Multiparameter approach to evaluate elderly patients undergoing aortic valve replacement

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The aging population is increasing, and as a result there are a growing number of elderly patients presenting with senile degenerative calcific aortic stenosis. Advanced age alone cannot be considered a precluding factor for surgery. Medical treatment options are limited. Elderly patients who did not receive aortic valve replacement (AVR) presented a 12-fold increased mortality risk compared with surgically treated patients.¹ Isolated AVR in octogenarians can be performed with a low overall pooled postoperative mortality of 6.7%.² AVR in elderly patients results in significant health-related quality of life with improvement in cardiac symptoms and significant functional gains after surgery.³ Furthermore, econometric analysis has shown that AVR is cost-effective even for very elderly patients.⁴

Surgical decision-making in this selected population undergoing cardiac surgery is challenging because of the heterogeneity of comorbidity, disability/frailty, and life expectancy. Transcatheter aortic valve replacement (TAVR) and sutureless AVR are emerging alternatives to conventional surgery in selected high-risk surgical cases or inoperable patients.⁵ In regard to current decision-making for AVR, the difficulty is to translate from the risk score to the best surgical treatment possibilities tailored to the individual patient. The actual risk scores do not completely describe the elderly population. There is a demand to combine (1) cardiac surgery risk scores with (2) measures of frailty and disability, and (3) life expectancy to provide a more complete model for risk prediction.

(1) In cardiac surgery, the European System for Cardiac Operative Risk Evaluation (euroSCORE) II, Society of Thoracic Surgeons (STS) score, and Parsonnet score are used the most. Their aim is to assess mortality and morbidity after cardiac surgery considering comorbidity and preoperative risk factors. The euroSCORE II and STS score have moderate discrimination for predicting 30-day mortality after TAVR.⁶ Moreover, these scores do not stratify the grade of aortic stenosis severity, based on left

ventricle stroke volume (normal flow vs low flow), pressure gradient level (low gradient vs high gradient), and ejection fraction (normal vs reduced).

(2) Frailty is defined as a geriatric syndrome of impaired resiliency to stressors (eg, cardiac surgery) and can be quantified by the 5-m gait speed, 5-item Cardiovascular Health Study frailty scale, 7-item expanded Cardiovascular Health Study frailty scale, and 4-item MacArthur Study of Successful Aging frailty scale subdimensions. Disability is defined as the impaired ability to carry out functional tasks and can be evaluated by the 6-item Katz Activities of Daily Living scale, 7-item Older Americans Research and Services Instrumental Activities of Daily Living scale, and 7-item Nagi scale.⁷ Moreover, frailty and disability can be assessed in a single score: the Comprehensive Assessment of Frailty or its simplified form, Frailty predicts One year after Elective Cardiac Surgery Test.⁸ The goal of frailty and disability scores is to assess mortality and morbidity for the short- and long-term after cardiac surgery in elderly patients. To evaluate short-term post-hospital mortality in the elderly, there are specific indexes, such as the Multidimensional Prognostic Index, which evaluates for hospitalized 1-year mortality on admission,⁹ and a Prognostic Index by Walter and colleagues,¹⁰ which evaluates for hospitalized 1-year mortality on discharge.

(3) Life expectancy is the average number of years of life remaining for people who have attained a given age. It is plotted in specific tables of life calculated as a snapshot of age-specific mortality rates in the recent past.¹¹ Prediction of life expectancy could be less accurate in the elderly population for high heterogeneity of associated conditions. Thus, to be able to predict life expectancy accurately in the elderly, numerous long-term mortality prognostic indices¹² have been developed at different time frames in hospitalized patients. The Dramé Index can quantify frailty and disability scores and identify predictive factors for 2-year mortality in frail elderly patients after hospitalization.¹³

We propose that in elderly patients undergoing cardiac surgery, the real global score has to be assessed considering life expectancy (evaluated as long-term mortality) and short-term mortality associated with comorbidity.

We consider high short-term mortality/high morbidity to be an STS score greater than 10%. A logistic euroSCORE greater than 20% has been suggested as an indication for TAVR, but this is known to markedly overestimate operative mortality,¹⁴ and a cutoff for euroSCORE II is still under evaluation.⁶ A Prognostic Index greater than 6 by Walter and colleagues¹⁰ presented a risk of 1-year mortality of

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Disclosures: Dr Gerosa reports consulting fees from Astra Zeneca. The other author has nothing to disclose with regard to commercial support.

Received for publication Dec 13, 2013; revisions received March 19, 2014; accepted for publication March 27, 2014; available ahead of print April 27, 2014.

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J Thorac Cardiovasc Surg 2014;148:1749-51

0022-5223/\$36.00

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<http://dx.doi.org/10.1016/j.jtcvs.2014.03.051>

		Life Expectancy	
		Good Life Expectancy	Low Life Expectancy
Short-Term Mortality	Low Short-Term Mortality Low Morbidity	GROUP A Low Short-Term Mortality/Low Morbidity Good Life Expectancy Conventional Surgery Sutureless Valve	GROUP C Low Short-Term Mortality/Low Morbidity Low Life Expectancy Patient-Family Counseling
	High Short-Term Mortality High Morbidity	GROUP B High Short-Term Mortality/High Morbidity Good Life Expectancy TAVR	GROUP D High Short-Term Mortality/High Morbidity Low Life Expectancy Contraindicated Surgery

FIGURE 1. Multiparameter approach to evaluate elderly patients undergoing cardiac surgery. TAVR, Transcatheter aortic valve replacement.

64% (95% confidence interval [CI], 58-70), and a Multidimensional Prognostic Index⁹ value between 0.67 and 1.0 presented a risk of 1 year mortality of 45% (95% CI, 47-65). These 2 indices could properly select an elderly frail population with disability associated with high short-term mortality/high morbidity for AVR.

We consider a short life expectancy (evaluated as long-term mortality) to be less than 1 year. European guidelines indicate eligible patients for TAVR to have a life expectancy of more than 1 year.¹⁴ A Dramé Index¹³ value greater than 6 presented a risk of 2-year mortality of 65% (95% CI, 55-76) and can properly select an elderly frail population with disability associated with short life expectancy.

We classified the elderly patients undergoing cardiac surgery in 4 risk groups (Figure 1): From group A to group D, there is an increasing risk score.

Group A is characterized by low short-term mortality/low morbidity and a good life expectancy. For these patients, conventional cardiac surgery is usually the suggested solution. Group B presents elderly patients with a high short-term mortality and high morbidity score, but good life expectancy. TAVR is usually advised in this group, whereas sutureless AVR is usually considered as a solution for the intermediate group between A and B.

Patients in group C present low short-term mortality/low morbidity and low life expectancy. A standard surgical procedure is achievable; however, it is important to consider that elderly patients with a low life expectancy require a lengthy recovery period, so counseling sessions with the patients and their family or caregivers are essential. In group D patients with high short-term mortality/high morbidity and low life expectancy, conventional surgery and TAVR would

be against the patient's best interest, and medical therapy is probably advisable.

A multiparameter approach to evaluate elderly patients undergoing cardiac surgery requires a dedicated "heart team," especially for patients in groups B, C, and D. The clinical impact of decision-making using a multiparameter approach could be a cost-effective strategy to improve treatment outcomes, quality of life, and resource optimization.

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