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Letter

Causes of fulminant tropical probable myocarditis: A retrospective cohort study in the French West Indies

Dear Editor,

Acute myocarditis (AM) is an inflammatory diseases, usually secondary to infectious or auto-immune disorders.[1–3] Myocarditis patients with hemodynamic failure are usually classified as fulminant myocarditis (FM). FM evolution is frequently severe with refractory cardiogenic shock and the need for mechanical circulatory support (MCS).[3] Large epidemiological studies on FM have been performed in temperate areas. Tropical myocarditis remains scarcely studied, despite highly different infectious epidemiology and tropical infectious diseases (i.e., dengue fever, leptospirosis, trypanosomiasis) described as FM causes.[4] Therefore, we aimed in this work to describe tropical FM clinical course and etiologies in a large intensive care unit (ICU) located in the Caribbean region.

We defined possible AM as proposed by Asaumi Y et al.[5] and Martens P et al.[6] by the association of criteria of systemic inflammatory response syndrome.[7] Evidence of myocardial damage (significant changes in electrocardiographic and elevation of serum creatine phosphokinase or/and troponin level) and recent onset of cardiac dysfunction (left ventricular ejection function [LVEF] measured by Simpson method) unrelated to myocardial ischemia (determined if possible by coronary angiography).

Patients with localized left ventricular dilatation and patients with predominant right ventricular dysfunction and/or left ventricular dilatation were excluded from analysis as alternative diagnoses of stress or sepsis-related cardiomyopathies could be discussed according to standard definitions.[8,9]

Between January 2014 and December 2023, 49 consecutive critically ill patients who met the criteria of possible myocarditis[6] were admitted to the ICU of the Centre Hospitalier Universitaire de Guadeloupe.

Due to the absence of endomyocardial biopsy (EMB) in our center, AM was classified as definite if cardiac magnetic resonance imaging (MRI) showed myocarditis signs or probable if MRI was not performed[6] (mostly for hemodynamic instability).

All echocardiography measurements were performed when patients were pre-load independent. Cardiac angiography was not performed if ischemic heart disease was ruled out by a cardiologist after clinical examination and echocardiography.

Clinical and biological characteristics at ICU admission are reported in Supplementary Table S1. Median (interquartile range [IQR]) age and Sequential Organ Failure Assessment were 55 (IQR: 40–63) years and 9 (IQR: 4–12), respectively. Within 24 h of ICU admission, 40.8% of the patients were mechanically ventilated and 95.9% were under vasopressors. Hemodynamic failure was characterized by severe cardiac impairment (median measured LVEF of 30% [IQR: 20%–40%] and indexed cardiac output of 1.4 [IQR: 0.8–1.9] L/(min·m^2), respectively). Cardiac angiography and MRI were performed in 34.7% of the patients and 12.2% of the patients, respectively. No abnormalities were observed on angiography and MRI showed myocarditis radiological pattern in 7/7 patients. During the ICU course, 24.5% (n=12) had steroid therapy, and 8.2% (n=4) had polyvalent immunoglobulins therapy. Due to refractory cardiogenic shock, 6 patients (12.2%) required MCS, with a death rate of 16.7% (n=1/6). The length of inotropic support in survivors was 7 (IQR: 5-8) days.

Four groups were designed for analysis (Supplementary Table S1): “Leptospirosis” (n=18, 36.7%), “viral” (n=17, 34.7%), “auto-immune” (n=5, 10.2%), and others (n=8, 16.3%). Causes of probable and definite myocarditis are reported in Supplementary Table S2. At ICU admission, the leptospirosis group differed only from the other groups by lower platelet level, higher bilirubin level, and a higher frequency of atrial fibrillation on admission electrocardiogram. There were no major differences considering hemodynamic and cardiac features at baseline in between groups. During the ICU course, days under inotropic support and mechanical replacement therapies rates were also similar in-between groups (Supplementary Table S1). Associated immunomodulatory treatment (steroids or immunoglobulins) was used only for auto-immune or coronavirus disease 2019-related myocarditis (Supplementary Table S1). Overall hospital mortality was 16.3% (n=8). Among survivors (n=41, 83.7%), cardiac outcome at 6-month follow-up was excellent with normal echocardiography and electrocardiogram in 97.5% of the surviving patients (n=40).

Outcomes of FM are highly linked to the initial clinical severity and the underlying etiology.[1,3] In a tropical area, we found a predominance of *Leptospira* infection, strikingly differing from European and North American studies in which viral infections are the main diagnosed causes.[3] In the Caribbean region, leptospirosis is endemic[4] with a high rate of ICU admission for hospitalized patients (30% in our center[10]). During the study period, 145 leptospirosis patients were admitted to our

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ICU,[10] and 41 % had myocardial involvement. Twelve percent (n=18/145) could be classified as probable AM. Myocardial involvement in leptospirosis is frequent, pleomorphic,[11] and still scarcely described with only one reported EMB in a leptospirosis-related FM.[12] Surprisingly, despite two large dengue outbreaks during the study period, we found only two dengue-related FM.

These results need to be confirmed in larger studies performed in other tropical areas, more particularly in areas with different incidences of dengue (particularly differences in dengue serotypes) and leptospirosis. The main limit of our study apart from its design is the absence of EMB.

In the Caribbean area, we found that leptospirosis was the main diagnosed etiology in possible tropical myocarditis patients. This result underlines two points: (1) the need to consider antibiotics for probable myocarditis in tropical areas and (2) the need for epidemiologic studies in other tropical areas with different dengue and leptospirosis epidemiology. Specific studies for leptospirosis myocardial involvement seem mandatory.

CRediT Authorship Contribution Statement

Laurent Camous: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Supervision, Validation, Visualization, Writing – original draft. **Nicolas Paulo:** Formal analysis, Investigation, Methodology, Validation, Visualization, Writing – original draft. **Frederic Martino:** Supervision, Validation, Visualization. **Sylvaine Bastian:** Data curation, Formal analysis, Supervision, Validation, Visualization, Writing – original draft. **Marc Valette:** Supervision, Validation, Visualization, Writing – original draft. **Jean-David Pommier:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Supervision, Validation, Visualization, Writing – original draft.

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Ethical Statement

Not applicable.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

The data sets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Supplementary Materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jointm.2024.07.001.

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