Case Report

Fast Atrial Fibrillation: could the Systemic uptake of Boric Acid through the Nasal Mucosa be the Cause?

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Received Date: August 13, 2020

Publication Date: September 01, 2020

Abstract

Boric acid is an insidious poisonous drug, a molecule carelessly used in the composition of several pharmaceuticals. We report the case of a 51-year-old woman, without pathological history, who presented in the emergency department with rapid atrial fibrillation revealed by dyspnea and palpitation. Investigations excluded hypoxemia, hypovolemia, anemia, and ionic disorders. A recent infection, hyperthyroidism, and acute coronary syndrome have also been eliminated. The cardiac ultrasound was normal. We later found out that the patient was placed under homeopathic healing ointment by frequent local nasal application for 6 months, the last application was 4 hours ago, this treatment contains boric acid at a rate of 1.6 grams per tube. Systemic passage through the nasal mucosa was discussed at the origin of the supraventricular arrhythmia. This treatment was immediately stopped, the patient was put on oral Beta-blockers to control the heart rate, recovery of sinus rhythm was in 48 hours.

Keywords: *Boric Acid, Atrial Fibrillation, Emergency Department.*

Introduction

Borate-containing compounds were used as topical antiseptics and were components of many medicinal preparations. These applications were subsequently discontinued by the medical community when the toxicity and potential lethality of borates were recognized **(**1,2**)**. Currently, boric acid is found in the composition of some medications including skin powders and ointments used for the treatment of burns and irritation. Although documented cases of borate poisoning are now rare **(**3**)**, we must always pay attention to the systemic passage of this product when applied locally, especially through the injured skin and mucous membranes. This systemic absorption of boric acid could have side effects more or less severe on the cardiovascular system **(**4**)**. we discuss a systemic passage of borate through the nasal mucosa as a probable etiology of rapid atrial fibrillation in a patient in the emergency room.

Patient and Observation

Case Presentation

A 51-year-old woman, without pathological history, who presented in the emergency department because of progressively worsening dyspnea, nausea, and palpitation for one hour. We found the notion of prolonged treatment for 6 months, at irregular doses, by a healing homeopathic ointment prescribed for irritation of the nasal mucosa. The composition of this drug per 100 grams was: Calendula Officinalis Mother Tincture (MT) 0.1 g, Phytolacca Decandra MT 0.3 g, Bryonia MT 0.1 g, Benzoe MT 0.1 g, and Boric Acid 4 g (4%). The last nasal application was 4 hours ago. Each local application is on average about 0.08 grams of boric acid.

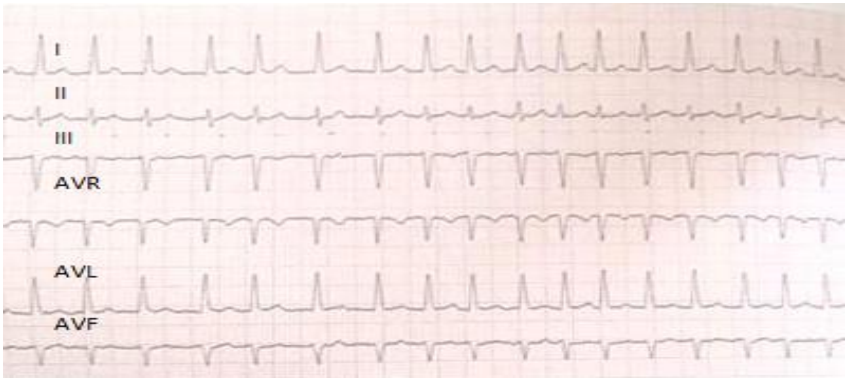

Figure 1: Fast atrial fibrillation in the ECG with no visible P waves and an irregular QRS complex, the ventricular rate was about 180.

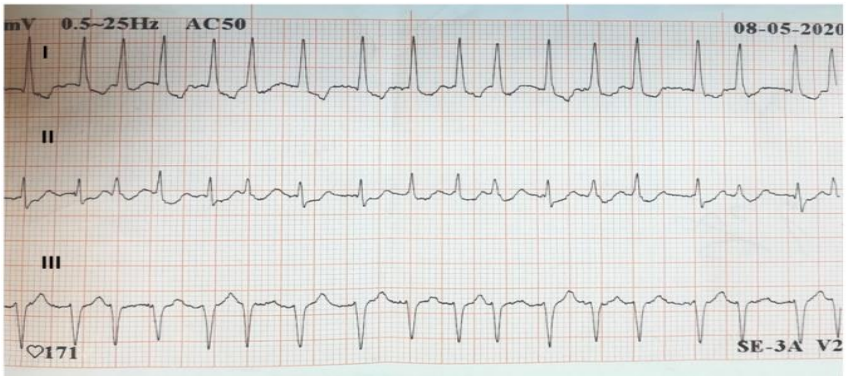

Figure 2: Fast atrial fibrillation in the ECG with no visible P waves and an irregular QRS complex, the ventricular rate was about 180.

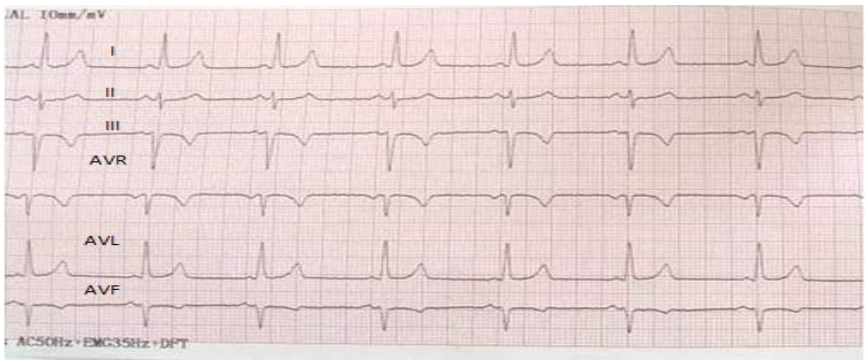

Figure 3: (ECG within 48 hours)

Sensual cardiac rhythm

Investigations

On admission, Body temperature and physical examination, as well as chest radiograph were normal. The ECG showed fast atrial fibrillation with no visible P waves and an irregular QRS complex, the ventricular rate was about 180 (**Figure 1,2**). Blood tests were normal (hemoglobin 12.3 g/dl, thrombocytes 250×109/L, leucocytes 8.2×109/L) negative C reactive protein. There was no coagulopathy (D-dimer, prothrombin time, and partial thromboplastin time values were normal) no ionic disorders, and no hyperthyroidism. Serum glucose levels were normal. To rule out the diagnosis of acute coronary syndrome two points of hypersensitive troponin were negative. A cardiac ultrasound had shown a good left ventricle function with 78% of ejection

fraction, without ischemic signs and valve diseases, no pericardial effusion, and right cavities were normal.

Treatment

Systemic passage of Boric Acid through the nasal mucosa was discussed at a likely origin of the supraventricular arrhythmia. Nasal ointment treatment was immediately stopped and the patient was put on oral Beta-blockers to control the heart rate.

Outcome and Follow-Up

The patient was kept under cardiac monitoring in the intensive care unit. The recovery of sinus rhythm was in 48 hours (**Figure 3**).

Discussion

Accidental poisoning is not always recognized. If there is no leading history of the ingestion or exposure to poison the signs can easily be misinterpreted. In this way, boric acid poisoning of adults may remain unsuspected, especially when it occurs by absorption through a mucous membrane. Boric acid has been in clinical use as an antiseptic for 90 years **(**5**)**. Many deaths and intoxications have been recorded following its ingestion, parenteral injection, irrigation or packing of wounds and body cavities, or application to damaged skin or a mucous **(**6–8**)**. The minimum lethal dose of ingested boric acid has not been precisely determined but is approximately 2 to 3 g in infants, 5 to 6 g in children, and 15 to 20 g in adults **(**6**)**. Under certain instances, systemic toxicity has resulted from the absorption of as little as 0.17-0.2 g boric acid/Kg body weight this dose can produce nausea, vomiting, tachycardia, mild peripheral vascular collapse, occasionally seizures, and respiratory depression **(**6**)**.

In the literature, fatal cases result of cardiac arrhythmias were reported following the voluntary ingestion of boric acid. A 49-year-old Japanese woman with a history of depression; she was found in an unconscious state after ingesting boric acid. She was in a deep coma with marked hypotension induced by atrial fibrillation and tachycardia **(**9**)**. A 45-year-old white man ingested approximately two cups of boric acid crystals dissolved in water in a suicide attempt. He presented to the hospital with hypotension and atrial fibrillation the ventricular response was rapid and could not be converted to sinus rhythm **(**10**)**.

We can discuss the imputability of the nasal application of the homeopathic ointment with a significant dose of Boric acid as the etiology of our patient's fast atrial fibrillation for the following reasons:

1. Other causes of fast atrial fibrillation were eliminated or highly unlikely.

- Physical examination did not show signs of hypoxemia, hypovolaemia.
- An ischemic coronary event and a pulmonary embolism seemed highly unlikely as the patient did not have any chest pain before and during admission as well as a negative troponin and D dimers value.
- A cardiac ultrasound excluded heart failure, valvulopathy, and pericardial effusion.
- A recent infection was ruled out by the absence of fever and symptoms, as well as a negative C reactive protein value.
- Blood tests on admission ruled out anemia, ionic disorders, coagulopathy, and hyperthyroidism.
- The patient won't have any daily or newly introduced medications.

2. Complete recovery of sinus cardiac rhythm was obtained within 48 hours once the treatment was stopped.

Conclusion

In our case, the medical history and the initial presentation are not usual and the imputability of the nasal absorption of significant doses of boric acid as the etiology of our patient's fast atrial fibrillation remains questionable. But given the long-known toxicity of boron, attention must always be taken for the risk of systemic passage of this product through the skin and mucous membranes and the undesirable effects incurred.

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Volume 1 Issue 1 September 2020