

## CASE REPORT

## Thrombotic thrombocytopenic purpura presenting as acute coronary syndrome

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## Introduction

Thrombotic thrombocytopenic purpura (TTP) is a microangiopathic hemolytic disorder that is induced by marked reduction in the level of von Willebrand factor-cleaving protease, ADAMTS13. It is characterized by development of microthrombi in small blood vessels leading to consumptive thrombocytopenia and hemolytic anemia. Although TTP is commonly associated with neurologic and renal dysfunction [1, 2], cardiac involvement is rarely seen. In fact, only 3% of TTP patients report chest pain [3]. Unfortunately, most cases with TTP with cardiac involvement are diagnosed on autopsy where a massive myocardial necrosis is usually evident [4]. In this report, we present a case of TTP-induced myocardial infarction treated successfully with plasma exchange.

## Case Report

A 59-year-old man with history of hypertension, coronary artery disease (CAD), and medications noncompliance presented to the emergency room with a 2-day history of chest pain, lethargy, and headache. The chest pain was retrosternal, pressure-like, increasing in severity, radiating to

### Key Clinical Message

In patients presenting with thrombotic thrombocytopenia purpura and non-ST elevation myocardial infarction, prompt initiation of plasma exchange takes precedence over other invasive diagnostic procedures for coronary artery disease. Such procedures should be delayed until clinical condition and laboratory parameters have been stabilized.

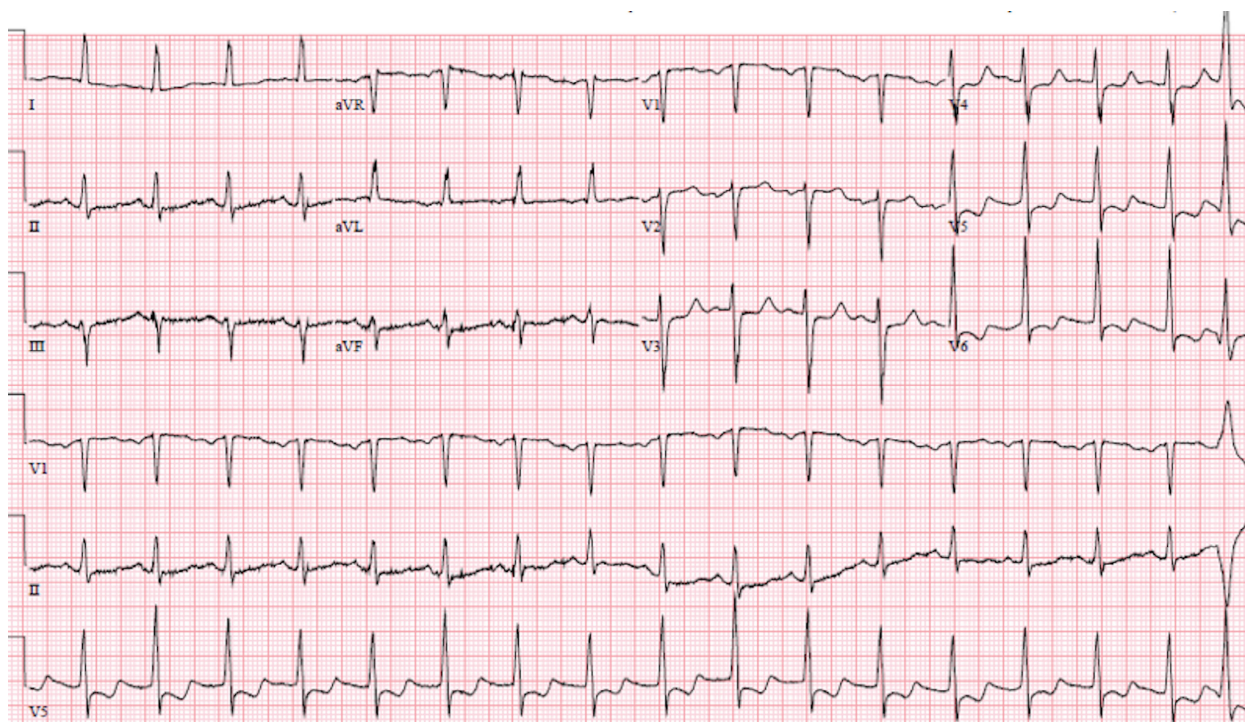
### Keywords

NSTEMI, thrombocytopenia, thrombosis, thrombotic thrombocytopenic purpura.

the left arm, and associated with diaphoresis. The patient was supposed to be on low dose aspirin, metoprolol tartrate, and atorvastatin. However, he has not taken them for the past 3 months. Physical examination was unremarkable. Computed tomography scan of the head was unremarkable. Electrocardiogram showed ST segment depressions (Fig. 1). Laboratory studies showed elevated troponin T at 0.33 ng/mL, low platelet count at 9,000/ $\mu$ L, low hemoglobin (6.4 gm/dL), and elevated creatinine of 3.3 mg/dL. The patient prothrombin time, International normalized ratio, and partial thromboplastin time were within normal limits.

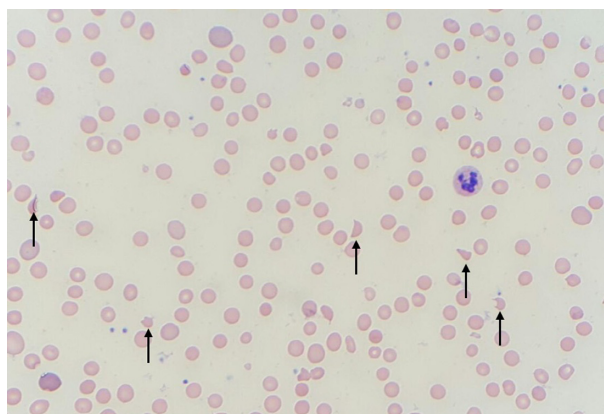
The patient was diagnosed with non-ST segment elevation myocardial infarction (MI). Antiplatelet therapy and anticoagulation were not given because of thrombocytopenia. Due to the severity of chest pain, he was started on nitroglycerin infusion and transferred to the cardiac intensive care unit. An emergent echocardiogram revealed global hypokinesis with low ejection fraction of 25–30%. A massive MI resulting in systolic heart failure was suspected. Cardiac catheterization was not performed due to thrombocytopenia.

Further work-up revealed elevated lactate dehydrogenase at 857 units/L, undetectable haptoglobin level and



**Figure 1.** EKG. This is the initial EKG which was read as abnormal. This demonstrates a sinus tachycardia within a normal axis. The patient has ST depression of the lateral precordial leads (V4–V6).

elevated indirect bilirubin level at 2.0 mg/dL. Direct Coombs test was negative. Peripheral blood smear revealed increased number of schistocytes (5 per high power field; Fig. 2). TTP was diagnosed and ADAMTS13 level was requested. A once-daily plasma exchange was initiated. After 6 days of daily plasma exchange, platelet count increased to 195,000/ $\mu$ L, hemoglobin level stabilized at 10.1 gm/dL, creatinine level decreased to 1.45 mg/dL, troponin T level decreased to 0.09 ng/mL, lactate dehydrogenase level decreased to 246 units/L, and his chest



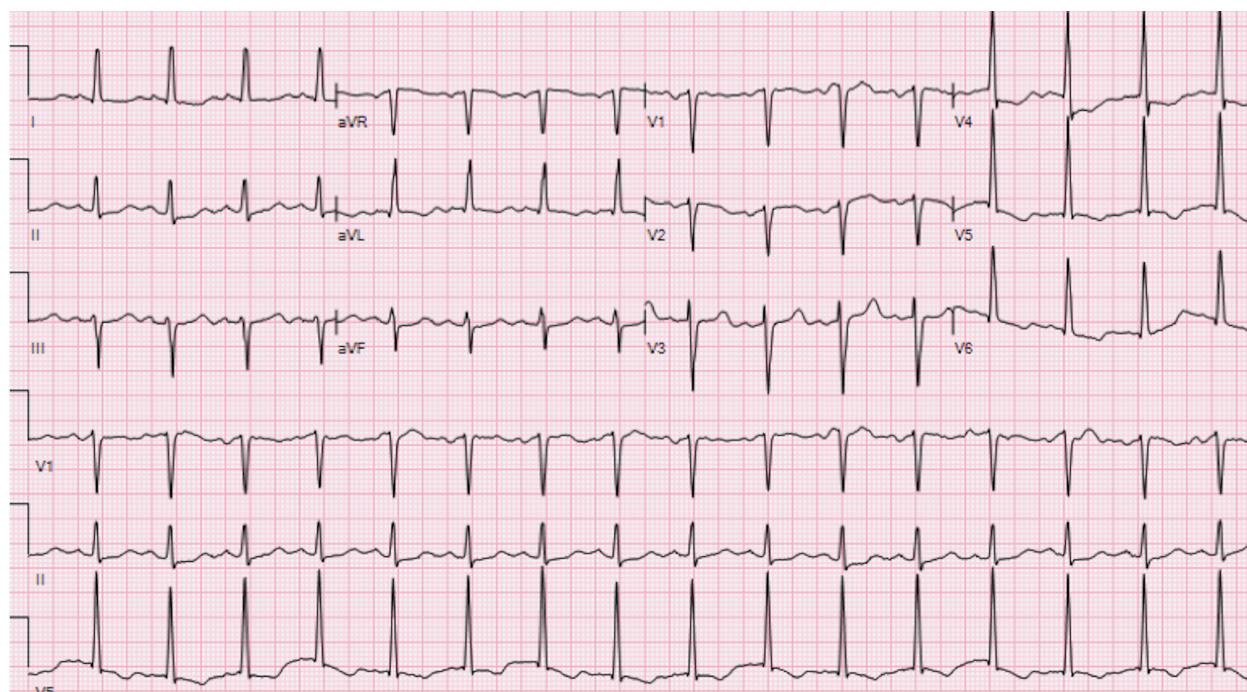
**Figure 2.** Peripheral blood smear showing increased number of schistocytes (Arrows).

pain improved with complete resolution of hemolysis and marked improvement of energy level. Repeat electrocardiogram showed resolution of the ST segment depressions (Fig. 3).

Prior to discharge, the patient underwent cardiac catheterization and revealed no evidence of occlusive CAD. ADAMTS13 activity level was less than 5%. A reflex ADAMTS13 inhibitor testing was negative. Three weeks later, a repeat echocardiogram showed an improved left ventricular ejection fraction to 65–70%. At 14 months' outpatient follow-up visit, the patient remains in complete remission.

## Discussion

In this report, we present a case with typical acute coronary syndrome (ACS) features including left-sided chest pain, elevated troponin T level, and risk factors for atherosclerosis such as hypertension and prior history of CAD. TTP can rarely present with ACS due to development of microthrombi in the small vessels supplying the myocardium, which makes it difficult to distinguish from atherosclerotic ACS, particularly in patients with multiple risk factors, as in our case. The presence of anemia, thrombocytopenia, and evidence of hemolysis should raise the suspicion for TTP-induced ACS. In addition, cardiac involvement in TTP patients can manifest as MI,



**Figure 3.** EKG following plasma exchange. This is the second EKG which demonstrates improvement of the ST segment depression as compared to Fig. 1.

tachyarrhythmias, conduction disturbances, congestive heart failure (CHF), cardiogenic shock, myocarditis, myocardial necrosis, or sudden cardiac death [4–8].

The exact incidence of TTP-induced MI is unknown, likely due to underdiagnosis [4]. In fact, most TTP patients with cardiac involvement are diagnosed postmortem at the time of autopsy, where thrombosis of the small vessels supplying the myocardium is seen in as high as in 77% of patients [9–12]. Some patients with TTP may present with CHF without MI. The presence of microthrombi in the microcirculation of the myocardium and the presence of anemia-related high cardiac output may contribute to cardiac dysfunction, leading to symptomatic CHF [11].

In a study conducted by Balasubramaniyam et al., the 2001–2010 nationwide inpatient sample database was used to identify patients aged  $\geq 18$  years with the diagnosis of TTP and acute MI. In this study, multiple variables were examined including age, gender, tobacco use, hypertension, diabetes mellitus, dyslipidemia, and prior history of CAD or stroke. None of these variables were shown to predispose for TTP-induced MI. ADAMSTS13 level was also not predictive of TTP-induced MI [13].

Patschan et al. conducted a study on 14 patients with TTP who underwent coronary angiography due to MI. Only one of these patients had significant coronary occlusion [14]. Our patient had angiography after six sessions

of plasma exchange, and did not demonstrate significant CAD.

Unlike our patient, most patients with TTP lack any cardiac symptoms on admission [4]. Since cardiac involvement in TTP carries a higher mortality rate, prompt recognition of cardiac involvement is vital [5, 15]. A study conducted by Benhamou et al. showed that a troponin I level higher than  $0.25 \mu\text{g/L}$  in patients with TTP predicts more refractory disease and is associated with a threefold increase in the risk of death, regardless of cardiac symptoms. The authors of this study concluded that troponin level should be used as a prognostic indicator in patients with TTP [16].

Due to its rarity, there is no consensus regarding the exact management of patients with TTP-induced MI. However, plasma exchange improves symptoms in the majority of these patients and should be initiated as soon as possible. In our patient, cardiac, neurologic, hematologic, and renal manifestations of TTP improved with plasma exchange. Invasive procedure such as coronary angiography have low yield in these patients and may even exacerbate TTP. As a result, it should be deferred until organ functions improve and hemolytic markers normalize. [17–20]. Based on our case, it is reasonable to initiate plasma exchange transfusion for such patients without delay in addition to any supportive care

measures. Imaging of the coronary arteries and other invasive procedures can be performed following clinical stabilization of the patient and improvement in laboratory parameters which will make such procedures safer.

## Conflict of Interest

None declared.

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