Skin and Soft Tissue Infections: Causes and Treatments

Clint Kalan, MMSc, PA-C*, Jon Femling, MD, PhD

KEYWORDS

• Abscess • Cellulitis • Necrotizing skin and soft tissue infection
• Incision and drainage • Loop drainage • Staphylococcus • Streptococcus • MRSA

KEY POINTS

- Skin and soft tissue infections are most commonly caused by *Streptococcus* spp and *Staphylococcus aureus*, with an increasing prevalence of MRSA.
- Cellulitis is best treated with antibiotic coverage for *Streptococcus* species.
- Abscess and other purulent infections have a predominance of MRSA, and are best treated with incision and drainage.
- Necrotizing soft tissue infections carry a high mortality and warrant emergent surgical consultation and broad-spectrum antibiotics.

INTRODUCTION

Skin and soft tissue infections (SSTIs) are a frequent cause of visits to the emergency department, with diseases of the skin and subcutaneous tissues accounting for 3.9% of all emergency department visits nationwide.[1] Physician assistants in emergency medicine are seeing an increase in disease prevalence and a changing pattern of disease in the last decade.[2–5] The breadth and scope of infections that confront an emergency medicine provider are large. Providers must be prepared to deal with spontaneous infections, intravenous (IV) drug use–associated infections, infected traumatic wounds, diabetic ulcers, surgical site infections, parasites, fungal infections, and animal bites. Although the diversity of infections is large, most cases seen by a physician assistant in the emergency department are bacterial in nature.[6–8] Bacterial skin infections are purulent or nonpurulent, and further differentiated by severity.[9]

Disclosure Statement: C. Kalan has no relevant financial disclosures. J. Femling has been funded by the Emergency Medicine Foundation to study Skin and soft tissue infections, has enrolled subjects in a clinical trial (but not personally received funds from) for Cubist Pharmaceuticals, and intends to enroll subjects in a clinical trial (but has not personally received funds from) for Cempra Pharmaceuticals.

Department of Emergency Medicine, University of New Mexico School of Medicine, #1 University of New Mexico, MSC 11 6025, Albuquerque, NM 87131, USA
* Corresponding author.
E-mail address: Cpkalan@salud.unm.edu

Physician Assist Clin 2 (2017) 421–433
http://dx.doi.org/10.1016/j.cpha.2017.02.006 physicianassistant.theclinics.com

Necrotizing infections, an important subset of acute bacterial skin infections, have exceedingly high morbidity and mortality and require prompt evaluation and treatment.[10] This article describes the microbiology, clinical findings, diagnosis, and treatment of acute bacterial SSTIs focusing on emergency department diagnosis, management, and disposition.

MICROBIOLOGY

Streptococcus species and *Staphylococcus aureus* are the primary organisms of concern in most acute bacterial SSTIs. Importantly, the incidence of SSTIs presenting for emergency care has risen dramatically[3,8,11–15] with a concomitant increase in the prevalence of community-acquired methicillin-resistant *S aureus* (CA-MRSA).[4,5,7,16,17] The dramatic increase in CA-MRSA has impacted the presentation of SSTIs with a greater proportion of infections presenting with a purulent abscess rather than pure cellulitis. Traditional risk factors for MRSA infection, such as recent hospital admission, antibiotic use, IV drug abuse, diabetes, and age,[18] have become less reliable as the incidence of purulent SSTIs in young, healthy populations has increased (generally thought to be CA-MRSA infections).[19] In general, MRSA should be considered in all patients with a purulent infection.

Although most nonpurulent SSTIs have historically been thought to be caused by streptococcal species,[20–22] a recent study using advanced microbial identification techniques questions this assertion and implicates *S aureus* in many of these infections.[23] Current clinical trials focused on identifying optimal treatment strategies for pure cellulitis in the setting of recent microbial changes are needed.

In contrast to cellulitis, the predominant cause of purulent infections is easier to identify and is most commonly *S aureus* with CA-MRSA representing a crucial cause that must be addressed in SSTIs presenting to the emergency department.[4,5,8,16,19,24–26] Importantly, methicillin resistance is reported in around 50% or more of most *S aureus* isolates[7,27] and is a crucial consideration when choosing antimicrobial therapies. Necrotizing infections are often polymicrobial, although single infections with group A β-hemolytic streptococci and clostridial species are important etiologies to consider. Consistent with the other acute SSTIs described in this article *S aureus* has shown an increased contribution to these infections.[28,29]

CELLULITIS AND ERYSIPELAS (NONPURULENT SKIN AND SOFT TISSUE INFECTIONS)

Clinical Presentation

Cellulitis has classically been defined as an infection of the deeper dermis and subcutaneous tissues, whereas erysipelas has been considered a well-demarcated infection of the upper dermis. Current guidelines do not differentiate the treatment of these entities,[9] therefore they are discussed together under the term of cellulitis.

Cellulitis is generally a painful, erythematous, warm and edematous area of skin, without any signs of purulent drainage, furunculous, carbunculosis, or fluctuance. A "peau de orange" appearance can occur with edema surrounding the follicles (**Fig. 1**). Sometimes streaking lymphangitis can occur. Risk factors for cellulitis are listed in **Box 1**.[30]

Diagnosis

Although the diagnosis of cellulitis is a clinical one, careful attention must be paid to excluding the possibility of a purulent infection requiring incision and drainage. Clinical examination is not sensitive enough to detect small areas of purulence or some deeper abscesses in certain patients.[31–34] Bedside point-of-care ultrasound should be used