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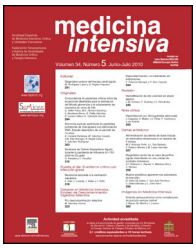

SERIES IN INTENSIVE CARE MEDICINE: NEW PERSPECTIVES IN THE MANAGEMENT OF CRITICAL BURN PATIENTS

Surgical treatment and management of the severely burn patient: Review and update

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Abstract Since one of the main challenges in treating acute burn injuries is preventing infection, early excising of the eschar and covering of the wound becomes critical. Non-viable tissue is removed by initial aggressive surgical debridement. Many surgical options for covering the wound bed have been described, although split-thickness skin grafts remain the standard for the rapid and permanent closure of full-thickness burns.

Significant advances made in the past decades have greatly improved burns patient care, as such that major future improvements in survival rates seem to be more difficult. Research into stem cells, grafting, biomarkers, inflammation control, and rehabilitation will continue to improve individualized care and create new treatment options for these patients.

PALABRAS CLAVE
Quemaduras;
Tratamiento quirúrgico;
Avances quirúrgicos

Tratamiento y manejo quirurgico del paciente gran quemado: revisión y puesta al día

Resumen La escarectomía precoz y la cobertura de la quemadura son fundamentales en la prevención de la infección en el paciente quemado agudo. Mediante un desbridamiento quirúrgico intensivo inicial se retira el tejido no viable. Se han descrito múltiples opciones quirúrgicas para cobertura del lecho cutáneo, aunque los injertos de piel parcial continúan siendo el estándar para una cobertura rápida y permanente de las quemaduras de espesor total.

Los grandes avances que han tenido lugar en décadas anteriores han mejorado de forma sustancial los cuidados del paciente quemado de tal forma que parece difícil que pueda haber mejoras importantes en las tasas de supervivencia futuras. Técnicas tales como la investigación en células madre, injertos, biomarcadores, control de la inflamación y rehabilitación contribuirán a mejorar unos planes de cuidados individualizados y a crear nuevas opciones de tratamiento para estos pacientes.

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Surgical treatment

Burns are common injuries with considerable morbidity and mortality. Early excision and grafting has been the standard care for decades. Since mid 70s most studies have shown that excision within 24–48 h after injury is associated with decreased blood loss, infection, length of hospital stay and mortality, and increased graft take,[1–4] although mortality reductions may only occur in patients without inhalation injury.[5,6]

The current therapy of the acutely burned patient is based on adequate resuscitation, early wound debridement and closure, support of post burn hypermetabolic response and control of infection. Therefore, since one of the main challenges in treating acute thermal injuries is preventing infection, excising the eschar and covering the wound as early as possible is critical. By early, aggressive surgical debridement, non-viable tissue is removed and hence the wound bed is relatively infection free. Furthermore, the removal of dead tissue has the potential to reduce the generation of chemical mediators that stimulate the inflammatory cascade leading to remote and multisystem organ failure.

Need for surgical intervention/debridement depends on the depth of the injury.

- Full-thickness burns destroy all of the dermal elements; hence there are no epidermal cells left to regenerate the injured area.
- Partial thickness injuries allow epidermal cells to survive in the dermal elements, such as sweat glands or hair follicles to repopulate the injured area.

In general, partial thickness and second-degree burns are used interchangeably, while full thickness and third degree are synonymous.

Complete debridement should proceed at the earliest possible opportunity, even if donor sites are insufficient to provide total wound coverage. In this case, biological dressings (preferably cadaveric donor allograft) should be used to cover the remaining wounds. Excision of burn wounds requires large volumes of blood for transfusion (approximately 1 cc/cm^2 to be excised).[7] Another factors leading to blood loss in burn patients are old age, male gender and extensive total body surface areas (TBSA) burnt. Blood loss can be minimized by the use of excision to the level of fascia or tourniquets when performing tangential excisions of the extremities. Moreover adrenaline-lidocaine subcutaneous infiltration solutions can be used in both burned areas and donor sites.[8] Besides, thrombin spray, fibrin glue, alginate dressings and topically applied adrenaline gauzes may also help dealing with bleeding.[7,8]

Tangential excision gives a better cosmetic outcome by leaving subcutaneous fat but blood loss is greater. On the contrary, fascial excision presents lower bleeding rates but worse cosmetic results. The latter is indicated in burns comprising extense TBSA and critical patients[1–3] (Table 1). The depth of excision is judged on the degree of bleeding and on visual inspection of the excised bed, both of which require the technical expertise of an experienced burn surgeon. Equally, to resolve the depth of the injury often relies on clinical examination and experienced judgment. In addition to examining burn wounds directly another potential method to determine the ability of burn wounds to heal is non-invasive imaging.[9] Recently, a number of non-invasive imaging techniques have been investigated for their use in determining burn depth. Such techniques include terahertz imaging, spatial-frequency-domain imaging, near-infrared spectroscopic imaging, and reflectance-mode confocal microscopy, among others.[10,11] Many of these techniques have not been yet refined sufficiently for clinical application. Nowadays, laser Doppler imaging provides the most evidence for accurately assessing burn severity,[12] but it has been shown to be superior to visual assessment only 48 h after thermal injury.[13]

The Versajet hydrosurgery system (Smith & Nephew, London, UK) is a device based on the Venturi effect, able to cut and aspirate debris contemporarily.[14] While in full thickness burns the sharp debridement is advisable, the Versajet shows its benefits in the treatment of partial thickness burns. Especially for debridement of difficult to treat areas such as the face, neck, lips, fingers, interdigital spaces, convex and concave areas. With the Versajet System, tissue excision is precise; moreover it helps to avoid the damage of viable tissue and its vascular supply. Is suggested by some to have facilitated a paradigm shift in wound management by allowing debridement of undesirable tissue while accurately preserving viable structures.[15]

Enzymatic debridement

Enzymatic debridement is considered one promising alternative to surgical excision and has driven motivated clinicians and researchers for half a century to investigate the potential of various non-surgical debriding agents and enzymatic debridement means for burns, even with slow and inefficient enzymes. Therefore, until recently, results proved to be highly variable.[16]

Hand burns have a special place in the field of burn care, demanding special attention and treatment. Hands are involved in 30–60% of all burn patients. Due to the anatomy of the hand (important and delicate structures crowded in a small limited space without subdermal soft tissue), surgical debridement of the burned tissue is technically difficult and may cause considerable complications[17] (Fig. 1).

Lately, enzymatic debridement studies have been reported with promising results.[18,19] Application is possible outside the operation room as long as sufficient analgesia is ensured during this otherwise painful debridement procedure. In a subgroup of hand burns, additional benefits were seen as these patients exhibited earlier time to wound closure and better long-term results.[18] Similar findings had previously been reported in a retrospective data analysis of 69 hand burns.[20] To date, other than pain, no enzyme-related adverse event or complications that jeopardize burn healing process have been reported.[19]

Escharotomy

When the burn eschar circumferentially surrounds any body structure (specially digits, extremities, abdomen, chest, or neck) the tissues within are subject to increasing interstitial pressures exacerbated by tissue edema developed