HOSPITAL PHYSICIAN®

EMERGENCY MEDICINE BOARD REVIEW MANUAL

STATEMENT OF EDITORIAL PURPOSE

The Hospital Physician Emergency Medicine Board Review Manual is a peer-reviewed study guide for residents and practicing physicians preparing for board examinations in emergency medicine. Each manual reviews a topic essential to the current practice of emergency medicine.

NOTE FROM THE PUBLISHER:
This publication has been developed without involvement of or review by the American Board of Emergency Medicine.

Endorsed by the Association for Hospital Medical Education

Evaluation and Management of Thermal Burns

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INTRODUCTION

Thermal burns are a frequent presenting complaint in US emergency departments (EDs). The National Center for Injury Prevention and Control (NCIPC) estimated that there were 467,929 ED visits for burns in 2003.[1] Of these patients, 441,655 were treated and released and 19,899 were admitted or transferred. The NCIPC also estimated that there were 3875 burn deaths in the United States in 2003. Approximately 55% of those who presented to the ED due to burns were males, and 68% of the burns requiring hospital admission or transfer were suffered by males. The incidence of burns prompting ED visits is bimodal, with a peak at ages 1 to 4 years and a second peak at ages 25 to 34 years.[1]

Most burns are caused by fire/flame (46.0%), scalds (32.5%), or contact with hot objects (8.1%). Scalds are the primary cause of burns in the very young, accounting for 65.5% of burns requiring burn center referral in the neonate to 4.9 years age-group. Fire/flame burns are the primary cause of burns for all other age-groups.[2]

Burn severity seen in the ED ranges from widespread full-thickness burns that lead to life-threatening airway compromise and hemodynamic collapse to small-area superficial burns that require only reassurance and discharge. Complex decisions must be made by the ED physician, including when and how to invasively manage a burn patient's airway; when to transfer a burn patient to a regional burn center; how to begin optimal fluid rehydration and manage electrolytes; how to minimize compartment syndrome and infection; and how to dress burn wounds to minimize pain, fluid loss, and subsequent scarring or infection. Optimal ED management of severe burns takes into consideration the dynamic nature of skin and systemic burn physiology and anticipates life-threatening complications before they occur. This article reviews the approach to emergency care of thermal burns, with an emphasis on burn management issues.

BURN SEVERITY AND PHYSIOLOGY

PHYSICAL PROPERTIES AFFECTING BURN SEVERITY

Burns are caused by heat transfer to the skin. In general, the physical properties of the substance causing the burn will determine its severity. Although temperature and duration of contact time with heat sources are important factors in determining the severity of the resulting burns, physical parameters such as heat capacitance and heat conductance are also critical. For example, the burn caused by superheated steam at a given temperature is typically much worse than a burn caused by superheated air at the same temperature because the heat capacitance of water is much greater than that of air. Likewise, contact with a rapid and efficient conductor of heat (eg, metal) will cause a relatively more severe burn in a shorter period of time than a poor conductor of heat.

BURN ZONES

Tissue damage from a thermal burn decreases as the distance (in both depth and surface distance) from the core of the burn increases, with necrotic tissue in the superficial and central portions of the burn giving way to progressively less damaged tissue with a higher likelihood of tissue survival. Although the relationship between distance and burn severity is continuous, severe burns are often divided conceptually into 3 "zones" based on long-term tissue viability. The *zone of coagulation* shows the greatest tissue damage and contains only dead tissue. The *zone of stasis* is adjacent to the dead tissue and is an area of potential injury. In this zone, cells are damaged and show increased permeability leading to edema as well as decreased perfusion and reversible ischemia. The tissues in the zone of stasis can survive if appropriate and timely treatment is initiated. The *zone of hyperemia* is the outermost burn zone. Tissue in this zone receives adequate blood flow and will survive unless there is secondary insult, such as infection or profound systemic shock.[3]