

Loxosceles rufescens: single-institutional epidemiology, diagnosis and treatment

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Abstract

Loxosceles rufescens, also known as “violin spider” due to its characteristic appearance, is a medium-sized spider species that can potentially pose a threat to humans. For this study, patients who presented to our hospital’s Poison Control Center between January 1, 2022, and December 31, 2022, and met the following inclusion criteria were included: Suspicion of a violin spider bite, as evaluated

by our center. Our protocol involves an initial local treatment, which includes local washing with copious water and disinfection, along with the application of chlorotetracycline hydrochloride. Systemic therapy utilizes Amoxicillin and Clavulanic Acid as the first-line medication. The primary endpoints of this study are the timing and effectiveness of the treatment for cutaneous lesions. Demographic and anamnestic information regarding age, gender, and timelines was summarized using descriptive methods. Our study’s results indicate that erythema and pain are the most frequent symptoms. Loxoscelism is highly concentrated in the Western hemisphere and is considered the only proven arachnological cause of dermo-necrosis. In recent years, there has been an increase in diagnoses.

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Introduction

Loxosceles rufescens, also known as “violin spider” due to its characteristic appearance, is a medium-sized spider species. It has a brownish color, a body length of 7-8 mm, and long, slender legs, and it is potentially harmful to humans. Endemic to the Mediterranean basin and the Middle East, this species is found in semi-arid habitats resembling steppes, typically under rocks and in crevices, allowing it to establish itself indoors when invading synanthropic environments.^{1,2} It can easily spread through transported goods. Most incidents have been described in America, Europe, Asia, Africa, and Oceania. Spider bites result in a clinical presentation characterized by necrotic skin lesions with a distinctive gravitational spread pattern. The bite is initially relatively painless and may go unnoticed at first. Pain, ranging from mild to severe, sets in after 2-8 hours. Small signs at the bite site, transient erythema, itching, swelling, and varying degrees of tenderness are common. This is followed by the formation of a blister (12-24 hours), surrounded by an area of ischemic tissue, and the blister may become hemorrhagic. In the following days, the necrotic lesions take on a blue-violet color, with a characteristic gravitational spread. An eschar can form within 3 to 7 days. During the subsequent week, the area becomes edematous and firm in consistency, and the central zone thickens to form an eschar.³⁻⁵ The eschar may eventually slough off, leaving an ulcer that heals over variable periods (6-8 weeks), but sometimes requires skin grafting (Figure 1, 2).⁶⁻⁹ Systemic involvement is infrequent. It occurs in a minority of cases and is generally mild and self-limiting, although it can lead to death in some cases, usually associated with renal failure, disseminated intravascular coagulation (DIC), and intravascular hemolysis. The manifestations of the spider’s toxin vary based on the victim’s health status, degree of obesity, bite location, and overall health. Erythema, pain, and macula at the bite site are the most common local symptoms of a spider bite, while fever is the most common

systemic symptom. Bites on the extremities are more frequent and more severe.^{10,11}

The primary toxin present in *Loxosceles* venom is the enzyme Sphingomyelinase D (SMase D), which triggers an indirect inflammatory mechanism. Therefore, the venom's spread defines the extent and severity of dermonecrotic lesions.¹²⁻¹⁴ Once in contact with erythrocyte surfaces, the SMase D enzyme activates endogenous metalloproteinases, which cleave the extracellular portions of glycoconjugates, turning these cells into activators of the alternative complement pathway, resulting in hemolysis. Additionally, enzyme binding to keratinocytes induces increased expression/secretion of matrix metalloproteinases (MMP-2, MMP-9, MMP-7), a major factor in the pathogenesis of cutaneous loxoscelism.^{13,14} Edematous predominant cutaneous loxoscelism occurs in about 4% of cases. Severe systemic loxoscelism occurs in less than 1% of cases of focal skin necrosis.¹⁵ Spider bites can have nephrotoxic effects. Clinical and laboratory features observed in victims may include hemoglobinuria, hematuria, and proteinuria.¹¹⁻¹⁸ The treatment therapy for loxoscelism refers to our internal protocol.¹⁹ Local treatment, following a bite from any unidentified spider, involves washing with abundant water, local disinfection with a 0.05% Sodium Hypochlorite solution, and local application of chlorotetracycline hydrochloride for at least 15 days three times a day, along with tetanus prophylaxis. Systemically, antibiotic and antihistamine therapy is recommended. As an analgesic treatment, aspirin or acetaminophen is advised. Violin spider bites require differential diagnosis from tick bites, making the measurement of anti-Borrelia immunoglobulins G and M helpful. Baseline blood tests for the determination of the LRINEC (Laboratory Risk Indicator for Necrotizing Fasciitis) score are essential to guide subsequent appro-

priate therapy; subsequent tests are conducted every 24 hours to assess the need for hyperbaric oxygen therapy.¹⁹

Materials and Methods

General information

For this study, patients seen at our Poison Center, from January 1, 2022, to December 31, 2022, were included. All patients received comprehensive monitoring, tetanus prophylaxis, and antibiotic treatment. Our endpoint is to assess potential correlations between latency and disease duration.

Inclusion and exclusion criteria

All patients with a suspected diagnosis of “violin spider” bite, evaluated by our center, were included. The enrolled patients were of both sexes and all ages. Pregnant and breastfeeding women were excluded from the study.

Treatment

The treatment used is based on our internal protocol, which includes the following.

Local treatment: i) local washing with plenty of water; ii) local disinfection with a 0.05% sodium hypochlorite solution (quaternary ammonium or hydrogen peroxide-based disinfectants are not used); iii) local application of chlorotetracycline hydrochloride three times a day for at least 15 days (sun exposure and pediatric use are discouraged); iv) tetanus prophylaxis.



Figure 1. Skin lesions from the bite of a “violin spider”.

Antibiotic therapy: choice of one of the following antibiotics: Amoxicillin and Clavulanic Acid, with a dosage of 1-2 g orally three times a day for 10-12 days in adults. For children weighing over 40 kg, 1 g three times a day for 10-12 days. Clindamycin at 300 mg every 6 hours for 8 days in adults and 30-40 mg/kg/day orally three times a day for 7-8 days in children. Azithromycin at 500 mg per day for 8 days in adults; pediatric dosages are weight-dependent.

Subsequent options for antibiotic therapy: doxycycline at 100-200 mg per day for 12 days in adults (not recommended in children).

Antihistamine therapy: use of Chlorphenamine Maleate at 10 mg intravenously for adults and 0.25 mg/kg/dose for children, followed by Hydroxyzine Dihydrochloride at 25 mg per day orally for 15-20 days in adults. For children under 6 years, the maximum dose is 0.5 mg/kg or 0.25 ml/kg, and for children over 6 years, the maximum dose is 6 mg per day or 6 ml per day. Alternatively, Loratadine at 10 mg per day can be used.

For pain relief in adults: acetylsalicylic acid (aspirin) is a choice (contraindicated in children).

For differential diagnosis, measuring anti-Borrelia IgG and IgM

(Lyme disease) is useful. Indication for Hyperbaric Oxygen Therapy (HBO) is based on repeated baseline blood tests every 24 hours (Table 1) and the evaluation of necrosis, pain, and edema (Table 2), combined with LRINEC scores.¹⁹

If experiencing paresthesia, Vitamin B12 and L-Carnitine.

Endpoint

The primary endpoints are the timing and effectiveness of treating skin lesions using our internal protocol for managing potential complications related to violin spider bites.

Statistical analysis

Demographic and anamnestic information regarding age, sex, and timing were summarized using descriptive methods. Categorical variables were summarized with relative frequencies, and continuous variables were summarized with mean, standard deviation, or median and interquartile range.

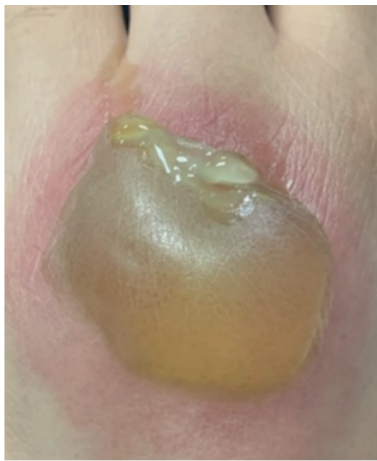


Figure 2. Atypical skin lesion.

Table 1. Baseline blood chemistry tests to monitor HBOT indication.

		Score
C-reactive protein	<150 mg/L	0
	≥150mg/L	4
Total leukocytes	<15 per mm ³	0
	15-25 per mm ³	1
	>25 per mm ³	2
Hemoglobin	>13.5 g/dL	0
	11-13.5 g/dL	1
	<11 g/dL	2
Sodium	≥135 mmol/L	0
	<135 mmol/L	2
Creatinine	≤1.59 mg/dL	0
	>1.59 mg/dL	2
Glucose	≤180 mg/dL	0
	>180 mg/dL	1

Table 2. Evaluation method for any indication of HBOT.

Low risk=0	Medium risk=1	Evolutionary risk=2	High risk=3
No necrosis	No necrosis	Ischemia/necrosis	Ischemia/necrosis
Negligent pain	Moderate pain	Intense pain	Intense pain
Negligible edema	Moderate edema	Severe edema	Severe edema
Lrinec score <6	Lrinec score <6	Lrinec score >6	Lrinec score ≥8
Basic therapy	Basic therapy	Basic therapy Hyperbaric oxygen therapy Tab. 9 u.s. navy rev. 6 2 sessions/day for 2 days Then re-evaluate	Basic therapy Hyperbaric oxygen therapy Tab. 2.8 ata 90 mins 2 sessions/day for 3 days Then tab. 9 u.s. navy 1 session daily/for at least 10 days
	CT or MRI	If compartment syndrome 2 sessions/day for 5 days after fasciotomy CT or MRI Surgical evaluation	CT or MRI Surgical evaluation
Blood tests for viscerocutaneous loxocelism	Blood tests for viscerocutaneous loxocelism	Blood tests for viscerocutaneous loxocelism	Blood tests for viscerocutaneous loxocelism

CT, computed tomography; MRI, magnetic resonance imaging.

Results

In this study, 63 patients were examined, including 42 females and 21 males, all with suspected “violin spider” bite-related skin lesions. Most patients were between 40 and 70 years old, comprising both sexes. All patients presented with skin lesions, 48% had pain, and 49% had erythema. Eschar was present in 27% of patients, itching in 33%, papule, fever, and necrosis were present in 2%, 3%, and 1% of cases, respectively. Edema was observed in 29% of cases, while 45% of patients exhibited other types of symptoms. Only one case tested positive for anti-Borrelia. Latency time data were derived from a mono-institutional epidemiological statistic. Only two patients had tetanus coverage, while for others, prophylaxis was recommended but not administered by all. Poison Severity Score (PSS) 1 was present in 65% of cases, PSS 2 in 33%, and PSS 0 in 1% of cases; PSS was not known for only one case. Healing days varied based on the severity of skin lesions (Table 3).

Discussion

Loxoscelism, despite being widespread worldwide, exhibits a strongly concentrated distribution in the Western hemisphere and is considered the only proven arachnological cause of dermo-necrosis. It manifests as pain and erythema that can progress into necrotic ulcers. The literature has also highlighted that the binding of SMase D to the cell surface increases intracellular levels of superoxide, leading to DNA damage, although the mechanism of action is not yet

fully clarified.¹⁴ The treatment for this type of cutaneous injury involves the initiation of systemic antibiotic and antihistamine therapy, along with local treatment and potential Oxygen Therapy Interface (OTI). Cutaneous Loxoscelism wounds can be complicated by concurrent infections. Literature data have shown that electrolyzed neutral water has been effective in treating severe skin injuries due to its antiseptic and tissue-regenerating effects, representing an additional therapeutic method for cutaneous loxoscelism injuries.²⁰ Our study suggests that the speed and effectiveness of treatment may be of fundamental importance in reducing complications. In recent years, we have witnessed an increase in diagnoses, mainly due to heightened medical awareness of this type of issue. However, further studies investigating potential correlations between risk factors and severe clinical outcomes are desirable.

Conclusions

Early diagnosis and the involvement of specialized personnel, such as the support of experts in toxicology, can positively impact patient health by reducing potential complications.

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Table 3. Descriptive table of results.

Total patients	63
Female	42
Male	21
Age ^a	40-70 years
Skin lesions	Everyone
Ache	48%
Hyperaemia	49%
Escara	27%
Itching	33%
Ponfo	2%
Fever	3%
Necrosis	1%
Edema	29%
Other symptoms	45%
Positivity at the anti-borrelia test	1%
Pss=0	1%
Pss=1	65%
Pss=2	33%
Pss=nn	1%
Latency time (0-10 days)	67%
Latency time (11-20 days)	16%
Latency time (>20 days)	1%
Latency time (nn)	16%
Healing time (1-15 days)	57%
Healing time (16-30 days)	13%
Healing time (>30 days)	3%
Healing time (nn)	27%

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