ACTIVE SURGICAL TREATMENT OPTIMIZATION OF SEVERE BURNS

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RELEVANCE

The results in treatment and recovery of severe burns are directly dependent on how soon the lost skin is restored. In this regard, the healing of burn wounds remains the most important general biological, medical and social problem [5]. There are no comprehensive data on the regeneration processes, not only in the burn wound itself, but also in the transplant [8]. Assessment of the condition of a burn wound, its readiness for autodermoplasty, the prediction of the success of surgical treatment are still subjective, depend on the experience and professionalism of the attending physician [2, 7]. In this regard, it is important to develop objective morphological criteria to optimize the surgical treatment of burn wounds. Therefore, it is necessary to have objective information about the depth of the burn lesion, about the possibilities of the regenerative potential of cellular elements in the affected area [1, 6. The issues of reparative processes and angiogenesis in the engrafted autodermal graft also remain poorly understood and are the subject of heated debate. The problem of accelerating the regeneration processes in a burn wound, suppressing wound infection, improving the results of autodermoplasty remains unsolved [3]. Despite the fact that in recent years the arsenal of means and methods used for thermal injury has significantly expanded, the results of treatment are not always satisfactory [4]. The costs of treatment of burn patients remain significant, resulting in difficulties with the long stay of patients in the hospital. This dictates the need for both the improvement of active surgical treatment of severely burned and the search for a morphological rationale for the optimal timing of necrotomy and autodermoplasty, which can ensure the fastest possible healing of burn wounds.

PURPOSE OF THE STUDY

Optimization of surgical treatment of patients with burn injuries based on the study of patterns of reparative regeneration of the morphological structures of the skin in the area of thermal damage.

MATERIAL AND METHODS

The study was conducted in accordance with the requirements of the Ministry of Healthcare of the Russian Federation No. 82 dated April 29, 1994 and according to the nomenclature of clinical laboratory research of the Ministry of Health of the Russian Federation (order No. 64 of February 21, 2013) taking into account the provisions of the Helsinki Declaration (2013). The work is based on studies of 196 patients aged 18 to 60 years with thermal burns who were treated in the Primorsky Burn Department of the Far Eastern Regional Medical Center of the Federal Medical and Biological Agency of Russia from 2004 to 2016. Inclusion criteria were the presence of burns of the IIIA–IIIB degree with an area from 10 to 20% of the body surface, the Frank index of 30–60 units. Exclusion criteria were the presence of a large area of superficial burns of I and II degrees, as well as deep ones of IV degree. To study the dynamics of morphological changes in all patients after receiving written voluntary consent, biopsy material was taken from burn wounds under local anesthesia and anesthesia. The study design was approved by the FEFU Biomedicine School of Ethics. The size of biopsy specimens was 2–3 mm^3. It was immunohistochemical identification of immunocompetent cells (Langerhans cells, macrophages, CD4, CD8). All patients received standardized treatment: infusion, antibacterial therapy, drugs to prevent acute stress ulcers of the upper gastrointestinal tract, DIC syndrome.

THE RESULTS OF THE STUDY

The dynamics of morphological changes in burn wounds was studied in two groups of operated patients, autodermal transplantation of which was performed in the first 7–14 days and at a later time.

We found that in the early days after a burn injury in the pathological focus in the 1–2 day there is a slight increase in the number of blood vessels in the loose to fibrous connective tissue with diffuse inflammatory infiltration, mainly lymphocytic, which is subject to the epidermis or wound surface. At the same time in the study of the proliferative activity of the epidermis and other skin structures, it was found that in the basal layers only a few cells have a high regenerative potential, and the Ki-67 gene is absent in the spinous layer. A mild regenerative potential is observed in the wall of hair follicles and sebaceous glands, in proliferating cells of the dermis. In the endothelium of the blood vessels, the low activity of the Ki-67 gene is also determined. By 3–4 days the regenerative potential of the skin increases. Epithelial cells with the inclusion of the Ki67 gene were found on the border of living and dead tissue. The fourth, fifth and sixth days are characterized by the fact that the number of proliferating cells in all skin structures increases, reaching a maximum on the 7th day and in the basal layers of the epidermis, where activity is manifested both in the basal and thorny layers, in the endothelium of blood vessels, and in the epithelial cells of the sweat glands. A quantitative analysis of the density of the capillary network of the skin showed that the density of capillaries increases from 7–8 days, then is approximately at the same level up to 9–14 days; at a later date, there is some decrease in this indicator. Engraftment of free skin autografts is divided into several stages: the formation of an adhesive or intermediate layer; degenerative processes; vascularization; regenerative processes.

When studying transplanted skin with the help of vital dyes, the bilateral conductivity of the *spine*, or intermediate, layer that develops between the flap and the bed is found. The skin flap is initially powered by soaking its intercellular gaps with tissue fluid. 8 hours after transplantation, leukocytes enter the graft, and after two days fibroblasts. We have found that with full engraftment of the graft, the amount of CD8+ increases less than 2 times to 5–7 days and by 14–15 days remains slightly elevated from the initial level. With full lysis of the graft, their content is tripled and remains high for 18–21 days. In the study of CD4 +, it was found that in the case of complete engraftment of the autodermal graft, their number slightly increases by 5–7 days, remains at the same level up to 14 days, and then quickly returns to its original level. With full lysis, the number of these cells remains elevated for a long time, but this indicator is not reliable. In the group of patients who had complete or partial lysis of the autodermal graft, it was noted that the number of Langerhans cells increased from 2–3 days after autodermoplasty and reached a maximum at 7–8 days. However, in contrast to the group where the complete engraftment of the skin flap occurred, their content remained high for 14–15 days after autodermoplasty. Only on the 20–21st day their number decreased to 15 in sight. In these same patients, the content of macrophages also increased, starting from 7–8 days, and reached maximum values also by 14–15 days, which indicates a pronounced antigenic stimulation and the development of immune responses in a burn wound.

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