



## Case report

## Scorpion envenoming caused by *Tityus cf. silvestris* evolving with severe muscle spasms in the Brazilian Amazon



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## ABSTRACT

Scorpion stings are a public health problem in the Brazilian Amazon. However, detailed clinical characterization with the proper animal identification is scarce. Here we report a confirmed case of envenoming by *Tityus cf. silvestris* in the Brazilian Amazon. The case evolved with generalized muscle spasms and was treated with antivenom and supportive therapy, requiring intensive care unit admission. The patient evolved favourably and was discharged after 9 days of hospitalization.

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### 1. Introduction

Scorpion stings are a neglected health problem with higher morbidity and mortality in tropical countries in Africa, Asia and Latin America (Chippaux and Goyffon, 2008; Chippaux, 2012; WHO, 2007). It is estimated that almost 2.5 billion people worldwide live in areas at risk for scorpion stings (Chippaux and Goyffon, 2008) and more than 1.5 million envenomings occur annually involving 2600 deaths (Chippaux, 2012). However, the true incidence of scorpion sting envenomings is probably underestimated because many victims do not seek health care (WHO, 2007). In Brazil, 87,801 cases of scorpion stings were reported in 2014 by the official surveillance system, with a lethality rate of 0.1% (SINAN, 2016). The highest incidence in this country is among adult men living in urban areas (Reckziegel, 2014).

In the Brazilian Amazon, scorpion stings annual incidence reaches 200 cases per 100,000 inhabitants in some areas of the Western Pará state and Southeastern Amazonas state and 100 cases per 100,000 inhabitants in the states of Mato Grosso, Tocantins and Maranhão (Wen et al., 2015). A survey from the Acre state found that about 10% rubber workers and 14% of Amerindians had been stung at least once in their lifetime by scorpions (Pierini et al., 1996). In the Amazonas state, mean annual incidence is 7.6 cases per 100,000 inhabitants, occurring mainly in adult men living in rural areas, and the lethality rate is 0.3%. In this area, scorpion stings are generally mild except in children (Queiroz et al., 2015).

The *Tityus* genus, belonging to the Buthidae family, is the main cause of envenomings and species of medical interest in this genus are *Tityus bahiensis*, *Tityus stigmurus*, *Tityus serrulatus* and *Tityus obscurus* (Brazilian Ministry of Health, 2009). *T. serrulatus* has a high adaptive capacity in urbanized environments and causes severe envenomings outside the Brazilian Amazon (Brazilian Ministry of Health, 2009; Bucaretychi et al., 1995). Despite little knowledge of scorpion species in the Brazilian Amazon, the main species of

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medical interest are *T. obscurus*, *Tityus metuendus* and probably *T. silvestris*, due to its large geographic distribution (Brazilian Ministry of Health, 2009; Wen et al., 2015). In Brazil, specific treatment for moderate and severe scorpion stings consists of antivenoms produced by immunizing horses with *T. serrulatus* venom (*Tityus* scorpion antivenom) or a mixture of *Loxosceles gaucho*, *Phoneutria nigriventer* and *T. serrulatus* venoms (polyvalent antivenom against *Loxosceles* and *Phoneutria* spiders and the *Tityus* scorpion) (Wen et al., 2015).

*Tityus silvestris* belongs to the subgenus *Archaeotityus* and is a scorpion species of sexual reproduction found in the tropical Amazonian rainforest in litter and palm trees (Lourenço, 1992). It presents the most extensive geographic distribution among the scorpions of potential medical importance in the Amazon, extending from the French Guyana and Amapá and Pará states in Brazil to the Peruvian Amazon (Lourenço, 1988, 1986). Over this area, *T. silvestris* is highly polymorphic without a geographical correlation, a phenomenon termed ‘ochlopecies’ (Lourenço, 1988). In spite of its large spatial distribution, to the best of our knowledge there are no confirmed cases of severe envenoming for this species reported in the literature. Herein, we report a severe case of envenoming by *T. silvestris* in the Brazilian Amazon.

## 2. Case report

A 39 year-old man was admitted to the *Fundação de Medicina Tropical Dr. Heitor Vieira Dourado*, a tertiary reference service for tropical diseases in the city of Manaus, Amazonas state, three hours after being stung on the left elbow and shoulder by a scorpion while he was sleeping. The scorpion sting occurred in his house in the urban area of Manaus. The patient had a history of chronic liver disease caused by hepatitis B virus associated with liver cirrhosis and esophageal varices. He was in use of entecavir, which was maintained during hospitalization, and waiting for liver transplantation. The scorpion that caused the envenoming was brought by the patient to the health service and preliminarily identified as a female adult specimen of *Tityus* cf. *silvestris* (Lourenço, 1988, 1986) (Fig. 1).

On admission, the patient showed only mild local pain and paresthesia in the left arm, pain control medication was administered (IV dipyrone). After two hours of admission, the patient showed dyspnoea, agitation, tachycardia, generalized muscle spasms and hypertension (Supplementary video). The envenoming was reclassified as a severe case of scorpion sting and 5 vials of *Tityus* scorpion antivenom were administered after pre-medication with IV hydrocortizone, dexchlorpheniramine and ranitidine. Generalized muscle spasms persisted despite administration of different doses of diazepam (IV 5 mg e IV 10 mg), phenytoin (IV 200 mg IV and IV 100 mg), and promethazine (IM 50 mg).

Supplementary video related to this article can be found at <http://dx.doi.org/10.1016/j.toxicon.2016.06.015>.

In the same day the patient was transferred to the intensive care unit for close monitoring of vital functions and advanced support with macronebulization and intravenous hydration. He was somnolent, eupneic, hemodynamically stable (BP 110 × 70 mmHg, CF 83 bpm; SaO<sub>2</sub> 99%), with alternated episodes of agitation. On the second day after the envenomation he showed hypothermia, episodes of bradypnoea and frequent generalized muscle spasms; he was held on macronebulization and received promethazine (IM 50 mg). On the third day after the envenomation, generalized muscle spasms still continued, so diazepam (IV 5 mg) was administered.

On the fourth day after the envenomation, the patient was transferred to the ward for clinical follow-up, where he remained until discharge. During the period of hospitalization at the ward, he

showed paresthesia and swelling in the affected limb, tachycardia, dyspnoea and headache, blood pressure fluctuations (100 × 60 mmHg – 180 × 10 mmHg), abdominal pain and an episode of melena. The patient was treated with propranolol (orally 40 mg), dipyrone (IV 1 g), and phytomenadione (IM 10 mg). Chest X-ray, electrocardiogram and abdominal and pelvic ultrasound performed on the seventh day after the envenomation showed no alterations. Hematology revealed mild to moderate leukopenia and thrombocytopenia. Abnormal coagulation and hepatic function tests were observed. There were no significant findings in the levels of electrolytes and renal function tests (Table 1). The patient was discharged nine days after admission without sequelae.

## 3. Discussion

In Brazil, severe cases and deaths caused by *Tityus* genus occur particularly in envenomations involving children (Albuquerque et al., 2013; Bucaretschi et al., 2014, 1995; Cupo et al., 1994). In the state of Amazonas, Brazil, 4.6% of scorpion stings are classified as severe cases, where age ≤ 10 years is independently associated with risk of developing life-threatening complications (Queiroz et al., 2015). The case reported here was a 39 year-old male presenting with generalized muscle spasms, which significantly were refractory to treatment with the Brazilian anti-*Tityus* antivenom. The case was classified as a severe envenoming and required transfer to an intensive care unit for close monitoring. Such reports need to be encouraged considering the increasing incidence of scorpionism in the Amazonian region (Queiroz et al., 2015). *T. silvestris* belongs to the subgenus *Archaeotityus*, which has been recognized by several authors as agents of generally low to moderate severity envenomings, as previously shown for *T. silvestris* (Asano et al., 1996) and *Tityus pusillus* (Albuquerque et al., 2009).

Muscle spasms reported here as due to envenoming by *T. cf. silvestris* are generally seen after envenoming by Amazonian scorpions in the *Atreus* subgenus, particularly *T. obscurus*. In this sense, it is significant that the cerebellar-muscular alterations occurring after *T. obscurus* envenoming elsewhere in the Amazonian region are not abolished by the anti-*Tityus* antivenom, as reported here for *T. cf. silvestris*, requiring treatment with benzodiazepines. Indeed, although the number of vials of *Tityus* scorpion antivenom administered was consistent with case classification in this report, it did not significantly reduce the occurrence of generalized muscle spasms, necessitating the use of symptomatic drugs. Administration of benzodiazepines, hydantoins and antihistamines contributed to progressive reduction in spasms, which persisted for three days after scorpion envenomation. However, careful use of benzodiazepines was taken into account for the risk of encephalopathy in this patient (Butterworth, 2015).

The clinical manifestations observed in scorpionism depend on the predominance of the adrenergic or cholinergic effects, which can result for example in hypertension followed by hypotension and tachycardia followed by bradycardia (Cologna et al., 2009; Dehesa-Dávila and Possani, 1994). In this case, the patient showed local clinical manifestations as pain, paresthesia and edema, and systemic manifestations as dyspnoea, bradypnoea, somnolence/agitation, tachycardia, headache, hypertension/hypotension, hypothermia, abdominal pain and generalized muscle spasms, showing the adrenergic and cholinergic effects induced by *T. cf. silvestris* venom. In envenomations caused by *Tityus stigmurus*, *T. serrulatus* and *T. bahiensis* neurological manifestations such as convulsion and agitation/somnolence have been observed (Albuquerque et al., 2013; Bucaretschi et al., 2014; Lira-da-Silva et al., 2000). In envenomations by *T. obscurus*, myoclonus and sensation of “electric shock” in the whole body have been reported (Pardal et al., 2014, 2003; Torrez et al., 2014). Severe and fatal cases have

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