

Chapter 24

BURNS

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Burns are skin injuries caused by direct or indirect contact with extreme temperatures, posing a significant public health challenge. In Brazil, approximately 1 million people suffer from burns annually, with the Unified Health System (SUS) spending around 55 million reais per year on treating these patients. This results in about 100,000 hospital visits and up to 2,500 annual deaths, significantly affecting the health and quality of life of those impacted. The depth and extent of tissue damage are fundamental classifications that directly influence clinical management and patient prognosis. In the context of

burns, the severity and complications associated with these injuries present a public health challenge, although most cases are preventable. Burns can result from direct or indirect heat action on organic tissues, causing trauma and compromising tissue integrity. They can be classified according to their origin into chemical and physical burns. Chemical burns are mainly caused by acidic and basic substances, while physical burns are associated with electricity, radiation, and extreme temperatures (Giordani *et al.*, 2016).

The consequences of burns go beyond localized skin damage, potentially triggering severe systemic complications such as sepsis, hemodynamic instability, electrolyte imbalances, and shock. Additionally, they compromise patients' psychological and emotional integrity (Morais *et al.*, 2022). Other complications include respiratory, renal, and metabolic imbalances. Fluid replacement is crucial to maintain vital organ function and preserve tissue perfusion, preventing hypovolemia (Callou *et al.*, 2023).

The therapeutic approach to burns includes traditional techniques, such as the use of silver sulfadiazine, and recent innovations, such as the use of Nile tilapia skin. The latter is recognized for its histological properties similar to human skin and its effectiveness in treating severe skin injuries. Case studies have also shown that hyaluronic acid, when applied to lesions and wounds, retains water and creates a conducive environment for collagen and elastin formation, highlighting the importance of these innovations in clinical management (Dos Santos *et al.*, 2022).

EPIDEMIOLOGY

Burn injuries are considered complex traumas due to their economic and social repercussions, presenting a morbidity and mortality rate affecting approximately 1 million people worldwide. In Brazil, this type of trauma directly impacts public health costs, with an average of 100,000 Brazilians hospitalized annually due to burns.

According to epidemiological data, only 10% of burn victims seek hospital care, with approximately 2,500 dying directly or indirectly from their injuries. Most patients are treated in emergency centers, and it is estimated that about 40,000 are hospitalized in severe condition (Giordani *et al.*, 2016).

Most accidents occur in domestic settings, involving mainly adult males, children and adolescents under 15 years old, and the elderly. Burns are the second leading cause of trauma-related deaths in children up to 4 years old and the third in older age groups. In the pediatric and elderly populations, the home environment is the most prone to burn accidents, while for adults, these accidents are more prevalent in the workplace (Rocha *et al.*, 2020).

The injuries are predominantly caused by scalding with hot liquids in children. In adolescents and adults, the main cause is related to the use of flammable liquids, commonly alcohol. Other frequent causes include exposure to fire, boiling water, and contact with heated objects (Giordani *et al.*, 2016).

DIAGNOSIS

Diagnosing burns requires a detailed evaluation of the burn's degree, the Burn Surface Area (BSA), the presence of airway injury, and psychobiological needs, such as oxygenation, hydration, mucocutaneous integrity, elimination, and thermal, vascular, and electrolyte regulation, in addition to pain perception (Sousa *et al.*, 2021). Identifying the etiology of the burn and conducting a specific psychosocial assessment for the severely burned patient are crucial for effective and longitudinal therapy (Morais *et al.*, 2022).

The BSA is assessed to determine the burn extent using three main methods:

- **Rule of Nines:** Divides the body into segments, assigning specific percentages. In adults, the head and neck represent 9%, each arm 9%, each leg 18%, anterior trunk 18%, posterior trunk 18%, and genital area 1%. In children, the head represents 21% and each leg 12%.
- **Palm Method:** The patient's palm (including fingers) represents approximately 1% of the BSA.
- **Lund-Browder Chart:** More accurate for children, adjusts the percentages according to age.

Patient management is directed according to the degree of involvement, making early and detailed assessment necessary for better assistance and achieving a more favorable prognosis and better quality of life. An example is debridement, which, when performed timely, helps prevent sepsis by controlling systemic inflammation and aiding in healing (Vieira *et al.*, 2024).

Burn patients may present cardiovascular, respiratory, and renal dysfunctions and are at greater risk for chronic inflammation, shock, and sepsis (Callou *et al.*, 2023). Respiratory manifestations commonly include dyspnea, which can be caused by airway injuries or smoke inhalation, potentially leading to respiratory failure and, eventually, death. Symptoms such as stridor, soot in the sputum, tearing, wheezing, and productive cough are also common (Sousa *et al.*, 2021).

According to De Souza *et al.* (2019), seven major problems are evident in burn victims, which fit into symptomatology and complications: skin lesions, infection, pain, fluid alterations, edema formation, intracranial bleeding, and changes in body and emotional image. The pain clinical picture of these patients varies according to the burn degree. First- and second-degree burns are generally more painful due to less destruction of nerve endings. In contrast, third-degree burns can be less painful or even painless due to the complete destruction of nerve endings (Sousa *et al.*, 2021).

TREATMENT

Burns are serious injuries that require intensive and specialized care to minimize complications and promote proper recovery. When burns are more severe, they present an even greater challenge in clinical practice due to potential complications such as infections and disabling scarring. Appropriate treatment not only involves immediate healing but also the prevention of infections and functional restoration of tissues, highlighting the importance of proper injury management (Rocha *et al.*, 2020). The good prognosis and quality of life of patients are directly linked to the training of healthcare professionals involved, who must be trained and updated to promote effective management and ensure positive outcomes (Vieira *et al.*, 2024).

Burn injuries are classified according to depth:

- First Degree: Limited to the epidermis, presenting erythema, pain, and absence of blistering.
- Superficial Second Degree: Affect the epidermis and superficial dermis, associated with pain, redness, blisters, and the possibility of mild scarring.
- Deep Second Degree: Affect the reticular dermis, causing intense pain and complete loss of the dermis, resulting in fibrous scar tissue.
- Third Degree: Affect the entire dermis and subcutaneous tissue, being painless due to the destruction of nerve endings.
- Fourth Degree: Deep injuries that extend through all tissues, including bones, tendons, and muscles, being potentially fatal and highly susceptible to infections (De Souza *et al.*, 2019).

Most burns occur in domestic or work environments due to the lack of proper equipment or safety measures. Anyone can be affected, although the elderly and children are more vulnerable and have a higher incidence of burns. This requires special and individualized care, ranging from outpatient care to treatment in Intensive Care Units (ICUs) for highly complex cases (Rocha *et al.*, 2020).

The treatment of burn patients involves a multidisciplinary team, including plastic surgeons, emergency physicians, dermatologists, nurses, occupational therapists, and psychologists. The psychologist plays a crucial role in helping overcome the traumatic experience and aligning expectations regarding the therapies used, being essential for a good clinical outcome (Vieira *et al.*, 2024).

Burn patients suffer significant emotional impacts due to physical and functional sequelae, as well as the painful process that influences recovery. Therefore, it is crucial to provide, in addition to physical care, emotional support. The actions of healthcare professionals should include detailed explanations about the stages of treatment and support for accepting changes and possible sequelae resulting from the trauma (Sousa *et al.*, 2021).

Initial therapy includes hemodynamic stabilization and the prevention of vascular complications, following the “ABCDE” trauma protocol. After this stage, the body area affected by burns and their extent is estimated using the Rule of Nines (Callou *et al.*, 2023). Next, the patient’s hydrostatic stabilization is performed following the Parkland formula, and then the focus is directed to the wound. If there is necrotic tissue, surgical debridement becomes essential for its removal, preparing the injury for proper healing. Local wound hygiene is then carried out, and dressings with healing and antimicrobial properties are applied (Dos Santos *et al.*, 2022).

Interventions may include the use of hydrocolloid and alginate dressings, which promote healing and reduce the risk of infections. Additionally, topical therapies with antiseptic agents prevent secondary infections and promote healthy tissue regeneration (Rocha *et al.*, 2020).

1% silver sulfadiazine remains a cornerstone in the initial treatment of third-degree burns due to its broad antimicrobial properties and its ability to reduce bacterial load in the wound bed. However, these dressings require frequent changes, increasing patient discomfort and associated costs, making them less accessible and more bothersome due to the pain caused during cleaning and dressing changes (Sousa *et al.*, 2021).

Recent studies have introduced an innovative approach to burn treatment with the application of tilapia skin. This technique has shown substantial advantages in the healing process and reducing discomfort associated with pain. Research on the use of stem cells has also shown high potential in the regeneration of affected tissues and improvement of dermal function in more severe cases (Callou *et al.*, 2023).

Despite advances, burn treatment faces significant challenges due to the high propensity for infections, healing difficulties, and the need for multiple surgical interventions. Strategies to overcome these obstacles include the appropriate use of antimicrobial agents according to resistance protocols, aiming to minimize the development of resistant bacteria (Vieira *et al.*, 2024). To promote effective tissue regeneration, the development and application of advanced skin graft techniques, such as cultured skin grafts, are fundamental. Additionally, it is essential to implement multidisciplinary protocols for pain management, incorporating pharmacological and non-pharmacological therapies to improve patient comfort during treatment (De Souza *et al.*, 2019).

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