



Breaking Clots, Not Sternum: Thrombolytic Therapy as an Alternative to Repeated Aortic Valve Replacement

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INTRODUCTION

Prosthetic valve thrombosis (PVT) is a rare and life-threatening condition that occurs following aortic valve replacement (AVR). Mechanical heart valves are generally more durable than bioprostheses; however, they are more prone to thrombus formation, thus requiring lifelong anticoagulation. Mechanical valves are categorized into 3 major designs: caged-ball, tilting disk, and bileaflet valves.

The On-X® prosthetic valve is a newer generation mechanical bileaflet valve with leaflets opening to 90 degrees, and featuring pyrolytic carbon rather than traditional silicon.

PVT presentation depends on the degree of valvular obstruction and/or regurgitation present, which may include poor adherence, subtherapeutic anticoagulation, echogenic structures on echocardiogram, and limited flow visualization on color Doppler.

CONSIDERATIONS

Surgical intervention may be employed to remove an artificial valve and replace it with a tissue valve, but in cases with high operative risk due to factors such as prior heart surgery and other comorbidities, surgery may not be optimal. Additionally, reoperation mortality rates in the case of PVT may be as high as 18%. In the case of cardiogenic shock or hemodynamic compromise, surgery is initiated immediately in the form of thrombectomy or valve replacement depending on the state of the valve. Hemodynamically stable patients, however, may be candidates for thrombolytic therapy.

CASE DESCRIPTION

A 54-year-old female with a history of type 2 diabetes mellitus, hypertension, dyslipidemia, morbid obesity, and severe aortic stenosis treated with an On-X® prosthetic valve presented to the emergency department with left leg pain. She was found to have a thrombus in the arterial system of the left leg. The patient underwent an open embolectomy of the left iliac, common iliac, profunda femoral, superficial femoral (SFA), and popliteal arteries with a left common femoral and SFA endarterectomy and patch angioplasty. Suspicion of a cardioembolic origin related to the mechanical valve prompted cardiac consultation for further evaluation. Prior to discovery of the thrombus in the left leg, the patient had been managed with warfarin but had discontinued use for 3 days prior.

A transesophageal echocardiogram (TEE) was performed upon evaluation by cardiology, which revealed a preserved ejection fraction, paravalvular leakage of the artificial valve, and restricted movement of the leaflet. The mean gradient was determined to be 32.0 mmHg based on Doppler echocardiographic measurement, which indicated partial aortic valve thrombosis.

A cardiac surgery consultation was obtained, and the patient was deemed high risk. In this case of a patient with high surgical risk, a regimen of low-dose slow infusion of tissue-type plasminogen activator (t-PA) was deemed appropriate, which included 25 mg of t-PA infused over 6 hours.

DISCUSSION

Thrombolytic therapy has yielded varying results in the treatment of PVT depending on the patient's hemodynamic stability, but is proving to be favorable in cases of fresh thrombus or when surgery is contraindicated. A low dose infusion over 24 to 48 hours is particularly associated with lower risk of bleeding and ischemic stroke.

The PVT in this patient was suspected to be due in part to the interrupted anticoagulation regimen. The thrombolytic therapy as outlined for this patient was initiated and monitored in the ICU. Results of a follow-up TEE showed an improved mean gradient of 10.0 mmHg, which suggested improved function of the aortic valve.

The use of thrombolytic therapy remains controversial for the lack of clinical trials and threat of stroke or transient ischemic attack, but patients treated with thrombolytic therapy have been found to have fewer complications and lower 3-month mortality compared to those who underwent surgery.

IMAGING

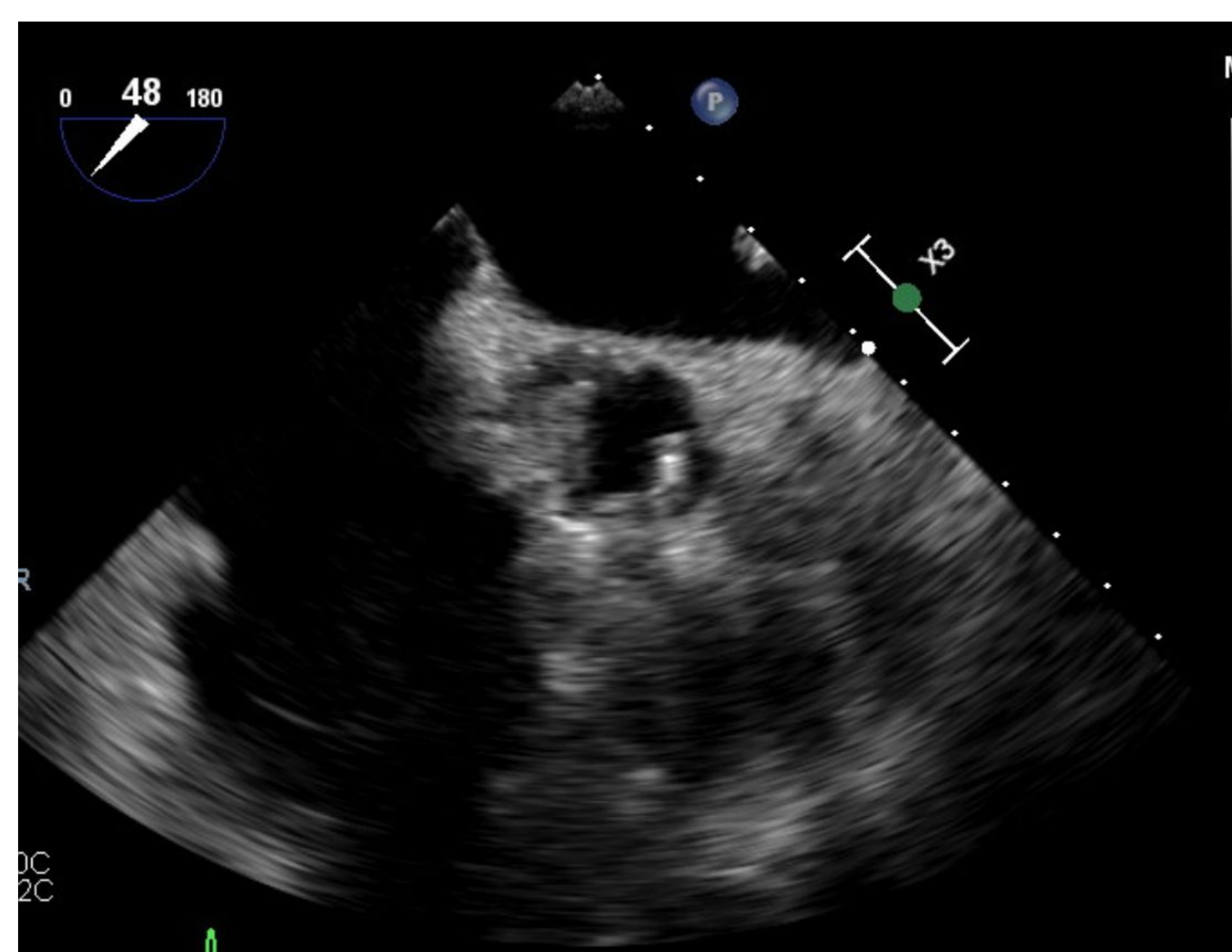


Figure 1: TEE showing restricted AV leaflet opening

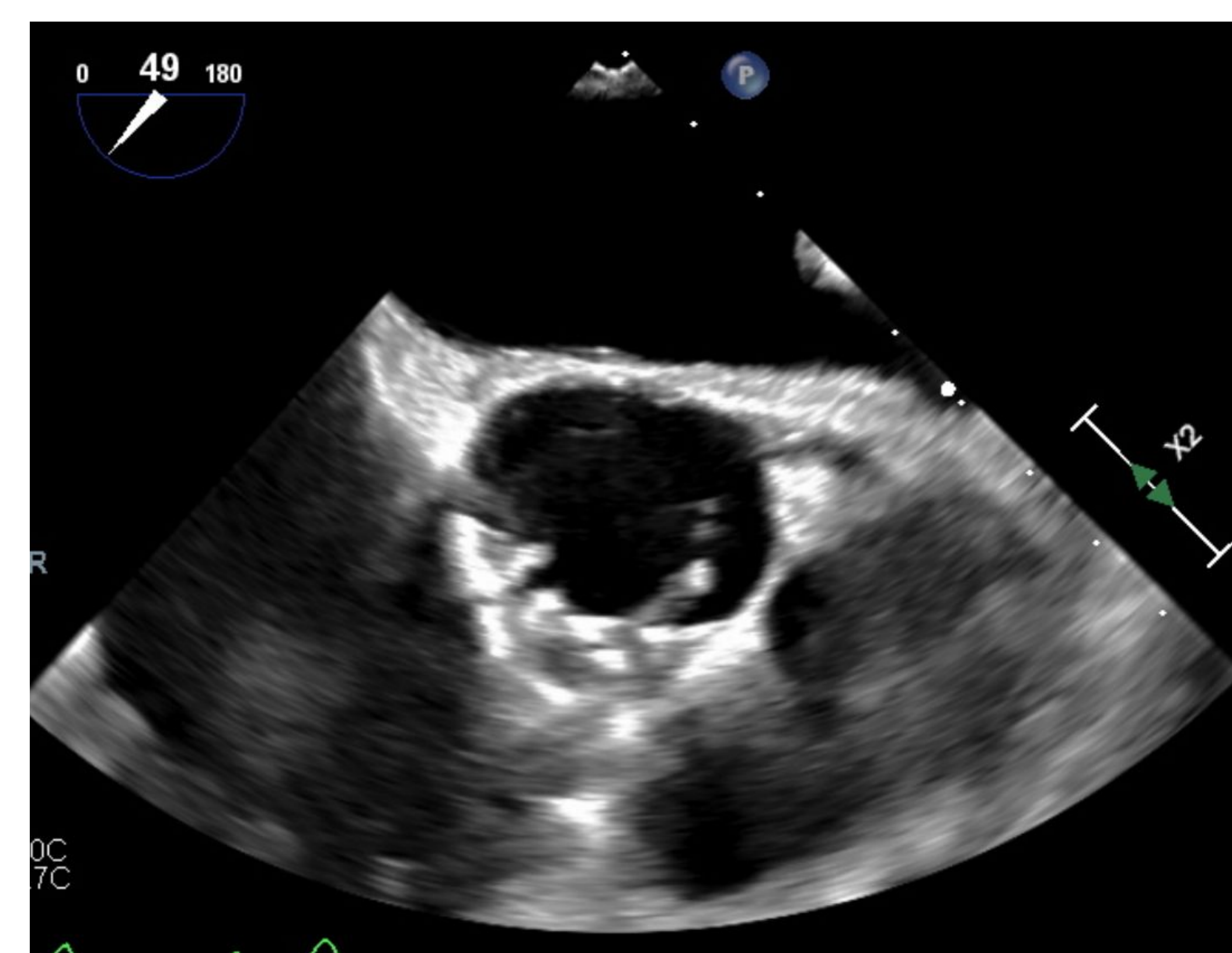


Figure 2: TEE showing improved AV excursion after TPA

REFERENCES

1. Chaudhary, R, Garg, J, Krishnamoorthy, P. et al. On-X Valve: The Next Generation Aortic Valve. *Cardiol Rev.* 2017 Mar, 5 (2) 77-83. doi: 10.1097/CRD.000000000000105. PMID: 28170357.
2. Chopard, R, Vidoni, C, Besutti, M. et al. Surgery Versus Thrombolytic Therapy for the Management of Left-Sided Prosthetic Valve Thrombosis Without Hemodynamic Compromise: A Systematic Review and Meta-Analysis. *JAHA.* 2024 Sept, 13 (19) e035143. doi: 10.1161/JAHA.124.035143
3. Özkan, M, Gündüz, S, Güner, A. et al. Thrombolysis or Surgery in Patients With Obstructive Mechanical Valve Thrombosis: The Multicenter HATTUSHA Study. *JACC.* 2022 Mar, 79 (10) 977-989. <https://doi.org/10.1016/j.jacc.2021.12.027>
4. Soria Jiménez, C, Papolos, A, Kenigsberg, B. et al. Management of Mechanical Prosthetic Heart Valve Thrombosis: JACC Review Topic of the Week. *JACC.* 2023 May, 81 (21) 2115-2127. <https://doi.org/10.1016/j.jacc.2023.03.412>