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CASE REPORT

Parotid swelling after Russell's viper envenomation: an unusual and poor prognostic sign

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Key Clinical Message

Parotid swelling, an unusual and poorly understood sign, is associated with poor prognosis in the setting of Russell's viper envenomation. The large, aggressive Russell's viper is one of the most deadly snakes causing severe hematological and neurological manifestations. Research into this sign should be initiated and understanding could lead to improved outcomes.

Keywords

Antivenom, coagulopathy, dialysis, Russell's viper.

Introduction

Snakebite remains one of the most neglected tropical maladies in the developing world. An estimated five million snakebites occur worldwide of which two million are venomous with 125,000 deaths and 400,000 limb deformities [1–3]. Approximately 10,000 people may die during each month of monsoon due to snakebite in India [4]. Government reporting of snakebite deaths depends on hospital reports, but it is estimated that more than 75% of mortality occurs outside the hospital [5]. Thus, the numbers of deaths reported by government agencies are thought to underestimate the true toll of death and disability by snakebite [5]. The common venomous snake species in India are Spectacled cobra (*Naja naja*), Saw-scaled viper (*Echis carinatus*), Russell's viper (*Daboia russelii*), and Common Krait (*Bungarus caeruleus*) [6], and are the target of commercially available polyvalent antivenoms of varying quality. Unfortunately, only 70–85% of bites are by these species and with the large number of bites, many patients cannot receive either specific or appropriately effective polyvalent antivenom therapy even if they reach a hospital. Snakebite remains an important public health hazard in India, affecting more than 800 million people living in rural settings and multiple potential exposures in and around domiciles and in the fields. Depending on factors such as bite depth, venom dose, and host factors such as size, age, and comorbidity, signs and symptoms of Russell's viper envenomation appear almost immediately, in a few minutes or few hours after a bite. A typical venomous bite includes severe, immediate pain with rapid swelling, bruising of the skin, and difficulty in breathing. Many victims have a metallic, rubbery or minty taste in the mouth, numbness or tingling around the mouth, tongue, scalp, feet, or the bite area, swelling in lymph nodes near the bite, and signs of shock. A significant percentage will develop hypopituitarism, acute renal failure, myocardial

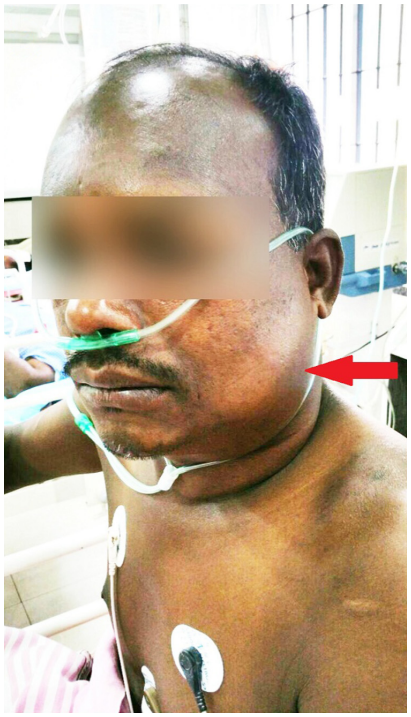

Figure 1. Parotid swelling appeared approximately 12 h after the bite (red arrow).

infarction, ventricular tachycardia, and neurological manifestations that may supervene, especially from Russell viper bite in the southern regions of India and Sri Lanka [7–12]. Because of the large number of bites, even these lower percentage complications can be seen as "common" when considered in such large populations being affected. A more unusual complication is development of parotid gland swelling. It is our experience and that of others that this finding is associated with poor prognosis [13–17]. The mechanism by which parotid gland swelling occurs is not documented and does not fit easily into the usual categories of suppurate (*e.g.*, Staphylococcus infection) or viral (*e.g.*, mumps) or noninfectious causes such as gout or uremia [18]. To our knowledge, no literature describes imaging or histopathological findings associated with this finding although such knowledge might lead to clues about how to treat these patients and others.

Case Report

A 37-year-old farmer spraying his field was bitten on his left foot by a Russell's viper (*Daboia russelii*) just before noon on the 31st of December 2015. He was taken to a local hospital where four vials of antivenom were administered before referral to our tertiary facility. He was admitted to our hospital approximately 4 h after the snakebite. In our Emergency Department, he presented with severe pain and bleeding at the bite site, throat irritation, difficulty breathing, and ptosis likely both as an acute reaction to venom and antivenom. He was treated upon arrival to emergency department for allergic reaction and with 30 additional vials of VINS antivenom, tetanus toxoid, and antibiotics. Within 12 h, he developed enlargement of the parotid glands without other signs of peripheral edema or capillary leak (Fig. 1) followed by hematuria and oliguria [17]. His other salivary glands appeared and palpated normal. His coagulation profile improved on the second day (Table 1), but within 36 hours he developed acute kidney injury (Table 2). His kidneys were then supported by 13 cycles of hemodialysis. His respiration was assisted by mechanical ventilation from day 1 until his death (Day 16). The patient became unarousable on the 11th day of admission. An urgent CT scan showed no intracranial bleeding but diffuse brain edema and pansinusitis. The patient was treated with broad-spectrum antibiotics and a trial of intravenous neostigmine while his hydration and nutritional needs were monitored throughout. Throughout the course of patient's stay in the hospital, his next of kin were regularly updated about the clinical progress and severity of the envenomation. Figure 2 illustrates the timeline of events and clinical course.

Investigations

Serial laboratory investigations were carried out to help guide clinical management. Initially, the whole-blood clotting time (Table 1) was more than 20 min despite the initial four vials of antivenom and improved significantly by day 2. The microscopic examination of the patient's urine showed a multitude of RBCs. There was a progressive deterioration of renal function and thrombocytopenia (Table 2). CT of the brain was performed because of coagulopathy and unexplained drowsiness. Imaging showed diffuse brain edema and pansinusitis but no signs of intracranial hemorrhage. Images of the parotids were not obtained.

Discussion

Most of snakebites occur in impoverished areas of India, sub-Saharan Africa, and Southeast Asia. Russell's viper is one of the most dangerous snakes found in Asia. A

Table 1. Coagulation results.

Test	Day 1	Day 2
Bleeding time	Beyond normal range	6 min 35 sec
Clotting time	Not clotting	12 min 25 sec

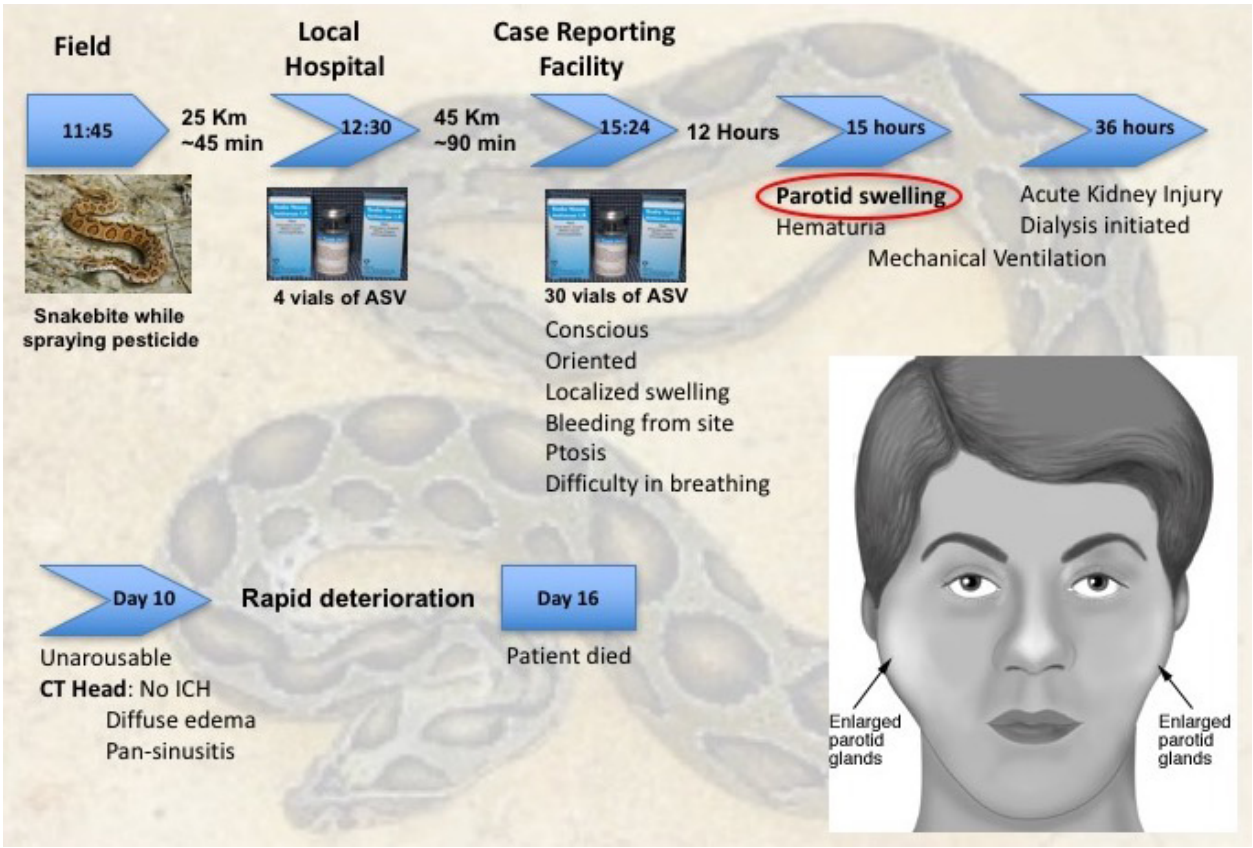

Figure 2. Timeline of events and clinical course. ASV = antivenom.

Table 2. Biochemistry.

Parameters	Day 1	Day 3	Day 5	Day 7	Day 9	Day 11	Day 13	Day 15
WBC (4–10 × 10^3/μL)	16.0	16.6	2.4	14.3	17.7	19.7	10.6	12.2
HGB (12–16 g/dL)	17.8	15.8	10.7	11.6	11.3	17.0*	11.8	12.3
PLT (100–300 × 10^3/μL)	201	140	33	34	31	47	80	94
Blood sugar (80–160 mg %)	159	219	142	116	167	121	197	174
Blood Urea Nitrogen (15–40 mg %)	40	76	98	110	229	218	224	169
Creatinine (0.6–1.2 mg %)	1.1	2.1	4.7	4.8	4.6	4.5	4.7	2.4
Potassium (3.48–5.50 mmol/L)	2.93	3.65	2.59	3.67	4.06	2.95	4.41	3.82

*Uncertain accuracy. Patient was not transfused.

southern state of Tamil Nadu, India, is estimated to have at least 10,000 deaths each year and is just one of many states in India greatly affected by snakebite [3]. Viper envenomation presentation varies from minor localized signs to life threatening systemic manifestations in up to 92% of cases, as Russell's viper is both a large and highly aggressive snake [19]. Apart from unusual complications such as ventricular tachycardia, myocardial infarction, and hypopituitarism [7], there is evidence that bilateral parotid swelling may occur and is associated with poor prognosis [14–16]. However, only a few cases of isolated parotid swelling following snakebite have been reported. [14–17]. Indian National snakebite protocol 2007 also states that parotid swelling is associated with poor prognosis [15].

Our patient travelled 25 km from his village to a local hospital where he was treated with four vials of antivenom and was then shifted to our hospital, which is

another 45 km. He was treated with a total of 34 vials of antivenom, early fasciotomy (a controversial practice, but standard of care in this hospital) [18–21], antibiotics, mechanical ventilation, neostigmine, and dialysis. In spite of aggressive management, our patient died of multi-organ failure. Autopsy was not carried out and is unusual for a private hospital serving the poor and a known cause of death (snakebite). The cause of parotid swelling in viper bite is unknown, but it seems to represent a poor prognostic outcome [17, 20]. Nevertheless, it is imperative that both acute care physicians and nursing staff are well informed in detecting parotid swelling in a much earlier stage in view of its prognostic significance. More research is needed to delineate the exact pathogenesis to establish this as a prognostic sign in viper envenomation. Reporting such case reports will sharpen the awareness of medical and nursing staff to redouble treatment and resuscitation efforts immediately upon receiving a suspected Russell's viper envenomation. The pathophysiology behind snakebite-induced parotid swelling has not been established but recently is subject of growing interest. [17, 18]. It would be desirable to image and possibly biopsy such a finding as it could eventually lead to better understanding of pathophysiology and ultimately, better treatments. In this case, failure to image parotids by ultrasound or CT was a lost opportunity and should be considered in future cases.

Authorship

MNS: contributed to the manuscript. SPS: contributed to patient care and wrote the manuscript. SCR: contributed to patient care and wrote the manuscript. MA: involved in background research and wrote the manuscript. TCB: contributed to the manuscript and background research. MRL: involved in background research and wrote the manuscript.

Conflict of Interest

None declared.

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