Clinical decision making in elderly with aortic stenosis
Bouma, B.J.

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Chapter 1

General introduction
Background

Aortic valve stenosis is a common disease in elderly. The prevalence of severe aortic valve stenosis in the general population is 2% in 72 years old and increases to 8% in 85 years old(1). With the aging of the population these patients will be seen more and more in clinical practice(2). Although once thought as a degenerative lesion, aortic stenosis has many features in common with coronary artery disease(3). Several clinical factors have been found to be associated with the presence and the progression of the stenosis(4). The stenotic process is usually gradual in onset and progression, giving the heart ample opportunity to respond. The left ventricular myocardium becomes hypertrophic, which leads to a greater pressure during systole, which in its turn forces blood past the mechanical obstruction. As a result, the cardiac output and left ventricular end-diastolic volume are maintained for a prolonged period despite the presence of a systolic pressure gradient between the left ventricle and peripheral arterial system.

However, as hypertrophy continues to progress, the left ventricle becomes less compliant. Left ventricular end-diastolic pressure can become elevated even though the ventricular size remains normal. Another factor contributing to the reduction in ventricular function is uncoordinated contraction, resulting from regional wall motion abnormalities, fibrosis, or subendocardial ischemia. Continued progression of this process ultimately leads to a reduction in myocardial function and a decrease in the ability of the left ventricle to develop pressure and shorten against a load. At this point, the left ventricle fails, resulting in reductions in stroke volume, and cardiac output, and, eventually, heart failure.

An elderly patient with aortic valve stenosis remains asymptomatic for a long time despite the obstruction and the pressure overload. Once the patient has developed one of the typical symptoms angina, syncope or shortness of breath, life expectancy is limited(5-7). The only possible treatment is replacement of the calcified valve by a mechanical or bio-prosthesis, a major procedure in these patients. Clinical decision making, however, can be very difficult. Life expectancy
is limited in the elderly. The cardiac morbidity, advanced age and the morbidity of other organ increase the risks on mortality and morbidity from surgery. These limitations make the benefits of surgery less than in younger patients. Clinical decision making in the elderly patient with additional morbidity is an area with much uncertainty; it will be demonstrated in the following clinical example.

**The clinical problem**

A 72 year old male at the outpatient clinic complains about shortness of breath. He is in functional class III (New York Heart Association criteria). He had a stroke a couple of years ago and he still has a slight paresis. On physical examination he has a normal blood pressure and pulse. Auscultation of the heart reveals a murmur with a maximum at 2R, radiating to the carotid arteries. There are no signs of heart failure. Laboratory tests show an impairment of the renal function (creatinin 250 μmol/L). His pulmonary function is normal. Doppler echocardiography confirms a severe aortic stenosis. The aortic valve area is estimated to be 0.6 cm². The left ventricular function ejection fraction is impaired with (20%). Subsequent coronary angiography shows no significant coronary artery disease.

After the diagnosis of heart failure and an impaired systolic ventricle function due to a severe aortic stenosis, the cardiologist has to decide whether this patient should be referred for aortic valve replacement. The ACC/AHH guidelines(8) prescribe surgery in patients with symptoms class III according the New York Heart Association. These guidelines can be used in middle aged patients with a long life expectancy, but they are not necessarily appropriate for patients with an advanced age, when cardiac and additional morbidity increases the risks of surgical treatment and limited the benefits.

In the absence of randomized clinical trials the information necessary to fill-out the decision path has to come from various sources. A treatment strategy with the decision "aortic valve replacement" has to estimate the early and late mortality
risks. In this strategy one also has to take account of non-fatal complications. In the postoperative course this can be recurrent stroke, renal insufficiency, myocardial infarction, pacemaker implantation, bleeding, sternum wound infection, and so on. Late complications as endocarditis, thrombo-embolism and bleeding can impair quality of life. If a conservative treatment strategy is chosen, the life expectancy has to be estimated. After collecting these data from the literature the applicability of all the obtained data for this specific patient has to be determined, especially with the patients’ cardiac and non cardiac morbidity in mind. Finally, the benefits of the surgical treatment strategy have to be determined to come to an appropriate decision.

**Aim of the thesis**

This thesis addresses multiple aspects in clinical decision making in elderly patients with aortic stenosis in daily practice. First, a systematic review of the literature on the results of aortic valve replacement with or without bypass grafting in patients over 70 years of age will be discussed (Chapter 2). The review focuses on operative- and late-mortality, and the clinical determinants found with multivariate analysis. Moreover it presents an overview of early and late complications following surgery. In Chapter 3 a cohort of patients above 70 years with a first time diagnosis of symptomatic aortic stenosis, but without major comorbidity, is analyzed. The conservative and surgically treated patients are compared for the long-term mortality and functional status. Data from three academic hospitals, Academic Hospital Maastricht, Academic Hospital Groningen, and the Academic Medical Centre, Amsterdam is used. In the following Chapter 4, a multivariate model was constructed to estimate the benefit of aortic valve replacement above conservative treatment for several different patients groups. Chapter 5 describes the findings of a nation-wide inquiry among all Dutch cardiologists. Thirty-two different paper cases describing elderly patients with a symptomatic aortic stenosis with various cardiac and non-cardiac morbidity were propound. The responder had to fill in whether he or she would advise a surgical treatment for each specific paper case. In the next paragraph (Chapter
6) the systematic inquiry was validated to the treatment decisions of the cardiologists which they had made in daily clinical practice. In Chapter 7 the progression of aortic stenosis in time is under investigation. The rate of progression of aortic stenosis in a cohort of patients with aortic valve stenosis from the Academic Medical Centre is calculated. Previously reported associations are tested in this cohort. Also, the literature is reviewed for the reported annual progression rates determined with Doppler echocardiography and associations of clinical and echocardiographic variables with progression. Finally the consistency of the association of the clinical variables is established. An overview of the results and the general discussion is presented in Chapter 8.
References


