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ACUTE ST-SEGMENT ELEVATION MYOCARDIAL INFARCTION WITH TWO CULPRIT VESSELS AND ITS REVASCULARIZATION STRATEGY

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Contribution
SA and BA conceived the idea of the case report. Data collection and manuscript writing was done by SA, BA, JAS, MH, AH, and IH. All the authors contributed equally to the submitted manuscript.

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ABSTRACT

Acute ST-segment elevation myocardial infarction (STEMI) is still the leading cause of morbidity and mortality worldwide. It usually occurs due to thrombotic occlusion of single coronary artery. Rarely, it can also occur due thrombotic occlusion of more than one coronary artery which is deem to be associated with lethal complications. Here we present similar case of a 60 years old male admitted in the hospital with presenting complain of typical chest pain for 10 hours. There was no past medical history of any disease. On investigation, ECG showed ST-segment elevation in multiple leads (V1-V6, II, III, Avf). Coronary angiogram showed occlusive thrombus in right coronary artery (RCA) and left Anterior Descending artery (LAD). Both Arteries were re-canalized and stents were placed in both arteries. There was slow flow in both arteries post-stenting so despite of stent under expansion it was planned to do Staged Post dilatation. Patient was administered GPIIb/IIIa inhibitor for 48 hours and low molecular weight heparin for 4 days followed by post-dilatation with non-compliant balloon. After giving antiplatelet and anticoagulation therapy, post-dilatation of both stents was done as staged procedure.

Keywords: ST-Elevation Myocardial Infarction, Primary PCI, Double Coronary Artery Thrombosis

INTRODUCTION

Acute ST-segment elevation myocardial infarction (STEMI) is still the leading cause of morbidity and mortality worldwide.[1] Primary percutaneous coronary intervention (PCI) is the preferred strategy among patients who present within 12 hours of onset of myocardial infarction.[2] The main cause of ST-segment elevation myocardial infarction is the ruptured plaque with thrombus formation at pre-existing site of stenosis in a single coronary artery known as the culprit artery.[3] Rarely, acute ST-segment elevation myocardial infarction can also occur due to more than one culprit artery leading to devastating complications like cardiogenic shock or ventricular arrhythmias.[4] To deal with such high risk in which we have large area of myocardium at risk require adequate planning. Reperfusion of two major coronary arteries especially in the setting of acute ST-segment Elevation myocardial infarction and high thrombus burden is challenging. Similarly, we present a case in which simultaneous formation of thrombi in two coronary arteries was observed and recanalization of both arteries simultaneously was carried out leading to patient survival. Hence, a careful review of Electrocardiogram and coronary angiogram at the time of primary percutaneous coronary intervention may lead to life-saving measures. We also observed that successful recanalization and staged post-dilatation of an under expanded stent after aggressive antiplatelet and anticoagulation therapy leads to improved angiographic outcomes. A careful review of electrocardiogram and coronary angiogram and a strategy of staged post-dilatation could help cardiologists in the recognition and management of patients with this rare occurrence of Acute ST-segment elevation myocardial infarction.

CASE REPORT

A 60 years male was reported in emergency department with presenting complain of chest pain lasting for 10 hours. The past medical history revealed no known comorbidities. At the time of admission, the patient's vitals were regular heart rate of 100 beats/min and Blood Pressure of 100/60 mmHg. On chest auscultation, bilateral basal crackles were present. Electrocardiogram showed ST-segment elevation with Q wave in V1 to V6 and II, III, Avf (Figure 1). Patient was preloaded with Aspirin 300mg, Clopidogrel 600mg (antiplatelet therapy) and heparin along with intravenous diuretics to help revascularization of suspected culprit artery.

Patient was then shifted to catheterization lab for urgent cardiac catheterization after high-risk consent. Left heart catheterization revealed moderate to severe left ventricular dysfunction with estimated Ejection fraction of 30%. Left heart catheterization further showed thrombotic occlusion of mid Left anterior descending artery and Mid Right Coronary artery (Figure 2).

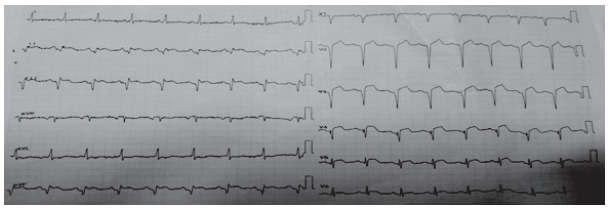

Figure 1: 12 lead Electrocardiography (ECG) showed ST-segment elevation with Q wave in lead V1 to V6 and II, III, AVF

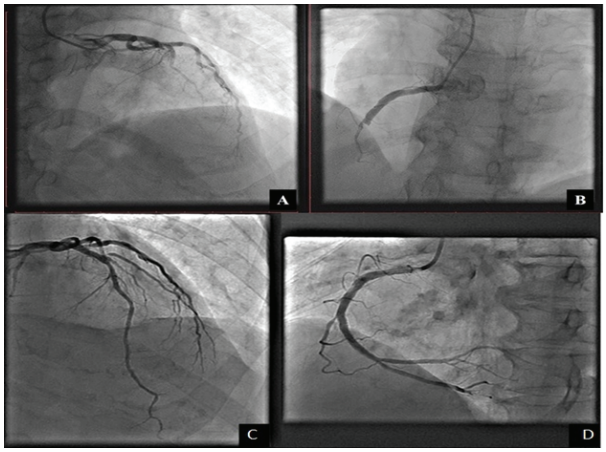

Figure 2: Total occlusion of mid Left anterior descending artery with thrombus (A) and Mid Right Coronary artery with thrombus (B). Post percutaneous coronary intervention of Left Anterior Descending artery (C) and Post percutaneous coronary intervention of Right coronary artery (D)

At first, right coronary artery was engaged with JR4 guide catheter, it was wired with floppy PT guide wire which failed to cross the lesion. A ABBOTT HI-TORQUE PILOT 50 guide wire was then tried which crossed the lesion easily. Lesion in mid right coronary artery was then pre-dilated with 2.0 X 10 sequent PTCA balloon after which it was stented with 4.0 X 24 promus premier DES stent. There was some under expansion of stent with slow (TIMI grade-II) flow, slow flow was successfully managed with intracoronary Adenosine.

Left coronary artery was then engaged with EBU 3.0 Guider catheter and Left Anterior Descending artery was wired with same ABBOTT HI-TORQUE PILOT 50 guide wire, lesion in its mid-portion was directly stented with the 3.5 X 16 promus premier DES stent. There was again slow flow in Left Anterior Descending artery which was managed successfully with intracoronary medication (adenosine and nitrates).

Although, there was some under expansion of stent in right coronary artery but post stenting there was slow flow and high thrombus burden in both arteries. Therefore, staged Post dilatation of both stents was planned. Therefore, administration of weight-based GpIIb/IIIa inhibitors (tirofiban) infusion for 48 hours along with Low molecular weight heparin for about 4 days was performed followed by post-dilatation of both stents. There was TIMI-III flow in both Right coronary artery and Left Anterior Descending Artery on initial angiographic views; Post-dilatation of both stents in Mid Right Coronary and Left Anterior Descending artery with Non-Compliant EUPHORA balloon 4.0 X 12 was successfully performed. The final angiographic result shows TIMI-III flow in both arteries with no angiographic under expansion (Figure 2).

DISCUSSION

Multivessel coronary artery plaque rupture and thrombosis is rare entity in acute ST-segment elevation myocardial infarction and has adverse patient prognosis. Very few cases has been reported and showed essential thrombocytosis, smoking and diabetes to be the risk factors of multivessel acute ST-segment elevation myocardial infarction. The most common arteries involved were left anterior descending artery and right coronary artery similar to the present case.[5] Electrocardiography is crucial in localizing suspected infarction. Majority of cases were found to have culprit artery in relation to corresponding ST-segment elevation and were associated with ventricular arrhythmia.[6]

The pathophysiology of double coronary artery thrombus is yet to be understood. However, Goldstein et al. defined the presence of multiple coronary artery thrombosis and complex plaques suggested that plaque disruption may be a pan-coronary process rather than a random vascular accident.[7] The exact incidence of multiple coronary artery thrombosis is unknown because of majority of the patients present as cardiogenic shock or sudden cardiac arrest. A single autopsy report of sudden cardiac death victims shows multiple coronary artery thrombosis in 50% of patients.[8] Majority of these patients who survived were male and smokers and majority of patients present with cardiogenic shock and cardiac arrest.[9, 10] Pollak et al. reported 2.5% cases had multivessel thrombus formation out of 711 patients and majority of them were hemodynamically unstable and smokers.[10] Our patient was vitally stable at the time of arrival in emergency but was in Killip-II and was successfully managed with percutaneous coronary intervention of both culprit arteries. There was high thrombus burden and stent under expansion. The post dilatation of stent in acute ST segment elevation myocardial infarction is associated with increased mortality and under expansion is associated with high in-stent restenosis (ISR).[11-13] Even in acute ST- segment elevation myocardial infarction due to higher chances of acute re-occlusion an immediate stenting may be deferred until adjunctive antithrombotic and antiplatelet have allowed thrombus burden meltdown.[14-15] Freixa X et al. acknowledged improved angiographic outcome with delayed stenting due to reduce thrombus burden.[16] So applying similar principles staged post-dilatation was performed after reducing thrombus burden with medication which surprisingly give better angiographic result.

Acute ST- segment elevation myocardial with more than one culprit is rare and associated with higher rate of complication and higher mortality. Careful evaluation of ECG and Coronary angiogram, appropriate procedural planning and actions for recanalization can make a great difference in reducing morbidity and mortality of such high-risk patients. Immediate post-dilatation of stent in high thrombus burden is associated with increased mortality; on the other hand data is scarce about the optimal management of stent under expansion in presence of high thrombus burden. We observed that excellent results were obtained after staged post-dilatation and aggressive antiplatelet and anticoagulation therapy. However further randomized studies are required to confirm their beneficial effect.

REFERENCES

1. Ahmed N, Carberry J, Teng V, Carrick D, Berry C. Risk assessment in patients with an acute ST-elevation myocardial infarction. J Comp Eff Res 2016;5(6):581-93.

2. O'Gara PT, Kushner FG, Ascheim DD, Casey DE, Chung MK, De Lemos JA, et al. 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: executive summary: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol 2013;61(4):485-510.

3. Vaidya SR, Devarapally SR, Arora S. Infarct related artery only versus complete revascularization in ST-segment elevation myocardial infarction and multi vessel disease: a meta-analysis. Cardiovasc Diagn Ther 2017;7(1):16.

4. Jassim Al Suwaidi M, Al-Qahtani A. Multiple coronary artery thrombosis in a 41-year-old male patient presenting with ST-segment elevation myocardial infarction. J Invasive Cardiol 2012;24(3):E43-E6.

5. Kanei Y, Janardhanan R, Fox JT, Gowda RM.

Multivessel coronary artery thrombosis. J Invasive Cardiol 2009;21(2):66-8.

6. Sia S-K, Huang C-N, Ueng K-C, Wu Y-L, Chan K-C. Double vessel acute myocardial infarction showing simultaneous total occlusion of left anterior descending artery and right coronary artery. Circ J 2008;72(6):1034-6.

7. Goldstein JA, Demetriou D, Grines CL, Pica M, Shoukfeh M, O'Neill WW. Multiple complex coronary plaques in patients with acute myocardial infarction. N Engl J Med 2000;343(13):915-22.

8. Davies MJ, Thomas A. Thrombosis and acute coronary-artery lesions in sudden cardiac ischemic death. N Engl J Med 1984;310(18):1137-40.

9. Mahmoud A, Saad M, Elgendy IY. Simultaneous multi-vessel coronary thrombosis in patients with ST-elevation myocardial infarction: a systematic review. Cardiovasc Revasc Med 2015;16(3):163-6.

10. Pollak PM, Parikh SV, Kizilgul M, Keeley EC. Multiple culprit arteries in patients with ST segment elevation myocardial infarction referred for primary percutaneous coronary intervention. Am J Cardiol 2009;104(5):619-23.

11. Zhang Z-J, Marroquin OC, Stone RA, Weissfeld JL, Mulukutla SR, Selzer F, et al. Differential effects of post-dilation after stent deployment in patients presenting with and without acute myocardial infarction. Am Heart J 2010;160(5):979-86.e1.

12. Nair Rajesh G, Jayaprasad N, Madhavan S, Sudha Kumary V, Jayaprakash K, Raihanathul Misiriya KJ, et al., editors. Predictors and prognosis of no-reflow during primary percutaneous coronary intervention. Baylor University Medical Center Proceedings; 2019: Taylor & Francis.

13. Kang S-J, Mintz GS, Park D-W, Lee S-W, Kim Y-H, Whan Lee C, et al. Mechanisms of in-stent restenosis after drug-eluting stent implantation: intravascular ultrasound analysis. Circ Cardiovasc Interv 2011;4(1):9-14.

14. Jolicoeur EM, Tanguay JF. From primary to secondary percutaneous coronary intervention: the emerging concept of early mechanical reperfusion with delayed facilitated stenting—when earlier may not be better. Can J Cardiol 2011 Sep 1;27(5):529-33.

15. Tang L, Zhou SH, Hu XQ, Fang ZF, Shen XQ. Effect of delayed vs immediate stent implantation on myocardial perfusion and cardiac function in patients with ST-segment elevation myocardial infarction undergoing primary percutaneous intervention with thrombus aspiration. Can J Cardiol 2011;27(5):541-7.

16. Freixa X, Belle L, Joseph L, Tanguay JF, Souteyrand G, Allier PL, et al. Immediate vs. delayed stenting in acute myocardial infarction: a systematic review and meta-analysis. EuroIntervention 2013;8(10):1207-6.