

## Complete Resolution of Electrocardiographic Changes Induced by Acute Chagas Myocarditis

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### Abstract

We present a case of a female adolescent with severe acute Chagas myocarditis, acquired by oral transmission in an endemic area in the Brazilian western Amazon, who had electrocardiographic changes normalized after empirical treatment with the antiparasitic drug benznidazole combined with conventional treatment for severe heart failure.

### Introduction

Chagas disease (CD) is a neglected parasitic infection caused by the protozoan *Trypanosoma cruzi*, which infects a wide range of triatomines and mammalian species, including man. About 8 million people worldwide are estimated to be infected, and 28 million people are at risk of acquiring the disease in 15 endemic countries of Latin America. Oral transmission of CD has been the most common route of infection in the Amazon region.<sup>1</sup> Since the 1960s, the drugs available for the treatment of the acute phase (0-4 months after infection) of CD have been benznidazole (BZ) and nifurtimox (NFX).<sup>2</sup> BZ administered orally is still the drug of choice in many countries despite its high dosage regimen and adverse side effects such as allergic dermatitis (skin rashes), peripheral neuropathy, anorexia,<sup>3</sup> and less commonly, bone marrow suppression. BZ is also potentially carcinogenic. Patients in the chronic phase

of CD treated with BZ and NFX had parasite persistence and progressive electrocardiographic changes, similar to untreated control patients.<sup>4,5</sup> The cardiac form of the disease starts with an acute dilated myocarditis, followed by myocardial remodeling, fibrosis, and arrhythmias.

### Case Report

A 12-year-old female, born in the rural area of Rodrigues Alves community, Acre, in western Amazon, northern region of Brazil, was admitted to the regional hospital with fever, dizziness, weakness and vomiting in the last month. A short time earlier, her brother, sister-in-law, and sister had similar symptoms, and her brother and sister-in-law died. The girl's family earn their living by growing and selling the fruit and juice of *açaí* (a small, round, dark colored fruit, obtained from a palm tree).

Physical examination revealed significant facial edema associated with bilateral periorbital edema, lower limb edema, anasarca, dyspnea on light exertion (NYHA III) and orthopnea. Regular tachycardia (117 bpm), third heart sound (S3) with gallop rhythm and hypotension (80/60 mmHg) were detected, in addition to decreased vesicular breath sounds and pulmonary crepitations in both lung bases. Respiratory rate was 20 breaths/min and O<sub>2</sub> saturation was 98%.

The liver was enlarged and tender at 3 cm from the right costal margin accompanied by splenomegaly. No fever was observed (35.6°C).

Chest X-ray showed generalized cardiomegaly and blunting of the right costophrenic angle.

Echocardiography showed severe deterioration of the left ventricular function with an ejection fraction of 19%

### Keywords

Chagas Disease/epidemiology; *Trypanosoma Cruzi*; Chagas Cardiomyopathy; Electrocardiography/methods; Heart Failure/drug therapy; Antiparasitic Agents.

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and dilated heart cardiac chambers. Laboratory tests revealed leukocytosis with lymphocytosis, hyponatremia and moderate increase of liver enzymes.

The initial electrocardiogram is shown in Figure 1.

Conventional treatment was started for severe heart failure with intravenous and oral administration of furosemide, carvedilol at increasing doses, spironolactone, and angiotensin-converting enzyme (ACE) inhibitors. After 10 days of treatment, although seropositivity for CD was still not confirmed by laboratory tests, it was decided to empirically administer oral BZ at conventional dose (2-4 mg/kg q. 12 h), based on recent family history, clinical symptoms, and lack of complete resolution using conventional treatment. In a few days, the patient showed quick improvement and complete resolution of edema and dyspnea. A second ECG was obtained (Figure 2) months later, showing complete normalized tracing. A concomitant transthoracic echocardiogram revealed normal cardiac chambers and normal left ventricular ejection fraction (63%). This significant response to BZ indicates that this drug can be effective in the treatment of the acute phase of Chagas myocarditis, but not the chronic phase.<sup>4,5</sup>

## Discussion

Possible modes of transmission of CD include: feces of the infected vector deposited on the skin and/or mucous membranes, while the vector sucks blood; transplacental vertical transmission which depends on maternal immune status, parasite strain and placental factors; lab accidents caused by violation of biosafety regulations; organ transplantation from an infected donor (this may occur by migration of contaminated individuals to non-endemic areas, in which serological test for Chagas is not made), oral transmission by ingestion of contaminated food, including *açaí* and sugarcane juice. In our case, the most probable mode was the oral transmission. The insects could be attracted by the light of the inside of the *açaí* grinding machine, or the fruit pulp could get contaminated because of lack of hygiene during fruit collection, transportation or processing.<sup>6</sup> In case of handcrafted food in areas with triatomines, good cooking and pasteurization regulations are essential. The pasteurization has been adopted for the *açaí* paste exported from the Amazon and other regions of Brazil.

The symptoms presented by the patient and the course of disease coincide with other studies and are

in accordance with the Ministry of Brazil guidelines, which state that people living in endemic areas, who have prolonged fever (> seven days), facial edema, hepatosplenomegaly, and manifestations of acute heart failure, should be treated empirically with BZ or NFX, even in the absence of a positive serology, aiming to reduce the mortality rate.<sup>7-9</sup>

To start empirical treatment of clinical and epidemiological manifestations compatible with CD with antiparasitics, even when the first serological test is negative, is supported and described in the guidelines for surveillance, prevention, control and clinical management of acute CD transmitted by food.

In this case report, early treatment with BZ resulted in complete electrocardiographic normalization, along with complete resolution of symptoms. The electrical changes of acute Chagas myocarditis can be completely reversed by antiparasitic drugs. Bastos et al.,<sup>10</sup> described the clinical outcome of 13 patients with acute CD acquired through oral transmission from two urban outbreaks in northeastern Brazil. They reported that ventricular repolarization abnormalities persisted in 50% of the patients with the antiparasitic treatment, while sinus bradycardia was observed in 18%. Left ventricular ejection fraction normalized in two out of three patients with initially depressed ventricular function, while pericardial effusion disappeared.<sup>10</sup>

## Conclusion

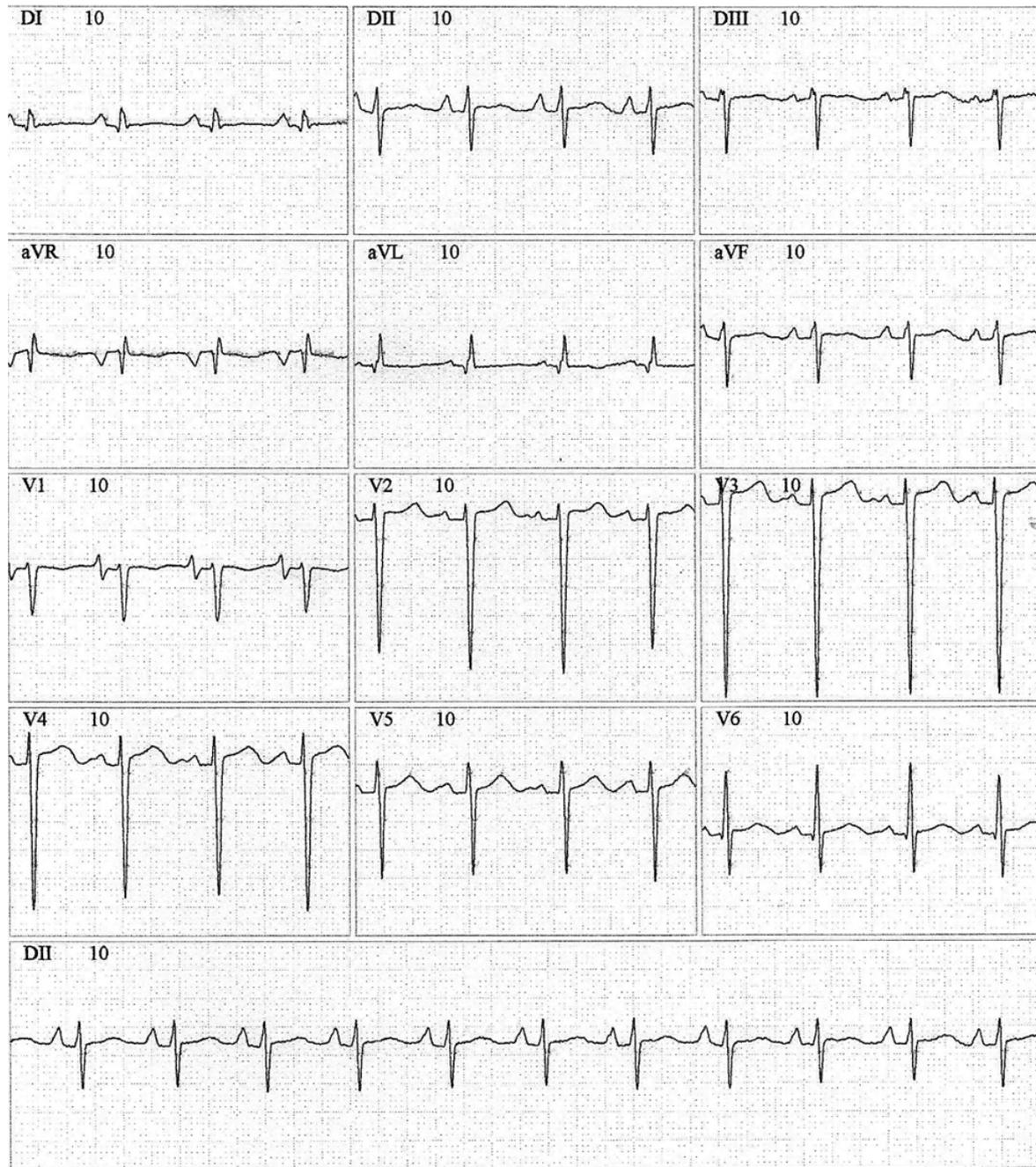
Complete reversal of ECG changes associated with acute Chagas myocarditis is achieved by antiparasitic therapy. This may positively impact long-term prognosis.

## Author contributions

Conception and design of the research: Valle JETMR, Pérez-Riera AR. Acquisition of data: Valle JETMR. Analysis and interpretation of the data: Pérez-Riera AR. Writing of the manuscript: Valle JETMR, Barros RB, Pérez-Riera AR. Critical revision of the manuscript for intellectual content: Valle JETMR, Abreu LC, Barros RB, Raimundo RD.

## Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.



**Figure 1 - ECG-1:** Sinus rhythm, heart rate of 90 bpm, P-wave axis + 55°, P-wave duration > 110 ms, P-wave voltage  $\geq 2.5$  mm in lead II, peaked, broad, bimodal, and plus-minus P-waves in lead V1, prolonged and bimodal P-wave in leads V<sub>4</sub>-V<sub>6</sub>, low QRS amplitude in lead V<sub>1</sub>, contrasting with high QRS voltage in lead V<sub>2</sub>: indirect signs of right atrial enlargement ("Sodi-sign"), normal PR interval, extreme left axis deviation (QRS axis - 60°), rS pattern in the inferior leads, qRs in I, and qR in aVL: left anterior fascicular block. Precordial QRS transition displaced to the left, deep S-waves in leads V<sub>5</sub>-V<sub>6</sub>, rS pattern from V<sub>1</sub> to V<sub>5</sub> demonstrating severe right ventricular overload. Conclusion: Biatrial enlargement; biventricular overload with predominant right ventricular overload; left anterior fascicular block.

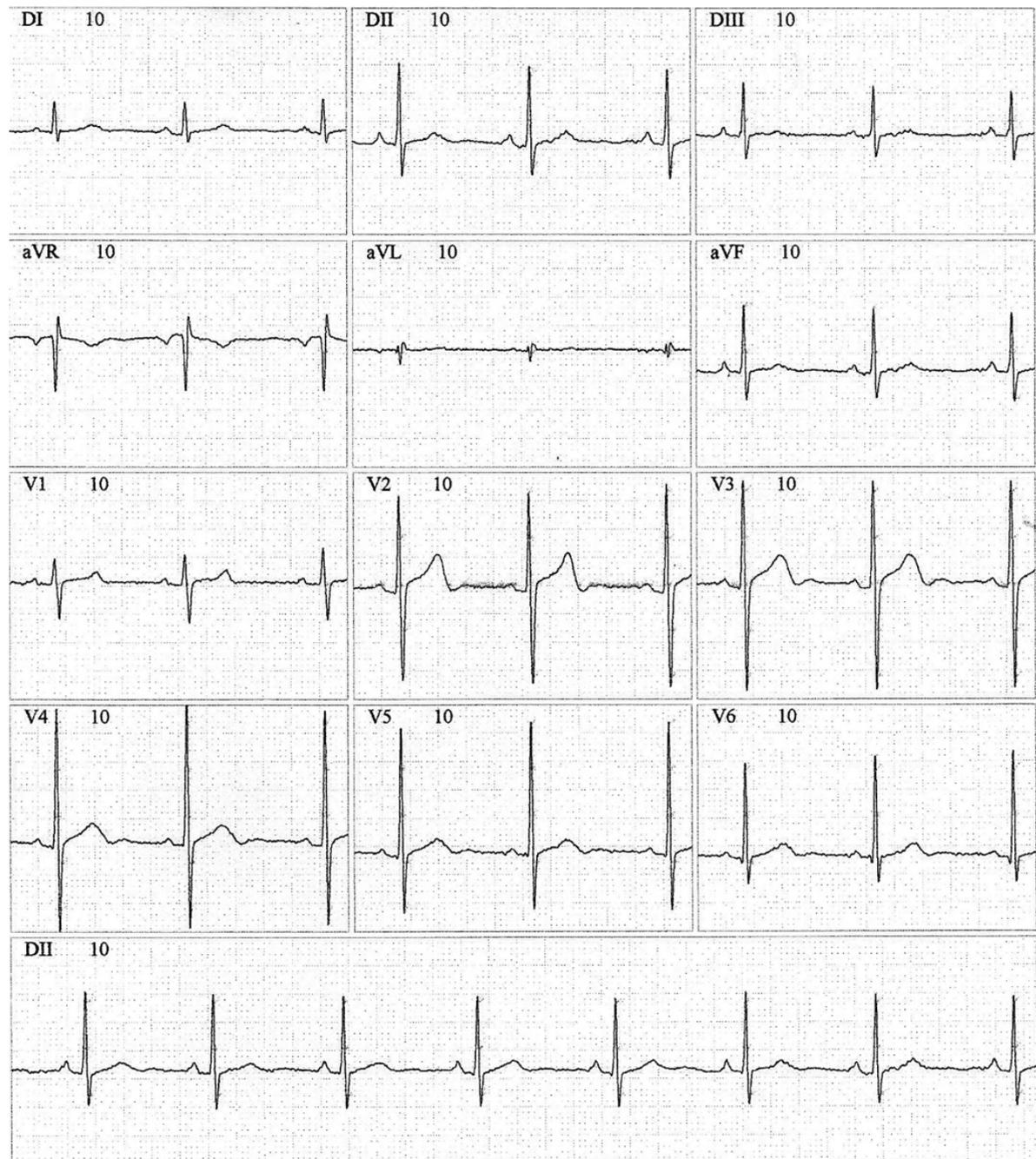


Figure 2 - ECG-2: Electrocardiographic tracing after empirical treatment with BZ associated with conventional treatment for heart failure. Sinus rhythm, heart rate of 60 bpm, normal P-wave, normal PR interval, normal QRS axis (+60°), precordial transition area in lead V<sub>2</sub> (normal), visible U-wave from leads V<sub>3</sub> to V<sub>5</sub>. Conclusion: normal tracing.

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## Study Association

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## Ethics approval and consent to participate

This article does not contain any studies with human participants or animals performed by any of the authors.

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