Clinical Images

Presentations of Cutaneous Disease in Various Skin Pigmentations: Cutaneous Abscesses

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Abstract

Description
Cutaneous abscesses are collections of pus resulting from skin and soft tissue bacterial infections. They clinically exhibit the four cardinal inflammatory signs of pain, warmth, swelling, and erythema. In patients with darkly pigmented skin, classically-associated erythema may be challenging to appreciate and can lead to missed or delayed diagnosis. We compare abscess presentations in different skin types. Recognition of varying presentations of cutaneous abscesses in diverse skin colors will help clinicians utilize additional clues to identify and diagnose this entity correctly.

Keywords
dermatology; skin pigmentation; skin of color; abscess/diagnosis; cutaneous abscess; bacterial infections; cellulitis/diagnosis; furunculosis; carbuncle; erythema; Fitzpatrick skin types

Introduction
Cellulitis refers to a bacterial infection of the skin and soft tissue.1 A break or defect in the skin barrier allows for the entry of pathogenic bacteria, which release toxins believed to trigger the inflammatory cascade.1 Cutaneous abscess is a form of cellulitis that results from a pathogenic bacterial infection of the dermal or subcutaneous tissue leading to collections of pus.1 In purulent cellulitis, cultures primarily show Staphylococcus aureus growth, with methicillin-resistant strains in 59% of patients and methicillin-sensitive strains in 17%.1

Ambulatory visits for cellulitis and abscess more than doubled in the United States (US) from 4.6 million in 1997 to 9.6 million in 2005.1 Emergency department visits in the US for cellulitis cost almost $500 million in 2016, with many of these encounters ultimately resulting in hospital admission.2 Hospitalizations in the US for cellulitis and abscess have increased

Figure 1. The Fitzpatrick scale provides a classification system for an individual’s skin type based on the ability to burn and/or tan when exposed to ultraviolet light. It is used to approximate the degree of skin pigmentation.

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In patients with darkly pigmented skin, classical-ly-associated erythema may be challenging to appreciate and can lead to missed or delayed diagnosis. Thus, accurately diagnosing cellulitis and abscesses is vital to preventing costly medical treatments and the development of more severe morbidities equitably across all populations.

Conceived in 1975, the Fitzpatrick scale clas-sifies skin types into six groups based on an individual’s ability to burn and/or tan in re-sponse to ultraviolet radiation. It serves as a surrogate for describing various skin pigmen-tations. Figure 1 provides a visual representa-tion of Fitzpatrick skin types I through VI. This scale will describe the various pigm-inations of skin tone in the patients presented. Addition-al background information on the Fitzpatrick scale and a description of the classification of skin types are discussed in further detail in the article “Presentations of Cutaneous Disease in Various Skin Pigmentations: An Introduction”.

Clinical Images
In lighter skin types, the erythema of cuta-neous abscesses is readily apparent. Figure 2 demonstrates a cutaneous abscess involving the right posteromedial proximal thigh of a middle-aged male with Fitzpatrick type II (mostly burns, rarely tans) skin. There is

Figure 2. Fitzpatrick type II (mostly burns, rarely tans) skin on a middle-aged male’s right pos-teromedial proximal thigh demonstrating a violaceous nodule with central desquamation on a background of a brightly erythematous, edematous, and indurated plaque with poorly defined borders.

Figure 3. Fitzpatrick type III (sometimes burns, often tans) skin on a young adult male’s left pos-terior mid-lower leg demonstrating a violaceous nodule with surrounding erythema. The nodule has overlying desquamation. The erythema has poorly defined borders and is less bright than the Fitzpatrick type II (mostly burns, rarely tans) patient in Figure 2.
an edematous and indurated subcutaneous nodule with overlying erythema. The color of the erythema is violaceous at the center of the nodule and changes from pink to red toward the periphery. There is a focus of desquamation within the violaceous hue of the nodule. The borders are poorly defined but well contrasted against the uninvolved skin surrounding the abscess.

In patients with skin of color, erythema is less pronounced from the darker-toned background. Figure 3 illustrates a cutaneous abscess on the left posterior mid-lower leg of a young adult male with Fitzpatrick type III (sometimes burns, often tans) skin. An edematous and indurated nodule is present with overlying erythema, which is violaceous at the center and faintly pink towards the periphery. There is appreciable desquamation of the overlying skin. The border of the erythema again is poorly defined, the pink hue is less bright, and its contrast with the surrounding skin is less apparent.

Figure 4 illustrates the appearance of a cutaneous abscess on the right posterior proximal thigh of a male child with Fitzpatrick type IV (rarely burns, mostly tans) skin. There is a tender subcutaneous nodule with overlying violaceous erythema. The hue of the erythema is darker than that of the previously presented patients. Additionally, the edges of the erythema are poorly defined and difficult to distinguish compared to the surrounding skin.

Figure 5 shows a cutaneous abscess in the right axilla of a young adult female with Fitzpatrick type V (almost never burns, always tans) skin. An edematous, subcutaneous nodule is present with very faint overlying erythema. On initial assessment, it isn’t easy to appreciate how far the erythema extends beyond the borders of the nodule. Against a naturally darker skin pigmentation background, the erythema is faintly pink and difficult to distinguish visually. Significant edematous skin swelling is more readily appreciated when viewed from a lateral angle rather than perpendicularly. Similarly, Figure 6 illustrates the right axilla of an adult male with Fitzpatrick type V (almost never burns, always tans) skin. Several erythematous subcutaneous nodules are present. The erythematous border is nearly indistinguishable from the surrounding normal, unaffected skin. The nodules were incised and drained to reveal several abscesses, collectively referred to as a carbuncle. Cultures from the resulting abscesses grew methicillin-sensitive Staphylococcal aureus, confirming the diagnosis.
A commonly encountered differential diagnosis for a cutaneous abscess is an inflamed epidermal inclusion cyst, illustrated on the mid-central back of an older-aged male with Fitzpatrick type II (mostly burns, rarely tans) skin in Figure 7. The skin has bright pink erythema overlying an edematous and indurated subcutaneous nodule. Several pustules are visible within the erythema. There is a focus of hemorrhagic crust within this nodule. Compared to a cutaneous abscess, where the borders of the erythema are poorly defined, inflamed epidermal inclusion cysts have clearer demarcation, as shown in this image. Figure 8 demonstrates another inflamed epidermal inclusion cyst in the mid-upper back of a middle-aged patient with Fitzpatrick type V (almost never burns, always tans) skin. Puncta are visible within the subcu-
Discussion

Cutaneous abscesses present with the four cardinal signs of inflammation: pain (dolor), heat (calor), erythema (rubor), and swelling (tumor). Classically, erythema of abscesses is poorly demarcated but distinct from unaffected skin. This may be difficult to visualize in patients with darker skin types, and clinicians must recognize the differences in the clinical presentation of erythema in individuals of varying skin colors to prevent delays in diagnosis. Due to the skin composition of darker skin-toned individuals, shades of erythema are present—reactive erythema in inflammation results from hyperemia. Hemoglobin is the primary chromophore in red blood cells, absorbing green-yellow wavelengths and reflecting visible red light. In darkly pigmented skin, the red hue of oxyhemoglobin may present as violaceous, brown, or even black, which decreases the contrast of erythema from the surrounding unaffected skin. This creates different appearances of the same disease in different skin types; a difference that has been demonstrated in various conditions. Erythema scores have been unreliable when evaluating darker pigmented patients with atopic dermatitis. A recent case
report illustrates the difficulty of appreciating erythema in darkly pigmented patients when assessing allergic response via patch testing. An important finding that helps distinguish cutaneous abscess from other entities is the skin’s temperature—increased blood flow resulting in a noticeable increase in inflamed skin temperature. Additionally, ultrasonography has high sensitivity and specificity for diagnosing abscesses and may assist in confirmation, regardless of skin type.

Physicians and educators should recognize that the erythematous response associated with inflammation in skin abscesses and other dermatologic conditions may present differently across different skin tones. Increasing recognition of differences in the appearance of the same disease in patients with varying skin pigmentation will improve physician competency in diagnosing inflammatory conditions in these populations. Preventing errors in diagnosis and delays in treatment in patients with darker pigmentation will contribute to a more equitable approach to medicine.

Informed Consent
Written informed consent was obtained from the patients for their anonymized information to be published in this article.

Conflicts of Interest
The authors declare they have no conflicts of interest.

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References
1. Raff AB, Kroshinsky D. Cellulitis: a review. JAMA, 2016;316(3):325-337. doi:10.1001/jama.2016.8825
2. Ren Z, Silverberg JI. Burden, risk factors, and infectious complications of cellulitis and erysipelas in US adults and children in the emergency department setting. *J Am Acad Dermatol.* 2021;84(5):1496-1503. doi:10.1016/j.jaad.2020.11.021

3. Fitzpatrick TB. The validity and practicality of sun-reactive skin types I through VI. *Arch Dermatol.* 1988;124(6):869-871. doi:10.1001/archderm.1988.01670060015008

4. Scheufele CJ, Weis D, Weis SE. Presentations of cutaneous disease in various skin pigmentation: an introduction. *HCA Healthcare Journal of Medicine.* 2022;3(3):135-138. doi:10.36518/2689-0216.1483

5. Del Bino S, Duval C, Bernerd F. Clinical and biological characterization of skin pigmentation diversity and its consequences on UV impact. *Int J Mol Sci.* 2018;19(9):2668. Published 2018 Sep 8. doi:10.3390/ijms19092668

6. Ben-Gashir MA, Hay RJ. Reliance on erythema scores may mask severe atopic dermatitis in black children compared with their white counterparts. *Br J Dermatol.* 2002;147(5):920-925. doi:10.1046/j.1365-2133.2002.04965.x

7. Tamazian S, Oboite M, Treat JR. Patch testing in skin of color: a brief report. *Pediatr Dermatol.* 2021;38(4):952-953. doi:10.1111/pde.14578

8. Waterman NG, Goldberg L, Appel T. Tissue temperatures in localized pyogenic infections. *Am J Surg.* 1969;118(1):31-35. doi:10.1016/0002-9610(69)90090-7

9. Wilson BN, Sun M, Ashbaugh AG, et al. Assessment of skin of color and diversity and inclusion content of dermatologic published literature: an analysis and call to action. *Int J Womens Dermatol.* 2021;7(4):391-397. doi: 10.1016/j.ijwd.2021.04.001