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Clinical Review

TOP 10 MYTHS REGARDING THE DIAGNOSIS AND TREATMENT OF CELLULITIS

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□ Abstract—Background: Cellulitis is commonly treated in the emergency department (ED). Patients who present with cellulitis incur significant health care costs and may be overtreated with antibiotics. The accurate diagnosis and treatment of cellulitis plays an important role in cost-effective, high-quality medical care, as well as appropriate antibiotic utilization. **Objective:** We aim to describe common fallacies regarding cellulitis. We present 10 myths that result in misdiagnosis, overtreatment, or inappropriate empiric management of cellulitis. **Clinical presentation,** including swelling and redness, is explored in depth, along with incidence of community-acquired methicillin-resistance *Staphylococcus aureus*, management of tick bites, and effective antibiotic therapy for cellulitis. **Discussion:** Patients are often treated for cellulitis unnecessarily or inappropriately. Awareness of these myths will help guide providers in clinical decision making in order to effectively tailor treatment for these infections. **Conclusions:** Cellulitis is not as simple as it might seem, and is commonly misdiagnosed in the ED. Noninfectious causes of local symptoms, including lymphedema, venous stasis, and deep vein thrombosis need to be considered. Cellulitis should be treated with empiric antimicrobial therapy based on patient risk factors and regional susceptibility patterns. This review will assist providers in managing cellulitis and avoiding treatment errors that lead to high costs, unwanted side effects for patients, and overuse of antibiotics. © 2017 Elsevier Inc. All rights reserved.

□ Keywords—cellulitis; acute bacterial skin and skin structure infections; CA-MRSA; stewardship; antimicrobial; treatment; diagnosis

INTRODUCTION

Acute bacterial skin and skin structure infections (ABSSSI) were the cause of more than 4 million emergency department (ED) visits in 2010, and are associated with a \$1.4–\$13.8 billion burden to society annually in the United States (1–4). According to the Healthcare Cost and Utilization Project National Inpatient Sample data, ABSSSI-related hospital admissions accounted for 1.8% of total admissions from 2005 through 2011 (5). Dramatically increasing rates of hospitalizations for these infections have resulted in a critical need to design best-practice models that minimize complications, costs, and inappropriate antibiotic use, while optimizing outpatient management of ABSSSI (1). Differential diagnoses for skin conditions include infection, acute gout, deep vein thrombophlebitis, and neoplastic disorders, making the clinical decision pathway difficult for providers (2,6). A recent study found that 30.5% of patients are misdiagnosed with cellulitis in the ED. Of those misdiagnosed, 84.6% had an unnecessary hospital

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admission and 92.3% received unnecessary antibiotics (7). A separate study discovered 15.5% of patients that present to the ED for an ABSSSI (surface area of infection at least 75 cm²) are discharged with two or more antibiotics, demonstrating there is room for improvement in the management of cellulitis (1,4).

METHODS

The authors are experienced clinicians and pharmacists in emergency medicine or infectious diseases and antimicrobial stewardship. The 10 myths and lessons outlined here were chosen by consensus to address the common misperceptions associated with the diagnosis and treatment of cellulitis. They were derived from personal observations and historical teachings that are propagated annually to trainees at their practice site. A literature search was conducted via PubMed using key words including but not limited to: cellulitis, bilateral cellulitis, cellulitis mimics, ["cellulitis" and "methicillin-resistant staphylococcus aureus"], ["cellulitis" and "antibiotic"], ["cellulitis" and "clindamycin"], and skin and soft tissue infections. Bibliographies and author libraries were also reviewed to identify additional pertinent literature as they pertained to the individual myths. Studies were chosen to address each myth in the form of a lesson intended to aid the ED provider with cellulitis diagnosis, management, and antimicrobial stewardship principles.

Myth 1: Skin that is red and swollen is definitely cellulitis.

Lesson 1: Local presentation of edema, erythema, warmth, hyperemia, tenderness, "orange peel" appearance, vesicles, bullae, petechiae, and pain may lead to a diagnosis of ABSSSI (6,8–10).

1. Diagnoses of deep venous thrombosis (DVT), venous stasis dermatitis, venous insufficiency, lymphedema, contact dermatitis, gout, herpes zoster, acute lipodermatosclerosis, noninfectious phlebitis, insect bite hypersensitivity, Sweet's syndrome, and fixed drug reaction should also be considered (6,11).
2. Fever and leukocytosis may be present, but are not required, for the diagnosis of cellulitis. These may also be caused by noninfectious inflammatory conditions (7,12).
3. A simple physical examination skill that can help differentiate true cellulitis from other etiologies of erythema of the lower extremity is the passive leg raise. During this examination, the patient lies horizontally on the examination table/bed and the leg is manually elevated to a 45-degree angle or higher. The leg is held aloft for 1 to 2 minutes while observing whether the erythema abates. Cellulitis

erythema will persist upon elevation, whereas erythema due to other etiologies, such as stasis dermatitis and lymphedema without superimposed cellulitis, usually disappears with elevation (11,13).

Myth 2: My patient has bilateral lower-extremity swelling and redness; my patient has bilateral cellulitis.

Lesson 2: Bilateral lower-extremity cellulitis is exceedingly rare. If bilateral swelling is present, noninfectious etiologies should be considered first, including but not limited to chronic stasis dermatitis, DVT, heart failure, venous stasis, and lymphedema (14–17).

1. Lower-extremity cellulitis is generally caused by direct inoculum to an affected limb through a breach in the skin. Bilateral cellulitis via this mechanism would require bacterial dispersion from one limb to the other. Simultaneous, independent inoculum of both legs is required for an acute bilateral cellulitis.
2. Treatment for noninfectious leg swelling should be considered before treatment of bilateral cellulitis and should generally consist of lower-extremity elevation. If the affected area improves rapidly via drainage of the edema, this may confirm the noninfectious etiology. Patients or providers can consider applying compression garments to assist with edema reduction (18).

Myth 3: All skin and soft-tissue infections need antibiotic treatment.

Lesson 3: Some skin and soft-tissue infections do not require antibiotic treatment.

1. For simple abscesses and boils (≤ 5 cm in diameter of erythema), incision and drainage alone is likely adequate as sole treatment without the need for antibiotics (6,8,19).
2. Treatment with antibiotic therapy should be considered for patients with abscesses and large erythema (combined diameter > 5 cm), multiple lesions, signs of systemic infection, rapid progression of cellulitis, areas that are difficult to drain (e.g., face, hand, and genitalia), or risk factors for reduced ability to heal (e.g., diabetes, immunosuppression) (8,19).

Myth 4: With the increased prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) in the community, all clinically stable, community-dwelling patients presenting to the ED with cellulitis should be treated with an antibiotic that has activity against MRSA.

Lesson 4: The antibiotic spectrum decision should be based on several factors, including presence or absence of purulence, severity of illness, patient-specific risk factors for MRSA, and local bacteria ecology.

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