

Preface

It is an honor to be the Guest Editor of this issue of the *Annals of Cardiothoracic Surgery*. Entirely devoted to aortic valve repair, this edition explores many aspects, issues and obstacles faced by this innovative field of surgery. Such a challenging task, in compiling an up-to-date clinical and biomedical knowledge bank, has been expertly and meticulously accomplished by all contributors, and I must thank them all for their work in this publication.

Aortic valve repair is emerging as a standardized and reproducible discipline in cardiac surgery for the treatment of aortic valve regurgitation and root aneurysms. Reflecting upon the evolution of aortic valve repair, it is normal to be tempted, either consciously or not, to make apt comparison of the valve with its close cousin, the mitral valve. Such an appraisal, worthy in its cause, expounds the lessons learnt during the evolution of mitral valve repair, encouraging us to embrace the same functional surgical approach for the aortic valve. Mitral valve repair has evolved from an art practiced by a handful of masters to an algorithmic science applied by many surgeons during their daily practice. During this transition, a revolutionary milestone was the development of classifications of mitral insufficiency by Carpentier, which provided a much needed tool to standardize the common language between different experts involved in valve repair. What are the other lessons learnt through our journey? The first is the clear understanding of the functional anatomy of the valve; a thorough analysis of the valve, including classification of its dysfunctions and identification of the mechanisms/lesions leading to such dysfunctions, has been instrumental in helping us select the appropriate surgical techniques. The second lesson is the dawning realization that lesions frequently coexist, therefore instigating regurgitation, and that failure to identify each and every one of these lesion will lead to incomplete correction, which is a recurrent cause of immediate and late failure. The third lesson learnt is the intimate bond between the valve leaflets and the annulus, and the association of annular dilation with the severity of regurgitation: any leaflet repair should be accompanied by annular stabilization and reduction in order to restore matching between the tissue and the orifice. In a few words, the goal of valve repair is to restore surface coaptation by systematically addressing the leaflets and the annulus.

Are we on the right route for the aortic valve? I believe the answer is an emphatic yes. The evolution of aortic valve repair bears significant resemblance to that of the mitral valve. The preservation of normal functioning aortic valve in root pathologies pioneered by Sir Magdi Yacoub and Tirone David heralded a new era of aortic repair, akin to the first annuloplasty of the mitral valve. Indeed, leaflet pathology, such as prolapse, was first considered a contraindication for sparing, and it was only later on, with awareness of their importance on the development of surgical techniques dealing with leaflet prolapse, that the aortic valve and the annulus was considered together as a functional unit. Such a symbiotic relationship led to the indelible recognition that to achieve a successful and durable repair both components need to be corrected together. Furthermore, we developed some years ago a mechanistic classification of aortic regurgitation which, after thorough analysis, helped us in selecting and applying the appropriate surgical techniques, much like the paradigm of mitral valve repair. Yet despite these parallels, we see two major differences between aortic and mitral valve repair. From a surgical point of view, the positioning of the aortic valve on the outflow side makes surgical analysis and repair assessments virtually impossible in its pressurized environment; hence, three-dimensional surgical visualization and echocardiography are critical for the success of the repair. The second difference is related to the fact that the functional annulus of the aortic valve is not a single planar structure, but rather two distinct constructs, namely the ventriculoaortic junction and the sinotubular junction. Both structures play a major role in aortic valve function and therefore deserve special attention when performing 3D aortic annuloplasty.

A lot of good work has already been done by the many pioneers of this field. However, the road is still long and several challenges, but also opportunities, lie ahead. What is the best way to achieve an annuloplasty? In bicuspid aortic valve, the best stabilization seems to be done by the reimplantation technique, but should normal roots also be replaced? What is the best leaflet configuration? What is the best material to restore a leaflet? How to best select patients appropriate for valve repair? Should we repair the aortic valve in this era of excellent bioprostheses? How can we teach and learn complex surgical techniques in the era of restricted live surgical transmission? We are fortunate to live in an age of surgical revolution, something that our medical forbearers could have only dreamed about. Such a wondrous opportunity must not be wasted, as we now have the ability to answer these critical questions.

It is evident that aortic valve repair still has a long way to go, as many concerns and problems remain unaddressed. It falls upon the shoulders of intrepid explorers and dedicated pioneers to help us decipher these mysteries in order to better benefit

and enrich the lives of our patients. We sincerely hope the readers will find some of these answers in this issue of *Annals of Cardiothoracic Surgery*.

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