



## Compartment Syndrome Complicating Snakebite; a Clinician's Dilemma

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### Abstract

**Background:** A diagnosis of compartment syndrome warrants a need for fasciotomy. We present a case of compartment syndrome complicating snakebite where prophylactic fasciotomy was not done following response to anti snake venom serum.

**Case Presentation:** We present a case of an 11 year old boy with compartment syndrome of left upper limb following a snake bite. The patient presented with progressively worsening local envenomation symptoms. A diagnosis of compartment syndrome was made and orthopedic team was consulted. With a prolonged 20 min Whole Blood Clotting Time (WBCT) and deranged coagulation profile, joint decision was made to start Anti-Snake Venom (ASV) and withhold fasciotomy unless there was no evidence of improvement. He developed an early allergic reaction to the polyvalent anti-venom which was promptly managed. Subsequently his coagulation profile began normalizing after completion of the anti-venom. His swelling and pain over the forearm reduced significantly with normal peripheral perfusion. With improvement of symptoms any surgical interventions were withheld. He responded well to the anti-venom despite late administration and was discharged on day 7 of admission.

**Conclusion:** Initiation of anti-venom should not be held for delayed presentation of snakebites. It is prudent to start ASV first with closely monitoring and consider surgery only if compartment symptoms persist with failed response to ASV. Anti-venom can, not only reverse coagulopathy, but may also be helpful in reducing symptoms of compartment syndrome, thereby negating the need for fasciotomies.

**Keywords:** Snakebite; Anti-snake venom; Fasciotomy; Compartment syndrome

### Abbreviations

ASV: Anti-Snake Venom; WBCT: Whole Blood Clotting Time; INR: International Normalized Ratio

### Introduction

Snake venom injected into the subcutaneous tissue causes progressive swelling through the lymphatic system spread which can rarely affect compartment pressures. However, some snakes with longer fangs can inject venom directly deep into muscular compartments which are more likely to cause compartment syndromes. This is seen more so in the hand and forearm, where the venom delivery into deep compartments is more likely [1]. It is almost always treated by fasciotomy to release the pressure, preferably within 6 h, to prevent irreversible muscle damage [2].

However, though controversial, in some cases fasciotomy is deemed not necessary following administration and improvement from anti-venom [3]. In other situations, fasciotomy is only recommended in selected cases where the compartment pressure continues to rise even after anti-venom administration [4]. The point of contention is that the cytotoxic symptoms of the venom can be indistinguishable from compartment syndrome [5]. This ambiguity creates a dilemma for clinicians where management is still unclear.

We present a case of compartment syndrome complicating snakebite where prophylactic fasciotomy was not done following response to ASV. This case suggests the possibility of use of ASV to negate the need for fasciotomies for compartment syndromes complicating snake bites.

### Case Presentation

An 11-year old previously healthy child presented with a history of snake bite on his left hand

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index finger complicated with progressive painful swelling of his left upper limb. His parents immediately tried to stop the bleeding by sucking out the venom and applying traditional remedies over the wound, though no cuts were made. The parents noticed bruising, bleeding and gradual swelling then, a tourniquet was tied and the patient was brought to the nearest district hospital which was 2 h away. The swelling had progressed over the left wrist and extended half way up the forearm. The tourniquet was immediately removed at the hospital. Intravenous antibiotics and tetanus prophylaxis were administered. He did not have any bleeding or neurological symptoms. However overnight the swelling had progressed beyond the elbow joint and there was bruising and bullae formation over the bite site. Painful finger movements on the left hand with absence of radial pulse were noted. The patient was then referred to the orthopedic surgeon at our hospital for management of compartment syndrome.

On examination there was swelling of the entire left upper limb extending onto the left shoulder joint. There was significant tenderness on palpation of forearm and arm muscles and pain on passive extension. Radial pulse was palpable. Capillary refill time on the finger beds was less than 3 sec. Local examination revealed evidence of severe envenomation including redness, swelling, blistering and underlying ecchymosis.

A diagnosis of compartment syndrome was made. Patient was initially planned for urgent fasciotomy. However, his 20 min Whole Blood Clotting Time (WBCT) was found to be prolonged and he also had prolonged pro thrombin time and International Normalized Ration (INR). In view of the rapidly progressive severe local envenomation signs and deranged coagulation profile, the decision to first administer polyvalent Anti- Snake Venom (ASV) was made, though at that time >24 h had elapsed since the bite. After discussion with the orthopedic surgeon, it was decided to continue ASV and to withhold fasciotomy unless there is no evidence of improvement.

During the course of administration of anti-venom, the patient developed early allergic reaction evidenced by cough, scratchy throat, and urticarial rashes and vomiting with presence of hematemesis. The reaction was immediately managed with fluids, oxygen, adrenaline, antihistamines and steroids. ASV was stopped and patient was monitored. With resolution of symptoms, the infusion was further diluted and slowly restarted at a slower infusion rate. Its coagulation profile was normalizing at 6 h. Overnight his swelling over the forearm reduced significantly and pain had reduced. With normalization of coagulation profile and improvement of compartment symptoms fasciotomy was withheld. He responded well despite late administration of ASV. His limb swelling drastically improved and was discharged on day 7 of admission.

## Discussion and Conclusion

Epidemiological data on snakebites in Bhutan remain limited. Of what is known and recorded, there are 69 species, of which 15 are venomous snakes belonging to two families, Elapidae and Viperidae [6].

The timely administration of ASV remains the mainstay to reduce the morbidity and mortality associated with snakebites. A retrospective study in Bhutan reported that around 35% of snake bites developed envenomation signs and symptoms. Polyvalent ASV was found to have excellent outcomes with only 7% mortality [7].

Compartment syndrome involves the sustained elevation of interstitial tissue pressures within an osteofascial envelope to non-physiologic levels. It causes tissue injury leading to irreversible damage and, therefore, early recognition and treatment is critical for optimal outcomes [8]. Alternatively, fasciotomy performed prophylactically may lead to worsened local myonecrosis [9]. In most cases of snakebite, fasciotomy is not necessary. Once administered, anti-venom helps neutralize the venom, reducing compartment pressure and inhibiting the development of compartment syndrome.

In our case, in view of deranged coagulation profile, a decision was made to defer fasciotomy and observe response to ASV. Gregory et al., reiterates that fasciotomy should only be performed in patients with clinical signs and symptoms of compartment syndrome that are present despite elevation of the affected limb and administration of 20 vials of anti-venom [10]. A study by Hall noted that, out of 1,257 cases of extremity bites only two required fasciotomies [11].

In contrast, a recent study, where intra-compartmental pressures were measured for diagnosis of compartment syndrome, recorded a higher rate fasciotomies at 10.8%. As in the discussed case, the local and systemic envenomation effects of venom closely resemble the signs and symptoms of compartment syndrome. Fasciotomy, in the past, could have been withheld in patients with actual compartment syndrome, attributing the symptoms to the venom [5].

Initiation of anti-venom should not be held for delayed presentation of snakebites. Prophylactic fasciotomies should be considered after correction of hematological parameters. Though controversial, it is still prudent to start ASV first with closely monitoring and consider surgery only if compartment symptoms persist with failed response to ASV. ASV can, not only reverse coagulopathy, but may also be helpful in reducing symptoms of compartment syndrome, thereby negating the need for fasciotomies.

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