A journey to the “sweet spot”

Israel M. Barbash, MD,^a and Ehud Raanani, MD^b

From the ^aInterventional Cardiology and ^bCardiothoracic Surgery Department, Leviev Heart Institute, Sheba Medical Center, Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel.

Disclosures: Authors have nothing to disclose with regard to commercial support.

Received for publication Jan 26, 2017; accepted for publication Jan 28, 2017.

Address for reprints: Ehud Raanani, MD, Director of Cardiac Surgery and the Leviev Heart and Vascular Center, Sheba Medical Center, Sackler Faculty of Medicine, Tel Aviv University, 52621 Ramat Gan, Israel (E-mail: ehud.raanani@sheba.health.gov.il).

J Thorac Cardiovasc Surg 2017;153:1316-7

0022-5223/\$36.00

Copyright © 2017 by The American Association for Thoracic Surgery

<http://dx.doi.org/10.1016/j.jtcvs.2017.01.044>

Transcatheter valve-in-valve (VIV) procedures have emerged as promising therapeutic options for patients with failed bioprosthetic valves in the aortic and mitral position.^{1,2} VIV procedures are safe and have high success rates. However, previous clinical studies have shown that acute and long-term procedural results vary greatly due to multiple factors: type of transcatheter heart valve (THV), valve failure mechanism (degeneration vs regurgitation), type of bioprosthetic valve, and most importantly, the bioprosthetic valve internal diameter.^{1,2} Overall, the main challenge confronting improved VIV outcomes depends on avoiding high postprocedural gradients across the implanted THV, as well as achieving a large effective orifice area.

Clinical decisions regarding selection of the appropriate THV for an individual patient is currently based on minimal clinical data, and frequently obtained from a popular VIV application (Dr Vinayak Bapat) that represents an expert opinion. Thus, enhanced techniques need to be developed to improve procedural success and VIV outcomes. The article by Azadani et al³ used a sophisticated in vitro model to simulate hemodynamic performance of a THV with a range of conditions implanted into a bioprosthetic valve, to achieve optimal conditions resulting in the best possible hemodynamic result. This is one of the first systematic approaches to develop evidence-based recommendations for VIV procedures. The main findings of this important article confirm our clinical experience, that supra-annular implantation of the THV leads to lower transvalvular gradients, a higher effective orifice area, and better leaflet coaptation, which may be associated with longer durability. This study also challenges current clinical practice in other aspects. Contrary to the recommendation by the VIV application, the authors found superior hemodynamics by using a larger valve for a 23- or 25-mm Hancock bioprosthesis.

The attempts to optimize VIV procedural results by studying in vitro models have some limitations that should be considered. The in vitro model chosen by the authors was

The sweet spot.

Central Message

VIV outcomes depend on avoiding high gradients across the THV. Bench-side studies are important, but the most important parameter is the size of the originally implanted bioprosthesis.

See Article page 1303.

not validated and no clinical correlation study was performed. Furthermore, the bioprosthetic valves used in this study were not degenerated; however, in clinical practice, VIV implantation within degenerated bioprosthesis is more complicated due to leaflet calcification distortion and pannus.

We believe that “prevention” is the best approach.

Nowadays, more than ever, surgeons should be educated that implantation of a bioprosthetic valve will most certainly have significant consequences on future therapeutic options for the patient. Emphasis should be directed toward implanting the largest valve possible, and, perhaps, novel devices and platforms should be designed to facilitate complete, percutaneous replacement of a bioprosthetic valve.

During the past 10 years, many relatively young patients (50 years) have preferred bioprosthetic valves with the hope of a future VIV procedure in the event of bioprosthetic valve failure. Many of these valves will fail after approximately 10 years after surgery. Currently, the lack of data regarding THV durability in young patients limits the use of VIV procedures in such patients.

Until more data are accumulated, older patients with large bioprosthetic valves should be liberally referred for a VIV procedure. However, considering that redo aortic valve replacement in experienced centers is performed with <3% mortality risk, redo surgery should be the preferred option in patients with small bioprostheses and reasonable surgical risk.

References

1. Dvir D, Webb JG, Bleiziffer S, Pasic M, Waksman R, Kodali S, et al. Transcatheter aortic valve implantation in failed bioprosthetic surgical valves. *JAMA*. 2014;312:162-70.
2. Ye J, Cheung A, Yamashita M, Wood D, Peng D, Gao M, et al. Transcatheter aortic and mitral valve-in-valve implantation for failed surgical bioprosthetic valves: an 8-year single-center experience. *JACC Cardiovasc Interv*. 2015;8:1735-44.
3. Azadani AN, Reardon M, Simonato M, Aldea G, Nickenig G, Kornowski R, Dvir D. Effect of transcatheter aortic valve size and position on valve-in-valve hemodynamics: an in-vitro study. *J Thorac Cardiovasc Surg*. 2017;153:1303-15.e1.