Predilation Ballooning in High Thrombus Laden STEMs: An Independent Predictor of Slow Flow in Patients Undergoing Emergent Percutaneous Coronary Revascularization

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ABSTRACT

Introduction: Predilation ballooning in high thrombus-laden ST-elevation myocardial infarctions (STEMIs) is a technique used during emergent percutaneous coronary revascularization (PCI) to improve blood flow and reduce clot burden in the coronary artery. Objectives: The main objective of the study is to find the predilation ballooning in high thrombus laden STEMs as an independent predictor of slow flow in patients undergoing emergent percutaneous coronary revascularization. Material and methods: The study was a retrospective analysis of 280 consecutive patients who underwent emergent PCI for STEMI at Hayat Abad Medical Complex. Data were collected from electronic medical records of patients who met the inclusion criteria, which were patients with STEMI who underwent emergent PCI and had high thrombus burden as assessed by angiography. Patients who did not undergo predilation ballooning or who had missing data were excluded from the analysis. The collected data included demographics, clinical characteristics, laboratory values, angiographic findings, procedural details, and outcomes. Results: The results of the study show that predilation ballooning is an independent predictor of slow flow in patients undergoing emergent percutaneous coronary revascularization for high thrombus burden STEMIs in the sample of 280 patients. Data presents a comparison between two groups of patients who underwent emergent percutaneous coronary revascularization with and without predilation ballooning. The comparison is based on demographic, clinical, and angiographic characteristics, as well as postprocedure in-hospital complications and outcomes. The two groups were propensity-matched in a 1:1 ratio to account for potential confounding factors. Conclusion: In conclusion, our study suggests that predilation ballooning may be an independent predictor of slow flow in patients undergoing emergent percutaneous coronary revascularization. The comparison of demographic, clinical, and angiographic characteristics between the predilation ballooning (+) and predilation ballooning (-) groups did not reveal any significant differences, indicating that the two groups were similar in terms of baseline characteristics.

INTRODUCTION

Predilation ballooning in high thrombus-laden ST-elevation myocardial infarctions (STEMIs) is a technique used during emergent percutaneous coronary revascularization (PCI) to improve blood flow and reduce clot burden in the coronary artery. However, recent studies have suggested that predilation ballooning may be associated with slow flow/no-reflow phenomenon, a complication that occurs when the blood flow to the heart muscle is impaired despite successful restoration of the blood vessel [1]. This phenomenon can lead to poor outcomes and increased mortality in patients with STEMI.

Therefore, the identification of independent predictors of slow flow/no-reflow in patients undergoing emergent PCI is essential to improve patient outcomes. This paper aims to explore the relationship between predilation ballooning in high thrombus-laden STEMIs and slow flow/no-reflow phenomenon and to evaluate the potential of predilation ballooning as an independent predictor of this complication [2]. ST-elevation myocardial infarction (STEMI) is a severe form of heart attack caused by a complete or near-complete blockage of a coronary artery. Emergent percutaneous coronary revascularization (PCI) is the preferred treatment for patients with STEMI as it can quickly restore blood flow to the heart and reduce the risk of damage to the heart muscle. However, despite successful revascularization, some patients may still experience slow flow/no-reflow phenomenon, a complication that can occur in up to 30% of cases. Slow flow/no-reflow phenomenon is characterized by impaired blood flow to the heart muscle despite successful restoration of the blood vessel [3]. This phenomenon can lead to poor outcomes, including increased mortality, and is a major challenge in the management of patients with STEMI. The exact mechanism of slow flow/no-reflow phenomenon is not well understood, but it is believed to be caused by a combination of factors, including microvascular obstruction, distal embolization, and impaired endothelial function [4]. Predilation ballooning is a technique used during emergent PCI to reduce clot burden and improve blood flow in the coronary artery. However, recent studies have suggested that predilation ballooning may be associated with slow flow/no-reflow phenomenon, particularly in patients with high thrombus burden [5]. The relationship between predilation ballooning and slow flow/no-reflow phenomenon is complex and not well understood. Several studies have attempted to identify predictors of slow flow/no-reflow phenomenon in patients undergoing emergent PCI for STEMI. These predictors include age, diabetes, hypertension, left ventricular ejection fraction, and thrombus burden. However, the role of predilation ballooning as an independent predictor of slow flow/no-reflow phenomenon remains unclear [6].

Objectives: The main objective of the study is to find the predilation ballooning in high thrombus laden STEMs as an independent predictor of slow flow in patients undergoing emergent percutaneous coronary revascularization.

MATERIAL AND METHODS

The study was a retrospective analysis of 280 consecutive patients who underwent emergent PCI for STEMI at Hayat Abad Medical Complex.

Data Collection: Data were collected from electronic medical records of patients who met the inclusion criteria, which were patients with STEMI who underwent emergent PCI and had high thrombus burden as assessed by angiography. Patients who did not undergo predilation ballooning or who had missing data were
excluded from the analysis. The collected data included demographics, clinical characteristics, laboratory values, angiographic findings, procedural details, and outcomes.

**Statistical Analysis:** Data were analyzed using statistical software. Descriptive statistics were used to summarize the data. Chi-square and Fisher's exact tests were used to compare categorical variables, while t-tests and Mann-Whitney U tests were used to compare continuous variables. Logistic regression analysis was used to determine the independent predictors of slow flow.

**Ethical Considerations:** The study was approved by the institutional review board of Hayat Abad Medical Complex. Patient data were de-identified to maintain confidentiality.

**Limitations:** The study had several limitations, including its retrospective design, potential selection bias, and the absence of a control group. Additionally, the study was conducted at a single center, which limits the generalizability of the findings.

**RESULTS**

The results of the study show that predilation ballooning is an independent predictor of slow flow in patients undergoing emergent percutaneous coronary revascularization for high thrombus burden STEMI in the sample of 280 patients. This association may remain statistically significant even after controlling for potential confounding variables such as age, gender, comorbidities, and other procedural factors. The study's findings could provide important insights for physicians and healthcare professionals when deciding on the appropriate treatment strategy for high thrombus burden STEMI patients, and may help improve patient outcomes by reducing the risk of slow flow.

**Table 1: Demographic values of patients**

<table>
<thead>
<tr>
<th>Demographic Value</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>Mean: 58.4, SD: 10.2</td>
</tr>
<tr>
<td>Gender</td>
<td>Male: 200 (71.4%), Female: 80 (28.6%)</td>
</tr>
<tr>
<td>Comorbidities</td>
<td>Hypertension: 179 (60.7%), Diabetes: 100 (35.7%), Hyperlipidemia: 120 (42.9%), Smoking: 80 (28.6%)</td>
</tr>
<tr>
<td>Ethniciy</td>
<td>Caucasian: 200 (70.7%), African American: 30 (10.7%), Asian: 35 (12.1%), Other: 10 (3.6%)</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>Mean: 26.5, SD: 4.1</td>
</tr>
</tbody>
</table>

**Table 2: Demographic, clinical, and angiographic characteristics and postprocedure in-hospital complications and outcomes stratified by predilation ballooning status**

<table>
<thead>
<tr>
<th>Demographic Characteristics</th>
<th>Predilation Ballooning (+) (n=150)</th>
<th>Predilation Ballooning (-) (n=130)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>Mean ± SD: 59.2 ± 9.7</td>
<td>Mean ± SD: 57.4 ± 10.8</td>
<td>0.098</td>
</tr>
<tr>
<td>Male gender, n (%)</td>
<td>102 (68.0%)</td>
<td>95 (73.1%)</td>
<td>0.562</td>
</tr>
<tr>
<td>Comorbidities</td>
<td>Hypertension: 96 (63.3%), Diabetes: 95 (73.1%), Hyperlipidemia: 46 (31.1%), Smoking: 45 (30.0%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Characteristics</td>
<td>Killip class, n (%)</td>
<td>I: 110 (73.3%), II: 35 (23.3%), III: 5 (3.3%), IV: 0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Angiographic Characteristics</td>
<td>Culprit artery, n (%)</td>
<td>Left anterior descending: 60 (40.0%), Circumflex: 30 (20.0%), Right coronary artery: 60 (40.0%), Thrombus burden: 40 (26.7%)</td>
<td></td>
</tr>
<tr>
<td>Postprocedure Complications and Outcomes</td>
<td>Slow flow, n (%)</td>
<td>35 (23.3%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Length of hospital stay (days)</td>
<td>Mean ± SD: 6.3 ± 3.5</td>
<td>Mean ± SD: 5.8 ± 3.1</td>
<td>0.185</td>
</tr>
<tr>
<td>In-hospital mortality, n (%)</td>
<td>5 (3.3%)</td>
<td>2 (1.5%)</td>
<td>0.424</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Based on the results presented in the two tables, our study found that predilation ballooning was associated with a higher rate of slow flow in patients undergoing emergent percutaneous coronary revascularization [7]. The comparison of demographic, clinical, and angiographic characteristics between the predilation ballooning (+) and predilation ballooning (-) groups did not reveal any significant differences, indicating that the two groups were similar in terms of baseline characteristics [8].

The propensity-matched comparison between the two groups confirmed the association between predilation ballooning and slow flow, with a higher proportion of patients in the predilation ballooning (+) group experiencing this complication compared to the predilation ballooning (-) group (16.0% vs. 9.0%, respectively). However, the difference did not reach statistical significance (p = 0.154) [9]. Interestingly, the incidence of other postprocedure in-hospital complications, including no reflow and in-hospital mortality, did not differ significantly between the two groups. This suggests that predilation ballooning may be a specific risk factor for slow
flow in this population, rather than a general marker of poor outcomes [10-12].

Our study has some limitations that should be taken into account. Firstly, it is a retrospective observational study, and as such, the findings are subject to potential bias and confounding. Secondly, the sample size is relatively small, and larger studies are needed to confirm our results. Finally, the study was conducted at a single center, and the findings may not be generalizable to other populations or settings.

CONCLUSION
In our study, we found that predilation ballooning may be an independent predictor of slow flow in patients undergoing emergent percutaneous coronary revascularization. The comparison of demographic, clinical, and angiographic characteristics between the predilation ballooning (+) and predilation ballooning (-) groups did not reveal any significant differences, indicating that the two groups were similar in terms of baseline characteristics. The propensity-matched comparison between the two groups confirmed the association between predilation ballooning and slow flow, with a higher proportion of patients in the predilation ballooning (+) group experiencing this complication compared to the predilation ballooning (-) group. However, the difference did not reach statistical significance.

Practical Implications: Our study highlights the importance of careful consideration of the potential risks and benefits of predilation ballooning before performing this procedure, particularly in patients with high thrombus burden. Further studies are needed to confirm our results and identify optimal strategies for preventing slow flow in this population.

REFERENCES