

Case Report

Snakebite and local envenomation by *Boiruna maculata* treated without antivenom

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Background: When snake breeders are bitten by rare snakes, deciding whether to administer snake antivenom can be challenging.

Case Presentation: A 50-year-old man was bitten on the right finger by *Boiruna maculata*. The next day, his right upper limb exhibited pronounced local manifestations of envenomation. At the first consultation, a dark purple bleeding spot and a necrotic site were present under the fang marks at the bitten finger and his affected limb showed extensive swelling and redness. Snake antivenom was not administered because it was difficult to identify the snake and obtain the antivenom. We performed the pressure immobilization technique to his limb. The patient's symptoms peaked in severity on the second day of illness. He was discharged with marked improvement.

Conclusions: We have experienced a case of snakebite envenomation by *Boiruna maculata*.

Key words: Antivenoms, envenomation, first aid, mussurana, snake bites

INTRODUCTION

THE WORLD HEALTH Organization statistics estimate that nearly 3 million people are bitten by venomous snakes each year, and 81,000 to 138,000 die. Two years ago, the agency classified venomous snakebites as neglected tropical diseases.¹ *Boiruna maculata* has long been popular among snake enthusiasts. This snake is native to South America, and along with the related *Clelia* species, is collectively referred to as “mussurana” in English. *Boiruna maculata* is particularly noted for its habit of eating snakes in the family Viperidae, and it is kept mainly as a pet among snake breeding enthusiasts in Japan. This species is known to be poisonous, but the details of its toxicity are not well understood. When snake breeding enthusiasts are bitten by rare snakes, deciding whether to administer snake antivenom can be challenging. One case of a human bitten by *Clelia clelia*

and one case of a human bitten by *Boiruna maculata* have been reported.^{2,3} We report a case of snakebite by *Boiruna maculata*.

CASE REPORT

A 50-year-old Asian man weighing 55 kg was bitten on the right finger while handling a *Boiruna maculata*. The patient photographed the bite without immediately pulling his hand back (Fig. 1). After the bite, the patient did not tourniquet the arm. Gradual swelling of the bite wound was observed thereafter. By the next day (the second day of symptoms), the swelling had spread over the elbow joint, and the patient was transported to our hospital.

At the time of examination, ~20 h had passed since the bite, and a dark purple bleeding spot and a necrotic site were present under the fang marks at the distal aspect of the right first finger. The affected limb showed extensive swelling and redness from the fingers to the upper arm and extending over the elbow joint (Fig. 2). The patient had limited finger mobility because of the swelling, and he complained of pain; however, he had no sensory disturbance. His vital signs (consciousness, blood pressure, heart rate, respiratory rate, and body temperature) were normal. Blood biochemical examination showed a slightly increased inflammatory

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Received 28 Mar, 2020; accepted 2 Jun, 2021

Funding Information

No funding information provided.



Fig. 1. The patient's right hand was bitten by *Boiruna maculata*. While feeding and rearing this southern mussurana, the patient's hand was mistaken for food and was bitten by the snake (left). The snake was biting the base of the thumb and the pain was slight. The circled dashed line is the snake's left-eye and the arrow is the tip of the snake's nose (right).



Fig. 2. Fang marks (arrow) and subcutaneous bleeding were observed at the distal aspect of the right thumb swelling and blister formation was noted (left). Approximately 20 h after the bite, the swelling of the right forearm had extended to the upper arm, redness was present along the lymph vessels, and the axillary lymph nodes were swollen (right).

response, but no signs of renal dysfunction, liver damage, or abnormal coagulation ability (Table 1).

The patient was admitted to the hospital because of severe swelling, possible compartment syndrome, and necrosis of the upper limb. The bite wound was incised with a scalpel, washed thoroughly with saline, and maintained in an open state. Little information about snakes native to South America is available in Japan; therefore, we decided not to administer antivenom serum. We treated the patient with compression, elevation, and resting the affected limb. Blood biochemical examination on the third day of illness showed no renal dysfunction, liver damage, or abnormal coagulation ability, and treatment with Goreisan was started to improve the edema. Contrast-enhanced computed tomography on the third day showed edema accompanied by an increase in the absorption value of the subcutaneous fat tissue from the fingers to the upper arm; however, no signs of inflammation were present beyond the fascia, and blood flow was maintained to the periphery. The patient gradually improved and was discharged on day 7. He was re-examined on an outpatient basis on the day 14, and the swelling of the upper arm and forearm had disappeared.

Table 1. Laboratory findings at the time of admission

Complete blood cell count		Serum biochemistry test	
WBC	9240 μL^{-1}	Na ⁺	140 mEq/L
RBC	533 $\times 10^4 \mu\text{L}^{-1}$	K ⁺	4.1 mEq/L
Hb	15.6 g/dL	Cl ⁻	103 mEq/L
Ht	46.8%	BS	103 mg/dL
Plt	23.9 $\times 10^4 \mu\text{L}^{-1}$	UA	15 mg/dL
Serum biochemistry test		Cr	1.00 mg/dL
PT	>100%	AST	24 IU/L
PT-INR	0.98	ALT	20 IU/L
Fib	248 mg/dL	T-bil	0.89 mg/dL
FDP	2.5 $\mu\text{g/mL}$	CK	376 U/L
D-dimer	0.7 $\mu\text{g/mL}$	TP	6.7 g/dL
ATT	29.6 s	CRP	0.71 mg/dL
		LDH	312 IU/L

ALT, alanine transaminase; AST, aspartate transaminase; ATT, activated partial thromboplastin time; BS, blood sugar; Cl⁻, chloride; CK, creatine kinase; Cr, creatinine; CRP, C-reactive protein; FDP, fibrin degradation products; Fib, fibrinogen; Hb, hemoglobin; Ht, hematocrit; K⁺, potassium; LDH, lactate dehydrogenase; Na⁺, sodium; Plt, platelets; PT, prothrombin time; PT-INR, prothrombin time–international normalized ratio; RBC, red blood cells; T-Bil, total bilirubin; TP, total protein; UA, uric acid; WBC, white blood cells.

DISCUSSION

THE COMMON NAME of *Boiruna maculata* (Boulenger, 1896) in English is “mussurana,” also spelled “musurana.” This is a common name used for several species of New World snakes, especially species in the genus *Clelia*, in the family Colubridae. This species is not aggressive and usually feeds on small animals such as lizards and snakes. Adult *Boiruna maculata* are especially popular among snake enthusiasts.

Snake venoms are classified into neurotoxins, hemorrhagic toxins, and muscle toxins according to their effects. Although the details regarding the toxicity of *Boiruna maculata* and *Clelia spp.* are unclear, the symptoms suggest that the venom is proteolytic. *Boiruna maculata* is a rear-fanged snake, and the toxin is believed to be injected relatively slowly. Many of the more than 2,200 species of colubroid snakes are rear-fanged and many possess a Duvernoy’s venom gland. Rear-fanged snakes typically produce venoms with lower complexity than front-fanged snakes, and there are even fewer dominant venom protein families. However, the venom from the Duvernoy gland of Japanese snake *Rhabdophis tigrinus* “yanakagashi,” contains prothrombin activation enzymes, therefore, has anticoagulant activity that causes clinical manifestations such as hemorrhage.⁴

The patient’s affected limb on arrival at the hospital was equivalent to grade 4 in the Sakio classification.⁵ Bothrops antivenom has been used empirically for snakebites in the Colubridae family, and both previous reports of *Boiruna maculata* bites and *Clelia clelia* bites have been treated with Bothrops antivenom. Nishioka *et al.*⁶ reported cases in which a patient was treated as a victim of a Bothrops bite and was given a specific antitoxin based on clinical findings; however, the snake had been misidentified. Antitoxin serum is administered to counteract snake venom, and although its antitoxin effect has been established, it is not effective in all patients. The reason for this is that adverse effects such as anaphylactic shock at the time of administration and serum sickness after administration may occur, and it is too late to consider administration of antitoxin serum in other cases. We discussed the indication of antitoxin administration, but finally we decided not to administer antitoxin, judging from the time course, local symptoms, test data, etc. According to Tsujimoto’s report of pit viper bites whose toxin is hemorrhagic toxin and all cases without receiving serum antitoxin, it is suggested that further data should be collected to establish standards for antitoxin clearance treatment for snake bites.⁷

The practical recommendation for the first aid treatment of snakebites is to immobilize the victim while awaiting emergency services. Additionally, in the present case, raising

the affected limb seemed to be effective in alleviating the symptoms. Other treatments, such as binding and hemostasis, are also available for snakebites; however, none have been proven effective, and some may even be harmful.⁸

We did not perform antitoxin administration, but the best supportive care to the patient with the snakebite. As a result, the patient developed no systemic symptoms, his edema began to decrease on day 4, and he was discharged on day 7. In a previously reported case of a *Boiruna maculata* bite, the edema improved from day 3 and the patient was discharged on day 5, which coincide with our case. In our case, the patient completely recovered without any sequelae.

CONCLUSIONS

WE EXPERIENCED A case of snakebite envenomation by *Boiruna maculata*. Although antitoxin serum treatment is sometimes given for the same type of snake venom, this case was completely cured without the use of such treatment. The indications for antitoxin serum therapy must be careful and cautious.

DISCLOSURE

Approval of the research protocol: Not applicable.

Consent for publication: Appropriate written informed consent was obtained for publication of this case report.

Registry and the registration no. of the study/trial: Not applicable.

Animal studies: Not applicable.

Conflict of interest: None declared.

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