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Original Article

Frequency of Incomplete ST Segment Resolution After Successful Primary Percutaneous Coronary Intervention

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ABSTRACT

The success of primary Percutaneous Coronary Intervention (PCI) can be verified on electrocardiogram through measuring ST Resolution (STR) and examination if their angiogram. **Objective:** The purpose of this research was to identify instances of after the primary PCI of partial STR and to investigate the characteristics associated with incomplete STR following primary PCI. **Methods:** At department of Interventional Cardiology of National Institute of Cardiovascular Disease (NICVD), Karachi, Pakistan, this Descriptive Cross-sectional study was conducted. The inclusion criteria set for data collection were patients with age between 18 to 65 years of both genders presented with complain of chest pain 12 hour previously and now diagnosed with acute STEMI, and undergoing successful primary PCI were included in the study. **Results:** Out of 196 patients, male was 74.5% while female were 25.5%. The Mean age of patients was 52.78±7.81 years. Out of 196 patients, with acute STEMI, 35.2% (69) had Incomplete STR after a successful primary PCI. When applying chi square on study variables with Incomplete STR after a successful primary PCI was found to be not associated with patient's baseline characteristics. **Conclusions:** Our research discovered that a considerable proportion of patients with STEMI have Incomplete STR after first PCI. However, no correlation between STR and baseline patient characteristics was observed.

INTRODUCTION

Highest affecting rate in both developed and developing countries worldwide of Coronary artery disease (CAD) [1]. Among all the types of CAD, STEMI is regarded as the most dangerous and life threaten factor [2]. In cluster of available treatments, PPCI is the first choice for patients with STEMI [3]. However, the success of PCI can be verified on electrocardiogram through measuring ST Resolution (STR) and examination if their angiogram. Currently, the elevation of ST-segment in the ECG is known to be the classical hallmark, also considered necessary criteria to identify the patients with chest pain who in dire need coronary vascularization [4]. The initial ECG suited for assessing STR after primary PCI is generally performed on the coronary care unit (CCU) as shown in figure 1. It may take anything from 30 minutes after PCI to another 30 minutes or perhaps many hours after being admitted to the CCU [5]. According to the research, various measures of myocardial perfusion other than STR perform less good than STR after 30 minutes after PCI [6]. In STR, the good blood supply to the epicardium does not always mean sufficient blood flow to the myocardium [7]. Therefore, monitoring of STR after successful direct PCI may be the most appropriate way to confirm coronary arteries suppling blood properly [8]. Despite the success of initial PCI, most patients still show

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poor symptoms of myocardial perfusion, manifested by a continuous ST segment increase and incomplete removal of STR Elevation. After PCI, the presence or absence of STRs is an important indication of left ventricular dysfunction and poor clinical outcome [9]. Monitoring STR after successful primary PCI for optimal perfusion in the cardiac micro vessels is the most convenient way [10]. Recent studies have shown that STR is a useful prognostic factor for late revascularization and myocardial infarction recurrence rate, but it does not predict long-term mortality in STEMI patients following PPCI [11]. In several studies, complete STR is defined as ST-segment decline of more than 70% of pre-PCI ST-segment elevation. The angiographic surrogate for myocardial perfusion are two commonly accessible procedures, namely recovery of electrocardiographic STR and restoration of normal myocardial blush (MB) [12]. According to current understanding, resolution or recovery of the ST-segment after reperfusion treatment indicates successful microvascular perfusion of cardiac tissue salvaging myocardium [13]. Numerous thrombolytic investigations have provided the most conclusive evidence for STR's predictive usefulness. [14]. However, significant variations in the degree of epicedial blood flow restoration were detected between PPCI and thrombolysis: 60% with thrombolysis versus close to 95% with PPCI, as well as the rate of blood flow restoration [15]. The purpose of this research was to identify instances of incomplete STR after primary PCI and to investigate the characteristics associated with incomplete STR during primary PCI.

METHOD

Study was conducted at Department of Interventional Cardiology at National Institute of Cardiovascular Disease (NICVD), Karachi, Pakistan as descriptive cross-sectional. WHO sample size calculator version 2.0 were used and total 196 patients were included to determine the frequency of incomplete ST-segment elevation resolution 95% confidence interval, 7% of margin of error and 49.4% of expected prevalence were targeted. P value 0.005 were considered significant. Non-probability, and consecutive sampling technique were used for data collection. The inclusion criteria set for data collection were patients with age between 18 to 65 years of both genders presented with complain of chest pain 12 hour previously and now diagnosed with acute STEMI, and undergoing successful primary PCI were included in the study. Whereas patients who had previous history of any cardiac related surgery were excluded from the study. Prior to sampling or data collection, the study was approved by the ethical review committee of NICVD, Karachi, Pakistan. Research questionnaire was pre-designed in which the demographic profile of the patients such as age, gender, smoking status, hypertension, family history and diabetes mellitus of CAD were retrieved. A verbal informed permission was obtained from each participant before the study's participation by outlining its goals, methods, dangers, and benefits. All PCI operations were documented by a consultant cardiologist with more than 5 years of experience. Patients were pre-treated with aspirin and a second oral antiplatelet drug, such as clopidogrel or ticagrelor, while post PCI angiography and ECG (before the operation & after 30 minutes of procedure) were conducted by competent cardiologists and personnel. STEMI was classified as per the defined operational definition. Incomplete STR was recorded for the selected patients. Strictly following inclusion and exclusion criteria was controlled for confounding variables and biases. The collected data was analysed in SPSS version-21. P-values of less than five percent were considered statistically significant. Pie-charts were employed for the visual representation of data.

RESULTS

We recruited a total of 196 patients of either gender i.e., male or female with the age of 18 years to 65 years. Out of 196 patients, 74.5% were male and 25.5% were female. The Mean age of patients was 52.78±7.81 years. The Descriptive statistics of age and further stratified in groups into frequency and Percentages presented in Table 1. Among all study subjects, 27.6% with diabetes mellitus, 51.5% with hypertension, 29.1% were smokers, and 9.2% had family history of CAD. The data revealed that people with hypertensive were more prone to CAD. Out of 196 patients, with acute STEMI, 35.2% (69) had Incomplete STR after a successful PCI. Incomplete STR after a successful PCI was found to be not associated with patient's baseline characteristics and family history of CAD. Among total study subjects, 27.6% with diabetes mellitus, 51.5% with hypertension, 29.1% were smokers, and 9.2% had family history of CAD. The STR by Different Patient Characteristics is presented in Table 1.

S. No.	CHARACTERISTICS	PRESENT (Frequency %)	ABSENT (Frequency %)
1.	Age	45.09 ± 3.5	47.03 ± 3.7
2.	Diabetes Mellitus	142 (72.4%)	54 (27.6%)
3.	Hypertension	95 (48.5%)	101 (51.5%)
4.	Smoking	139 (70.9%)	57 (29.01%)
5.	Family History of CAD	178 (90.8%)	18 (9.2%)

Table 1: Descriptive statistics of 196 study patients of STR

The initial ECG suited for assessing STR after primary PCI is generally performed on the coronary care unit (CCU) as shown in figure 1.

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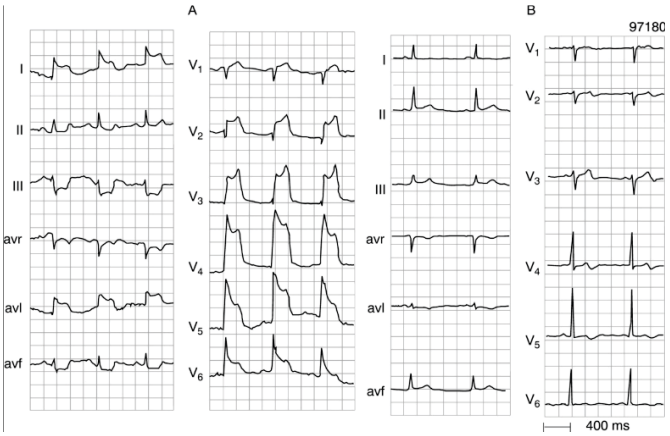

Figure 1: ECG showing ST elevations in leads V1, V2, V3, V4, V5, V6 and 1, aVL before PPCI (A) and ST segment resolution after PPCI (B)

When applying chi square on study variables with Incomplete STR after a successful primary PCI was found to be not associated with patient's baseline characteristics and family history of CAD. The STR by Different Patient Characteristics along with their p values are presented in Table 2. Although the very low incidence rate of incomplete STR among male, Age 18 to 50%, nondiabetic, non-hypertensive, non-smoker and with no family history of CAD were predicted as shown in table 2. It can be resulted that study variables do not influence in incomplete STR.

Variables	Incomplete ST-Segment Resolution		p-value
	Present	Absent	
	n (%)	n (%)	
Gender			
Male	49 (33.60%)	97 (66.4%)	0.411**
Female	20 (40%)	30 (60%)	
Age Group			
18 to 50 years	30(34.1%)	58 (65.9%)	0.768**
51 to 65 years	39 (36.1%)	69N(63.9%)	
Diabetes Mellitus			
Yes	22 (40.7%)	32 (59.3%)	0.317**
No	47 (33.1%)	95 (66.9%)	
Hypertension			
Yes	38 (37.6%)	63 (62.4%)	0.465**
No	31 (32.6%)	64 (67.4%)	
Smoking			
Yes	24 (42.1%)	33 (57.9%)	0.195**
No	45 (32.4%)	94 (67.6%)	
Family History of CAD			
Yes	6(33.3%)	12 (66.7%)	0.862**
No	63 (35.4%)	115 (64.6%)	
Chi Square Test was applied.			
P-value≤0.05 considered as significant.			
**Not significant at 0.05 level.			

Table 2: Statistical Stratification among study variables and study outcome of 196 patients

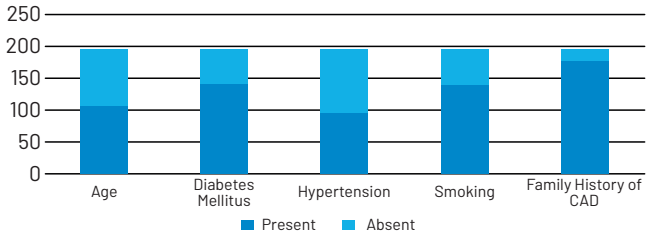

Figure 2: The demographic information about the 196 patients. The frequency and the distribution of 196 patients on the basis of Gender, Age, Diabetes Mellitus, Hypertension, Smoking and CAD.

DISCUSSION

The baseline characteristics of the patients were statistically analysed and the results showed that STR is not associated with initial characteristics of the patients, age, gender, diabetic mellitus, family history and hypertension. For a long time, the use of STR as a diagnostic tool in STEMI has been established in an age of thrombolytic therapy [16]. The role of STR in the current PCI era is not well understood due to the limitations of previous PCI studies, including the use of irregular stents, lack of information on drug-filled stents, lack of standardization of ECG time after reperfusion, and relatively short follow-up time [3]. STR has been proved to be a stronger predictive predictor than epicardial blood flow recovery, as seen in our findings. As a result, STR may be a useful early-stage marker for predicting the outcome of AMI patients. The majority of trials assessed STR effect on clinical, angiographic, and outcome measures 30–120 minutes after PCI [8-9]. In 2009 Park S, et al., conducted study on "clinical predictors of incomplete STR in the patients with acute ST segment elevation myocardial infarction". Beside other study variables age, gender, hypertension, diabetes mellitus, and tobacco smoker were similar with our study. Age, gender, diabetes mellitus, tobacco smoker has no significant difference in partial, complete and incomplete STR. However, hypertension reflect higher significance with p value of <0.004 in incomplete STR group which contrast the statement of our study [17]. Similarly, another study was conducted in 587 patients to determine the magnitude of STR with an Acute Myocardial Infarction (AMI) after thrombolytic therapy (streptokinase) resulted in successful STR in short- and long-term outcomes [18]. It has been said that more than 90 mins of ST segment analysis is associated with reperfusion which leads to induced cell death. However, for that cause, we evaluated STR for 30 min after PCI. Another hypothesis contends that TIMI blush grading may be used to assess myocardial perfusion following PPCI. Longer angiographic recordings need to be made in order for blush grade analysis to be possible. Since our goal was to investigate ST-segment resolution and there was no specific procedure for

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angiographic examination, we examined TIMI flow in sub epicardial arteries [19]. In our study we divided age into two group i.e. 18 to 50 years and 51 to 65 years and found out age has not effect in incomplete STR. Similar result was declared by Prasad A, et al, they divided the Age in 4 categories which evaluated in respect of mortality as well. As per their study findings age of patient significantly effect in partial and complete STR but in incomplete STR no association was predicted (p value 0.33) [20]. In Iraq, the most recent study was conducted for evaluating the factors that are associated with incomplete ST segment elevation. The association of above-mentioned factors in the population of Iraq shows that geographically the diseases vary and the may be genetic and environmental factors are also causing the variation in the symptoms and factors [21].

CONCLUSIONS

Our study showed a significant number of patients presented with STEMI had Incomplete STR after primary PCI. However, no association was found between STR and patient's baseline characteristics. It is important to identify factors affecting STR to improve the outcomes of STEMI.

Conflicts of Interest

The authors declare no conflict of interest.

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