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# A Viper bite in an urban area : A case report

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ABSTRACT

Envenomous viper snakes are not natural inhabitants of Istanbul, Turkey. The city is crowded and lacks an appropriate area for wild life. Viper snakes are mostly found in southern and middle rural Anatolia in Turkey. To our knowledge, viper bites have not been reported in our urban area previously. Here, we report a envenomous snakebite case, treated with polyvalent antivenom successfully. The snake was identified as *Vipera Pontica*, by the National Poisons Center.

Keywords: Viper, Snakebite, Venoms, Antivenins

## 1. INTRODUCTION

Only a small percentage of the 2,700 snake species in the world are potentially lethal. Among the venomous species, the family of Viperidae is found in the Old World: Africa, Europe, and Asia. In Turkey, viper snakes are primarily found in southern and middle rural Anatolia in Turkey. As a result, venomation of vipera was predominantly observed in Turkey's rural areas. [1,2].

Viper envenomation can cause different variety of complications from local swelling to systemic shock syndromes of anaphylaxis, cardiovascular collapse, hematotoxic and neurotoxic problems [3]. Antivenom treatment is the mainstay of the envenomous snakebites. Antivenom is the immunoglobulin of the equine or ovine, produced against the venom of the snakebite [4, 5]. The aim of the antivenom treatment is to neutralize the toxin and to protect the patient from toxin-induced neurotoxicity, hematotoxicity, systemic cardiovascular collapse and shock, all of which lead to death.

To our knowledge, no previous cases of viper envenomation have been reported in our city. The goal of this case report was to describe a unique vipera bite in Istanbul's metropolitan area and to underline the need of initiating snakebite treatment in the emergency room. In a city where snakebite is uncommon but potentially lethal, this case emphasizes the significance of early detection and details critical stages in envenomation management.

## 2. CASE REPORT

A 71-year-old male was admitted to the Emergency Department of our institution located in the urban area, nearby settled and populated living areas in the district of Pendik, Istanbul with the complaint of a snakebite. The patient reported that he was admitted to hospital right after a snake has bitten his right-hand middle finger at the garden of his home, which was situated in Pendik, Istanbul, close to our institution. He was admitted to emergency service policlinics, where he waited for consultation for about 30 minutes. When he was in the examination room, his next of kins brought the dead snake for identification. The patient had a medical history of hypertension, coronary artery disease, and diabetes mellitus and had been on drug therapy for twenty years. At presentation he was in good clinical condition and able to walk, talk, and cooperate. Vital signs at presentation were as follows: BP 133/80 mmHg, HR 98 bpm, Temperature 36.2 °C, $SO_2$ 98% on room air, Glasgow Coma Scale (GCS) 15. Minor swelling and edema on the middle finger

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of his right hand with a subtle mark of the snake fangs were noted on inspection (Figure I). He was admitted to critical care area for monitoring and further evaluation immediately. His electrocardiogram (ECG) was within normal limits without any change from his previous medical records. There were no physical and neurological symptoms or signs except the edema on the hand. We reported and consulted the case to the National Poisons Center (NPC) on the phone (Telephone no: 114) for documentation and discussed online via the WhatsApp mobile application with the Toxicology Study Group of the Emergency Medicine Association of Turkey (EMAT) which consists of nationwide experts on the management of toxicology cases. In the meanwhile, we requested polyvalent snake antivenom from the poison center on the Anatolian side of Istanbul, which our institution is located. The snake was identified as "*Vipera pontica*" according to the consultations.

***Figure I.*** *Right hand of the patient with snake fang mark at presentation to emergency department.*

The diagnostic blood tests including complete blood count, electrolytes, renal and hepatic function tests, blood coagulation tests and urine analysis were all within normal range. In the 30$^{th}$ minute of admission into the critical care area, the patient's clinical condition deteriorated. He became hypotensive and hypoxic, and the vital signs were noted as follows : BP 95/60 mmHg, HR 110 bpm, Temperature 36.2 °C, SO2 87% on room air and GCS 13 with symptoms of vomiting and swelling in the hand. His clinical stage had progressed from Grade 1 to Grade 3 of the Snakebite Severity Grading (Table I) [6]. To treat the shock state, noradrenaline infusion 1 mg/kg/hr was started in addition to fluid therapy, tetanus vaccination, and ceftriaxone 1 gr administered intravenously as well.

***Table I.*** *Snakebite severity grading scale. 10 ml= 1 vial [6].*

| Severity | Manifestations | Amount of antivenom recommended |
|---|---|---|
| 0 (No envenomation) | Local or systemic signs or symptoms absent | - |
| 1 (Minimal) | Local swelling, absence of systemic signs, normal labaratory findings | 2 – 4 vial |
| 2 (Moderate) | Swelling extending past bite site (15 – 30 cm), more than one systemic sign or symptom, abnormal laboratory | 5 – 9 vial |
| 3 (Severe) | Marked (30 cm) swelling, tissue loss, multiple or severe systemic symptoms, immediate systemic signs, rapid progression of symptoms | 10-15 vial |
| 4 (Very severe) | Rapid development of local reaction, ecchymoses, necrosis, sweeling severe enough to obstruct blood or lymph flow | >15 vial |

A type of polivalent snake antivenom serum consisting of different venoms of viper species was readily available in NPC. 4 vials of antivenom, the whole amount that NPC stored, was obtained in 1 hour after demand and the antivenom treatment was started as soon as it arrived to the department. The required dose of the venom was calculated as 10-15 vials according to the clinical state of the patient, but the only 4 vials of antevenom were available in NPC. A slower infusion rate was used to prevent an anaphylactic reaction for the first 30 minutes and then the remaining dose was completed with the infusion rate as recommended by the NPC. Following the antivenom therapy, hypoxia and hypotension of the patient resolved dramatically. He was then transferred to the intensive care unit for hospitalization.

On admission to the intensive care unit, the vital signs were as follows : BP 120/60 mmHg, HR 95 bpm, Temperature 36.1°C, SO2 94% on room air, GCS 15. His ECG and physical and neurological examinations were normal except for the edema on the right hand. His shock state did not recur during the hospitalization period. After 24 hours of monitorization, he was handed over to ward from the intensive care unit and discharged to home afterwards. Patient's laboratory values remained within normal range during the hospital stay.


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## 3. DISCUSSION

In Europe, the estimated yearly prevelance of snakebite is 0.4 to 1.1 per 100,000 population with four casualties each year. In a review including 5501 cases in Europe, France was the leading country in the number of reports (Figure II) [3]. In Europe, *Vipera berus*, *V. aspis*, and V. *ammodytes* are the most common snake species of the Viper genus. Other than these vipers, *Macrovipera lebetina*, *Montivipera xanthina*, and *Vipera latastei* are clinically relevant in the southern parts of Europe [3]. Most recently, a snakebite envenoming case, most probably with *Vipera latastei*, was reported from Portugal, which was potentially fatal [7]. In Istanbul which is a crowded and entirely inhabited city, snakebites are very unlikely to occur such as the other European urban areas [3, 8]. Parks and green-zone regions are not large enough to bear wildlife species such as vipers in the district of Pendik. This zone in Istanbul mainly consists of factories, manufactures, and chemical industry plants. The most probable reason for this viper case may be the transfer of the viper snake unintentionally from other regions with other commercial goods.


***Figure II.*** *European map, with the distribution and relative number of cases according to the results of a systematic review [3].*

Although, there are many signs and symptoms following viper snakebites, the most severe complications are neurotoxicity and coagulopathy. In our patient, no coagulopathy had developed, yet his mental status deteriorated but dramatically improved following the antivenom treatment. The other severe consequences include: loss of a limb, prolonged dysfunction of the limb, prolonged length of hospitalization, admissions with later complications; particularly in children and in cases where there is delayed or inadequate treatment [9]. Acute lower extremity ischemia following a snakebite was reported recently [10]. In case of late hospital admissions, the clinician should be aware that tetanus may have complicated the clinical course [11].

Management of the snakebite starts with conventional first aid [12]. Calming the patient down, immobilization of the bitten body area, application of pressure over the bitten area, and urgent transfer of the patient to a health care center where he can receive proper antivenom treatment are the most critical initial steps. If the bitten site is on facial, abdominal or thoracic regions, the patient will not benefit from any splinting. In that case the spreading of the venom will be very fast and the patient may require early rapid sequence intubation before the transfer [4, 12]. During the transfer to the hospital, the patients should be closely monitored because these patients may deteriorate very rapidly depending on the venom type, regardless of the initial clinic.

Antivenom dosing and the indication of the clinical staging are still controversial issues although this therapy has been used for decades [5, 13, 14]. In some geographical regions, polyvalent (e.g. polyspecific) antivenoms are very important to apply. Since, these antivenoms include more than one specific antivenom, this therapy has the risk of side effects [14]. If the geographical region has only one envenomous species, monovalent antivenoms may be used; however, this is a seldom setting in clinical practice. In Turkey, polyvalent antivenoms are used in the treatment [5]. Antivenom therapy is used in patients with systemic signs and symptoms such as hypotension, hypoperfusion, cardiovascular collapse, shock, myotoxicity, neurotoxicity, bleeding and coagulation disorders, massive local swelling of the extremities with a risk for compartment syndrome, and the risk of necrosis of the extremes of the limbs. Some of the local and systemic symptoms that warrant administering antivenom are listed in Table II [9]. Laboratory tests may be an early indicator for the antivenom treatment. Leukocytosis (>20,000 WBC), severe anemia, bleeding disorders and abnormal coagulation blood tests, elevated hepatic enzymes, abnormal renal tests, myoglobinuria, hematuria, oliguria are often present [3, 9, 12]. In our patient, labaratory tests remained within normal range.

Antivenom treatment is given intravenously due to the poor absorbability via subcutaneous or intramuscular routes. While administering antivenom treatment, a physician must be alert for any signs of anaphylaxis, regardless of the rate of administration or the dilution of the antivenom, and be ready to start vasopressor therapy, as well as to discontinue the antivenom infusion; however, these cases have severely unfavorable clinical outcomes [3, 5]. The proposed dosing algorithm is the same for all age groups and the initial dosage may be repeated after about six hours.

Each patient should be monitored at the hospital even after a successful antivenom therapy at least for 48 hours because the redistribution of the venom from the snakebite site continues; furthermore, the risk for late-onset allergic reactions of the treatment is possible [4, 13].

***Table II.*** *Site of action of venom, clinical features, testing, and management [9].*

| Site of Action and/ or Systems Effected | Signs and Symptoms | Ancillary tests | Management |
|---|---|---|---|
| Local tissue | Fang marks, pain, swelling, bruising, ecchymoses, tissue necrosis (late), lymphadenopathy | | Antivenom<br>Compartment syndrome therapy |
| Neurological | Ptosis, diplopia, dysphagia, dyspne, paralysis, paresthesia | Neostigmine trial | Antivenom, anticholinesterase, support ventilation |
| Hematological | Epistaxis, bruising and ecchymoses, increase in clinical evident bleeding (melena, hematuria, etc) ecchymoses | Thrombocytopenia, anemia, prolonged aPTT and INR, decreased fibrinogen, increased D – dimer | Antivenom,<br>blood products transfusion |
| Circulation | Hypotension, tachycardia, shock, altered mental state | CVP and urine monitoring | Antivenom<br>Isotonic fluids<br>Vasopressor therapy |
| Rhabdomyolysis with renal insufficiency | Red or brown urine,<br>Oliguria | Urine dipstick,<br>increased serum CK, potassium, BUN, creatinine | Fluid therapy<br>Hemodialysis |

*aPTT activated partial thromboplastin clotting time, INR international normalized ratio, CVP central venous pressure,CK creatine kinase, BUN blood urea nitrogen*

## Conclusion

Viper envenomation is a rare emergency in urban European cities. Prompt recognition and medical envenomation and supportive treatment in a timely manner is crucial. Hospital preparedness for medical envenomation problems and for antivenom maintenance should be considered on a regular basis.

## Compliance with Ethical Standards

**Patient Consent**: The patient gave his consent for images and other clinical information relating to his case to be reported in a medical publication.

**Conflict of interest**: The authors have no conflicts of interest to declare.

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