

Synergistic Necrotizing Cellulitis in the Hand of a Renal Dialysis Patient: A Case Report

Leo M. Rozmaryn, MD, Rockville, MD

Necrotizing cellulitis in the hand of a renal dialysis patient is reported. There are three types of aggressive dermal and subcutaneous infections that can be differentiated by rates of progression and by levels of tissue toxicity. Necrotizing fasciitis is rapidly progressive, synergistic necrotizing cellulitis (also known as anaerobic cellulitis) is moderately progressive, and Meleney's synergistic gangrene is slowly progressive.¹

The first two types are caused by a symbiosis between aerobic Gram-negative organisms and a facultative anaerobe. Together these two groups of microorganisms are more aggressive than if they were acting alone. These infections, which may be resistant to antibiotics and conventional debridement and drainage procedures, are found commonly in immunocompromised patients.

This was described by Brewer and Meleny in 1926,² and was comprehensively reviewed in 1971 by Stone and Martin.³ They stressed that diabetes, cardiovascular disease, chronic renal disease, alcoholism, and obesity all predispose to this condition. Frequently, cultures reveal mixed organisms, that is, *Klebsiella*, *Aerobacter*, *Proteus*, *Escherchia coli*, Group-D *Streptococcus*, and *Bacteroides*. In this setting the anaerobe is missed because of inadequate culture technique.

From the Orthopaedic Center, Rockville, MD.

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Reprint requests: Leo M. Rozmaryn, MD, The Orthopaedic Center, 9711 Medical Center Drive, Suite 210, Rockville, MD 20850.

Case Report

A 64-year-old diabetic man with chronic renal failure on hemodialysis was noted to have a chronic ulceration on the distal ulnar aspect of the left, non-dominant long finger, extending underneath the nailplate (Fig. 1). Over a month, it involved the nailplate and the germinal matrix. Digital Doppler studies showed filling of both digital arteries to the long finger, but the Allen's test showed sluggish arterial filling. Surgery was performed because of pain and progression of the infection.

The entire nailbed, germinal matrix, and distal phalanx were necrotic and were removed. The proximal metaphysis and articular surface were spared. An anterior flap of skin was developed over a drain. The following day the wound was opened and packed because of local pain, and by 48 hours the entire tip had become necrotic and malodorous. Thus, an amputation through the middle phalanx was necessary. The wound was left open and Gram's stain showed Gram-positive and Gram-negative cocci with few white blood cells. Antibiotic therapy with gentamycin and metronidazole was begun. Despite wound care and intravenous antibiotics, swelling, pain, and erythema persisted and spread to the proximal phalanx level. Cultures demonstrated *Klebsiella*, *Morganella*, and *Proteus vulgaris*. Attempts to show anaerobes were unsuccessful "due to swarming *Proteus*." Redebriement exposed the proximal phalanx and necrotic flexor digitorum profundus and flexor digitorum superficialis tendons, which were removed to the A1 pulley. At 72 hours the proximal phalanx was amputated at the midshaft, and skin flaps were closed with skin strips. The wound finally healed 3 months after presentation.



Figure 1. A renal dialysis patient with a digital ulcer of 1 month duration. It extends under the nailbed. Note that the nailplate is lifted off the nailbed.

Discussion

Necrotizing fasciitis can occur within hours of exposure from an area of patchy erythema and spread rapidly over 24 hours. Dusky purple areas develop with blistering and widespread edema and erythema. There is rapid development of necrosis and undermining of the subcutaneous tissue. Patients frequently become febrile and toxic. Histopathologic examination reveals focal abscess formation and arteriolar thrombosis. When this affects the male genitals, it is known as Fournier's gangrene.

Synergistic necrotizing cellulitis is more indolent and spreads over several days. The edges of the lesion are diffusely demarcated, but the pain can be intense. Lymphangitis and lymphadenopathy may be present. Patients are febrile but not toxic. Surgical exploration will rule out gas gangrene in deeper muscle layers. Organisms include *Clostridia*, anaerobic *Streptococcus*, and *Bacteroides*. Synergistic infection with aerobes such as *E. coli*, *Klebsiella*, *Proteus*, and *Pseudomonas* is usually present.

Meleny's synergistic gangrene presents as skin and subcutaneous ulceration with an erythematous periphery and may take weeks to develop. If unchecked, these ulcers can reach enormous size, with multiple fistulous tracks and necrotic undermining. Organisms include *Entamoeba histolytica*, *Microaerophilic streptococcus*, and *Staphylococcus aureus*.

Bacterial infections are common in patients with renal failure; this has been attributed to immunologic changes in uremia. Bertazzoni et al.⁴ compared the antibacterial activity to *Proteus* of fresh and heat-inactivated sera to sera from patients with chronic renal failure. They reported that patients on hemodialysis had diminished humeral immunity compared to the other groups. This was less than in uremic patients not on dialysis. These findings suggest that dialysis itself may further diminish the humeral substances, such as opsonins and C₃ and C₄ factors, necessary to fight infections. Cellular immunity may also be affected.

Despite the fact that no obvious anaerobic source could be found in this patient, clinically this patient demonstrated all the traits of necrotizing cellulitis. It was only after an adequate margin (1–2 cm) was achieved with the wound packed tightly for 72 hours that the patient began to produce "healthy" granulation tissue and the wound began to close. Schechter et al.⁵ reporting on 33 cases of necrotizing nerve transfer fasciitis, stressed the importance of early detection and aggressive debridement to prevent extreme morbidity and possible mortality.

References

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