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Case Report

Double Trouble: A Case of Simultaneous Coronary Artery Thrombosis and Aspiration Thrombectomy

Stephen Maharaj[1], Sophina Baksh[1], Jose Martinez[1], Risshi Rampersad[1], Gianni Angelini[2,3,*]

[1]Cardiology Department, Caribbean Heart Care Medcorp Ltd., St. Clair Medical Centre, Port of Spain, Trinidad and Tobago
[2]Surgical Department, Caribbean Heart Care Medcorp Ltd., St. Clair Medical Centre, Port of Spain, Trinidad and Tobago
[3]Bristol Heart Institute, Bristol University, BS28HW Bristol, UK
*Correspondence: g.d.angelini@bristol.ac.uk; gianniangelini1@hotmail.co.uk (Gianni Angelini)

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Abstract

This study reports a rare case of acute myocardial infarction due to double coronary artery occlusion in a 53-year-old woman who presented with acute chest pain, elevated troponin levels, and ST-elevation myocardial infarction (STEMI). Coronary angiography revealed simultaneous occlusions in the left anterior descending artery (LAD) and circumflex artery (Cx). Complete resolution and restoration of coronary perfusion were achieved through aspiration thrombectomy using the Penumbra CAT RX system and percutaneous coronary intervention (PCI), with one drug-eluting stent (DES) in each artery.

Keywords

multiple coronary artery occlusions; multiple culprits; myocardial infarction; thrombosis; aspiration thrombectomy

Introduction

Acute myocardial infarction (AMI) usually results from an occlusion in a single culprit coronary artery. Simultaneous coronary artery occlusions are a rare but clinically significant phenomenon [1]. The prevalence of multivessel coronary thrombosis in patients undergoing primary percutaneous coronary intervention (PCI) is estimated to be approximately 2.5%, though autopsy studies suggest a higher prevalence in cases of sudden cardiac death [1]. Patients with multivessel thrombosis often present in a hemodynamically unstable state, necessitating urgent diagnosis and intervention [2]. We report a case of 53-year-old woman with diabetes and prior ischemic heart disease who presented with ST-elevation myocardial infarction (STEMI) due to simultaneous occlusion of the left anterior descending artery (LAD) and circumflex artery (Cx). This case highlights importance of early recognition, timely intervention, and the potential role of aspiration thrombectomy as an adjunct to PCI in achieving successful revascularization. This report adds to the limited body of literature and underscores the need for the further research to establish standardized management guidelines.

Case Report

A 53-year-old diabetic woman with ischemic heart disease and psoriasis, presented with a two-day history of intermittent retrosternal chest pain. The patient had no significant family history of cardiovascular disease. She had a previous inferior STEMI treated with primary PCI with two drug-eluting stents (DES) in the right coronary artery (RCA) in 2019. At that time, coronary angiogram also revealed 50% stenosis in the mid-segment of the LAD and no significant findings in the Cx. The patient had infrequent cardiology follow-up but was compliant with medications at that time.

On admission, she was hemodynamically stable with chest pain (6/10 intensity) less than at the onset (10/10 intensity), and without pulmonary congestion. Vital signs were blood pressure 122/78, heart rate 112, and urine output 65 mL/hr. She was also diaphoretic but denied nausea and vomiting. An electrocardiogram (ECG) showed sinus tachycardia with ST elevation in inferior leads and ST depression in leads I and aVL. Echocardiogram revealed a non-dilated left ventricle with abnormal wall motion in the LAD, Cx and RCA territory, and a mildly reduced systolic function with an ejection fraction of 45%. There was no significant valve disease or ascending aortic disease. Laboratory results showed elevated troponin I, for which high risk STEMI was considered. The patient was then loaded with aspirin (ASA) 325 mg (Bayer, Whippany, NJ, USA 07981) and Plavix 600 mg (Sanofi, Bridgewater, NJ, USA), thrombolytic therapy was not indicated since a decision to proceed with coronary intervention was made. Management with primary PCI was indicated due to tachycardia, ongoing chest pain and a diagnosis of STEMI which was made less than 120 minutes after admission to the emergency department. The patient was transferred to the catheterization

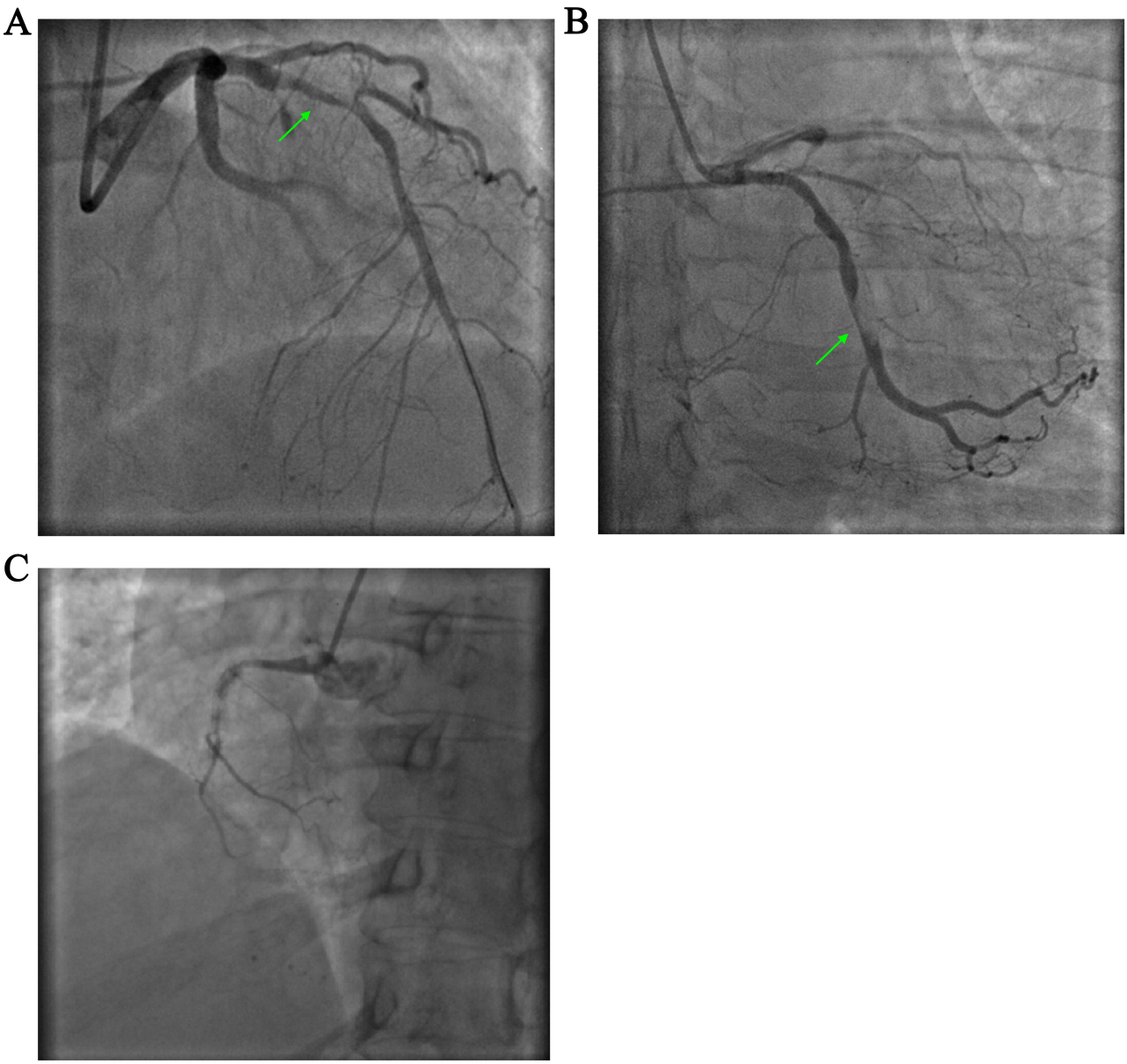

Fig. 1. Coronary angiogram. (A) Occlusion in the mid-segment of the left anterior descending coronary artery as indicated by the green arrow. (B) Occlusion in the mid-segment of the circumflex coronary artery as indicated by the green arrow. (C) Restenosis of previous right coronary artery stent.

lab with a door-to-device time that was approximately 45 minutes (Heart Score 7 pts with a 50–65% risk of major adverse cardiovascular events; Grace Score 104 pts 4% risk of death in six months).

Using a modified Seldinger technique, a 6 Fr introducer sheath was placed via the right radial artery. The coronary artery was engaged using Judkins technique. Coronary angiogram was performed with Ultravist (Bayer) used as the contrast agent. Coronary angiography findings included 100% atherothrombotic occlusion in the mid-segment of the LAD (Fig. 1A), and 95% stenosis with a thrombotic lesion in the mid-segment of the Cx (Fig. 1B). In the LAD, the epicardial distal segment had thrombolysis in myocardial infarction (TIMI) flow grade 1 and the myocardial segment had TIMI flow grade 0, while in the Cx the epicardial and myocardial segments had TIMI flow grade 2. Additionally, there was total occlusion of the previous RCA stents with distal collateral circulation (Rentrop 1) from septal branches (Fig. 1C). Based on current guidelines, treatment of the culprit lesions was indicated with PCI.

The LAD was engaged with a 6 Fr EBU 3.5 catheter, 7000 units of intracoronary heparin (Samarth Life Sciences Pvt, Mumbai, Maharashtra, India) and Aggrastat infusion (Medicure Inc., Winnipeg, Canada) were given, and the lesion was successfully crossed with a Pilot 150 190 cm

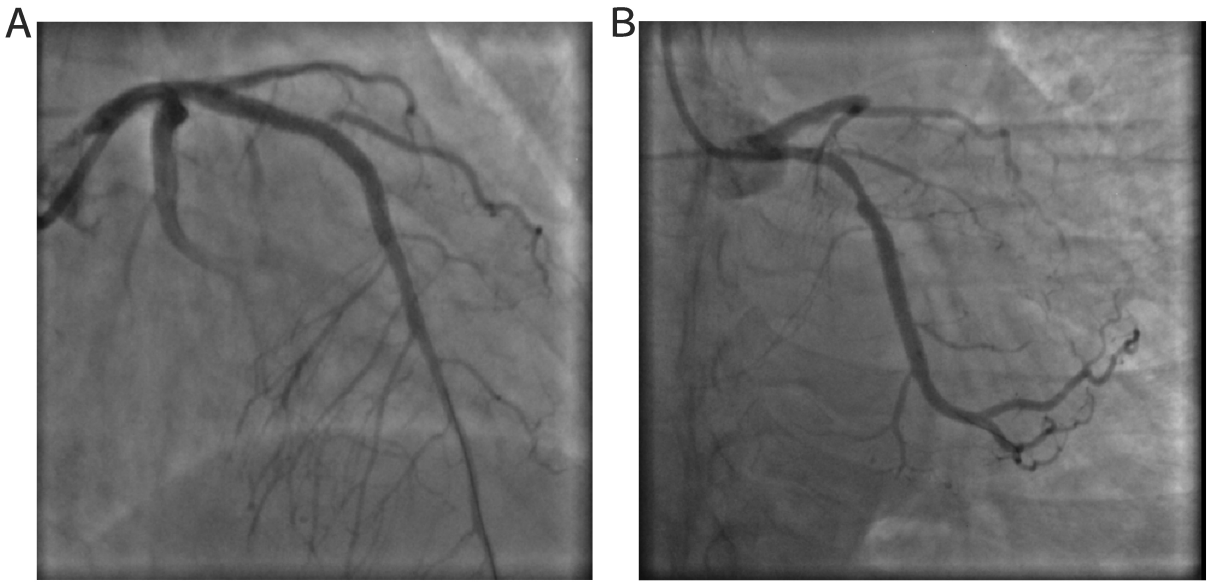

Fig. 2. Coronary angiogram. (A) Left anterior descending coronary artery post-stenting. (B) Circumflex coronary artery post-stenting.

guide wire. Vascular protection was achieved by ensuring that there were Pilot 150 190 cm guide wires in both the LAD and Cx arteries before thrombectomy was initiated. The thrombus in the LAD was aspirated using the Penumbra CAT RX KIT indigo system (REF CATRXKIT/LOT F00005562, Alameda, CA, USA), then several pre-dilations were performed with a 3.5 × 12 mm Euphora SC balloon (REF NCEUP3512X/Lot No. 2278211179, Medtronic Ireland, Galway, Ireland), and a 2.75 × 34 mm Onyx Frontier stent (REF ONYXNG27534X/Lot No. 0011771731, Medtronic Ireland, Galway, Ireland) was implanted (Fig. 2A). The Cx was successfully crossed with a Pilot 150 190 cm guide wire. The thrombus in the Cx was aspirated using the Penumbra CAT RX KIT indigo system, then pre-dilation was performed with a 2.5 × 20 mm Euphora SC balloon, and a 3.5 × 28 mm Synergy stent (REF H7493926228350/Lot No. 30156348, Boston Scientific Synergy, Marlborough, MA, USA) was implanted (Fig. 2B). The procedure was successful with no complications. It was decided that treatment of the chronic total occlusion of the RCA would be done as an elective procedure after further investigation.

After revascularization, the patient was transferred to the cardiac care unit, continuing Aggrastat infusion (Bayer) and receiving beta-blockers, antiplatelet medications, and a statin. She had an uneventful stay for 24 hours. An echocardiogram was performed before discharge, which revealed moderately reduced ejection fraction of 32%, global hypokinesis and akinetic segments in the RCA territory. She was then discharged with medications that involved triple therapy (ASA (Bayer)/Plavix (Sanofi)/Xarelto 2.5 mg twice daily (Bayer)) for three months, then continuing with dual antiplatelet treatment (ASA (Bayer)/Plavix(Sanofi)) for twelve months. Treatment with angiotensin-converting enzyme inhibitor or angiotensin receptor-neprilysin inhibitor was not indicated given borderline low blood pressure. In view of her heart failure with reduced ejection fraction, treatment with a sodium-glucose co-transporter 2 inhibitor was commenced. The patient is frequently followed up in the cardiology outpatient clinic and had an exercise stress echocardiogram about 6 months post PCI of the LAD and Cx, which was negative for inducible myocardial ischemia and as such, it was decided to optimize medical therapy and treat the RCA lesion conservatively.

Discussion

STEMI usually results from a thrombotic occlusion in a single vessel coronary artery, known as the culprit vessel [1]. It is rare for patients to present to the hospital and be diagnosed with simultaneous coronary artery thrombosis (SCAT) [2]. The prevalence of multiple culprit lesions accounts for about 2.5% in patients undergoing primary PCI [1]. However, autopsy reports indicate that the prevalence of multivessel acute coronary thrombosis is far more significant, with 50% of patients who had sudden cardiac death (SCD) were found to have more than one culprit lesion [1]. Patients who have multivessel disease usually present hemodynamically unstable with rapid decline prior to coronary angiography, accounting for the rarity seen in clinical practice. Early diagnosis, involving timely investigations, and appropriate treatment are paramount to successful management [2].

The exact cause of the development of multiple culprit vessels is not well understood. Acute simultaneous coronary artery thrombi may be due to several unstable plaque ruptures in multiple coronary arteries. This may be asso-

ciated with a diffuse inflammatory process, referred to as "pancoronaritis" [2,3]. Another proposed theory for concomitant coronary vessel thrombi is occlusion in a primary vessel resulting in a hypercoagulable state and a heightened inflammatory response which generates a secondary arterial thrombus and subsequent occlusion [1,2]. Several cases reported risk factors for multiple coronary thrombosis such as coronary artery spasm, idiopathic thrombocytopenia purpura, antithrombin III deficiency, cocaine abuse and diabetes mellitus [1].

Available data determined that patients with multivessel thrombosis in acute STEMI had a mean age of 53 ($\pm$14) and were likely to be male with multiple risk factors, most notably a history of smoking, previous coronary artery disease, myocardial infarction (MI), or PCI [2]. Our patient is a female, non-smoker, diabetic with a history of previous MI and subsequent primary PCI. Interestingly, while SCAT is rare in clinical practice, diagnosis and successful management of a patient with these specific demographics and medical history is an even rarer occurrence. Considering the likelihood of a rapid fatal course in patients presenting with acute MI due to multivessel occlusion, a short door-to-device interval for restoration of coronary blood flow is of great importance to patient survival.

Guidelines from the American College of Cardiology (ACC) and European Society of Cardiology (ESC) state that PCI is the primary reperfusion method for patients with acute myocardial infarction [4,5]. The ACC and ESC both have guidelines which address culprit lesion only PCI and complete revascularization of non-infarct related lesions. However, there are no guidelines or randomized controlled trials that stipulate the best management of STEMI with multiple culprit lesions [4,5]. Most of the available data about management of the acute MI patient with SCAT are obtained from case reports and series. The most common angiographic finding of double-vessel occlusion in patients presenting with STEMI is seen in both RCA and LAD (49%), then RCA and Cx (28%) [1,3]. Of note, acute MI due to simultaneous occlusion of LAD and Cx, as in the case of our patient, is seldom seen. In most cases, angiographic evidence of concomitant occlusion of coronary vessels were treated with PCI for both arteries [1,3]. Some reported additional use of intra-aortic balloon pump (IABP), aspiration thrombectomy, and intravenous pacemaker [1–3]. Successful management of our patient included continuous aspiration thrombectomy (Penumbra CAT RX) and PCI.

Aspiration thrombectomy has been considered in treatment of acute myocardial infarction with a high thrombus burden to decrease distal embolization and the no reflow or slow reflow phenomenon [5]. The Penumbra device comprises of an atraumatic tip and a vacuum source that provides sustained aspiration power, making it more effective at reducing the thrombus burden and allowing for a rapid TIMI 3 flow restoration and removal of distal emboli [6,7].

Conclusions

Simultaneous coronary artery thrombosis is rarely seen in clinical practice, given the high mortality risk. Our case adds to relatively scarce literature describing acute myocardial infarction caused by multiple culprit arteries. The case highlights the importance of timely investigations and ensuring the shortest door-to-stent interval as possible. Although there are no specific guidelines for managing multivessel occlusions in STEMI, our case demonstrated that PCI in conjunction with mechanical aspiration thrombectomy proved to be effective in optimal revascularization of the culprit coronary vessels. Further research is recommended to establish guidelines for the best approach to managing double-vessel occlusion in an acute MI, however, this case provides evidence that treatment of both culprit lesions is a viable option.

Availability of Data and Materials

All data points generated or analyzed during this study are included in this published article.

Author Contributions

All authors were responsible for conception and drafting/editing of the manuscript. GA, RR and JM contributed to the conceptualization of the case report. SM and SB wrote the original draft of the case report. SM and SB performed research for the discussion. GA, RR and JM provided assistance and advice on improving case report, discussion and conclusion. All authors read and approved the final manuscript. All authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Ethics Approval and Consent to Participate

The study was carried out in accordance with the guidelines of the Declaration of Helsinki. Approved by Ethics Review Board under Medcorp Limited with reference number CHCMSM7. Written informed consent was obtained from the patient for publication of this case report and images used.

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Conflict of Interest

The authors declare no conflict of interest. Despite the affiliation under Caribbean Heart Care Medcorp Ltd., the judgments in data interpretation and writing were not influenced by this relationship. Given Gianni Angelini's role as the Editorial Board member, he had no involvement in the peer-review of this article and has no access to information regarding its peer review.

Supplementary Material

Supplementary material associated with this article can be found, in the online version, at https://doi.org/10.59958/hsf.8179.

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