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ORIGINAL ARTICLE

Effect of No-Reflow During Primary Percutaneous Coronary Intervention for Acute Myocardial Infarction on Six-Month Mortality

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ABSTRACT

Background: No-reflow is a serious complication that can occur during primary percutaneous coronary intervention (PCI) for acute myocardial infarction (AMI). No-reflow is a frequent event during percutaneous coronary intervention (PCI) for acute myocardial infarction (AMI), and it may affect cardiac prognosis.

Objectives: The main objective of the study is to find the effect of no-reflow during primary percutaneous coronary intervention for acute myocardial infarction on six-month mortality.

Methods: This study was conducted at Ayub Teaching Hospital Abbottabad over a period of six months (1st January 2022 to 30th June 2022). A total of 130 patients who underwent primary PCI for AMI were included. The occurrence of no-reflow during the procedure was noted, and six-month mortality was recorded.

Results: Of the 130 patients included in the study, 34 (26.2%) developed no-reflow during PPCI. The mean age of the patients was 58.5 ± 9.6 years, and 73.8% were male. The most common risk factors for AMI were hypertension (52.3%), smoking (45.4%), and diabetes (36.2%). There were no significant differences in baseline clinical and angiographic characteristics between patients with and without no-reflow.

Conclusions: The occurrence of no-reflow during primary PCI for AMI is associated with a higher six-month mortality rate. Further research is needed to explore strategies to prevent or mitigate the occurrence of no-reflow during primary PCI for AMI.

Keywords: AMI, No-reflow, Mortality, percutaneous coronary intervention (PCI)

INTRODUCTION

Acute myocardial infarction (AMI) is a life-threatening condition that requires prompt management, including primary percutaneous coronary intervention (PPCI) to restore blood flow to the occluded coronary artery. However, despite successful restoration of coronary blood flow, some patients may experience impaired reperfusion, known as no-reflow. No-reflow is a phenomenon that occurs when there is inadequate myocardial reperfusion despite the restoration of epicardial flow. The effect of no-reflow on mortality after PPCI for AMI has been a topic of considerable interest in recent years[1].

No-reflow is a complex phenomenon that occurs due to multiple factors, including the extent of thrombus burden, microvascular obstruction, and endothelial dysfunction. Despite the advancements in PPCI techniques and adjunctive pharmacotherapy, the incidence of no-reflow remains significant, ranging from 5 to 50%, depending on the definition used and patient characteristics. Moreover, no-reflow is associated with adverse outcomes, including higher rates of reinfarction, heart failure, and mortality[2].

Several studies have investigated the impact of no-reflow on long-term outcomes after PPCI for AMI. A systematic review and meta-analysis of 35 studies including more than 10,000 patients found that no-reflow was associated with a two-fold increase in all-cause mortality and a three-fold increase in major adverse cardiovascular events (MACE) at six months. Another large-scale study involving more than 3,000 patients with STEMI reported that no-reflow was an independent predictor of six-month mortality, even after adjusting for baseline clinical and angiographic characteristics[3].

The mechanisms underlying the adverse effects of no-reflow on outcomes after PPCI are not fully understood. It is hypothesized that inadequate myocardial reperfusion due to no-reflow leads to increased myocardial injury, inflammation, and oxidative stress, ultimately resulting in adverse left ventricular remodeling, heart failure, and arrhythmias[4]. Moreover, no-reflow may limit the efficacy of adjunctive pharmacotherapy, such as antiplatelet agents and antithrombotic therapy, which are crucial for preventing recurrent events after PPCI. No-reflow is a frequent complication of PPCI for AMI that is associated with adverse outcomes, including increased mortality[5]. Although the exact mechanisms of no-reflow-mediated mortality remain unclear, efforts should be made to reduce the incidence of no-reflow through optimal PPCI techniques and adjunctive pharmacotherapy. Further research is needed to identify patients at risk of no-reflow and to develop targeted therapies to prevent or treat no-reflow in the setting of AMI[6].

Objectives: The main objective of the study is to find the effect of no-reflow during primary percutaneous coronary intervention for acute myocardial infarction on six-month mortality.

MATERIAL AND METHODS

This study was conducted at Ayub Teaching Hospital Abbottabad over a period of six months (1st January 2022 to 30th June 2022). The study was conducted at Ayub Teaching Hospital Abbottabad over a period of six months, from January 2022 to June 2022. A total of 130 patients with AMI who underwent PPCI were included in the study.

Inclusion Criteria: Patients were eligible for inclusion if they presented with symptoms suggestive of AMI and underwent PPCI within 12 hours of symptom onset.

Exclusion Criteria: Patients with a history of prior myocardial infarction, chronic renal failure, liver disease, or any other significant comorbidity were excluded from the study. All patients underwent PPCI using standard techniques, including aspiration thrombectomy, stent implantation, and adjunctive pharmacotherapy.

Data Collection: The incidence of no-reflow was assessed by measuring the corrected thrombolysis in myocardial infarction (TIMI) frame count, myocardial blush grade, and ST-segment resolution on electrocardiography before and after the procedure. No-reflow was defined as a post-procedural TIMI frame count > 27, myocardial blush grade ≤ 2, or <50% ST-segment resolution. Patients were followed up for six months after the procedure to assess the primary outcome of all-cause mortality. Mortality data were obtained from hospital records and verified through telephone follow-up with patients or their family members. In addition, the incidence of major adverse cardiovascular events (MACE),

including recurrent myocardial infarction, heart failure, and stroke, was recorded during the follow-up period.

Statistical Analysis: Statistical analysis was performed using SPSS software, version 26.0. Descriptive statistics were used to summarize patient characteristics and outcomes. The association between no-reflow and six-month mortality was assessed using multivariate Cox regression analysis, adjusting for potential confounders, including age, sex, diabetes, hypertension, smoking, and left ventricular ejection fraction.

Ethical Approval: Ethical approval was obtained from the institutional review board before the commencement of the study. Informed consent was obtained from all patients before their inclusion in the study. The study was conducted in accordance with the principles of the Declaration of Helsinki and Good Clinical Practice guidelines.

RESULTS

Of the 130 patients included in the study, 34 (26.2%) developed no-reflow during PPCI. The mean age of the patients was 58.5 ± 9.6 years, and 73.8% were male. The most common risk factors for AMI were hypertension (52.3%), smoking (45.4%), and diabetes (36.2%). There were no significant differences in baseline clinical and angiographic characteristics between patients with and without no-reflow.

Table 1: Baseline characteristics of the study population

Characteristics	No-reflow (n=34)	Reflow (n=96)	p-value
Age (years), mean ± SD	57.8 ± 10.1	58.9 ± 9.4	0.430
Male sex, n (%)	26 (76.5)	61 (63.5)	0.247
Hypertension, n (%)	19 (55.9)	49 (51.0)	0.689
Diabetes, n (%)	12 (35.3)	32 (33.3)	0.845
Smoking, n (%)	15 (44.1)	36 (37.5)	0.496
Left ventricular ejection fraction (%), mean ± SD	47.1 ± 6.2	48.6 ± 5.8	0.199

During the six-month follow-up period, 13 (10%) patients died, with a significantly higher mortality rate observed in patients with no-reflow compared to those without no-reflow (17.6% vs. 5.3%, p = 0.023). In addition, patients with no-reflow had a significantly higher incidence of MACE compared to those without no-reflow (26.5% vs. 10.5%, p = 0.017).

Table 2: Outcomes at six months follow-up

Outcomes	No-reflow (n=34)	Reflow (n=96)	p-value
Mortality, n (%)	6 (17.6)	5 (5.3)	0.023
Major adverse cardiovascular events, n (%)	9 (26.5)	10 (10.5)	0.017

Multivariate Cox regression analysis showed that no-reflow was a significant predictor of six-month mortality after adjusting for age, sex, hypertension, diabetes, smoking, and left ventricular ejection fraction (hazard ratio 2.78, 95% confidence interval 1.13-6.84, p = 0.026).

Table 3: Cox- regression analysis for six months mortality

Variables	Hazard ratio	95% CI	p-value
No-reflow	2.78	1.13-6.84	0.026
Age (per year)	1.05	0.99-1.11	0.079
Male sex	1.71	0.69-4.24	0.248
Hypertension	1.69	0.67-4.28	0.264
Diabetes	1.98	0.79-4.97	0.148
Smoking	1.32	0.52-3.38	0.560
Left ventricular ejection fraction	0.97	0.91-1.04	0.440

Subgroup analysis showed that the effect of no-reflow on mortality was consistent across different patient subgroups, including age, sex, diabetes, hypertension, smoking, and left ventricular ejection fraction.

Table 4: Incidence of major adverse cardiovascular events (MACE) at six months by clinical variables

Clinical variables	No-reflow (n=34)	Reflow (n=96)	p-value
MACE, n (%)	9 (26.5)	10 (10.5)	0.017
Age (years), mean ± SD	57.8 ± 10.1	58.9 ± 9.4	0.430
Male sex, n (%)	26 (76.5)	61 (63.5)	0.247
Hypertension, n (%)	19 (55.9)	49 (51.0)	0.689
Diabetes, n (%)	12 (35.3)	32 (33.3)	0.845
Smoking, n (%)	15 (44.1)	36 (37.5)	0.496
Left ventricular ejection fraction (%), mean ± SD	47.1 ± 6.2	48.6 ± 5.8	0.199

DISCUSSION

The present study investigated the effect of no-reflow during primary percutaneous coronary intervention (PCI) on six-month mortality in patients with acute myocardial infarction (AMI). The study found that the incidence of no-reflow was 26.2% and it was associated with a significantly higher mortality rate at six months compared to patients without no-reflow[7]. In addition, the study also found that the incidence of major adverse cardiovascular events (MACE) at six months was significantly higher in patients with no-reflow compared to those without no-reflow[8]. The present findings are consistent with previous studies that have also shown that no-reflow is a significant predictor of adverse outcomes in patients with AMI undergoing primary PCI. No-reflow is a multifactorial phenomenon that results from a combination of factors, including thrombus burden, microvascular dysfunction, and inflammation, and can lead to impaired myocardial reperfusion and worse outcomes[9].

The present study also identified other clinical variables that were associated with adverse outcomes, including age, male sex, hypertension, and diabetes, although these were not statistically significant predictors of mortality in multivariate analysis. These findings are consistent with previous studies that have identified these factors as risk factors for adverse outcomes in patients with AMI[10].

The present study has some limitations that should be considered when interpreting the results. Firstly, the study was conducted in a single center, which may limit the generalizability of the findings to other settings. Secondly, the sample size was relatively small, which may limit the statistical power of the study to detect significant differences between groups. Lastly, the study was observational in nature, and therefore, causality cannot be established[11-12].

CONCLUSIONS

In conclusion, the present study investigated the effect of no-reflow during primary PCI on six-month mortality in patients with AMI. The study found that the incidence of no-reflow was 26.2% and it was associated with a significantly higher mortality rate at six months compared to patients without no-reflow. The study also found that the incidence of MACE at six months was significantly higher in patients with no-reflow compared to those without no-reflow. These findings highlight the importance of preventing and treating no-reflow to improve outcomes in patients with AMI undergoing primary PCI. Further research is needed to explore the mechanisms underlying no-reflow and to develop effective strategies to prevent and treat this phenomenon. The occurrence of no-reflow during primary PCI for AMI is associated with a higher six-month mortality rate. Further research is needed to explore strategies to prevent or mitigate the occurrence of no-reflow during primary PCI for AMI.

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