Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/14083
DOI URL: http://dx.doi.org/10.21474/IJAR01/14083

RESEARCH ARTICLE

CARDIAC ARREST AFTER INTRA-CORONARY NICORANDIL: A CATH LAB NIGHTMARE

Dr. Manish Ruhela, Dr. Rakesh Kumar Ola and Dr. Rajeev Bagarhatta

Manuscript Info

Manuscript History
Received: 15 November 2021
Final Accepted: 18 December 2021
Published: January 2022

Key words:-
PPCI, Microvascular Dysfunction, Nicorandil, Cardiac Arrest

Abstract

Primary percutaneous coronary intervention (PPCI) is the most effective therapy for patients with an acute ST-segment elevation myocardial infarction (STEMI). However, up to half of STEMI patients suffer from coronary microvascular dysfunction, presenting as the slow flow or no-flow phenomenon. A 50 years male patient admitted with acute anterior wall myocardial infarction, PPCI was performed on the patient. After thrombus aspiration, a stent was placed in the proximal LAD. As coronary angiography showed slow flow in LAD, 6mg nicorandil was administrated intra-coronary. Immediately, cardiac arrest occurred and cardiopulmonary resuscitation (CPR) was performed.

Introduction:-

Acute thrombotic occlusion of a coronary artery results in acute ST - segment elevation myocardial infarction(STEMI).[1]. Primary percutaneous coronary intervention(PPCI) is one of the most effectivetreatment for STEMI.[2-3]. Primary PCIhas many advantages over thrombolysis,including greater re-opening rates of the infarct related artery and higher coronary flow grades.[4] The no-reflow/slow flow phenomenon is the inadequate reperfusion of the myocardium of a given coronary artery segment in the absence of angiographic evidence of obstruction of the coronary artery [5]. The no-reflow phenomenon has a reported prevalence of >30% in patients with acute STEMI who undergo primary PCI and can lead to an adverse clinical outcome,including arrhythmia,heart failure,sudden cardiac death,and other major cardiovascular complications[6-7]. Intracoronary administration of nicorandil reduced the occurrence of slow flow or no- reflow phenomenon by improving microvascular circulation in patients with acute STEMI. [8] Nicorandil,an ATP-sensitive potassium(KATP) opener with nitrate like characteristic that result in dilation of coronary microcirculation,ischemic preconditioning,anti-arrhythmia, and reduction of reperfusion injury. [9] Nicorandil can be used in the patients with brady-arrhythmias and/or atrio-ventricular conduction blocks. [10-11]

In this case,we report a case of intracoronary nicorandil induced sudden cardiac arrest during primary PCI in a 50years old male patient with anterior wall STEMI.

Case Report:

A 50 years old male admitted with severe retrosternal diffuse chest pain radiating to bilateral arms, sweating since last four hours. He had history of chronic smoking for last 20 years. On examination his Pulse rate 68 beat per minute, blood pressure was 100/70 mm of Hg. Electrocardiogram was done which showed ST –segment elevation in V1 to V6 with reciprocal changes in inferior leads which suggestive acute anterior wall ST elevation myocardial infarction [Figure 1]. Patient admitted for primary coronary angioplasty. Coronary angiography showed proximal left anterior descending (LAD) 100% thrombotic occlusion [Figure 2], left circumflex artery (LCX) and right

Corresponding Author:- Dr. Manish Ruhela

coronary artery (RCA) were normal. EBU guiding catheter was taken to hook left anterior descending for primary angioplasty. Thrombus aspiration was done with Medtronic thrombus aspiration catheter [Figure 3].The lesion was predilated with 2.0x10 mm sapphire balloon catheter. Drug eluting stent 3.00x28 mm was deployed in left anterior descending artery. Post stent dilation was done with 3.00x10sapphire balloon catheter @ 20 atm. Post dilation angiography showed TIMI grade 2 flow in left anterior descending artery. Nicorandil 6 mg intracoronary injection wasadministered. Suddenly heart rate dropped to zero. Immediately cardiopulmonary resuscitation was started and 1 mg adrenaline was administered. Patient recovered with in few minutes. Repeated angiography showed TIMI GRADE 3 flow in left anterior descending artery [Figure 4]. The patient was stable during follow up for >6 months.

Discussion:-

Primary percutaneous coronary intervention(PPCI) is considered as the most effective treatment for patients with acute ST segment elevation myocardial infarction.

Microvascular dysfunction termed as slow flow or no-reflow phenomenon occurs in up to half of patients with STEMI even after revascularization of the culprit artery[12]. The mechanism of the No-reflow phenomenon may relate to microvascular endothelial damage, microvascular spasm, inflammation, oxidative stress, and thromboembolism, especially microcirculatory obstruction caused by microcirculation structural damage or dysfunction.[13-14]

In the present case,acute total occlusion was found in the proximal LAD and thrombus aspiration was performed. After stent deployment and post stent dilation, microvascular dysfunction (slow flow) occurred in this patient indicated by TIMI-2 flow in LAD.

The pathophysiological mechanism of no-reflow phenomenonstill poorly understood. Ischemia-related injury,reperfusion-related injury,distal embolization from the culprit plaque, and thrombus[1]. As no-reflow or slow-flow phenomenon was found after post-dilation,we speculate that distal embolization induced by emboli from residual thrombus or emboli from fissured plaque are the leading causes for occurrence of slow-flow in this patient.

Treatment of no-reflow or slow flow phenomenon remains further studied.Generally, thrombus aspiration and intra-coronary administration of medicines might be effective. Although routine thrombus aspiration is not recommended, it may be considered in cases of large residual thrombus burden after opening the artery with a guide wire or a balloon[15].

Currently, there are several drugs that have been shown to be effective in the prevention or treatment of no-reflow,includingadenosine,nitroprusside,verapamil,nicorandil,dipyridamole,epinephrineand cyclosporine[4]

In our case we used intra-coronary nicorandilto improve TIMI grade. Nicorandil, a hybrid with nitrate like and adenosine triphosphate(ATP) sensitive potassium (K_{ATP}) channel activator,is considered to be the optimal to improve coronary flow in acute coronary syndrome because of its nearly no effect on heart rate and blood pressure. Singer et al [16] have reported a few cases of life-threatening hyperkalemia and hemodynamic disturbance due to K_{ATP} channel activator. Lee et al [17] have also reported a case of life-threatening bradycardia due to nicorandil induced hyperkalemia. In our case we speculated that activation of K_{ATP} channel and subsequent hyperkalemia might be the reason for nicorandil induced cardiac arrest.

Conclusion:-

No-reflow phenomenon frequently occurs during Primary PCI. Thrombus aspiration and intra-coronary medicines should be considered to prevent this phenomenon. Intra coronary nicorandil might improve TIMI flow grade during no-reflow but should be carefully administrated due to its potential side effects. Cause of cardiac arrest just after intra-coronary nicorandil administration should be studied further.

Figure Legends:

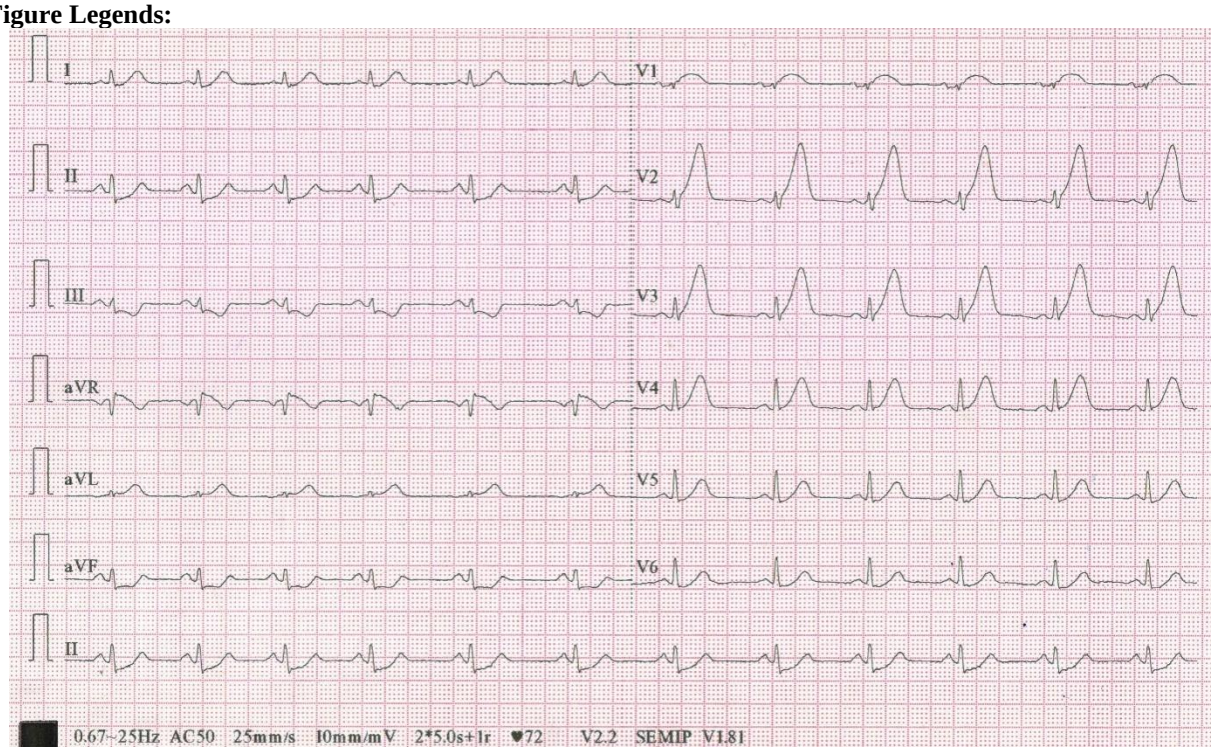

Figure 1:- The first electrocardiogram performed in emergency department.

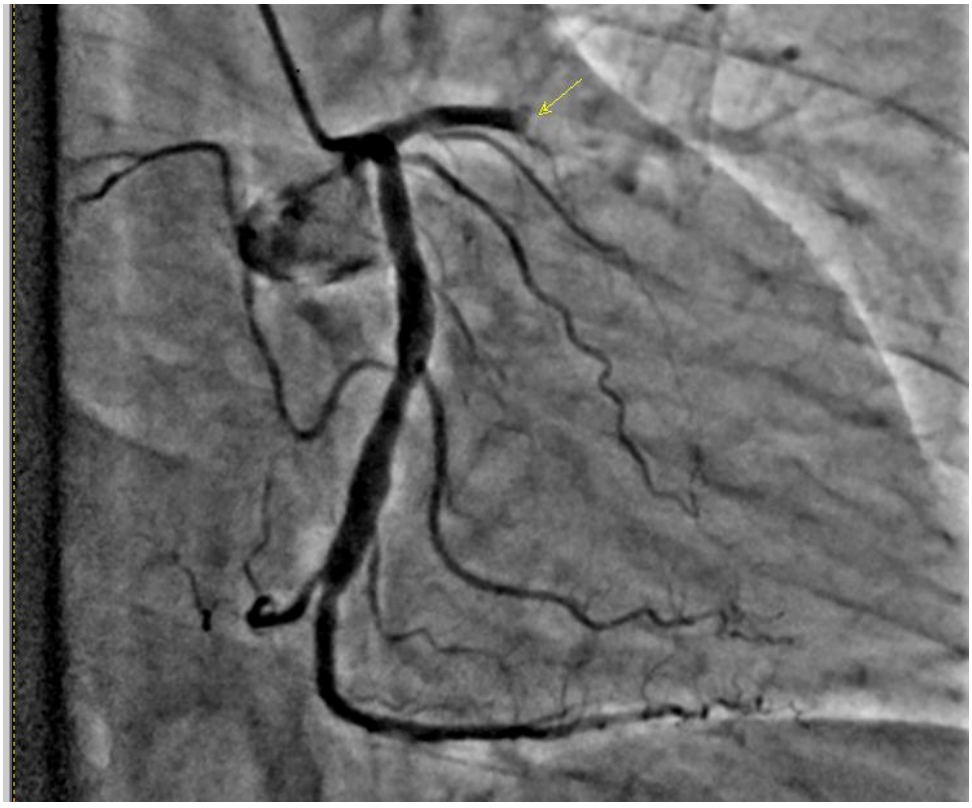

Figure 2:- Coronary angiogram showed acute total occlusion in the proximal LAD.

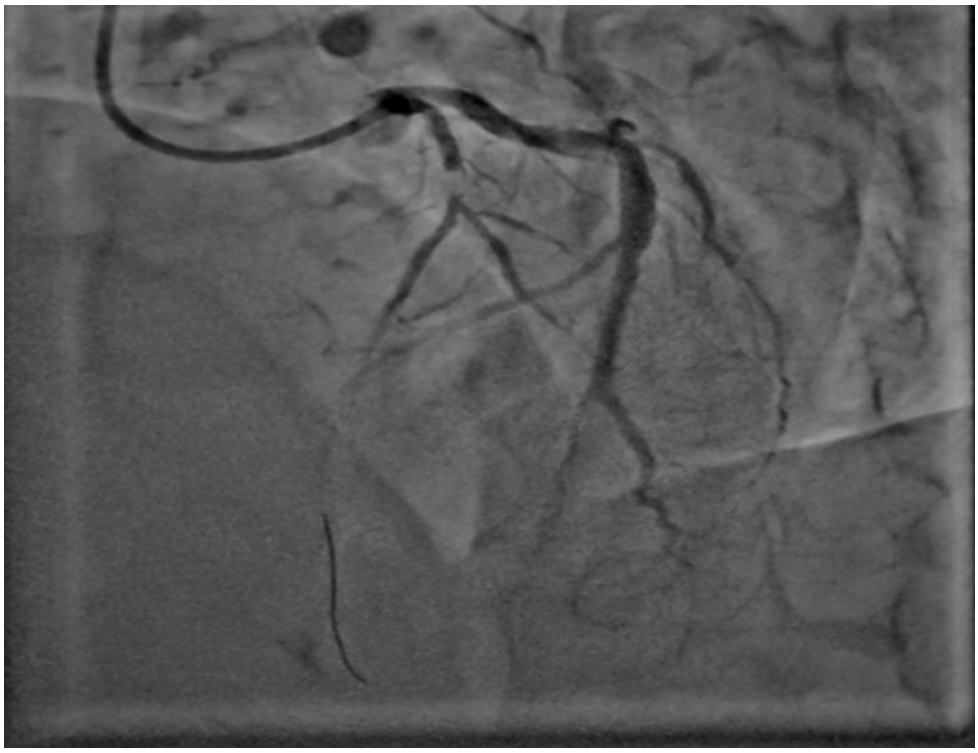

Figure 3:- Coronary angiogram of LAD after thrombus aspiration and about 90% stenosis was found in the proximal LAD.

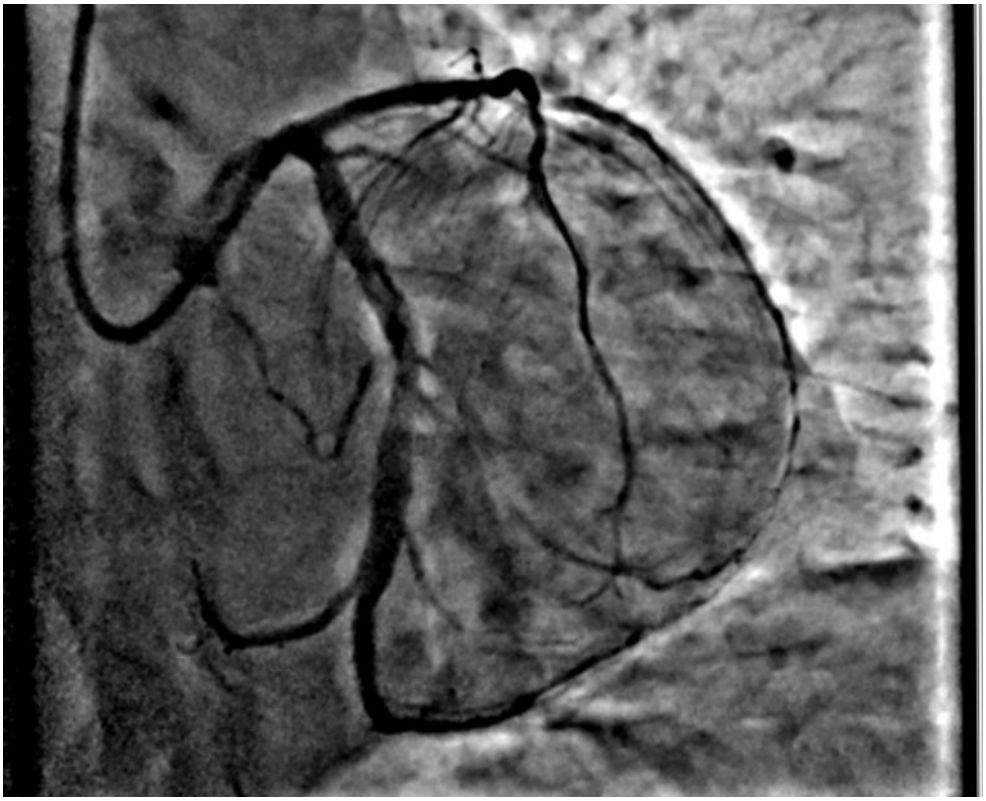

Figure 4:- Coronary angiogram after stent deployment and post-dilation, TIMI grade 3 flow finally.

References:-

1. Niccoli] G, Scalone G, Lerman A, et al. Coronary microvascular obstruction in acute myocardial infarction. Eur Heart J 2016;37:1024–33.
2. Zhou SS, Tian F, Chen YD. Combination therapy reduces the incidence of no-reflow after primary percutaneous coronary intervention in patients with ST-segment elevation acute myocardial infarction. J GeriatrCardiol 2015; 12: 135-142.
3. Khan R, Ly HQ. Transradial percutaneous coronary interventions in acute coronary syndrome. Am J Cardiol 2014; 114: 160-168.
4. Wong DT, Puri R, Richardson JD, et al. Myocardial 'no-reflow'—diagnosis, pathophysiology and treatment. Int J Cardiol 2013;167:1798–806.
5. Olivier M, Catalina T, Eric E. Myocardial no-reflow treatment. CurrVascPharmacol 2013; 11: 278-285.
6. Chen CH, Fu XH, Li W. Intracoronary administration of anisodamine and nicorandil in individuals undergoing primary percutaneous coronary intervention for acute inferior myocardial infarction: a randomized factorial trial. Exp Ther Med 2015; 10: 1059-1065.
7. Celik T, Balta S, Ozturk C. Predictors of no-reflow phenomenon in young patients with acute ST-segment elevation myocardial infarction undergoing primary percutaneous coronary intervention. Angiology 2016; 67: 683-689.
8. Lee HC, An SG, Choi JH, et al. Effect of intra-coronary nicorandil administration prior to reperfusion in acute ST segment elevation myocardial infarction. Circ J 2008;72:1425–9.
9. Ota S, Nishikawa H, Takeuchi M, et al. Impact of nicorandil to prevent reperfusion injury in patients with acute myocardial infarction: SigmartMulticenter Angioplasty Revascularization Trial (SMART). Circ J 2006;70:1099–104.
10. Ueda H, Hayashi T, Tsumura K, et al. Intravenous nicorandil can reduce QT dispersion and prevent bradyarrhythmia during percutaneous transluminal coronary angioplasty of the right coronary artery. J Cardiovasc PharmacolTher 2004;9:179–84.
11. Jang HJ, Koo BK, LeeHS, et al. Safety and efficacy of a novel hyperaemic agent, intracoronary nicorandil, for invasive physiological assessments in the cardiac catheterization laboratory. Eur Heart J 2013;34:2055–62.
12. Fordyce CB, Gersh BJ, Stone GW, et al. Novel therapeutics in myocardial infarction: targeting microvascular dysfunction and reperfusion injury. Trends Pharmacol Sci 2015;36:605–16.
13. Rezkalla SH, Kloner RA. No-reflow phenomenon. Circulation 2002; 105: 656-662.
14. Reffelmann T, Kloner RA, The "no-reflow" phenomenon: basic science and clinical correlates. Heart 2002; 87: 162-168.
15. Ibanez B, James S, Agewall S, et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: the Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). Eur Heart J 2018;39:119–77.
16. Singer M, Coluzzi F, O'Brien A, et al. Reversal of life-threatening, drugrelated potassium-channel syndrome by glibenclamide. Lancet 2005;365:1873–5.
17. Lee HH, Hsu PC, Lin TH, et al. Nicorandil-induced hyperkalemia in a uremic patient. Case Rep Med 2012;2012:812178.