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Electrocardiographic findings at presentation, in relation to in-hospital mortality and 30-day outcome of patients with Acute Coronary Syndromes; The GREECS study

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Abstract

Background: We sought to evaluate the impact of initial electrocardiographic findings at presentation on in-hospital mortality and 30-day outcome of patients with acute coronary syndromes (ACS).
Methods: From October 2003 to September 2004, a sample of 6 hospitals located in several urban and rural Greek regions was selected, and almost all survivors 24 h after an admission for ACS were enrolled into the study (2172 patients were included in the study; 76% were men and 24% women). ECG and biochemical indices of myocardial damage were considered in all patients. Electrocardiographic findings at presentation were categorized as ST-elevation (STE), non-STE and non-diagnostic ECG abnormalities.
Results: Of the 2172 patients, 34% had STE, 24% had non-STE and the 32% of them had non-diagnostic ECG abnormalities. After adjusting for age, sex and various other risk factors we observed that patients with STE had 3.3 (95% CI 1.4 to 7.7) higher risk of dying during hospitalization compared to those who had non-diagnostic ECG abnormalities. Furthermore, patients with non-STE had 1.5 (95% CI 0.9 to 2.5) higher risk of having an event (death or re-hospitalization due to CVD) during the first 30-days following discharge as compared to those who had non-diagnostic ECG abnormalities. All patients presented with non-STE ACS had higher 30-day event rates.
Conclusion: Patients with STE had higher in-hospital mortality, but lower longer term event rate after ACS in our population, irrespective of age, gender and other characteristics.

Keywords: Acute coronary syndromes; Risk; ST elevation

1. Introduction

A change in the distribution of the clinical presentation of acute coronary syndromes (ACS) has become evident during the last years. In particular, several investigators have reported that the clinical expression of ACS has been shifted to milder forms like unstable angina, while the mortality among patients with acute myocardial infarction (AMI) is decreasing, and the hospitalized patients have smaller in size infarcts and show lower mortality [1–7]. In the FINMONICA AMI Register Salomaa et al., [1] observed that the numbers of hospitalized AMIs are declining during the 1980s, and this decrease was attributed to the decreased risk-factor levels in the population, as well as in the improved treatment of coronary heart disease and changed hospital admission policy. Similarly, Dauerman et al., [3] studied patients from 16 hospitals of the Worcester, Massachusetts, in USA and observed that the proportion of patients with Q-wave AMI decreased from 52% in late 1980s to 35% in middle 1990s. In line with the previous reports, Rosengren et

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al., [7] from the EUROHEART Acute Coronary Syndrome survey observed that the overall in-hospital mortality in a large survey of ACS patients from 25 countries in Europe and the Mediterranean basin was less than 5%. Moreover, the mean age of ACS patients is growing steadily, emphasizing the need to define the relation of age and gender, on the development of ACS. Even though, the impact of lifestyle characteristics, like physical activity and dietary habits, on clinical presentation and short-term outcome of patients with the whole spectrum of ACS have not been well evaluated [8,9]. Toward this end, we investigated the impact of these characteristics on clinical presentation and hospital outcome in a sample of hospitalized patients with different manifestations of ACS.

2. Methods

2.1. Study population

The GREEk acute Coronary Syndrome (GREECS) study is a national registry of hospitalized patients with ACS. Between October 1, 2003 and September 30, 2004 we enrolled almost all consecutive patients (participation rate = 98%) that hospitalized in the cardiology clinics or the emergency units of six major General Hospitals, in Greece (Hippokration hospital in Athens, and the general hospitals in Lamia, Karditsa, Halkida, Kalamata and Zakynthos island). Thus, 1649 men (65 ± 13 years old) and 523 women (62 ± 11 years old, $p < 0.001$) who were hospitalized for ACS were enrolled into the study. A-posteriori power analysis showed that the number of participants was adequate to evaluate two sided differences between patients' groups, as defined by the ECG findings on admission and the investigated parameters, greater than 20% (±5%), achieving statistical power greater than 0.80 at 5% probability level (p-value).

At entry a 12-lead electrocardiogram (ECG) was performed and clinical symptoms were evaluated by a cardiologist. In 232 patients the initial ECG was low quality and we did not include it in the analysis. Based on the electrocardiographic (ECG) findings patients were classified as having: (a) ST-segment elevations (STE) with a threshold of greater than 0.1 mV on at least two leads (this group also included new LBBB), (b) non-STE with a threshold of at least 0.1 mV ST segment depression or negative T waves, and (c) non-diagnostic ECG abnormalities (old LBBB, atrial fibrillation, paced rhythm, ventricular or supraventricular tachycardia, advanced atrioventricular block). Moreover, blood tests were performed to detect evidence of myocardial cell death. We measured troponin I levels and the MB fraction of total creatinine phosphokinase. According to the Joint European Society of Cardiology and American College of Cardiology Committee, blood samples were obtained on hospital admission, at 6 to 9 h, and again at 12 to 24 h if earlier samples were negative and the clinical index of suspicion was high [10]. We included only patients with discharge diagnoses of ACS (acute myocardial infarction (MI) or unstable angina (UA)). In particular, acute myocardial infarction was defined by typical rise and gradual fall (for troponin) or more rapid rise and fall (for CK-MB) of biochemical markers of myocardial necrosis with at least one of the following: (a) ischemic symptoms, (b) development of pathologic Q waves on the ECG, (c) ECG changes indicative of ischemia (ST segment elevation or depression) or (d) coronary artery intervention (e.g. coronary angioplasty). UA was defined by the occurrence of one or more angina episodes, at rest, within the proceeding 48-h, corresponding to class III of the Braunwald classification [10].

The study was approved by the Medical Research Ethics Committee of our Institution and was carried out in accordance with the Declaration of Helsinki (1989) of the World Medical Association.

2.2. Other characteristics of the participants

With the exception of 15 patients who died during the first 24 h of their admission, a detailed medical history was recorded from all other patients using accurate medical records. Particularly, following established criteria, we recorded previous hospitalization for cardiovascular disease (i.e. coronary heart disease, stroke or other cardiovascular disease), presence and management of hypertension, hypercholesterolemia, renal failure and diabetes mellitus [11]. Height and weight were measured, to the nearest 0.5 cm and 100 g respectively. Body mass index (BMI) was then calculated as weight (in kilograms) divided by height (in meters) squared. Overweight was defined as BMI between 25 and 29.9 kg/m^2, while obesity as BMI greater than 29.9 kg/m^2. Socio-demographic characteristics were included: age, gender, year of school, and mean annual income of the family (through self reports) during the last three years. Current smokers were defined as those who smoked at least one cigarette per day or have stopped cigarette smoking during the past 12 months. Former smokers were defined as those who had stopped smoking more than one year previously. The rest of them were defined as never or rare smokers. To evaluate physical activity status of the patients during the past year we used a modified version of a self-reported questionnaire provided by the American College of Sports Medicine [12]. Based on this questionnaire we assessed the frequency (times per week), duration (in minutes per time) and intensity of sports or occupation related physical activity. Participants who did not report any physical activities were defined as sedentary. For the rest of the participants we calculated a combined score by multiplying the weekly frequency, duration and intensity of physical activity. The evaluation of the nutritional habits was based on a semi-quantitative food frequency questionnaire developed for the study. The consumption of certain food items (non-refined cereals and products, fruits and nuts, pulses, vegetables, olive oil, non-fat or low-fat dairy, fish,