Mechanical Wenckebach Phenomenon in Thrombosed Tricuspid Valve Prosthesis

Constantina Aggeli, MD, FESC, Athanasios Aggelis, MD, Ioannis Felekos, MD, Kostas Zisimos, MD, Themistoklis Psarros, MD, Sophia Vaina, MD, and Dimitris Tousoulis, MD, FESC, FACC, Athens, Greece

INTRODUCTION
Prosthetic valve thrombosis is a rare but serious clinical entity that is associated with significant morbidity and mortality. However, a diagnostic approach can be rather challenging, depending on clinical presentation and degree of valve dysfunction. In this case report we present a patient with periodic obstruction of the tricuspid valve, analogous to the electrical Wenckebach phenomenon. A short discussion of existing data regarding treatment and diagnostic options is provided.

CASE PRESENTATION
A 78-year-old Caucasian woman presented with fatigue and bilateral ankle edema, progressively deteriorating over a 1-month period. Her medical history was notable for valve replacement surgery with a triad of bileaflet mechanical prosthetic implants in the mitral, aortic, and tricuspid valve positions, along with permanent pacemaker insertion. Her treatment regimen consisted of a vitamin K antagonist. However, coagulation panel results reported a suboptimal international normalized ratio of 1.9.

In the context of the patient’s clinical presentation and suboptimal anticoagulation treatment, transthoracic echocardiography was undertaken to evaluate prosthetic valve function. Two-dimensional imaging revealed a progressively limiting excursion throughout consecutive cardiac cycles of the median tricuspid prosthesis disk, while the lateral disk was immobile, resulting in periodic partial obstruction of the valve. Color Doppler depicted a prominent aliasing diastolic transvalvular tricuspid flow, alternating with progressively weaker signals on consecutive cardiac cycles, as the valve was intermittently blocked (Video 1A). Accordingly, spectral Doppler demonstrated a progressive decrement in duration between opening and closing clicks throughout consecutive cardiac cycles. Moreover, progressive alterations in peak velocities and transvalvular gradients analogous to the degree of opening of the partially mobile median disk were noted (maximal mean gradient, 10–12 mm Hg), thus mimicking a mechanical analogue to the Wenckebach electrical phenomenon. More restricted opening is accompanied by a less steep deceleration curve, while less restricted opening leads to pressure half-time prolongation along with smoother flow patterns. Thus, in cycles with almost no disk opening, a blunt acceleration flow pattern is recorded (Figure 1). Respectively, M-mode imaging shows sequentially different morphology of the prosthetic valve’s opening box (Figure 2). Moving forward, we proceeded with transesophageal echocardiography, which clearly demonstrated mechanical tricuspid valve dysfunction along with valve thrombus (Video 1B).

Similarly, on cine fluoroscopy, a characteristic periodic motion reduction of the partially opening disk was recorded (Video 2). On the basis of clinical presentation and laboratory and imaging findings, thrombosis of the tricuspid valve prosthesis was diagnosed, and thrombolysis was instituted. We opted for a slow 5-hour infusion of tissue plasminogen activator, which has been demonstrated to have low complication rates. After thrombolysis, the mobility of the partially dysfunctional disk was restored (mean gradient with continuous-wave Doppler estimated at 4 mm Hg) and the “mechanical” Wenckebach phenomenon was resolved (figures 3 and 4, Video 3). This was also confirmed by cine fluoroscopy (Video 4).

On discharge, anticoagulation therapy with a target international normalized ratio of 3.0–4.0 plus aspirin 75 mg/d was prescribed.

DISCUSSION
Tricuspid mechanical valve has a relatively higher nidus for thrombosis compared with other valve implants and may occur despite...
However, symptoms may develop insidiously, making diagnosis truly challenging, especially in cases with intermittent valve dysfunction. Clinical suspicion, bedside echocardiography, and cine fluoroscopy are the corner-stone elements for establishing the proper diagnosis. Of note, most echocardiography laboratories acquire images using one or two frames. In this case, prolonged acquisition time improved the diagnostic yield of the echocardiography study, as the tricuspid valve was intermittently dysfunctional. Specific thrombolytic protocols may offer therapeutic options with a low complication rate.

**CONCLUSION**

The mortality associated with prosthetic valve thrombosis is quite significant. Therefore, suspicion of prosthetic valve thrombosis is a clinical emergency, which needs to be immediately confirmed. Clinical findings, echocardiography, and fluoroscopy are the mainstays of diagnosis. Treatment options are dependent on prosthetic valve position and patient hemodynamic status.

**SUPPLEMENTARY DATA**

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.case.2017.03.006.

**REFERENCES**

1. Nishimura R, Otto C, Bonow R, Carabello BA, Erwin JP, Guyton RA, et al. 2014 AHA/ACC guideline for the management of patients with valvular heart disease. Am J Cardiol 2014;63:57-185.
2. Ozkan M, Kaymaz C, Kırma C, Sonmez K, Ozdemir N, Balkanay M, et al. Intravenous thrombolytic treatment of mechanical prosthetic valve thrombosis: a study using serial transesophageal echocardiography. Am J Cardiol 2000;35:1881-9.
3. Kao CL, Lu MS, Chang JP, Yang TY, Cheng HW. Thrombotic obstruction of a mechanical prosthetic valve in tricuspid position. Images Cardiovasc Med 2009;36:261-3.
4. Zoghbi WA, Chambers JR, Dumesnil JG, Foster E, Gott diener JS, Grayburn PA, et al. Recommendation for evaluation of prosthetic valves with echocardiography and Doppler ultrasound. J Am Soc Echocardiogr 2009;22:975-1015.