Clinical Update of Thermal Burns Injury
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1. Introduction

Globally, burns are a prevalent source of harm and possess the capacity to result in illness and death. The specific environmental conditions in which a burn occurs have an impact on the prognosis. Low-resource situations, such as wilderness or low-income communities, are characterized by a lack of adequate resources, resulting in delayed and inadequate access to standard burn care.¹²

The initial 48 hours following a thermal burn injury present the most significant window of opportunity to influence a patient’s life expectancy. As a result of timely surgeries, careful wound care, nutrient delivery through the digestive tract, control of blood sugar levels and overall metabolic care, effective ways to avoid and treat infections, and plans to avoid both low body temperature and compartment syndrome, the death rate has gone down significantly and hospital stays have been cut down significantly. Research using different levels of burn severity has shown how important a patient’s other health problems are in determining how well someone with a severe burn injury will do.³ This review was aimed to describe clinical update of thermal burn injury.

**Burn injury classification**

Burns are categorized according to their size, severity, the age of the patient, and any related medical conditions or injuries. A precise assessment of the magnitude and extent of the burn injury is essential for quantifying resuscitation parameters. Smoke inhalation, trauma, and electrical injuries are frequently present with burns. Severe burns, regardless of their origin, can lead to comparable complications such as infection, difficulty breathing, dysfunction of multiple organs, blood clot formation in veins, and gastrointestinal issues. In conclusion, the treatment plan of thermal burns will be determined based on the expected location, size, and depth of the burn. The initial 48 hours of burn care have the most significant influence on the morbidity and death of burn victims.
Extent

The "rule of nines" (Figure 1) is a helpful method for promptly evaluating the size of a burn in adults. For an appropriate assessment of skin results during initial and subsequent examinations, it is crucial to observe the complete patient. An established guideline states that open palms in adult patients account for 1% of the total body surface area (TBSA). The calculation of total body surface area (TBSA) is applicable to burns of both partial and full thickness.6

Depth

Assessing the extent of the injury's depth is challenging. Superficial burns may exhibit a red or gray coloration, but they will demonstrate a commendable restoration of blood flow and will not develop blisters at first. A wound that forms blisters and exhibits a pink and moist appearance is indicative of a superficial, partial-thickness burn. Partial-thickness burns exhibit a whitish and moist appearance and may bleed upon puncture; the feeling in the skin remains intact. Full-thickness burns lead to the complete destruction of adnexal structures and can manifest as either a white-yellow tint or a black-charred look. The skin is rigid and dehydrated, lacking the ability to bleed upon puncture and devoid of feeling.7,8 Partial-thickness and full-thickness burns are managed using identical treatment methods. Both necessitate an initial process of debridement and grafting in order to achieve adequate healing. Failure to undergo these procedures might result in the skin becoming thin and scarred.

Survival rates following burn injuries

Patients are transferred to the burn unit based on criteria such as the extent of the burns, injuries that wrap around a body part, burns affecting critical joints or body parts, and the presence of other medical conditions. Because of improvements in treatment, like better wound care, better control of infections, faster removal of burn wounds, use of skin substitutes, and early provision of nutritional support, the death rates have gone down by a large amount.2,4

Associated injuries or illnesses

Smoke inhalation, trauma, and electrical injuries are frequently present with burns. Severe burns, regardless of their origin, can lead to comparable complications such as infection, difficulty breathing, dysfunction of multiple organs, blood clot formation in veins, and gastrointestinal issues.9-11

Systemic response to burns

Burns exceeding roughly 20% of the total body surface area (TBSA) can lead to systemic metabolic
problems that necessitate substantial maintenance. The activation of the inflammatory cascade can result in the development of shock and coagulopathy.

Management of thermal burn injury

Initial resuscitation

Burn patients necessitate a comprehensive evaluation of their injuries, commencing with the examination of the “ABCDEs” (airway, breathing, circulation, disability, exposure). Maintaining control of the airway is crucial as it helps prevent airway obstruction and the development of acute respiratory distress syndrome (ARDS), particularly in those with inhalation damage. Obtaining vascular access is necessary for all burn patients. Patients with burns over 15% of the total body surface area (TBSA) necessitate the intravascular administration of substantial quantities of crystalloid fluids. The Parkland formula is the most renowned guideline for fluid resuscitation. According to this formula, the predicted fluid requirements in the initial 24 hours are calculated as 4 mL per kilogram of body weight multiplied by the percentage of body surface area that is burned. 50% of the predicted fluids were supplied within the initial 8-hour timeframe following the injury, rather than upon arrival for medical treatment. The residual liquid is subsequently transferred throughout the following 16-hour period. Significant quantities of liquid may be necessary. Crystalloid solutions in isolation may not be adequate to fully replenish the cardiac load during the fire shock phase. Physicians should prioritize monitoring clinical symptoms of volume overload since it can result in pulmonary problems or compartment syndrome due to edema. Electrical burns and respiratory injuries might augment the need for fluids.\textsuperscript{12,13}

Pain management and prophylaxis

Effective pain management is of utmost importance in the treatment of burn victims. The recommended treatment involves the use of nonsteroidal anti-inflammatory medicines, which can be taken orally or administered intravenously, as well as opioids. As chemoprophylaxis, confirm and revise tetanus prevention status for all burn patients. Topical antibiotics should be applied to all lesions that are not superficial. There is no need to use systemic antibiotics for prophylaxis.\textsuperscript{14,15}

Surgical intervention

Escharotomy

When there is swelling of the tissue, ischemia can occur beneath constricted eschars on the limbs, neck, chest, or burns that round the body on the trunk. An escharotomy incision is a crucial procedure that can be life-saving and prevent the loss of a limb.

Fasciotomy

Fasciotomy is necessary for all cases of compartment syndrome. Medical practitioners should regularly observe patients for the emergence of initial indications of compartment syndrome, particularly in individuals with burns that encircle a body region.

Debridement and dressing

Debridement, dressing, and the administration of topical and systemic antibiotics are recommended. Debridement should be performed on minor burns to assess the extent of the burn and thereafter cleanse it meticulously. Subsequently, the recommended daily wound care regimen should include the removal of dead tissue as necessary, the application of antibiotics directly to the wound, and the use of dressings to cover the lesion. Ensuring patient adherence and sufficient pain management are crucial for effective outpatient therapy. The treating physician should reassess the site within 24–72 hours to check for any indications of infection.

The objective of burn treatment is to shield the wound from desiccation and avert further harm or infection. Consistent and meticulous cleansing of the scorched region is required. After washing the wound, topical antibiotics can be used. The use of silver sulfadiazine is currently not recommended. Systemic infection continues to be a significant contributor to illness among people with severe burn injuries. The prevalence of healthcare-associated infections is on the rise.\textsuperscript{15}
Wound management

The objective of treatment following fluid resuscitation is to achieve prompt and steady closure of the wound. Burns that affect the top or bottom layers of skin don’t heal on their own for more than 7–10 days. To treat these wounds most effectively, a specialist must remove the damaged tissue surgically and replace it with healthy skin from the patient’s own body. This approach helps prevent the creation of excessive scar tissue and reduces the risk of infection. The regenerative capacity of the skin in profound partial-thickness burns is compromised due to the presence of a thin dermis layer. Allogeneic keratinocyte transplant cultures offer prompt initial covering for superficial burn injuries. Utilizing cultured grafts for skin replacement can be a lifesaving intervention for those with severe burns. The restored dermis has histologic features that are almost normal, but it lacks adnexal structures and contains very few if any, elastic fibers. \(^{13}\)

Abdominal compartment syndrome

Abdominal compartment syndrome is a life-threatening illness that can occur in badly burned individuals, resulting in a death rate of around 60% even with surgical treatment. In those who are at risk, a bladder pressure above 30 mm Hg confirms the diagnosis. While surgical belly decompression can enhance ventilation and oxygen supply, its impact on survival remains uncertain. \(^{10}\)

Supportive care

Patients with burn injuries necessitate comprehensive support in terms of both physiological and psychosocial aspects. To ensure the well-being of patients with burns covering more than 20% of their total body surface area (TBSA), it is crucial to maintain a normal core body temperature and prevent hypothermia. This can be achieved by maintaining an ambient temperature of 30°C or higher. Patients with burn injuries are susceptible to many consequences, including respiratory damage, acute respiratory distress syndrome (ARDS), or respiratory failure that does not respond to maximum ventilatory support, sepsis, multiorgan failure, and venous thromboembolism. \(^{8,9}\)

Burn patients have heightened metabolic and energy needs for the purpose of wound healing and necessitate meticulous evaluation and adequate nourishment. Giving food and fluids early on, either through parenteral (intravenous) or enteral (through the digestive system), has been shown to lower the risk of infection, shorten the time needed for recovery, lower the number of non-infectious problems, shorten the hospital stay, reduce long-term effects, and lower the death rate. The prevention of long-term scarring continues to be a challenging issue for individuals with severe burns. \(^{9}\)

Prognosis

The prognosis is contingent upon the severity and site of the burn tissue injury, concurrent injuries, coexisting medical conditions, and potential consequences. Hyperglycemia serves as an indicator of more unfavorable results. Frequent complications encompass sepsis and gangrene necessitating limb amputation, as well as neurological, cardiac, cognitive, or mental impairment. Psychiatric assistance may be necessary after sustaining burn damage.

Indications for referral

People with extensive burns (partial-thickness burns covering more than 10% of the body’s surface area or full-thickness burns covering more than 5% of the body’s surface area), burns that surround a body part, injuries from breathing in harmful substances, or scalds that happen on sensitive areas like the face, hands, feet, or genitals should be taken to a burn unit. Additionally, transfer to a burn unit is advised for individuals with underlying health conditions. All significant burn patients necessitate comprehensive supportive care, encompassing both physiological and psychosocial aspects. Burn center consultations can provide guidance on which patients necessitate transfer and which can be effectively managed by telemedicine or telephone consultation. Monitoring includes checking vital signs, taking care of wounds, and keeping a close eye out for problems that could happen because of electrolyte imbalances, acute
kidney dysfunction, liver dysfunction, heart disease, high blood sugar, or infections.4,5

2. Conclusion
The treatment plan will be determined based on the expected location, size, and depth of the burn. The initial 48 hours of burn care have the most significant influence on the morbidity and death of burn victims.

3. References