ARTICLE

OUTCOME OF PRIMARY PERCUTANEOUS CORONARY INTERVENTION IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASES IN CENTRAL IRAN, ISFAHAN

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ABSTRACT

It is still unclear whether chronic obstructive pulmonary disease (COPD) has an impact on the outcome of patients with ST-segment elevation myocardial infarction (STEMI) who underwent primary percutaneous coronary intervention (PCI). Accordingly, the present study aimed to evaluate the incidence of COPD in patients with ST-segment elevation myocardial infarction who underwent primary PCI and also its role to predict short -term and long -term clinical outcome in these patients following primary PCI. In this prospective study, 336 patients with acute STEMI undergoing primary PCI at our institute were consecutively included into the study. Of the 336 patients recruited in this study, 45 (13.4%) fitted the criteria of COPD. Both in-hospital and one-year cumulative mortality rates were higher in COPD than in non-COPD groups; however the length of stay in hospital did not differ between them. Among long-term cardiac events, the incidences of recurrent MI and readmission for heart failure were significantly higher in COPD than in non-COPD group. Univariate Cox regression analysis demonstrated that the baseline variables, including advanced age, female gender, and the presence of diabetes mellitus as well as COPD were strongly predictive one-year MACE. In multivariable Cox analysis, COPD showed a strong positive correlation with one-year MACE. In conclusion, COPD is an independent predictor of one-year MACE for patients with STEMI undergoing primary PCI.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a common finding in patients with ischemic cardiac events and also can be frequently occurred following cardiac revascularization [1-3]. This clinical condition can result in high mortality and morbidity for hospitalized patients in various disease settings and it has been demonstrated to be cause of surgery-related life-threatening evens in those with acute myocardial infarction (AMI). COPD is a chronic inflammatory phenomenon involving only the lung parenchyma and is also accompanied with increased level of circulating inflammatory biomarkers, including cytokines and C‑reactive protein [4-6]. Because various types of disorders such as cardiovascular diseases have an inflammatory basis, the occurrence of COPD as an underlying event may affect the severity and extension of the diseases [7, 8]. Of particular importance is that ischemic heart disease has been reported to be a leading cause of death in patients with COPD [9, 10]. Indeed, the similarity between cardiovascular diseases and COPD are noteworthy [11, 12]. Recent clinical studies have revealed that cardiac ischemic event and COPD tend to coexist and share similar prevalence in the population [13-16]. Additionally, coronary artery disease (CAD) has been shown to be the main cause of death in COPD patients [17, 18]. COPD has been identified as an independent predictor of death after MI [7,19‑22]; however, a number of patients suffered MI is scheduled for undergoing primary percutaneous coronary intervention (PCI) as a well-recognized therapeutic strategies for reducing long‑term poor outcome in these patients. Hence, it is still unclear whether COPD has an impact on the outcome of patients with ST-segment elevation myocardial infarction (STEMI) who underwent primary PCI. Accordingly, the present study aimed to evaluate the incidence of COPD in patients with ST-segment elevation myocardial infarction who underwent primary PCI and also its role to predict short‑term and long‑term clinical outcome in these patients following primary PCI.

MATERIALS AND METHODS

In this prospective study, 336 patients with acute STEMI undergoing primary PCI at our institute were consecutively included into the study. The main inclusion criteria were the experience of acute ST-segment elevation myocardial infarction that led to primary PCI within 12 hours. All patients gave written informed consent for primary PCI. Detailed in-hospital and follow- up data including age, gender, coronary risk factors, Killip score on admission, peak level of creatine phosphokinase (CPK), arrival time, duration from puncture to first balloon inflation, reperfusion time, duration of procedure, pre- and post-PCI TIMI flow grades, angiographic results, number of diseased vessels, in-hospital adverse events, and in-hospital mortality were collected from hospital recorded files and were prospectively entered into a digital database. In definition, STEMI was defined as typical chest pain lasting for more than 30 minutes plus ST-segment elevation > 1 mm in two consecutive precordial or inferior leads or typical chest pain lasting for

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more than 30 minutes with a new onset complete left bundle branch block. COPD was defined based on one of the following criteria: (1) the need for pharmacologic therapy using bronchodilator agent; (2) Past history of a 1-second forced expiratory volume < 70% of the predicted value (by pulmonary function test); (3) physical examination that showed expiratory wheezing and further confirmed by blood gas and chest radiograph; or (4) current use of bronchodilators prior to STEMI. In this context, of the 336 patients recruited in this study, 45 (13.4%) fitted the criteria of COPD.

Results were presented as mean ± standard deviation (SD) for quantitative variables and were summarized by frequency (percentage) for categorical variables. Continuous variables were compared using t test or Mann-Whitney U test whenever the data did not appear to have normal distribution or when the assumption of equal variances was violated across the study groups. Categorical variables were, on the other hand, compared using chi-square test. Univariate Cox regression analysis was utilized to determine correlations between COPD and one-year MACE defined as occurring at least one of these events: mortality, recurrent MI, or admission because of heart failure. Hazard ratio (HR) for this time was used using multiple Cox- regression analysis only parameters with a value of $p < 0.1$ in univariate analysis were evaluated. For the statistical analysis, the statistical software SPSS version 20.0 for windows (SPSS Inc., Chicago, IL) was used. P values of 0.05 or less were considered statistically significant.

RESULTS

Comparing two groups with and without COPD showed that the patients in former group were older, but other baseline parameters including the gender, risk factors of CAD, and the incidences of previous ischemic events were similar in the two groups. Electrocardiographic assessment showed also no difference in infarction location between them. However, the peak levels of cardiac enzymes level were remarkably higher in COPD. In addition, LVEF was notably lower in group with COPD patients than those without COPD. The incidences of current medical use, including beta-blockers, calcium-channel blockers, angiotensin converting enzyme inhibitors/angiotensin II type I inhibitors and statins did not differ between the two groups. Regarding angiographic findings, it was demonstrated similar distribution of infarct-related artery between the two groups. But, those in COPD group had more severe obstruction of the affected artery prior to primary PCI.

Table 1: Baseline characteristics of study patients

Characteristics	COPD (+) (n = 45)	COPD (-) (n = 291)	P-value
Age	68.52 ± 4.45	59.25 ± 8.82	< 0.001
Male gender	43 (95.6)	266 (91.4)	0.847
Hypertension	22 (48.9)	142 (48.8)	0.995
Hyperlipidemia	10 (22.2)	75 (25.8)	0.691
Diabetes	12 (26.7)	72 (24.7)	0.831
Current smoking	23 (51.1)	132 (45.4)	0.666
Previous stroke	6 (13.3)	32 (11.0)	0.683
Previous MI	3 (6.7)	14 (4.8)	0.618
Anterior wall infarction	28 (62.2)	190 (65.3)	0.852
Peak CPK level (unit/L)	3191 ± 2997	2665 ± 2998	< 0.001
Peak CK-MB level (unit/L)	972 ± 2561	648 ± 2137	< 0.001
LVEF (%)	51.4 ± 3.2	56.5 ± 5.8	0.021
Advanced CHF	9 (20.0)	51 (18.2)	0.738
Multi-vessel disease	24 (53.3)	143 (49.1)	0.764
B-blocker utilization	32 (71.1)	198 (68.0)	0.859
Calcium channel blocker Utilization	6 (13.3)	32 (11.0)	0.683
Statin utilization	26 (57.7)	169 (58.1)	0.985
ACE-inhibitor	39 (86.7)	243 (83.5)	0.875

Table 2: Early and late outcome

Characteristics	COPD (+) (n = 45)	COPD (-) (n = 291)	P-value
Length of stay in hospital	11.2 ± 2.2	10.9 ± 3.1	0.224
In-hospital mortality	4 (8.9)	7 (2.4)	0.031
Recurrent MI	2 (4.4)	2 (0.6)	0.035
Re-admission for CHF	8 (17.8)	12 (4.1)	0.004
Cumulative mortality in one year	9 (20.0)	15 (5.2)	0.004
One-year MACE	18 (37.5)	31 (10.7)	< 0.001

Table 3: Multivariate analysis of predictors for MACE

Variable	Hazard Ratio	95% CI	P-value
Age	1.111	1.023 – 1.254	0.032
Male gender	2.214	1.456 – 3.245	0.001
Hypertension	1.147	1.112 – 5.214	0.024
Hyperlipidemia	3.314	1.247 – 6.478	< 0.001
Diabetes	2.789	1.147 – 4.457	< 0.001
Current smoking	1.799	1.144 – 2.247	0.040
Previous stroke	1.478	0.789 – 2.217	0.068

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Previous MI	2.258	1.199 – 4.147	0.002
Anterior wall infarction	3.378	1.478 – 4.994	< 0.001
Peak CPK level (unit/L)	1.547	1.478 – 1.898	0.001
Peak CK-MB level (unit/L)	1.898	1.002 – 4.478	0.002
LVEF (%)	1.478	0.755 – 2.147	0.098
Advanced CHF	1.478	1.132 – 1.775	0.042
Multi-vessel disease	1.478	0.256 – 2.478	0.112
COPD	2.745	1.457 – 3.357	0.025

Regarding PCI outcome, both in-hospital and one-year cumulative mortality rates were higher in COPD than in non-COPD groups; however the length of stay in hospital did not differ between them. In addition, among long-term cardiac events, the incidences of recurrent MI and readmission for CHF were significantly higher in COPD than in non-COPD group. In Univariate Cox regression analysis demonstrated that the baseline variables, including advanced age, female gender, and the presence of diabetes mellitus as well as COPD were strongly predictive one-year MACE. In multivariable Cox analysis, COPD showed a strong positive correlation with one-year MACE.

DISCUSSION

This study investigated the incidence of COPD in patients with STEMI undergoing primary PCI and also to determine the impact of COPD on the prognostic outcome of the patients.

In the setting of STEMI, the incidence of COPD in our population was nearly similar to that in the Eastern and Western population [7, 19-22]. In our study COPD was an independent predictor of short-term mortality and also it was a significant predictor of one-year MACE after adjusting traditional risk factors. The results of previous studies [7, 19-22] could demonstrated that COPD was independently predictive of both short-term and long-term outcome. Our findings, therefore, were consistent with those of the previous studies. These consistent findings between the present studies may be explained by the following reasons. First, the exclusion criteria and the diagnosis of COPD may be identical between our investigation and studies by others. The diagnosis of COPD was obtained from hospital records and questioning the patient or only by 1-second forced expiratory volume < 70% of the predicted value. Second, primary PCI, which was a criterion for study enrollment in the majority of recent studies, was performed in all patients in the present study. Convincing data have established that primary PCI is one of the most effective life-saving procedures that also help in preserving heart function and reducing short-term and long-term mortality in patients after AMI [23-25].

The results of the current study imply that successful primary PCI may confirm the independent influence of COPD on the clinical outcome of patients after AMI. Campo et al. [26] showed that COPD was an independent predictor of mortality and also hospital readmissions for recurrent MI were significantly more frequent in patients with COPD as compared with those without. Also, hospital readmissions for COPD were more frequent in patients with a previous history of COPD as compared with those without. In total, in their study, patients with a hospital readmission for COPD showed a fourfold increased risk of death. In another study by Lazzeri et al. [27] Kaplan-Meier survival curve documented a significantly worse outcome in COPD patients. Also, at multivariate analysis, the following variables were independent predictors for death at follow up: age, GFR, COPD, and discharge left ventricular ejection fraction. In the current study, univariate analysis showed that COPD was strongly associated with MACE and multivariate Cox regression analysis also produces consistent result. These findings suggest that, besides traditional risk factors, COPD was a predictor of clinical outcome in STEMI patients undergoing primary PCI. COPD and CAD are frequently found to share common risk factors such as smoking and inflammation [7,13,14]. This could explain the prevalence of these two disease entities in patients with AMI [15,16]. In summary, COPD is an independent predictor of one-year MACE for patients with STEMI undergoing primary PCI (HR = 2.745, P = 0.025).

CONFLICT OF INTEREST
There is no conflict of interest.

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FINANCIAL DISCLOSURE
None

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