

IMAGES IN INTERVENTION

Not All Immobile Bioprosthetic Valve Cusps Are Thrombosed



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Bioprosthetic valve thrombosis (BPVT) has been increasingly recognized (1,2). Computed tomographic diagnosis relies on detecting reduced cusp mobility and the presence of thrombus, but the latter is more difficult to visualize. Here we present 2 cases of abnormal bioprosthetic cusp mobility in the absence of BPVT. Both patients were on high-intensity heparin anticoagulation at the time of diagnosis.

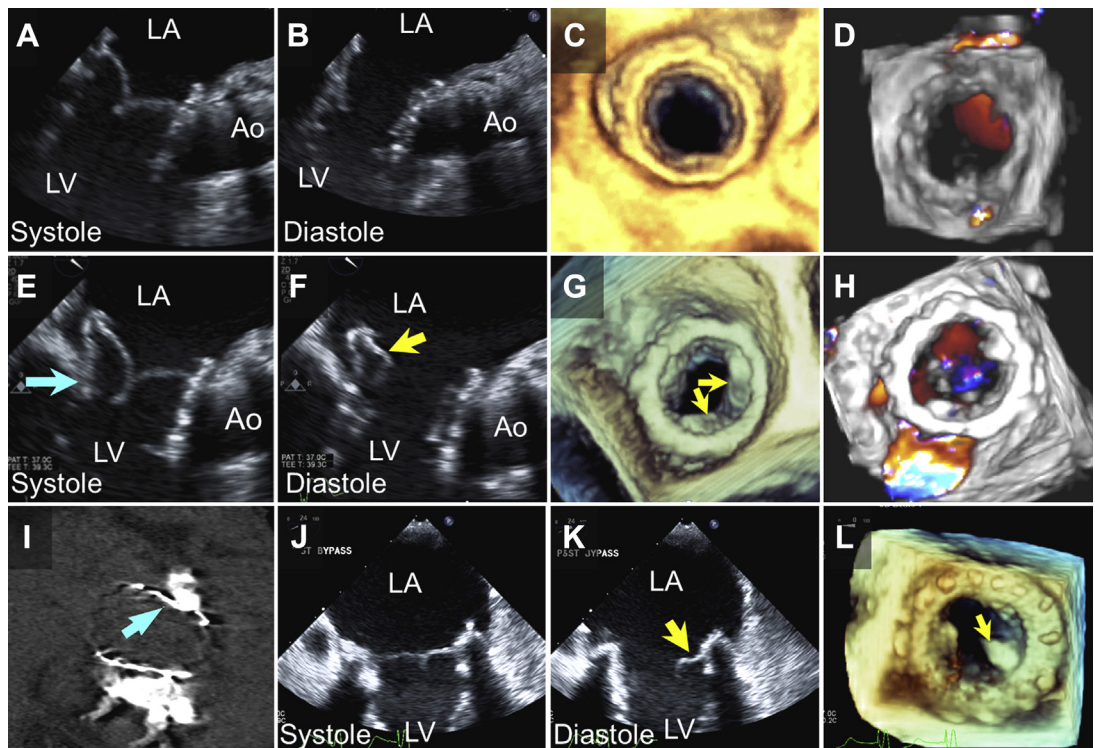
A 73-year-old patient underwent implantation of a SAPIEN S3 prosthesis (Edwards Lifesciences, Irvine, California) for inoperable calcific mitral stenosis. Transesophageal echocardiography (TEE) immediately post-deployment demonstrated normal cusp mobility (2-dimensional TEE, systolic and diastolic frames: **Figures 1A and 1B**; 3-dimensional TEE: **Figure 1C**; **Online Video 1**) and mild periprosthetic regurgitation (**Figure 1D**). One day post-implantation, the patient developed hemolysis. Repeat TEE demonstrated focal impingement on the valve stent by the native calcified annulus (**Figure 1E**, blue arrow), resulting in reduced opening of the prosthetic cusps (**Figures 1F and 1G**, yellow arrows; **Online Video 2**) and severe periprosthetic regurgitation (**Figure 1H**). Cardiac computed tomography confirmed compression of the prosthesis (**Figure 1I**). The patient underwent valve-in-valve implantation with a second SAPIEN S3.

Periprosthetic regurgitation was reduced to trivial, and hemolysis resolved.

The second case was a 64-year-old woman undergoing surgical mitral valve replacement. Intraoperative TEE immediately post-bypass demonstrated reduced mobility in 1 cusp (**Figures 1J to 1L**, yellow arrow; **Online Video 3**) despite therapeutic heparin anticoagulation.

These 2 cases shared normal cusp morphology and absence of laminated thrombus in freshly implanted valves. Despite normal cusp appearance, mobility was reduced, possibly because of valve deformation and unusual tensile forces on the prosthetic cusps. These observations confirm that reduced cusp mobility alone is not sufficient to support a diagnosis of BPVT and may result in significant overdiagnosis. We have proposed (1) and validated (3) a BPVT diagnosis score relying on 3 factors: abnormal cusp mobility, thickened cusps consistent with thrombosis, and gradient increase >50% over baseline.

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FIGURE 1 Abnormal Bioprosthetic Cusp Mobility Without Evidence of Thrombosis

Two patients (Patient #1, **A to I**; Patient #2, **J to L**; [Online Videos 1, 2, and 3](#)) with abnormal mitral bioprosthetic cusp mobility but no evidence of thrombosis. Ao = aorta; LA = left atrium; LV = left ventricle. See text for details.

REFERENCES

1. Egbe AC, Pislaru SV, Pellikka PA, et al. Bioprosthetic valve thrombosis versus structural failure: clinical and echocardiographic predictors. *J Am Coll Cardiol* 2015;66:2285-94.
2. Makkar RR, Fontana G, Jilaihawi H, et al. Possible subclinical leaflet thrombosis in bioprosthetic aortic valves. *N Engl J Med* 2015;373:2015-24.
3. Egbe AC, Connolly HM, Pellikka PA, et al. Outcomes of warfarin therapy for bioprosthetic valve thrombosis of surgically implanted valves: a prospective study. *J Am Coll Cardiol Intv* 2017;10:379-87.

KEY WORDS bioprosthetic valve thrombosis, prosthetic valve dysfunction

APPENDIX For supplemental videos and their legends, please see the online version of this article.