Clinical Burn Therapy

A Management and Prevention Guide

Edited by
Robert P. Hummel

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FOREWORD

A serious burn injury is a catastrophic event. It is painful and life-threatening as a result of the shock, infection, and complex pathophysiologic and metabolic effects that may follow. In addition, it is often associated with many complications, prolonged morbidity, multiple operations, expensive methods of treatment, and a number of important cosmetic and psychological sequelae.

The successful management of the seriously burned patient usually requires special knowledge and skills. Great progress has been made in reducing the mortality and increasing the effectiveness of treatment. These gains have been related primarily to the development of a better understanding of the pathophysiologic effects of burns, the control of infections, and improved surgical techniques. As more knowledge and greater skills have been acquired, however, modern concepts of burn therapy have necessarily become more complex and specialized.

It is important, nevertheless, for every physician and nurse, and all intensive care unit personnel and acute care hospitals to have competence in the initial and emergency treatment of the acutely burned patient so that appropriate therapy as well as comfort, reassurance, and confidence can be provided promptly. Positive and informed action without causing any harm at this time is very important. This book provides much useful information in that regard.

In the more extensive burns, more complicated and skilled treatment become of greater importance. Specialized facilities and equipment are needed, and trained and dedicated personnel assume an increasingly important role in providing better comfort, surgical treatment, and medical and psychological help over the extended periods of the postburn illness. In addition, the complications that develop present hazards to other surgical patients. For example, the dangers of cross-contamination and infection by microorganisms colonizing or infecting the burn wound may be of considerable significance, particularly those emerging as antibiotic-resistant strains. Strict isolation procedures are required for limitation and confinement of such bacteria, and they may be difficult or impossible to provide. Another consideration is the laboratory testing required on a night-and-day basis, and tests may be stressful or impossible to obtain in many laboratories.

As a result of these considerations, the trend has been to develop burn units within the larger hospitals, or burn centers. Modern transportation with ambulances, helicopters, and airplanes has made it possible to provide rapid transfer of seriously burned individuals to such centers at little or no increased risk to the burn patient.

This book defines and recognizes the importance of the various aspects of burn care. The most modern concepts and techniques are described and illustrated. The book also provides a ready and useful reference for physicians, nurses, emergency room and intensive care unit personnel, and technicians responsible for patients with burn injuries.

William A. Altemeier

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Certainly the authors of all chapters are to be acknowledged for their excellent work and their cooperation in completing the chapters and revising them where necessary. The Foreword contributed by Dr. W. A. Altemeier is especially appreciated. And finally, I wish to acknowledge the help and support of Mrs. Helen Hummel throughout this project.

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1 Introduction

Robert P. Hummel

By any measure there has been great progress in the treatment of burn injuries over the past 25 years. Mortality related to age and size of burn injury has been significantly reduced. Length of hospital stay and morbidity statistics for burn victims have also been markedly improved. Much of the impetus for this progress originated from the founding of specialized burn units in the United States. With the establishment of the original Surgical Research Unit at Brooke Army Hospital in San Antonio, Texas in the early 1950s, the concept of a specialized burn center was advanced. The original Surgical Research Unit was initiated by the Army because of: 1) the threat of atomic warfare involving mass burn injuries, and 2) the number of thermal injuries actually resulting from the Korean conflict in progress at that time. The Army's Burn Center (Surgical Research Unit, Brooke Army Medical Center) under the direction of such men as Col. Edwin Pulaski and Col. Curtis P. Artz stimulated worldwide interest in the pathophysiology and treatment of thermal injuries. Burn units had certainly existed before that time. In

1942 Dr. William A. Altemeier established one of the first at the University of Cincinnati Medical Center. The Army's burn unit, however, with its excellent staffing, equipment, and financing was of incalculable value in the subsequent progress of burn therapy.

In 1962 the establishment of the Shriners Burns Units in Galveston, Cincinnati, and Boston, which were linked academically to university medical schools in those cities, gave further impetus to the care and study of thermally injured patients.

The American Burn Association, established in 1968, provided impetus of a different kind. This organization, composed of doctors from many specialties, nurses, physical and occupational therapists, clinical and laboratory technicians, dietitians, and others, not only greatly increased the national interest in burn care but also advanced the concept of the "burn team," which is made up of many professionals united for the best possible care of the burn patient.

In spite of the remarkable progress that has been made, a serious burn is still the most severe and devastating injury that can be inflicted upon an individual. Burns are common. It is estimated that some 2,000,000 burn patients are seen by physicians every year. Fortunately, most burn injuries are minor and patients can be treated on an ambulatory basis. Only 10% of the burns seen in the hospital emergency room require admission to the hospital, and most of these can be treated in the well-equipped community hospital. Only the more critically burn patients require transfer to burn centers.

Almost all burns are first seen by the community physician in his office or in the local hospital emergency room; this fact has prompted the publication of this book, which is intended as a guide for physicians and other health care personnel who are not burn specialists and do not regularly care for burn patients. It is imperative that those who first see the burn victim have an understanding of the problems of burn injury and not be overwhelmed when presented with this type of patient. This book provides basic information to the community physician and health care specialist so that they may develop a systematic approach for the evaluation and care of the burn patient.

It may also serve as a text for the medical student who should have a basic knowledge of the problems of burn injury, and as a resource text that is brief but complete. The chapters in this book cover those topics important for the understanding and proper care of the burn victim. The topics deal primarily with acute care and not plastic or reconstructive therapy, and are presented in more or less the sequence of the problems faced by those caring for a patient with an acute burn. The early emergency care and treatment on arrival at the hospital, triage and transfer procedures for the critical burns, and the organization of the

burn team for the moderate burns are topics that should be of practical value to primary care physicians and surgical specialists.

This book contains no separate section on basic burn pathology or pathophysiology, although some of the authors review these areas as they relate to the particular subject of their chapters. There are likewise few experimental data or review of current research. We have attempted to put together a practical guide for the interested physician and surgeon, who in fact is the primary care specialist who first sees these burn victims. This physician is vital to the outcome of the patient's injury. In the case of serious burns, early care may well determine the patient's survival. Proper emergency resuscitation, supportive care, wound care, and proper transfer procedure will greatly influence the morbidity and mortality of the critically burned patient.

Certain chapters are longer and more detailed than others. To some degree this choice reflects the author's preference, but certain topics that are germane to all burn injuries are given additional attention. The psychiatric support of the burn victim and his family applies to any burn patient and is critical for the eventual well-being of both patient and family. This topic is reviewed clearly and in appropriate detail. Respiratory problems in burn patients may develop quickly even with minor burn injuries and are well reviewed. The section on the pediatric burn victim also has widespread application and has been expanded accordingly. All chapters attempt to deal with the important topics that will enable the medical student to understand the subject and the practicing physician to organize and lead the burn team in the community hospital.

Although burn centers are certainly preferable for the more complicated burns or for patients who have other significant medical and surgical problems in addition to burns, there is little proof that all burn patients do better in this type of special care unit. While it is difficult to compare statistics, some data seem to indicate poorer results from certain burn units than from care of similar injuries in community hospitals. One of the difficulties encountered in burn care units is related to environmental colonization by antibiotic-resistant bacterial and fungal organisms—less likely to occur in the community hospital.

In fact, most burn victims should be treated in the community hospital if local interest can be stimulated to form a "burn team" from the medical, nursing, and support personnel. Patients are usually happier to stay close to home and can receive more family support during their period of treatment and rehabilitation.

Burn injuries may occur to anyone but are proportionately more common in children and the aged. Children are active and curious. They are unaware of the dangers of fire, stoves, and boiling water. The aged

and disabled are usually burned because of carelessness resulting from senility or infirmity. Others, such as alcoholics and epileptics, may lose consciousness and become victims of burning cigarettes, open flames, or radiators. There is a slight preponderance of male over female burn victims except among the elderly where the female population outnumbers the male (Figure 1-1). Although some statistics indicate that scald injuries are the most common form of burns, most agree that flame injury is the most frequent cause of the more serious burns requiring hospitalization (Figure 1-2). Burn injuries in children and elderly adults occur mostly in the home (Figure 1-3). Young and middle-aged adults, although also burned in home accidents, are often injured on the job in industrial accidents and automotive mishaps. Adolescents and young adults have shown a marked increase in burn incidence, particularly in the industrialized states.

As with most accidental injuries, prevention is by far the best treatment. In the workplace, considerable effort should be expended to avoid the occasion of accidents and to alert all personnel to the dangers of possible burn injuries by flame, boiling liquid, steam, or electricity. Time and effort expended in prevention of burns is well invested and will reap great dividends, not only in prevention of death, pain, and suffering but also in great financial savings for hospital care and industrial working time lost.

Educational programs for children and adults are of great benefit in the prevention of home accidents. The last chapter in this book is devoted to these educational efforts and has been included because of its

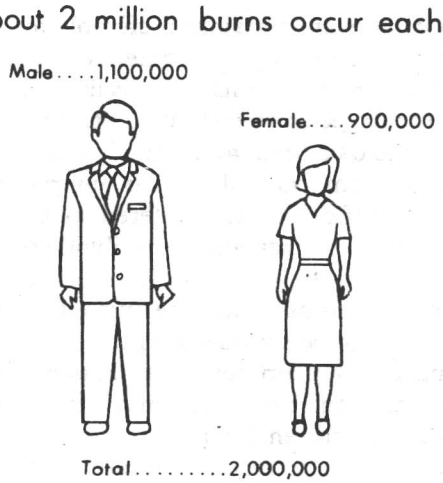

Figure 1–1 Of the 2 million burns that occur each year, slightly more than half are suffered by men.

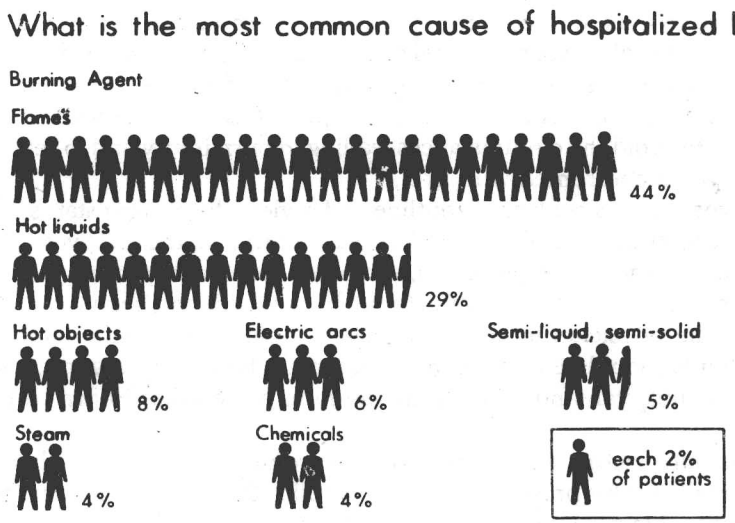

Figure 1–2 The most common causes of burns.

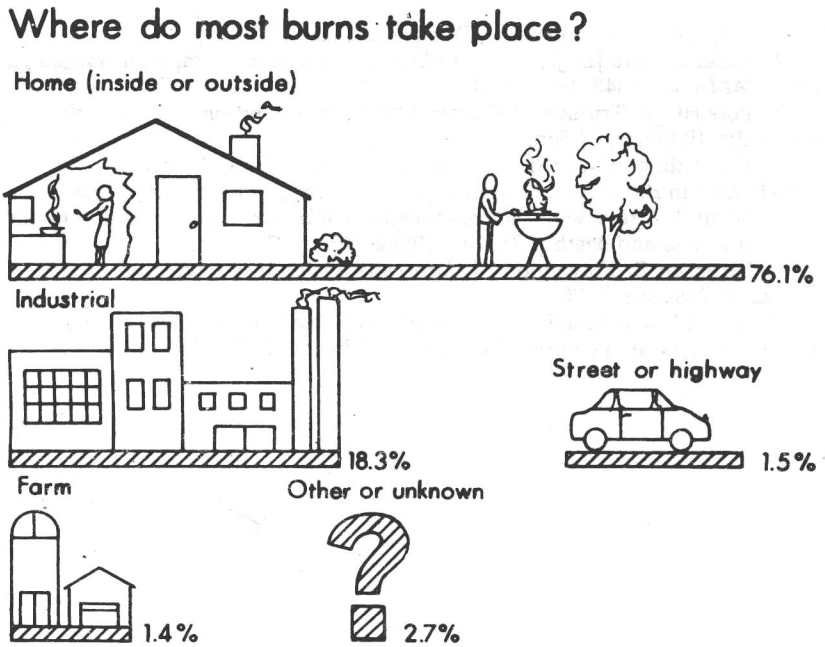

Figure 1–3 Sites of burn accidents.

importance to everyone concerned with health care. The community physician and health care personnel should be aware of these needs and do all they can to support the propagation of information that may decrease the incidence of burn injuries. Proper education can enable the individual to avoid the circumstances leading to burn injury and to react properly when confronted with fire.

The goals of this book are to outline and review the current status of burn therapy and enable the general or plastic surgeon, the family practitioner, emergency room physician, and other health care professionals interested in burn injuries to evaluate the burn victim and begin proper therapy. The physician in charge should be able to determine which burn patients should be treated on an outpatient basis, which admitted to the local hospital, and which transferred to a specialized burn care center.

If the burn victim is to be treated at the community hospital, plans must be made for his proper care. To accomplish this goal there must be a knowledgeable group of health care professionals who band together as a burn team under the leadership of an interested physician.

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2 Emergency Care

Alan R. Dimick

PRIMARY CARE AT THE SCENE OF INJURY

The first medical personnel to see the burn victim are usually the emergency medical technicians (EMTs) whose responsibility is to set in motion the proper care, which is significant in decreasing morbidity and even saving the life of the patient. As for all emergency patients, initial care should begin with the ABCs of resuscitation: airway, breathing, and circulation. The EMT should remove the patient from the source of the heat. Hot or burning clothing should always be removed. Once the burning process has been arrested and the ABCs have been insured, the burned area should be covered with a dry sterile sheet before the patient is transported to the hospital.[1]

If the transportation time to the hospital is less than 15 or 20 minutes, the burn patient may be transported without further care. However, if the transportation time for a patient with a major burn is

likely to be longer than 30 minutes, an intravenous line with lactated Ringer's solution should be started.

If radio communications are available to the EMT, the following information shoud be relayed to the receiving hospital: the patient's name and age, date and time of burn, type of burn, approximate size of burn, medical complications (such as diabetes, drugs), associated injuries, and treatment that has been initiated.[2]

The emergency treatment of extensive burns is basically that required for all patients with major trauma. The airway must be maintained and oxygen administered. All patients with extensive burns initially have low oxygen saturation in the blood and therefore should receive oxygen therapy as soon as possible after the burn injury. The burn patient is in progressively more severe hypovolemic shock, which begins at the time of his injury. The more extensive the burn, the more severe the shock.

Inhalation Injuries

The EMT must check carefully for other injuries. The obvious burn might cause the EMT to overlook other significant injuries, particularly damage from smoke inhalation. A patient may have minimal surface burns but have severe pulmonary inhalation injury with hypoxia. He may also have the complication of carbon monoxide poisoning, which requires the administration of 100% oxygen as treatment. Careful note should be made of the the surroundings in which the patient was burned. The physician at the hospital emergency department needs to know whether this burn occurred in an open area or in an enclosed space where the patient could have inhaled more of the smoke and/or toxic fumes causing injury to his lungs. In particular, the physician will need to know what type of materials were involved in the burning process. Plastics, when they burn, release many toxic fumes. Smoke usually contains chemicals that are irritating to the lungs, causing a severe chemical pneumonitis. This pneumonitis usually inhibits the diffusion of oxygen from the alveolus to the pulmonary capillary. Thus, oxygen therapy should be initiated immediately.

Particular attention should be given to the airway en route. When the high probability of a respiratory burn exists, the airway and breathing should be checked repeatedly. With the exception of most minor burns, all patients with burn injury should receive high flow oxygen during transport.

If the patient is not breathing or has difficulty in breathing, an open airway must be assured by at least the insertion of an oropharyngeal airway. If this is not sufficient to allow ventilation, then an esophageal