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Original Research Article

IN-HOSPITAL MORTALITY WITH NO-REFLOW DURING PRIMARY PERCUTANEOUS CORONARY INTERVENTION

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Abstract: *This study aimed to determine the in-hospital mortality rate associated with No Reflow During Primary Percutaneous Coronary Intervention. The study was conducted at the Peshawar Institute of Cardiology Hayatabad, Peshawar, between January 2023 and June 2023. A total of 90 patients who underwent primary percutaneous coronary intervention (PCI) for acute myocardial infarction (AMI) were included in the study. The incidence of no-reflow during the surgery was observed, and the death rate at six months was recorded. The mean age of the patients was 52.46±10.09 years. Out of the 90 patients, 19 (21.1%) experienced no reflow. No reflow was significantly associated with age, in-hospital mortality, and 3-point MACE (P = 0.03). The study's findings suggest that no-reflow during primary percutaneous coronary intervention is associated with a significant increase in mortality rates in the hospital setting.*

Keywords: Primary Percutaneous Coronary Intervention, Mortality, Reflow

Introduction

Primary Percutaneous Coronary Intervention (PPCI) is a cornerstone in managing acute myocardial infarction (AMI), aimed at rapidly restoring blood flow to the occluded coronary artery. While PPCI has substantially improved the outcomes of AMI patients, the occurrence of the "no-reflow" phenomenon during the procedure remains a perplexing challenge in the field of interventional cardiology (Sunamura et al., 2017). AMI, commonly referred to as a heart attack, is a medical emergency characterized by the sudden cessation of blood flow to a portion of the heart muscle, leading to ischemia and potential myocardial damage (Dubey et al., 2017; Parhar et al., 2018). This procedure aims to salvage viable myocardium, reduce infarct size, and improve the patient's overall prognosis. While PPCI is highly effective, a subset of patients undergoing the procedure experiences the "no-reflow" phenomenon (Mirbolouk et al., 2018). No-reflow is a condition in which, despite the successful revascularization of the epicardial coronary artery, there is a persistent impairment of microvascular perfusion within the myocardium. This paradoxical situation results in inadequate tissue-level blood supply, leading to compromised cardiac function and myocardial damage (Ashraf et al., 2019; Fajar et al., 2018).

The mechanisms contributing to no-reflow during PPCI are multifactorial and not fully elucidated. The release of embolic material, such as platelet aggregates and atherothrombotic debris, during the PPCI procedure, can obstruct the microvasculature, hindering optimal reflow (Maznyczka and Haworth, 2021).

The acute inflammatory response triggered by reperfusion can constrict small blood vessels, contributing to no-reflow. Spasms in the microvasculature can lead to transient or persistent reductions in blood flow, exacerbated by endothelial dysfunction and endothelin release. Increased myocardial pressure upon reperfusion can cause swelling and compression of the microvasculature, reducing blood flow (Matta et al., 2020; Sindou and Mercier, 2018).

No-reflow results in suboptimal myocardial perfusion, leading to persistent ischemic injury and infarct expansion, ultimately affecting the patient's prognosis. Inadequate perfusion caused by no-reflow can trigger arrhythmias, such as ventricular tachycardia and fibrillation, which are associated with a higher risk of mortality (Kumar et al., 2019; Tasar et al., 2019). The reduction in myocardial function due to no-reflow can lead to heart failure, a known predictor of adverse outcomes and increased in-hospital mortality (Schwartz and Kloner, 2012).

In-hospital mortality remains a significant concern during PPCI, and the no-reflow phenomenon stands as a complex and enigmatic factor in this context. While the exact mechanisms linking no-reflow to in-hospital mortality are not entirely understood, it is clear that early detection, prevention, and effective management of no-reflow are critical for improving patient outcomes. Reducing in-hospital mortality in PPCI necessitates a comprehensive approach that addresses the multifaceted challenges posed by this phenomenon, ultimately enhancing the safety and efficacy of this life-saving intervention for patients experiencing AMI.

Methodology

This study was conducted at the Peshawar Institute of Cardiology Hayatabad, Peshawar, from January 2023 to June. 2023. The study involved a cohort of 90 patients diagnosed with AMI who had PPCI. Patients who exhibited symptoms that indicated AMI and had PPCI within 12 hours of the start of these symptoms were enrolled in the study.

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All participants in the survey received PCCI using established procedures, which included aspiration thrombectomy, stent placement, and the administration of additional medication—the process of gathering and recording information for analysis and interpretation. No-reflow was evaluated by utilizing several measures, including the corrected thrombolysis in myocardial infarction (TIMI) frame count, myocardial blush grade, and ST-segment resolution on electrocardiography. These assessments were performed before and during the treatment. "no-reflow" refers to a condition characterized by a TIMI frame count more significant than 27 following a medical procedure, a myocardial blush grade of 2 or lower, or less than 50% resolution of the ST-segment. The patients were monitored for a duration of six months subsequent to the procedure to evaluate the primary outcome of mortality caused by any reason. Furthermore, the occurrence of MACE, which includes stroke, heart failure, and recurrent myocardial infarction, was documented throughout the duration of the observational period.

Statistical analysis was performed using SPSS; data was analyzed according to its type. Independent samples T and chi-square tests were used, keeping a P value < 0.05 as significant.

Results

Our research was carried out on 90 patients. Patients had a mean age of 52.46±10.09 years. Male-male patients were 51 (56.7%), while female patients were 39 (43.3%). About 38 (42.2%) patients had hypertension, while 31 (34.4%) had diabetes. The incidence of no reflow was 19 (21.1%), around 8 (8.9%) patients had 3-point MACE, and mortality in the hospital was 5 (5.6%). No reflow was notably associated with age (P = 0.002) (Table 1), in-hospital mortality (P = 0.02), and 3-point MACE (P = 0.03) (Table 2).

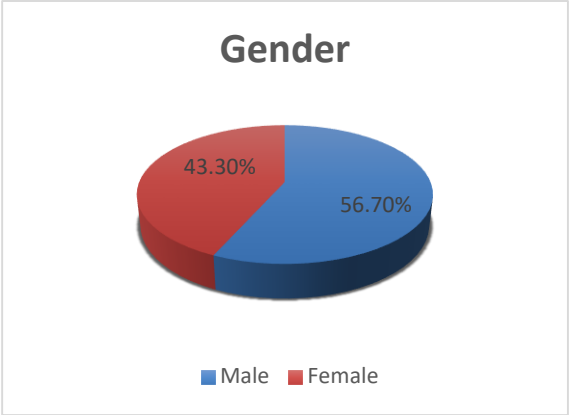

Figure 1 Gender distribution

Table 1 Association of no-reflow with age

	No reflow	N	Mean	Std. Deviation	P-value
Age (Yrs.)	Yes	19	58.68	8.413	0.002
	No	71	50.79	9.896	

Table 2 Association of no-reflow with 3-point MACE and in-hospital mortality

Outcomes		No reflow				P-value
		Yes		No		
		N	%	N	%	
3 point MACE	Yes	4	21.1%	4	5.6%	0.03
	No	15	78.9%	67	94.4%	
Mortality	Yes	3	15.8%	2	2.8%	0.02
	No	16	84.2%	69	97.2%	

Discussion

When PCI is performed on patients with STEMI, the condition known as "no-reflow" has been found in 11-41% of patients. Poor left ventricular function, adverse clinical outcomes, and mortality have all been associated with this condition. Several clinical, serologic, and angiographic variables have established a connection with no-reflow prevalence (Harrison et al., 2013; Members et al., 2012).

Ruptured plaque in the epicardial coronary artery, followed by thrombotic occlusion, is the direct cause of AMI. STEMI patients are commonly treated with PCI. Improved cardiac remodeling results are linked to early infarct-related artery (IRA) revascularization (Jaffe et al., 2010). MACE is predicted to diminish due to the intervention, which improves left ventricular systolic and diastolic function.

Patients with STEMI have an 8.8-10% chance of having no flow during their first PCI. Age, delay in diagnosis, ectatic coronary artery, and a high thrombus burden are all associated with this condition. Failure to restore blood flow following PCI may result from several causes, such as insufficient stent expansion, vasoconstriction, arterial wall injury, or the creation of a blood clot within the treated channel. Other contributors to the situation at hand include microvascular obstruction and distal embolization. The lack of blood flow, termed as clinically no flow, can manifest as the reappearance of heart failure, chest tightness, cardiogenic shock, and malignant ventricular arrhythmias. During PCI, a lack of angiographic blood flow has been linked to worse outcomes, such as unfavorable cardiac remodeling, reduced myocardial salvage, and larger infarcts. Early detection, prevention measures, and effective treatment of no flow are vital to the final prognosis following PCI (Su et al., 2015).

Our study found that 21.1% of cases had no flow, whereas another study found that 26.2% did not have any reflow.17 The results of our investigation corroborate those of the aforementioned study (Khan et al., 2023), which found that the mortality and 3-point MACE rates were significantly greater in patients without reflow than those with reflow.

The average age of patients with no-reflow was significantly higher than that of reflow patients, confirming our findings

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and those of a previous study that found that increasing age is a significant risk factor for no-reflow (Mazhar et al., 2016).

Conclusion

Based on our research findings, it can be deduced that there was a notable increase in mortality rates within the hospital setting among patients who experienced no reflow during primary percutaneous coronary intervention. No reflow during primary percutaneous coronary intervention (PPCI) is positively correlated with advancing age, as well as with higher rates of three-point MACE and in-hospital mortality.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department Concerned.
Consent for publication
Approved
Funding
Not applicable

Conflict of interest

The authors declared absence of conflict of interest.

References

Ashraf, T., Khan, M. N., Afaque, S. M., Aamir, K. F., Kumar, M., Saghir, T., Rasool, S. I., Rizvi, S. N. H., Sial, J. A., and Nadeem, A. (2019). Clinical and procedural predictors and short-term survival of the patients with no reflow phenomenon after primary percutaneous coronary intervention. *International journal of cardiology* **294**, 27-31.

Dubey, G., Verma, S. K., and Bahl, V. K. (2017). Primary percutaneous coronary intervention for acute ST elevation myocardial infarction: Outcomes and determinants of outcomes: A tertiary care center study from North India. *Indian Heart Journal* **69**, 294-298.

Fajar, J. K., Heriansyah, T., and Rohman, M. S. (2018). The predictors of no reflow phenomenon after percutaneous coronary intervention in patients with ST elevation myocardial infarction: A meta-analysis. *Indian Heart Journal* **70**, S406-S418.

Harrison, R. W., Aggarwal, A., Ou, F.-s., Klein, L. W., Rumsfeld, J. S., Roe, M. T., Wang, T. Y., and Registry, A. C. o. C. N. C. D. (2013). Incidence and outcomes of no-reflow phenomenon during percutaneous coronary intervention among patients with acute myocardial infarction. *The American journal of cardiology* **111**, 178-184.

Jaffe, R., Dick, A., and Strauss, B. H. (2010). Prevention and treatment of microvascular obstruction-related myocardial injury and coronary no-reflow following percutaneous coronary intervention: a systematic approach. *JACC: Cardiovascular Interventions* **3**, 695-704.

Khan, M. I., Farooq, M. U., Iqbal, H., Kazmi, S. I. A., Aqeel, I., and Khan, B. U. (2023). Effect of No-Reflow During Primary Percutaneous Coronary Intervention for Acute Myocardial Infarction on Six-Month Mortality. *Pakistan Journal of Medical & Health Sciences* **17**, 796-796.

Kumar, J., O'Connor, C. T., Kumar, R., Arnous, S. K., and Kiernan, T. J. (2019). Coronary no-reflow in the modern era: a review of advances in diagnostic techniques and contemporary management. *Expert Review of Cardiovascular Therapy* **17**, 605-623.

Matta, A., Bouisset, F., Lhermusier, T., Campelo-Parada, F., Elbaz, M., Carrié, D., and Roncalli, J. (2020). Coronary artery spasm: new insights. *Journal of Interventional Cardiology* **2020**.

Mazhar, J., Mashicharan, M., and Farshid, A. (2016). Predictors and outcome of no-reflow post primary percutaneous coronary intervention for ST elevation myocardial infarction. *IJC Heart & Vasculature* **10**, 8-12.

Maznyczka, A., and Haworth, P. A. (2021). Adjunctive intracoronary fibrinolytic therapy during primary percutaneous coronary intervention. *Heart, Lung and Circulation* **30**, 1140-1150.

Members, A. T. F., Steg, P. G., James, S. K., Atar, D., Badano, L. P., Lundqvist, C. B., Borger, M. A., Di Mario, C., Dickstein, K., and Ducrocq, G. (2012). ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force on the management of ST-segment elevation acute myocardial infarction of the European Society of Cardiology (ESC). *European heart journal* **33**, 2569-2619.

Mirbolouk, F., Gholipour, M., Salari, A., Shakiba, M., Kheyrkhah, J., Nikseresht, V., Sotoudeh, N., Moghadam, N., and Mirbolouk, M. J. (2018). CHA2DS2-VASc score predict no-reflow phenomenon in primary percutaneous coronary intervention in primary percutaneous coronary intervention. *Journal of cardiovascular and thoracic research* **10**, 46.

Parhar, K., Millar, V., Zochios, V., Bruton, E., Jaworksi, C., West, N., and Vuylsteke, A. (2018). Clinical outcomes of patients undergoing primary percutaneous coronary intervention for acute myocardial infarction requiring the intensive care unit. *Journal of intensive care* **6**, 1-10.

Schwartz, B. G., and Kloner, R. A. (2012). Coronary no reflow. *Journal of molecular and cellular cardiology* **52**, 873-882.

Sindou, M., and Mercier, P. (2018). Microvascular decompression for hemifacial spasm: outcome on spasm and complications. A review. *Neurochirurgie* **64**, 106-116.

Su, Q., Nyi, T. S., and Li, L. (2015). Adenosine and verapamil for no-reflow during primary percutaneous coronary intervention in people with acute myocardial infarction. *Cochrane Database of Systematic Reviews*.

Sunamura, M., Ter Hoeve, N., Geleijnse, M., Steenaard, R., Van den Berg-Emons, H., Boersma, H., and Van Domburg, R. (2017). Cardiac rehabilitation in patients who underwent primary percutaneous coronary intervention for acute myocardial infarction: determinants of programme participation and completion. *Netherlands Heart Journal* **25**, 618-628.

Tasar, O., Karabay, A. K., Oduncu, V., and Kirma, C. (2019). Predictors and outcomes of no-reflow phenomenon in patients with acute ST-segment elevation myocardial infarction undergoing primary percutaneous coronary intervention. *Coronary artery disease* **30**, 270-276.

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