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- The accelerated pace of clinical and laboratory research over the past century and application of the research findings to patient care have resulted in unprecedented survival of burned patients in all age groups. Resuscitation based on an understanding of the nature and magnitude of the multisystem response to injury now prevents burn shock; effective topical antimicrobial chemotherapy and early excision prevent wound toxemia and sepsis; biologic and bioengineered dressings compensate for the missing skin; and broad spectrum metabolic support regimens prevent exhaustion and accelerate convalescence. Rehabilitation programs have also been developed to restore physical function and permit the burn patient to reenter society as a productive individual.
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- Remarkable advances in burn care have been made over recent decades, and it is recognized that the organized efforts of burn teams are required to continue enhancing survival rates and quality of life for patients. Patients with major burns are unique, representing one of the most severe models of trauma, and therefore necessitate treatment in the best specialized facilities available for that endeavor. Burn centers have developed to meet these intricate needs but can only function most productively and efficiently through well-organized, multifaceted, patient-centered teams in the areas of both clinical care and research.
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- Smoke inhalation injury, a unique form of acute lung injury, greatly increases the occurrence of postburn morbidity and mortality. In addition to early intubation for upper-airway protection, subsequent critical care of patients who have this injury should be directed at maintaining distal airway patency. High-frequency ventilation, inhaled heparin, and aggressive pulmonary toilet are among the therapies available. Even so, immunosuppression, intubation, and airway damage predispose these patients to pneumonia and other complications.
- Fluid Resuscitation of the Thermally Injured Patient** 569
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- Increased capillary permeability and reduced plasma colloid osmotic pressure following burn injury result in hypovolemia and development of edema in the burn

and nonburn tissues. Replenishment of the intravascular deficit with crystalloid fluid has been the mainstay of resuscitation for the better part of four decades. A progressive but as yet unexplained trend toward provision of resuscitation volumes well in excess of those predicted by the Parkland formula, associated with numerous edema-related complications, has been repeatedly observed recently. Correction of this phenomenon, called fluid creep, will likely revolve around several strategies, which may include tighter control of titration, re-emergence of colloids and hypertonic salt solutions, and possibly the use of adjunctive markers of resuscitation other than urinary output.

The Hypermetabolic Response to Burn Injury and Interventions to Modify this Response 583

Felicia N. Williams, David N. Herndon, and Marc G. Jeschke

Severe burn injury is followed by a profound hypermetabolic response that persists up to 24 months after injury. It is mediated by up to 50-fold elevations in plasma catecholamines, cortisol, and inflammatory cells that lead to whole-body catabolism, elevated resting energy expenditures, and multiorgan dysfunction. All of these metabolic and physiologic derangements prevent full rehabilitation and acclimatization of burn survivors back into society. Modulation of the response by early excision and grafting of burn wounds, thermoregulation, early and continuous enteral feeding with high-protein high-carbohydrate feedings, and pharmacologic treatments have markedly decreased morbidity.

Topical Antimicrobial Agents for Burn Wounds 597

David G. Greenhalgh

Because burns destroy the barrier against invading bacteria, topical antimicrobial agents have been developed to minimize the proliferation of bacteria and other microorganisms. The topical treatment depends on the depth of burns. The goal for superficial burns is to optimize re-epithelialization. For deep burns, topical antimicrobial agents should be used to minimize microbial growth until the wound is grafted. This article introduces a strategy for the rational use of these agents.

What's New in Critical Care of the Burn-Injured Patient? 607

Tina L. Palmieri

The number of cases of mortality after burn injury continues to decline, in part because of advances in respiratory, fluid, and sepsis management. However, care needs to be exercised in the application of these new techniques and technologies, many of which have never been assessed or have been incompletely studied in patients who have burn injury. Use of any of these advances in critical care needs to be individualized for any given patient and altered based on the patient's response to therapy. Future advances in the critical care of burns will require multicenter prospective trials at dedicated burn centers to define the optimal therapy for the patient who has burn injury.

Surgical Excision of the Burn Wound 617

Michael J. Mosier and Nicole S. Gibran

Early excision of the burn eschar has been one of the most significant advances in modern burn care. Historical advances in understanding of the pathophysiology of burn injury and the systemic inflammatory response fueled by the burn wound,

and refinements in the techniques of tangential and fascial excision, have led to earlier excision and grafting of the burn wound with improvements in morbidity and mortality. Efforts to control blood loss, and good operative planning and attention to special areas, can lead to the safe excision and grafting of large burns.

Closure of the Excised Burn Wound: Temporary Skin Substitutes **627**

Jeffrey R. Saffle

Prompt excision of major burn wounds has been repeatedly shown to improve survival, speed closure, and reduce infection. Immediate coverage with autograft skin is the preferred method of definitive closure of these wounds. However, when harvesting of donor skin is unavailable, or wounds are not ready for autografting, temporary closure with a variety of products can help reduce evaporative loss, prevent infection, and ameliorate pain and metabolic stress. Fresh cadaver allograft is the gold standard for such closure, but other products, including frozen cadaver skin, xenografts, and several synthetic products, are also available. This article reviews the physiology, and types of products, and their uses.

Closure of the Excised Burn Wound: Autografts, Semipermanent Skin Substitutes, and Permanent Skin Substitutes **643**

Robert Sheridan

Although definitive closure of the excised burn wound using split- or full-thickness autografts is the gold standard, permanent closure of larger defects may not be immediately feasible, especially if the presence of large burns limits the availability of donor sites. Newer temporary and permanent membranes can serve as adjuncts in some cases. Someday, burn surgeons may be in a position to close virtually any wound they generate using an immediately available, permanent, synthetic or laboratory-derived autologous composite.

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Jonathan S. Friedstat and Matthew B. Klein

Facial burns present significant acute and reconstructive challenges. It has long been our practice to excise facial burns unlikely to heal in a timely manner in order to reduce the risk of aesthetic and functionally debilitating scar contractures. We present our approach to the acute surgical management of facial burns.

Pathophysiology and Management of the Burn Scar **661**

Adil Ladak and Edward E. Tredget

Fibroproliferative disorders (FPDs) are common and serious disorders. Hypertrophic scar (HSc) and keloids represent the dermal equivalents of FPD and impose lower mortality but great morbidity. This article reviews current knowledge in the pathophysiology and molecular and cellular characteristics of postburn HSc. Additionally, current treatment modalities and future treatment options based on advancements in the understanding of the pathophysiology of HSc are discussed.

Rehabilitation After a Burn Injury **675**

Michael Serghiou, April Cowan, and Christopher Whitehead

Burn rehabilitation is a serious undertaking, and to produce the best outcomes, it demands the special attention of the entire medical team. A significant burn injury may lead to functional and aesthetic limitations along with psychosocial issues

affecting the quality of life for the person who has the injury. Burn rehabilitation professionals specialize in assisting patients to achieve optimal functional outcomes at the completion of the rehabilitative process.

Burn Reconstruction: the Problems, the Techniques, and the Applications 687

David J. Wainwright

Many patients continue to experience problems long after burn wounds have closed. Contracture and deformity are frequent sequelae of the scar tissue that is formed secondary to thermal trauma. A variety of techniques are available to the burn reconstructive surgeon, ranging from simpler grafting methods to complex free-tissue transfers. In this article, the clinical applications of these procedures are discussed, with examples of management techniques for selected problems commonly encountered by the reconstructive surgeon.

Outcomes from Burn Injury—Should Decreasing Mortality Continue to be Our Compass? 701

Amín D. Jaskille, Jeffrey W. Shupp, Anna R. Pavlovich, Philip Fidler, Marion H. Jordan, and James C. Jeng

Patient survival continues to be the standard measure of outcomes after burn injury. The current mortality following thermal injury, however, is very low, around 5% to 6%, and has changed little in almost 30 years. This article uses the National Burn Repository to assess the factors that affect mortality and discusses the need for other outcome measures. Although improving survival is a lofty goal and should not be abandoned, aspects such as quality of life and return to baseline activity should be taken into account in the assessment of patient outcome after burn injury.

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