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Case Report

Treatment of a 41-year old female patient bitten by a viper conducted at the emergency department – A case report

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ABSTRACT

Introduction: *Vipera berus* is the only species of venomous viper found in Poland, especially in Bieszczady. Cases of such bites in this country are rare and mortality does not exceed 1%. Most viper bites are dry bites with hardly any symptoms and do not require any hospital treatment; however, viper venom contains a complex mixture of proteolytic enzymes such as hyaluronidase, phospholipase A₂, cardiotoxins and presynaptic neurotoxins, which can be very dangerous for the victim. Thus, if symptoms exacerbate in the victim, observation and hospital treatment become a necessity.

Aim: The aim of this paper was to present the importance and validity of multi-diagnostic procedure and treatment at the Hospital Emergency Department (ED) in the case of viper bite and to describe the effect of viper venom on the human body. The diagnosis, management and care leading to the fast recovery of the patient are discussed.

Materials and methods: This study presents a case report involving a patient admitted to the ED in the Provincial Specialist Hospital in Olsztyn, following a viper bite.

Results and discussion: *V. berus* bites are rare in Poland, occasionally causing severe complications. Most bites are asymptomatic. Much less likely to develop are wide ranges of symptoms caused by toxins contained in the viper venom, including serious hypotension, cardiac arrhythmias, irritation of the central nervous system, heart rhythm disturbances, multiple organ dysfunction, pulmonary edema, disseminated intravascular coagulation syndrome, and anaphylactic shock. A typical viper bite involving extremities results in edema and ischemia of the distal parts of extremities with peripheral nerve damage. Due to a variety of possible complications, for patients with emerging symptoms, hospitalization becomes necessary in order to implement multidisciplinary treatment. The units predisposed to provide adequate care are EDs which ensure proper medical staff as well as diagnostic and monitoring facilities and access to appropriate treatment. Particular importance is given to controlling blood pressure, coagulation function, swelling of the bite area and the peripheral circulation. Specific treatment consists of administering specific

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antitoxin against viper venom. In symptomatic treatment, besides the use of anticoagulants, corticosteroids, antibiotics and antitetanic anatoxin, surgical procedures are also considered.

Conclusions: Rapid and well-coordinated medical assistance at the ED helps to avoid complications and facilitates faster recoveries in patients bitten by vipers.

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1. Introduction

Vipera berus of a viper species is the only venomous reptile found in Poland in the natural environment. Adults grow to a length of 70 cm (in exceptional cases to 90 cm). The color pattern visible on its back varies, ranging from brown, yellowish, olive green, bluish gray, orange, or reddish brown, with a characteristic zigzag pattern, the so-called "Cain band".⁴ *V. berus* is mainly found in wetlands and forest clearings.

This viper species generally avoids and evades people, but when in danger, it can attack a human. *V. berus* venom is usually not highly toxic and in the majority of cases complications do not occur after the bite; however, the venom can be dangerous, especially to children and the elderly. Mortality following the bite is approximately 1%. The volume of venom injected into the victim's body depends on the length of time elapsing since the previous bite and the viper's size (in *V. berus* up to 60 cm, a single volume of venom in both venom glands amounts to 30 mg – i.e., 10 mg of dry mass).^{7,10}

V. berus venom contains proteolytic enzymes: hyaluronidase which facilitates the invasion of toxins from the bite site further into the skin and subcutaneous connective tissue, thus its name: "spreading factor," phospholipase A₂ (PLA₂), as well as cardiotoxins, presynaptic neurotoxins, amino acids and polypeptides with toxic properties. In total, it contains approximately 25 various proteins and peptides. Venom is absorbed via the lymphatic circulation and via veins. Presynaptic neurotoxins are contained in the venom of the *Viperidae* family of venomous snakes (also *Crotalidae*, *Elapidae*, and *Hydrophiidae* families). These neurotoxins are divided into PLA₂ toxins as well as dendrotoxins and fasciculins. Their neurotoxic activity is associated with the ability to hydrolyze phospholipids anchored at a cell membrane. Presynaptic toxins' activity follows three phases. Initially, there appears a short-term interference with the release of neurotransmitters from nerve terminals (this phase depends on the phospholipase activity). During the second phase, due to the phospholipase activity, the release of neurotoxins increases; in the last phase, neurotransmission is completely blocked.

V. berus venom is characterized by proteolytic, fibrinolytic and anticoagulative properties.^{2,4,5} Venom can cause myonecrosis, hemorrhages, severe local pain and edemas, nausea, vomiting, abdominal pain, diarrhea, sleepiness, fever, angioneurotic edema of the lips and tongue, acidosis, and leukocytosis. Local symptoms and pain at the bite site are associated with damage to the surrounding tissues and blood vessels by proteolytic enzymes and the release of inflammatory mediators. Venom at higher concentrations can lead to blood pressure disturbances (hypotonia), tachyarrhythmia, confusion, convulsions, proteinuria,

erythrocyturia, and, in extreme cases, renal failure, multiple organ dysfunction, pulmonary edema, disseminated intravascular coagulation (DIC), and anaphylaxis (results from cross reaction in individuals allergic to bee sting venom and venom of other hymenopterous insects). At the bite site, there appears an oozing wound with visible traces of two fangs.^{1,2,3,5}

2. Aim

This paper presents the importance and validity of multi-diagnostic procedure and treatment at the Hospital Emergency Department on the basis of a female patient bitten by *V. berus*. Its aims are to describe the effect of viper venom on the human organism; to present specific and symptomatic treatments; and, finally, to discuss the diagnosis, management and care leading to the fast recovery of the patient, while avoiding complications.

3. Materials and methods

The research method involves a case report concerning a female patient treated at the Provincial Specialist Hospital in Olsztyn, complemented by data from the literature.

The patient, 41 years old, arrived at 15:00 at the Emergency Department (ED) of the Provincial Specialist Hospital in Olsztyn, reporting a viper bite. While in the forest, she had spotted a snake. On her attempt to avoid it, she had been attacked and bitten at the dorsal metatarsus of the right foot. This incident occurred at 14:00. The patient experienced severe pain at the bite site, which exacerbated within the following minutes. Based on the description provided by the patient during the interview (brownish and copper-colored snake, approximately 50 cm long and 7 cm in diameter), the reptile was identified as *V. berus*. The patient had no history of chronic diseases. On physical examination her condition was good, she was aware with respect to place, time and her identity. Abnormalities involved pain experienced on palpation in the projection of the right inguinal canal and tachycardia of 122 beats/min. Upper extremities were symmetrical with normal mobility. The left lower extremity was not painful, with normal range of motion, and free from swelling. On the right lower extremity, at the level of the 2nd and 3rd toes, 1 cm from the anterior edge of the foot (Fig. 1) a bite wound was detected. The wound comprised two puncture-like openings, 1 cm from each other, parallel to the toes, approximately 5 mm deep, and slightly bleeding. The extremity presented excessive skin warmth, pain on palpation, clearly visible swelling from the toes of the right foot (ascending towards the shank and knee) to the right inguen, and oval erythema, uniform in color (red),

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