

# A Case of Upper Limb Compartment Syndrome following Snake Envenomation

## Measure Twice, Cut Once

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### ABSTRACT

*We report a case of a 16-year old male patient who sustained a poisonous bite from a mapepire balsain snake on the dorsum of his left hand. The subject presented within one hour of envenomation and subsequently developed clinical features of acute compartment syndrome in the involved upper limb. Early diagnosis and emergency fasciotomy effectively treated his condition. Aggressive physiotherapy coupled with this ensured best functional outcome.*

**Keywords:** Fasciotomy, snake bite, upper limb acute compartment syndrome

# Un Caso de Síndrome Compartimental de la Extremidad Superior tras Envenenamiento Ofídico: “Mide Dos Veces, Corta una Vez...”

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### RESUMEN

*Reportamos el caso de un paciente de 16 años que sufrió una mordedura venenosa de una serpiente Bothrops atrox (conocida como “mapepire balsain” en Trinidad) en el dorso de su mano izquierda. El sujeto se presentó tras una hora del envenenamiento, y posteriormente desarrolló las características clínicas del síndrome compartimental agudo en la extremidad superior en cuestión. El diagnóstico precoz y la fasciotomía de emergencia hicieron posible un tratamiento eficaz de su condición. A esto se añadió una fisioterapia agresiva, asegurándose de este modo un resultado funcional óptimo.*

**Palabras claves:** Fasciotomía, mordedura de serpiente, síndrome compartimental de la extremidad superior

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### INTRODUCTION

A poisonous snake bite can have serious local as well as systemic complications in human subjects. There have been a few cases reported in the literature of acute compartment syndrome (ACS) from snake bites. However, these have been reported in snakes such as adders (1) and vipers (2). Upper limb compartment syndrome secondary to mapepire balsain snake envenomation is an uncommon local complication that can result in serious functional impairment. Management should encompass both early life saving medical and limb saving surgical treatment.

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### CASE REPORT

We report the case of a 16-year old healthy male student with no relevant medical or surgical history. He is right handed. He was bitten on the left hand by a mapepire balsain while gathering food for his pet rabbit at the back of his home in the countryside of Guaico, Tamana in Trinidad. The incident occurred at 7:45 am. At 8:05 am, he arrived in the Emergency Department at the Sangre Grande regional hospital. At the time of admission, his main complaints were severe pain despite having analgesia, paresthesia and inability to clench his fist. On examination, two puncture wounds were noted on the dorsum of his left hand (Fig. 1). There was also significant swelling of the left hand, forearm and upper arm. He could not move any of his fingers.

The patient reported severe pain; a score of 10 was noted on a visual analogue scale from 1 to 10, with 10 being most severe. The patient also complained of paresthesia of the median nerve distribution. Laboratory tests showed no leucocytosis with elevated C-reactive protein (CRP) and a



Fig. 1: Image of mapepire balsain puncture wounds on dorsum of left hand.



Fig. 2: Cyanotic left palm.

body temperature of 37.4 °C. The prothrombin time/partial thromboplastin time (PT/PTT), D-dimer and creatine kinase (CK) were slightly elevated. At 9:25 am, after consulting the toxicology consultant with the laboratory results, no anti-venin was administered (Table).

A diagnosis of acute compartment syndrome of the left upper limb was made and the orthopaedic registrar was contacted *via* telephone at 9:28 am. The registrar reviewed the case at 10:30 am and verified worsening compartment syndrome. Despite having multimodal analgesia, the patient continued to complain of severe pain. He also had severe pain on passive motion of his fingers. He could not actively move his fingers or wrist. The paresthesia persisted and his left upper limb had almost doubled in size compared to the contralateral limb. His palm was also cyanotic (Fig. 2).

The patient was booked for emergency fasciotomy in the operating theatre. Informed consent was obtained from his mother whilst assent was taken from the subject. The emergency procedure was performed at 1:30 pm. A single dorsal incision as well as the standard palm and forearm incision were performed by the registrar on call.

Intra-operatively, oedematous, ischaemic muscle tissue was seen bulging out of the incision but no necrosis was

observed. The wound area was temporarily covered with sofratulle dressing and saline soaked sterile gauze.

Day one postoperatively, there was already a significant reduction of clinical signs of compartment syndrome and increased range of motion (ROM) at the inter-phalangeal joints (IPJ). After four days, partial coverage was obtained with secondary wound closure (Figs. 3A–B). Complete closure was performed on postoperative day seven (Fig. 4).



Fig. 3A: Day four – partial closure of left forearm and palm.

Table: Blood investigations of patient from admission to day four post-operation

Investigation	28.3.12 8:45 am	28.3.12 10:30 am	29.3.12	31.3.12	1.4.12	3.4.12
Wbc	6.51	10.9	10.5			10.8
Hb	14.3	14.4	13.1			10.7
Plt	259	237	164			165
Crea	0.9	0.7	0.8	0.7		0.8
Urea	8	9	7	8		10
CRP			60	18	8	
PT	16.2	16.6	19.4	16.9	18.4	19.4
APTT	24	24	28	23	25	27
D dimer	0.1	2.2	1.1	1.1	0.9	0.9

Wbc = white blood cells, Hb = haemoglobin, Plt = platelet count, Crea = creatinine, Urea = urea, CRP = C-reactive protein, PT = prothrombin time, APTT = activated partial thromboplastin time



Fig. 3B: Day four – tensioning suture on left dorsal surface of hand.



Fig. 4: Day seven – complete closure of fasciotomy incision.

Nerve function was normal after a few weeks. He went back to school four weeks after surgery. The six-month follow-up showed sufficient scar maturation and he could clean and dress himself as well as use eating utensils. Grip strength was almost normal. He had returned to all previous activities.

## DISCUSSION

The snake involved in this case scenario was the mapepire balsain also known as fer-de-lance or *Bothrops atrox* (3). There are only four types of poisonous species of snakes in Trinidad. Tobago has no poisonous snakes. The commonest snake bite in Trinidad is from the mapepire snake (3). The venom is classed as a haemotoxin and it is very virulent (3). Envenomation is defined as enough venom introduced to cause local or systemic signs.

Clinical features of snake bites are either local or systemic. Venom characteristically disrupts cell membranes and

can affect the clotting cascade (4). Local features include swelling, skin or muscle necrosis and clotting derangements. Systemic manifestations include shock, respiratory muscle paralysis and renal toxicity.

The severity of snake bite was not documented using the Dart's severity score which is a snake-bite scoring system (5). This often helps decision-makers institute antivenin or other appropriate treatment measures and also helps determine outcome. Despite the toxicologist not advising antivenin in this case as the patient had no systemic signs, the emergency officers and the orthopaedic team diagnosed compartment syndrome, which is an orthopaedic emergency.

Common causes of acute compartment syndrome include fractures, soft tissue trauma and crush injuries (6). Acute compartment syndrome results from injury to normal tissue causing an increase in intra-compartmental pressure. A decrease in capillary blood flow then leads to a decrease in oxygen supply to tissues. Tissue necrosis ultimately occurs and the cycle is repeated (7). In this case, snake bite envenomation caused severe local manifestations, rapidly causing acute compartment syndrome of the left upper limb to develop (6).

Local guidelines recommend immediate resuscitation, informing medical and surgical teams if necessary, toxicologist notification and admission.

Early diagnosis and treatment of acute compartment syndrome prevented permanent functional disability. Clinical diagnostic measurement was the assessment tool used in this scenario despite having low sensitivity (8). There was no objective measurement tool available in this public hospital. Emergency fasciotomy was performed within six hours of envenomation before necrosis of muscle could occur (9). Aggressive physiotherapy commenced while as an in-patient and continued in the outpatient setting and would have contributed to return to his normal quality of life.

In summary, upper limb compartment syndrome secondary to snake bite envenomation is uncommon (1, 2). Management entails high vigilance, early diagnosis, careful monitoring and emergency fasciotomy (10). Aggressive physiotherapy, coupled with medical and surgical treatment from onset, ensures best functional outcome. Treatment protocols also decrease mortality/morbidity outcomes.

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