

CASE REPORT

Management of a Pediatric Snake Envenomation After Presentation With a Tight Tourniquet

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We describe an illustrative case of pediatric snake envenomation presenting with a tightly wound tourniquet. A 10-year-old boy presented after a snake bite to the right calf. A tourniquet was in place just below the right knee. The species of snake was unknown. The patient was hemodynamically stable, but the entirety of the right leg distal to the tourniquet was discolored. Over concern for a potential venom bolus effect upon tourniquet removal, the decision was made to start a crotaline Fab antivenom infusion and gradually loosen the tourniquet. The patient tolerated the infusion and removal of the tourniquet without signs of anaphylaxis or decompensation. Dynamic improvements were observed in the right leg and wound site that appeared to be the result of vascular congestion. Tourniquets are generally not recommended for snakebites; however, if a tourniquet is already placed, we avoid removal until prepared to manage acute toxicity or immediate hypersensitivity.

Key words: snake, bite, tourniquet, envenomation, venom, envenoming

Introduction

When a person is bitten by a snake, interventions by others at the time of the bite can influence the pathophysiology of the snakebite, the medical management when the patient arrives at the hospital, and the patient's long-term prognosis. A common, often misguided, intervention utilized by the lay public after a snake bite is the application of a tourniquet, a material applied circumferentially to the involved extremity proximal to the site of injury that, depending on how tightly it is applied, impedes arterial, venous, and lymphatic drainage of the distal region of the extremity.¹

This report is of an illustrative case managed in our children's emergency department and hospital at a teaching facility. The antivenom used in this case was *Crotalidae* Polyvalent Immune Fab (Ovine [CroFab, BTG International, West Conshohocken, PA, USA]) and will be referred to here as antivenom.

Case Presentation

A 10-year-old, otherwise healthy boy was brought to the emergency department by private vehicle after a

snakebite, which had occurred approximately 25 minutes earlier. No adult was present at the time of the snakebite, but the family reported sightings of copperhead snakes where they live in North Carolina. The snakebite was in the right calf, with two fang puncture sites located 18 mm apart. There was localized bruising and a small bulla at the bite site. A tight tourniquet was placed in the field by the patient's brother. The tourniquet was a leather belt wrapped around the patient's right leg to the knee joint. Dusky purple discoloration was observed distal to the tourniquet (Figure 1). Otherwise, the patient's physical examination was unremarkable. He was alert and oriented, and in mild distress. Initial vital signs were blood pressure 126/89 mm Hg, heart rate 119 beats/min, respiratory rate 25 breaths/min, temperature 36.9°C, and 100% oxygen saturation on room air by pulse oximeter. Results of the initial set of laboratory tests as well as the subsequent laboratory analyses are available in the Table.

Six vials of antivenom were prepared as expeditiously as possible and in accordance with the manufacturer's new prescribing information, and the infusion of antivenom was started approximately 1 hour after presentation at a rate of 50 mL per hour. That was tolerated well, with no signs of adverse drug or immune reaction. Ten minutes later, the infusion rate was increased to 250 mL per hour as the tourniquet was loosened over the next

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Figure 1. Before antivenom infusion.



Figure 2. Five minutes after start of antivenom infusion. Process of loosening tourniquet has begun, with subsequent decrease in signs of vascular congestion.

10 minutes. No evidence of acute systemic toxicity or hypersensitivity was observed. The wound evolved in a dynamic manner, as demonstrated by serial images (Figures 2–4) with the most proximal region of tenderness to palpation marked on the patient’s leg. The region of swelling and tenderness to palpation receded over the course of the antivenom infusion.

Before discharge the next morning, the small bulla had increased in size minimally. Mild edema was present in dependent regions. The patient was ambulatory with

crutches. He was discharged with snakebite wound management and follow-up instructions. No further antivenom was administered. Seven weeks after the bite, the patient had recovered almost completely, and he was ambulating without crutches. He did report some residual, episodic pain in his right leg; that had resolved at the 3-month follow-up.

Table. Laboratory measurements

Laboratory measurement	Time after bite, hours			
	0.5	2.5	12	72
Platelet count, 1000/mm ³	246	251	226	282
Fibrinogen level, mg/dL	—	—	267	—
INR	1.0	1.0	1.0	1.0
d-Dimer	—	—	0.50	—

INR, international normalized ratio.

Discussion

Numerous different types of tourniquets have been described in the literature, both historically and in recent years, as techniques used by first-responders handling snakebites in the field. Arterial tourniquets result in a pressure gradient that is high enough to impede arterial blood flow distal to the device.¹ Venous tourniquets

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