



Case report

A non-infectious necrotizing fasciitis of the lower limb after a snakebite: Case report and literature review

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1. Introduction

Necrotizing fasciitis is a disease characterized by necrosis of the skin, subcutaneous tissue, fascia and muscles. It progresses rapidly and not only impairs the viability of the affected limb, but is also life-threatening [4,11,3,7,12]. Correct early diagnosis is essential, because mortality increases exponentially with increasing delays in treatment [13,10,8,14]. Here we present the case of a patient who sustained a snakebite in her foot and developed necrotizing fasciitis in the affected limb. We describe the treatment applied and provide a review of the literature.

2. Clinical case

Female patient aged 24 with no relevant associated conditions presented at our hospital complaining of intense pain and swelling in her lower right limb. She reported a snakebite received some 48 h beforehand (On capture, the snake was identified as *Vipera aspis*.) On the day of the snakebite, the patient had reported to another hospital, but at that time no significant erythematous reaction had appeared on the dorsum of her foot and she was discharged with analgesic treatment. On presentation at the Emergency Room in our hospital, she was conscious and lucid, showed no signs of acute neurological dysfunction, and was afebrile and haemodynamically stable. Her lower right limb presented significant swelling extending from the groin region to the dorsum of the foot, with a violet erythema across the entire posteromedial area of the limb (Fig. 1A and B). 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 on the dorsum of her foot, where two puncture wounds could be observed at a distance of 1 cm on the outer edge.

With a suspected diagnosis of necrotizing fasciitis or compartment syndrome in the lower right limb secondary to a snakebite, a full blood count was requested. The results showed an elevated white blood count with neutrophilia and mild normocytic anaemia. The biochemical parameters were within normal ranges. 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 was performed under general anaesthesia on all the compartments of the lower right limb (thigh, leg and foot). The patient presented macroscopic thrombosis in the suprafascial and transfascial vessels of the thigh, leg and foot (Fig. 2A). 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 four additional surgical procedures for debridement, assessment of progress and closure of her wounds (Fig. 2B), as well as transfusion with 21 concentrates of red blood cells, one pool of platelets and 4 L of frozen fresh plasma. Clinical evolution was satisfactory and the patient was discharged from hospital 30 days after admission.

3. Discussion

Necrotizing fasciitis is a disease that progresses with great rapidity and has a mortality rate that varies between 15% and 75% [4,11,3,7,12]. The early hours of evolution provide no objective data to establish reliable diagnosis, and primary-care doctors frequently have little experience in identifying the early signs of this rare condition. As a result, diagnosis may be delayed by hours or even days [13,10,8,14]. Most affected patients present an altered immunological status such as diabetes mellitus or immune deficiency, and also peripheral vasculopathy, although there have been cases in young patients with no relevant existing pathologies [7,12]. The early hours of evolution show common signs and symptoms of cellulitis (erythema, swelling, pain and heat), and at advanced stages, the evolution of underlying physiopathology phenomena causes cutaneous necrosis, haemorrhagic phlyctenas, crepitation and even cutaneous anaesthesia. The appearance of these factors clarifies the diagnosis, but given the advanced state of the process the prognosis is poor [7,12]. The basic physiopathological phenomenon is microthrombosis of the transfascial vessels

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Fig. 1. (A) Asymmetry can be observed between the two lower limbs, given the significant swelling of the entire lower right limb. Extensive erythema is also visible on the posteromedial area of the lower right limb. (B) Detail of right foot showing two puncture wounds 1 cm apart, corresponding to a snakebite. Swelling and ecchymosis are visible around the area of the inoculation of venom.

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 related to thrombogenic toxins [3,7,12,1,2]. The toxic effects of snake venom frequently affect the cardiovascular, haematological and nervous systems. Haemotoxic venoms present pre-coagulant and haemolytic substances that produce thrombotic and haemorrhagic phenomena. The signs of a snakebite may be two small punctures at a distance of 6–10 mm from one another. Wounds may be numerous (multiple bites) or single if the snake has sunk only one fang into the victim. In the minutes subsequent to the bite, local inflammation occurs. The pain may become very intense, but it may also pass unnoticed and only increases when oedema appears. General effects may appear during the hours following the bite. The person usually feels anxious and restless and has a rapid pulse. The most frequent symptoms include intense pain in the affected limb, nausea, vomiting, abdominal pain, diarrhoea, obtundation and headache. In highly exceptional cases and after very severe accidents, the patient may present symptoms of anaphylactic shock. The degree of poisoning and therefore its severity is evaluated by clinical signs and biological data. When the snake can be identified, the patient should be administered the specific antidote, admitted for monitoring and treated with broad-spectrum antibiotics [1,2].

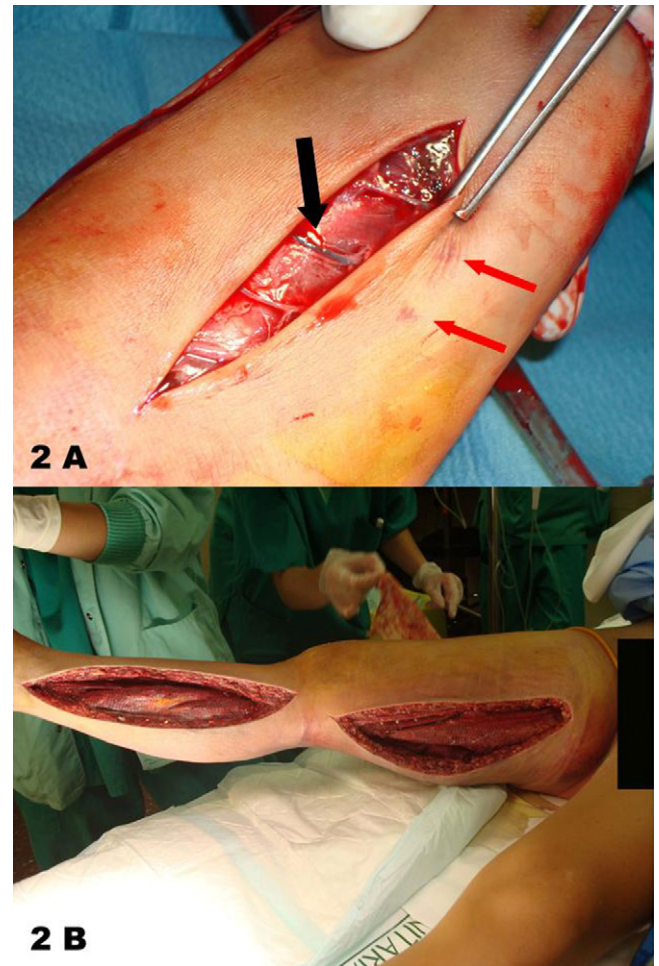


Fig. 2. (A) Detail from the latero-external area of the right foot during fasciotomy. Thrombosis can be observed (black arrow) in all the superficial vessels. Note the proximity of the snakebite (red arrows). (B) Medial aspect of the lower right limb during one of the debridements. Note the extensive exposure of the muscular compartments by means of medial fasciotomies (fasciotomies were also performed on the external face of the entire limb and on the dorsum of the foot). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of the article.)

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) [7,12,8,5,6]. This treatment should be followed until the results of cultures and pathology studies are available, which will offer a definitive diagnosis. During hospitalization, the patient must undergo several interventions of surgical debridement depending on the evolution and in order to close surgical wounds, which frequently require skin covering [7,12]. In the absence of any definitive complementary test, scoring systems have been devised to assist in decision-making, including the “LRINEC score” [13,10,14]. The LRINEC score gives us the ability to assign to some laboratory parameters such as glucose, creatinine, leukocytes, hemoglobin, C-reactive protein and sodium a score according to their values. Depending on the end result will be three groups of patients (with low, intermediate and high risk). Depending on the group, should perform additional diagnostic tests, or go directly to surgery. However, in the early hours of evolution, the analytic parameters

may be within normal ranges [9]. As a result, a high index of suspicion is currently the most important factor, because the speed of surgical response is fundamental to the patient's prognosis.

Conflict of interest statement

The authors have received no financial assistance in the preparation of this paper. The authors have also signed no agreement to receive benefits or fees from any commercial entity. No commercial entity has paid or will pay any foundations, educational institutions or other non-profit organizations with which the authors have affiliations.

Contributorship statement

All authors have made substantive contributions to the study, and all authors endorse the data and conclusions.

Ethics committee approval

Authors state that an ethics committee approval was secured for the study and assessed it by the Ethics Committee of the Hospital Clínic of Barcelona.

References

- [1] Angel MF, Zhang F, Jones M, et al. Necrotizing fasciitis of the upper limb resulting from a water moccasin bite. *Southern Medical Journal* 2002;95: 1090–4.
- [2] Cawse NH, Inglefield CJ, Hayes C, et al. A snake in the clinical grass: late compartment syndrome in a child bitten by adder. *British Journal of Plastic Surgery* 2002;55:434–5.
- [3] Giuliano A, Lewis Jr F, Hadley K, et al. Bacteriology of necrotizing fasciitis. *American Journal of Surgery* 1977;134(1):52–7.
- [4] Meleney FL. Haemolytic *Streptococcus gangrene*. *Archives of Surgery* 1924;9:317–64.
- [5] Norrby-Teglund A, Muller MP, Mcgeer A, et al. Successful management of severe group A streptococcal soft tissue infections using an aggressive medical regimen including intravenous polyspecific immunoglobulin together with a conservative surgical approach. *Scandinavian Journal of Infectious Diseases* 2005;37(3):166–72.
- [6] Norrby-Teglund A, Haque KN, Hammarstrom L. Intravenous polyclonal IgM-enriched immunoglobulin therapy in sepsis: a review of clinical efficacy in relation to microbiological aetiology and severity of sepsis. *Journal of Internal Medicine* 2006;260(6):509–16.
- [7] Soriano A, Ballesteros JR, García S. Infecciones necrosantes de piel y partes blandas. *JANO* 2006;(9–15):29–33.
- [8] Stevens DL, Madaras-Kelly KJ, Richards DM. In vitro antimicrobial effects of various combinations of penicillin and clindamycin against four strains of *Streptococcus pyogenes*. *Antimicrobial Agents and Chemotherapy* 1998; 42(5):1266–8.
- [9] Tsai YH, Hsu RWW, Huang KC, Huang TJ. Laboratory indicators for early detection and surgical treatment of vibrio necrotizing fasciitis. *Clinical Orthopaedics and Related Research* 2010;468:2230–7.
- [10] Wall DB, de Virgilio C, Black S, et al. Objective criteria may assist in distinguishing necrotizing fasciitis from nonnecrotizing soft tissue infection. *American Journal of Surgery* 2000;179(1):17–21.
- [11] Wilson B. Necrotizing fasciitis. *American Surgeon* 1952;18(4):416–31.
- [12] Wong CH, Chang HC, Pasupathy S, et al. Necrotizing fasciitis: clinical presentation, microbiology and determinants of mortality. *Journal of Bone and Joint Surgery* 2003;85A:1454–60.
- [13] 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 Medicine* 2004;32:1535–41.
- [14] 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 Medicine* 2004;32(7):1535–41.