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Case Report

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Severe Coagulopathy, Retroperitoneal Hemorrhage and Acute Respiratory Distress Syndrome Following Presumed Green Pit Viper *(Trimeresurus spp.)* Envenomation: A Case Report from Rural Nepal

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Abstract

Introduction: Green pit viper *(Trimeresurus spp.)* envenomation chiefly results in localized tissue injury and hemotoxic sequelae. But systemic signs, including psoas hematoma, hemoperitoneum and Acute Respiratory Distress Syndrome (ARDS), are quite rare. In places with few resources, it is especially hard to diagnose and treat problems early.

Case presentation: We present the case of a 38-year-old male from rural Nepal who had increasing edema and hemorrhage after a green pit viper envenomation. Laboratory tests showed severe coagulopathy and a quick decline in hemoglobin levels. Ultrasound at the bedside showed a hematoma in the left psoas muscle and significant hemoperitoneum. The patient declined advanced imaging. Then he acquired ARDS and needed therapy in the ICU and CPAP ventilation. The patient got completely better after acquiring antivenom on time and getting care from a group of doctors.

Clinical discussion: The thrombin-like enzymes present in green pit viper venom can induce consumptive coagulopathy and result in spontaneous hemorrhagic consequences. Venom-induced capillary leak and systemic inflammation may lead to ARDS. In this case, bedside ultrasonography functioned as an essential diagnostic alternative in the absence of CT imaging. To get a good result, one needs to respond swiftly and be able to adjust how one manages things.

Conclusion: This case underscores the importance of identifying atypical yet life-threatening systemic effects following green pit viper envenomation. It also highlights how crucial it is to have flexible techniques to diagnose and treat patients in areas with minimal healthcare resources in order to save lives.

Abbreviations: ARDS: Acute Respiratory Distress Syndrome; ICU: Intensive Care Unit; CPAP: Continuous Positive Airway Pressure (continuous positive airway pressure); PT: Prothrombin Time; INR: International Normalized Ratio; APTT: Activated Prothrombin Thromboplastin Time; FFP: Fresh Frozen Plasma; PRBC: Packed Red Blood Cells; Spp.: Species; CBC: Complete Blood Count; CK-MB: Creatine Kinase-MB; CT: Computed Tomography; D-Dimer: Fibrin Degradation Product; ECG: Electrocardiogram; ECHO: Echocardiography; Hb: Hemoglobin; IV: Intravenous; LFT: Liver Function Test; PCV: Packed Cell Volume; PRP: Platelet-Rich Plasma; RFT: Renal Function Test; SOB: Shortness of Breath; SVT: Supraventricular Tachycardia; USG: Ultrasonography (Ultrasound)

Keywords: Snake bite; Envenomation; Coagulopathy; Respiratory distress syndrome; Case report

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Introduction

Green pit vipers *(Trimeresurus spp.)* are venomous snakes native to Asia, particularly Nepal, where snakebites continue to pose a major public health challenge [1]. People living in the hilly and Himalayan regions are especially at risk of bites from these snakes, whose venom produces both hemotoxic and cytotoxic effects [2]. The hemotoxins disrupt normal blood clotting mechanisms, leading to bleeding tendencies, coagulopathy and thrombocytopenia [3]. Envenomation commonly causes local symptoms such as swelling, pain, blistering and tissue necrosis. Although rare, delayed systemic hemorrhagic complications including hemoperitoneum and deep muscle hematomas can develop between 2 and 6 days after the bite [4]. Acute Respiratory Distress Syndrome (ARDS), a severe but uncommon lung disease, can also result from systemic inflammation caused by venom [5]. We present a unique case of severe coagulopathy associated with psoas hematoma, hemoperitoneum and Acute Respiratory Distress Syndrome (ARDS), treated at a tertiary care hospital in Nepal. This case exemplifies the diagnostic challenges faced in the absence of advanced imaging and is recorded in compliance with CARE Guidelines [10].

Case Presentation

A 38 year old man from rural Nepal who worked as a farmer got bitten by a presumed green pit viper on the dorsal aspect of his left hand around the base of his thumb while he was working in the field. The patient reported the snake was green; however, species confirmation was not possible due to a lack of photographic evidence or specimen collection and no herpetological consultation was available.

Four hours after the bite, he had his first treatment at a small health post. After 24 hours, he was referred to the nearest provincial hospital. He reported that he was having severe pain (8 out of 10 on the pain scale). On examination, his left forearm was swollen and the puncture site was continuously bleeding when he came in. His vitals were stable and there were two separate fang marks and swelling in the area around them.

Initial laboratory tests indicated severe coagulopathy:

- **Prothrombin Time (PT):** 120 seconds (11-14 seconds is normal)
- **International Normalized Ratio (INR):** 9.23 (0.8-1.2)
- **Activated Prothrombin Thromboplastin Time (aPTT):** 120 seconds (Reference: 25-40 seconds)
- **Platelets:** 38,000/µL (Normal range: 150,000-400,000/µL)
- Hemoglobin (Hb) levels fell from 18.3 g/dL to 4.1 g/dL in 48 hrs.

He was admitted to the intensive care unit (ICU) and given 10 vials of polyvalent anti-snake venom over 48 hours **(Table 1)**. Specific antivenom against the green pit viper is not available in Nepal; therefore, polyvalent antivenom targeting other snakes was administered empirically. The following day, the patient developed an episode of supraventricular tachycardia, which was brought under control using intravenous amiodarone (150 mg in 100 ml NS over 10 min). He said he had pain in his lower abdomen and swelling on the left side of his groin on the third day. A bedside ultrasound revealed a psoas hematoma (8.7 cm x 3.2 cm x 2.4 cm) and considerable hemoperitoneum **(Figure 1)**. A CT scan was recommended, which was declined by the patient. Supportive therapy included Intravenous (IV) fluids, opioids, Fresh Frozen Plasma (FFP), Packed Cell Volume (PCV)and Platelet-Rich Plasma (PRP) transfusions.

Table 1: Hospital course timeline correlating clinical events, laboratory findings and interventions from day 1 to 16.

Day	Key events and findings	Interventions and management	Status/remarks
Day 1	Snakebite presentation; baseline labs and imaging done	Anti-snake venom (10 vials over 48 hrs), vitamin K injection, ICU admission	Initial stabilization; coagulopathy treated
Day 2	Cardiac arrhythmia (SVT) detected	Amiodarone started (150 mg in 100 ml NS over 10 min); cardiac enzymes, including Troponin-I and Creatine Kinase-MB (CK-MB)and echocardiography (echo) were doneand appear normal	Cardiac monitoring and management initiated
Day 3	Inguinal swelling noted; psoas hematoma detected by USG with considerable hemoperitoneum	Surgery consulted; transfused FFP 2 pints	Psoas hematoma diagnosis; supportive care maintained
Day 4	PT/INR and APTT significantly increased; Hb dropped progressively, reaching a low of 4.1 g/dl	FFP 2 pints transfused; antibiotics and analgesics given	Coagulopathy worsening, severe anemia management
Day 5	SOB developed early-onset bilateral lung effusions on a Chest X-Ray (CXR) Posteroanterior (PA) view and an evolving hemoperitoneum on USG	PRBC (Packed Red Blood Cells) transfusion (3 pints); CPAP started	Respiratory support for ARDS

Day 6	Persistent coagulopathy; elevated Liver Function Test (LFT) and PT/INR	FFP 2 pints transfused	Ongoing coagulation correction
Day 7	High D-dimer (>10 mg/l Fibrinogen Equivalent Units (FEU)); further transfusions	PRP transfused; continued supportive care	Platelet support for thrombocytopenia. Normal value for D-dimer.
Day 8	Respiratory status improved; Hb improved	Continued monitoring	Clinical improvement noted
Days 9-11	Serial coagulation tests and clinical assessments	ICU supportive care continued	Monitoring hematoma progression and coagulation
Day 12	Psoas hematoma size decreased on Ultrasonography (USG)	Surgical consult ongoing; conservative management	Hematoma reduction; ongoing observation
Days 13-15	Routine coagulation monitoring and supportive care	Blood product transfusions as needed	Efforts toward stabilization were ongoing
Day 16	Patient clinically stable	Discharged with follow-up advice	Hematoma, ARDS and Hemoperitoneum resolved

The patient then had difficulty breathing, low oxygen levels (arterial Oxygen Saturation (SpO_2) 78% on room air) and bilateral infiltrates on chest X-rays **(Figure 2)**. CPAP (continuous positive airway pressure) ventilation was initiated in the ICU due to hypoxemia and radiographic evidence of ARDS **(Figure 3)**. Over the following week, the patient showed marked clinical improvement. Coagulation parameters gradually normalized and repeat ultrasonography demonstrated complete resolution of the psoas hematoma. He was subsequently discharged in stable condition without any neurological deficits.

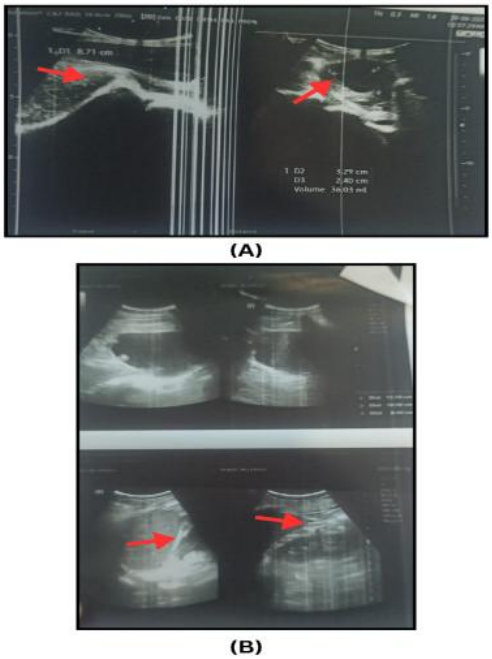

Figure 1: Ultrasonographic findings in green pit viper envenomation showing: A: Left psoas hematoma (red arrows); B: Evolving hemoperitoneum and intraabdominal heterogeneous echogenic collections (red arrows).

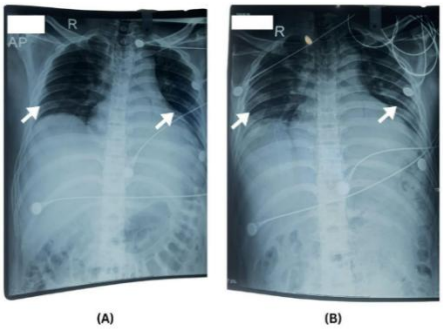

Figure 2: Chest X-rays showing progression from early bilateral infiltrates to diffuse consolidation in Acute Respiratory Distress Syndrome (ARDS) following green pit viper envenomation (arrows).

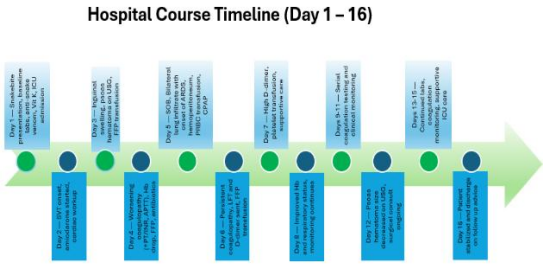

Figure 3: Hospital course graphical timeline (day 1-16).

Discussion

One major component of the green pit viper's venom resembles thrombin, called Thrombin-Like Enzyme (TLE), which cleaves fibrinopeptide A, producing abnormal fibrin polymerization and a friable fibrin clot, resulting in consumption of fibrinogen, causing low fibrinogen levels in the blood and this can contribute to spontaneous bleeding [6]. Although local bleeding is frequent, systemic

hemorrhages, including hemoperitoneum and deep muscle hematoma, are uncommon but dangerous side effects [6].

With an incidence rate of about 0.1%, spontaneous psoas hematoma is a very uncommon clinical entity [7]. Clinical symptoms of psoas hematoma can include low back, abdominal or inguinal pain; radiating pain involving the distribution of nerve roots; or chronic, ongoing blood loss [7]. Potential bleeding tendencies associated with spontaneous psoas hematoma might result in hemorrhagic shock and in extreme situations, become fatal [7]. An essential clinical aspect is that a big psoas hematoma may compress and apply pressure on the femoral nerve, leading to paralysis [4]. Hemoperitoneum is a rare but significant consequence of snake envenomation that needs to be managed by a team of experts, which can be hard to do in places with few resources [8].

Venom toxins raise the permeability of capillaries, which causes fluid to seep out and leads to ARDS. Immune complex deposition and micro thrombotic blockage in lung capillaries also play a role in this process [9]. The Berlin 2012 criteria are used to diagnose ARDS. These include symptoms starting within 7 days and bilateral chest X-ray opacities without heart failure or fluid overload [9]. CT imaging is the best way to find deep hematomas and hemoperitoneum. But bedside ultrasound is a useful option when CT is not available, rejected or not recommended, especially in places with few resources.

In Nepal, anti-snake venom is imported from India and targets envenomation by common cobra *(Naja naja)*, common krait *(Bungarus caeruleus)*, Russell's vipers *(Daboi resseli)* and saw scaled viper *(Echis carinatus)* [11]. However, specific antivenom against the green pit viper is not available in Nepal [11]. As in our case, the patient did not specify any other distinguishing characteristics of the snake other than its green color; therefore, antivenom was administered as a precaution.

This case highlights how crucial it is to identify respiratory issues and systemic bleeding in snakebite victims as soon as possible. To improve outcomes, multidisciplinary supportive care and prompt antivenom administration should be used in conjunction with flexible diagnostic techniques like laboratory testing, clinical evaluation and bedside ultrasound when advanced imaging is not available.

Conclusion

Green pit viper envenomation can result in life-threatening ARDS and severe coagulopathy, complicated by uncommon systemic bleeding, including psoas hematoma and hemoperitoneum. Improving patient outcomes in resource-constrained environments such as Nepal requires prompt antivenom medication, early diagnosis and all-encompassing supportive care directed by flexible diagnostic techniques.

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Competing Interests

The authors declare that they have no competing interests.

Consent for Publication

Written informed consent was obtained from the patient for publication and any accompanying images. A copy of the written consent form is available for review by the editor-in-chief of this journal upon request.

Ethics Approval

Since the subject matter is a case report, ethical clearance was not necessary.

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