

## Cardiac Surgery in Elderly Patients

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The aging of the population is an important social phenomenon. In Europe there are 12 million elderly persons and this figure is expected to double in 2010. In Spain, predictions indicate that more than 35% of the population will be over 75 years old in 2010. In the U.S., 35% of the patients hospitalized for acute myocardial infarction are over 75 years old and 80% of the patients hospitalized for heart failure are over the age of 65.<sup>1</sup> Consensus about allowing access to health care unconstrained by age limits, in addition to increased life expectancy and advances in high specialty medicine have brought us to the point where surgical treatment is indicated in progressively older sectors of the population.

Until the mid-1970s, cardiac surgery was rarely performed in patients over the age of 65 years. Since then, cardiac surgery has been performed in progressively older patients with satisfactory results. The article on cardiac surgery in the elderly by Rodríguez et al,<sup>2</sup> published in this issue of the REVISTA ESPAÑOLA DE CARDIOLOGÍA, reflects this trend: surgery in patients over the age of 70 years passed from just 1.7% of surgical activity in 1985 to 32% in 2001. In the last decade, several studies of elderly patients have demonstrated that although these patients have a greater surgical mortality than young adults, the intermediate-term survival and quality of life achieved with surgery are better than with medical treatment.

Age has been considered an independent predictive factor for mortality. The scale of surgical risk of Parsonnet<sup>3</sup> assigns 7 points to an age of 70-74 years, 12 points to 74-79 years, and 20 points to age over 80 years. Each point represents 1% of mortality. Experience that has accrued since the development of the Parsonnet scale reveals that this scale assigns too

much weight to age. The European euro-SCORE scale, with patients included in the last trimester of 1995, assigns one point for every 5-year period from the age of 60 years. Thus, the risk of a patient of age 70 to 74 years is similar to that of a patient under the age of 60 who has undergone previous surgery or has a critical preoperative state or severely depressed left ventricular function. The risk of a patient more than 80 years old is equivalent to the sum of two of the above mentioned risk factors or to the presence of one risk factor associated with severe pulmonary hypertension.

The increased risk of these patients is related to: *a)* aging, which causes structural changes in the heart and reduces the physiological reserves of most organs, thus impairing the capacity to recover from surgical aggression;<sup>1</sup> *b)* an increase in associated diseases, as studied by Rodríguez et al,<sup>2</sup> especially diabetes, kidney failure, arterial hypertension, chronic obstructive pulmonary disease, and cerebrovascular disease; *c)* the advanced phase of the heart disease, as indicated by the greater incidence of heart failure, depressed left ventricular function, and preoperative pulmonary hypertension; *d)* reduction of the inflammatory response to surgical aggression, which correlates with a depression in postoperative cellular immunity;<sup>4</sup> *e)* undernourishment, measured by anthropometric and biochemical parameters, which is a frequent preoperative finding before cardiac surgery; its incidence is even greater in older persons and is associated with an increment in postoperative complications due to an impaired response to surgical aggression, and *f)* the increased complexity of the surgical technique in these patients, due to the presence of severe calcification of the aortic ring and the greater incidence of associated coronary and valvular surgery, which require more prolonged aortic clamping times.

Hospital mortality is significantly related to the preoperative presence of depressed left ventricular systolic function, pulmonary hypertension, symptoms of heart failure, kidney failure, longstanding mitral valve disease, and nutritional deficiencies. When these risk factors are absent in the preoperative period, the mortality is similar to that of the youngest patients. Emergency surgery and reoperations are factors pre-

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dictive of mortality, although they are not specific to patients of advanced age.

Mortality has decreased in recent series. In the European study of Dalrymple-Hay et al,<sup>5</sup> the mortality of elderly patients who underwent surgery with cardiopulmonary bypass was 5.7%. This series included mitral surgery and urgent interventions that increased mortality. Craver et al<sup>6</sup> have studied results in relation to age. Hospital mortality has declined from 9.1% in elderly patients to 6.7% for the 70 to 79-year-old group and to 3.4% for patients under 69 years. In the study by Rodríguez et al,<sup>2</sup> the mortality of coronary surgery decreased from 20% in the 1985-1990 period to 5.26% in 1999-2001. These results were influenced by the introduction of coronary surgery without cardiopulmonary bypass. These results are similar to those of Gabe et al,<sup>7</sup> who reported a mortality during coronary surgery of 5.26% and an incidence of atrial fibrillation of 29% and of cerebrovascular accidents of 2.8%. The English registry of 1100 aortic valvular prostheses implanted in elderly patients indicates a hospital mortality of 6.6%.<sup>8</sup> The association of myocardial revascularization surgery increased surgical risk by 7% to 9% in most series, although there were series in which it was not accompanied by an increase in mortality. Mitral valve surgery, mitral plasty, and valve replacement continue to have a high mortality due to the presence of pulmonary hypertension with associated ischemic heart disease in some cases and a long duration of disease in others.

The life expectancy of the Spanish population is slightly higher than 75 years for men and 80 years for women. Patients without symptomatic heart disease who reach this age have a life expectancy of 8 to 10 years because they have already overcome the mortality related with the diseases of childhood and early adulthood. Age *per se* is not a surgical contraindication so the risk-benefit relation should be analyzed individually to make the surgical decision. The 5-year survival of elderly persons who underwent surgery was 55% in the series of Craver et al<sup>6</sup> and 68% in the series of Asimakopoulos et al.<sup>8</sup> Extracardiac causes like pneumonia and neoplastic disease are responsible for more than half of deaths. The survival curves are similar to those of persons of the same age without symptomatic heart disease for the first 5 years, although the slope of the survival curve increases sharply from then on in the operated population. In the series of Craver et al,<sup>6</sup> the 5-year survival increased from 55% in elderly patients to 69% in the 70 to 79-year-old group. Myocardial revascularization was accompanied by a greater 5-year survival than aortic valve substitution, 79% vs 64%.<sup>5</sup>

These results give us cause to reflect on the surgical indications of elderly patients. The intermediate-term survival after surgery for myocardial revascularization justifies this surgical indication when the criteria esta-

lished in the guidelines of the American Heart Association and American College of Cardiology are met. The natural evolution of symptomatic aortic stenosis and the results of surgery raise no doubts about the surgical indication after an individualized assessment of each patient. Nevertheless, is surgery indicated in certain patients with asymptomatic aortic stenosis and conserved left ventricular systolic function? In asymptomatic aortic stenosis, Roshenhek et al<sup>9</sup> have demonstrated that calcification of the aortic valve and an annual increment in the aortic flow rate of more than 0.3 m/s are factors predictive of poor prognosis, with 79% of patients dying or requiring surgery within a period of 2 years. Although it is relatively safe to postpone surgery in asymptomatic aortic stenosis until symptoms appear, early surgery must be contemplated in the group of asymptomatic patients with severe aortic valve calcification and an increase in aortic flow rate. In order to evaluate the results, we must also consider the repercussions of surgery on the quality of life. All the authors have reported excellent intermediate-term results, with improvement of the NYHA class and recovery of the patient's independence in most cases, which confirms functional improvement.

Although mortality has decreased in recent series until it now approaches the results obtained in younger patients, morbidity continues to be high. In several series, morbidity has significantly prolonged hospitalization time in the intensive care unit and ward in more than 50% of patients. This morbidity involves mainly low cardiac output syndrome, kidney failure, respiratory infections, cerebrovascular accidents, and atrial fibrillation. In the series of Craver et al,<sup>6</sup> the incidence of cerebrovascular accidents in the elderly decreased from 5.7% to 4.7% in patients 70 to 79 years old and to 2.8% in patients under the age of 69 years. Recently, Gabe et al<sup>7</sup> reported an incidence of cerebrovascular accidents of 2.8% in patients over the age of 75 years who had undergone coronary surgery, 22% of them without cardiopulmonary bypass. This complication, and the high incidence of atrial fibrillation, which ranges from 17% to 29% in different series, are forceful arguments for performing surgical revascularization without cardiopulmonary bypass using the two mammary arteries. Although the high incidence of postoperative atrial fibrillation could be related with the aging of the heart and poor nutrition, which leads to intracellular potassium depletion, coronary surgery without cardiopulmonary bypass is accompanied by a very significant postoperative reduction in atrial fibrillation in all age groups.<sup>10</sup> In the absence of randomized studies, it can be expected that revascularization surgery without cardiopulmonary bypass will also reduce the incidence of pulmonary and renal complications by reducing the surgical aggression in a group of patients with a depressed immune response secondary to aging and nutritional de-

ficiencias.

The forecasts for cardiac valve surgery in 2005 are influenced by the disease in elderly patients. In spite of the regression of rheumatic cardiac valve disease, a 6% increase in valvular surgery is expected, mainly at the expense of calcified aortic stenosis, which has a prevalence of 2.9% in the 75 to 86-year-old population. The ratio of conservative surgery to mitral valve replacement will rise due to the progressive increase in the incidence of degenerative mitral incompetence. The number of valvular prostheses implanted in the 1995-2000 period increased by 3% for mechanical prostheses and by 16.7% for biological prostheses. Forecasts for 2005 suggest a stabilization or minimal rise in the implantation of mechanical prostheses and an increase by more than 15% in the implantation of biological prostheses. Aortic valve substitution in elderly patients, especially women, often must address the problem of the small aortic root diameter. This may explain why mechanical prostheses were implanted in 11% of elderly patients in the English registry.<sup>8</sup> The increased risk inherent to enlarging an aortic ring that is located on highly calcified tissues raises the dilemma of whether to implant a small bioprosthesis, even if it results in a residual gradient. Unsupported biological prostheses can be an excellent option, but their implantation is often not possible due to severe calcification of the ascending aorta around the coronary ostia. This unfavorable anatomy, in addition to greater technical complexity, explains why these prostheses are used in only 9%, and are not expected to pass 15% in 2005.

Age has ceased to be an absolute contraindication in cardiac surgery and the limitations depend on the assessment of each individual patient. The good results

obtained are due to the identification of risk groups and exquisite preoperative, intraoperative, and postoperative treatment.

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