

Case Report

Type 1 cardiorenal syndrome in a patient with an acute infection caused by *Trypanosoma cruzi* in the Brazilian Amazon region – a case report

**Karla Cristina Petrucelli^[1], Gabriel Castro Tavares^[1], Márcio Pinheiro Lima^[1],
Jessica Vanina Ortiz^{[2],[3]}, Alba Regina Brandão^[1], Katia do Nascimento Couceiro^{[2],[3]},
João Marcos Bemfica Barbosa-Ferreira^{[2],[3],[4]}, Mônica Regina Hosannah da Silva e Silva^[5],
Maria das Graças Vale Barbosa Guerra^{[2],[3]} and Jorge Augusto de Oliveira Guerra^{[2],[3]}**

[1]. Faculdade de Medicina, Universidade Federal do Amazonas, Manaus, AM, Brasil.

[2]. Programa de Pós-Graduação em Medicina Tropical, Universidade do Estado do Amazonas, Manaus, AM, Brasil.

[3]. Fundação de Medicina Tropical Dr. Heitor Vieira Dourado, Manaus, AM, Brasil.

[4]. Hospital Universitário Francisca Mendes, Manaus, AM, Brasil.

[5]. Fundação de Hematologia e Hemoterapia do Amazonas, Manaus, AM, Brasil.

Abstract

Cardiorenal syndrome type 1 (CRS 1) occurs when acute heart failure leads to acute kidney injury. There are several etiologies of CRS 1, including Chagas disease. Here, we present the first case report of CRS 1 in a patient with acute Chagas disease. Electrocardiography, transthoracic echocardiography, and cardiac magnetic resonance imaging showed signs of acute myocarditis. Laboratory examination revealed severe loss of kidney function, with a creatinine clearance of 30 mL/min, which fully normalized after treatment. Due to emergence of Chagas disease in the Brazilian Amazon, it is important to report unique clinical features in order to improve patients' outcomes.

Keywords: Acute kidney failure. Chagas disease. Brazilian Amazon.

INTRODUCTION

Cardiorenal syndrome (CRS) is a pathophysiological disorder in which an acute or chronic dysfunction of one organ causes another acute or chronic dysfunction in another. It can be subdivided into five subtypes: type 1 – acute heart failure causing acute renal failure, type 2 – chronic heart failure causing renal failure, type 3 – acute renal failure causing cardiac insufficiency, type 4 – chronic renal failure causing heart failure, and type 5, in which a systemic condition leads to cardiac and renal impairment¹. Approximately 27% of patients admitted to hospital for heart failure develop acute renal injury. There are several etiologies of cardiovascular complications that can result in type 1 CRS, among them is Chagas disease (CD)².

Chagas disease is caused by *Trypanosoma cruzi*, and can be transmitted by several routes, with vectorial transmission being the most traditional pathway, particularly in areas where triatomines are domiciled. Oral transmission occurs through

ingestion of infected vectors and reservoirs by susceptible mammals, and is considered in recent years to be responsible for outbreaks of the acute form, particularly in the Amazon region^{3,4}.

Considered endemic in Latin America since its description by Carlos Chagas in 1909, CD has experienced a significant change in its epidemiological profile in recent decades due to the increase in immigration, resulting in its importation into previously non-endemic countries such as the United States, Canada, Switzerland, and Spain⁵. The Brazilian Amazon Region, long considered an area free of CD, has recorded several outbreaks of the disease, many of them related to oral transmission due to the consumption of açai fruit *in natura*^{6,7}.

The acute cardiac manifestations of *T. cruzi* infection are characterized by myocarditis, pericarditis or electrical conduction disturbances, which in vector-transmitted cases resolve between 1–2 weeks after infection. Cases transmitted orally show a higher precocity of symptoms, a higher incidence of myocarditis and greater lethality when compared to cases transmitted by vectors^{8,9}.

Here we present the first report describing the occurrence of CRS due to acute *T. cruzi* infection in the state of Amazonas, Brazil.

Corresponding author: Karla Cristina Petrucelli.

e-mail: kapeisrael@gmail.com

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CASE REPORT

A 43-year-old male chainsaw operator from the municipality of Atalaia do Norte, Amazonas, Brazil, presented with a three-day history of fever, chills, headache, and myalgia, and sought medical care at the Fundação de Medicina Tropical Dr. Heitor Vieira Dourado in Manaus, Amazonas (**Figure 1**). A thick blood smear test was done to investigate *Plasmodium* sp. infection but showed positivity for *T. cruzi* instead, and hospital admission was requested. On admission, the patient presented pain on deep palpation of the epigastrium and the liver was palpable at 4 cm from the rib cage but was non-tender. His heart rate was 60 bpm.

One day after admission, the patient presented oliguria and altered renal function examination, with a creatinine clearance of 30 mL/min and creatine phosphokinase level of 1726 U/L. The creatinine clearance increased to 48 mL/min two days after the initial measurement. The results of the hepatic and renal biomarkers, as well as other biochemical parameters are presented in **Table 1**.

He did not present signs or symptoms of heart failure, although cardiac examination yielded signs of acute myocarditis: (1) alteration of ventricular repolarization in the anterolateral wall on the electrocardiogram (**Figure 2**); (2) left ventricular ejection fraction of 45%, diffuse hypokinesia, mild left ventricular enlargement, and systolic dysfunction of a discrete degree on two-dimensional echocardiogram and (3) minimal pericardial effusion with a slight increase in ventricular diameters and volumes on cardiac magnetic resonance imaging.

Treatment with benznidazole (Rochagan®) 5–7 mg/kg for 60 days was initiated following the guidelines of the 2nd Brazilian Consensus on CD⁷. After the fifth day of hospitalization, and the third day of treatment, there was an improvement in symptoms, but with a persistent positivity in the thick blood smear. New examinations were performed fifteen days after admission in which the thick blood smear showed negative results. Three months later, in the outpatient follow-up, cardiac examinations were repeated and showed normal findings, the transthoracic echocardiogram showed an ejection fraction of 70%, and laboratory examination confirmed the complete normalization of the glomerular filtration rate.

DISCUSSION

Although considered endemic in Latin America, CD in the Brazilian Amazon region has undergone a significant change in its epidemiological profile associated with the consumption of contaminated food, such as açai fruit *in natura*⁷. The acute myocarditis presented by the patient described was associated with and probably caused the acute renal failure, which completely resolved after treatment. This is the first report describing the occurrence of CRS probably due to acute *T. cruzi* infection in the Brazilian Amazon region.

T. cruzi has a tropism mainly for cardiac cells, but may also proliferate in renal cells, though organ involvement is rare and poorly studied. Previous studies have already demonstrated the existence of structural and functional changes, such as proximal tubular epithelial lesion and decreased renal blood flow.

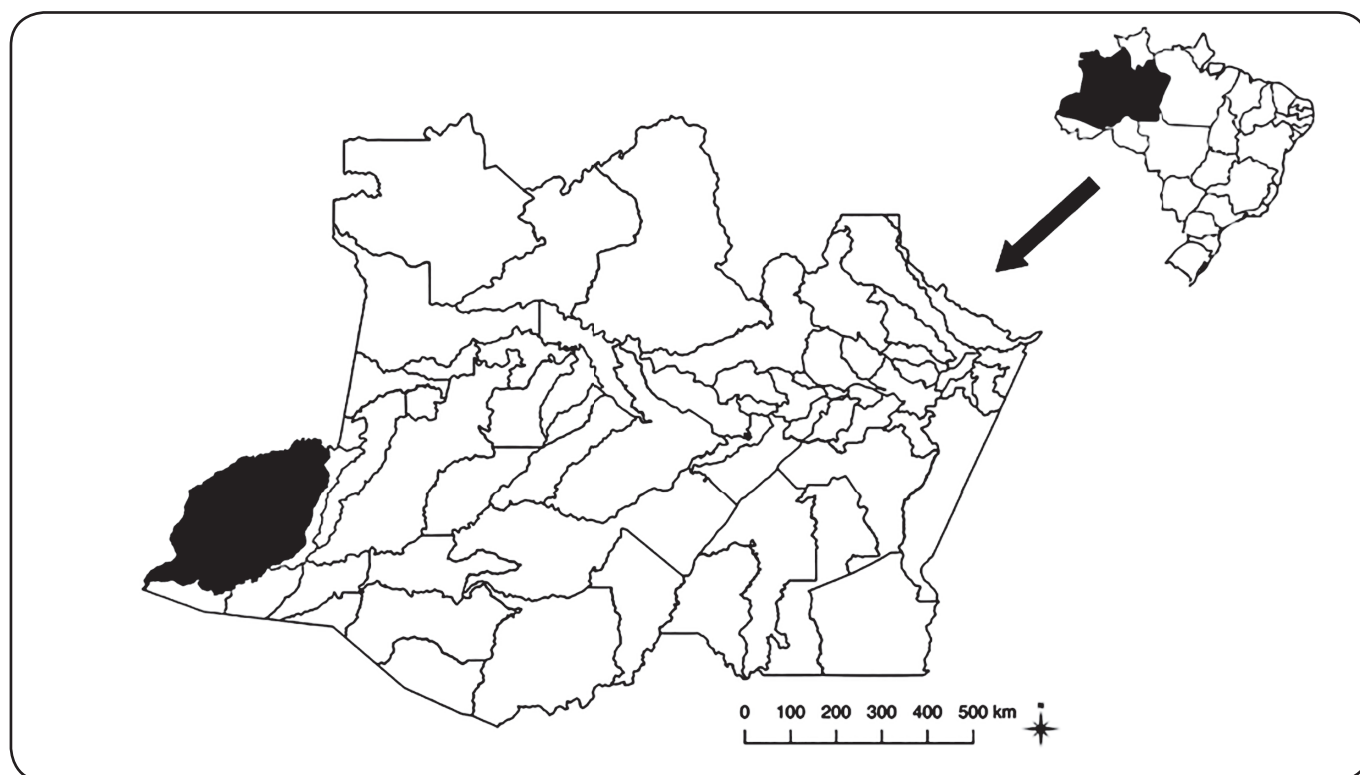


FIGURE 1: Map of the location of Atalaia do Norte, state of Amazonas, Brazil.

TABLE 1: Admission and follow-up laboratory exams .

Exams	02/28	03/02	03/06	03/13	03/20	Reference
Hemoglobin (g/dL)	15,64	15,75	11,58	12,44	12,92	12,5-15,5
RBC (mi/mm ³)	5,28	-	-	-	4,81	4,2-5,5
WBC (/mm ³)	2160	3050	6440	9420	7080	4000-10000
Platelets (/mm)	80000	75000	210000	638000	534000	15000-400000
Glucose (mg/dL)	128	136	-	-	-	70-100
Urea (mg/dL)	69	62	22	23	31	10-45
Creatinine (mg/dL)	1,8	1,7	0,7	0,8	0,9	0,6-1,2
LDH (U/L)	1436	1503	1259	902	-	140-280
Alkaline phosphatase (U/L)	891	1446	1610	989	569	45-115
GGT (U/L)	211	277	-	290	190	7-60
AST (IU/L)	694	397	253	70	41	2-38
ALT (IU/L)	264	233	191	90	59	2-44
Bilirubin (mg/dL)	2,69	-	-	1,01	0,69	0,2-1,2
Sodium (mg/dL)	134	-	139	139	137	135-145
Potassium (mmol/L)	3,7	3,8	3,5	4,1	4,5	3,6-5,2
Creatinine kinase (U/L)	-	1726	106	-	-	52-336
Amylase (U/L)	40	0	25	-	-	40-140

RBC: red blood cells; **WBC:** white blood cells; **LDH:** lactate dehydrogenase; **GGT:** gamma-glutamyltransferase; **AST:** aspartate aminotransferase; **ALT:** alanine aminotransferase.

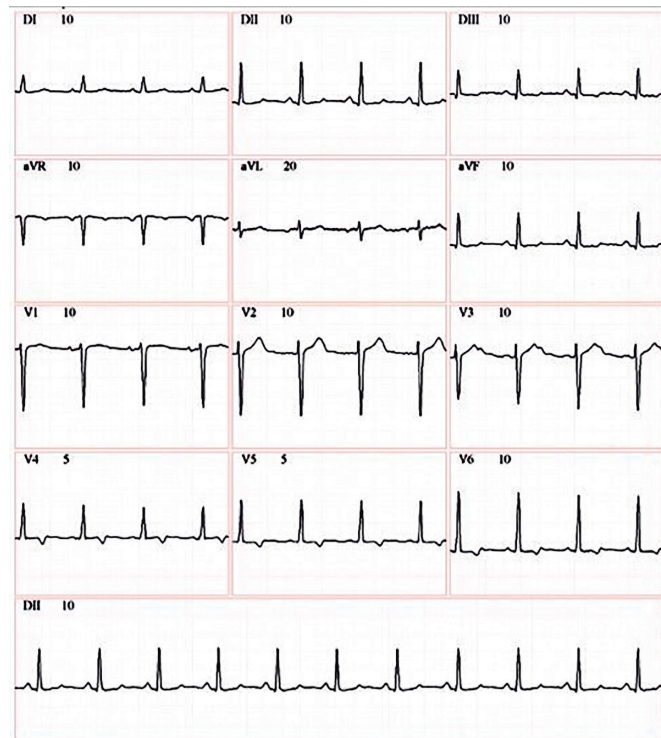


FIGURE 2: Electrocardiogram showing alteration of ventricular repolarization in the anterolateral wall.

Significant interstitial inflammatory infiltrates and increased pro-inflammatory cytokines are observed, as well as increased renal size. Acute renal failure may occur when parasitemia is very high^{10,11}.

The pathogenesis of cardiorenal syndrome type 1 (CRS 1) involves a series of mechanisms not yet fully clarified. Situations in which there is left ventricular dysfunction with reduction in cardiac output and subsequent reduction in renal blood flow lead to a continuous activation of the renin-angiotensin-aldosterone system (RAAS) and consequent retention of sodium and water, vasoconstriction and reduction of the glomerular filtration rate. In CRS 1 these processes are potentially reversible, with appropriate support measures in place².

CRS management involves hemodynamic support aimed at improving cardiac function mainly through inotropic use, RAAS antagonists, vasodilators, and beta-blockers. It is also important to reduce volume overload either by diuretic therapy or renal replacement therapy¹². The use of benznidazole is not formally contraindicated in renal failure, but its prescription in these cases should be evaluated individually. In the present case, the severity of the patient's cardiorenal profile played a role in the choice of benznidazole, which seemed to be quite effective.

The Brazilian Amazon is a peculiar locality in which CD presents an emerging situation and therefore, still neglected and difficult to control. For that reason, it is important to study and describe the unique clinical features associated with the disease to provide an improvement in patient management. Fortunately, this was a successfully treated case in which rapid cardiac and renal clinical improvement concomitantly occurred.

Conflict of Interest

The authors declare that there is no conflict of interest.

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