Case Reports

Use of Computed Tomography to Distinguish Thrombus from Pannus

on a Bioprosthetic Aortic Valve

Jessica V. Kealhofer, MD
Jeremy S. Markowitz, MD
Prabhjot S. Nijjar, MD

Bioprosthetic valve thrombosis was previously considered to be a relatively rare complication of surgical or transcatheter bioprosthetic valve replacement. Although echocardiograms can reliably show the characteristic findings of prosthetic valve stenosis, differentiating between thrombus formation and pannus overgrowth as the underlying cause of prosthetic valve dysfunction can be challenging.

We present the case of a 75-year-old man who underwent transthoracic Doppler echocardiography in the presence of an elevated valvular gradient 2 years after his aortic valve had been surgically replaced with a bioprosthesis. The echocardiographic findings suggested prosthetic valve stenosis. Cardiac computed tomography, performed to distinguish between thrombus formation and pannus overgrowth, revealed hypoattenuated leaflet thickening and reduced leaflet mobility, which suggested thrombus. After the patient took oral anticoagulants for 3 months, images showed complete resolution of the previous abnormalities, thus confirming the diagnosis of bioprosthetic valve thrombosis. We found cardiac computed tomography valuable when evaluating our patient who had an elevated prosthetic valve gradient. ***(Tex Heart Inst J 2019;46(3):219-21)***

Key words: *Bioprosthesis/adverse effects; heart valve diseases/diagnostic imaging/etiology; heart valve prosthesis implantation/adverse effects; prosthesis failure; thrombosis/etiology/prevention & control/therapy; treatment outcome*

From: *Division of Cardiology, Department of Medicine, University of Minnesota Medical School, Minneapolis, Minnesota 55455*

Address for reprints: *Prabhjot S. Nijjar, MD, Cardiovascular Division, Department of Medicine, MMC 508, University of Minnesota, 420 Delaware St. SE, Minneapolis, MN 55455*

E-mail: *nijja003@umn.edu*

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Despite increasing recognition of the risk of bioprosthetic valve thrombosis (BPVT), differentiating this complication from pannus overgrowth remains a diagnostic challenge. Furthermore, the clinical significance of BPVT and the associated risk of long-term structural degeneration have not been clarified. We describe the case of an elderly patient who had undergone surgical aortic valve replacement (SAVR) and in whom echocardiographic findings suggested prosthetic valve stenosis. We document the role that cardiac computed tomography (CT) played in distinguishing thrombus formation from pannus overgrowth in our patient, and we discuss the effects of anticoagulation therapy.

Case Report

In January 2015, a 75-year-old man with severe aortic stenosis underwent SAVR with use of a 27-mm Epic™ valve (St. Jude Medical, an Abbott company). Postoperatively, complete heart block led to dual-chamber pacemaker implantation. Two years later, a transthoracic echocardiogram (TTE) was obtained to reevaluate left ventricular systolic function under 100% right ventricular pacing. The TTE showed a substantially elevated transvalvular aortic gradient (mean gradient, 49 mmHg; peak velocity, 4.4 m/s), along with reduced leaflet motion (effective orifice area, 0.7 cm^2), suggesting severe prosthetic valve stenosis. It was unclear whether the valvular dysfunction resulted from pannus or thrombus formation. Contrast-enhanced cardiac CT (with retrospective electrocardiographic gating, no dose modulation, 120 kV) was subsequently performed with use of a second-generation, dual-source, 128-slice Somatom® Definition Flash scanner (Siemens Healthcare). The images revealed circumferential hypoattenuated material originating from the junction of the prosthetic valve ring and leaflets, resulting in severe leaflet thickening (Fig. 1) and reduced leaflet motion (Fig. 2), which are consistent with BPVT. Oral warfarin therapy was initiated. Three months later, TTE showed normal Doppler echocardiographic values (mean gradient, 6 mmHg; peak velocity, 1.8 m/s) and leaflet motion (effective orifice area, 1.6 cm^2). Cardiac CT showed dramatic resolution of the hypoattenuated thrombotic material, as well as normal leaflet thickness and mobility (Fig. 3). The patient remained

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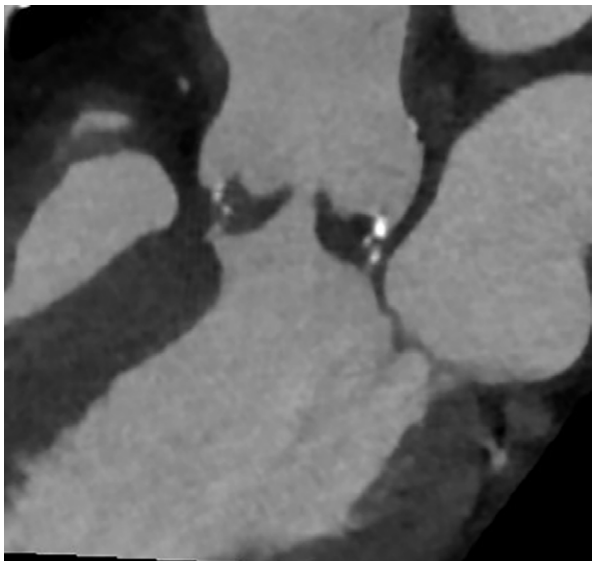

Fig. 1 *Cardiac computed tomogram (reconstructed 3-chamber view with multiplanar reformatting) shows circumferential hypoattenuated leaflet thickening of the bioprosthetic aortic valve.*

Supplemental motion image is available for Figure 1.

Fig. 2 *Cardiac computed tomogram (reconstructed short-axis view with multiplanar reformatting) shows the bioprosthetic aortic valve with reduced leaflet motion.*

Supplemental motion image is available for Figure 2.

asymptomatic. Indefinite oral anticoagulation therapy was recommended.[1]

Discussion

Although BPVT is considered to be a relatively rare clinical entity, its true incidence, clinical implications,

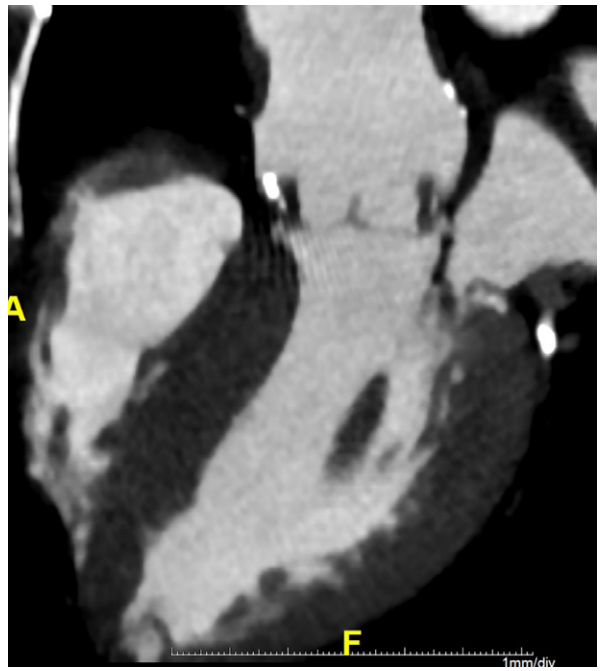

Fig. 3 *Cardiac computed tomogram (reconstructed 3-chamber view with multiplanar reformatting) shows normal bioprosthetic leaflet thickness.*

Supplemental motion image is available for Figure 3.

and optimal management have not been established. In a series of 397 patients who underwent SAVR, Mayo Clinic investigators reported that the prevalence of BPVT upon explantation was 11.6%.[2] Subclinical leaflet thrombosis, hypoattenuated leaflet thickening, and reduced leaflet motion identified by cardiac CT were first reported in 2015 by Makkar and colleagues[3] in a registry of patients who underwent SAVR and transcatheter aortic valve replacement (TAVR). Investigators from multiple centers have since reported similar findings. In the largest series (890 patients) involving CT studies, the prevalence of subclinical leaflet thrombosis was 12% (13% in TAVR vs 4% in SAVR).[1] The clinical importance of this complication is still unknown; moreover, long-term structural degeneration of bioprosthetic valves is a notable concern.

Anticoagulation therapy has been shown to resolve BPVT and to restore leaflet motion in nearly all patients.[1] In a prospective trial of 52 patients with suspected BPVT, warfarin therapy for 3 months reduced the prosthesis gradient by at least half in 83% of the patients.[4]

Echocardiography is a key tool for diagnosing prosthetic valve stenosis; however, guidelines state that routine monitoring of bioprosthetic valves by means of annual TTE should begin 10 years after implantation.[5] Some investigators have called for annual TTE screening[2,6] because the peak incidence of BPVT may occur during the first 1 to 2 years after valve implantation.[6]

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Distinguishing between thrombus and pannus as the underlying cause of bioprosthetic valvular dysfunction can be challenging on TTE alone. Echocardiograms may not reveal leaflet thickening or motion abnormalities. Moreover, the quality of echocardiographic findings depends greatly on patient characteristics and operator skills. In contrast, cardiac CT reveals detailed anatomic information about the prosthetic valve that can confirm thrombosis. A systematic approach has been developed for CT evaluation and reporting of subclinical leaflet thrombosis after aortic valve replacement.[7] We found cardiac CT to be useful in evaluating and treating our patient who had bioprosthetic valve thrombus.

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