Sepsis in the Burn Patient

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KEYWORDS

• Sepsis • Infection • Burn • Burn treatment • Infection prevention

KEY POINTS

- Sepsis is the leading cause of death in burn patients, resulting in up to 50% to 60% of burn injury deaths.
- Because of the destruction of the skin's natural barrier to infection, all burn types are a risk for complications; therefore, all treatments should involve prevention and treatment of infection in the burn patient.
- Clinical presentation of sepsis is similar to clinical presentation of the burn patient without infection, which presents a challenge in differentially diagnosing sepsis in the burn patient.
- Because of the persistent hypermetabolic response, patients will have persistent tachycardia, tachypnea, and/or leukocytosis, and their normal temperature is reset to an average of 38°C.
- Important steps in monitoring the burn patient for infection and subsequent sepsis are continuous monitoring for signs of infection and implementation of preventative measures to prevent infection.

INTRODUCTION

A burn is damage to the skin and loss of the primary barrier to infection.[1] Burned skin is at risk for infection as long as the barrier is absent. If untreated, an infection from a serious burn can be life-threatening and lead to sepsis. Burns can be caused by a range of sources, including thermal (scalding, flame, contact with hot surfaces), electrical, chemical (acids, gasoline, household cleaners, garden products), and radiation. A burn injury can range from minor to severe.[1]

Sepsis is a life-threatening organ dysfunction caused by dysregulated host response to infection; early treatment is critical.[2] Sepsis is the leading cause of death, resulting in up to 50% to 60% of burn injury deaths. Improvements in care outcomes for burn sepsis patients have been slow owing to the common exclusion of burn patients from sepsis research.[2]

The Surviving Sepsis campaign, a campaign that aims to reduce mortality from sepsis, focuses on patients presenting to hospitals with recent signs of infection.[3] Although many patients are affected by burn sepsis, interventions to treat sepsis in

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burn patients is challenging owing to a lack of specific guidelines. One critical element is differentiating burn sepsis from sepsis to ensure optimal patient treatment.[3]

INCIDENCE AND PREVALENCE

According to the Centers for Disease Control and Prevention (2018), more than 1.5 million people are diagnosed with sepsis each year in the United States.[2] Of this number, 11% of patients developed sepsis from a skin infection. Because of the infection challenges in burn patients, survival from sepsis is especially challenging. As a result, sepsis is the cause of 50–60% of all deaths in patients with severe burns.[4]

The American Burn Association (ABA) reports more than 450,000 patients are treated in emergency rooms for burns annually.[1] Mortality for patients with more than a 40% total body surface area (TBSA) burn is 95%.[5] Approximately 3400 burn patients will not survive their injuries.[1]

Burns and fires are the third leading cause of death in the home, with a fire-related death occurring every 169 minutes.[1] Most admissions to burn centers result from fire or flame burns (44%), followed by scalding injuries caused by wet or moist heat (33%).[1] The widespread impact burns have on health care warrants the understanding of patient assessment and implementation of the most effective treatments based on the most current evidence.[2]

BURN TYPES

Intact skin is vital to preserving several important body functions, including fluid homeostasis, thermoregulation, and protection from infection. The skin plays an important role in essential immunologic and neurosensory body functions, as well as metabolism of important vitamins such as vitamin D.[3] Whenever there is a break in the skin, these body functions are affected. The relationship of burn types with associated physiologic responses and symptoms as they relate to sepsis are described in **Table 1**. Understanding the physiologic responses and symptoms of burn types is appropriate before addressing the unique sepsis issues associated with burn patients.[2]

All burn types, even when minor, are risks for complications if not treated properly. This is due to the destruction of the skin's natural barrier to infection. All treatments should involve prevention and treatment of infection.[3]

RISK FACTORS

Sepsis can develop in any burn patient with an infection. Risk factors include age, preexisting conditions, type of burn, and response to treatment. Patients with the highest risk are the very young and older adults. Patients with additional risk factors include those with a weakened immune system; a chronic illness, such as diabetes, kidney, or liver disease; AIDS, and/or cancer.[6]

Burn patients are more vulnerable to developing sepsis owing to the increased opportunity for infections to become complicated following invasive hospital procures (eg, central line placement). Rising antibiotic resistance is another factor because it results in microbes becoming immune to drugs that would otherwise control infection.[7]

Open burn wounds pose risks for infection and, ultimately, sepsis. The occurrence of sepsis in burn patients is caused by depression in the immune response and a massive systemic inflammatory response (SIRS). Infections commonly resulting from urinary catheters or mechanical ventilation can be complication risks for the burn patient. Treatment of an infection can be further complicated by the increasing prevalence of drug-resistant pathogens worldwide.[4]