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ORIGINAL ARTICLE

Characteristics and Survival Determinants in Patients After Out-of-Hospital Cardiac Arrest in The Era of 24/7 Coronary Intervention Facilities

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Background Survival rates and outcomes after out-of-hospital cardiac arrest (OHCA) remain low despite investments of time and money.
The goal of this analysis was to identify variables related to survival of patients transferred to our coronary care unit (CCU) after an OHCA.

Methods 102 consecutive OHCA patients, mean age 64.6 (SD 13.3), 70.6% men, between January, 2011 and December, 2013, who were transferred to our tertiary care CCU, were studied.

Results Cardiac-cause OHCA was present in 84 patients (82.4%). Of these 60.7% had an acute coronary syndrome (ACS) – STEMI 35.7%; NSTEMI 23.8%. Coronary angiography was performed in 73 (71.6%) patients – 81% with cardiac- and 31.3% (5/16) with a non-cardiac cause. Percutaneous coronary intervention (PCI) was performed in 50 patients (68.5%), 49 with cardiac-cause, and succeeded in 92%. In-hospital mortality was 38.2%, one-year mortality was 51.5%. In-hospital and one-year mortality were related to age ($p = 0.002$ resp. $p = 0.001$), first ECG rhythm ($p = 0.001$, resp. $p = 0.005$), history of coronary artery disease (RR 2.1; $p = 0.026$ resp. RR 1.71; $p = 0.029$), and history of arrhythmia (supraventricular tachyarrhythmia, bradyarrhythmia) (RR 2.74; $p = 0.003$ resp. RR 2.3; $p = 0.001$). One-year mortality was also related to a history of diabetes mellitus (RR 1.89; $p = 0.006$).

Conclusion Cardiac-cause was the most common cause of OHCA. Acute coronary syndrome was present in more than half of the cases. Availability of interventional facilities was a crucial factor in OHCA management. A history of coronary artery disease, diabetes mellitus, and arrhythmia were associated with worse survival.

Keywords Out-of-hospital cardiac arrest • Acute coronary syndrome • Coronary angiography • Echocardiography • Survival • Mortality

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Introduction

Q4 Out-of-hospital cardiac arrest (OHCA) is, at present, one of the most challenging medical conditions for intensive care staff. Because of patient heterogeneity and the variety of causes for cardiac arrest, an individual approach is needed. Occurrence of OHCA increases with age, but young adults are not immune [1,11]. The true incidence of OHCA in populations is seldom known because of difficulties with the methodology used to determine the cause of sudden cardiac death. A prospective study in the Maastricht area of the Netherlands reported an annual incidence of OHCA of 90 to 100 cases per 100,000 inhabitants aged 20 to 75 years [2]. The incidence of emergency medical services-treated (EMS) OHCA in Europe is 37.72 per 100,000 person-years [3]. Approximately 70 to 85% of cases of OHCA have a cardiac-related cause [4], and up to 80% are associated with coronary artery disease [5]. Based on the Cardiac Arrest Registry to Enhance Survival (CARES), the mean age of patients after OHCA, with a presumed cardiac aetiology, is 64 years (SD 18.2) and increased age itself presents an independent predictor of prognosis [10]. Despite better access to EMS, automatic external defibrillators in pre-hospital care, and advances in post-resuscitation care (pharmacotherapy, hypothermia, percutaneous coronary interventions, implantable cardioverter defibrillators, extracorporeal life support, etc.), survival rates and outcomes in patients after OHCA remain low [6]. Therefore, OHCA represents a medical challenge and a substantial socio-economic burden.

Limited numbers of studies have focussed on baseline population characteristics and their impact on survival. The goal of this analysis was to identify variables that were significantly related to the survival/mortality of patients after OHCA admitted directly to a coronary care unit (CCU) of a tertiary care institution and compare them to previous studies.

Methods

Patient Population

Consecutive patients, aged over 18 years, who suffered an OHCA between January, 2011 and December, 2013, admitted to the CCU of our tertiary care institution, were studied [12]. The study was conducted according to the Declaration of Helsinki.

Database

Patient data were entered into a preformed database and included baseline characteristics such as: age, sex, BMI, prior medical history (e.g. hypertension, diabetes mellitus (DM), coronary artery disease (CAD), dyslipidaemia, arrhythmia, stroke, smoking history, etc.), initial cardiac rhythm, echocardiographic parameters (estimated ejection fraction, left ventricle end-diastolic diameter, valve disease), coronary angiography findings, percutaneous coronary interventions (success of intervention, type of intervention, TIMI classification after intervention). In-hospital mortality and one-year mortality were followed. Long-term follow-up was available in 101 of 102 patients. One foreign patient was lost to follow-up.

Procedures

Patients treated after OHCA by EMS personnel (usually including a physician), in which cardiac origin was presumed, were transferred directly to a tertiary care institution with a CCU and coronary intervention facilities that were available 24 hours a day, 7 days a week (approximately 2500 procedures/250 primary PCIs annually). Based on the instruction of the attending cardiologist, patients with presumed acute coronary syndrome (ACS) or suspected myocardial ischaemia were admitted directly to the catheterisation laboratory to undergo an emergency coronary angiography. The other patients were admitted to the CCU for an expeditious differential diagnosis and appropriate therapy. Rush exam (Rapid Ultrasound for Shock and Hypotension) was performed within the first minutes after admission; detailed echocardiography was performed within 12 hours after admission. All patients treated at CCU received guideline-based treatment, including mild hypothermia, if not contraindicated.

Statistical Analysis

The Mantel-Cox test was used to evaluate survival relative to observed quantitative parameters. In a comparison of subgroups, the T-test was used for quantitative parameters and the Chi-quadrant test or Fisher's test was used for qualitative parameters.

Analysis of specific subgroups was performed: The subgroup of patients in whom the cause of OHCA was ACS versus the subgroup without an ACS cause; and the subgroup of patients with cardiac-cause OHCA versus non-cardiac-cause OHCA. Kaplan-Meier survival analysis was used to evaluate the mortality in the whole population.

Results

Population

Between January, 2011 and December, 2013, 4984 patients were admitted to the CCU of our institution and 102 patients (70.6% men) had suffered an OHCA. Cardiac arrest was witnessed in 86 patients (84.3%); mean time to return of spontaneous circulation was 19.9 (SD 12.3) minutes.

The mean age of patients was 64.6 (SD 13.3) years, mean BMI of 27.51 (SD 4.15), mean estimated ejection fraction of 39.8% (SD 14.92), and mean diastolic diameter of left ventricle of 52.9 mm (SD 9.45). Most patients (58.8%) had a history of arterial hypertension, 24.5% had a history of diabetes mellitus, and 34.3% were active smokers. Eighteen patients (17.6%) had a history of arrhythmia – atrial fibrillation – 10 patients, sick sinus syndrome – 3 patients, supraventricular tachycardia – 2 patients, atrial flutter – 1 patient, second degree AV block – 1 patient, and third degree AV block – 1

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