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## Ophidian accident-related multi-organ failure: a case report

*Insuficiência múltipla de órgãos relacionada a acidente ofídico: relato de caso*

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### ABSTRACT

Ophidian accidents are not rare in Brazil. Its frequency is of about 30,000 cases/year in Brazil, although ranging between different regions. The gender Bothrops, which includes snakes popularly known as 'jararaca', is by far the most frequently involved, followed by the gender Crotalus, mainly represented by the rattlesnake. Other genders as Micrurus and Lachesis have lower epidemiological relevance. Critical cases are uncommon, and the most severe complications include

renal failure and blood coagulation disorders. Adult respiratory distress syndrome and multi-organ systems failure are described, although rare. This report aims to describe a case involving a Bothrops ophidian accident progressing to adult respiratory distress syndrome and multi-organ and systems failure, and to discuss the therapy used.

**Keywords:** Snake bites; Respiratory distress syndrome, adult; Renal insufficiency, acute; Multiple organ failure; Case reports

### INTRODUCTION

According to the Brazilian Ministry of Health, 28,597 cases of ophidian accidents were reported during the year 2005.<sup>(1)</sup> Considering that this is compulsorily reported event, and that its main therapy is under the Ministry of Health and State Secretaries control, this is likely actual. Its incidence of 15 cases for 100,000 inhabitants ranges widely between the different regions, e.g. 9.5/100,000 in the Southern region and 54/100,000 in the Northern region, as it is typically proper of rural areas. For a relevance comparison, these figures are higher than, for instance, chronic renal failure incidence, with 26,603 new cases reported in 2007 according to the Brazilian Nephrology Society census.<sup>(2)</sup>

Ophidian accidents involving the gender Bothrops, which includes the snakes popularly known as 'jararaca', are the most frequent, responding for 87.5% of the cases. The gender Crotalus (involving the rattlesnakes) ranks second, with 9.2%. The remainder cases are distributed between the genders Micrurus and Lachesis, with minor epidemiological relevance.<sup>(3)</sup>

The venom properties are different between the genders; they are predominantly proteolytic and coagulant in Bothrops and neuro- and myotoxic for the gender Crotalus. Therefore, the clinical presentations are also different, with a predominance of local features in the first case, and neurological features in the last. Regarding clotting disorders, common

to both genders, they may manifest either as hemorrhagic or thrombotic events.<sup>(3)</sup>

Severe cases are rare, due to several factors, being one of the most important the early appropriate serum therapy. In Bothrops accidents, the most frequent complication is massive tissue destruction.<sup>(4)</sup>

Renal failure is more frequently seen in Crotalus accidents, between 9 and 31% of the cases.<sup>(5)</sup> A study of 3,139 Bothrops accidents reported acute renal failure in 1.6% of the cases.<sup>(6)</sup> Its genesis involves several mechanisms, as rhabdomyolysis, intravascular coagulation and direct nephrotoxins action.<sup>(7)</sup> Additionally, other factors associated with acute renal failure are age (more frequent in children), snake size, bite site, patient's hydration, and the time between the bite and the specific serum administration.<sup>(8)</sup> Adult acute respiratory distress syndrome (ARDS) and multi-organ systems failure (MOSF) are described as rare.<sup>(3,4,9)</sup>

The mortality rate is low, around 0.5% of the cases, and the type of poisoning and time to therapy may increase mortality up to 8 folds.<sup>(1,3-6,9)</sup>

This report aims the description of an ophidian accident case, caused by a Bothrops gender snake, involving ARDS and MOSF, as well as to discuss the therapeutic approach.

## CASE REPORT

A 37 years old male patient was referred to the emergency department 2 hours after a snake bite. The snake was subsequently identified as 'jararaca'.

The patient was in good general shape, his blood pressure was 130/80 mmHg, heart rate 96 beats per minute, temperature 37.2°C, pulse oxymetry above 92% at room air, was very anxious and reporting severe pain at the bite site. His accompanying persons reported a loss of consciousness lasting about 10 minutes. No relevant past medical history was reported. The lateral part of his left ankle showed two punctiform lesions, with a small haematoma and edema around the lesions.

As the snake gender was not immediately identified, 3 vials of polyvalent serum were dosed, and the patient was hydrated with 1,000 mL saline every 8 hours, and given the analgesics Dipyrone and Tramadol.

Relevant admission tests results: hematocrit 55%; white blood cells count, 25,000/mm<sup>3</sup>; creatinine 1.6 mg%; prothrombin activity time: uncoagulable blood. Based on these tests, the serum dose was repeated, and the patient referred to the intensive care unit (ICU).

During the first day in the ICU the patient was hemodynamically stable, with pulse oxymetry > 92% at room air, no sensitive changes and no signs of bleeding, although the significantly changed coagulation tests. The patient's picture progressively deteriorated, with clinical and laboratory signs of renal function impairment. On hospitalization day 3, the 24 hours urinary output dropped to 200 mL, with 5.8 mg% creatinine and 345 mg% blood urea nitrogen. Abdominal dialysis was started, with a rigid tube. Pulse oxymetry was > 90% with a 50% Venturi mask, alternating with positive airway pressure (CPAP). Dialysis was repeated on days 6 and 9. During this last day, the patient presented jaundice related to direct bilirubin (5 mg%). The respiratory function worsened, with hypoxia refractory to non-invasive ventilation, and identification of diffused pulmonary infiltrate on chest X-ray. Mechanic volume-controlled ventilation assistance was started, with plateau pressure at 30 cm of water. After 36 hours in dialysis, nevertheless the negative 11,000 mL balance, the patient had no clinical improvement, and the blood urea nitrogen remained above 300 mg%. A decision was made to change the peritoneal dialysis to hemodialysis, which was conducted in a 3 hours session, without interurrences.

Hemodialysis was repeated 5 times in the next days, until the day 18. From then on, the urinary output improved, and steadily did other clinical features. The patient was extubated on the day 20, and maintained without dialysis support.

He was discharged from the ICU 24 days after his admission, with blood urea nitrogen 154 mg%, creatinine 3 mg%, and urinary output around 3 liters daily, with 90% saturation at room air.

## DISCUSSION

This was an ophidian accident due to a Bothrops snake, in an otherwise healthy adult patient.

The time to treatment was near to the ideal, which is considered to be around 2 hours.<sup>(3)</sup> Serious ophidian accident complications are rare, and death extremely rare. Ribeiro et al., studying 3,139 Bothrops snakes bites cases found renal failure in 1.6%, and shock in 0.7%. Nine patients died.<sup>(6)</sup> Another study analyzed the medical chart of 43 fatal cases observed in 12,639 ophidian accidents reports in the State of São Paulo (Brazil) within 5 years. Renal failure was mentioned as main or contributing death cause in 34 patients (79% of the deaths), while respiratory failure was seen

in 28 patients (65% of the deaths).<sup>(9)</sup> Studying only the patients admitted to intensive care units with this diagnosis, Silva et al. found a mortality rate of 20%.<sup>(10)</sup> Pinho et al., in a prospective study of 100 *Crotalus* snake poisoning cases found acute renal failure in 25% of the patients.<sup>(5)</sup> Unfortunately, the diagnosis criteria for renal failure are not standardized, rendering difficult to compare the different studies.

The renal injury mechanism is multi-factorial, being involved hypotension, rhabdomyolysis, and intravascular coagulation.<sup>(5)</sup> Boer et al. studied the effects of the Bothrops venom in rats and found glomerular basal membrane and mesangial matrix changes, ascribed to direct venom proteolytic action.<sup>(7)</sup> The Bothrops venom increases the capillary permeability at the bite site. For Gold et al., this mechanism may also take place in the lungs, myocardium, kidneys, peritoneum, and central nervous system.<sup>(11)</sup> Barravieira et al. studies evidenced increased cytokines and tumor necrosis factor within the first five days after the ophidian accident, leading to a systemic inflammatory response syndrome. The author does not preclude the anti-ophidian serum involvement in its genesis.<sup>(3)</sup>

The syncope episode and the early coagulation tests changes were clues to the condition severity. Although the patient was given anti-ophidian serum as soon as reached the hospital, this was polyvalent and given in insufficient dose. Subsequently the dose was repeated,

however still below the recommended dose for severe cases (Chart 1).<sup>(11)</sup> It should also be considered that the increased hematocrit is a possible indicator of dehydration, specially considering that the accident took place while the patient was in outdoor activities in a hot weather region. The initially prescribed volume of saline solution, around 3,000 mL in 24 hours, may have been insufficient, and contributed to the renal function impairment. Prompt admission to the intensive care unit was appropriate, although the patient was initially stable. The progression to acute renal failure was fast and severe. The choice of peritoneal dialysis was shown to be too conservative. Being a safe but less effective method, it would not be the best choice for an increased catabolism case. On the other hand, the prescription of daily hemodialysis sessions, early enteral diet and ventilation within the parameters recommended by the Brazilian Consensus on Mechanical Ventilation<sup>(12)</sup> were decisive factors for the favorable outcome.

Santos et al., in a recent review on this subject, emphasize that the early and appropriate serum therapy is the mainstay for preventing complications. They also alert that potentially nephrotoxic drugs should be avoided, such as non-steroidal anti-inflammatory drugs and aminoglycoside antibiotics.<sup>(13)</sup>

It is noteworthy that 60 days after the events the patient still had mild renal function deficit, indicating long term follow-up requirement in such conditions.

**Chart 1 – Bothrops accident. Severity classification and recommended serum therapy**

Features and therapy	Classification		
	Mild	Moderate	Severe
Local Pain Edema Bruise	Absent or discrete	Evident	Severe**
Systemic Severe hemorrhage Shock Anuria	Absent	Absent	Present
Coagulation time (CT)*	Normal or changed	Normal or changed	Normal or changed
Serum therapy (n <sup>r</sup> vials) SAB/SABC/SABL***	2-4	4-8	12
Administration	Intravenous		

\* normal CT: up to 10 min; prolonged CT: 10 to 30 min; uncoagulable > 30 min.

\*\* severe local features may be the only criteria for severity rating.

\*\*\*SAB – anti-bothrops serum; SABC – anti-bothrops-crotalus serum; SABL – anti-bothropic-lachetic serum.

Reproduced from: Fundação Nacional de Saúde. Manual de diagnóstico e tratamento de acidentes por animais peçonhentos. 2a ed. Brasília: Ministério da Saúde; 2001.

## RESUMO

O acidente ofídico não é ocorrência rara no Brasil. Embora com grandes variações entre as diversas regiões, sua incidência é próxima de 30.000 casos por ano. O gênero botrópico, do qual fazem parte as serpentes conhecidas popularmente como jararacas, é, de longe, o mais frequente, seguido pelo gênero crotálico, cujas principais representantes são as cascavéis. Outros gêneros, como *Micrurus* e *Lachesis*, são desprovidos de interesse epidemiológico. Casos críticos são incomuns e as complicações mais graves são insuficiência renal e distúrbios na coagulação

sanguínea. A síndrome do desconforto respiratório do adulto e a insuficiência de múltiplos órgãos e sistemas são descritas, porém raras. O objetivo do presente relato é descrever um caso de acidente ofídico do gênero botrópico, que evoluiu com síndrome do desconforto respiratório do adulto e insuficiência de múltiplos órgãos e sistemas, bem como analisar criticamente o tratamento realizado.

**Descritores:** Mordedura de cobra; Síndrome do desconforto respiratório do adulto; Insuficiência renal aguda; Insuficiência de múltiplos órgãos; Relatos de casos

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