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Bacteriologically Undocumented Necrotizing Dermohypodermitis after Inappropriate Application of a Plant-Based Analgesic Spray on Abrasions: A Case Report

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Abstract | **Case Report**

Necrotizing dermohypodermitis and necrotizing soft-tissue infections are rare but severe surgical emergencies that require early recognition and prompt management. Their diagnosis is mainly clinical, but inflammatory, irritant or immunoallergic skin reactions may mimic necrotizing infection, particularly after topical exposure on damaged skin. We report the case of a 19-year-old male patient with no notable medical history who sustained anterolateral abrasions of the left leg after a motorcycle fall. He subsequently applied a plant-based analgesic spray directly onto the abraded skin, outside the usual conditions of use. Forty-eight hours after this application, the clinical course was marked by diffuse soft-tissue edema, violaceous ecchymotic skin discoloration and areas of early necrosis. The patient was admitted to the emergency department on day 7 with extensive necrotizing dermohypodermitis of the left leg. Laboratory tests showed marked inflammation, with a white blood cell count of 22,000/mm³ and C-reactive protein of 340 mg/L. HIV, viral hepatitis A, B and C, and syphilis serologies were negative. Management consisted of wide surgical debridement, repeated local wound care and split-thickness skin grafting at week 6. Deep bacteriological samples obtained during debridement, with no documented antibiotic treatment before sampling, were negative. The outcome was favorable, with a very good result at 1 year, despite residual dyschromia at the donor site. This case highlights the need to investigate recent topical exposure in atypical cutaneous-hypodermic necrosis while maintaining early surgical management in any severe necrotic presentation.

Keywords: Necrotizing dermohypodermitis; plant-based spray; essential oils; contact dermatitis; surgical debridement; skin graft; case report.

INTRODUCTION

Necrotizing soft-tissue infections include a spectrum of severe disorders involving the dermis, subcutaneous tissue, fascia and sometimes muscle. They are characterized by rapid progression, tissue necrosis and a high risk of morbidity and mortality. Clinical suspicion requires urgent management based on early medical and surgical assessment, deep microbiological sampling whenever feasible, appropriate antimicrobial therapy and surgical debridement when necrosis is established or strongly suspected [1,2].

Diagnosis may be difficult, especially in early or atypical presentations. Bacterial cellulitis, necrotizing fasciitis and some inflammatory, toxic or immunoallergic dermatoses may all present as an acute red swollen leg. Several non-infectious conditions can therefore mimic cellulitis or dermohypodermitis, leading to diagnostic error and inappropriate management [3].

Among these differential diagnoses, irritant or immunoallergic reactions to topical products are particularly relevant. Products based on plants, botanical extracts or essential oils are often perceived as harmless, but they may cause contact dermatitis, especially when applied to damaged skin or used outside the usual instructions for use [4,5]. We report a case of bacteriologically undocumented necrotizing dermohypodermitis of the left leg after application of a plant-based analgesic spray on post-traumatic abrasions.

CASE PRESENTATION

A 19-year-old male patient with no notable medical history sustained a motorcycle fall that caused

abrasions on the anterolateral aspect of the left leg. The initial lesions were superficial and located on the antero-external aspect of the left leg.

Figure 1: Abrasions on the anterolateral aspect of the left leg on the day of the accident

Following these cutaneous lesions, the patient applied a plant-based and/or essential oil-based analgesic spray directly onto the damaged skin, outside the usual conditions of use for this type of product. The commercial name of the product is not mentioned in this manuscript. Forty-eight hours after this application, the course was marked by diffuse soft-tissue edema, violaceous ecchymotic skin discoloration and areas of early necrosis.

Figure 2: Local evolution 48 hours after application of a plant-based analgesic spray on the abrasions, showing diffuse soft-tissue edema, violaceous ecchymotic skin discoloration and areas of early necrosis

The patient was admitted to the emergency department on the seventh day after the accident because of significant local worsening. Clinical examination found an acute red swollen left leg associated with an extensive necrotic plaque on the antero-external aspect of the leg. No clinically evident purulent discharge was observed. The patient was afebrile.

Figure 3A–B: Clinical appearance at emergency admission, seven days after the accident, showing extensive necrotizing dermohypodermitis of the left leg with necrotic plaques on the antero-external aspect and no clinically evident purulent discharge

Initial laboratory tests showed a major inflammatory syndrome, with leukocytosis of 22,000/mm³ and C-reactive protein of 340 mg/L. An additional immuno-infectious and etiological work-up was performed. HIV, viral hepatitis A, B and C, and syphilis serologies were negative.

Given the local necrotic appearance and the intensity of the inflammatory syndrome, surgical management was indicated. Treatment consisted of wide surgical debridement, removing necrotic tissues up to macroscopically healthy areas. Deep bacteriological samples from necrotic tissues were obtained during the procedure and were negative. According to the available data, no antibiotic treatment had preceded these samples.

Figure 4: Intraoperative appearance after wide surgical debridement, with excision of necrotic tissue up to macroscopically healthy areas

The postoperative course included paraffin gauze dressings, with dressing changes every three days, approximately twice weekly, under sedation. The patient was discharged home on postoperative day 10, with continuation of the same local wound care protocol, preventive anticoagulation with enoxaparin 4000 IU/day and analgesic treatment.

Local evolution was favorable, with progressive development of satisfactory granulation tissue over the cutaneous-hypodermic defect.

Figure 5: Clinical appearance before readmission for skin grafting, showing satisfactory granulation after surgical debridement and repeated local wound care

Split-thickness skin grafting was performed at week 6, using a graft harvested from the ipsilateral thigh.

Figure 6A–B: Intraoperative images of skin grafting performed at week 6 after preparation of a satisfactory granulation bed

The first postoperative graft dressing was performed on day 6 after grafting during hospitalization. The patient was discharged the following day with local wound care instructions. Dressings of the donor and recipient sites were changed every three days, initially with paraffin gauze dressings, with continuation of preventive anticoagulation and analgesic treatment.

On day 15 after grafting, the evolution was favorable at both the donor and recipient sites. Dressings of the thigh were discontinued, while dry dressings were continued on the leg.

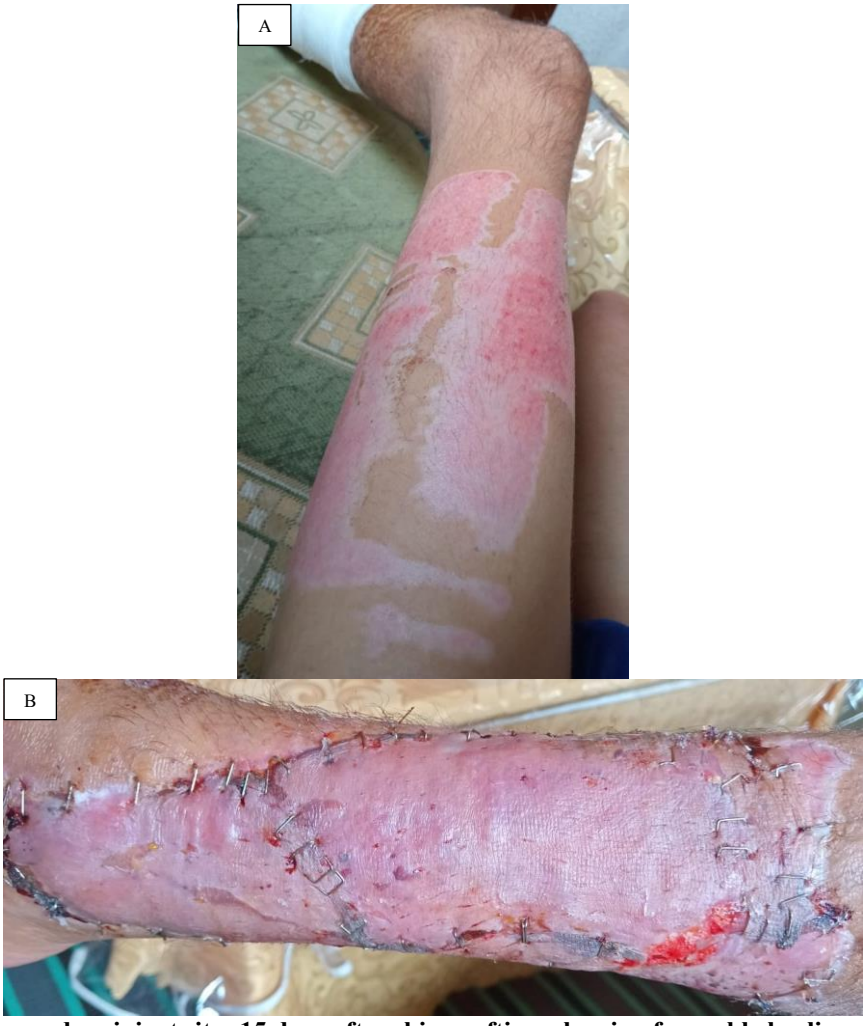

Figure 7A–B: Donor and recipient sites 15 days after skin grafting, showing favorable healing and good graft take

Staples were removed at the fifth week after skin grafting. A rehabilitation program was then started to recover joint range of motion and muscle strength. Protected touch-down weight-bearing with two crutches was allowed.

Figure 8: Recipient site 5 weeks after skin grafting, at the time of staple removal, showing good graft integration

At three months, the outcome was satisfactory, with complete resumption of weight-bearing. Residual amyotrophy of the left leg persisted, probably related to prolonged bed rest and immobilization, justifying continued muscle strengthening.

Figure 9: Recipient site 3 months after skin grafting, showing good graft adherence and favorable healing, with residual amyotrophy of the left leg requiring continued muscle strengthening

At 1-year follow-up, the result was very satisfactory, with good integration of the skin graft at the recipient site and no functional complaint reported by the patient. Residual dyschromia persisted at the donor site on the ipsilateral thigh.

Figure 10A–C: Clinical follow-up at 1 year showing a very good morphological and trophic result at the recipient site, with good integration of the skin graft. Residual dyschromia persisted at the donor site

Timeline

Time point	Clinical or therapeutic event
Day 0	Motorcycle fall with abrasions on the anterolateral aspect of the left leg
Immediate course	Application of a plant-based analgesic spray directly onto damaged skin
48 h after application	Diffuse soft-tissue edema, violaceous ecchymotic skin discoloration and early necrosis
Day 7	Emergency admission for acute red swollen leg with antero-external necrotic plaque, no pus, afebrile patient
Admission	WBC 22,000/mm³, CRP 340 mg/L; HIV, viral hepatitis A, B, C and syphilis serologies negative
Initial management	Wide surgical debridement to healthy tissue; negative deep bacteriological samples
Postoperative day 10	Home discharge with regular dressings, preventive anticoagulation and analgesic treatment
Week 6	Readmission for split-thickness skin grafting from the ipsilateral thigh
Day 6 post-graft	First graft dressing during hospitalization
Day 15 post-graft	Discontinuation of thigh dressings; dry dressings continued on the leg
Week 5 post-graft	Staple removal; start of rehabilitation with protected touch-down weight-bearing
Month 3	Complete resumption of weight-bearing; residual amyotrophy requiring strengthening
1 year	Very good recipient-site outcome, no functional complaint; residual donor-site dyschromia

DISCUSSION

This observation illustrates a severe form of cutaneous-hypodermic necrosis of the left leg occurring in a young patient with no notable medical history after application of a plant-based analgesic spray on post-traumatic abrasions. The initial presentation was concerning because of the extent of local necrosis and the marked biological inflammatory syndrome, requiring prompt surgical management.

In the presence of an acute red swollen leg associated with necrotic plaques, the primary diagnosis to consider is infectious necrotizing dermohypodermitis or a necrotizing soft-tissue infection. Guidelines emphasize the urgent nature of these conditions, in which delayed diagnosis or treatment may worsen outcomes. Cutaneous necrosis, marked inflammation and rapid extension justify early surgical management even in the absence of fever or pus [1,2].

In our observation, however, several elements made the infectious diagnosis less straightforward. The patient was afebrile, there was no purulent discharge, deep bacteriological samples from necrotic tissue were negative and no antibiotic treatment was documented before sampling. These elements do not formally exclude a bacteriologically undocumented necrotizing infection, but they support discussion of an associated or triggering non-infectious mechanism.

Topical exposure is the original feature of this case. Application of a plant-based and/or essential oil-based product directly onto damaged skin may have promoted increased penetration of irritant or sensitizing components in a context of impaired skin barrier. Essential oils and some botanical products can cause allergic or irritant contact dermatitis. Reactions to topical herbal remedies have been described particularly when such products are applied to wounds, ulcers or other pre-existing skin lesions [4,5].

The timing of lesion onset is also compatible with an irritant or immunoallergic mechanism. In our case, the development within 48 hours of diffuse edema, violaceous ecchymotic discoloration and early necrosis suggests an intense local reaction. Nevertheless, the seven-day interval between the accident and admission may also correspond to the evolution of secondary infection through a cutaneous portal of entry. The retained hypothesis must therefore remain cautious: bacteriologically undocumented necrotizing dermohypodermitis, possibly favored by an irritant or immunoallergic reaction after inappropriate application of a plant-based analgesic spray on damaged skin.

This case also recalls that cellulitis and dermohypodermitis can be overdiagnosed or confused with pseudocellulitis. A recent systematic review showed that diagnostic errors in presumed cellulitis are frequent, emphasizing the need for careful clinical analysis and diagnostic reassessment when clinical evolution or additional tests are not concordant [3]. In our observation, local severity nevertheless required immediate surgical management, because the major risk was missing a true necrotizing infection.

Management was essentially surgical and reconstructive. Wide debridement allowed removal of necrotic tissues and progressive development of a favorable granulation bed under repeated dressings. Split-thickness skin grafting at week 6 provided satisfactory coverage of the defect. Long-term follow-up showed a very good result at 1 year, with no functional complaint, good integration of the recipient site and residual dyschromia at the donor site. Muscle wasting observed at three months highlights the importance of early and prolonged rehabilitation after this type of management in order to restore muscle strength, weight-bearing and lower-limb function.

The main limitation of this observation is the absence of histological examination and allergological or patch testing. These examinations could have strengthened the hypothesis of an immunoallergic or irritant reaction. In their absence, a causal link with the spray cannot be formally established. It should be presented as a plausible pathophysiological hypothesis based on chronology, application of the product on damaged skin, negative deep samples and favorable evolution after surgical treatment and local wound care.

CONCLUSION

Necrotizing dermohypodermitis in a young patient after application of a plant-based analgesic spray on abrasions is a rare and potentially misleading situation. A necrotic plaque, major inflammatory syndrome and rapid worsening require early surgical management. However, negative deep bacteriological samples, absence of purulence, afebrile presentation and inappropriate application of a plant-based topical product on damaged skin should raise the possibility of an associated irritant or immunoallergic mechanism. This case underlines the importance of asking about locally applied products, especially plant-based remedies or sprays, and reminds clinicians that such products should not be used directly on damaged skin outside recommended conditions of use.

Declarations

Patient consent. Written informed consent from the patient for publication of this case report and anonymized clinical images should be obtained or confirmed before submission.

Conflicts of interest. The authors declare no conflict of interest related to this work.

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Reporting guideline. The manuscript structure follows the general principles of the CARE guidelines for case reports [6].

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