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Emergency Percutaneous Coronary Intervention in Post–Cardiac Arrest Patients Without ST-Segment Elevation Pattern

Insights From the PROCAT II Registry

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ABSTRACT

OBJECTIVES In a large cohort of out-of-hospital cardiac arrest (OHCA) patients without ST-segment elevation (STE), the study assessed the relationship between the use of an early invasive strategy and patient outcome.

BACKGROUND Emergent coronary angiogram (CAG) and reperfusion are currently a standard of care in patients resuscitated from an OHCA with ST-segment elevation (STE). However, using a similar invasive strategy is still debated in patients without STE.

METHODS In the absence of an obvious extracardiac cause, for many years our practice has had to perform an emergent CAG in all OHCA patients (STE and no STE) at admission, followed by percutaneous coronary intervention (PCI) when required. All patients' characteristics are prospectively collected in the PROCAT (Parisian Registry Out-of-Hospital Cardiac Arrest) database. Focusing on non-STE patients and using logistical regression, we investigated the association between early PCI and favorable outcome (cerebral performance category 1 to 2 at discharge) and we searched predictive factors for PCI requirement.

RESULTS During the study period (2004 to 2013), we investigated 958 OHCA patients with an emergent CAG. Among them 695 of 958 (73%), mostly male (76%), and average 60 years of age had no evidence of STE on the post-resuscitation electrocardiography. A PCI was deemed necessary in 199 of 695 (29%). A favorable outcome was observed in 87 of 200 (43%) in patients with PCI compared with 164 of 495 (33%) in patients without PCI ($p = 0.02$). After adjustment, PCI was associated with a better outcome (adjusted odds ratio: 1.80 [95% confidence interval: 1.09 to 2.97]; $p = 0.02$). The other predictive factors of favorable outcome were a shorter resuscitation length (<20 min), an initial shockable rhythm, and a lower dose of epinephrine during resuscitation ($p < 0.001$). An initial shockable rhythm (adjusted odds ratio: 2.83 [95% confidence interval: 1.84 to 4.36]; $p < 0.001$) was the sole independent indicator for PCI requirement.

CONCLUSIONS A culprit coronary lesion requiring PCI was found in nearly one-third of OHCA patients without STE. In these patients, emergent PCI was associated with a nearly 2-fold increase in the rate of favorable outcome. These findings support the use of an invasive strategy in these patients, particularly in those resuscitated from a shockable rhythm. (J Am Coll Cardiol Intv 2016;9:1011–8) © 2016 by the American College of Cardiology Foundation.

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ABBREVIATIONS AND ACRONYMS

ACS = acute coronary syndrome(s)

CAG = coronary angiography

CI = confidence interval

CPC = cerebral performance category

ECG = electrocardiography

ICU = intensive care unit

OHCA = out-of-hospital cardiac arrest

OR = odds ratio

PCI = percutaneous coronary intervention

ROSC = return of spontaneous circulation

STE = ST-segment elevation

Current guidelines of the International Liaison Committee on Resuscitation highlight the need for a comprehensive etiological research, focused on reversible causes of out-of-hospital cardiac arrest (OHCA) (1). When return of spontaneous circulation (ROSC) is obtained, finding and treating the cause of the arrest can prevent relapse and subsequent clinical deterioration. Acute coronary syndrome (ACS) is considered a frequent cause of OHCA, and emergent percutaneous coronary intervention (PCI) is associated with improved hospital survival in OHCA patients with ACS (2,3). Recent guidelines therefore recommend that resuscitated patients of presumed coronary cause should undergo emergent coronary angiography (CAG) with subsequent PCI if indicated (4).

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In OHCA patients with ST-segment elevation (STE) on the post-ROSC electrocardiography (ECG), this invasive strategy is widely and routinely applied because an acute coronary occlusion is most often the cause of the arrest and because an early coronary revascularization is associated with a significant clinical benefit. However, patients without evidence of STE on post-ROSC ECG represent the vast majority, ranging from one-quarter to nearly two-thirds of resuscitated OHCA patients. Previous studies have reported variable rates of acute coronary occlusion in this group of patients, ranging between 21% and 53% (5–8). We previously found at least 1 significant coronary lesion requiring PCI in only 26% of patients without STE, as compared with 74 % in patients with STE (3). Whether it is useful to use an immediate invasive strategy in non-STE patients resuscitated from OHCA is debated, as it is associated with multiple logistical and organizational challenges, and because the benefit of emergent PCI on outcome is still debatable in these patients (9,10).

Using the PROCAT (Parisian Registry Out-of-Hospital Cardiac Arrest) registry, we assessed the influence of emergent PCI on outcome in patients without STE on post-resuscitation ECG. In addition, we aimed to identify the characteristics of patients who would mostly benefit from this invasive strategy.

METHODS

STUDY SETTING AND POPULATION. In Paris (France), management of OHCA involves mobile emergency units and fire departments. They cover a population of approximately 6.5 million during the day. Upon witnessed call and in suspected cases of sudden cardiac arrest, the closest emergency unit is dispatched on the scene. Out-of-hospital resuscitation is delivered by an emergency team, which includes at least 1 trained physician in emergency medicine according to the European guidelines (11). Patients in whom ROSC is achieved are then referred to a cardiac arrest center with an intensive care unit (ICU) and coronary intervention facilities available 24 h a day, 7 days a week. According to the Utstein template (12), resuscitated patients with obvious extracardiac causes, such as respiratory failure, brain stroke, metabolic disorder, hemorrhage, or any other noncardiac causes, are explored and treated according to standard critical care procedures. In the absence of an obvious extracardiac cause, patients are admitted directly to the cardiac catheterization laboratory at hospital admission, regardless of clinical and ECG findings. An immediate CAG and a left ventricular angiography are performed using standard techniques. If indicated, a PCI is attempted. After the procedure, patients are admitted to the ICU for supportive treatment including targeted temperature management (13).

DATA ANALYSIS. Patients' data were prospectively entered in the PROCAT electronic registry database that was previously described (3). All eligible cases entered in the database between January 2004 and December 2013 were included in the present analysis. OHCA data were collected according to the Utstein recommendations (12) and included age (according to its median), sex, cardiovascular risk factors (e.g., hypertension, diabetes mellitus, current smoking), location of cardiac arrest, and initial cardiac rhythm (presence of ventricular fibrillation or ventricular tachycardia). The delay between the onset of OHCA and ROSC estimated by the emergency medical service team and the cumulated initial epinephrine dose were classified according to their medians. The post-ROSC ECG pattern, the use of therapeutic hypothermia and occurrence of a post-cardiac arrest shock, previously defined (14), were also noted. Coronary angiographic data were prospectively entered in the database. A coronary lesion resulting in more than a 70% reduction in luminal diameter by visual estimation was considered clinically significant. Considering angiographic aspects, a PCI was attempted if there was an acute coronary artery occlusion or if there was an unstable lesion that could be considered as the cause of cardiac arrest. At the end of the procedure, PCI was deemed successful if it resulted in residual stenosis of <50% with Thrombolysis In Myocardial Infarction flow grade 3.