

Snakebite in a Child: Could We Avoid the Anaphylaxis or the Fasciotomies?

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Abstract

Introduction: We report the unusual presentation and complications of a case of snakebite, involving a child and his mother, who were bitten by the same snake. **Clinical Picture:** The mother was well but the child developed worsening local pain and swelling. **Treatment and Outcome:** Test doses of antivenom were administered but he developed anaphylactic shock. Subsequently, he developed compartment syndrome and fasciotomies were performed. **Conclusions:** This report serves to alert the public to a few of the avoidable risk factors associated with snakebites (such as avoiding areas known to harbour snakes in the evening in summer and autumn, and wearing protective footwear), and the clinician of the important management issues in snakebites. Precautions for anaphylaxis must be taken when antivenom is administered. If a bitten patient with rapid extension of local injury does not receive any antivenom, compartment syndrome complicating local injury can occur.

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Introduction

Snakebites have become uncommon in the metropolitan and densely populated city of Hong Kong.¹⁻³ We recently reported a 10-year survey of snakebites in children in Hong Kong and concluded that children should be discouraged to play in areas where snakes may hide and that protective footwear should be worn.⁴ We now report the unusual presentation and complications of a case of snakebite, involving a child and his mother, who were bitten by the same snake. The subsequent evolution of local injury, occurrence of anaphylaxis to antivenom, and development of compartment syndrome are documented and various management issues discussed.

Case Report

The incident occurred when the 6-year-old child and his mother were walking in a grassy area in a village at 10 pm in August. Both victims were wearing slippers and were bitten on the feet by a green snake. The son developed rapidly worsening local pain and swelling. His mother recognised the snake as the “green bamboo” snake

(*Trimeresurus albolabris*) with the help of standard identification photographs provided at the emergency department. Apart from the fang punctures on her right big toe, the mother did not develop any local or systemic symptoms.

Physical examination at the emergency department of a local hospital within 30 minutes of the incident revealed fang marks over the lateral aspect of his left ankle (Fig. 1). Bruising was noted at the foot, and swelling and tenderness extended to 4 cm below the patella. The circumference of the leg 5 cm below the left patella was 21 cm as compared to 20 cm on the right side. The circulation to the left lower limb was not compromised. He was haemodynamically stable and was given oral paracetamol and intravenous morphine for pain relief. He was admitted to the paediatric ward for monitoring. Initial blood tests were: haemoglobin 13.1 g/dL; platelet count $137 \times 10^9/L$; prothrombin time (PT) 12.5 seconds; activated partial thromboplastin time (APTT) 40.2 seconds and creatine phosphokinase 71 U/L (normal range, 5 U/L to 55 U/L). His urinalysis was unremarkable.

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Fig. 1. Fang marks over the lateral aspect of the left ankle (arrows), bruising at the foot, and swelling extending toward the left knee.

However, this boy experienced worsening left leg pain and swelling that extended to mid-thigh 12 hours later. Orthopaedic surgeons decided against fasciotomy as his platelet count had fallen to $24 \times 10^9/L$. Test doses of purified *Agkistrodon halys* antivenom (0.1 mL diluted with 1.9 mL of normal saline; Shanghai Institute of Biological Products, People's Republic of China) was administered subcutaneously at 14 hours following pre-medication with intravenous chlorpheniramine. This was the only antivenom available at the hospital which provided cross-neutralisation for *Trimeresurus albolabris*. This patient developed anaphylactic shock within minutes of the second test dose of antivenin (0.4 mL of diluted antivenin, subcutaneously given 15 minutes after the first test dose). His blood pressure plummeted to 50 mm Hg systolic and 12 mm Hg diastolic. The shock was promptly reversed with the treatment of normal saline bolus, intravenous adrenaline and hydrocortisone. All along, there was no arterial desaturation and the patient remained fully alert. He was then transferred to the paediatric intensive care unit (PICU) of a teaching hospital. Laboratory investigations were as follows: haemoglobin 14.0 g/dL; platelet count $18 \times 10^9/L$; PT 12.5 seconds and APTT 47.8 seconds. Urinalysis remained unremarkable. Subsequently, compartment syndrome developed, necessitating left foot and leg fasciotomies at 18 hours (anterior compartment pressure, 28 mm Hg). Abnormalities in haematologic parameters were noted (Table 1). He also received packed red cells, fresh frozen plasma, platelet transfusions, broad-spectrum antibiotics, tetanus booster, intravenous chlorpheniramine and corticosteroid. After 3 days in the PICU, he was transferred to the orthopaedic ward for rehabilitation.

Discussion

Snakebites are typically associated with marked oedema and pain within an hour of envenomation.¹⁻⁵ Haemorrhage and necrosis are common and paired bite marks are often noted.^{2,4} Adverse reactions to antivenom usually take the

Table 1. Abnormal Haematologic Parameters in the Patient

Laboratory test	Worst value	Time from bite (day 1)	Normal range
Haemoglobin	7.5 g/dL	Day 2	11.5 - 15.5 g/dL
Platelet count	$18 \times 10^9/L$	Day 2	150 - 400 $\times 10^9/L$
PT	27.9 seconds	Day 2	11 - 15 seconds
APTT	120.0 seconds	Day 2	25 - 35 seconds
D-dimer	1105 ng/mL	Day 4	<500 ng/mL

APPT: activated partial thromboplastin time; PT: prothrombin time

form of anaphylaxis or serum sickness. The *Agkistrodon halys* antivenom used in this case is derived from horse serum. Our patient did not have any prior exposure to the antivenom or any contact with horses. In our experience, antivenom is not used routinely in greensnake bites due to the known risk of anaphylaxis and because most bites are mild and do not cause systemic manifestations.⁴ The indications for using antivenom include rapid extension of local injury and systemic manifestations.⁶ However, these recommendations are derived from US data with a known, limited number of pit viper snakes and from well-characterised antivenoms. The same criteria might not be applicable in the Chinese antivenom. Nevertheless, we believe that the antivenom was rightly considered at the local hospital in this case, where there was rapid local extension of swelling and pain, and test doses administered.^{6,7} However, the patient still reacted dramatically with anaphylactic (distributive) shock, which was promptly reversed with intravenous fluid and adrenaline. Acute reactions to antivenom have been reported in approximately 23% to 56% of patients, even in patients who have never received previous treatment.^{6,8} In order to avoid serious anaphylactic reactions, some authors recommend that appropriate skin tests should be carried out prior to the administration of antivenin (by the injection of 0.02 mL to 0.1 mL of a 1:10 dilution of the reconstituted antivenin intradermally, with a saline control administered in the opposite extremity).^{6,7} A positive skin test constitutes a relative contraindication to its use, but this must be assessed according to the clinical condition of the patient. If the result of the skin test is negative, one then can proceed with the slow infusion of the diluted antivenin. In our patient, skin testing was not performed at the local hospital. This may be conceivable if local hospital staff is not trained to interpret results of infrequently performed skin tests. Skin test may or may not predict anaphylaxis, and can itself precipitate an anaphylactoid reaction. Precautionary measures (such as adrenaline) to treat anaphylaxis must be on hand before initiating skin testing or antivenom therapy. A double-blind, randomised and placebo-controlled trial reported that low-dose subcutaneous adrenaline was useful in preventing acute adverse reactions with antivenin in

patients with snakebites.⁹ Management of anaphylaxis included rapid volume administration, and the use of inotropes, antihistamine and corticosteroid. Without the use of antivenom, local disease may extend in some patients. In our patient, compartment pressure in the anterior compartment of the left leg was elevated to 28 mm Hg at 18 hours. Because of concern over the increased compartment pressure, operative fasciotomies were performed. Fasciotomy may be indicated in carefully selected patients but evidence regarding the procedure is sparse.¹⁰

Snakebites have become uncommon in the metropolitan and densely populated city of Hong Kong. In our recent review of snakebites over a 10-year period, several risk factors were identified, namely, being of male gender and not wearing protective footwear.⁴ Incidences of snakebites tend to occur near the home, in the evening to early morning hours, in the late summer to early autumn months. All of these factors are present in this case. Although identification of the species may aid management, this case serves to illustrate that a snake may bite successively and that discharge of venom can occur in the second bite. Therefore, we discourage any attempt by the victim to try to capture the snake for identification.

In conclusion, this report serves to alert the public to precautions they can take to avoid snakebites (such as avoiding areas known to harbour snakes in the evening from summer to autumn, and wearing protective footwear), and to remind clinicians of the important management issues in snakebites. Precautions for anaphylaxis must be taken even when test doses of antivenom therapy are

administered. If a bitten patient with rapid extension of local injury does not receive any antivenom, compartment syndrome complicating local injury can occur.

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