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Percutaneous Non-Stenting Approach for Distal Simultaneous Multivessel Acute Coronary Occlusions

Muhammad Nasir Rahman and Bilal Hussain

ABSTRACT

The occurrence of distal coronary lesions causing simultaneous occlusion of two coronary arteries in the setting of ST elevation myocardial infarction is a rare occurrence. This can occur due to simultaneous plaque rupture at more than one site or embolisation in coronary arteries. We describe a case of a middle-aged man who presented with acute inferoposterior lateral wall ST elevation myocardial infarction with simultaneous occlusion of distal left anterior descending artery and distal left circumflex artery on angiogram. The patient was treated with intracoronary streptokinase, followed by glycoprotein (GP) IIb/IIIa inhibitor and Factor X inhibitor (Rivaroxaban) with full resolution of flow in the distal vessels. Thus, coronary lesions, not amenable to stenting, can be dealt percutaneously, using a combination of old and newer pharmacological agents without stenting.

Key Words: Simultaneous coronary occlusions. Intracoronary streptokinase.

INTRODUCTION

The simultaneous occlusion of two coronary arteries in the setting of ST elevation myocardial infarction is a rare occurrence and is estimated to occur in 2.5% of all primary PCI patients.¹

Occasionally, such multivessel occlusions of coronary vessels can be at areas where stenting might not be feasible due to very small vessel or very distal vessel occlusion. These lesions pose a unique challenge to the interventional cardiologist. We, herein, report such a case of a patient with simultaneous distal occlusion of two coronary arteries in the setting of ST elevation myocardial infarction that were dealt with intracoronary streptokinase upfront separately in each vessel for restoration of flow, followed by glycoprotein (GP) IIb/IIIa inhibitors infusion and then Factor Xa inhibitor (Rivaroxaban) with full recovery of patient.

CASE REPORT

A 57-year gentleman presented to the Aga Khan University Hospital, Karachi, Pakistan in May 2015 with Killip I Inferoposterior lateral STEMI (Figure 1A). ST segments did not show any response to sublingual nitrates in emergency room. His baseline investigations are shown in Table I. He was transferred to the cath lab for emergent coronary angiogram that showed simultaneous occlusion in distal left circumflex artery

(LCx) and apical left anterior descending artery (LAD). As the patient had borderline blood pressures, intracoronary nitroglycerin (IC GTN) was not given to rule out spontaneous coronary spasm. Due to the very distal location of the lesions, it was decided to use intracoronary streptokinase (SK) for revascularisation. 250KU intracoronary SK was injected sequentially into the LAD and LCx over 3 minutes via aspiration catheter. Post-intracoronary SK, TIMI III flow was seen both in distal LAD and LCx (Figure 2). The ECG changes settled

Table I: Investigations at admission.

Investigations	Result	Normal Lab value
Hemoglobin	14.8 g/dl	12.0-15.0 g/dl
Platelets	290x10 ⁹ /L	150-300x10 ⁹ /L
Creatinine	0.9 mg/dl	Less than 1.2 mg/dl

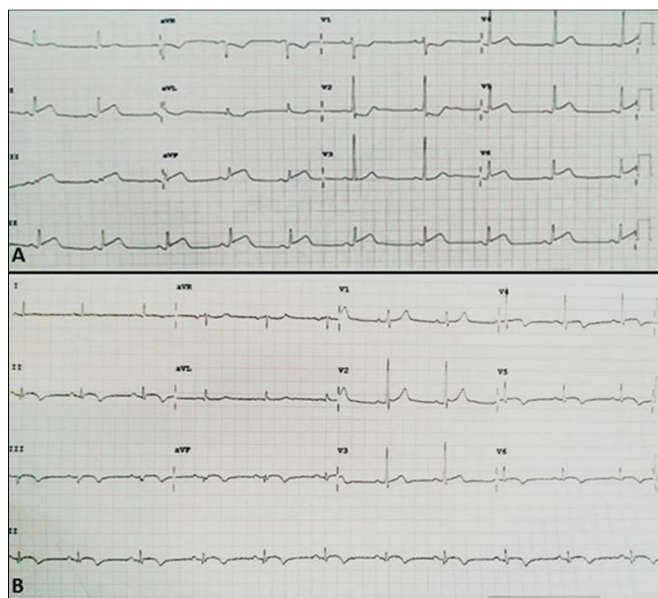


Figure 1: Electrocardiograms (ECG): (A) at presentation; (B) after intracoronary streptokinase.

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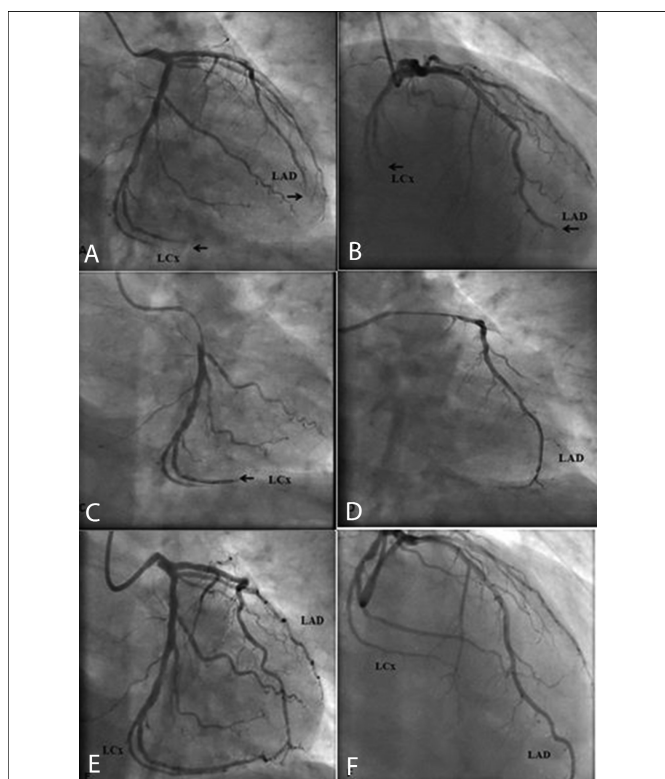


Figure 2: Coronary angiogram: (A) RAO caudal view showing occlusion of distal LAD and LCx branches; (B) RAO cranial view showing occlusion of distal LAD and LCx branches; (C) Intracoronary streptokinase injection into left circumflex artery; (D) Intracoronary streptokinase injection into left anterior descending artery; (E) RAO caudal view after intracoronary streptokinase showing flow in distal LAD and LCx; (F) RAO cranial view after intracoronary streptokinase showing flow in distal LAD and LCx.

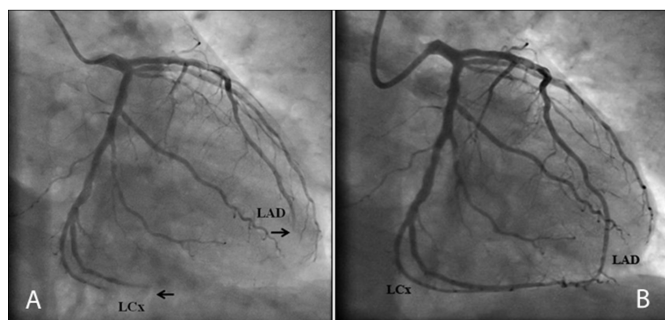


Figure 3: (A) Coronary angiogram pre-intracoronary streptokinase; (B) Post-intracoronary streptokinase.

(Figure 1B) and the patient became pain-free. Patient was started on GP IIb/IIIa inhibitor infusion for 24 hours and then on tablet Rivaroxaban 10 mg twice daily. The patient remained symptom-free during hospital stay. A trans-esophageal echocardiograph (TEE) was done which showed no evidence of vegetation or clot. A relook angiogram was done prior to discharge that showed TIMI III flow in LAD and LCx. The patient was discharged on dual antiplatelets (DAPT) and Rivaroxaban 15 mg once daily. Rivaroxaban was continued for 3 months and then he was kept on DAPT. At one year follow-up, the patient is asymptomatic with full recovery of left ventricle function on echocardiograph.

DISCUSSION

Review of literature shows that simultaneous occlusion of more than one coronary vessel causing STEMI is unusual and often lethal associated with cardiogenic shock and high mortality.^{1,2} Simultaneous occlusion of more than one coronaries may occur due to plaque rupture, embolisation, coronary spasm, hypercoagulable states such as malignancy, thrombocytosis and antithrombin III deficiency.^{3,4} Most of these patients are hemodynamically unstable with high incidence of cardiogenic shock and chances of life-threatening ventricular arrhythmias.⁵

A review of literature on the use of thrombolytics in the setting of STEMI with simultaneous multivessel occlusions on coronary angiogram shows four cases which were dealt with intracoronary (IC) thrombolytics (Table II). In these cases, use of IC thrombolytics was reserved with stenting, mostly for proximal coronary artery lesions. The most common combination for simultaneous occlusions of vessels was LAD and right coronary artery (RCA). Urokinase appeared as the thrombolytic agent of choice.⁶⁻⁸ To our knowledge, there is no reported case where an IC thrombolytic therapy with SK was used for distal occlusions in the setting of STEMI caused by simultaneous occlusion of more than one coronary vessels.

Though, IC SK was used in the pre-stenting era, but its use was associated with complications such as systemic

Table II: Review of case reports of patients with ST elevation myocardial infarction with simultaneous occlusion of two coronary arteries treated with intracoronary thrombolytics.

Study	Year	Age	Presentation	Vessel involved	Treatment	Dose of intracoronary thrombolytics	Immediate results of intervention	Outcome
Hamada [11]	1989	59	Inferior STEMI	Proximal left anterior descending and right coronary artery	Intracoronary urokinase to LAD and RCA	720,000 IU to RCA 480,000 IU to LAD	60% residual stenosis in RCA, 50% residual stenosis in LAD	Alive
Yoshitomi [12]	1998	34	Anterolateral STEMI	Proximal left anterior descending and proximal left circumflex coronary artery	Stenting of LAD and Intracoronary prourokinase to LCx	3,000 IU to LCx	30% distal stenosis in LAD and LCX	Alive
Hosokawa [13]	2001	33	Inferolateral STEMI	Proximal left anterior descending and mid right coronary artery	Stenting of RCA and Intracoronary tiskinase in LAD	6,400,000 IU	TIMI III flow in RCA, LAD showed residual thrombus	Alive
Turgeman [14]	2007	44	Anteroinferior STEMI with cardiogenic shock	Proximal left anterior descending and proximal right coronary artery	Thrombus aspiration followed by intracoronary urokinase in the left and right coronary system	125,000 IU	TIMI III flow in LAD and RCA	Alive

*RCA = Right coronary artery; LAD = Left anterior descending artery; LCx = Left circumflex artery; IU = International units; STEMI = ST elevation myocardial infarction.

bleeding and bleeding at the puncture site. These complications were more pronounced if dose of SK exceeded 200,000 IU. The other major cardiac complications of IC SK administration were reperfusion arrhythmias. With the advent of stenting, the use of IC SK became limited. However, in 2007, Murat in his study used IC SK after stenting in patients undergoing primary percutaneous intervention.⁹ The dose used by Murat *et al.* was 250 KU, at which the chances of SK associated complications were significantly low. However, in that study IC SK was used after stenting to achieve better flow. The authors used this dose of SK (250KU) separately for each vessel upfront without any complications. This case showcases the fact that this dose of SK can be used safely in more than one vessel occlusion.

This case report is an unusual occurrence of STEMI with simultaneous multivessel occlusions that might have occurred because of possible simultaneous plaque rupture in multiple coronary arteries or due to embolisation of a proximal clot. In the patient, the TEE did not show any evidence of proximal clot; however, the possibility of clot embolisation from a proximal source cannot be ruled out completely. An intravascular ultrasound (IVUS) might have helped in delineating the etiology. However, due to the distal location of lesions, it was not performed during the angiogram. The history and laboratory workup did not suggest any hypercoagulable state. Another differential was spontaneous coronary spasm in the distal vessels; however, patient did receive sublingual nitrates in emergency room, but due to low blood pressure during the procedure, IC GTN could not be used. Furthermore, we found in our procedure that flow was only restored after fibrinolytic therapy suggesting a thrombotic event rather than spasm. Other possibility in this case was spontaneous plaque rupture occurring at more than one distinct site simultaneously leading to ST-elevation myocardial infarction. Therefore, to prevent re-occlusion of arteries, we decided to keep our patient initially on GP IIb/IIIa inhibitors and then on Rivaroxaban for few months.

Rivaroxaban, a coagulation Factor Xa inhibitor, is approved for use in nonvalvular atrial fibrillation for the prevention of stroke and systemic embolism. However, in patients with acute coronary syndromes, low-dose Rivaroxaban is known to reduce the risk of the composite end-point of death from cardiovascular causes, myocardial infarction, or stroke.¹⁰ As spontaneous plaque rupture at multiple sites was suspected in our patient, we used a higher dose of Rivaroxaban. This approach helped in our

patient's management without recurrence of any clinical events and full recovery of left ventricular function.

This case is unique in which there was simultaneous occlusion of two distal vessels, which were dealt with old (SK, DAPts and GP IIb/IIIa) inhibitors and new pharmacological agents (Rivaroxaban) combined with percutaneous intervention for full recovery of patient.

Though rare, ST-segment elevation myocardial infarction with simultaneous multiple coronary artery occlusions may occur. In patients with distal coronary lesions not amenable to stenting, the use of IC SK initially and then followed by GP IIb/IIIa inhibitors and newer anti-coagulants based on clinical condition and risk factors of patients can provide good immediate angiographic results with full recovery of left ventricular function in these patients on follow-up.

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