Dermatologic Manifestations of Infection in the Compromised Host

JOHN S. WOLFSON and ARTHUR J. SOBER

1. Introduction

Among the most formidable challenges to the clinician is the care of the patient with an impaired immune system—the compromised host.\(^1\)\(^–\)\(^4\) Two characteristics in particular contribute to the complexity of management of infection in these patients: the exceptionally broad variety of potential microbial pathogens, and the wide spectrum of clinical manifestations of disease resulting from the abnormal immune response.\(^5\)\(^–\)\(^7\)

In the compromised patient, cutaneous and subcutaneous tissues may be expected to be an important aspect of infection, for three reasons.\(^8\)\(^–\)\(^13\) First, the skin together with the mucosal surfaces represents the first line of defense of the body against the external environment. These barriers assume an even greater importance when secondary defenses, such as phagocytosis, cell-mediated immunity, and antibody production, are impaired. Second, the rich blood supply of the skin provides a route of spread of infection both from the skin to other bodily locations and also to the skin from other infected sites\(^14\) (Fig. 1). In the latter case, a skin lesion may serve as an early warning system to alert the patient and the clinician to the existence of a systemic infection.\(^14\) Importantly, these lesions may be benign in appearance, presumably because of the impaired host-immune response, and therefore be easily missed or dismissed as not significant. And third, skin infections are common, occurring in up to one-third of significantly compromised hosts.\(^9\)\(^–\)\(^17\)

It is the purpose of this chapter to give an overview of infection of the cutaneous and subcutaneous tissues in compromised hosts. Topics of discussion are the skin as a barrier to infection, a four part classification of skin infection in compromised patients,\(^12\)\(^,\)\(^13\) dermatologic lesions associated with the acquired immunodeficiency syndrome (AIDS), and diagnostic considerations. Three illustrative cases are presented.

2. Skin as a Barrier to Infection

The skin is usually quite resistant to infection. The mechanisms by which this resistance occurs are not well understood. Three important components contributing to microbial resistance are nonspecific: (1) intact keratinized layers of the skin, which prevent penetration of microorganisms; (2) dryness of the skin, which retards the growth of certain organisms such as the aerobic gram-negative bacilli and \textit{Candida} sp., and (3) the suppressant effect of the normal skin flora, which appears to reduce colonization of pathogens, a phenomenon known as bacterial interference.\(^18\) Within this framework, then, one might expect potentially serious skin infection to develop under the following three circumstances: (1) destruction by trauma or bypass by introduction of intravascular catheters of the previously intact ker-


EXTERNAL ENVIRONMENT

- BACTERIA
- ATYPICAL MYCOBACTERIA
- FUNGI
  - ASPERGILLUS
  - CANDIDA
  - PAECILOMYCETES
  - PHYCOMYCES
- ALGA
  - PROTOTHECA

INTERNAL ENVIRONMENT

- NOCARDIA
- FUNGI
  - ASPERGILLUS
  - CANDIDA
  - PHYCOMYCES
  - CRYPTOCOCCUS
- VIRUSES

**FIGURE 1.** Schematic representation of the role of the skin in the occurrence of localized and disseminated infection in the compromised patient. (From Wolfson et al. 12)

atiniized layer of skin; (2) moistening of the skin, such as under occlusive dressings; and (3) alteration of the normal colonizing flora, such as after administration of antimicrobial agents. These types of events would represent risk to the normal patient but are considerably more threatening to the compromised patient with impaired immunologic defenses that are likely to be more readily overwhelmed when the primary cutaneous barrier breaks down.

An example of these phenomena is the development of invasive fungal infection in compromised patients whose skin has been traumatized by tape holding intravascular lines in place.19–27 Infection with *Rhizopus* sp. has been associated with use of Elastoplast tape to secure intravascular catheters.21–24 Skin infection with *Rhizopus* and *Aspergillus* sp. has occurred with the use of adhesive tape and boards to stabilize arms to protect intravenous lines. Because of the occurrence of these types of infections, the following approach would seem warranted. Occlusive dressings in immunocompromised patients should be avoided when possible and skin covered by such dressings should be routinely inspected. Paper tape should be used in preference to cloth tape, and surgical dressings might be secured with girdles of elasticized netting rather than tape whenever possible.11

The effect of chronic administration of corticosteroids on the skin is another factor that may contribute to increased susceptibility to infection of compromised patients.28 Steroid therapy appears to inhibit proliferation of fibroblasts, synthesis of mucopolysaccharides, and deposition of collagen. The net effect is thin and atrophic skin that heals poorly.9,28 Minor trauma generates lesions that tend to persist, providing potential portals of entry for pathogens. An example of this phenomenon that has been observed is recurrent staphylococcal cellulitis.