EDITORIAL

Aortic valve repair: creativity is making the complicated simple

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RELATED ARTICLE
by Gocoł et al,
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Making the complicated simple, that's creativity.

Charles Mingus, composer and musician

Heart valve disease still constitutes one of the main indications for cardiac surgery. As a rule, valve repair is preferable to replacement, because it avoids implantation of a prosthesis with the inherent complications—thromboembolism of the mechanical valves and biodegradation of the bioprosteses. This principle is currently widely applied to the mitral valve, but much less to the aortic. This may appear incomprehensible since the anatomy of the aortic valve seemingly is much simpler than that of the mitral apparatus. Oscar Wilde once said: "I love simple things; they are the last resort of a complex spirit." He could have said: simple things may turn complex! And Henry Louis Mencken, an American journalist and scholar, is known to have said that for every complex problem there is always a simple, elegant, and completely wrong solution!

That sentence serves well in aortic valve repair. Initial attempts at preservation of the aortic valve occurred almost simultaneously with those for the mitral valve, over 5 decades ago,[1] but while mitral valve repair had an ever growing acceptance, the aortic procedure(s) never managed the same degree of success. However, it recently emerged from an almost forgotten to a subject of increasing interest. In the last decade, several reports have attested the feasibility and successful outcomes of aortic valve repair,[2,3] although the reproducibility still raises some concerns. Still, some surgical groups around the world have mastered the techniques of aortic valve repair,[4,5] as did Carpentier's and Duran's groups several decades ago for the mitral valve.

These considerations pertain only to cases of isolated pathology of the aortic valve, that is, do not entirely apply to patients in whom the valvular dysfunction, usually regurgitation (aortic regurgitation) is not due to abnormalities of the valve, with normal leaflets, but to alterations of the geometry of the aortic root, such as ascending aortic aneurysms and dissections. In these cases, preservation of the aortic valve has always been in the mind, and effectively practiced by most surgeons. In the case of aneurysms, this is achieved by either remodeling or reimplantation of the valve, typified by the Yacoub and David procedures,[6,7] with proven good long-term results, while in most cases of aortic dissection it is corrected by supravalvular tube graft replacement of the ascending aorta, with resuspension of the valve. Hence, in my view, discussion on aortic valve repair should be limited to cases with primary pathology of the valve, with or without secondary ascending aortic aneurysmal formation.

In this issue of *Kardiologia Polska* (*Kardiol Pol*, *Polish Heart Journal*), Gocoł et al[8] from Katowice, reported their 504-patient experience with aortic valve repair and/or aortic valve sparing root replacement consecutively performed at their institution over a 17-year period until the end of 2019. This included 452 (89.7%) elective and 52 (10.3%) emergency surgeries for acute type A aortic dissections. The median follow-up time was 35 months. Five- and ten-year survival rates were 83% and 73%, respectively, being apparently superior after elective than after emergency surgery, although the difference was not statistically significant, I presume because of the small number of patients in the emergency group. Freedom from at least moderate aortic

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valve regurgitation was confirmed in 86.6% of patients. The authors thus concluded that "aortic valve repair is a durable and effective surgical procedure associated with low early and late mortality. Aortic valve reconstruction in patients with acute type A aortic dissection yields good long-term results."

This is, indeed a very large series, apparently the largest in Poland, but 184 patients (37%) had dissection (52 cases) or aortic root aneurysm (132 cases), hence, for the reasons indicated above, constitute a different entity. Indeed, the Yacoub or the David operation were performed in 137 patients. On the other hand, 223 patients had ascending aorta aneurysm, the majority, I presume secondary to the AR, which requires direct valve intervention.

Aortic valve repair now mainly consists of techniques directed at the reconstruction of the leaflets and / or narrowing and remodelling of the annulus.[9-11] Aortic leaflets may either be congenitally abnormal, most frequently a bicuspid valve or fenestrations, or affected by a degenerative process, often causing free edge elongation and prolapse. In these cases, leaflet realignment or reconstruction is required to restore valve competence. Isolated endocarditis lesions with perforation may also be surgically corrected by leaflet patching. Finally, rheumatic leaflet retraction may be treated by leaflet replacement or extension with pericardium.[12] On the other hand, annular dilatation may either be primary or secondary to the AR. It has been treated with annuloplasty, either subvalvular or supravalvular, or both, by interrupted or continuous sutures, rings, or bands.

All of these techniques have been there for quite some time but were reapplied and refined recently in order to standardize and increase the reproducibility of the results, with consequent improvement of the outcomes.[9-11] Most importantly, there have also been significant advancements in the understanding of the anatomy and physiology of the aortic valve and in classifying the large spectrum of the pathology, to build a common language for everybody involved.[13] Most of these principles and methods were applied in the current series of patients operated on in Katowice in the last decade and a half, and the authors are to be congratulated on their pioneering effort in Poland.

The proof of the pudding is in the eating! As it had happened earlier with the mitral valve, it remains to confirm the durability of the repair. Because of the recent nature of the revival of the procedure, it will still take some time to prove its durability and generalizability, that may make this approach superior to aortic valve replacement. Of note, the median follow-up time of the Katowice experience was only 35 months, far too short to assess durability of any valve procedure. Besides, there has never been a prospectively randomized study comparing repair and replacement, but recent data in the literature suggest that repair can offer prolonged durability compared to bioprostheses and fewer valve-related events compared to mechanical valves.[14] Finally, the AVIATOR (Aortic Valve Insufficiency and Ascending Aorta Aneurysm International Registry) has very recently been initiated to analyze a large homogeneous series of patients undergoing aortic valve repair for the treatment of AR.[15] Naturally, this will still be a long process and it only remains, for now, to encourage individual surgeons and surgical teams around the world to follow the concepts and to contribute to further improvements of the procedures.

ARTICLE INFORMATION

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REFERENCES

1 Cabrol C, Cabrol A, Guiraudon G, et al. Treatment of aortic insufficiency by means of aortic annuloplasty. Arch Mal Coeur Vaiss 1966; 59: 1305-1312.

2 Salem R, Zierer A, Karimian-Tabrizi A, et al. Aortic valve repair for aortic insufficiency or dilatation: technical evolution and long-term outcomes. Ann Thorac Surg. 2020 May 8. [Epub ahead of print].

3 Ehrlich T, de Kerchove L, Vojacek J, et al. State-of-the art bicuspid aortic valve repair in 2020. Prog Cardiovasc Dis. 2020 May 5. [Epub ahead of print].

4 Lansac E, Di Centa I, Bonnet N, et al. Aortic prosthetic ring annuloplasty: a useful adjunct to a standardized aortic valve-sparing procedure? Eur J Cardiothorac Surg 2006; 29: 537-544.

5 Boodhwani M, de Kerchove L, Glineur D, et al. Repair-oriented classification of aortic insufficiency: impact on surgical techniques and clinical outcomes. J Thorac Cardiovasc Surg. 2009; 137: 286-294

6 Yacoub MH, Gehle P, Chandrasekaran P, et al. Late results of a valve sparing operation in patients with aneurysm of aorta and root. J Thorac Cardiovasc Surg. 1998; 115: 1080-1090.

7 David TE, Feindel CM. An aortic valve-sparing operation for patients with aortic incompetence and aneurysm of the ascending aorta. J Thorac Cardiovasc Surg. 1992; 103: 617-622.

8 Gocoł R, Malinowski M, Bis J, et al. Long-term outcomes of aortic valve repair in over 500 consecutive patients: a single-center experience. Kardiol Pol. 2020; 78: 861-868.

9 Schafers HJ, Schmied W, Marom G, Aicher D. Cusp height in aortic valves. J Thorac Cardiovasc Surg 2013; 146: 269-274.

10 Lansac E, Di Centa I, Sleilaty G, et al. Remodeling root repair with an external aortic ring annuloplasty. J Thorac Cardiovasc Surg. 2017; 153: 1033-1042.

11 Lansac E, de Kerchove L. Aortic valve repair techniques: state of the art. Eur J Cardiothorac Surg. 2018; 53: 1101-1107

12 Afifi A, Hosny H, Yacoub M. Rheumatic aortic valve disease-when and who to repair? Ann Cardiothorac Surg. 2019; 8: 383-389.

13 Le Polain de Waroux JB, Pouleur AC, et al. Functional anatomy of aortic regurgitation: accuracy, prediction of surgical repairability, and outcome implications of transesophageal echocardiography. Circulation. 2007; 116: I264-I269.

14 Zeeshan, A, Idrees JJ, Johnston DR, et al. Durability of aortic valve cusp repair with and without annular support. Ann Thorac Surg. 2018; 105: 739-748.

15 de Heer F, Kluin J, Elkhoury G, et al. AVIATOR: an open international registry to evaluate medical and surgical outcomes of aortic valve insufficiency and ascending aorta aneurysm. J Thorac Cardiovasc Surg. 2019; 157: 2205-2211.