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Original article

Immediate coronary angiography in survivors of out-of-hospital cardiac arrest without obvious extracardiac cause: Who benefits?

Coronarographie immédiate après arrêt cardiaque préhospitalier sans cause extracardiaque évidente : qui peut en bénéficier ?

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Abstract

Background. – Immediate coronary angiography (iCA) and primary percutaneous coronary angioplasty (pPCI) in patients successfully resuscitated after out-of-hospital cardiac arrest (OHCA) of suspected cardiac cause is controversial. Our aims were to assess the results of iCA, the prognostic impact of pPCI after OHCA, and to identify subgroups most likely to benefit from this strategy.

Methods. – In this single-centre retrospective study, patients aged ≥ 18 years with sustained return of spontaneous circulation after OHCA and no evidence of a non-cardiac cause underwent routine iCA at admission, with pPCI if indicated. Results of iCA, and factors associated with in-hospital survival were analysed.

Results. – Between 2006 and 2013, 160 survivors from OHCA presumed of cardiac origin were included (median age, 60 years; 85% males). iCA showed significant coronary-artery lesions in 75% of patients, and acute occlusion or unstable lesion in only 41%. pPCI was performed in 34% of patients and was not associated with survival by univariate or multivariate analysis ($P = 0.67$). ST-segment elevation predicted acute coronary occlusion in 40%. An initial shockable rhythm was associated with higher in-hospital survival (52% vs. 19%; $P < 0.001$). After initial defibrillation, the first rhythm recorded by 12-lead electrocardiography was highly associated with prognosis: secondary asystole had a very low survival rate (5%, 1/21) despite PCI in 43% of patients, compared to sustained ventricular tachycardia/fibrillation (42%, 15/36) and supraventricular rhythm (71%, 50/70) ($P < 0.001$).

Conclusions. – In our experience, the prevalence of acute coronary occlusion or unstable lesion immediately after OHCA of likely cardiac cause is only 41%. Immediate CA in OHCA survivors, with pPCI if indicated, should be restricted to highly selected patients.

Keywords: Out-of-hospital cardiac arrest; Coronary angiography; Percutaneous coronary intervention; Resuscitation

Résumé

Contexte. – La place de la coronarographie immédiate (iCA) et de l'angioplastie coronaire de première intention (pPCI) chez les patients survivants d'un arrêt cardiaque préhospitalier (ACEH) suspecté de cause cardiaque reste controversée. Les buts de cette

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étude étaient d'évaluer les résultats de la iCA, l'impact pronostique de la pPCI après ACEH et de tenter d'identifier les patients qui pourraient bénéficier au mieux d'une stratégie invasive coronaire immédiate.

Méthodes. – Étude monocentrique rétrospective, dans laquelle les patients de plus de 18 ans, survivants d'un ACEH sans cause extracardiaque évidente, ont eu une iCA avant l'admission en soins intensifs, suivie d'une pPCI si indiquée. Les résultats de l'iCA et les facteurs associés à la mortalité hospitalière ont été analysés.

Résultats. – Entre 2006 and 2013, 160 survivants d'ACEH d'origine cardiaque présumée ont été inclus (âge médian 60 ans ; hommes 85 %). L'iCA a trouvé des lésions coronaires significatives chez 75 % des patients et une occlusion aiguë ou une lésion instable chez 41 %. La pPCI a été réalisée chez 34 % des patients et n'a pas été associée à une meilleure survie en analyse uni et multivariée ($p = 0{,}67$). Le sus-décalage du segment ST a prédit une occlusion coronaire aiguë dans 40 % des cas. Un rythme initial choquable était associé à une meilleure survie hospitalière (52 % vs. 19 % ; $p < 0{,}001$). Après choc électrique initial, le premier rythme à l'électrocardiogramme 12-dérivations était fortement associé à la survie. En cas d'asystolie ou dissociation électromécanique secondaire, la survie était très faible (5 %, 1/21) malgré une pPCI chez 43 % des patients, comparativement à la persistance d'une tachycardie/fibrillation ventriculaire (42 %, 15/36) ou de la restauration d'un rythme supraventriculaire soutenu (71 %, 50/70) ($p < 0{,}001$).

Conclusions. – Dans cette série de patients coronarographiés en urgence après récupération d'un ACEH sans cause extracardiaque évidente, la prévalence de l'occlusion coronaire aiguë ou des lésions instables n'était que de 41 %. Chez les survivants d'un ACEH de cause présumée cardiaque, la coronarographie immédiate doit être réservée à des patients sélectionnés.

Mots clés : Arrêt cardiaque ; Arrêt cardiaque préhospitalier ; Coronarographie ; Angioplastie coronaire ; Défibrillation

1. Introduction

Out-of-hospital cardiac arrest (OHCA) is a leading cause of death in Europe and in the USA. [1–5]. Post-mortem and clinical studies have shown that OHCA is often due to ventricular arrhythmias complicating acute coronary syndrome (ACS) with acute coronary-artery occlusion [6–10]. Therefore, routine immediate coronary angiography (CA) with percutaneous coronary intervention (PCI) when indicated has been advocated in patients who are successfully resuscitated after OHCA [6,7,11]. However, as no randomised trials are available, routine immediate CA in all OHCA survivors, remains controversial [11,12] Immediate CA is recommended in OHCA complicating acute ST-segment elevation myocardial infarction (STEMI) [13,14]. For patients without STEMI, depending on the most recent international guidelines, immediate CA should be either reserved for patients with a strong suspicion of ACS or haemodynamic instability [15,16] or needed in all patients following OHCA of likely cardiac cause [17].

In our department, OHCA survivors with no obvious non-cardiac cause routinely underwent CA upon arrival at the hospital, before intensive care unit (ICU) admission, regardless of the initial rhythm and of no-flow and low-flow durations. This strategy is in accordance with the European Resuscitation Council and the European Society of Intensive Care Medicine 2015 guidelines [17], which emphasised on the "need for urgent coronary catheterisation and percutaneous coronary intervention following out-of-hospital cardiac arrest of likely cardiac cause", although it has been applied several years before their publication. We retrospectively analysed data from consecutive OHCA survivors managed at our department in 2006–2013. Our aims were to evaluate CA findings and the prognostic impact of PCI immediately after successfully resuscitated OHCA, and to identify patients likely to better benefit from immediate CA with PCI if indicated.

2. Methods

2.1. Study design

We conducted a retrospective single-centre study of OHCA survivors admitted between January 2006 and December 2013. The study complied with the Declaration of Helsinki (2008 revision). No informed consent was required from the patients or the next of kin. The two-tailed prehospital management of patients with OHCA in France has been described previously [5,7–9]. Briefly, when a witness calls the medical emergency telephone number to report OHCA, the closest first-response emergency unit is dispatched to the scene, as well as a physician-staffed mobile unit. The first-response unit usually consists of an ambulance staffed by fire-fighters who are trained as emergency medical responders and can start basic life support, perform cardiopulmonary resuscitation (CPR), and deliver cardiac defibrillation using a semi-automatic or automatic external defibrillator (AED), but do not record electrocardiogram (ECG). Upon arrival of the physician-staffed mobile unit, few minutes later generally, a 12-lead ECG is recorded and complete cardio-respiratory support is provided. Patients from our district successfully resuscitated from OHCA were dispatched to four hospitals. CA was not performed in patients with an obvious non-cardiac cause of cardiac arrest such as asphyxia, trauma, electrocution, hypovolemic shock, or stroke. All other OHCA survivors undergo routine CA upon arrival at our centre, irrespective of resuscitation time and even in the absence of clinical and/or ECG data indicating a cardiac cause of the arrest.

2.2. Population

We included consecutive comatose patients aged at least 18 years who were admitted during the study period with sustained return of spontaneous circulation (ROSC) after OHCA and who were immediately taken to the catheterisation laboratory for

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