Instituto de Investigación Biomédica de A Coruña (INIBIC)
A Coruña, Spain

<http://dx.doi.org/10.1016/j.jtcvs.2015.03.028>

Video clip is available online.

TURNING TO THE TRUTH: IS MECHANICAL AORTIC VALVE ORIENTATION IMPORTANT IN TRANSTHORACIC ECHOCARDIOGRAPHIC DETECTION OF PROSTHETIC

DYSFUNCTION AND PARAVALVULAR ENDOCARDITIS COMPLICATIONS?

Reply to the Editor:

We read with interest the letter by Bouzas-Mosquera and Álvarez-García proposing universal positioning of bileaflet mechanical aortic prostheses with the hinge points of the occluders oriented from the right to the left coronary cusp to maintain the ultrasound beam parallel to the disks in the transthoracic echocardiographic (TTE) parasternal short-axis view during postoperative imaging. According to the hypothesis of Bouzas-Mosquera and Álvarez-García, this not only would allow adequate visualization of dual disk

mobility by TTE but would increase the sensitivity for detection of endocarditis-related perivalvular complications, particularly posterior aortic root abscess.

Rational concern with this hypothesis exists on both fronts, however. Although occluder orientation could theoretically play a role in the quality of leaflet mobility visualization by TTE, other factors such as body habitus, gain or compression settings, and prosthesis size are critical. In fact, although it is uncommon, it is certainly feasible to visualize bileaflet disk mobility with occluder orientation opposite to that suggested by Bouzas-Mosquera and Álvarez-García. As shown in Figure 1, clear systolic visualization of both disks in the parasternal long-axis view (Figure 1, A, arrows) as well as the parasternal short-axis view (Figure 1, B, arrows, and Video 1) is obtained in a patient with a body mass index of 26 kg/m², a large aortic prosthesis, and excellent acoustic windows.

Notably, when prosthetic obstruction is suspected, TTE visualization of disk mobility alone is not sufficient to differentiate instances of pseudoobstruction, such as patient-prosthesis mismatch, from fixed anatomic obstruction. In these cases, assessment of opening occluder angles (as specified by the prosthetic device manufacturer) is critical but rarely possible by TTE¹ or even transesophageal echocardiographic visualization of leaflet mobility. Figure 2 shows early systolic (Figure 2, A, arrows) and late systolic (Figure 2, B, arrows) bileaflet disk mobility by transesophageal echocardiography (parasternal short TTE-equivalent view; Video 2) in an obese patient with a small prosthesis where leaflets were indistinguishable by TTE. Although the orientation of this patient's prosthesis fits the "ideal" according to Bouzas-Mosquera and Álvarez-García, it is, in fact, impossible to determine the systolic opening angles of the disks because the anatomic level of the tomographic plane is unknown. Rather, fluoroscopic imaging perpendicular to the lateral long axes of

FIGURE 1. A, Transthoracic echocardiographic parasternal long-axis view systolic still frame shows a mechanical aortic valve with good systolic bileaflet visualization (arrows) even though disks are oriented perpendicular to the ultrasound beam. B, Transthoracic echocardiographic parasternal short-axis view systolic still-frame on the same patient also shows good systolic bileaflet visualization (arrows) despite valve orientation. RV, Right ventricle; LV, left ventricle; LA, left atrium; RA, right atrium.

FIGURE 2. Bileaflet mechanical aortic valve systolic excursion appears normal in short-axis view (A and B); however, opening angles are abnormal by fluoroscopy (C). Arrows depict bileaflet mechanism in early systole (A) and late systole (B). Pannus-related mechanical aortic valve obstruction identified at the time of surgical aortic valve re-replacement (D). LA, Left atrium.

the occluders with visualization of the base and tips of the disks is essential (Figure 2, C, and Video 3). In this particular case, as in many others, the combination of hemodynamic TTE data and anatomic fluoroscopic evaluation (note abnormal disk opening angles; Figure 2, C, and Video 3) confirmed the diagnosis of fixed mechanical valve obstruction,¹ subsequently determined to be related to pannus formation at the time of surgical explantation (Figure 2, D).

Regarding posterior aortic root visualization, a significant sensitivity advantage for transesophageal echocardiography (relative to TTE) during the identification and characterization of perivalvular abscesses exists for both native and prosthetic aortic valves.^{2,3} The notion that occluder positioning parallel to the beam would routinely improve TTE's ability to evaluate the posterior aortic root in any substantial way thus appears unfounded, and its implementation might potentially be associated with patient risk when technically impractical at the time of surgical implantation.

In conclusion, reliance on disk orientation to guide detection of bileaflet aortic prostheses' abnormalities by TTE appears to be without justification. This conflict is particularly relevant when surgeons favor a specific disk orientation to avoid mechanical interference between occluders and underlying suture material or annular tissue. Nonetheless, well-designed clinical research to evaluate the "orientation hypothesis" could potentially yield interesting results capable of informing the decisions of surgeons and broadening the scientific understanding of postoperative TTE imaging.

Hector I. Michelena, MD^a

Rakesh M. Suri, MD, DPhil^b

^aDivision of Cardiovascular Diseases
Mayo Clinic, Rochester, Minn

^bDivision of Cardiovascular Surgery
Mayo Clinic, Rochester, Minn

References

1. Muratori M, Montorsi P, Maffessanti F, Teruzzi G, Zoghbi WA, Gripari P, et al. Dysfunction of bileaflet aortic prosthesis: accuracy of echocardiography versus fluoroscopy. *JACC Cardiovasc Imaging*. 2013;6:196-205.
2. Daniel WG, Mügge A, Martin RP, Lindert O, Hausmann D, Nonnast-Daniel B, et al. Improvement in the diagnosis of abscesses associated with endocarditis by transesophageal echocardiography. *N Engl J Med*. 1991;324:795-800.
3. Daniel WG, Mügge A, Grote J, Hausmann D, Nikutta P, Laas J, et al. Comparison of transthoracic and transesophageal echocardiography for detection of abnormalities of prosthetic and bioprosthetic valves in the mitral and aortic positions. *Am J Cardiol*. 1993;71:210-5.

<http://dx.doi.org/10.1016/j.jtcvs.2015.03.055>

FREEDOM SOLO: PREMATURE FAILURES OR TECHNICAL FLAWS DURING IMPLANTATION?

To the Editor:

We read with interest the article by Stanger and colleagues¹ reporting the long-term results after implantation of the Freedom SOLO pericardial stentless valve (Sorin Group, Milan, Italy) at the University of Bern. Of note, the same series of patients and complication has been recently published in another peer-reviewed journal.²