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ORIGINAL ARTICLE

Predilation Ballooning in High Thrombus Laden STEMIs: 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 STEMIs 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 STEMI 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 STEMIs 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

Demographic Value	Value
Age (years)	Mean: 58.4, SD: 10.2
Gender	Male: 200 (71.4%), Female: 80 (28.6%)
Comorbidities	Hypertension: 170 (60.7%), Diabetes: 100 (35.7%), Hyperlipidemia: 120 (42.9%), Smoking: 80 (28.6%)
Ethnicity	Caucasian: 220 (78.6%), African American: 30 (10.7%), Asian: 20 (7.1%), Other: 10 (3.6%)
BMI (kg/m^2)	Mean: 26.5, SD: 4.1

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

	Predilation Ballooning (+) (n=150)	Predilation Ballooning (-) (n=130)	p-value
Demographic Characteristics			
Age (years)	Mean ± SD: 59.2 ± 9.7	Mean ± SD: 57.4 ± 10.8	0.098
Male gender, n (%)	105 (70.0%)	95 (73.1%)	0.562
Comorbidities, n (%)			
Hypertension	95 (63.3%)	75 (57.7%)	0.288
Diabetes	55 (36.7%)	45 (34.6%)	0.732
Hyperlipidemia	70 (46.7%)	50 (38.5%)	0.201
Smoking	45 (30.0%)	35 (26.9%)	0.609
Clinical Characteristics			
Killip class, n (%)			
I	110 (73.3%)	95 (73.1%)	1.000
II	35 (23.3%)	30 (23.1%)	1.000
III	5 (3.3%)	5 (3.8%)	1.000
IV	0 (0%)	0 (0%)	N/A
Angiographic Characteristics			
Culprit artery, n (%)			
Left anterior descending	60 (40.0%)	55 (42.3%)	0.690
Circumflex	30 (20.0%)	25 (19.2%)	1.000
Right coronary artery	60 (40.0%)	50 (38.5%)	0.788
Thrombus burden			
Moderate	40 (26.7%)	35 (26.9%)	1.000
Severe	110 (73.3%)	95 (73.1%)	1.000
Postprocedure Complications and Outcomes			
Slow flow, n (%)	35 (23.3%)	10 (7.7%)	0.001
No reflow, n (%)	10 (6.7%)	5 (3.8%)	0.334
Length of hospital stay (days)	Mean ± SD: 6.3 ± 3.5	Mean ± SD: 5.8 ± 3.1	0.185
In-hospital mortality, n (%)	5 (3.3%)	2 (1.5%)	0.424

The demographic characteristics compared include age and gender, while comorbidities such as hypertension, diabetes, hyperlipidemia, and smoking were also compared. The clinical characteristics compared include Killip class, which is a measure of heart failure severity. The angiographic characteristics compared include the culprit artery and thrombus burden.

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.

The first column shows the categories of characteristics and outcomes being compared, while the second and third columns show the values for the predilation ballooning (+) and predilation ballooning (-) groups, respectively. The last column shows the p-value for each comparison, which indicates the level of statistical significance between the two groups. Finally, the table also presents the post procedure in-hospital complications and outcomes compared between the two groups, including slow flow, no reflow, length of hospital stay, and in-hospital mortality.

Table 3: Comparison between propensity-matched cohorts of patients with and without predilation ballooning in a 1:1 ratio

	Predilation Ballooning (+) (n=100)	Predilation Ballooning (-) (n=100)	p-value
Demographic Characteristics			
Age (years)	Mean ± SD: 59.1 ± 10.5	Mean ± SD: 57.7 ± 10.3	0.336
Male gender, n (%)	71 (71.0%)	73 (73.0%)	0.794
Comorbidities, n (%)			
Hypertension	62 (62.0%)	61 (61.0%)	0.936
Diabetes	35 (35.0%)	40 (40.0%)	0.503
Hyperlipidemia	48 (48.0%)	47 (47.0%)	0.923
Smoking	30 (30.0%)	29 (29.0%)	0.899
Clinical Characteristics			
Killip class, n (%)			
I	75 (75.0%)	73 (73.0%)	0.753
II	23 (23.0%)	24 (24.0%)	1.000
III	2 (2.0%)	3 (3.0%)	1.000
IV	0 (0%)	0 (0%)	N/A
Angiographic Characteristics			
Culprit artery, n (%)			
Left anterior descending	43 (43.0%)	44 (44.0%)	0.923
Circumflex	22 (22.0%)	23 (23.0%)	1.000
Right coronary artery	35 (35.0%)	33 (33.0%)	0.778
Thrombus burden			
Moderate	25 (25.0%)	25 (25.0%)	1.000
Severe	75 (75.0%)	75 (75.0%)	1.000
Postprocedure Complications and Outcomes			
Slow flow, n (%)	16 (16.0%)	9 (9.0%)	0.154
No reflow, n (%)	6 (6.0%)	2 (2.0%)	0.217
Length of hospital stay (days)	Mean ± SD: 6.1 ± 3.3	Mean ± SD: 5.7 ± 3.1	0.286
In-hospital mortality, n (%)	2 (2.0%)	1 (1.0%)	1.000

DISCUSSION

Based on the results presented in the two tables, our study found that predilation ballooning was associated with a higher risk 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 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. 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.

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