

Necrotizing Fasciitis of the Hand: Management with Literature Review

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Summary: This report presents a case of necrotizing fasciitis following a seemingly minor injury sustained from handling a spiny plant. Despite initial primary care by a physician, the patient presented with severe septic shock and necrotizing fasciitis of the hand, necessitating emergency surgical intervention. The use of scoring systems aided in the prompt recognition of the condition. Subsequent surgery was required due to infection progression, leading to significant soft tissue defects and functional impairment. The patient underwent multiple reconstructive procedures, including placement of dermis-replacement material and, ultimately, free flap reconstruction, to restore the hand function. This case report highlights the importance of rapid identification of potential cases of necrotizing fasciitis in cases of hand infections, demonstrates that scoring systems can assist in smaller affected body sites such as the hand, and illustrates the difficulties of defect reconstruction following necrotizing fasciitis. (*Plast Reconstr Surg Glob Open* 2024; 12:e5981; doi: 10.1097/GOX.0000000000005981; Published online 19 July 2024.)

Minor injuries caused by plant thorns or spines are not uncommon. In this report, we present a case where a seemingly innocuous injury led to a life-threatening situation due to necrotizing fasciitis. While the decision for surgical exploration remains a clinical one, scoring systems such as the Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC score; by Wong et al; 2004) and the Laboratory and Anamnestic Risk Indicator for Necrotizing Fasciitis (LARINF score; presented by our department; 2022) can help in the decision-making process (Table 1).^{1,2}

CASE PRESENTATION

The patient, a 45-year-old man with a history of a groove pancreatitis with a mass in the head of the pancreas,

cachexia, and chronic gastritis, sustained a minor injury to the first interdigital space of his right hand 4 days before presenting to our hospital. The injury occurred while he was attempting to extract a spiny plant, *Lactuca serriola*. The patient arrived at our hospital with a severe septic condition, with renal insufficiency and extensive swelling and inflammation in his right hand, accompanied by the presence of blisters and lymphangitis. The primary focus of the infection was identified in the thenar hand region (Fig. 1). The patient's critical laboratory values were as follows: leukocyte count 35.2/mm³, hemoglobin 14.8g/dL, sodium 139 mmol/L, creatinine 1.8mg/dL, glucose 123mg/dL, C-reactive protein 34.2mg/dL, and procalcitonin 6.5 ng/mL. The LRINEC score of eight and LARINF score of six both indicated a high risk for necrotizing fasciitis.

Emergency surgery was performed, revealing significant amounts of putrid fluid and partially necrotic or lytic fascias in the thenar hand, leading to a radical debridement, fasciotomy, and necrosectomy of the right hand and distal forearm. The patient was admitted to the intensive care unit postoperatively. He presented with a deteriorating condition, tachycardia, somnolence, and mild respiratory distress. Broad-spectrum antibiotics, piperacillin/tazobactam, and clindamycin were initiated. Histopathologic examination confirmed the diagnosis of necrotizing fasciitis, and microbial investigation

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Table 1. LRINEC and LARINF Scores

LRINEC Score by Wong et al			LARINF Score by Breidung et al		
Variable	Value	Score/ Risk Group	Variable	Value	Score/ Risk Group
C-reactive protein, mg/dL	<15	0	Hemoglobin, g/dL	>13.5	0
	≥15	4		11–13.5	1
Leukocyte count, per mm ²	<15	0	Procalcitonin, ng/mL	<1	2
	15–25	1		<1	0
	>25	2		≥1	3
Hemoglobin, g/dL	>13.5	0	C-reactive protein, mg/dL	<10	0
	11–13.5	1		≥10	1
Sodium, mmol/L	<11	2	Heart, liver or renal insufficiency	No	0
	≥135	0		Yes	2
Creatinine, mg/dL	<135	2	Immunosuppression	No	0
	≤1.6	0		Yes	2
Glucose, mg/dL	>1.6	2	Obesity	No	0
	≤180	0		Yes	1
Score and risk group	>180	1	Score and risk group	<5	Low risk
	<6	Low risk		≥5	Increased risk
	6–7	Moderate risk			
	≥8	High risk			

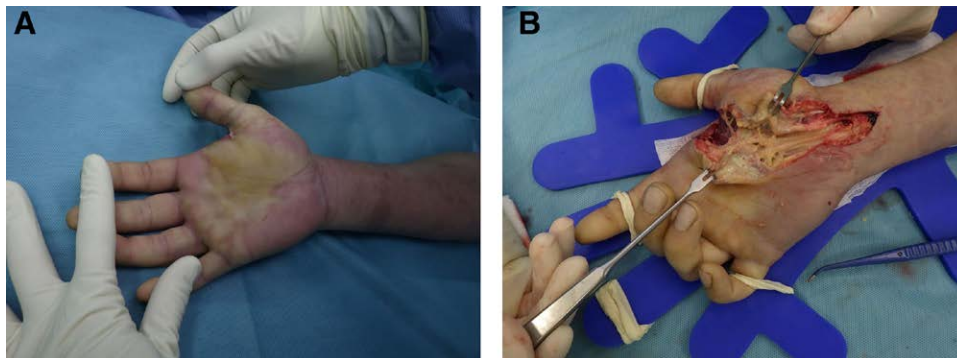


Fig. 1. Case of necrotizing fasciitis of the hand. A, Presentation before surgical incision after initiation of emergency surgery. B, After surgical exploration, a massive purulent fluid and partially necrotic muscle fascia were found.

of intraoperative samples identified the presence of *Streptococcus pyogenes* and *Staphylococcus aureus*, along with the detection of *Streptococcus pyogenes* bacteremia. A second operation, conducted two days later, revealed no signs of infection progression.

Subsequently, the patient’s respiratory status deteriorated, necessitating intubation and mechanical ventilation. Investigation revealed pneumonia, which led to an extension of antibiotic therapy with the addition of penicillin G. Four days after admission, a third-look operation was performed, during which additional necrotic tissue required debridement, resulting in a defect measuring 23 × 8 cm, necessitating the placement of a vacuum-assisted closure (VAC) system on the right hand and forearm. The patient’s respiratory status improved, and he was extubated on the sixth day. Due to the patient’s general condition, which was at this point still not optimal, we initially decided against a free flap reconstruction. On the eighth day after admission, the fourth surgical procedure involved the application of dermis-replacement material, NovoSorb biodegradable temporising matrix (BTM;

PolyNovo Biomaterials Pty Ltd, Port Melbourne, Victoria, Australia), followed by the reinstallation of a VAC system. Subsequently, the patient’s respiratory status stabilized, and he was transferred to the general ward.

After one more VAC change, followed by bedside VAC removal, the patient was discharged on the 21st day after admission. The patient was followed up, and one month after discharge, with adequately conditioned BTM, a split-thickness skin transplantation was performed. (See figure, Supplemental Digital Content 1, which shows the result after conditioning with dermis-replacement material and split-thickness skin grafting. <http://links.lww.com/PRSGO/D347>.) The patient continued to undergo regular follow-up examinations and, despite the physiotherapy performed, the patient’s thumb was in a stiff, flexed position in the hand. Approximately 4 months after the split-skin coverage, the split-skin and the dermis-replacement material were removed. Extensive tenolysis, arthrolysis, and subsequent free anterolateral thigh flap reconstruction were performed. (See figure, Supplemental Digital Content 2, which shows the final result after removal of the

Table 2. Cases of Necrotizing Fasciitis of the Hand Reported in the Literature and the Case Presented in This Article

Case Report	Age and Sex of Patient	Injury and Main Site of Infection	Time between Injury and Presentation in Hospital	Clinical Presentation	Diagnosis	Causative Microorganism(s)	Clinical Outcome Including Reconstructive Procedures
Dahman et al ³	45, male	Puncture wound to left ring finger, sustained while handling a fish	2 d	Painful, esoteric, purple ring finger with blisters and lymphangitis	Necrotizing fasciitis (histologically confirmed)	<i>Vibrio vulnificus</i>	Amputation of left ring finger and skin grafting
Johnson et al ⁴	65, female	No trauma, left index finger	—	Swelling of the hand, cold and bluish discolored index finger with epidermolysis of the dorsal skin	Necrotizing fasciitis	<i>Streptococcus pyogenes</i>	Amputation of left index finger and skin grafting
Bradley, et al ⁵	64, male	Endodontic therapy, left thumb	2 days	Left hand redness and swelling, bulla formation around the left thumb metacarpophalangeal joint	Necrotizing fasciitis	<i>Streptococcus pyogenes</i>	Reconstruction using an acellular xenograft dermal substitute
Martin, et al ⁶	74, male	Laceration during scaling of a fish, left index finger	1 d	Erythema extending to the distal forearm, decreased range of motion of the hand, diffusely decreased sensation and blisters	Necrotizing fasciitis	<i>Photobacterium damsela</i>	Transhumeral, amputation followed by forequarter amputation and ultimately death of the patient
Delavari et al (this article)	45, male	Minor injury caused by a plant in the area of the first interdigital space of the right hand	4 d	Extensive swelling and inflammation of the hand with blistering and lymphangitis	Necrotizing fasciitis (histologically confirmed)	<i>Streptococcus pyogenes</i> and <i>Staphylococcus aureus</i>	Reconstruction using a dermis-replacement material and skin graft followed by free flap reconstruction

dermis-replacement material and reconstruction with an anterolateral thigh flap. <http://links.lww.com/PRSGO/D348>.) The patient could be discharged from the hospital on the eighth day after the free flap surgery. At our 4-month postoperative follow-up, the patient's examination showed a 30-degree extension restriction in the MCP joint of the thumb, with full flexion (50 degrees) and an IP joint flexion of 70 degrees with a 20-degree extension deficit. Lateral pinch strength was 3 kg compared with 7 kg on the contralateral side, and grip strength was 18 kg versus 27 kg. The patient remained in physiotherapy for continued progress.

LITERATURE REVIEW

A total of four recent publications were included in the literature review (Table 2). In three of four cases, a form of minor trauma could be identified in the development of the condition; in two case reports, the trauma was regional in the area of the hand, and in the other case report, a prior oral procedure was performed, leading to a suspected hematogenous seeding of the bacteria. In contrast to the case report presented here, the infections were all monopathogen infections. In one case, the course of necrotizing fasciitis was fatal, and in two cases, finger amputations were necessary. For reconstruction, skin grafts were performed in two cases, and a dermal substitute in one case.

DISCUSSION

According to our case and the literature review, distinct clinical manifestations develop relatively quickly, between

2 and 4 days after the trauma event. Also, smaller sites of infection, such as the hand, can potentially be detected in cases of necrotizing fasciitis with the help of scoring systems,⁷ so that initial surgical intervention can be initiated immediately. The hand is a relatively rare site of manifestation for necrotizing fasciitis, which is also shown in a meta-analysis by Christopoulos et al⁸ with 48 case reports and three retrospective cohort studies as eligible articles. In cases with successful limb preservation, larger soft tissue defects often remain in the post infectious phase. BTM is already a proven dermal substitute, in particular for defect coverage after necrotizing fasciitis.^{9,10} However, further reconstructive cases are necessary to clarify the strengths and weaknesses in this specific area.

CONCLUSIONS

Necrotizing fasciitis is a rare but potentially life-threatening complication of minor injuries, such as plant thorn injuries. This case report underscores the challenges faced in managing such cases, particularly regarding the reconstruction in the post infection phase.

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DISCLOSURES

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