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Management of acute myocardial infarction in a patient with idiopathic thrombocytopenic purpura, the value of optical coherence tomography: a case report

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Background	Treating myocardial infarction in the setting of immune thrombocytopenic purpura (ITP) is always a challenge especially if the platelet count is labile. Cardiologists dealing with such patients should keep a delicate balance between thrombotic and bleeding complications.
Case summary	A 50-year-old gentleman with treatment-challenging ITP presented with acute inferior ST elevation myocardial infarction after receiving recent intravenous immunoglobulin. Using optical coherence tomography (OCT) guidance, it was decided to treat him with percutaneous old balloon angioplasty especially with the labile nature of his platelet count. Subsequently, dual antiplatelet therapy was a challenge and he remained on clopidogrel for a period of only 10 weeks.
Conclusion	This case highlights the rare presentation of patients with ITP with thrombotic complications and the usefulness of OCT in formulating a management plan.
Keywords	Case report • Plaque • Acute myocardial infarction • Idiopathic thrombocytopenia purpura • Optical coherence tomography • Anti-platelets

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Learning points

- Intracoronary imaging with optical coherence tomography can help guide percutaneous coronary intervention strategy in challenging cases, and plain old balloon angioplasty can be safe and effective in some cases.
- Patients with immune thrombocytopenic purpura can present with acute coronary syndromes especially after intravenous immunoglobulin therapy carrying the risk of both bleeding and thrombosis. Treatment should be individually tailored.

Introduction

Immune thrombocytopenic purpura (ITP) is a disease causing auto-immune destruction of platelets and suppression of platelets production. Its incidence in adults is 3.3/100 000 adults per year and the prevalence is 9.5/100 000 adults. The disease affects more females than males in young adults but after the age of 65, there is no sex pre-dilection.[1] Mortality is higher among ITP patients than normal population.[2] Although ITP patients present mainly with mucocutaneous bleeding, they are at a higher risk of thrombotic cardiovascular events.[3] This makes managing them a real challenge. As regards to percutaneous coronary intervention, a difficult decision needs to be made as whether to put a stent or not as in-stent thrombosis has mortality of 17-45%.[4] Here we present a patient with difficult-to-treat ITP presenting with acute coronary syndromes (ACS) and discuss management options, highlighting the benefit of using optical coherence tomography (OCT).

Timeline

Day 0	Worsening bleeding complications and platelet count of 2×10^9 requiring intravenous immunoglobulin
Day 7	Inferior ST-elevation myocardial infarction and plain old balloon angioplasty to right coronary artery guided by optical coherence angioplasty
Week 10	Dual antiplatelets therapy interrupted due to symptomatic drop in platelet count
1 year	Patient continues to be chest pain free

Case presentation

50-year-old gentleman, an ex-smoker with background of hypertension and obesity, presented with inferior ST-segment elevation myocardial infarction. Eight years earlier, he was diagnosed with ITP, which was difficult to treat despite immunosuppressive agents due to highly labile platelets count (PC). Apart from thrombocytopenia, his complete blood count was normal in addition to routine biochemical profile, lactate dehydrogenase level, autoantibodies levels, and immunoglobulins. He was negative for hepatitis profile and human immunodeficiency virus. He was on daily 75 mg of Eltrombopag (Revolade® Novartis), a small molecule agonist of thrombopoietin receptor, with occasional dexamethasone rescue therapy. Unfortunately, he developed sepsis and petechiae affecting his lower limbs and was admitted in our hospital. His PC was 2×10^9/L (normal range 150–400 $\times 10^9$/L) and he received intravenous immunoglobulin (IVIG). He was discharged home but on Day 7 post-IVIG initiation, presented with acute chest pain for 3 h and electrocardiogram confirming ST-elevation in the inferior leads (*Figure 1*). He was haemodynamically stable and cardiovascular examination was normal. His PC was 658 $\times 10^9$/L, haemoglobin 13.4 g/dL (13–16.2 g/dL) and white blood count 9.3 $\times 10^9$/L (normal range 4.3–11.2 $\times 10^9$/L). He was given 300 mg of aspirin

and clopidogrel. Radial coronary angiogram showed critical proximal stenosis in the right coronary artery (RCA) with TIMI 2 flow (*Figure 2A*). Additionally, there was mild distal left main stem disease with moderate proximal left anterior descending artery disease, and mild lesion in proximal circumflex artery. A bolus of 1000 IU of heparin was given with the aim to achieve activated clotting time of 250–300 s. A 2.5 $\times$ 15 mm balloon was inflated to improve flow. The lesion was further assessed with OCT which showed proximal atheroma with plaque erosion and red thrombus (*Figure 3A*). A 4.0 $\times$ 15 mm balloon was then inflated to low pressure at the lesion, no stents were deployed and TIMI 3 flow was restored (*Figure 2B*). Optical coherence tomography analysis was re-done, and did not reveal any significant dissections (*Figure 3B*). Laboratory tests post-procedure showed high sensitivity-Troponin I level of 6444 ng/L (normal <34 ng/L), with normal lipid profile. After consultation with the haematologist, both aspirin and clopidogrel were continued with the addition of lansoprazole to reduce the risk of upper gastrointestinal bleeding. Echocardiogram post-percutaneous coronary intervention (PCI) showed normal left ventricular ejection fraction (55%). Eltrombopag was paused due to the thrombocytosis and restarted 12 days later during an outpatient visit due to symptomatic drop in PC to 3 $\times 10^9$/L. Clopidogrel was stopped, aspirin continued, and a short course of dexamethasone started. When the PC rose above 30 $\times 10^9$/L, clopidogrel was restarted and given for a total of 10 weeks before discontinuing it completely due to a fall in PC from 162 to 49 $\times 10^9$/L. One year later, aspirin was stopped as PC decreased to 1 $\times 10^9$/L with occurrence of spontaneous bruises. The patient has remained angina-free so far.

Discussion

Platelets play a major role in the pathogenesis of atherosclerosis-related coronary artery disease and other thrombotic conditions. However, it is well known that thrombocytopenia does not give immunity against such conditions.[4] There have been several case reports of patients with thrombocytopenia associated with various illnesses such as cancers, hereditary thrombocytopenias, ITP, etc. who also got ACS. In case of ITP, there are several proposed mechanisms for this phenomenon such as the formation of young platelets which are large and more adhesive, and rising level of platelets microparticles which are highly thrombogenic. Also, it is well-known that IVIG increases blood viscosity and this makes patients with ITP prone to ACS especially with incremental PC which can happen up to 8 days post-infusion.[5] Our patient developed MI 7 days after initiating IVIG with a PC of 658 $\times 10^9$/L.

Treatment of such patients poses a challenge due to the rarity of the problem, lack of evidence, and limited guidelines. The main two points facing any cardiologist treating this condition is how to tailor antiplatelets therapy and what is the best interventional strategy.

As far as dual antiplatelets therapy (DAPT) is concerned, it seems it is a safe approach if PC remains more than 30 $\times 10^9$/L and the patient is not bleeding.[6] Regarding the choice of antiplatelets, we propose aspirin and clopidogrel as clopidogrel has fewer bleeding complications compared with other P2Y12 inhibitors.
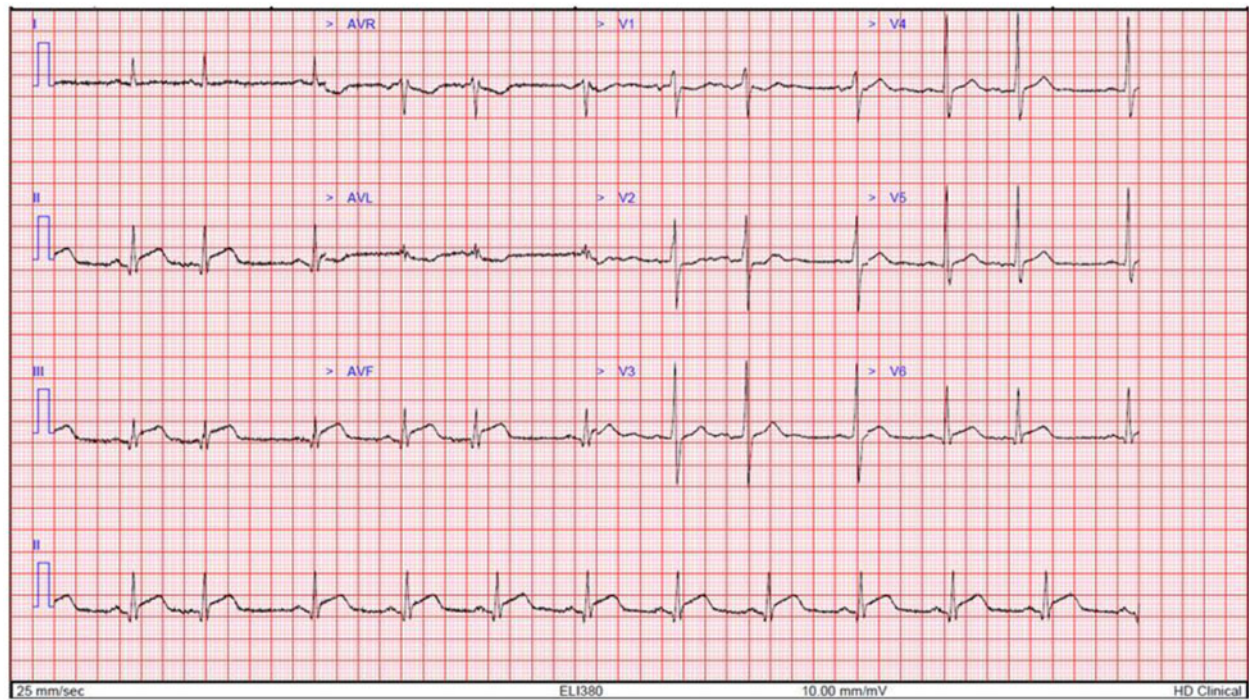
**Figure 1** Electrocardiogram showing ST-elevation in the inferior leads.
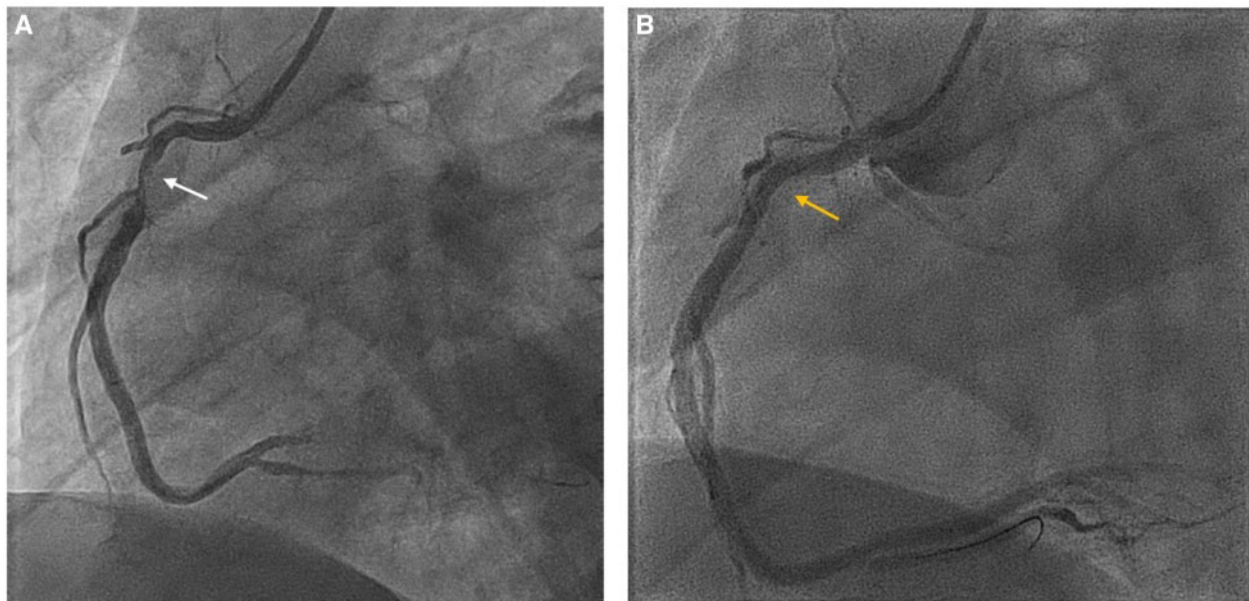
Figure 2 (*A*) Coronary angiogram showing thrombotic lesion in proximal right coronary artery (white arrow). (*B*) Final angiographic result in right coronary artery with stenotic segment open (yellow arrow).

Percutaneous coronary intervention in patients with low PC lacks evidence and thrombolysis is contraindicated. Radial approach is preferred due to reduced bleeding complications as compared with femoral approach. In most cases, bare metal stent (BMS) was used to reduce the duration of DAPT.[7] A study published in 2015 suggested the use of polymer-free drug-coated coronary stents (such as
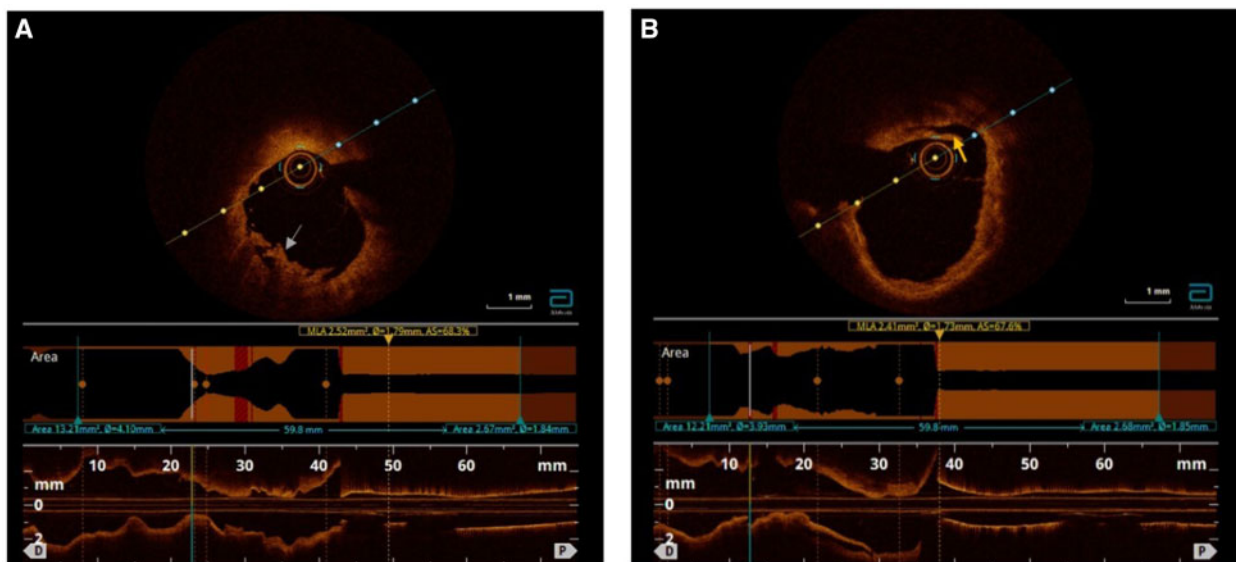
Figure 3 (*A*) Optical coherence tomography showing red thrombus overlying lipidic plaque with evidence of plaque erosion (white arrow). (*B*) Optical coherence tomography showing minimal intimal dissection post procedure (yellow arrow).

BioFreedom stent) might be better than BMSs because of less rate of restenosis and target-lesion revascularization with same duration of DAPT.[8] The problem with that study is that it defined thrombocytopenia as PC $< 100 \times 10^9$/L without mentioning the minimum number. Furthermore, bleeding rate was high (7.2%) and majority of the study population were regarded as being at high risk of bleeding solely because of advanced age. Moreover, there is no long-term safety outcome data for that stent beyond 390 days with regards to stent thrombosis, myocardial infarction, or cardiac death. With regards to drug-coated balloon, evidence in large coronary arteries of 4 mm is limited though it has been successful in arteries with 3 mm diameter.[9] Moreover, it requires more aggressive lesion preparation with pre-dilatation having a balloon-to-vessel ratio of 0.8–1.0.[10] This increases the risk of dissection mandating stent implantation, the thing we were trying to avoid. We used percutaneous old balloon angioplasty because it gave us the flexibility to discontinue DAPT if PC dropped. This happened to our patient on Day 12 necessitating withdrawal of clopidogrel. One of the major disadvantages of percutaneous old balloon angioplasty is the recurrence of stenosis in the treated segment. This is largely driven by a high incidence of post-angioplasty dissection especially when the vessel lumen is narrow. In our case, the lumen diameter was 4.0 mm. To ensure that there is no dissection, we used OCT that (besides confirming the diagnosis and showing the atherosclerotic nature of the stenosis) demonstrated only minimal dissection. Furthermore, the images were consistent with plaque erosion rather than rupture with no calcification. This further reduced the risk of clinically significant acute recoil. Based on this, we decided not to implant a stent. We identified three case reports for the use of plain balloon angioplasty in patients with ITP and acute MI.[11–13] No intracoronary imaging used in two cases and Re-infarction

occurred 9 h after PCI in one case. The most recent report used intravascular ultrasound. We are the first to report use of OCT in such patients. Finally, non-interventional, stent-less approach with only DAPT might be considered based on the EROSION study.[14] However, it is a small, non-randomized, and single-centre study that was not powered for the clinical endpoint. It also did not include ITP patients in whom such strategy might be harmful.

Conclusion

This case highlights the risk of developing a major thrombotic event in patients with ITP especially after IVIG therapy. Our case is unique in that we are the first, to our knowledge, to report successful use of OCT to guide treatment in a patient with severe thrombocytopenia and ACS with a very good clinical result.

Lead author biography

Dr Kumayl Al-Lawati qualified as a medical doctor from Sultan Qaboos University in 2004. He graduated from Oman medical Specialty Board in 2010 and got the Arab Board certificate in 2013. He then got a fellowship in general cardiology in 2016 and is currently specializing in Heart Failure and Devices at the Queen Elizabeth Hospital (University Hospitals Birmingham NHS Foundation Trust) under the supervision of Professor Francisco Leyva-Leon.

Supplementary material

Supplementary material is available at *European Heart Journal - Case Reports* online.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as Supplementary data.

Consent: The authors confirm that written consent for submission and publication of this case report including images and associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: none declared.

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