Trabucco from Sorin Group for support with the gross examination of the explanted devices.

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EDITORIAL COMMENTARY

Do the “eyes” have it? Lobbying for magnetic resonance imaging to guide transcatheter aortic valve deployment

Robert E. Michler, MD

See related article on pages 1067-72.

Of the many medical advances over the years, few have been as impactful on the practice of medicine as imaging technology. Initially used to peer into the human body for

diagnosis, with time imaging technology has become a tool in planning and monitoring medical and surgical treatments, aiding preoperative planning through 3-dimensional computer modeling, and real-time guidance during surgical interventions. There is probably no finer example of the merger of an imaging tool with a concurrent interventional therapy than percutaneous coronary intervention.

The success of transcatheter aortic valve replacement is exquisitely dependent upon imaging, and requires both fluoroscopy and echocardiography during the procedure to deploy a prosthetic aortic valve. In looking toward the future and thinking of improving deployment precision, Horvath and colleagues have been asking the question of whether the precision of valve deployment could be enhanced by using real-time magnetic resonance imaging (MRI) during the procedure. The motivation for this inquiry arises from the limitations of fluoroscopy and echocardiography relative to MRI. MRI is significantly superior at

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Disclosures: Author has nothing to disclose with regard to commercial support.

Received for publication Feb 4, 2015; accepted for publication Feb 4, 2015.

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J Thorac Cardiovasc Surg 2015;149:1072-3

0022-5223/\$36.00

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<http://dx.doi.org/10.1016/j.jtcvs.2015.02.024>

distinguishing anatomic features such as the coronary ostia, valve leaflet anatomy, and position of the aortic annulus; MRI is not associated with the risk of intravenous contrast toxicity; and the radiation exposures for the patient and the operative team are less with MRI.

Whether these advantages will be sufficient to overcome the logistic issues surrounding MRI use will depend on the end users' "true" and not "perceived" requirement for greater anatomic fidelity, the end users' desire for immediate assessment of function and perfusion readily and uniquely provided by MRI, and the vigor with which the end users drive for the installation of expensive MRI operating room suites within their hospitals. Of course, every budget-conscious person will know to build a rationale for such procedure rooms around the expectation of achieving better outcomes, shorter procedure times and lower procedural costs.

Horvath and colleagues¹ have demonstrated the ability to deploy the Perceval S sutureless aortic valve (Sorin SpA, Milan, Italy) through a transapical approach in a porcine model by means of an ingeniously designed device delivery system, guided by real-time MRI and without the need for rapid ventricular pacing. Horvath and colleagues highlight their finding that real-time MRI permits accurate anatomic deployment of a transcatheter aortic valve without the need to "freeze" heart motion, as is required when the procedure is guided by fluoroscopy and echocardiography. This would certainly prove to be a significant advantage in the delicate and fragile patient population now receiving transcatheter aortic valve replacement.

Horvath and colleagues¹ have shared with readers the lessons they have learned in sizing and deploying a sutureless nitinol valve in a porcine model and have achieved commendable results in a short-term survival model. This work builds on their previous research in this area and leaves us eager to know where they might be headed with feasibility testing in human patients. They correctly point out that the only commercially available valve that could be considered in clinical trials would be the CoreValve (Medtronic, Inc, Minneapolis, Minn), because unlike the stainless steel stent of the Sapien valve, the CoreValve is based on a nitinol frame. Moreover, the Perceval S valve used in this animal study, although nitinol framed, is designed to be implanted only in patients who have had the native aortic valve removed. Are these investigators or others considering ways to remove the aortic valve partially in situ, then rapidly deploy a Perceval S nitinol valve, all while protecting the brain from embolization? For the present, this seems far-fetched.

For the many undeniable advantages of real-time MRI to prove sufficient to move the field away from what is currently being accomplished with impressive success through the use of fluoroscopy and echocardiography will likely require an unequivocal and significant advantage in outcomes (such as lower paravalvular leak rates), as well as the evolution of valve design to take advantage of real-time MRI-guided deployment.

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