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Predictors of mortality: A comparison between two burn wound treatment policies

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ABSTRACT

Retrospective review of outcomes and experiences of a single burn centre between two time periods during which a new wound care technique was employed after the first period. The time period was divided into two: 1977–1984 and 1984–1990. Due to the use of cerium nitrate-silver sulphadiazine, the introduction of serial excision and grafting became possible in the second time period. Multivariate risk-analysis was done by logistic regression analysis. The mortality rate decreased from 13.7% (1997–1983) to 4.7% (1984–1990). Results of multiple logistic regression analysis indicate that the change in periods was advantageous for patients with >50% TBSA, within the age group, 0 to 30 years. Obviously, the care which a patient receives has improved significantly. Many developments occurred simultaneously and it appears impossible to conclude that only the use of cerium nitrate–silver sulphadiazine was the reason for improved survival. Nevertheless, the use of cerium nitrate–silver sulphadiazine enables sequential excision and grafting and in consequence allows for many of these developments to occur.

1. Introduction

Over the past decades, major advances in the treatment of burns patients have occurred. The prevalence of patient mortality after severe burn has decreased dramatically [1]. Generally, it is assumed that this is also due to a change of burn wound treatment policy namely to excise and close the burn wound as soon as possible [2–4]. However, in major burns it is not always possible to cover the burn wound immediately after excision of the eschar. The availability of autologous skin grafts and temporary skin substitutes play an important role in planning the operations [5]. Furthermore, clinical and bacteriological conditions are of paramount importance in selecting time, type and extent of the operation. Alternatively, burn wound excision can be staged, at weekly intervals, as sufficient autologous skin grafts become available to close the burn wound. Treatment with cerium nitrate–silver sulphadiazine was initiated to reduce the risk of burn wound infection. Cerium nitrate-silver sulphadiazine also allows for spreading the operations over fixed intervals by calcifying the burn eschar [6]. Because mortality continues to represent a leading role in determining the consequences of changes in burn care [7] we compared the mortality rates of the two consecutive time periods.

2. Materials and methods

In total 1231 patients were treated at the Leuven Burns Unit between 1977 and 1990. In the first period (1977–1983) 490 patients were treated and 741 patients were treated during the second time period (1984–1990). The age of the total group of patients varied from 0 to 92 years old (mean 28.5 years). The 25 quartile point was at 9 years, the 50 quartile point (median)

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Fig. 1 – The formed crust remains adherent three weeks post burn.

Fig. 3 – Tangential excision of the formed dry leathery crust.

was at 26 years, and the 75 quartile was at 42 years. Both genders were represented, 428 females and 803 males. The mean percentage burnt total body surface area (TBSA) was 22% (varied from 0–10% to 90–100%).

2.1. *Wound care protocol in the first time period*

Burn wound treatment entailed daily washing of the wound with a soapy diluted chlorexidine solution (0.05%) and application of topical treatment with silver sulphadiazine. Excision and grafting started after completion of fluid resuscitation at third to seventh day post burn. No total burn excision was performed. In an average operation 10–20% of the body surface was grafted. Application of 1.5/1 meshed autografts or 3/1 or 6/1 expanded was necessary, in order to obtain sufficient wound coverage. When insufficient donor material was available a xenograft (pig skin) was used or areas were left open to granulate. After healing of the donor site, further grafting was performed.

2.2. *Wound care protocol in the second time period*

Burn wounds were still washed with the soapy diluted chlorexidine solution (0.05%), however these wounds also received a daily 3 mm layer of 2.2% cerium nitrate–1% silver sulphadiazine cream (Flammacerium®). Cerium nitrate–silver sulphadiazine transformed the burn eschar into a leathery yellowish crust that did not separate from the deeper layers (Figs. 1 and 2). The leathery crusts were tangentially excised (Fig. 3) and covered with 1.5/1 meshed autografts. The average area excised and grafted per operation was between 5 and 10% total burnt surface area. If the wound bed was not suitable for rapid revascularisation of the autografts, a 1-week period of glycerolised allograft coverage (Dutch Skin Bank) was performed to enhance angiogenesis of the wound bed and to enhance the autograft take. In large burns 3/1 meshed autografts were covered with 1.5/1 meshed allografts [8]. Donor sites were re-harvested from non-aesthetically important areas.

In both periods patients received hypertonic fluid resuscitation during the first 24 h [9]. The infusion rate was adjusted every hour according to urine output. In the second time period a bolus of fluid was administered for the very first hour of therapy, independent from the time post burn. The first hour after admission fluid resuscitation consisted of 0.5 ml/(kg %TBSA) hypertonic lactate saline [10]. Anaesthetist and ventilator support have not been altered during the course of this study. In both periods total parenteral or enteral hypercaloric nutrition was initiated as soon as possible. For the control of infection individual isolation rooms were used. Patients received no systemic antibiotics and no selective digestive tract decontamination. Gastric mucosal protection, tetanus prophylaxis, analgesia, and Vitamin C were given to each patient. Standard techniques were used for dressing and graft fixation and the area was covered with standard burn wound bandage.

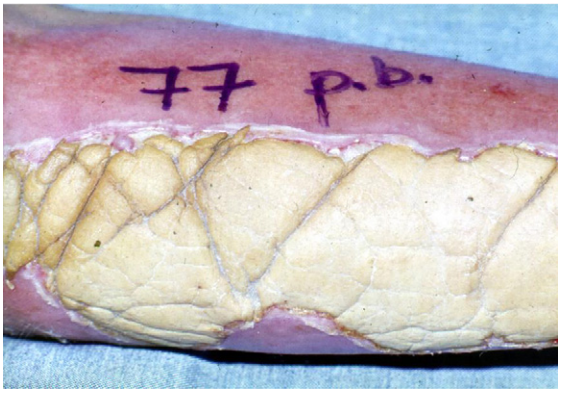

Fig. 2 – Dry leathery crust without signs of desloughing 77 days post burn.

2.3. *Statistical analysis*

In this study a data file of 1231 treated patients was used. Mean and standard deviation were given for age, medians and quartiles for TBSA%, and frequencies and percentages for mortality. Odds ratios, 95% confidence intervals (CI), log-likelihood chi-squares and *p*-values were given for the univariate relationships between mortality and potential risk factors. Multivariate analysis was done by logistic regression analysis using age and TBSA% as continuous variables. In order to allow for second-order interactions a best fitting model was used. Backward elimination and log-likelihood chi-squares were performed to test the found effects in the best fitting model. Categorized versions of TBSA% (a trichotomy) and of age (four classes) were used to compare and test odds