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RESEARCH ARTICLE

MULTIDISCIPLINARY MANAGEMENT OF A VIPER BITE COMPLICATED BY COMPARTMENT SYNDROME AND DISSEMINATED INTRAVASCULAR COAGULATION

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Abstract

Viper bites represent a critical medical emergency, particularly in rural areas or military contexts where rapid access to care may be limited. These envenomations can lead to severe and potentially fatal complications, including local effects (tissue necrosis, compartment syndrome) and systemic effects (disseminated intravascular coagulation (DIC), acute kidney injury (AKI), and shock). This article reports the case of a 29-year-old man who sustained a viper bite on his right hand. The envenomation rapidly progressed to compartment syndrome, severe DIC, and AKI, necessitating intensive multidisciplinary management. Prompt administration of antivenom, followed by urgent surgical interventions (fasciotomy and necrosectomies) and intensive management of hematological and renal complications, resulted in a favorable outcome. This case highlights the importance of a rapid and coordinated approach in the treatment of severe envenomations.

Introduction:-

Viper bites represent a major public health issue, particularly in rural areas and developing countries where access to medical care is often limited. According to the World Health Organization (WHO), approximately 5.4 million snakebites occur globally each year, resulting in 2.7 million cases of envenomation and an estimated 81,000 to 138,000 deaths [1]. Among these bites, those caused by vipers are particularly concerning due to their severe local and systemic effects [2].

These envenomations lead to a variety of complex clinical manifestations, depending on the species of viper, the amount of venom injected, and patient-related factors such as age and comorbidities. The most common systemic complications include disseminated intravascular coagulation (DIC), which results from uncontrolled activation of the coagulation cascade, and acute kidney injury (AKI), often caused by venom-induced rhabdomyolysis or hemoglobinuria [3].

This article describes a severe case of a viper bite complicated by compartment syndrome, DIC, and AKI, illustrating the challenges posed by these envenomations and the multidisciplinary therapeutic strategies that can improve outcomes.

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Case Presentation

A 29-year-old man with no significant medical history was bitten by a viper on his right thumb. At the site of the accident, initial first aid included local wound cleaning and administration of a first dose of antivenom, which partially mitigated the envenomation. The patient was then transferred to a hospital for more advanced care.

Upon admission, the patient was conscious, with stable hemodynamic parameters (BP 120/80 mmHg, HR 120 bpm, SpO_2 99%), and initial symptoms including headaches, nausea, vomiting, and intense pain in the bitten limb. However, the local edema rapidly progressed from the forearm to the right hemithorax, accompanied by vesicle formation (figure 1,2,3,4), indicating severe envenomation.Given this presentation, the patient was admitted to the operating room for a decompressive fasciotomy and removal of necrotic tissues.

During hospitalization, the patient developed severe disseminated intravascular coagulation (DIC) complicated by hemorrhagic shock. This required massive transfusion, including 19 units of red blood cells and 16 units of fresh frozen plasma, to correct the coagulopathy and restore hemodynamic stability. Concurrently, anuric acute kidney injury (AKI) ensued, necessitating renal replacement therapy via hemodialysis.

Despite the initial severity of his condition, the patient's outcome was favorable. After 20 days in intensive care, progressive recovery of diuresis was observed, along with respiratory and hemodynamic stabilization. Gradual discontinuation of sedation allowed for the patient's full awakening, marking significant recovery and a favorable clinical outcome thanks to rapid and multidisciplinary management.

Discussion:-

Viper bites, responsible for 2.7 million cases of envenomation annually, are a major cause of morbidity and mortality [1]. They are particularly common in tropical and subtropical regions, where they primarily affect rural populations. In sub-Saharan Africa, viper bites account for up to 90% of reported envenomation cases, with a case fatality rate reaching 20% in the absence of appropriate antivenom treatment [4]. In Europe, although viper bites are less frequent, they still cause up to 30% of systemic envenomations [5]. These data highlight the need for rapid diagnosis and effective management to reduce mortality and severe complications.

Antivenom therapy is the cornerstone of managing severe envenomations caused by viper bites. Polyclonal antivenoms, developed from antibodies targeting venom toxins, effectively neutralize both systemic and local effects [6]. In our case, the rapid administration of two doses of antivenom helped limit early systemic complications. Literature reports indicate that early administration of antivenom significantly reduces mortality and severe complications such as disseminated intravascular coagulation (DIC) and acute kidney injury (AKI) [7]. However, allergic reactions and resistance can occur, underscoring the importance of strict medical supervision during its administration [8].

Compartment syndrome is a serious local complication of viper bites, occurring in 1–5% of cases according to studies [9]. It results from intense edema induced by venom toxins, leading to increased intracompartmental pressure which, if untreated, can cause ischemia and muscle necrosis [10]. In our case, compartment syndrome required urgent fasciotomy and multiple necrosectomies to prevent functional impairment of the limb. This management aligns with current recommendations, which advocate immediate surgical decompression in cases of clinical suspicion or after confirmation via compartmental pressure measurement [3].

DIC is a common systemic complication of viper bites, affecting approximately 10–15% of severely envenomated patients [11]. It is triggered by the activation of coagulation factors by venom enzymes, leading to excessive consumption of platelets and coagulation factors, and resulting in major bleeding [12]. In our case, the patient developed severe DIC complicated by hemorrhagic shock, requiring massive transfusion. This management is supported by the literature, which recommends targeted transfusions to correct hematological abnormalities and restore functional hemostasis [13].

AKI is a frequent complication of viper bites, affecting up to 25% of patients in certain contexts [14]. It is caused by a combination of rhabdomyolysis, hemoglobinuria, and direct toxic effects of venom on renal tubules [15]. In our case, anuric AKI required renal replacement therapy, underscoring the importance of intensive nephrological monitoring in severe envenomations. The literature highlights that dialysis improves patient prognosis by restoring electrolyte balance and enabling progressive recovery of renal function [16].

Severe viper bite envenomations require a multidisciplinary approach involving intensive care, surgical, and nephrological teams to manage systemic and local complications [17]. Our case exemplifies this necessity, with successful coordination among various departments to simultaneously address compartment syndrome, DIC, and AKI. Studies show that this approach significantly reduces mortality and long-term sequelae [18]. Interdisciplinary communication and rapid management of complications are the cornerstones of effective treatment for viper bites.

Figure 1:-

Figure 2:-

Figure 3:-

Figure 4:-

Conclusion:-

The management of severe viper bites presents a complex medical challenge due to the diversity and severity of the complications they cause, whether local or systemic. These envenomations require a rapid and coordinated multidisciplinary approach, involving clinical, surgical, and intensive care resources to optimize survival chances and minimize functional sequelae.

In our case, a multidisciplinary approach involving antivenom therapy, massive transfusions, renal replacement therapy, and appropriate surgical interventions led to a favorable outcome, despite the severity of the initial complications. This case highlights the importance of an integrated and coordinated approach, based on rapid clinical evaluation and the simultaneous implementation of necessary interventions.

Finally, this case also underscores the need to raise awareness among healthcare professionals about protocols for managing severe viper envenomations, as well as the importance of broader access to essential resources, particularly antivenoms. These measures, combined with rigorous management and adapted intensive care, can dramatically improve outcomes even in the most critical situations, providing new hope for severely envenomated patients.

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