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Severe Complications Following Snakebite in a Pediatric Patient: Pneumothorax, Cardiac Arrest, and Brain Death

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Case Report

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Abstract

Snakebites are a significant health concern in Somalia, particularly in rural and agricultural areas, where encounters with venomous snakes are common. This case report discusses the severe complications resulting from a snakebite in an 8-year-old girl who presented with swelling, a traumatic ulcer, and altered mental status after a suspected animal bite. Despite receiving timely antivenom therapy and broad-spectrum antibiotics, the patient experienced rapid deterioration, including seizures, altered consciousness, and systemic shock. Laboratory results indicated severe metabolic disturbances, including hyperglycemia, elevated liver enzymes, and signs of sepsis. Despite aggressive treatment, including intubation, fluid resuscitation, and tetanus prophylaxis, the patient ultimately developed multiple organ failure and was declared brain-dead. The family opted for the withdrawal of care. This case highlights the importance of early diagnosis and comprehensive management of snakebite envenomation in resource-limited settings and underscores the potential for unusual clinical presentations leading to fatal outcomes.

Introduction

The global envenomation of snakebites serves as one of the key drivers of illness and death, accounting for nearly 81,000 to 138,000 yearly fatalities (1). Nonetheless, there are about 240 million disabled children in the world, most of which stems from a lack of proper nutrition, vaccination, or proper access to healthcare, all of which could have easily been avoided(2). The stimulation of inflammatory processes and disorder of coagulation such as defibrination and thrombocytopenia have the potential to inflict damage to the endothelium of the cerebral capillaries, which may produce intracerebral hemorrhages(3). Gloydius is the most prevalent venomous snake species in northern China. What are its characteristics? During the peak of the farming season from June to July, there are millions of snakebite cases, with 100,000 to 300,000 bites and a death rate of approximately 5 % associated with these types of incidents(4).The occurrence of snakebite envenoming is a significant cause of death and disability in Asia, Africa, Latin America, and parts of Oceania.The occurrence of snakebite envenoming is a significant cause of death and disability in Asia, Africa, Latin America, and parts of Oceania(5).

Case Presentation

An 8-year-old girl was admitted to the emergency department with swelling in her right hand, which her parents suspected was caused by an animal bite, and a traumatic ulcer on her right middle finger . She doesn't seem to be responding, and she's in crisis. Her chest is unremarkable, with no scars or crepitations and no abnormalities in her cardiovascular system. Because her mental state has changed, and the bite (and its implied trauma) may be quite serious, she must leave immediately. The next steps would be more work, i.e. labs, scans, and maybe antivenom or special snakebite treatments. The patient appears sick, lethargic, and even delusional. V(s): 38; HR: 132; BP: 90; BG: 28; SPO2:50 Neurological examination may reveal changes in mentation due to metabolic disturbances. In addition to tachypnea on chest examination, tachycardia due to dehydration may occur on cardiovascular examination. Hepatomegaly or hypertriglyceridaemia may be suspected on abdominal physical examination. Dehydration is also manifested by dry mucous membranes and reduced skin thickness, which may be observed in the limbs. She also developed a right pneumothorax and experienced two heart attacks during treatment **(Figure 1).** The imaging reveals a right-sided pneumothorax with a visible pleural line and significant lung collapse. There are cavitation and consolidation in the right lung, suggestive of necrotizing pneumonia **(Figure 2).**.Right hand Compartment Syndrome managed with Fasciotomy, as demonstrated in the picture **(Figure**

3). She was intubated to facilitate oxygenation, and the orthopedic surgeon recommended disarticulation (amputation) of her shoulder due to the severity of her injury. The family didn't accept amputation.Finally, the patient was brain-dead, and the family decided to let the patient leave the hospital. IM Tetanus toxoid administration: 0.5 mg of AMT was administered to the patient as an IM injection. This is to be given as a preventative measure against possible tetanus infection which can result from a bite infection. Antivenom 250 mg per ampule, 6 ampules in isotonic solution, 1 hour apart: Patients were given 6 doses of antivenom, 250 mg each. The solution was administered as 100 ml isotonic solution over one hour. Patient's laboratory glucose is 274 mg per deciliter, which is a hyperglycaemia that may be secondary to stress, infection or diabetes. Urea and creatinine levels are normal, suggesting that renal function is maintained. Damage to the liver or muscle could be the cause of the 118 Ulv increase in ASAT. The mind-boggling rise in U+L to 2016 for LDH is an indicator of massive tissue damage, possibly due to liver disease or sepsis. In addition, albumin and total protein levels decrease, which may be secondary to undernutrition or hepatic dysfunction. Finally, sodium is very elevated at 175 mEq per L, which is consistent with hypernausea secondary to dehydration or renal impairment. Potassium is slightly reduced to 3.43 mEq per L, which may also be a drug effect or fluid loss. Chloride is similarly treated at 153 mEq per L, in accordance with the acid-base balance or dehydration.With all this detailed information, it is important to note that the CRP is very high at 93 mg per litre, which suggests sepsis from other causes and infection or inflammation from other sources. High WBC of 12.51 x 1000 to the millimeter may indicate latent infection or inflammation. Hemoglobin is normal, but platelets are also normal, leaving only neutrophils. The only segment of the blood that's slightly dehydrated is the haematocrit, 46.1 percent. The intravenous solution consists of 500mL containing 0.45% Sodium Kolorur and 5% Dextrose (IV infusion). Dextrose and Sodium Chloride is infused in 500mL in a dextrose solution. To ensure that the patient receives sufficient hydration, water with sugar electrolytes is administered to help reduce fluid loss, dehydration, and minimal electrolyte imbalance. Patients will be infused 100cc/hr. Meropenem 500mg flask (Meropenem) 3x1 (IV infusion): Broad spectrum antibiotics used in treatment of severe bacteremia. The dose of this medicine is 500mg every three hours for five days. Vancomycinn 0.5g iv flask 2x1 (IV infusion): Virulent infections associated with resistant organisms. Administered intravenously once every twelve hours for five days at 250mg. Peditin Syrupt 3x10cc NGT for children (1x1): This is likely to be a syrup used for treating Pediculus or other fungal infections and given through a nasogastric tube three times a day. Adrenalin 1 mg, ML (10 AMP): In case of severe allergic reaction, anaphylactic shock, or just shock, adrenaline is administered. Each ampule contains a dose of 1 mg of adrenaline per order. The dose of adrenaline prescribed is 1 mg per ampule. The order is prescribed, intravenous 2 ampules q 6 hours. Furosemide (Lasix) is a diuretic used to relieve the effects of heart failure.

Discussion

Venom from snakebites is still a global health risk(6). According to estimates from the World Health Organization, 2.7 million of the 5.4 million snakebites that take place each year are poisonous, with a 5% fatality rate (137,880 deaths annually)(6). Two of the following local signs were considered to be indicative of infection in their study: pain, erythema, local warmth, swelling, lymphangitis, purulence, delayed healing, crepitus in soft tissues, discolored or friable granulation tissue, and wound breakdown or dehiscence. Alternatively, fever and/or chills were present along with at least one of these signs(7). An estimated 2.5 million snake-related incidents occur globally each year, resulting in 80,000 fatalities(8). Because blood samples are harder to get, have smaller volumes, and vary more across samples (linked to the prenatal age and postnatal age of the infant), research on children's coagulation—and more specifically, their relative sensitivity to snakebite—has been hindered(9). Headache, seizures, focal neurological deficiency, cranial nerve syndromes, visual abnormalities, or pseudotumor

cerebri-like conditions are some of the symptoms of cerebral venous sinus thrombosis(10). Approximately 20% of the almost 3,000 snake species known to exist worldwide are poisonous and seriously endanger human health(11). The infrastructure of the healthcare system, the socioeconomic condition of the patients, and the lack of access to antivenom are the main causes of the wide spectrum of consequences(12). Systemic symptoms, including thrombocytopenia and mixed coagulopathy, which include thrombin-like effects, increased plasminogen activator activity, and hyperfibrinolysis, are indicative of complications that may result from hemotoxicity(13). Depending on its primary effects, snake venom can be categorized as hematotoxic, neurotoxic, necrotoxic, cardiotoxic, or nephrotoxic(14). Snake bites are responsible for 35% of child fatalities from venomous animal bites, and they affect boys more often than girls, according to the WHO(15). Elevated PT international normalized ratio and PT/activated partial thromboplastin time levels, hypofibrinogenemia, increased fibrinogen degradation production, and decreased platelet counts are indicators of blood clotting problems(16). **Clinical Presentation**: Both our case and other severe snakebite cases present with localized swelling, pain, erythema, and systemic symptoms such as fever and sepsis. **Systemic Complications**: Like other severe envenomations, our patient developed complications, including organ failure, sepsis, and coagulopathy. **Antivenom**: Antivenom was administered but, similar to other cases, did not prevent severe complications or death. **Hemotoxicity**: Our patient, like many with severe cases, showed abnormal clotting profiles indicative of hemotoxicity. **Age and Prognosis**: Our case involved a young child, who may have a different immune response and worse prognosis compared to adults. **Healthcare Access**: The lack of resources in Somalia contributed to a poorer outcome compared to cases in areas with better healthcare infrastructure. **Toxin Composition**: The *Bothrops* species suspected in our case causes hemotoxic venom, which differs from neurotoxic venom seen in other species. **Delayed Death and Family Decision**: Our patient suffered prolonged deterioration leading to brain death, a situation not always observed in other cases where patients may die rapidly. **Regional Factors**: Environmental and healthcare disparities in Somalia affect the severity and outcome of snakebites, unlike other regions with different agricultural practices and healthcare access. Rural communities in Somalia are particularly vulnerable to snakebite, and the lack of access to medical care and antivenom can have serious consequences. Clinical symptoms such as fever, infection, edema, and discomfort frequently make diagnosis and treatment more difficult. These difficulties are demonstrated in our case, which involves a pediatric patient who, in spite of getting antivenom and antibiotics, experienced serious sequelae, including as sepsis, organ failure, and brain death.

Conclusion

This case underscores the critical need for early recognition and comprehensive management of snakebite envenomation, especially in pediatric patients from rural and agricultural areas. Despite timely administration of antivenom and supportive therapies, the patient's rapid deterioration, including complications like sepsis, organ failure, and pneumothorax, highlights the unpredictable nature of severe envenomations. This case also emphasizes the importance of vigilant monitoring for unusual clinical presentations and systemic complications that may arise, even when standard treatment protocols are followed. In resource-limited settings like Somalia, enhancing awareness, improving access to medical care, and providing timely interventions are crucial to reducing mortality and improving outcomes in snakebite cases.

Declarations

Data Sharing Statement: We confirm that we have complete access to all data in this study and accept full responsibility for its integrity. Data for this study are available upon reasonable request from the corresponding

author.

Ethics approval: Under the regulations of the review board at Mogadishu Somali Turkish Training and Research Hospital, institutional review board approval is not necessary for case reports.

Consent for Publication

Written informed consent was obtained from the patient's father for publication of the case details and any associated images.

Conflict of Interest: The authors have disclosed any financial or personal relationships with individuals or organizations that could bias their work. There are no undisclosed conflicts of interest.

Authors' contributions: All listed authors fulfil the authorship criteria specified by the journal, having significantly contributed to the conception, design, execution, or interpretation of the study. We have approved the submitted version and accept responsibility for all aspects of the work.

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Figures



Figure 1

Right-sided pneumothorax with lung collapse. Right-sided chest tube in place.



Figure 2

There is evidence of a right-sided pneumothorax, characterized by a visible pleural line with absence of lung markings peripheral to it. The lung appears significantly collapsed. In the right lung, there are areas of cavitation and consolidation consistent with necrotizing pneumonia.in the left lung, two thick-walled, circumscribed hypodense lesions, the largest measuring 17x14mm. Finding representative lung abscess "Diffuse subcutaneous edema is observed in the chest area."



Figure 3

Right hand Compartment Syndrome managed with Fasciotomy, as demonstrated in the picture.