

Rattlesnake bite accident followed by first psychotic episode: a clinical folklore

Acidente crotálico seguido por primeiro episódio psicótico: um folclore clínico

Accidente crotálico seguido de primer episodio psicótico: un folclore clínico

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Abstract

Introduction: Snakebites are neglected diseases and constitute an important part of the morbidity of working-age people who live in rural areas. Most of their short-term effects are widely known, especially those of a clinical nature; however, there is still an important gap in the knowledge of the long-term consequences of such injuries, notably those of a psychotic nature. This article aims to report a case of mental illness subsequent to a rattlesnake bite accident and generate cultural and pathophysiological reflections regarding the consequences of such events. **Case presentation:** An adolescent residing in the interior of the state of Bahia was bitten by a rattlesnake and required hospitalization in an intensive care unit. It was observed that even after clinical improvement, the case started with prodromal psychotic symptoms and progressed to severe mental deterioration that culminated in psychiatric hospitalization and diagnosis of schizophrenia over the following months. **Conclusions:** In this case, there was a direct correlation between these two events, but because of the scarcity of scientific works that address such issues, it is necessary to investigate and study in greater depth possible associations between snakebite accidents and psychoses.

Keywords: Snakebites; Crotalus; Psychotic disorders; Case reports; Folklore.

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Resumo

Introdução: Acidentes ofídicos são doenças negligenciadas e constituem uma parcela importante da morbidade de pessoas em idade produtiva que vivem em zonas rurais. A maior parte dos seus efeitos a curto prazo é amplamente conhecida, especialmente aqueles de natureza clínica; no entanto, ainda se observa lacuna importante do conhecimento das consequências a longo prazo de tais agravos, notadamente as de ordem psíquica. Este artigo relata um caso de adoecimento mental subsequente a um acidente crotálico e gera reflexões de âmbito cultural e fisiopatológico a respeito das sequelas de tais eventos. **Apresentação do caso:** Trata-se de adolescente residente no interior baiano que foi vítima de mordedura por cascavel e teve necessidade de hospitalização em unidade de terapia intensiva. Observou-se que, mesmo após melhora clínica, iniciou com sintomas psicóticos prodrômicos e progrediu para piora mental grave, que culminou em internação psiquiátrica e diagnóstico de esquizofrenia no decorrer dos meses seguintes. **Conclusões:** Nota-se, neste caso, correlação direta entre esses dois eventos; mas, em razão da escassez de trabalhos científicos que abordem tais questões, depreende-se que é preciso investigar e estudar com maior profundidade possíveis associações entre acidentes crotálicos e psicoses.

Palavras-chave: Mordedura de serpentes; *Crotalus*; Transtornos psicóticos; Relatos de caso; Folclore.

Resumen

Introducción: Las mordeduras de serpientes son enfermedades desatendidas y constituyen una parte importante de la morbilidad de las personas en edad laboral que viven en zonas rurales. La mayoría de sus efectos a corto plazo son ampliamente conocidos, especialmente los de carácter clínico; sin embargo, todavía existe un importante vacío en el conocimiento de las consecuencias a largo plazo de este tipo de lesiones, en particular las de carácter psíquico. Este artículo tiene como objetivo informar un caso de enfermedad mental posterior a un accidente crotálico y generar reflexiones culturales y fisiopatológicas sobre las consecuencias de tales eventos. **Presentación del caso:** Se trata de un adolescente residente en el interior de Bahía que fue mordido por una serpiente cascabel y requirió hospitalización en unidad de cuidados intensivos. Se observó que, aún después de la mejoría clínica, comenzó con síntomas psicóticos prodrómicos y progresó a un deterioro mental severo que culminó con hospitalización psiquiátrica y diagnóstico de esquizofrenia en los meses siguientes. **Conclusiones:** En este caso, existe una correlación directa entre estos dos eventos pero, debido a la escasez de trabajos científicos que aborden tales cuestiones, parece necesario investigar y estudiar con mayor profundidad posibles asociaciones entre accidentes crotálicos y psicosis.

Palabras clave: Mordeduras de serpientes; *Crotalus*; Transtornos psicóticos; Informes de casos; Folclore.

INTRODUCTION

Neglected diseases are understood as those that occur endemically in low-income populations and that do not receive sufficient investment for research because, in part, they carry considerable stigma and are not globally profitable.¹ Among these diseases, the World Health Organization points out snakebites,² which represent an individual and collective health problem in Brazil.^{3,4} This is a disease of neglected people and communities, and there is little international academic interest in the study of these diseases. However, there has been a growing scientific body investigating the therapeutic potential of natural poisons that may have neuropsychotropic action,⁵ as is the case with the venom of the *Bufo alvarius* frog (potent hallucinogenic)⁶ or the venom of the *Polybia occidentalis* wasp (potent anticonvulsant),⁷ among others. The study of such compounds among the wide biodiversity of the animal kingdom could be a new milestone in the understanding of human neurobiology and therapeutic alternatives for diseases of the psychic system.

It is known that the viper of the genus *Crotalus* (popularly known as rattlesnake) ranks second in accidents caused by snakes in Brazil.⁸ This snake has a venom that carries several toxins, the main one being crotoxin, a substance with neurotoxic activity, which acts particularly in the pre-synaptic region, inhibiting the release of acetylcholine in the neuromuscular junctions.⁹ Furthermore, the venom encompasses a multiple mixture of biologically active molecules with properties still under study, such as convulxin, gyroxin, crotamine and thrombin. Accordingly, this venom can act in a coagulant, nephrotoxic, myotoxic and cardiotoxic manner, while also exerting anti-inflammatory, analgesic and antitumor

immunomodulatory effects.^{10,11} This complexity clarifies the mysteries related to its actions, whether from a pathological or therapeutic point of view.

Such accidents occur in rural regions, places that are often endowed with a repertoire of popular tales and beliefs that relate everyday situations to folkloric explanations.¹² Among the various entities that inhabit the Brazilian popular imagination, the figure of Caipora is famous, from Tupi-Guarani mythology, a guardian of the forests who sabotages excessive hunting practices, being often treacherous and responsible for bad luck on the path of hunters.¹³ There are reports that narrate the result of unfortunate hunts in which the individual returns from the forest with torn clothes and the face filled with fear and astonishment. Therefore, illness often takes on the connotation of penance for transgressing the balance of natural systems.

The fact is that there is still a significant lack of studies that examine the long-term psychiatric repercussions of such accidents,¹⁴ especially those involving rattlesnakes. It is not known for certain whether, when psychic symptoms are imminent, these are more related to the biological action of the poison or to the stressful event itself, that is, being the target of a potentially lethal attack. The postulate of the diathesis-stress model, which helps explain the configuration of mental disorders, does not seek a definitive differentiation of the nature of this event but, above all, its effect on the psyche.¹⁵ Even though each person's response is unique, it will be the result of their internal and external mental processes, which range from their genetic predisposition to their health context, such as social and cultural aspects and religious and family factors, as well as other factors that may even perpetuate illness.

The clinical case presented below shows the development of a psychotic disorder that begins with a rattlesnake bite of a teenager who was hunting in the woods.

CASE PRESENTATION

A 15-year-old black teenager, living in a rural area in western Bahia, was brought by his father to the psychiatric emergency of a public tertiary hospital in Brasília in October 2022 because of behavioral disorganization that had started six months earlier. Despite the various social limitations in seeking specialized assistance in another state, the family chose to do so because of the high risk of serious self-harm. The parent said that the patient had been bitten by a rattlesnake in the right tarsal region on March 10, 2022, while in the forest hunting birds with his friends. The young man identified the typical rattle of the reptile and killed it. Later, he developed exuberant local pain and edema. He was immediately taken for clinical treatment at a small municipal hospital, where he suffered from myasthenia gravis, generalized muscle pain and choluria. He received five ampoules of antitropic serum upon admission and another ten ampoules of antitropic serum when transported by the Mobile Emergency Care Service to a hospital in a medium-sized city.

There, he was hospitalized for ten days (seven in intensive care) for management of acute renal failure and clinical support. A non-contrast head tomography was performed on March 20, 2022, which showed no changes. After clinical improvement, the patient was discharged still with mild neck pain and episodes of amnesia, in addition to being prescribed enalapril 10 mg/day because of increased blood pressure levels sustained during hospitalization. Despite the fear related to a fatal outcome, family and patient were not emotionally disturbed by the hospitalization, having adopted a resilient stance. However, the father said that after this episode, his son for weeks started to show hyporexia and a feeling of constant estrangement and distrust that had never been noticed before. Psychiatric symptoms became increasingly frequent and

intense, manifested by bouts of agitation, restlessness and disorganized and morbid speech (that he was going to die or kill himself). At first, there was fear in the family about the patient's health situation, since one of his uncles had died at the age of 14 after a rattlesnake bite. There was a spiritual perception among them that this was a prodigious animal with evil stigmas, returning to Abrahamic theological conceptions as well as the belief in vengeful forest spirits.

In mid-June 2022, the psychotic condition became plain. The boy presented persecutory and reference delusions, saying that they wanted to kill him, and that people were using their cell phones to talk about him. He had illusions and visual hallucinations (he would see a big man and also constant figures). He showed behavioral disorganization, during which he looked perplexed and scared, constantly anxious and restless, looking at the sky and raising his hands, manipulating the skin on his abdomen, changing his clothes multiple times a day without explanation, being naked in the presence of strangers, walking long distances and laughing unmotivated. He displayed an equally disorganized speech, presenting constant soliloquies and mussions, sometimes saying that "everything is blurry" and lacking coherence, in addition to adding morbid content such as "I'm going to die, there's no other way". The course of symptoms fluctuated, occurring noticeably about every ten days. Relatives sought care at the region's Psychosocial Care Center in mid-July, and antipsychotic treatment with olanzapine 10 mg/day was prescribed, with a significant response, but still unsatisfactory and unsustainable. Later, family members took the patient to the local faith healer, where they received spiritual help, but without any changes in the condition. By the end of September of that year, no major advances in response to treatment had been observed, and the teenager was already "asking for a knife to kill himself or cut off his anus", which according to him did not exist. This situation led to the search for emergency care.

There was a positive family history of schizophrenia (patient's paternal aunt and maternal uncle). However, the teenager had not used psychoactive substances throughout his life and had no clinical comorbidities or even hospital admissions. The family said that the patient's pre-morbid personality was that of a quieter and more withdrawn child, having learned to read and write after his peers (around the age of 14) and even failing three years of school. Despite this, he was charismatic and had good social interaction with peers and family, making friends at school and carrying out collective and sporting activities with satisfactory performance. He lived with his parents and seven siblings in a financially fragile situation, but with a well-established network of affection.

Upon examination of mental state upon admission, the patient was noted to be restless, with increased psychomotricity, apparently unreasonable body movements, frequently raising his upper limbs and looking at the sky, scanning the treatment room, lifting his shirt and twisting the skin of his abdomen continuously, gesturing excessively (he covered his mouth, passed his hands over his head, punched his hands), forced eructations, spitting regularly, showing a frightened look, soliloquies and mussions. He had a hallucinatory attitude, where he would grab his father's face and then his, turning his head randomly. He was hypervigilant, euthymic, with inadequate affect, derailed ideas, accelerated thinking and delusional content with themes that were sometimes derogatory, sometimes banal and often with abrupt moments of interruption in train of thought. He behaved with collaborative and harmless behavior, partially auto- and allopsychically oriented, impaired judgment of reality, sense of morbidity partially present, appearing conscious and awake.

During psychiatric hospitalization, laboratory and neuroimaging tests were performed and organic hypotheses were ruled out. The patient and family agreed to progressive treatment with a drug reserved for refractory cases (clozapine), after unsuccessful attempts with other antipsychotics (risperidone,

haloperidol and olanzapine). Over the course of three weeks on clozapine, there was a drastic improvement in symptoms and no significant side effects. When a dose of 200 mg/day was reached, the patient already appeared calm and was able to continue the interview attentively, maintaining eye contact, demonstrating appropriate concern and with a considerable reduction in unreasonable and incessant gesticulations. He talked about the period of hospitalization clearly and fluently, demonstrating that he understood the objectives of care and perceived improvement, saying that “the head is no longer confused, but there is still a little bit left to be healthy” and retrospectively explained himself by saying that “I had the feeling that the world was ending, so I went out to see if things were still there”, but this belief was no longer present. After improving, he explained with relative calm that he did not have ophidiophobia nor was he reliving trauma related to the accident. The father added that at the time, he returned to the forest and found the rattlesnake’s corpse. During his delusional production, rattlesnakes were neither central nor peripheral to the content of his thoughts. Furthermore, he had no complaints and maintained regular, physiological sleep, appetite, diuresis and bowel movements.

The family was discharged at the beginning of November 2022, with psychoeducation on the nature, course, prognosis and treatment of schizophrenia, in addition to a prescription for clozapine 300 mg/day, amlodipine 5 mg/day and care coordination with the Basic Care Unit and Health and Psychosocial Care Center in their area. One year after hospitalization, the patient continues to undergo regular mental health monitoring in his city and maintains psychiatric stability, using the same medication and being monitored by a multidisciplinary team (Figure 1).

DISCUSSION

When faced with a first psychotic episode such as the one described, it is imperative to exclude potentially reversible causes, which are often sufficient to explain the symptoms. The removal of causal factors (for example, interruption of drug use or treatment of organic conditions such as poisoning) is a necessary part not only of treatment but of evaluation, and it is usually sufficient for the diagnostic definition and differentiation in relation to schizophrenia.¹⁶ In epidemiological terms, it is known that the average age of onset of this disorder is between 18 and 25 years for males.¹⁷ It is clear that this patient’s psychotic onset was at the age of 14 and considering the vulnerability-stress model, it can be suspected that the accident was the most likely predisposing agent for the schizophrenic split, since it was from there that the described symptoms began and developed exponentially.

To date, there is little data in the medical literature regarding the association between these two events that could establish any degree of causality¹⁸. However, a singular caveat must be made regarding the gap in knowledge that exists in the study of neglected diseases and their complications. The largest proportion of scientific works that deal with this field of mental illness and snakebites is in India, Bangladesh and Sri Lanka, covering a series of cases and also case reports similar to this one, in which the emergence of conditions that are not only anxious or depressive, but hallucinatory and delusional like in the above.¹⁸

From the perspective of the person-centered clinical method, the bite event appeared to be fundamental in the illness process, according to the assessment of the family and the adolescent himself.¹⁹ The father and son believed that the rattlesnake was responsible for the current condition. Even though the doctor could not conclude with any certainty, the simple mention of the caregiver and the patient were enough to draw some associative connection, as they themselves were the ones who interpreted something as important or not in the patient’s experience with the disease.



Source: image created with help of artificial intelligence.

Figure 1. Figurative illustration of the case presented.

The role of the venom and its long-term neurological and vascular action is questioned here, since, in principle, it would be excreted in a matter of hours or days.²⁰ It is also known that, depending on the severity of certain poisoning, considerable sequelae can occur, and we cannot rule out the possibility that the poison in some way contributed to some permanent and unusual cerebral effects.²¹ Considering the increased blood pressure levels even months after the accident, the integrity of vascular health at the systemic level after trauma must be questioned. As an example, there is a published Indian case report that follows this line of reasoning: the action of the vasculotoxic venom of the snake *Daboia russelii* in a 42-year-old man was sufficient to cause empty sella syndrome and trigger organic delusional disorder of the schizophrenic type.²²

At the same time, the fact that the patient did not have an aversion to rattlesnakes constitutes an element of apparent contradiction to the assumption that the attack itself would carry with it a high extent of stress that would precipitate schizophrenic disruption. Furthermore, the content of the delirium had no correlation with the reptilian theme, which makes it strange to think that it was just a psychologically traumatizing event.

On the other hand, the idea of disregard for the laws of nature, often incorporated and perpetuated in rural areas by folkloric entities such as Caipora, and the feelings of suffering and guilt resulting from this can greatly contribute to generating high levels of mental stress.²³

It is also necessary to consider the effect of hospitalization in intensive clinical care and its intrinsic risks (such as iatrogenic), which lead to a distance from the family environment during hospitalization, and the trauma of separation and the feeling of helplessness in the face of a serious illness cannot be underestimated.²⁴

CONCLUSION

In summary, a sequence between rattlesnake bite accident and first psychotic episode is revealed here, but it is not known precisely where the responsibility for the effects of the poison or the psychosocial stress of this event in the illness process of this teenager begins and ends. The clinical case raises this discussion and contributes to the materialization of reports in the medical literature about neglected diseases and their morbidity, illustrating a clinical case with regional content that links long-term psychic effects to a snakebite accident. This allows us to investigate the psychotropic effects of crotalic venom, as well as broaden our view of folk cultural issues in the collective unconscious and the development of mental disorders.

CONFLICT OF INTERESTS

Nothing to declare.

AUTHORS' CONTRIBUTIONS

RFA: Conceptualization, Data curation, Investigation, Writing – original draft, Writing – review & editing. REMB: Supervision, Visualization, Writing – original draft, Writing – review & editing.

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