DOI 10.4149/BLL_2024_122

Bratisl Med J 2024; 125 (12):
797–801

CLINICAL STUDY

Necrotizing fasciitis as a result of a black widow spider bite

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ABSTRACT
The poison ivy does not normally occur in Slovakia, like in the Czech Republic, but it can be introduced. The venom of the black widow spider is an effective weapon for capturing prey. It is a mixture of various active substances containing a protein neurotoxin called α-latrotoxin (α-LTX). Necrotizing fasciitis (NF) is a rapidly progressive soft tissue infection caused by fulminant tissue destruction with severe systemic toxicity and high mortality *(Fig. 9, Ref. 16)*. Text in PDF www.elis.sk
KEY WORDS: poisonous weaver, necrotizing fasciitis, streptococcus pyogenes, latrodectism, multiorgan failure.

Introduction

There are approximately 970 species of spiders in Slovakia, more than half of which are poisonous. At the current rate of climate change, migration of more dangerous exotic species is expected, the bite of which can cause life-threatening complications, especially in elderly, immunocompromised patients, pediatric population and allergy sufferers. Identification of the causative agent of a bite injury is often impossible because the insect cannot be caught, but the site after the bite can be a gateway to secondary infection, which makes differential diagnosis particularly challenging. In our work, we will focus on a patient who developed life-threatening complications after being bitten by an unknown insect.

Materials and methods

The homeland of the poisonous weaver is North and Central America. It can be found in Canada (British Columbia, Alberta, Saskatchewan, Manitoba, Québec), the United States, Guatemala, Belize, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, the Dominican Republic or Hawaii. Due to shipping and other transport, it also reached other parts of the world, all continents except Antarctica (1).

The poison ivy does not normally occur in Slovakia, like in the Czech Republic, but it can be introduced. It can get here, for example, in a shipment from abroad. However, she probably wouldn't survive this winter. However, it can be expected that as long as the climate changes continue and the winters become milder, the poisonous weaver (or some form of it) can "deal" with us as well. Occurrence is already reported from, for example, Austria, Croatia, Slovenia, Italy, Spain, the south of France, the islands of Corsica and Sardinia, or also Greece (however, it is probably already widespread on the entire Balkan Peninsula) (2).

The clinical diagnosis of a black widow spider bite depends mainly on the history, wounds, non-specific clinical manifestations and corresponding epidemiological findings. Visualizing the bite along with associated symptoms and taking a detailed history will allow for an accurate diagnosis. Therefore, patients with a suspected diagnosis should actively collect evidence to identify the spider. To officially confirm the diagnosis, the patient must isolate the spider after the bite, which is identified by a qualified professional such as an entomologist, medical toxicologist or other qualified professional. However, it is not necessary and patients are not advised to catch, harm or handle the spider (9) (Figs 1–9).

Results

Black widow spider venom is an effective weapon for capturing prey and defending against enemies. It is a mixture of various active substances containing a protein neurotoxin called α-latrotoxin (α-LTX). The toxin receptor is also a member of the G-protein coupled receptors (GPCR) (2). Black widow spider toxin is a glycoprotein with a relative molecular weight of 130 kDa that can act on a variety of synaptic and sodium ion and potassium ion channels. In humans, it can cause depolarization of the presynaptic membrane, causing the release of acetylcholine from synaptic vesicles. Massive release of acetylcholine can cause excessive muscle depolarization. It causes excessive hy-

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Figs 1 and 2. Necrotizing fasciitis of the right leg after a venomous weaver bite (source: author).

Figs 3 and 4. Necrotizing fasciitis of the right leg after a venomous weaver bite (source: author).

peractivity of autonomic and cerebral cortical neurons, and most patients suffer from headaches, lethargy, irritability, myalgia, tremors, and ataxia (3).

Unfortunately, the patient developed a streptococcal infection secondary to the bite. Streptococcus pyogenes group A is the cause of a wide range of diseases, namely pharyngitis, impetigo, pneumonia, necrotizing fasciitis, cellulitis, streptococcal bacteraemia, osteomyelitis, otitis media, sinusitis, meningitis or brain abscess (a rare complication resulting from the direct spread of an ear or sinus infection cavities or from hematogenous spread). The result of streptococcal infection can be acute kidney failure, rheumatic heart disease – chronic damage to the valves, especially the mitral valve, or acute glomerulonephritis.

In the treatment of severe cellulitis, Staph.aureus should be considered as a possible alternative pathogen or co-pathogen. Empiric treatment with vancomycin or ceftriaxone may be

Figs 5 and 6. Secondary wound healing after necrotizing fasciitis (source: author).

considered, and antibiotic therapy should be adjusted based on culture. Clindamycin should be used to inhibit toxins in sepsis or septic shock. It is necessary to take into account the patient's allergies. An alternative can be linezolid, which has broad-spectrum effects on gram-positive bacteria and has the property of inhibiting toxins (8).

Discussion

The black widow spider (Latrodectus mactans) is known for the phenomenon that the female spider kills the male after mating, thus becoming a widow. Symptoms of poisoning range from local irritation and pain to a systemic syndrome called "latrodectism", characterized by a variation in manifestations from autonomic disturbances to widespread pain and stiffness. The black widow has a body length of 10 to 14 mm and lives in grasslands, deserts, farms, stone seams, caves, hay, but can also be found in human dwellings (10).

In our case report, we would like to present a patient with necrotizing fasciitis after a black widow spider bite.

40-year-old female patient, without significant pre-disease, in excellent physical condition (marathon runner). While the black widow spider was reported to be multiplying, she was on vacation in Croatia, where she was bitten on the terrace in the evening on her right leg by an insect that could not be caught and identified. She was treated for irritation and pain at a local surgical clinic, but due to worsening of her condition, they decided to transport her to Slovakia. On the second day after the bite, edema of the perineum developed around the wound, she was treated at the surgical outpatient clinic, but subsequently she was hospitalized for the onset of hypotension and overall worsening of the condition with rapid progression, the patient had to be transferred to the intensive care unit due to hypotension and altered consciousness. The laboratory results at admission were as follows: CRP 247 mg/l, PCT 38 ug/l, Lactate 4.5 mmol/l, Myoglobin 545 ug/l, Urea 10 mmol/l, Creatinine 234 umol/l, leukocytes 19 10^9/l , the development of anemia occurs at a hemoglobin of 9.08 g/dl. After consultation with an infectious disease specialist, the differential diagnosis was based on the suspicion of poisoning after a bite of black water or phlegmon caused by a toxin-producing bacterium causing toxic shock. Empirically, she was given a triple antibiotic treatment with penicillin, clindamycin and meropenem, steroids, immunoglobulins and surgical debridement, incisions and counter incisions were performed. Streptococcus pyogenes was subsequently cultured from the wounds. The condition was further complicated by suspected myocarditis, elevation of D-dimers, swelling of the right lower limb and fluidothorax. After a comprehensive series

Figs 7 and 8. Secondary wound healing after necrotizing fasciitis (source: author).

Fig. 9. A healed wound on the right leg (source: author).

of examinations, myocarditis and deep vein thrombosis were ruled out. During intensive treatment, the patient's condition gradually improved, but the local finding on the right leg required long-term treatment with the application of local antibiotics and daily bandages, hyperbaric oxygen therapy, with subsequent secondary healing of the wound (Figs 1–9).

Educational conclusions

Traditional treatment for black widow bites is aimed at providing symptomatic relief until the effects of the venom wear off. These include primarily opioid analgesics and muscle relaxants. Conducted studies of providing symptomatic treatment have had at best partial success (11, 12, 13, 14). Calcium treatment was once considered an antidote to black widow poisoning. Calcium was thought to stabilize the permeability of nerve membranes, leading to a decrease in neurotransmitters (15, 16). Although this effect was demonstrated in vitro and reported in some early clinical series, (14, 15, 16) subsequent experience did not demonstrate its efficacy. Therefore, calcium therapy has fallen out of favour in the medical toxicology community.

The only treatments with proven efficacy are opioid analgesics and black widow spider antidote. Latrodectus mactans antidote is a horse antidote based on immunoglobulin G (10).

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Received June 1, 2024.
Accepted July 17, 2024.