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Etiologies, clinical features and outcome of cardiac arrest in HIV-infected patients☆·☆☆

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ABSTRACT

Background: Compared to many other cardiovascular diseases, there is a paucity of data on the characteristics of successfully resuscitated cardiac arrest (CA) patients with human immunodeficiency virus (HIV) infection. We investigated causes, clinical features and outcome of these patients, and assessed the specific burden of HIV on outcome.

Methods: Retrospective analysis of HIV-infected patients admitted to 20 French ICUs for successfully resuscitated CA (2000–2012). Characteristics and outcome of HIV-infected patients were compared to those of a large cohort of HIV-uninfected patients admitted after CA in the Cochin Hospital ICU during the same period.

Results: 99 patients were included (median CD4 lymphocyte count 233/mm^3, viral load 43 copies/ml). When compared with the control cohort of 1701 patients, HIV-infected patients were younger, with a predominance of male, a majority of in-hospital CA (52%), and non-shockable initial rhythm (80.8%). CA was mostly related to respiratory cause (n = 36, including 23 pneumonia), cardiac cause (n = 33, including 16 acute myocardial infarction), neurologic cause (n = 8) and toxic cause (n = 5). CA was deemed directly related to HIV infection in 18 cases. Seventy-one patients died in the ICU, mostly for care withdrawal after post-anoxic encephalopathy. After propensity score matching, ICU mortality was not significantly affected by HIV infection. Similarly, HIV disease characteristics had no impact on ICU outcome.

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Conclusions: Etiologies of CA in HIV-infected patients are miscellaneous and mostly not related to HIV infection. Outcome remains bleak but is similar to outcome of HIV-negative patients.

1. Introduction

Widespread use of highly active antiretroviral therapy (HAART) radically improved survival among patients infected with the human immunodeficiency virus (HIV) and has transformed this infectious disease into a chronic one [1,2]. Cardiovascular diseases are nowadays the leading cause of non-HIV related deaths in seropositive patients, resulting from common cardiovascular risk factors, chronic inflammatory response to HIV infection, as well as metabolic adverse effects of HAART. All these pathophysiological elements concur to heart and coronary diseases in HIV-infected patients, and expose them to sudden cardiac death [3,4]. Beyond intrinsic cardiovascular disease, way of life, comorbidities, chronic medication, neurologic or respiratory diseases associated with HIV and subsequent immuno-suppression may lead to multiple other causes of cardiac arrest (CA).

While characteristics of organ failure occurring in HIV-infected patients admitted to the intensive care unit (ICU) are now well-described [5–12], CA has mostly been studied under the light of epidemiology on large databases [13]. Only isolated cases of CA occurring in HIV-infected patients and one small series provided individual details [14], although this information is required for bedside decisions. Thus, to date, available data on epidemiological, clinical and virological characteristics of HIV-infected patients admitted for CA are very scarce. Similarly, etiologies of CA, therapeutic approaches and outcome are poorly known in this specific subgroup of critically ill patients.

As a consequence, we conducted a multicentre retrospective study to determine epidemiology, characteristics, and outcome of CA in HIV-infected patients hospitalized in ICU. In particular, we aimed at describing the prognosis of this dual affection. We also assessed the specific burden of HIV infection on CA by comparing outcome of these patients to matched HIV-uninfected patients.

2. Methods

2.1. Study participants and data collection

As previously described, the Cochin ICU is a tertiary referral centre for CA in Paris, France [15]. Clinical and biological data of all patients admitted after successfully resuscitated CA are prospectively acquired since 2000 according to Utstein style [16]. We retrospectively reviewed all cases of HIV-infected patients who were admitted to the Cochin ICU for successfully resuscitated CA, between January 2000 and May 2012. We also looked for HIV-infected patients admitted for CA in others French ICUs with CA management expertise: 27 university affiliated and general ICUs in France were invited; in each participating centre, one physician from the medical staff was responsible for collecting the retrospective data (see Appendix—acknowledgments for the whole list of contributors). Patients were included in Cochin and in the other centres if a) the patient was admitted to ICU after CA whatever its location, b) HIV infection was already known or discovered during the ICU stay, and c) age was over 18. HIV-positive patients admitted to ICU for another initial reason than CA and/or who experienced an in-ICU CA were not included. Patients were identified through computerized records of the pathology laboratories, ICU charts and search in hospital databases and were included if previous inclusion criteria were fulfilled. HIV infection and CA were determined through a systematic review of the hospital database records, in which HIV disease and CA were identified by the presence of the International Classification of Diseases, 10th Revision, codes B20 and I46—associated diagnosis.

The following clinical and biological data were collected through full review of medical charts: demographic data, clinical parameters, first recordable rhythm, location, no flow and low flow durations, cause and location of CA, hypothermia implementation, HIV-related data (co-morbidities, date of diagnosis, mode of contamination, viral load, CD4 lymphocyte count, HAART treatment, opportunistic infections), onset of post-cardiac arrest shock and pneumonia, length of mechanical ventilation and ICU stay, ICU mortality and hospital discharge status. Post-cardiac arrest shock was defined as a requirement for vasopressors (epinephrine or norepinephrine) lasting more than 6 h despite adequate volemia. Long-term follow-up was assessed for survivors up to the last recordable medical consultation.

Acquired Immuno-Deficiency Syndrome (AIDS) and opportunistic infection were defined according to the 1997 WHO criteria (available at http://www.who.int/hiv/strategic/surveillance/definitions/en/). Combination of HAART was defined as the use of a protease inhibitor or a non-nucleoside reverse transcriptase inhibitor or abacavir, in a regimen including three or more antiretroviral agents.

The investigation was approved by the ethics committee of the French Society of Critical Care Medicine. Informed consent was obtained from each patient or next of kin, and the study protocol conforms to the ethical guidelines of the 1975 Declaration of Helsinki.

2.2. Statistical analysis

Descriptive statistics were reported as medians (with interquartile range) and frequency (percentage) for continuous and categorical variables respectively unless otherwise specified. Baseline characteristics were compared according to HIV status and vital status at ICU discharge using Pearson chi-square test for categorical variables and Mann–Whitney test for continuous variables.

To evaluate the specific burden of HIV disease, we performed a matched comparison between HIV-positive patients and control HIV-negative CA patients of the Cochin database [17] after propensity score matching analysis. We determined the propensity score of HIV status for each patient by conducting a multivariable logistic regression analysis (with HIV status as the dependent variable) including age, gender, CA location, initial shockable rhythm, bystander CPR, duration of resuscitation, therapeutic hypothermia, coronary angiogram and cardiac cause of CA as covariates. We matched patients according to their HIV status using a 1:1 matching procedure without replacement.

All statistical tests were two-sided using a type I error of 0.05 otherwise mentioned. Analyses were performed using Stata 11.1 software (Stata, College Station, TX).

3. Results

Of the 26 solicited ICUs, 24 agreed to participate in the study, and 5 investigators declared no cases during the study period. Data were thus fully available in 20 ICUs, in which centres declared a median number of 3 [1–7] (range: 1–25) patients. Finally, a total of 99 patients were admitted for successfully resuscitated CA during this 12-year period and were included in the analysis. During the same period, 1701 CA patients were admitted to the Cochin ICU and served as controls.

3.1. Baseline characteristics of the HIV infected patients admitted for cardiac arrest

Among the 99 HIV-infected patients resuscitated from CA, characteristics were as follows: age 44 [38–51] years and sex ratio 62/37 male/female. As compared with HIV negative patients, HIV-infected patients were younger with a predominance of male. Sixty-one percent were Caucasians, 38% were of Sub-Saharan African origin, and 1% was from Asia. Co-morbidities were mainly chronic hepatitis virus infection (hepatitis B virus 7 patients, hepatitis C virus 12 patients, dual infections 2 patients), arterial hypertension (n = 15), chronic obstructive pulmonary disease (n = 10), cirrhosis (n = 9), diabetes mellitus (n = 9) and coronary artery disease (n = 7). Active addictions included tobacco (n = 37), alcohol (n = 24) and intravenous drug (n = 12).

HIV disease was diagnosed during ICU stay in 11 patients, whereas HIV infection was previously known before in 88 patients. Before admission, HIV infection was diagnosed for 9.9 [4.5–15.6] years, mainly through sexual and intravenous drug injection contamination. Key characteristics of HIV infection are displayed in Table 1, and suggest an advanced stage in the disease, according to the WHO classification but a relatively well-controlled infection, according to CD4 count and viral load.

3.2. Comparison of initial characteristics of the CA according to HIV status

CA in HIV-negative patients (control group) occurred predominantly at home, with initial shockable rhythm. Conversely, more than half of the cases of CA in HIV-positive patients were in-hospital CA, followed by home and public area (Table 2). First recordable rhythm was non-shockable in 80.8% of cases. No-flow duration was significantly shorter