The importance of longitudinal assessment of valve function

Thierry Carrel, MD

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Mokhles and colleagues¹ have to be congratulated on providing us in their article in this issue of the *Journal of Thoracic and Cardiovascular Surgery* with a comprehensive model of longitudinal analysis in more than 300 patients to assess the function of an allograft valve with time after aortic valve replacement with homografts either in the subcoronary technique or as a full root replacement. The report is seductive: the goals of the article are to propose a method to predict the performance of allograft valves through the years and to identify the most significant clinical and echocardiographic predictive factors for adverse outcome.

In fact, Mokhles and colleagues¹ are convincing that there is no well-established method for continuous heart valve function assessment. A statistical technique was therefore applied to depict the prevalence of various allograft valve dysfunctions (regurgitation, increased transvalvular pressure gradient) versus time on the basis of numerous echocardiographic recordings. As a pioneer in this field, a senior member of the group, Blackstone, described as early as 1986 a method to decompose hazard into biologically meaningful hazard phases: early, constant, and late.² Each of these hazard phases is modulated by separate groups of risk factors depending on the interval after the surgical procedure. More recently, the same group³ perfected the adaptation of temporal decomposition methodology to longitudinal continuous outcome, like that used in their current report.

Before commenting on this approach, here are just a few words on the general findings of this article. First, the early mortality of 5.9% was quite high for aortic valve (or root) replacement in a younger collection of patients (with a mean age of 46 years). Because some of these patients may have represented complex cases, it would have been helpful to compare the results of Mokhles and colleagues¹ with a risk score (for instance

Society of Thoracic Surgeons score or euroSCORE) to evaluate better whether this mortality was acceptable. As a second main finding, the survivals of 78% at 10 years and 65% at 15 years, as well as the reoperation-free survival, were surprisingly poor in this report. Mokhles and colleagues¹ found that subcoronary implantation was associated with a higher postoperative incidence or degree of allograft valve regurgitation. One could speculate that some technical problems were responsible for early postoperative allograft regurgitation. If regurgitation appeared in the midterm to long-term follow-up, however, should it be considered as a classic allograft failure independently of the mechanisms of increasing aortic regurgitation? Another interesting finding was that aortic diameter decreased with time, which means that homografts were shrinking. In this sense, some information about calcifications of the wall of the allograft when used in the miniroot technique would have been helpful, because this is one of the major challenges during reoperation.

When the dynamic of the allograft valve degeneration is considered, it would be interesting to know what Mokhles and colleagues consider to be the ideal interval to perform echocardiographic follow-up in these patients. Personally, I would expect that an interval of 2 years should be reasonable.

The results presented in this report confirm the fact that allograft durability is comparable to that of other biologic valve substitutes. For this reason, application of allografts should mainly be reserved for patients with complex cardiac or root pathologies and in the setting of endocarditis. Male sex was found to be significantly correlated with higher aortic gradient; Mokhles and colleagues¹ speculated about immunologic reaction, but in fact it would also have been very interesting to assess the ABO compatibility of the allograft (ABO match or mismatch), because some groups have found significantly worse results when ABO-incompatible allografts (donor to recipient) were used.

Finally, I believe that advanced longitudinal data analysis is really helpful to predict the behavior of the allograft with time, and this type of information should be available for every biologic valve substitute. Continuous heart valve function, rather than valve function at certain periods after valve replacement, would help because valve failure is a continuous process and not a hard end point. This piece of information would be extremely helpful to justify the optimal choice of the valve substitute. Nowadays, registries or retrospective

From the Clinic for Cardiovascular Surgery, University Hospital Berne, Berne, Switzerland.

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Address for reprints: Thierry Carrel, MD, Clinic for Cardiovascular Surgery, University Hospital Berne, Berne, Switzerland (E-mail: thierry.carrel@insel.ch).

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studies are frequently sponsored by our industrial partners, but the scientific power of such studies is by far not always convincing. What we need to allow a proper discussion with our patients on the choice of a valvular substitute is the detailed durability of biologic valves. In that sense, it remains a hope that reports such as that of Mokhles and colleagues¹ will open the door to similar analyses on other (if not all) biologic valve prostheses.

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