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CRITICAL THERMAL BURNS MANAGEMENT ::RECENT SUGGESTIONS

Plastic Surgery

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ABSTRACT

Background: Burn injury and its aftermath multisystem effects are commonly encountered by acute care health workers. Resuscitation is the major component of initial burn care and must be managed to restore and preserve vital organ function. Later complications of burn injury are dominated by infection.

Methods: A selected review is provided of key management concepts as well as of recent reports published by the American Burn Association in Indian context.

Results: The burn-injured patient is easily and frequently over resuscitated, with ensuing complications that include delayed wound healing and respiratory compromise. A feedback protocol designed to limit the occurrence of excessive resuscitation has been proposed, but no new "gold standard" for resuscitation has replaced the venerated Parkland formula. While new medical therapies have been proposed for patients sustaining inhalation injury, a paradigm-shifting standard of medical therapy has not emerged. Renal failure as a specific contributor to adverse outcome in burns has been reinforced by recent data.

Conclusion: Recent reports emphasize the dangers of over resuscitation in the setting of burn injury. No new medical therapy for inhalation injury has been generally adopted, but new standards for description of burn-related infections have been presented.

KEYWORDS

burns ;infection; resuscitation; smoke inhalation injury.

INTRODUCTION

The burn-injured patient presents special challenges regarding resuscitation requirements, metabolic stress, pattern of complications and determinants of outcome. This review highlights a selected group of papers focused on those aspects of care which are unique to burn centers and the burn-injured patient and contribute in important ways to outcome. This selective review of key principles, recent literature, and summary statements is directed toward the acute care physician or surgeon with an interest in such injuries who does not encounter such problems on a daily basis.

Contemporary discussions of burn resuscitation often feature the Parkland formula proposed by Baxter and coworkers in the 1960s .Reviews of recent experience with burn resuscitation suggest that treatment objectives and fluids administered in the approach originally recommended by the Parkland group should be re-examined . The American Burn Association (ABA) has recently presented a statement to address this question . The Parkland Burn Center of Dallas, Texas (USA) also published a report on the use of the Parkland formula in the institution where it originated . Apart from understanding the special needs of fluid support, the practitioner should also recognize that sepsis also presents in non-traditional ways in the burn-injured patient . In this paper, we summarize for the non-burn physician and surgeon some of the key aspects of a recent consensus statement produced by the ABA about organ-specific infectious complications in the setting of burn injury.

A number of outcome indicators related to burn unit practice are coming into clearer focus. Renal failure has a major impact on mortality in any critical care unit population . We now have data indicating that similar concerns hold true regarding the extensively burned patient. Burn units are often selected to manage other problems of the integument and internal organs that bear resemblance to those of thermal exposure. Life-threatening lightning strikes and other forms of electrical injury pose problems beyond the degree and pattern of skin exposure. In fact, outcome is generally determined by the degree of internal injury in patients victimized by damaging electrical energy . Common to all varieties of extensive thermal injuries are the challenges to appropriately manage fluid balance and infection hazard.

Resuscitation

Fluid administration in the setting of burn injury and monitoring of efficacy are addressed by consensus recommendations presented in recent work published in the Journal of Burn Care & Research . In short, the accuracy and practicality of the original Parkland formula has been questioned. Resolution of these debates is important, in part because many burn centers have 'protocolized' the implementation of the formula by highly trained and specialized nursing personnel.

A valuable retrospective analysis has been conducted of the experience with burn patients treated at Parkland Memorial Hospital Burn Center during a 15 year period from 1991 to 2005 Included were burns in adults > 19% total body surface area (TBSA). In a review of nearly 500 patients, 43% received adequate resuscitation based on urine output criteria. Forty-eight percent were over resuscitated. Using these adequacy criteria, however, there was no observed difference in complication rates or mortality incidence between resuscitation categories.. While other groups have reported that intra-abdominal In summary, even in the home of the Parkland formula, actual burn resuscitation frequently does not meet the standard set forth by this clinical strategy. Patients commonly received higher fluid volumes than predicted by the Parkland formula. The Parkland team recommended placing emphasis on calculated formula volumes only as a guide to initial resuscitation, with subsequent fluids titrated to urine output.

A consensus statement has been released from the ABA regarding burn/shock resuscitation .Notably, no "standards" for the approach to the resuscitation of burn-injured patients have been derived from high quality contemporary studies.

Lacking unequivocal evidence, there currently is little agreement regarding optimal fluid composition, rate of fluid administration, and the role of colloids, such as albumin. No resuscitation parameters geared to regulating individual patient fluid needs by formula perform clearly better than routine hemodynamic endpoints and adequate urine output. Practitioners must be compulsive in providing adequate fluids but must also avoid excessive resuscitation. Many centers begin with the Parkland formula, which has now been renamed the Consensus formula for resucitation because it is the most widely used approach. This formula provides 4 mL/kg/% TBSA burned, describing the amount of lactated Ringers solution required in the first 24 hours after burn injury where 'kg' represents initial patient weight, and '% TBSA' is the extent of 2nd and 3rd degree burn injury. Starting from the time of burn injury, half of the fluid is given in the first 8 hours and the remaining half is given over the next 16 hours. Unfortunately, rapid determination of % TBSA burn and calculation of fluid requirements can be difficult and is often incorrect when the clinician charged with treating burns is relatively inexperienced.

Three additional points of clarification regarding burn resuscitation should be made. First, many patients, particularly those with burns <

20% TBSA, may be candidates for oral resuscitation as an intact gastrointestinal tract tolerates large amounts of administered fluid. Enteral resuscitation should be considered when resources are limited, an austere setting is encountered, and the patient is able to tolerate enteral intake. Second, invasive hemodynamic monitors including central venous catheters and pulmonary artery catheters have been employed to optimize burn resuscitation in a variety of prospective and retrospective studies. Patients with invasive central hemodynamic monitors tend to have far more fluid administered without commensurate improvement in outcome. While invasive monitoring may be indicated for patients with co-morbidities or patients who fail to respond to resuscitation prescriptions, a blanket endorsement of this approach cannot be made. Third, antioxidant therapies show promise in reduction of burn resuscitation fluid requirements and edema formation in a variety of preclinical trials. Unfortunately, patient data is limited and multicenter prospective validation has not been attempted.

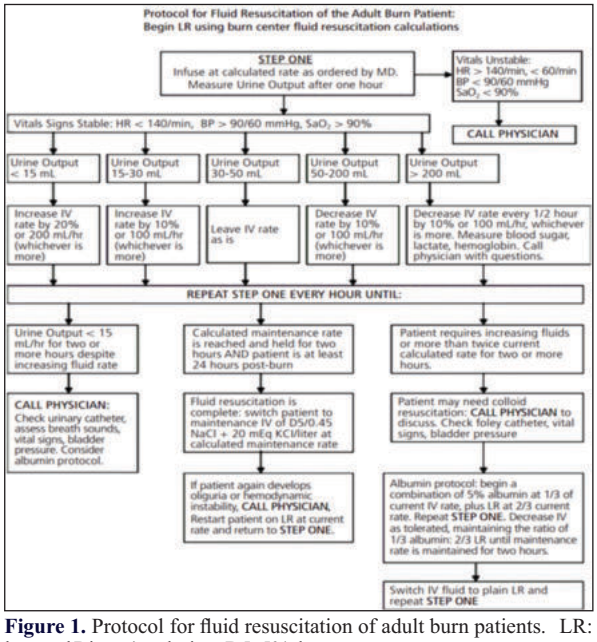

Figure 1. Protocol for fluid resuscitation of adult burn patients. LR: lactated Ringer's solution; D5: 5% dextrose.

Sepsis And Infection In Burn-injured Patients

In an important action, the ABA convened a consensus conference addressing burn sepsis and infection using methodology recently employed by the Society of Critical Care Medicine and other critical care societies .The conference and the documents produced from it applied consensus-driven definitions of organ dysfunction and infection as described in the general critical care population and modified these as appropriate to reflect the perturbations encountered in burn injury. This work is important, as the major cause of late death in the burn patient population is multiple organ dysfunction syndrome, which typically is driven by infection. Findings of this consensus conference process are highlighted below.

The concept of Systemic Inflammatory Response Syndrome (SIRS) should not be applied to burn patients While the SIRS concept has been widely accepted and utilized in critical care practice and clinical trials, it has been widely criticized for being too inclusive and insufficiently specific to effectively identify a relevant inflammatory state. Burn patients frequently demonstrate characteristics of SIRS throughout the majority of hospitalization. Biochemical markers have also been evaluated but at present do not apply to the specific physiology of the burned patient.

Septic shock for the burned patient is defined as sepsis induced hypotension that persists despite adequate fluid resuscitation. Sepsis-induced hypotension is defined as a systolic blood pressure (SBP) < 90 mmHg or mean arterial pressure < 70 mmHg or a SBP decrease > 40 mmHg or > 2 SD below normal for age in the absence of other identified causes of hypotension.

Smoke inhalation injury by anatomic definition is inflammation occurring below the glottis that results from exposure to the by-products of combustion. Diagnosis requires a relevant history of acute exposure and bronchoscopy that reveals carbonaceous material or signs of edema/ulceration. Smoke inhalation injury can occur with or without detection of products such as cyanide or carbon monoxide. Bronchoscopy demonstrating anatomic injury is the “gold standard” for diagnosis.

Pneumonia, a common complication of inhalation injury, is defined in a fashion similar to those of previous consensus conferences conducted by critical care and respiratory societies Clinical suspicion of ventilator-associated pneumonia must be verified by quantitative culture results.

VAP is an important complication in burn-injured patients. Burn patients are at high risk for developing VAP, particularly in the setting of inhalation injury. Prevention strategies are recommended, but relatively few are supported by strong evidence. Clinical diagnosis of VAP can be challenging in mechanically ventilated burn patients, a population in whom systemic inflammation, acute lung injury and non-infectious pulmonary infiltrates are prevalent. Quantitative strategies for identifying pathogens are the preferred method to confirm the diagnosis of VAP. Empiric antimicrobial therapy should cover resistant *Staphylococcus aureus* and gram-negative bacilli. In general, at least eight days of antibiotic therapy are recommended .

The role of early tracheostomy to facilitate secretion clearance remains unclear, along with the optimal means to deliver antimicrobials. While most centers use intravenous administration, several investigators are assessing the value of aerosolized antibiotics, which could enhance delivery to the lower respiratory tract.

Definitions of wound-related complications were also assembled .Wound colonization is present with bacteria on the wound surface at low concentrations. Wound infection is present with high concentrations of bacteria in the wound and wound eschar ($> 10^5$ bacteria/gram tissue). *Pseudomonas aeruginosa* is a frequent colonizing organism in burn and other soft tissue wounds. The yellow/green exudate of *Pseudomonas* does not necessarily indicate invasive infection. When changes consistent with deep tissue injury and systemic changes including organ dysfunction are seen, aggressive antibiotic therapy and surgical debridement are urgently warranted.

Pulmonary Issues

Respiratory failure in the burn victim is often characterized by hypoxemia with evolution to acute lung injury or acute respiratory distress syndrome (ARDS) .Even in patients without defined inhalation injury, the presence of ARDS is associated with poorer outcome. Management of inhalation injury consists primarily of time-honored supportive care. This may include mechanical ventilation with supplemental oxygen therapy and effective pulmonary toilet aided by catheter means or bronchoscopic interventions.

Inhalation injury describes pulmonary trauma caused by inhalation of thermal or chemical irritants. Such injuries are classified into categories of heat injury (which is usually restricted to upper airway structures except in the case of steam jet exposure), of local chemical irritation to the respiratory tract, and of systemic toxicity that may occur with exposure to carbon monoxide or cyanide.

Cutaneous burn injury may be excised and replaced with skin grafts, but injury to pulmonary tissue must merely be supported and protected from secondary injury. In addition to smoke inhalation, the critically ill burn patient often has multiple mechanisms contributing to lung injury, such as sepsis, ventilator-induced lung injury, or systemic inflammation in response to burns. Thus, inhalation injury impacts burn patient outcome but its role is difficult to separate from the contributions of other injury drivers which affect the lungs. Another significant limitation for clinicians treating smoke inhalation has been the lack of uniform criteria for diagnosis and scaling of outcome severity. As a result, multicenter trials are confounded by differing local definitions of inhalation injury. The need for widely accepted diagnostic criteria and for a quantifying system for inhalation injury has been acknowledged in the burn literature.

Outcomes

For over half a century, investigators have sought reliable predictive indices for outcomes from burn injury. Perhaps the best known is the

Baux rule, a simple sum of patient age and total body surface area in those suffering 2nd and 3rd degree burns. This index continues to receive attention; in fact, the Baux rule was recently addressed using patient registry data from the ABA.

CONCLUSIONS

The burn patient is easily over resuscitated. Practitioners must be willing to reduce fluid prescriptions when signs of adequate perfusion are present. Currently, adequate vital signs and urine output are the "gold standard" for perfusion assessment.

In the burn-injured patient traditional definitions of systemic inflammatory response syndrome (SIRS) and sepsis must be redefined based on the physiologic characteristics of burn injury. In addition, the burn patient is at risk for soft tissue infections and burn wound infection which have been better defined.

Inhalation injury that requires respiratory assistance should be provided in accordance with the same principles of lung protective mechanical ventilation used in other patients with ARDS.

Upper airway damage and smoke inhalation injury can occur with or without detection of oropharyngeal change or detection of combustion products in the blood such as cyanide or carbon monoxide. Bronchoscopy demonstrating anatomic injury represents the "gold standard" for diagnosis.

A number of factors predict mortality in burn injury. Burn size, presence or absence of inhalation injury, and extremes of age have been widely reported to be influential.

Renal failure and insufficiency are strongly associated with poor outcome following extensive burns.

Management by verified burn centers reduces cost of therapy for burn injury.

REFERENCES

1. Latenser BA. Critical care of the burn patient: the first 48 hours. Crit Care Med 2009; 37: 2819–26.
2. Baxter CR. Fluid volume and electrolyte changes of the early postburn period. Clin Plast Surg 1974; 1: 693–703.
3. Saffle JR. The phenomenon of "fluid creep" in acute burn resuscitation. J Burn Care Res 2007; 28: 382–95.
4. Pham TN, Cancio LC, Gibran NS, American Burn Association. American Burn Association practice guidelines burn shock resuscitation. J Burn Care Res 2008; 29: 257–66.
5. Blumetti J, Hunt JL, Arnoldo BD, Parks JK, Purdue GF. The Parkland formula under fire: is the criticism justified? J Burn Care Res 2008; 29: 180–6.
6. Greenhalgh DG, Saffle JR, Holmes JH 4th, Gamelli RL, Palmieri TL, Horton JW, et al. American Burn Association consensus conference to define sepsis and infection in burns. J Burn Care Res 2007; 28: 776–90.
7. Uchino S, Kellum JA, Bellomo R, Doig GS, Morimatsu H, Morgera S, et al. Acute renal failure in critically ill patients: a multinational, multicenter study. JAMA 2005; 294: 813–8.
8. Ivy ME, Atweh NA, Palmer J, Possenti PP, Pineau M, D'Aiuto M. Intra-abdominal hypertension and abdominal compartment syndrome in burn patients. J Trauma 2000; 49: 387–91.
9. Singer M, Deutschman CS, Seymour CW, Shankar-Hari M, Annane D, Bauer M, et al. The third international consensus definitions for sepsis and septic shock (Sepsis-3). JAMA 2016; 315: 801–10.
10. Chung KK, Rhie RY, Lundy JB, Cartotto R, Henderson E, Pressman MA, et al. A survey of mechanical ventilator practices across burn centes in North America. J Burn Care Res 2016; 37: e131–9.
11. Peck MD, Weber J, McManus A, Sheridan R, Heimbach D. Surveillance of burn wound infections: a proposal for definitions. J Burn Care Rehabil 1998; 19: 386–9.
12. ARDS Definition Task Force; Ranieri VM, Rubenfeld GD, Thompson BT, Ferguson ND, Caldwell E, et al. Acute respiratory distress syndrome: the Berlin Definition. JAMA 2012; 307: 2526–33.
13. Dries DJ, Endorf FW. Inhalation injury: epidemiology, pathology, treatment strategies. Scand J Trauma Resusc Emerg Med 2013; 21: 31.
14. Jeng JC. Patrimonie de Docteur Baux--Baux Scores >> 100 gleaned from 170,791 admissions: a glimmer from the National Burn repository. J Burn Care Res 2007; 28: 380–1.
15. Sheridan RL. Burn care: results of technical and organizational progress. JAMA 2003; 290: 719–22.