

See Article page 85.



Commentary: Aortic root enlargement—when and how?

Manuel J. Antunes, MD, PhD, DSc

Prosthesis–patient mismatch (PPM) associated with aortic valve replacement (AVR), especially of aortic stenosis, is common and challenging. Initially defined in 1978 by Rahimtoola¹ as “effective prosthetic valve area, after insertion into the patient, less than that of a normal human valve,” the concept was developed by Pibarot and Dumesnil,² who have shown that moderate PPM, defined as an indexed effective orifice area $\leq 0.85 \text{ cm}^2/\text{m}^2$, was independently associated with a 60% increase in the risk of heart failure.

Enlargement of the narrow aortic root (ARE) is now increasingly accepted as a method to facilitate implantation of a larger prosthesis, hence, to diminish the risk of PPM. Yet, many surgeons are still afraid or reluctant to perform ARE for fear of potential complications that might lead to increased perioperative mortality and morbidity. However, the procedure has been proven safe, effective, and reproducible and in reach of any minimally experienced cardiac surgeon. In addition, there are diagnostic methods and tables that help to predict the risk of PPM and assist in the planning of the surgery and modifications of the classical techniques that make ARE simpler and even more reproducible.

In a paper published in this issue of the *Journal*, Chowdhury and colleagues³ from New Delhi, India, evaluate their results of ARE with the Nicks procedure, using untreated autologous pericardium for reconstruction of the aortic root. In this single-surgeon experience, a series of 115 consecutive patients (mean age 26.6 years; mean body surface area, 1.46 m^2) underwent AVR with ARE from 1997 to 2019. The predominant valvular lesion was stenosis. Hospital mortality was 1.7% and, at a mean follow-up of 123 months (minimum 2 years), the actuarial survival was

From the Faculty of Medicine, Clinic of Cardiothoracic Surgery, University of Coimbra, Coimbra, Portugal.

Disclosures: The author reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

Received for publication Aug 1, 2020; revisions received Aug 1, 2020; accepted for publication Aug 4, 2020; available ahead of print Aug 11, 2020.

Address for reprints: Manuel J. Antunes, MD, PhD, DSc, Faculty of Medicine, University of Coimbra, 3000-548 Coimbra, Portugal (E-mail: mjantunes48@sapo.pt). *JTCVS Techniques* 2020;4:99-100

2666-2507

Copyright © 2020 The Authors. Published by Elsevier Inc. on behalf of The American Association for Thoracic Surgery. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

<https://doi.org/10.1016/j.jtc.2020.08.001>



Manuel J. Antunes, MD, PhD, DSc

CENTRAL MESSAGE

Enlargement of a narrow aortic root is now accepted as an easy, safe, and efficacious method to facilitate implantation of a larger prosthesis, hence diminishing the risk of patient–prosthesis mismatch.

93%. No cases of severe PPM were observed. At discharge, the mean aortic root diameters at the level of sinus of Valsalva and sinotubular junction were 29.8 mm and 32.0 mm, with no significant changes at latest follow-up and no cases of late pericardial aneurysm. Hence, the authors conclude that “ARE is a safe adjunct to AVR ... in patients with a small aortic annulus to prevent PPM.”

The results are good and the conclusion is appropriate and the authors are to be congratulated for a 100% follow-up and completeness of data after a period extending beyond 20 years. However, they do not constitute a novelty; other recent series, some larger, came to similar conclusions.⁴⁻⁶ This is a subject that has been particularly close to me in the last 4 decades, and I have done my best to practice and promote the procedure.⁷⁻¹⁰ From the beginning, I have adopted the modification of the Nicks procedure¹¹ described by Kinsley in 1977,¹² also using autologous pericardium, but avoiding interference with the mitral valve by extending the incision in the noncoronary sinus anteriorly toward the medial mitral valve commissure.^{7,12}

I have some further remarks on the current paper:

1. A total of 1411 patients had AVR, of whom 115 (8.2%) had ARE. Two-thirds of the patients had a standard Nicks procedure and one-third underwent a simpler modification of the Nicks, developed by the senior author, in which the aortic incision does not extend

beyond the annulus, yet it is stated that in the majority of the cases the prosthesis seated in an intra-annular position. The authors report the diameters at the level of the sinuses of Valsalva (at what level in the sinus?) and of the sinotubular junction, but not at annular level. I, therefore, have great difficulty in understanding how, within an intact annulus, a prosthesis 1 or 2 sizes up was implanted.

2. As one of the reviewers stated during the editorial process, “it is unclear if the (pre-operative) echo exams were performed using a standardized protocol. This is particularly important as echo is an operator-dependent technique and the effect of inter-operator variability can be very important especially when dealing with continuous measurements, such as root dimensions. The study period includes more than 20 years and it is likely that the echo methods, equipment and personnel have changed over the course of the time.”
3. The etiology was rheumatic in just over one half of the patients. In my experience with patients with rheumatic disease, aortic regurgitation is the most common lesion, especially in younger patients. In the vast majority of these cases, even in children, a large-enough prosthesis can be used without ARE. In the current study, a prosthesis size 21 mm was used in about one half of the patients, which is obviously enough for the small body surface, characteristic of the Indian population, but a size 23 mm was used in about one-fifth of the patients.
4. In any case, judging by the title, this work’s main objective was the evaluation of the aortic root after ARE. In this respect, the manuscript falls short of the promise, as the only information about the evolution of the aortic root is contained in the last paragraph of the results: “At a mean follow-up of 123.11 ± 77.67 months... none of the survivors demonstrated any periprosthetic leakage, aneurysm or pseudoaneurysm formation of the aortic root and calcification of the pericardial patch. Five patients had mild speckle of ascending aortic wall calcification.”

In conclusion, Chowdhury and colleagues conducted a very successful series of ARE performed in very young patients by the senior surgeon. It is unclear whether there were other cases not included in this series operated on by other surgeons. Although the main aim of the procedure, ie, to avoid PPM, was achieved in almost all patients, as expected and proved by other groups, this particular study confirms the information that we had reported in 1983,⁷ that the use of untreated autologous pericardium for reconstruction of the aortic root is remarkably exempt of problems, such as dehiscence, aneurysm or pseudoaneurysm of the aortic root, and calcification of the patch, after a mean follow-up of more than 10 years.

And that may still be new and, perhaps, important information!

References

1. Rahimtoola SH. The problem of valve prosthesis–patient mismatch. *Circulation*. 1978;58:20-4.
2. Pibarot P, Dumesnil JG. Prosthesis–patient mismatch: definition, clinical impact, and prevention. *Heart*. 2006;92:1022-9.
3. Chowdhury UK, Singh S, George N, Hasija S, Sankhyan L, Pandey NN, et al. Early evaluation of the aortic root after Nick’s procedure. *J Thorac Cardiovasc Surg Tech*. 2020;4:85-96.
4. Haunschild J, Scharnowski S, Mende M, von Aspern K, Misfeld M, Mohr FW, et al. Aortic root enlargement to mitigate patient-prosthesis mismatch: do early adverse events justify reluctance? *Eur J Cardiothorac Surg*. 2019;56:335-42.
5. Tam DY, Dharma C, Rocha RV, Ouzounian M, Wijeyesundera HC, Austin PC, et al. Early and late outcomes following aortic root enlargement: a multicenter propensity matched cohort analysis. *J Thorac Cardiovasc Surg*. September 28, 2019 [Epub ahead of print].
6. Correia PM, Coutinho GF, Branco C, Antunes MJ. Long-term follow-up of patients undergoing aortic root enlargement for insertion of a larger prosthesis. *Eur J Cardiothorac Surg*. 2016;50:82-8.
7. Kinsley RH, Antunes MJ, McKibbin JK. Enlargement of the narrow aortic root and oblique insertion of a St Jude prosthesis. *Br Heart J*. 1983;50:330-2.
8. Coutinho GF, Correia PM, Paupério G, de Oliveira F, Antunes MJ. Aortic root enlargement does not increase the surgical risk and short-term patient outcome? *Eur J Cardiothorac Surg*. 2011;40:441-7.
9. Antunes MJ. Commentary: aortic root enlargement, a useful and reproducible way to a larger prosthesis. *J Thorac Cardiovasc Surg*. September 24, 2019 [Epub ahead of print].
10. Antunes MJ. Enlargement of the narrow aortic root: fear of what? *J Card Surg*. July 11, 2020 [Epub ahead of print].
11. Nicks R, Cartmill T, Bernstein L. Hypoplasia of the aortic root. The problem of aortic valve replacement. *Thorax*. 1970;25:339-46.
12. Kinsley RH. The narrow aortic annulus. A technique for inserting a larger prosthesis. *Am Heart J*. 1977;93:759-61.