Skin and Soft Tissue Infections

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KEYWORDS

• Skin and soft tissue infections • *Staphylococcus* • Abscess • *Streptococcus*
• Cellulitis • Polymicrobial cutaneous infection
• Acute bacterial skin and skin structure infection • Necrotizing skin infections

KEY POINTS

- Skin and soft tissue infections (SSTIs) are increasing in frequency, with drug-resistant organisms contributing to increased hospitalizations and health care utilization.
- Community-acquired and hospital-acquired methicillin-resistant *Staphylococcus aureus* (MRSA) is the major pathogen contributing to this increase and risk stratification for MRSA must be used to maximize treatment efficacy.
- *Staphylococcus* and *Streptococcus* species are predominant organisms of SSTIs, but anatomic location of infections and patient comorbid conditions may promote infection with less common organisms and require alteration of empirical therapy.
- Careful evaluation of patient clinical condition and situational epidemiology must be quickly and accurately performed to identify those in need of hospitalization, immediate intravenous antibiotics, and further workup or surgical intervention.
- Numerous antibiotics are available for use against SSTIs, and knowledge of their activity spectra, side effects, local resistance patterns against suspected pathogens, and administration cost must factor into the choice to provide the most efficacious therapy while minimizing side effects and unnecessary costs.

INTRODUCTION

When Alexander Fleming first concentrated the active substance he named penicillin in 1928, the world was a different place: soldiers in generations of wars were lost due to simple wounds that became infected and no treatment could provide relief. Children became deaf from ear infections, thousands had tragic complications from simple streptococcal throat infections, and women would die from childbirth due to infection. The 1945 Nobel Prize given to Chain, Fleming, and Florey for mass production of penicillin seemed like the promise of a new world in which simple bacterial infections could no longer threaten the populace. That dream lasted less than 100 years. Antibiotics

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were used, overused, and organisms became resistant. Still, innovation is not just for the microbe because the clinician continues to look toward antibiotics as the salvation from common infections in this young century.

Skin and soft tissue infections (SSTIs) cover a multitude of clinical presentations, ranging from mild, which require minimal intervention, to severe life-threatening infections, which demand immediate intravenous (IV) antibiotic administration and surgical intervention. Evaluation of infection severity and identification of the most likely causative organism promotes improved outcomes and decreases development of resistance in the microorganisms. New pharmacologic agents have increased options for treatment of these infections but must be used prudently to enhance long-term drug sensitivity and minimize health care costs.

Infections of the skin and soft tissue occur commonly and have been increasing rapidly over the last 30 years when methicillin-resistant *Staphylococcus aureus* (MRSA) began to emerge as a causative agent in hospital-acquired infections.[1,2] Before the 1990s, most MRSA was nosocomial[1] (termed health care-associated MRSA [HA-MRSA]) but resistance rates have continued to climb and community-acquired MRSA (CA-MRSA) has emerged as a widespread contributor to a 3-fold increase in emergency department visits[3,4] and hospitalizations.[5] Likewise, some isolates of enteric gram-negative bacteria have become more resistant and the increase of diabetes mellitus has placed a larger population at risk for these infections.[6] With initial treatment failure rates of SSTIs estimated to be between 15% and 30%, knowledge of local resistance patterns and stratification of risk for resistant strains becomes paramount to decrease both the indirect and direct costs to the medical system and society.[1,6]

To maximize efficacy of clinical empirical therapy, this article outlines evaluation and treatment of purulent infections, nonpurulent infections, polymicrobial and surgical infections, and the commonly used drugs recommended for these cases.

PURULENT SKIN INFECTIONS

The most common agent in purulent skin infections is *Staphylococcus aureus*.[6] Since the early 1990s, the emergence of MRSA has risen dramatically, with an increase of 50% since 2008.[4] Current rates of MRSA are approximately 30% to 50% of all staphylococcal isolates,[6,7] although true numbers are unclear because outpatient infections are not as frequently cultured and thus full-resistance patterns remain partially unknown.[1] Resistant strains of *Staphylococcus aureus* are frequently encountered in primary care situations and the clinician must have a high suspicion for MRSA to empirically cover in the high-risk patient, then deescalate therapy as cultures become available.[6]

Genetically, *Staphylococcus aureus* from nosocomial infections is distinctly different from CA-MRSA, and HA-MRSA strains are more often implicated in pneumonia or surgical site infections, rather than SSTIs.[2] However, in the last decade, increased prevalence of both strains has caused a more indistinct separation of infection spectra.[2] Overall, MRSA increases morbidity and relapse due to inadequate treatment or unrecognized resistance, and contributes to a higher incidence of mortality during the first year after diagnosis than in those patients without MRSA.[1]

Abscesses

Traditionally, purulent infections resulting in collections of pus in the dermis and deep tissues are associated with *Staphylococcus aureus*,[6] and remain the most common isolate in surgical infections and complicated skin infections.[8] In certain