

SEPSIS IN DERMATOLOGY: FROM SKIN BARRIER DYSFUNCTION TO LIFE-THREATENING INFECTION

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Abstract

Sepsis is a life-threatening medical emergency resulting from a dysregulated host response to infection and subsequent organ dysfunction. Its global burden remains substantial: the Global Burden of Disease 2021 analysis estimated approximately 166 million cases and 21.4 million sepsis-related deaths worldwide in 2021 [1]. Prevention and early recognition therefore remain major challenges across different fields of medicine. This review focuses on the role of dermatology in recognizing sepsis, dermatological conditions that may predispose to systemic infection, relevant cutaneous manifestations, and the importance of timely diagnosis.

The relationship between sepsis and dermatology is bidirectional: the skin may represent the primary source of infection leading to sepsis, while systemic infection may itself produce diagnostically and prognostically relevant cutaneous manifestations [2]. Dermatologists may recognize potentially severe skin and soft tissue infections (SSTIs) before progression to sepsis and may also identify cutaneous manifestations of evolving systemic infection. Early findings such as skin mottling and alterations in acral skin temperature may reflect impaired peripheral perfusion [2]. In patients with sepsis and septic shock, the extent of mottling can be quantified using the mottling score; greater extension reflects more severe peripheral hypoperfusion and is associated with poorer prognosis. The skin may additionally provide etiological clues in specific infections, including meningococcal purpura [2].

Disruption of the epidermal barrier provides another important link between dermatology and systemic infection. Extensive burns, chronic wounds and ulcerations, and inflammatory dermatoses associated with impaired barrier function facilitate microbial invasion. In atopic dermatitis, epidermal barrier defects, type 2 inflammation, cutaneous dysbiosis, and *Staphylococcus aureus* colonization contribute to increased susceptibility to both cutaneous and, less commonly, systemic infections [3]. Extensive burns are particularly important because loss of the skin's protective barrier, together with post-burn immune dysfunction, substantially increases susceptibility to invasive infection and sepsis [4].

Among SSTIs, necrotizing soft tissue infections (NSTIs), including necrotizing fasciitis, necrotizing cellulitis, and clostridial myonecrosis, represent a particularly important diagnostic challenge because of their rapid progression, extensive tissue destruction, and potential progression to sepsis and septic shock. Early recognition is primarily clinical and requires a high index of suspicion, particularly when severe pain disproportionate to cutaneous findings and rapidly progressive erythema or edema are present.

Early NSTI may closely resemble uncomplicated cellulitis or erysipelas. A systematic review of 1,463 patients found that initial misdiagnosis occurred in almost three-quarters of cases; the most frequent early manifestations were swelling (80.8%), pain (79.0%), and erythema (70.7%) [5]. Timely recognition is therefore critical. A 2025 study of 121 patients with necrotizing fasciitis reported mortality of 5.7% when diagnosis occurred within six hours, compared with 13.2% when diagnosis was delayed beyond

six hours [6]. Furthermore, a systematic review and meta-analysis involving 6,051 patients found mortality of 19% when surgical treatment was performed within six hours compared with 32% when surgery was delayed beyond six hours [7]. These findings emphasize the potential importance of early clinical recognition and immediate multidisciplinary, particularly surgical, assessment.

Conclusion

The relationship between dermatology and sepsis extends beyond the skin as a potential source of infection. Disruption of the cutaneous barrier may facilitate invasive infection, while skin findings may provide early visible evidence of systemic deterioration and valuable diagnostic or prognostic information. Early recognition of severe SSTIs, particularly NSTIs, and their differentiation from uncomplicated cellulitis or erysipelas may prevent critical diagnostic and therapeutic delays. Dermatologists may therefore play an important role in both identifying infections at risk of progression to sepsis and recognizing cutaneous manifestations of established systemic infection, facilitating prompt multidisciplinary intervention and potentially improving patient outcomes.

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