Assessment and classification of burn injury

Extent of the problem

Burns are skin injuries caused by excessive heat. They result from traumatic injuries to the skin or other tissues and result when some or all cells are destroyed by heat, electrical discharge, friction, chemicals, or radiation. While burns tend to be more prevalent in underdeveloped countries, they are a global problem annually affecting about 11 million people severely enough to seek medical attention.[1] In the U.S. alone, 450,000 to 1.1 million burn injuries occur annually, resulting in 40,000 to 50,000 hospitalizations and approximately 5,000 deaths, burdening the healthcare system with an estimated $18 billion in specialized burn care expense.[2,3]

Assessment of burn severity

Accurate assessment of burn severity is essential to ensure efficient utilization of healthcare resources and to optimize patient outcomes. The severity of a burn considers the burn mechanism, burn depth, burn extent, and anatomic location. Taken together, these factors provide an overall assessment of the burn severity and a general guidance to direct patient care.

Assessment of burn mechanism

Thermal burns are the most common type of burn injuries and are caused by dry heat such as fire, flame, or an iron. A scald is caused by something wet, such as hot liquid(s) or steam. Most fire-related deaths (up to 70%) are due to smoke inhalation, and the rest are due to the actual flame.[4] The most common cause of home-related fires is cooking equipment, but other common causes include cigarettes or other smoking materials, space heaters, gasoline or propane fires, and injuries due to the unsafe use of fireworks. Other common burn etiologies, especially in the workplace, include high-voltage electrical injuries and/or chemical burns, which can be extremely serious but also very difficult to initially assess.[5,6]

Classification of burn depth

Burns are typically classified according to the depth of tissue injury, which determines the healing potential and the treatment method of choice. The older, traditional classification system, still used by the National Institutes of Health (NIH), classifies burns as first, second, third, or fourth degree.[7] More recent designations often use superficial, superficial partial thickness, deep partial thickness, and full thickness, reserving the term "fourth degree" to describe the most severe burns that extend past the skin and into the underlying tissues, often involving muscle, nerves, vessels, and/or bone (Table 1).

Table 1: Burn classification

NIH Classification	Recent Classification	Depth of Burn
First degree	Superficial	Epidermis
Superficial second degree	Superficial partial thickness	Epidermis and superficial dermis
Deep second degree	Deep partial thickness	Epidermis and deep dermis (including hair follicles and glandular tissue)
Third degree	Full thickness	Epidermis, dermis, and subcutaneous fat
Fourth degree	Fourth degree	Epidermis, dermis, subcutaneous fat, and into muscle, nerves, vessels and/or bone

Burns are typically not uniform in depth. Many have a mix of superficial and deep components that are difficult to assess initially because they are dynamic and can progress to deeper burns over the

Note: OASIS Burn Matrix is the product name in the U.S. OASIS Extracellular Matrix is the product name outside the U.S.

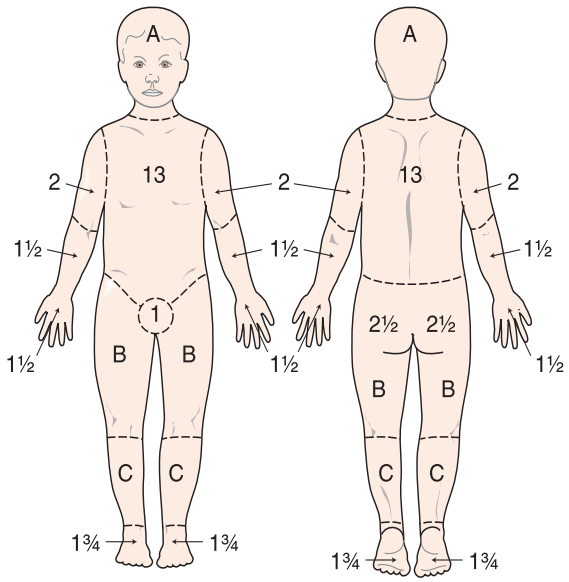
initial few days.[8] Children under 5 years old and adults over age 55 typically have thinner skin, making them much more susceptible to burn injuries that are deeper than suggested by initial appearance.[9]

Assessment of burn extent

A thorough and accurate estimation of burn size is essential to guide treatment and ensure that the patient receives any required specialist care.[9] The extent of a burn is estimated and expressed as the amount of total body surface area (TBSA) involved, using one of two methods. The Lund-Browder chart (Figure 1) is typically the most accurate method for estimating TBSA for children because it considers the relative percentage of body surface area affected by growth. (Children have proportionally larger heads and smaller lower extremities.)

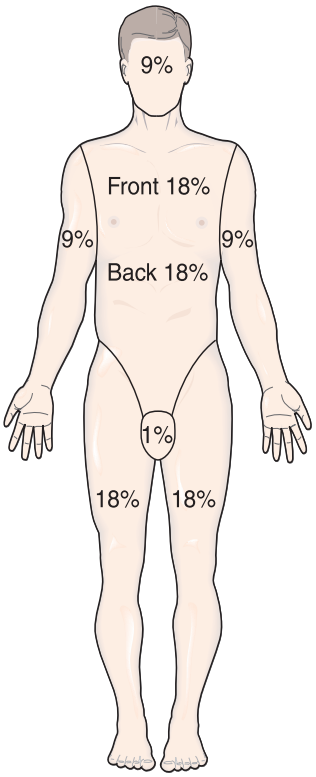
Figure 1: Lund-Browder chart

Relative percentages affected by growth			
Age (years)	Area		
	A	B	C
0	9½	2¾	2½
1	8½	3¼	2½
5	8½	4	2¾
10	5½	4½	3
15	4½	4½	3¼
Adult	3½	4¾	3½
A = 1/2 of head			
B = 1/2 of one thigh			
C = 1/2 of one leg			



For adults, the fastest method to estimate TBSA is the "Rule of Nines" (Figure 2), though accuracy can vary greatly and may underestimate the area of involvement in obese patients or in women with large breasts who have burns to the anterior trunk. When using the Rule of Nines to assess TBSA, the head represents 9% TBSA, each arm represents 9% TBSA, each leg represents 18% TBSA, and the anterior and posterior trunk each represent 18% TBSA.

Figure 2: Rule of Nines



Location of injury

The location of a burn dictates its severity and may also direct its treatment. For example, facial burns may affect airway patency, vision, the ability of a patient to eat, and may permanently affect facial appearance. Burns on the face, hands, feet, and genitals, as well as

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inhalation burns, are often referred to burn centers for specialized treatment because of their potential to greatly impact the patient's future quality of life.[10]

Summary

Burn injuries vary greatly in their severity and etiology. An accurate assessment of a burn's severity will dictate the level of specialized burn care needed and will also directly impact the caregiver's choice of treatment options.

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