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Original Research Article

Association between the use of renin-angiotensin system blockers and development of in-hospital atrial fibrillation in patients with ST-segment elevation myocardial infarction

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ARTICLE INFO

Article history:
Received 14 May 2015
Received in revised form
19 February 2016
Accepted 29 February 2016
Available online 11 March 2016

Keywords:
Myocardial infarction
Atrial fibrillation
Renin-angiotensin system

ABSTRACT

Background and aim: Atrial fibrillation (AF) is the most common supraventricular arrhythmia following ST-segment elevation myocardial infarction (STEMI). We evaluated the association between use of previous angiotensin converting enzyme inhibitors and/or angiotensin receptor blockers (renin-angiotensin system [RAS] blockers) and started RAS blockers after MI and development of AF in patients presenting with acute STEMI.

Materials and methods: This retrospective study enrolled 1000 patients with acute STEMI who were admitted to the coronary care unit. Patients were divided into groups according to the use of RAS blockers before MI and development of AF rates was compared. Predictors of AF were determined by multiple logistic regression analysis.

Results: Of the 1000 patients presenting with STEMI, 247 received and 753 did not receive RAS blockers. The incidence of AF was 7.9%. The incidence of AF in patients receiving RAS blockers and did not receiving RAS blockers before MI were similar (5.7% vs. 8.6% respectively, $P = 0.13$). On the other hand, AF rate was lower in patients in whom RAS blockers were administered during MI as compared to those in whom these agents were not administered (7.2% vs. 28.6%, $P < 0.001$). Multiple regression analysis results showed that administration of RAS blockers or statins during hospitalization and left atrial diameter were associated with development of AF in patients with acute STEMI.

Conclusions: Previous therapy with RAS blockers does not reduce the incidence of AF in STEMI. Administration of RAS blockers at the hospital may decrease the AF rate in STEMI.

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Peer review under the responsibility of the Lithuanian University of Health Sciences.

Production and hosting by Elsevier

http://dx.doi.org/10.1016/j.medici.2016.02.006

1. Introduction

Atrial fibrillation (AF) is the most common type of arrhythmia in clinical practice, and its prevalence increases with age. Previous studies have shown that the prevalence of AF is less than 0.5% at the age of 40–50 years and increases to 5%–15% at the age of 80 years [1].

Atrial fibrillation is the most common type of the supraventricular arrhythmia occurring after ST-segment elevation myocardial infarction (STEMI), and its prevalence is even higher in elderly patients with heart failure and severe left ventricular impairment [1]. The incidences of stroke and death have been found to be higher in patients who develop AF after STEMI compared to those who do not develop AF. Some conditions such as left ventricular dysfunction, atrial ischemia or infarction, right ventricular infarction, pericarditis, and excessive catecholamine release can be predisposing factors for the development of AF [1].

Statins, omega-3 polyunsaturated fatty acids, angiotensin-converting-enzyme inhibitors, angiotensin receptor blockers and aldosterone antagonists are termed ''upstream'' therapies for the management of atrial fibrillation. These therapies aim to prevent or delay remodeling after myocardial infarction and may prevent the development of new AF (primary prevention), or once established, its rate of recurrence or progression to permanent AF (secondary prevention) [1].

Studies on patients with acute myocardial infarction (MI) and heart failure showed that renin-angiotensin system (RAS) blockers reduce the incidence of new onset AF [2–6]. Studies investigating patients treated with cardioversion showed that angiotensin-converting-enzyme inhibitors facilitate rhythm control and reduce the recurrence of AF [7–10]. In one study, the incidence of AF in patients who received RAS blockers was similar to that in patients who did not receive RAS blockers after cardiac surgery [11]. Another study showed that, the use of RAS blockers was associated with low incidence of postoperative AF [12]. Meta-analyses of randomized studies showed a decreased risk of development of new onset AF associated with RAS blocker therapy [13–15].

In previous studies investigating the development AF after acute MI, RAS blockers were initiated in patients after MI and explored for the development of AF. However, there are no studies in the literature exploring the effects of receiving RAS blockers before MI on the development of AF. Unlike other studies, the aim of our study was to evaluate the effects of angiotensin-converting-enzyme inhibitor and/or angiotensin receptor blocker therapies (RAS blockers) before or after MI on AF in patients presenting with STEMI.

2. Materials and methods

2.1. Study population

The patients who were on follow-up in the coronary intensive care unit with the diagnosis of STEMI were included in the study. A retrospective study design was used in the present study. Approval was obtained from the ethics committee. A total of 1028 patients were included in the study.

The diagnosis of STEMI was based on the presence of at least one of the following criteria: ischemic symptoms with an increase and/or decrease in the cardiac enzyme levels (chest pain longer than 20 min), and significant electrocardiography (ECG) changes (in at least two contagious leads after j point ST-elevation ≥0.2 mV in men, ≥0.15 mV in women in V2-3 leads, or ≥0.1 m in other derivations or new onset left bundle branch block) [16]. The onset time of acute MI was based on the patient-reported onset time.

The exclusion criteria included unstable angina pectoris, non-STEMI, MI occurring after coronary artery bypass graft or invasive cardiac procedures, patients who underwent primary percutaneous coronary intervention, presence of AF on admission, moderate-severe valvular heart disease, hyperthyroidism, advanced chronic obstructive pulmonary disease, sepsis, medical history of malignancy, previous anti-arrhythmic drug use, and the presence of a known severe psychiatric disease. Twenty-eight patients who met the exclusion criteria (hyperthyroidism [$n = 11$], presence of AF upon hospital admission [$n = 7$], severe valvular disease [$n = 5$], primary percutaneous coronary intervention [$n = 4$], and sepsis [$n = 1$]) were excluded from the study.

Patient data including age, gender, time to hospital admission after symptom onset, and cardiac therapies that the patient underwent outside the hospital were recorded. The risk factors for coronary artery disease, previous medical history, presence of arrhythmia and previous medications of the patients were recorded.

Electrocardiography recordings were obtained upon first admission. Subsequent cardiac rhythm monitoring was conducted by continuous monitoring in the coronary intensive care unit and by ECG recordings obtained routinely on a daily basis or upon report of a complaint suggesting arrhythmia. During the follow-up of patients in the cardiology service, cardiac rhythm was monitored by ECG recordings obtained routinely on a daily basis or upon report of a complaint suggesting arrhythmia. The diagnosis of AF was based on the absence of p waves, presence of fine and coarse fibrillation waves, and irregular RR interval.

Sodium, potassium, urea, creatinine, glucose, creatine kinase, creatine kinase-myocardial band and troponin T levels, liver function tests, lipid parameters and complete blood count were retrospectively reviewed.

All patients were treated according to current published guidelines. Routine primary percutaneous coronary intervention was not available at our hospital at the time of patient recruitment. Therefore, patients treated by this method were limited in number, and were excluded from the study.

The patients were divided into groups according to the use of RAS blockers before MI, and the initiation of these therapies after MI.

2.2. Statistical analysis

SPSS version 11 (SPSS Inc., Chicago, IL) software package was used in the statistical analyses of the study. Categorical variables were expressed as frequency (%) and compared with the χ^2 test. A Kolmogorov–Smirnov test was used to test the distribution of numeric variables, and those with normal distribution were expressed as mean ± standard deviation and