



A life-threatening situation due to a spider bite : a non-infectious necrotizing fasciitis

Juan Miguel RODRÍGUEZ-ROIZ, José Roberto BALLESTEROS-BETANCOURT, Victor Antonio RODRÍGUEZ-ROIZ,
Raquel GARCÍA-TARRIÑO, Sebastián GARCÍA RAMIRO

From the Department of Orthopedic Surgery and Trauma, Hospital Clinic de Barcelona, University of Barcelona, Spain.

We present the case of a healthy patient who sustained a spiderbite in the elbow and developed a non-infectious necrotizing fasciitis in the affected limb. Female patient aged 24 pain reported a spiderbite received some 72 h previously in Mexico (the spider was identified as a brown recluse spider-*Loxosceles reclusa*). Under the suspected diagnosis of necrotizing fasciitis urgent surgery was indicated. During her hospital stay, the patient required three additional surgical procedures, and was discharged from hospital 30 days after admission. Spider bites in the limb may be limb-threatening and life-threatening. Emergency doctors should be aware of this possibility, because spiders can be unintentionally transported all over the world.

Keywords : spider bite, *Loxosceles*, necrotizing fasciitis.

INTRODUCTION

Necrotizing fasciitis is a serious invasive soft tissue infection, characterized by necrosis of the skin, subcutaneous tissue, fascia and muscles. This relatively rare condition impairs the viability of the affected limb, and is often life-threatening as well (9,13,14). Correct early diagnosis and early surgical treatment is essential, since mortality rates increase exponentially with delayed treatment (1,15).

Although this disease occurs most frequently in immunosuppressed patients, here we present the case of a healthy patient who sustained a spiderbite in the elbow and developed a non-infectious

necrotizing fasciitis in the affected limb. We describe the treatment applied and present a review of the literature.

CLINICAL CASE

Female patient aged 24 with no relevant associated conditions, who presented at our hospital complaining of intense pain and swelling in her left elbow, and fever of 39°C of 24 hours' evolution. She reported a spiderbite received some 72 h previously in Mexico (the spider was identified as a brown recluse spider-*Loxosceles reclusa*) where she was on vacation. On the day of the bite, the patient had consulted a local hospital, but at that time no significant erythematous reaction had appeared in the medial part of her elbow and she was discharged with analgesic treatment. On presentation at our

- Juan Miguel Rodríguez-Roiz¹,
- José Roberto Ballesteros-Betancourt¹,
- Victor Antonio Rodríguez-Roiz²,
- Raquel García-Tarriño¹,
- Sebastián García Ramiro¹

¹ Department of Orthopedic Surgery and Trauma, Hospital Clinic de Barcelona, University of Barcelona, Spain

² Department of Orthopedic Surgery and Trauma, Hospital de L'Esperit Sant, Santa Coloma de Gramenet, Barcelona.

Correspondence: Juan Miguel Rodríguez-Roiz, Department of Orthopedic Surgery and Trauma, Hospital Clinic de Barcelona, University of Barcelona, Spain. C/Villarroel 17, Postal Code 08036,

E-mail : jmleon41@gmail.com

© 2017, Acta Orthopædica Belgica.

*No benefits or funds were received in support of this study.
The authors report no conflict of interests.*

Acta Orthopædica Belgica, Vol. 83 - 2 - 2017

hospital's Emergency Room she was conscious and lucid, showed no signs of acute neurological dysfunction, was hemodynamically stable and had a fever of 39°C. Her upper left limb presented significant swelling extending from the medium forearm to the medium arm, with a violet erythema across the entire medial area of the elbow (Fig. IA and IB). She had high local temperature and intense pain on palpation across the entire limb and with passive and active movements. The most intense pain was located in the medial area of her elbow, where a puncture wound could be observed as a necrotic area.

With a suspected diagnosis of necrotizing fasciitis or compartment syndrome in the upper left limb secondary to a spiderbite, a full blood count was requested. The results showed a high white blood count (15,000 WBC) with neutrophilia (79%) and high C-reactive protein (45 mg/dl). The biochemical parameters were within normal ranges.



Fig. I. (A-B) — Detail of left elbow showing a central necrotic injury associated with the spiderbite. Swelling and ecchymosis are visible around the area of the inoculation of venom (marked). Extensive erythema is also visible on the distal part of the arm and proximal forearm of the upper left limb.

An X-ray of the limb revealed swelling in the soft tissue, with no presence of gas in the subcutaneous tissue.

Urgent surgery was indicated, and a radical debridement of the upper left limb was performed under general anesthesia. The patient presented macroscopic thrombosis in the suprafascial and transfascial vessels of the elbow, distal arm and proximal forearm (Fig. II A and II B). Tissue samples (vessels, fascia, swabs) were sent to the lab for microbiological culture and pathology study, which revealed acute phlebitis and acute necrotizing fasciitis. No microorganisms were isolated in the cultures.

During her hospital stay, the patient required three additional surgical procedures for debridement, assessment of progress and closure of her wounds (Fig. III A and III B), as well as transfusion with two concentrates of red blood cells, one pool of platelets and 1 L of frozen fresh plasma. Clinical evolution

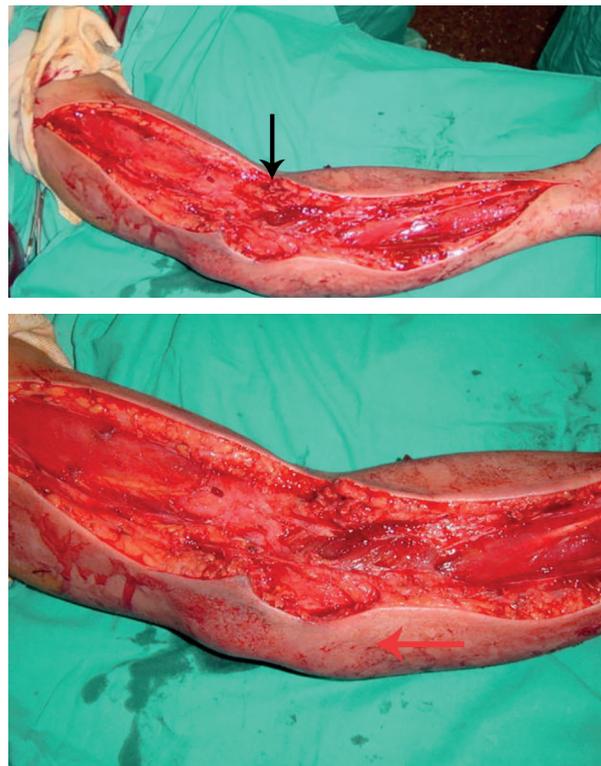


Fig II (A-B). — Detail from the frontal part of upper left limb during the first surgical debridement. Thrombosis can be observed (black arrow) throughout the superficial vessels. Note the extensive exposure of the muscular compartments in the proximity of the bite (red arrows)

was satisfactory and the patient was discharged from hospital 30 days after admission.

DISCUSSION

Necrotizing fasciitis is a disease that progresses with great rapidity and has a mortality rate that



Fig IIIA. — Surgical closure after first debridement, soft tissues with healthy appearance, good perfusion and normal bleeding.



Fig IIIB. — Final closure after the fourth surgery, after regularization of clinical and blood parameters.

varies between 15% and 75%.

The most important prognostic factors of this disease are early diagnosis, polymicrobial broad spectrum antibiotic treatment, and an exhaustive surgical debridement, which not only reduces mortality but also speeds recovery and is associated with the lowest risk of sequelae (1,10).

The basic physiopathological phenomenon is microthrombosis of the transfascial vessels that irrigate the fascia and suprafascial soft tissue.

Frequently, it is the consequence of monomicrobial or polymicrobial infections. However, as in this case, its cause may be non-infectious and may be related to thrombogenic toxins. The toxic effects of spider venom frequently affect the cardiovascular, haematological and nervous systems. Hemotoxic venoms present procoagulant and hemolytic substances that produce thrombotic and hemorrhagic phenomena.

Loxoscelism is the most important clinical syndrome resulting from *Loxosceles* spp spider bite and follows two well-defined clinical variants: the cutaneous form which manifests as erythema and edema and may develop into necrotic ulcer, and the systemic form which is characterized by intravascular hemolysis and occasional renal failure (5). In one study of clinically diagnosed brown recluse bites, skin necrosis occurred in 37% of cases, while systemic illness occurred in 14% (8).

The *Loxosceles* venom contains hyaluronidase, RNase, DNase, alkaline phosphatase, lipases and sphingomyelinase D (4,5). Sphingomyelinases D are the major component of *Loxosceles* venoms and are responsible for both dermonecrosis and complement-dependent hemolysis.

Sphingomyelinases D catalyze the hydrolysis of sphingomyelin resulting in formation of ceramide 1-phosphate (C1P) and choline or the hydrolysis of lysophosphatidyl choline, generating the lipid mediator lysophosphatidic acid (LPA) (11). C1P is involved in the stimulation of cell proliferation via a pathway that involves inhibition of acid sphingomyelinase and the simultaneous blocking of ceramide synthesis (6). LPA is known to induce various biological and pathological responses such as platelet aggregation, endothelial hyperpermeability, and pro-inflammatory responses by signaling through three G-protein-coupled receptors (2). Skin areas cause vasoconstriction and other bleeding, which quickly lead to local ischemia and gangrenous plaque formation.

In many cases the bite is not felt initially and may not be immediately painful. The majority of brown recluse spider bites heal gradually within six weeks and require little intervention (7, 12). This is why 80% of reported brown recluse bites have been misdiagnosed. Sometimes the history of a

bite and wound characteristics are the only reliable assessment data (3,4).

If no spider is caught or identified, other pathologies must be ruled out before making a definitive diagnosis. Streptococcal, staphylococcal, pyoderma gangrenosum, herpes simplex, herpes zoster, fungal infections, certain carcinomas, localized vasculitis and other conditions can all resemble a brown recluse spider bite (12).

Treatment for spider bites is typically the same regardless of the causative agent. Rest, ice compresses, and elevation, or "RICE" therapy are the mainstays of treatment whenever a spider bite is suspected. Antibiotics to prevent secondary infection and analgesics may be indicated. Tetanus booster, if due, and antihistamines may also be appropriate (3,4). In the setting of *Loxoscelism*, specific antivenom and dapsone treatment may be beneficial for moderate-to-severe dermonecrosis, but they are controversial and they need to be assessed in randomized controlled trials.

When infectious or non-infectious necrotizing fasciitis is found and diagnosed, surgical debridement must be performed in addition to antibiotic treatment. The recommended course of antibiotic treatment needs to cover the main causal microorganisms. As a result, it must be broad-spectrum (third-generation cephalosporin + clindamycin or metronidazole, or a carbapenem or piperacillin-tazobactam as monotherapy). This treatment should be administered until the results of cultures and pathology studies are available, which will offer a definitive diagnosis. During hospitalization, the patient must undergo several surgical debridements depending on the evolution and in order to close surgical wounds, which frequently require skin covering.

CONCLUSIONS

Though rare, spider bites in the limb may be limb-threatening and life-threatening. Emergency doctors should be aware of this possibility, because spiders can be unintentionally transported all over the world. Their increasing popularity as pets also raises the likelihood of spider bites in new geographical areas.

Ethics committee approval

The authors state that ethics committee approval was secured for the study and that the study was assessed by the Ethics Committee of the Hospital Clinic of Barcelona.

REFERENCES

1. Al Shukry S, Ommen J. Necrotizing Fasciitis - report of ten cases and review of recent literature. *J Med Life* 2013 ; 6 : 189-94.
2. Anliker B, Chun J. Lysophospholipid G protein-coupled receptors. *J Biol Chem* 2004 ; 279 : 20555-8.
3. Braitberg G, Segal L. Spider bites - Assessment and management. *Aust Fam Physician* 2009 ; 38 : 862-7.
4. Clowers TD. Wound assessment of the *Loxosceles reclusa* spider bite. *J Emerg Nurs* 1996 ; 22 : 283-7.
5. Da Silva PH, da Silveira RB, Appel MH et al. Brown spiders and loxoscelism. *Toxicol* 2004 ; 44 : 693-709.
6. Gómez-Muñoz A, Kong JY, Salh B et al. Ceramide-1-phosphate blocks apoptosis through inhibition of acid sphingomyelinase in macrophages. *J Lipid Res.* 2004 ; 45 : 99-105.
7. Hubiche Thomas, Pascal Delaunay, Pascal del Giudice. A Case of *Loxoscelism* in Southern France. *A .m. J Trop Med Hyg* 2013 ; 88 : 807-808.
8. Leach J, Bassichis B, Itani K. Brown recluse spider bites to the head : three cases and a review. *Ear Nose Throat J* 2004 ; 83 : 465-70.
9. Soriano A, Ballesteros JR, García S. Infecciones necrosantes de piel y blandas. *JANO* 2006 ; 29-33.
10. Sultan HY, Boyle AA, Sheppard N. Necrotizing fasciitis. *BMJ* 2012 ;345 : e4274
11. Van Meeteren LA, Frederiks F, Giepmans BN et al. Spider and bacterial sphingomyelinases D target cellular lysophosphatidic acid receptors by hydrolyzing lysophosphatidylcholine. *J Biol Chem* 2004 ; 279 : 10833-6.
12. Vetter R. Shay, M. Bitterman, O. "Identifying and misidentifying the brown recluse spider". *Dermatol Online* 1999 ; 5 : 7
13. Wilson B. Necrotizing fasciitis. *American Surgeon* 1952 ; 18 : 416-31.
14. Wong CH, Chang HC, Pasupathy S, et al. Necrotizing fasciitis : clinical presentation, microbiology and determinants of mortality. *J Bone Joint Surg* 2003 ; 85A : 1454-60.
15. Wong CH, Khin LW, Heng KS, et al. The LRINEC (laboratory risk indicator for necrotizing fasciitis) score : a tool for distinguishing necrotizing fasciitis from other soft tissue infections. *Critical Care Med* 2004 ; 32 : 1535-41.