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## DETALJNI PRIKAZ, UZ OPIS LIČNOG ISKUSTVA, NEUROTOKSIČNOG TROVANJA USLED UJEDA VIPERA BERUS BOSNIENSIS U VOJVODINI, SRBIJA

### DETAILED DESCRIPTION, WITH PERSONAL EXPERIENCE, OF A NEUROTOXIC ENVENOMATION DUE TO VIPERA BERUS BOSNIENSIS BITE IN VOJVODINA, SERBIA

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**Sažetak:** Slučaj koji smo opisali jedan je od tek nekolicine zabeleženih ujeda koje su nanele šarke na području Vršackih planina tokom poslednjih 40 godina. Inače zdrav četrdesetogodišnji muškarac ujedeno je za srednji prst ruke. Zmija je samo zagrebala kožu pacijenta ispod nokta, i to jednim zubom. Simptomi koje je pacijent iskusio tipični su za neurotoksično trovanje sa minimalnom lokalnom reakcijom. Preduzeta je standardna medicinska procedura: dati su protivotrov i uobičajena simptomatska terapija. Pacijent je u bolnici proveo šest dana i otpušten je u dobrom stanju. Ipak, subjektivno se potpuno oporavio tek nakon 10–12 dana. Uspeli smo da pronađemo samo tri publikacije koje opisuju konkretno posledice ujeda *Vipera berus bosniensis* iz okolnih zemalja i jednu iz okoline Vršca, tako da naš izveštaj predstavlja značajan dodatak iskustvima vezanim za ovo medicinsko stanje. Kako su izveštaji o ujedima otrovnih zmija u Srbiji uopšte izuzetno retki – iako sami ujedeni nisu – detalji koje smo ovde predstavili od velikog su značaja kako za lekare tako i za stanovništvo.

**Ključne reči:** balkanska šarka; manjak informacija; međudisciplinarna saradnja; obrazovanje.

**Summary:** The case we described here is among only a dozen bites inflicted by adders in the region of the Vršacke planine Mountains recorded during the past 40 years. The previously healthy 43-year old man was bitten on his middle finger. The snake only scratched the patient's skin under the nail, with only one fang. The symptoms the man experienced were typical of neurotoxic envenomation with minimal local reaction. The standard medical procedure was undertaken: the antivenin and the usual symptomatic therapy were administered. The patient spent six days in the hospital and was discharged in good condition. Nevertheless, subjectively, he fully recovered only after 10–12 days. We found only three publications describing specifically the consequences of the bites by *Vipera berus bosniensis* from the neighboring countries and one from the surroundings of Vršac, hence our report is an important addition to the experience regarding this medical issue. As the reports of venomous snakebites in Serbia in general are extremely rare – although the bites are not – the details we provided here are of considerable importance for both physicians and laypeople.

**Keywords:** Balkan adder; lack of information; interdisciplinary cooperation; education.

#### INTRODUCTION

In Serbia, only three species of venomous snakes exist, each with one or two subspecies: the nose-horned viper (*Vipera ammodytes*), the adder (*V. berus*), and the meadow viper (*V. ursinii*) [1-4]. All are strictly protected or protected by law [5]. In our country, including the surroundings of the city of Vršac (Banat region, Vojvodina province, northeastern

Serbia), the Balkan adder, *Vipera berus* subsp. *bosniensis* occurs (Figure 1A,B) [1,2,6]. Another viper, *V. ammodytes*, widely distributed south of the Danube and Sava rivers, also was recorded approximately 40 kilometers to the south from Vršac [7]. The experts did not exclude the possibility that in rare remnants of steppe habitats in Vojvodina

the third viper occurs, *V. ursinii*, subsp. *rakosiensis* [1].

Figure 1. *Vipera berus bosniensis* from the Vršačke planine Mts.: A) an adult in the open, and B) a specimen well hidden in dry grass (Photos: Milivoj Krstić).

Slika 1. *Vipera berus bosniensis* sa Vršačkih planina: A) odrasla jedinka na otvorenom i B) jedinka dobro sakrivena u suvoj travi (Fotografije: Milivoj Krstić).



According to the World Health Organization, two of the vipers present in Serbia are medically important – the nose-horned viper and the adder; the meadow viper is only moderately harmful to humans [8].

The venoms of adder and nose-horned viper differ in composition and effects [9]. Neurotoxic effects of adder venom are known for a long time, as are the differences in venom composition and in consequences of envenomation between two of the adder subspecies present in the Balkans, *V. b. berus* and *V. b. bosniensis* [10,11]. Resulting from the distribution patterns of the species, bites by *V. ammodytes* are more frequent than those by *V. berus* in all ex-Yugoslav countries for which the overview publications could be found [Nikolić, unpublished].

In Serbia, bites by venomous snakes do occur every year [Nikolić, unpublished], but their analyses are not being performed and made publicly available. A central register of the incidences of venomous snakebites still does not exist in Serbia: its making was initiated only in 2018, and the collected data were not available at the time of this manuscript preparation [12].

In general, published information concerning the bites of *Vipera b. bosniensis* are almost inexistent. Detailed case reports from the neighboring countries date back only to the 2010s [11,13,14]. On the other hand, the first adder bites in Vojvodina were described by a medical professional already in 1901 [15], although from the Fruška gora Mt., Srem region. Only one publication was found

regarding adder bites in the Vršac area, presenting six cases [16]. Between these two reports, a 100-years gap exists. After the year 2000, nothing of a kind was published for Vojvodina: several other cases previously treated in the Vršac hospital were not presented in the scientific literature. In general, in Serbia, only two additional publications were found concerning venomous snakebites, regarding *V. ammodytes* [17,18]. Importantly, no fatal outcomes were recorded. People often cannot recognize snake species, but in our case, no doubts existed regarding the identification of the “culprit”: the professional was bitten, who clearly recognized the species.

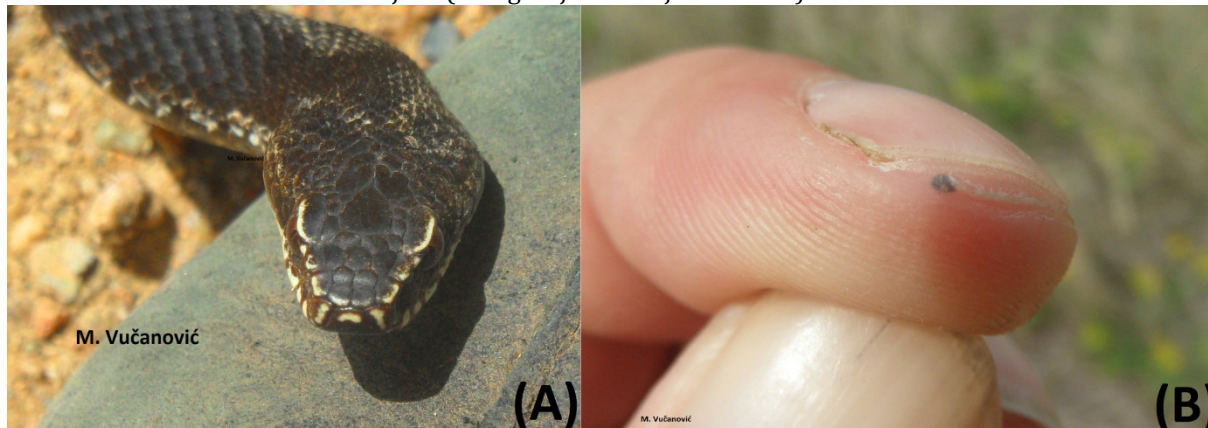
With this case report, we intended to contribute to the collecting and publishing of the data regarding the seriously neglected venomous snakebites.

#### CASE REPORT

On April 25, 2019 at around 10:40 a.m., one of the authors, an experienced 43-year old field investigator, ranger in the Landscape of Outstanding Features “Vršačke planine”, encountered an adder and wanted to photograph it, for the documentation. It was a sub-adult almost melanistic male (Figure 2A). Although well aware of the potential threat and despite handling the snake with due caution, for a moment his attention dropped and the snake bit him at the tip of his left-hand middle finger. The single fang only scratched the skin under the nail (Figure 2B).

Figure 2. A) The snake that inflicted the bite; B) tip of the patient's left-hand middle finger a week after the bite (Photos: Milivoj Vučanović).

Slika 2. A) Zmija koja je nanela ujed; B) vrh srednjeg prsta leve ruke pacijenta nedelju dana nakon ujeda (Fotografije: Milivoj Vučanović).



The patient squeezed and intuitively sucked the bite wound and probably ingested a bit of venom. During the first ten minutes, there was no reaction to the bite. After those ten minutes, “an initially unidentifiable change in the body” was felt. The injured man started driving his car towards the hospital by himself but accompanied by a colleague. Along the way he felt sudden exhaustion and noted that the colors of the surroundings had changed, i.e. brightened (the sky was brightly shining, leaves turned fluorescent green, the road shimmered like ice). The hospital was reached after about 35 minutes.

On admission, approximately 40 minutes after the bite, the patient was sweating and he complained of nausea and exhaustion but was able to explain what happened. He sat on the chair and vomited for the first time. Since he was unable to stand alone, he was put in a wheelchair. While being driven to the Infectious diseases department, he was unable to keep his feet lifted.

Of average osteomuscular build, he was conscious, oriented in space, time and towards faces, afebrile, acyanotic, anicteric, eupneic at rest, with no signs of hemorrhagic syndrome. His systolic blood pressure was 80 mmHg, but the diastolic was immeasurable. He denied chronic diseases and allergies to medications; he is a non-smoker and does not consume alcohol. During the admission, the patient vomited watery contents twice but he did not have diarrhea. Physical findings on head and neck were normal; there was no strabismus or diplopia. Auscultation showed normal breath sounds, cardiac action was rhythmic with clear

tones; TA 80/NA (still immeasurable) mmHg. The abdomen was soft, insensitive on palpation; liver at right costal margin, renal succussion negative. There was no swelling or deformities on extremities, only the bitten finger was slightly hyperemic: although the bite mark was not visible, minor swelling and redness developed at the place of bite. The patient had no neurologic deficits; meningeal signs were negative. Slight ptosis of the left eyelid developed. After being put to bed, the patient vomited three more times and had mild but uncontrollable diarrhea. He was conscious but was too weak to talk or keep his eyes open. Immediately after the admission, the patient received the antihistamine Synopen (loropiramin) i.v., and Lemod-Solu (metilprednizolon) 80 mg. Intravenous infusions were introduced – sol NaCl (natrii chloridi infundibile) 0.9% 500.0, sol Dextrosae (glucose) 5% 500.0, and the Jugocilin (benzilpenicilin-prokain) antibiotic 1,600,000IU was given i.m.

A single dose (5 ml) of the equine viper venom antiserum Viekvin® was administered i.m. at 11:45 a.m., approximately 65 min after the bite, at the place of bite on the hand and in the forearm. After an hour, the patient started feeling better.

At 12:20 p.m. tension still 80/NA mmHg; infusion application continued (sol NaCl 0.9% and sol Dextrosae 5%). Slight ptosis of the left eyelid became evident. The patient appeared drowsy, his talk was slow and slurry. Nevertheless, after two hours, all sensations were back to normal, and the patient felt good, except he could not control his eyelids.

At 13:20 p.m., the patient felt better, with TA 120/70 mmHg and diuresis of 350 ml (the single instance from the admission, at 13 p.m.). During the afternoon the ptosis of both eyelids developed: he could not open the eyes.

At 18:30 p.m. the patient's TA was 140/100 mmHg. At 22:00 p.m. TA was unchanged, and body temperature was 37.5°C. The patient was stable.

During the first day in the hospital, the patient was given 3 l of liquid i.v. He was not given anti-tetanus protection because he had already received the third dose of Tetalpan in February 2018, i.e. he was regularly vaccinated previously.

On April 26, the patient felt well, his TA was 120/80 mmHg and diuresis 2.250 ml (from admission until 6 a.m.). Ptosis was less prominent than on the previous day. Physical findings were normal.

On the third day, April 27, ptosis was still present but weaker: the patient could keep his eyes open, but still did not completely regain eyesight. Findings on the place of the bite were normal.

On April 28, ptosis receded almost completely; the patient had no objective sight problems. On April 29, the ptosis receded completely.

The patient was released from the hospital on April 30, the sixth day after the bite. Although clinically well, his sight did not fully recover: he still had trouble "sharpening" images for a couple of seconds after turning his head. In addition, after two or three hours of activity, his head would start aching. Subjectively, he fully recovered after 10–12 days. The bitten fingertip remained numb for about a month.

Laboratory tests: Laboratory analyses were performed at the admission, on the second day of hospitalization and before the patient was released. Values of the tests that departed from normal are provided in Table 1. Other hematological, biochemical and hemostatic parameters were within their reference ranges. Urine was tested only on the second day, and all parameters were normal/negative (pH, density, appearance, color, blood, bilirubin and urobilinogen, leucocytes, ketones, proteins, nitrites, and glucose).

Table 1. Results of laboratory analyses during the course of hospitalization. Elevated values are given in boldface, lowered are italicized.

Tabela 1. Rezultati laboratorijskih analiza vršenih tokom hospitalizacije. Povišene vrednosti su podebljane, a snižene iskošene.

	Reference ranges (units)	April 25	April 26	April 30
erythrocytes	3.80– 5.80 ( $\times 10^{12}$ G/L)	5.98	4.91	5.87
lymphocytes %	17.0–48.0 (%)	64.2	12.5	49.1
monocytes %	4–10 (%)	2.7	2.3	3.4
granulocytes %	42.0–76.0 (%)	33.1	85.2	47.5
lymphocytes total number	1.2–3.2 ( $\times 10^9$ /L)	4.3	1.1	3.4
s-glucose	3.3–6.1 (mmol/L)	9.1	7.9	5.0
s-CRP	< 5.0 (mg/L)	0.6	11.1	1.7

### DISCUSSION

Although previously healthy and practically merely scratched on the finger with only one snake's fang, the patient experienced moderately severe envenomation and spent six days in the hospital. He encountered a snake in a place that is not isolated: weekend house owners regularly use the road he took that day – mostly in cars, but also on foot; other types of visitors are also quite usual. *Vipera b. bosniensis* is long known for its potent neurotoxic venom, and reactions to its bites similar to the one we described were reported from Croatia, Bulgaria, and Hungary, in addition to the previous six cases from the Vršac hospital [11,13,14,16]. Although sometimes causing severe clinical pictures, adder bites are rarely fatal [e.g. 19]. Importantly, the antivenin manufactured in Serbia is effective in the cases of adder bites,

although it is made from the venom of *Vipera ammodytes* [17,20].

Our laboratory analyses of blood and urine did not show dramatic aberrations from reference values. Varga et al. [14] provided a list of papers presenting and discussing laboratory findings in the cases of *V. berus* bites: among the previously reported, we found elevated levels of glucose and CRP. We also had increases in erythrocytes, but lowered monocytes %, while the numbers/percentages of lympho- and granulocytes oscillated from below to above the reference ranges. Systemic symptoms did develop but did not last for long. The only persistent effects were problems with eyes – blepharoptosis and vision impairment. The cases of adder bites previously described from the surroundings of Vršac [16] were similar to the one we reported of here. Of the six patients treated during 18 years, three got

bitten to the fingers while attempting to catch the snakes; two sucked the wound and one squeezed it (the remaining three did not apply the first aid). Both local and systemic symptoms were mild to moderate, with complications in a person suffering from asthma. All patients (22–57 years of age) received antivenin within 30 min to 4 hours after the bite, and they spent 2–8 (4.8 on average) days in the hospital.

In general, adder bites in the surroundings of Vršac are not frequent and they are surely not lethal, as the media like to present them, using the phrases like “he barely survived the attack of a snake”.

Vršacke planine Mts. are one of only several remaining lowland/hilly habitats of *Vipera berus* in Serbia [1,6,21]. Like in its other non-mountainous habitats, due to the constant spreading of human influences, the adder is often found near the settlements and arable land [21]. This makes it vulnerable to various anthropogenic influences [6] and poses the potential threat to people. In Serbia, the species is strictly protected by national legislation and was recently designated as vulnerable; the prescribed fine for its killing is 100.000 dinars (app. 850 €) [2,5,22].

In our case, the snake bit an experienced and cautious person, a professional biologist, who was aware that his own mistake during the handling of the animal led to the bite. Laypeople either fear snakes enough to wish to

kill them all, or they want to show off trying to catch or/and torture them. Those are the situations in which many of the bites occur [16,23,24].

#### CONCLUSION

Although the distribution of vipers in Serbia is comparatively well explored, some new populations of all three species might be “discovered” in suitable habitats, like in e.g. Hungary [25]. The exchange of information is necessary among scientists (professionals in biology and medicine), and between the experts and the general public, including the media. With humble effort, proper education could be provided to the target population and the risk of snakebites could be minimized.

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#### Conflicts of interest

None.

#### REFERENCES

- Jelić D, Ajtić R, Sterijovski B, Crnobrnja-Isailović J, Lelo S, Tomović L. Distribution of the genus *Vipera* in the western and central Balkans (Squamata: Serpentes: Viperidae). *Herpetozoa* 2013; 25 (3/4): 109–32.
- Ajtić R, Tomović L. *Vipera berus* (Linnaeus, 1758). In: Tomović L, Kalezić M, Džukić G, editors. Red book of fauna of Serbia II – Reptiles. University of Belgrade, Faculty of Biology, and Institute for Nature Conservation of Serbia, Belgrade; 2015. p. 241–7.
- Tomović L. *Vipera ammodytes* (Linnaeus, 1758). In: Tomović L, Kalezić M, Džukić G, editors. Red book of fauna of Serbia II – Reptiles. University of Belgrade, Faculty of Biology, and Institute for Nature Conservation of Serbia, Belgrade; 2015. p. 233–9.
- Tomović L, Ajtić R. *Vipera ursinii* (Bonaparte, 1835). In: Tomović L, Kalezić M, Džukić G, editors. Red book of fauna of Serbia II – Reptiles. University of Belgrade, Faculty of Biology, and Institute for Nature Conservation of Serbia, Belgrade; 2015. p. 249–54.
- Anonymous. Pravilnik o proglašenju i zaštiti strogo zaštićenih i zaštićenih divljih vrsta biljaka, životinja i gljiva [Regulation on the designation and conservation of the strictly protected and protected wild species of plants, animals and fungi]. Službeni glasnik Republike Srbije [Official Gazette of the Republic of Serbia] 2011; Nos. 5/2010 and 47/2011.
- Tomović L, Ajtić R, Ljubisavljević K, Urošević A, Jović D, Krizmanić I, et al. Reptiles in Serbia – Distribution and diversity patterns. *Bull Nat Hist Mus Belgr* 2014; 7: 129–58. <https://doi.org/10.5937/bnhmb1407129T>.
- Džukić G, Kalezić M, Marković M. Poskok (*Vipera ammodytes*) – autohtona zmija Vojvodine! [Nose-horned viper (*Vipera ammodytes*) – autochthonous snake in Vojvodina!] Godišnji bilten Prirodnačkog društva Gea 2005; 5: 13.
- WHO – World Health Organization. Health Systems and Services: Quality and Safety of Medicines – Blood Products and related Biologicals. Available at <http://apps.who.int/bloodproducts/snakeantivenoms/database/default.htm> (Last accessed on 11 September 2019).
- Latinović Z, Leonardi A, Šribar J, Sajevec T, Žužek MC, Frangež R, et al. Venomics of *Vipera berus berus* to explain differences in pathology elicited by *Vipera ammodytes ammodytes* envenomation: Therapeutic implications. *J Proteomics* 2016; 146: 34–47. <https://doi.org/10.1016/j.jprot.2016.06.020>.
- Radovanović M, Martino K. Zmije Balkanskog poluostrva. Srpska akademija nauka, Naučno-popularni spisi, Knjiga 1; Institut za ekologiju i biogeografiju, Knjiga 1. [Snakes of the Balkan Peninsula. Serbian Academy of Sciences, Scientific-popular writings, Book 1. Institute for Ecology and Biogeography, Book 1] Naučna knjiga, Belgrade. 1950: p. 43.
- Malina T, Krecsák L, Jelić D, Maretić T, Tóth T, Šiško M, et al. First clinical experiences about the

- neurotoxic envenomings inflicted by lowland populations of the Balkan adder, *Vipera berus bosniensis*. *NeuroToxicology* 2011; 32: 68–74. <https://doi.org/10.1016/j.neuro.2010.11.007>.
12. Dobaja Borak M, Babić Ž, Bekjarovski N, Cagánova B, Grenc D, Gruzdyte L. et al. Epidemiology of Viperidae snake envenoming in central and south-eastern Europe: CEE Viper Study. In: Abstracts from the 39th International Congress of the European Association of Poisons Centres and Clinical Toxicologists (EAPCCT) 21–24 May 2019, Naples, Italy. *Clin Toxicol* 2019; 57(6): 470.
13. Westerström A, Petrov B, Tzankov N. Envenoming following bites by the Balkan adder *Vipera berus bosniensis* – First documented case series from Bulgaria. *Toxicon* 2010; 56: 1510–5. <https://doi.org/10.1016/j.toxicon.2010.08.012>
14. Varga C, Malina T, Alföldi V, Bilics G, Nagy F, Oláh T. Extending knowledge of the clinical picture of Balkan adder (*Vipera berus bosniensis*) envenoming: The first photographically-documented neurotoxic case from South-Western Hungary. *Toxicon* 2018; 143: 29–35. <https://doi.org/10.1016/j.toxicon.2017.12.053>.
15. Mirković S. Kako prost narod u Fruškoj gori i Srijemu lieči rane nastale ujedom otrovnih zmija [How laypeople in Fruška gora and Srijem heal the wounds resulting from venomous snake bites] *Liečnički Viestnik* 1901; 23: 246–8. [In Serbian].
16. Častven J, Šinžar T, Kovačević D, Moroanka E, Mitrović D, Stanivuković M. Zmijski ujedi u području Vršackih planina – prikaz slučajeva [Snakebites in the region of Vršac mountains – case reports]. *Acta Infectologica Yugoslavica* 2000; 5: 75–82. [In Serbian with summary in English]
17. Milićević M. Prikaz bolesnika ujedjenih od otrovnih zmija lečenih od 1960. do 1968. godine / Vorstellung der Kranken die von Giftschlangenbissen im Jahre 1960 bis 1968 behandelt wurden [Presentation of the patients bitten by venomous snakes treated between 1960 and 1968]. *Srpski arhiv za celokupno lekarstvo* 1968; 96(10): 999–1006. [In Serbian with summary in German].
18. Stojanović M, Stojanović D, Živković Lj, Živković D. Hemoragijski sindrom kod zmijskog ujeda [Hemorrhagic syndrome in snakebite]. *Apollineum Medicum et Aesculapium* 2007; 5(3-4): 8–10. [In Serbian with summary in English]
19. Tranca S, Cocis M, Antal O. Lethal case of *Vipera berus* bite. *Clujul Med* 2016; 89(3): 435–7.
20. "Torlak" Institute of Virology, Vaccines and Sera, Belgrade, Serbia. User's manual for Viekvin@: [www.torlakinstitut.com/pdf/Viekvin-en.pdf](http://www.torlakinstitut.com/pdf/Viekvin-en.pdf).
21. Nikolić S, Simović A. First report on a trichromatic lowland *Vipera berus bosniensis* population in Serbia. *Herpetol Conserv Bio* 2017; 12(2): 394–401.
22. Anonymous. Pravilnik o odštetnom cenovniku za utvrđivanje visine naknade štete nedozvoljenom radnjom u odnosu na strogo zaštićene i zaštićene divlje vrste [Regulation on the compensation charges for the damages caused by illegal actions towards strictly protected and protected wild species]. *Službeni glasnik Republike Srbije* 2010; No. 37/2010.
23. Stahel E, Wellauer R, Freyvogel TA. Vergiftungen durch einheimische Vipern (*Vipera berus* und *Vipera aspis*). Eine retrospektive Studie an 113 Patienten [Poisoning by domestic vipers (*Vipera berus* and *Vipera aspis*). A retrospective study of 113 patients]. *Schweiz Med Wochenschr* 1985; 115(26): 890–6. [In German with abstract in English]
24. Warrell DA. Treatment of bites by adders and exotic venomous snakes. *BMJ* 2005; 331: 1244. <https://doi.org/10.1136/bmj.331.7527.1244>.
25. Malina T, Schuller P, Krecsák L. Misdiagnosed *Vipera* envenoming from an unknown adder locality in northern Hungary. *North-West J Zool.* 2011; 7(1): 87–91.