EDITORIAL

Use of Bioprosthetic Valves in the Aortic Position

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Since Hufnagel implanted the first mechanical valve in the descending aorta in 1952, and since Murray also implanted a fresh human aortic valve also in the descending aorta in 1956, we are available to treat patients with aortic valve disease either with mechanical or biological valves. (1)

It is well known that there is an 'antinomy' between the two types of valves, sustained by the strengths and weaknesses of each of them.

Nevertheless, the dramatic design and technological development of new models require continuous updating of the different and also new characteristics and their benefits, to be embodied in published surgical outcomes.

In this regard, the latest bioprostheses offer the classic rigid or semi-rigid stented model, or the stentless model. They may be either of human (homograft) or of animal (xenograft) origin. To this group belongs the true cardiac valve derived from pigs, or others manually manufactured with biomaterial, such as the one made of bovine pericardium. Most of them undergo a special treatment, whether physical or chemical, in order to avoid tissue calcification.

Also, it is necessary to include here those procedures in which the autologous pulmonary valve is used to replace the damaged valve in aortic position, by means of a homograft in pulmonary position (Ross procedure).

This brief list summarizes the different weaknesses of valve bioprostheses, which are necessary to be improved:

- Increase of the effective orifice area.
- Durability.
- Infection resistance.

INCREASE OF EFFECTIVE ORIFICE AREA (EOA)

A current problem in the first generation of both biological and mechanical valves was the appearance of high-pressure gradients between the left ventricle and the aorta, coexisting with a reduced prosthetic valve area, when contrasted to the normal human area. In 1978, Rahimtoola defined it as 'patient-prosthesis mismatch' (PPM). (2)

Design solutions such as the stent reduction and the homologous and allogeneic stentless valves provided better *in vitro* and *in vivo* hemodynamic profiles. This even brought about benefits, for instance, a higher and faster ventricular mass regression. However, it is yet unclear how these valves impact on overall survival and on the freedom of events during follow-up. (3, 4)

DURABILITY

The appearance of calcification, fibrosis and even rupture of the biological valve after its implant is known as 'structural failure or bioprosthetic degeneration'. It is known at present that this phenomenon is driven by two related reasons: the first one is the phosphocalcic metabolic activity in the implant receptor site, and the second is the fatigue or stress episodes the artificial valves (pericardium, dura mater) or the natural valves (porcine valves) undergo, when inserted into an artificial stent. The agression would not be that much according to the patient's age (the older the patient, the less the aggresion) and to how freely and elastically the valves can move.

That is why the strategies to increase durability are based on generating dynamic prosthetic rings with a movement associated to the aortic root movement, and in finding specific biological treatments that avoid the valve deterioration and calcification. Some of these consist of the tissue culture in a highly concentrated ethanol medium, followed by an exhaustive washing process, (5) or the use of alpha-*amino-oleic-acid (AOA) after being fixed with glutaraldehyde.* (6)

INFECTION RESISTANCE

Much has been written about the theoretical advantages in the use of biological tissue versus metallic material to treat infective endocarditis. An increased resistance to bacterial implant is postulated among the biological tissue advantages. However, there is no demonstrated evidence. The use of valve homografts is the exception, since they show improved capacity to adapt to the infected tissue, in addition to having the anterior mitral valve to cover areas with abscesses or pseudoaneurysm. (7)

In this issue of the *Revista Argentina de Cardiología*, Piccinini et al (8) publish their nine-year experience in aortic valve replacement with a biological valve. They describe the follow-up of a series of 256 patients who underwent aortic valve replacement, isolated or combined with coronary artery bypass surgery.

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Both the global survival rate and the freedom for rehospitalization and reintervention are similar to the ones published in the international bibliography.

What calls the attention is that only the absence of sinus rhythm during preintervention is the only predictor of mortality during the follow-up. Whether most authors include preoperative chronic auricular fibrillation as an important predictor, factors such as age, male sex, diabetes, presence of acute aortic regurgitation, the need for intraortic counterpulse balloon both during and after surgery, post-surgical kidney failure and stroke are also mentioned, with independent value. (9, 10)

There are discrepancies regarding other risk factors; for instance, some consider the need for concommitant artery bypass a risk in itself, (10) while others see it as a protection in the follow-up of new coronary ischemic events. (11) The previous functional class is also discussed.

Probably, in a follow-up average of 3.17 years (1,158 days) it is difficult to perceive the total number of possible events, since it is a mid-term follow-up. It is surprising to see how the PPM, which is both an early and late mortality predictor, loses this value among the elderly,who are generally implanted with biological valves. (12) In the series presented in this issue of the *Revista*, the mean age is of 72.

Piccinini et al's work is very helpful, since it shows the immediate and late outcomes of a group of patients from our area undergoing aortic valve replacement with bioprosthesis, which entails a complete follow-up for more than 94% of the surgical patients. The adequate outcomes, as well as the predictors of mortality and readmittance, match the outcomes in the bibliography. It will be very helpful to know new predictors that may appear throughout the follow-up. The inclusion of a score for life quality, especially in a population with a high mean age, is also helpful.

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