intensity.

Echocardiographic examination is the cornerstone to confirm the diagnosis of AS, and assess its severity and its consequences on the left ventricle. Valve area below 0.6 cm²/m² of body surface area is a marker of severe AS and it has the advantage of taking into account

body size. Despite its flow dependence, aortic gradient should also be taken into account since it is less subject to errors of measurements. A mean aortic gradient over 40–50mmHg indicates severe stenosis.^{3,4}

Coronary angiography is indicated before surgery and is also an important component of decision making, given the implications of coronary disease on operative risk and prognosis. Cardiac catheterisation is seldom needed to assess valve disease. It should be performed only in the rare cases where non-invasive assessment is inconclusive, and should not be systematically associated with coronary angiography.

Other investigations are indicated according to clinical evaluation, in particular as regards comorbidities.

Decision making

Therapeutic decisions should be based on a risk-benefit analysis weighing the operative risk against the benefit of surgery as compared to the spontaneous outcome of AS. This decision should also take into account the patient's life expectancy and quality of life regardless of AS. In this regard, the use of multivariate scoring systems could be a useful aid to reduce the subjectivity of the assessment of operative risk and life expectancy.

Unlike in young patients, the main purpose of surgery in the elderly is to improve symptoms rather than to increase the duration of life. This explains why surgery is generally not considered in asymptomatic AS in the elderly since the operative risk is not justified by the spontaneous outcome.

Besides their negative impact on operative mortality and life expectancy, certain comorbidities, such as respiratory insufficiency or neurological dysfunction, compromise the improvement of quality of life following cardiac surgery.

The clinical decision should take into account not only many patient characteristics but also their wishes and expectations. The final decision to operate or not should be taken according to a joint approach involving the cardiac surgeon, anaesthetist, cardiologist, and geriatrician if needed. This evaluation should lead to thorough assessment of the patient's wishes as well as information from the patient and relatives.

Symptoms are often difficult to interpret in the elderly and this tends also to defer the time at which surgery will be considered. Of all factors increasing operative mortality, the severity of symptoms is the



Pictured: Aortic valve replacement operation

only one on which clinicians can act by avoiding too late a decision for surgery. Therefore, it is of importance to weigh its risk and benefits at the onset of symptoms. This helps to avoid taking the decision in a patient with advanced disease in an urgent situation, which increases operative mortality.

The decision to operate in people over 80 years should be based on the desire to improve symptoms and prolong independence. However even at the age of 80 years, the average life expectancy of a woman is eight years. This is a lot better than that of the patient of a similar age with symptomatic severe AS, which has a mortality rate of about 2% per month or 25% per year with three-quarters being dead within three years of symptom onset along with several well published reports of the risk of sudden death within three months of symptom onset. In contrast a patient of 90 years who has mild angina caused by AS but who is not limited by their symptoms has little to gain from surgery in terms of life expectancy since the average life expectancy is much lower (3-7 years).

Modalities of intervention

A bioprosthesis is the substitute of choice in the elderly. Coronary artery bypass grafting should be combined in case of significant coronary disease. In carefully selected patients who are deemed high risk for open surgery, TAVI remains a viable option.

I do not have any conflict of interest

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