

A case series of prosthetic heart valve thrombosis-derived coronary embolism

Protez kalp kapağı trombüsü kökenli koroner emboli olgu serisi

Süleyman Karakoyun, M.D., Mustafa Ozan Gürsoy, M.D.,
Macit Kalçık, M.D., Mahmut Yesin, M.D., Mehmet Özkan, M.D.

Department of Cardiology, Koşuyolu Kartal Heart Training and Research Hospital, Istanbul

Summary– Coronary thromboembolism is a rare cause of acute coronary syndromes (ACS). The information regarding ACS in patients with prosthetic heart valves is scarce and based mainly on case reports. Although plaque rupture is the most common cause of acute myocardial infarction, coronary embolism (CE) is not a rare cause of acute myocardial infarction. There is no consensus regarding the treatment in such a situation. We present three cases of prosthetic valve thrombosis complicated with CE causing non-ST elevation ACS, who were successfully treated with thrombolytic therapy (TT). We administered low-dose (25 mg), slow-infusion (6 hours) tissue plasminogen activator (t-PA), which was shown to be safe and effective in our group in a large study. The patients benefited from TT with respect to the coronary flow, as shown by the lysis of thrombi in all three patients on coronary angiogram.

Coronary thromboembolism is a rare cause of acute coronary syndromes (ACS). The information regarding ACS in patients with prosthetic heart valves is scarce and based mainly on case reports. Although plaque rupture is the most common cause of acute myocardial infarction, coronary embolism (CE) is not a rare cause of acute myocardial infarction.^[1] It has been barely described in the literature, and its definitive diagnosis is challenging and many times vague. There is no consensus regarding the treatment in such a situation.

We present three cases of prosthetic valve thrombosis (PVT) complicated with CE causing non-ST

Özet– Koroner tromboemboli akut koroner sendromun (AKS) nadir bir nedenidir. Protez kalp kapağı olan hastalarda meydana gelen AKS'ye ilişkin bilgi yetersizdir ve genellikle olgu raporları ile sınırlıdır. Plak rüptürü akut miyokart enfarktüsünün en sık nedeni olmasına rağmen koroner emboli (KE) de nadir bir sebep değildir. Böyle bir durumda tedaviye ilişkin görüş birliği yoktur. Biz bu yazıda ST elevasyonu olmayan AKS'ye neden olan KE ile komplike olmuş ve trombolitik tedavinin (TT) başarılı olarak uygulandığı protez kapak trombüslü üç olguyu sunuyoruz. Bu çalışmada daha önce de tarafımızdan büyük bir çalışmada güvenilirliği ve etkinliği gösterilen düşük doz (25 mg) yavaş infüzyon (6 saat) tPA protokolü uygulandı. Üç hasta da koroner akım açısından TT'den yarar gördü ve koroner anjiyografide trombüsün eridiği gösterildi.

elevation ACS (NSTEMI-ACS), who were successfully treated with thrombolytic therapy (TT).

CASE REPORT

Case 1– A 48-year-old woman who underwent aortic mechanical valve replacement (AVR) (No. 25 Sorin) six years ago admitted to the emergency room (ER) with typical chest pain. The anginal symptoms had been present for two days, and ECG revealed T wave negativity (Figure 1a) on V1-V4 derivations. On admission, troponin-I level was elevated to 2.65 ng/ml and international normalized ratio (INR) was subtherapeutic (1.07). The patient had no atherosclerotic risk

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Correspondence: Dr. Süleyman Karakoyun. Denizler Caddesi, Cevizliği Kavşağı, No: 2, 34846 Cevizli, Kartal, İstanbul.

Tel: +90 216 - 459 44 40 e-mail: sleymankarakoyun@yahoo.com.tr

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factors, and had a history of normal coronary arteries at the time of valve surgery. Transthoracic echocardiography (TTE) showed normal transaortic mean gradient with left ventricular ejection fraction (LVEF) of 63%. Transesophageal echocardiography (TEE) (Figure 1b) revealed a nonobstructive PVT with a mobile portion of 7 mm in length. Urgent coronary angiography was not considered in view of low cardiovascular risk, absence of hemodynamic compromise and potential thromboembolic risk due to catheter manipulation during angiography, and hence TT was scheduled. A low-dose (25 mg) slow infusion of tissue plasminogen activator (tPA) was administered for six hours as previously reported.^[2-4] TEE was performed again at the end of thrombolysis, and revealed a thrombus-free prosthesis. Coronary angiography was then performed, which showed a visible thrombus (Figure 1c) in the distal left anterior descending artery (LAD) without any further distal flow. A new episode of tPA was administered, and follow-up angiography showed complete lysis of the thrombus with Thrombolysis in Myocardial Infarction (TIMI) IV

flow (Figure 1d). LVEF remained normal on TTE.

Case 2– A 58-year-old man who had undergone AVR (no. 23 St Jude) three years ago due to rheumatic heart disease was admitted to the ER with unstable angina that became severe within 24 hours. ECG revealed ST segment depression (Figure 2a) on anterior derivations, and troponin levels were elevated up to 50 ng/ml. INR on admission was 1.1. LVEF and transaortic mean gradient were within normal limits. TEE revealed nonobstructive PVT (Figure 2b) measuring 0.5 x 1.1 cm on the aortic prosthesis. Angiography was deferred and low-dose slow-infusion tPA (25 mg, 6

Abbreviations:

ACS	Acute coronary syndrome
AVR	Aortic valve replacement
CE	Coronary embolism
ECG	Electrocardiogram
ER	Emergency room
INR	International normalized ratio
LAD	Left anterior descending
LVEF	Left ventricular ejection fraction
NSTEMI-ACS	Non-ST elevation ACS
PVT	Prosthetic valve thrombosis
TEE	Transesophageal echocardiography
TIMI-IV	Thrombolysis in myocardial infarction-IV
tPA	Tissue-type plasminogen activator
TT	Thrombolytic therapy
TTE	Transthoracic echocardiography

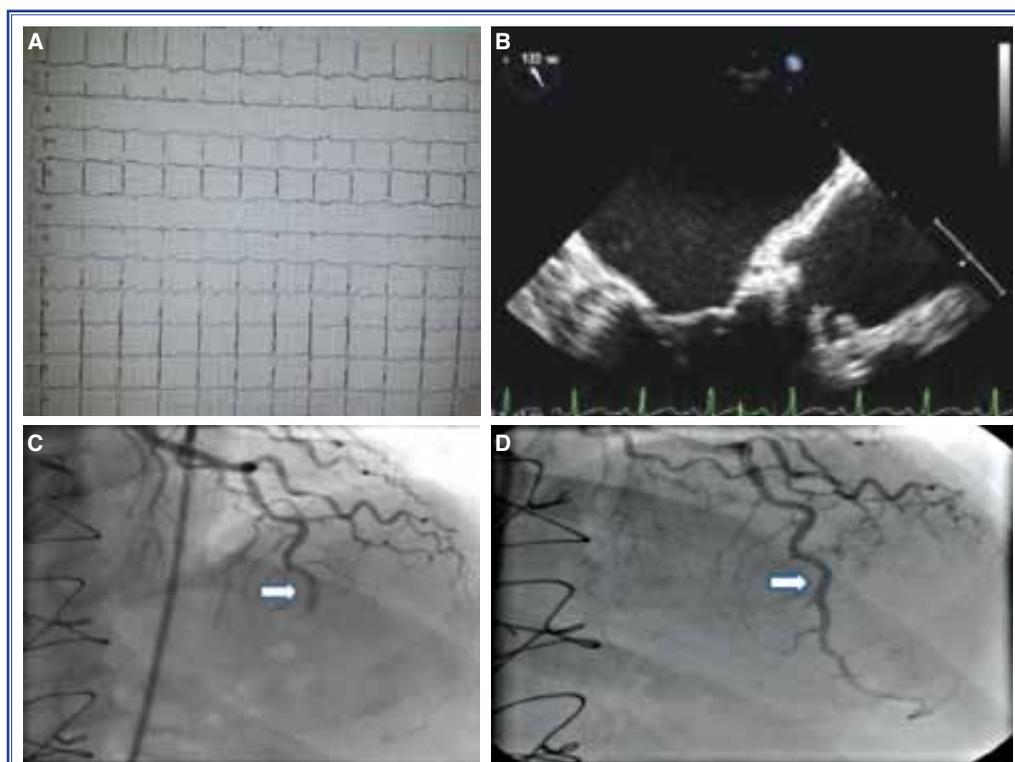
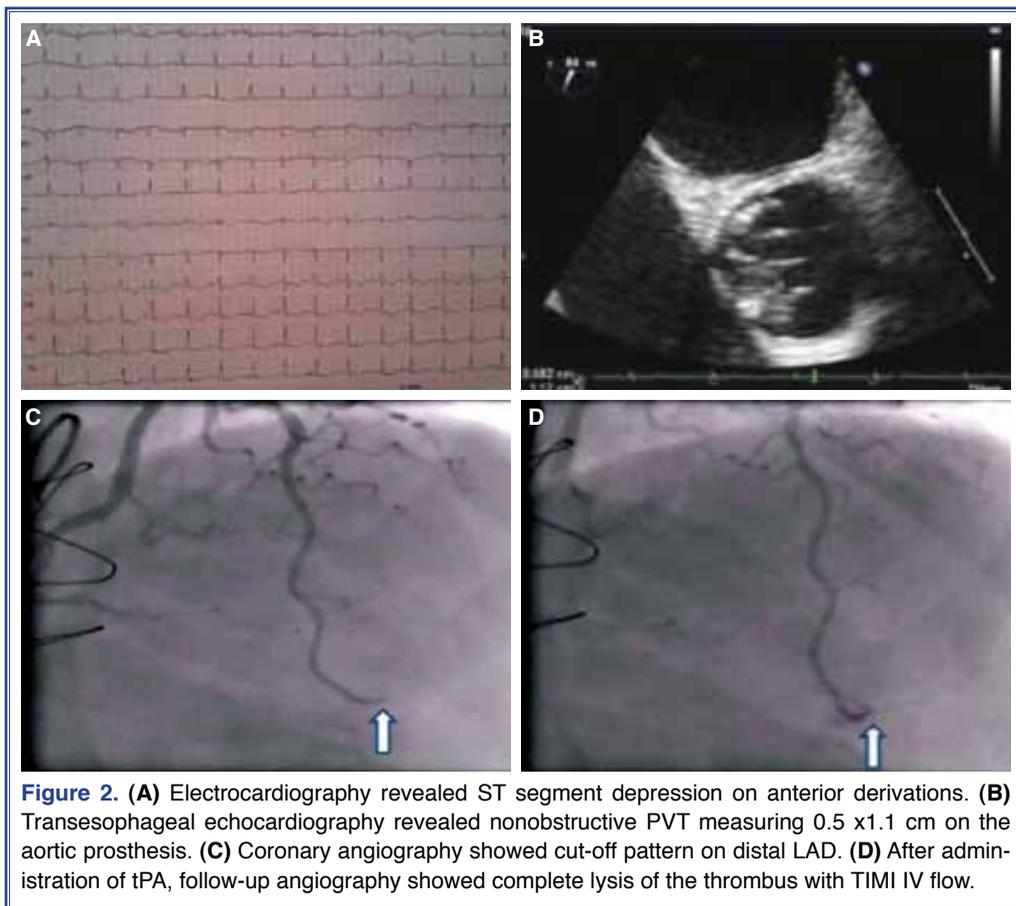


Figure 1. (A) Electrocardiography revealed T wave negativity. (B) Transesophageal echocardiography revealed a nonobstructive aortic PVT with a mobile portion of 7 mm in length. (C) Coronary angiography showed a visible thrombus at the distal LAD without any further distal flow. (D) After administration of tPA, follow-up angiography showed complete lysis of the thrombus with TIMI IV flow.



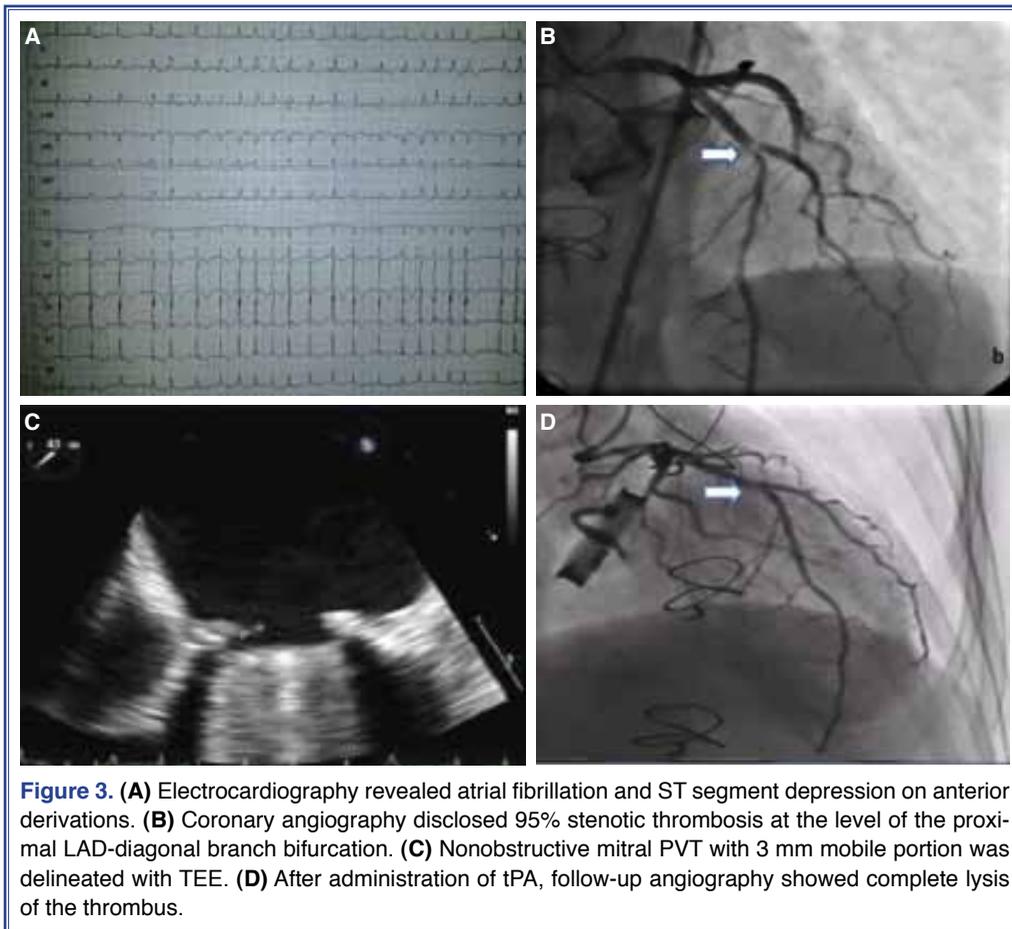
hours) was administered, which resulted in lysis of the thrombus shown by TEE. As TEE findings suggested that catheter intervention would be safe and not cause thromboembolic compromise, coronary angiography was performed, which showed a cut-off pattern (Figure 2c) on the distal LAD. tPA was re-administered with the same protocol, and follow-up angiography showed complete lysis of the thrombus with distal TIMI IV flow (Figure 2d). LVEF remained constant on TTE.

Case 3– A 45-year-old woman who underwent mitral mechanical valve replacement (no. 29 St. Jude) five years earlier due to rheumatic heart disease was admitted to the ER with burning chest pain. The ECG revealed atrial fibrillation and ST segment depression on anterior derivations (Figure 3a), and troponin I level was 21 ng/ml. She had inadequate anticoagulation with an INR value of 1.78. The patient underwent coronary angiography, which disclosed 95% stenotic thrombosis (Figure 3b) at the level of the proximal LAD-diagonal branch bifurcation. The

patient underwent TTE and TEE examinations, which revealed a LVEF within normal limits, mean diastolic mitral transvalvular gradient of 6 mmHg, and a mitral valve area of 2 cm² with nonobstructive PVT (3 mm mobile portion, Figure 3c) attached to the annulus. ACS was attributed to the PVT, and low-dose (25 mg) slow-infusion (6 hours) tPA was administered.^[2-4] Final coronary angiography disclosed almost complete lysis of the thrombus (Figure 3d), and the patient was discharged with effective-dose anticoagulation. LVEF was unchanged on TTE. TEE revealed complete lysis of the mobile portion of the thrombus.

DISCUSSION

Patients with a prosthetic heart valve complicated with NSTEMI-ACS represent a rare subgroup. In keeping with this, the majority of patients with prosthetic heart valve who admitted with ACS had NSTEMI-ACS rather than ST segment elevation ACS.^[5] The incidence of coronary artery embolism causing myocardial infarction in autopsy series has been reported as



between 10%–13%.^[6] CE should always be suspected, especially in the context of a valvular prosthesis, rheumatic valvular disease, chronic atrial fibrillation, dilated cardiomyopathy, intracardiac shunts, infective endocarditis, and hypercoagulable states including pregnancy. Embolic infarctions compromise the anterior ventricular wall in 75% of cases due to hemodynamic factors that favor diastolic blood flow into the left coronary artery.^[7]

There is a controversy regarding the treatment of patients with CE. In the current literature, intracoronary thrombolysis, stent implantation and embolectomy were performed as reperfusion strategies, but there is no consensus regarding the optimal treatment. Although there is some evidence that a double regimen (streptokinase+aspirin or urokinase+ abciximab) with thrombolytic agents is superior to a single regimen (urokinase or alteplase), published reports are few, and the results are not definitive.^[8] Besides the invasive strategy and thrombolysis, glycoprotein IIb/IIIa inhibitors and bivalirudin infusions were also

tried as treatment modalities.^[9,10] Percutaneous transluminal coronary angioplasty (PTCA) and stenting can be performed in certain circumstances. Hernandez et al.^[11] reported three cases, two of whom underwent successful primary PTCA and stenting, although distal embolization had occurred, and TIMI-II flow was maintained. Furthermore, successful catheter aspiration embolectomy has been described by some authors.^[8,12,13] To prevent distal embolization, Belli et al.^[12] and Beran et al.^[13] described the use of commercial systems to aspirate the thrombus from a native coronary artery and to improve the safety of epicardial flow. Conversely, there are some reported cases in which catheter aspiration was unsuccessful.^[14]

In the present case series, ACS was considered to be derived from PVT-related embolism, so TT was considered for the management of PVT and concurrent CE. We administered low-dose (25 mg), slow-infusion (6 hours) t-PA, which was shown to be safe and effective by our group in a large study.^[2] The patients benefited from TT with respect to the coronary flow,

as shown by lysis of the thrombi in all three patients on coronary angiogram. The fresh nature of the embolic material and involvement of the distal coronary arterial bed could have played a role in the successful outcomes without development of any complication. Another issue that merits discussion is the optimal timing of interventional procedures in patients with AVR who admit with ACS.^[15] Coronary angiography can be deferred due to thromboembolism risk of catheter manipulation in aortic PVT patients who admit with CE, to whom special attention should be paid.

In conclusion, CE is a potential complication of prosthetic valves and should be suspected in patients with prosthetic valves who admit with ACS. The timing of coronary angiography should be evaluated carefully on the basis of the location of the prosthesis, as it can be deferred in patients with AVR due to potential risk of embolization, and TEE should be performed earlier. The optimal treatment strategy should be considered on a case-specific basis, and low-dose, slow-infusion t-PA can be performed successfully in selected cases.

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Key words: Acute coronary syndrome/therapy; angioplasty, balloon, coronary; heart valve diseases/epidemiology; heart valve prosthesis; thrombosis/diagnosis.

Anahtar sözcükler: Akut koroner sendrom/televi; anjiyoplasti, balon, koroner; kalp kapağı hastalığı/epidemioloji; kalp kapağı protezi; tromboz/tanı.