Assessing operative risk and benefit in elderly patients with heart valve disease†

Maurizio Taramasso1,2*, Alberto Pozzoli1, Nicola Buzzatti1, and Ottavio Alfieri1

1San Raffaele University Hospital, Milan, Italy; and 2Cardiac Surgery Department, San Raffaele Scientific Institute, via Olgettina, 58, Milan, Italy

Received 2 February 2013; revised 9 May 2013; accepted 30 May 2013; online publish-ahead-of-print 2 July 2013

The prevalence of heart valve disease increases with age, with the predominance of degenerative aetiology, as shown by the Euro Heart Survey on valvular heart disease. Advanced age is one of the pre-eminent risk factors of mortality and major morbidity after cardiac surgery. Nevertheless, several reports (including randomized studies) showed that consistent benefits can be achieved from cardiac surgery and percutaneous valve therapies in elderly patients, in terms of quality-of-life improvement, alleviation of symptoms, prevention of major adverse events, and increased survival. The clinical decision-making and individual risk profile evaluation in this context have been so far particularly challenging, leading to the clinical question of utility vs. futility. Concomitantly, the economic burden in high-risk elderly patients could have crucial implications and should be considered before proceeding, due to reduced expectancy of life. Moreover, ethical implications should be taken into account. The therapeutic decision in this context should be reached through a shared decision-making process, not only by a multidisciplinary ‘heart team’ discussion, but also by informing the patient thoroughly, and finally by deciding with the patient and family which treatment option is optimal, taking into account the patient perspective.

Heart valve diseases in the elderly are often associated with a consistent number of extracardiac comorbidities, mainly related to atherosclerosis. In the clinical routine, the two surgical risk scores mostly used are the Logistic EuroScore (http://www.euroscore.org/calcold.html) and the STS score (http://riskcalc.sts.org/STSWebRiskCalc273/). Although both of them are quite accurate in predicting mortality in low-risk surgical candidates, they present several limits in the subset of the high-risk elderly patients. These scores provide relatively good discrimination (a gross estimation of risk category), but cannot be used to estimate an accurate operative mortality in an individual patient, because of unsatisfactory calibration (comparison between predicted and observed mortality). The value and limitations of risk scores in valvular heart diseases have been reviewed in a recent position paper by the ESC Working Group. The STS score is more accurate than the Logistic EuroScore (which has been validated in low-risk patients and is more specific for coronary surgery) in the high-risk setting. Notwithstanding, various medical conditions, such as liver disease, porcelain aorta, neurological impairment, and previous chest radiation, which impact mortality are not included in both algorithms (Figures 1 and 2).

The major disadvantage of these scores, in the elderly population, is that the ‘biological status’ of patients is not represented.

Although surgical risk increases with chronic age and comorbidities, these factors alone are insufficient to predict outcome vs. benefit and the biological age rather than the chronologic age should be considered. New versions of both the Logistic EuroScore and the STS score have been recently developed (respectively the EuroScore II and STS 2.73) to improve pre-operative evaluation of high-risk patients, but data are still insufficient to judge their accuracy.

Besides intra- and early-postoperative risks, it would appear equally important integrating the quality of life and functional scoring systems at a defined postoperative follow-up, to judge whether a certain procedure could lead to the expected functional improvement.

Different patients, with the same chronologic age, show different vulnerabilities to the external factors (Figure 3), and this condition refers to a syndrome which is known as ‘frailty’ in geriatric medicine.

A formal definition of ‘frailty’ has been provided by Fried et al., and it is indeed a syndrome of decreased reserve and resistance to stressors, resulting from multiple declines across multiple physiological systems, leading to vulnerability to adverse events. Frailty is defined by the presence of three criteria or more among weakness, weight loss, exhaustion, low physical activity, and slow walking speed.

Frailty is a common occurrence in elderly persons and represents the most important factor that should be considered when weighting treatments in aged patients.

The concept of frailty is relatively easy to describe, although it is much more difficult to be clinically quantified. It is also important...
Many physicians often refer to the ‘eyeball test’, when assessing the likelihood that a patient will survive receiving a benefit from a procedure. However, there are many differences from patient to patient and from clinician to clinician, resulting in a lack of objectivity. Different frailty scores have been reported in the literature, considering aspects of cognitive impairment, weakness, exhaustion, malnutrition, slowness, geriatric impairments, and physical performance (Figure 4).

The use of tools for the assessment of frailty to estimate the operative risk in elderly patients undergoing cardiac surgery is increasing. In particular, the use of the gait speed as a marker of frailty has been shown to improve the prediction of mortality and major morbidity in elderly patients undergoing coronary artery bypass and valve repair or replacement. Afilalo et al. reported in a multicentre prospective cohort of 131 elderly patients that the slow gait speed (defined as a time $\geq 6$ s taken to walk 5 m) was an independent predictor of in-hospital mortality or major morbidity, with a nearly three-fold risk increase after surgery. The operative risk is particularly raised in female patients with slow gait (eight-fold increased risk).

The same group analysed a series of 152 subsequent elderly patients undergoing cardiac surgery: four different frailty scales, three disability scales, and five cardiac surgery risk scores were measured in all patients. The most predictive factors of morbidity and mortality in each domain were: 5 m gait speed $\geq 6$ s as a measure of frailty, $\geq 3$ impairments in the Nagi scale as a measure of disability and either the Parsonnet score or STS predicted risk of mortality or major morbidity as a cardiac surgery risk score.

Another recent study by Sundermann et al. on the comprehensive assessment of frailty in elderly patients undergoing cardiac surgery was performed in 400 patients. The frailty score used combined...
characteristics of the Fried criteria, patient phenotype, physical performance, and laboratory results.\textsuperscript{13} The frailty showed significant correlation with the observed 30-day mortality, confirming the comprehensive assessment of frailty an additional tool to evaluate elderly patients adequately, in addition to traditional scoring systems.

Likewise, the evaluation of frailty parameters was also used as criteria for inoperability in the PARTNER trial.\textsuperscript{4} A frailty index was used based on the subsequent parameters: grip strength < 18 kg, 5 m walk > 6 s, serum albumin < 3.5 mg/dL, and Katz ADLs 4/6 or less. To be classified inoperable, a patient should present three of four of these criteria.

Besides the preoperative risk assessment, it is of particular importance the planning of surgical and interventional procedures: a strategy based on ‘skillful omission’ should always be taken into account, dealing with fragile and sick patients, in whom the trauma has to be minimized. Additional procedures in association with valves surgery should only be carried out if strictly required. For instance, the opportunity to

\begin{itemize}
\item Cognitive Impairment
  \begin{itemize}
  \item MMSE
  \item Clock Drawing
  \item Dementia
  \item Trails Test
  \item Word Recall
  \end{itemize}
\item Weakness
  \begin{itemize}
  \item Grip Strength
  \item Calf Circumference
  \item Physical function (SF-36 PF, DASI)
  \item Minnesota Leisure Time Scale
  \item Inactivity
  \end{itemize}
\item Slowness
  \begin{itemize}
  \item Gait speed
  \item Chair stands
  \item Balance
  \item Get up and go
  \end{itemize}
\item Nutrition
  \begin{itemize}
  \item Body Mass Index
  \item Weight Loss
  \end{itemize}
\item Exhaustion
  \begin{itemize}
  \item Fatigue Scales
  \end{itemize}
\item Other
  \begin{itemize}
  \item Mood disturbance
  \item Depression
  \end{itemize}
\end{itemize}
The importance of a dedicated Heart Team has also been stressed in the last ESC/EACTS guidelines on the management of valvular disease (Figure 6). In this specific context, it could be advisable the involvement of the geriatric specialist. A multidisciplinary approach by a dedicated Heart Team tailored on the individual patient is probably the key to obtain a comprehensive assessment of the real surgical risk.

**Conflicts of interest:** None declared.

**References**


