



# Contemporary principles of surgical treatment of severely burned children

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## Summary

**Introduction.** The main problem of contemporary medicine is treatment of patients with deep and large burns. Among them the main group is burned children. Severely burned children are underwent great hazard than adults because of immaturity of tissue structures, imperfection of protection adaptability reactions of organs and systems of organism.

**Material and methods.** Early (on 5-7<sup>th</sup> days after injury) and early postponed (on 7-9<sup>th</sup> days after injury) necrectomy with radical excision of injured tissues were performed in 182 children aged from 8<sup>th</sup> month to 14 years old with burns IIIB-IV grade on the 5-40% of body's surface. In 37 burned children after surgical necrectomy skin defect was closed using temporary "Foliderm" wound covering. Afterwards final closing of skin defect was performed with perforated autograft at perforation coefficient 1:2. In all patients area of deep burn IIIB-IV grade was differentiated with method of thermometry using dermal thermometer developed in the clinic.

**Results.** The temperature of skin at the area of deep lesions was 1,5-3,0°N, which was lower than undamaged skin. Thus, method of active surgical management by using "Foliderm" synthetic temporary covering and subsequent final closing of deep burn areas with autograft provides reduce of lysis rate of transplanted autografts considerably.

**Conclusions.** Application of combined allo- and autodermoplasty, using of cultivated allofibroblasts in severe burned children with large deep burns and deficit of donor resources permits shorten of restoration term of skin, contributes to favorable outcome of burn disease.

**Keywords:** burn disease, treatment, active surgical tactic, necrectomy, autodermoplastic, temporari wound covering

## INTRODUCTION

The main problem of contemporary medicine is treatment of patients with deep and large burns [1-6]. Among them the main group is burned children [7]. Severely burned children are underwent great hazard than adults because of immaturity of tissue structures, imperfection of protection adaptability reactions of organs and systems of organism [3,5].

Being important component of the complex treatment of burn disease, the surgical treatment of deep burns in younger children significantly differ from treatment procedures of elder children and adults. Traditional methods of treatment of victims from thermal injury, designed for spontaneous rejection of burn scab, are insufficient effective because of treatment duration, which often cause generalization of infection processes and development of wound dystrophy [3,8].

Common viewpoint to the role of surgical necrectomy in treatment of burned children is absent [3]. According to opinions of several authors, optimal conditions for the engraftment are created in aseptic wound formed after excision of necrotic tissue, which shortens the treatment term and improves functional results [5,9].

Analysis of literatures data allows considering that multiple organ failure, burn sepsis and pneumonia are the main causes of lethal outcome in severely burned children. The problems of prevention of these complications of burn disease are not studied completely. One of the causes of the developing these complications is long existing of burn wound, lack of well-defined indications and contraindications for surgery, methods of closing of large deep burn wounds.

The purpose of this investigation was improving results of treatment of burn disease in children using methods of modern technology, active surgical tactics and temporary wound covers.

## MATERIALS AND METHODS

Early (on 5-7<sup>th</sup> days after injury) and early postponed (on 7-9<sup>th</sup> days after injury) necrectomy with radical excision of injured tissues were performed in 182 children aged from 8<sup>th</sup> month to 14 years old with burns IIIB-IV grade on the 5-40% of body's surface. In 32 children postponed autodermplasty (10-12 days after necrectomy) with split reticulate transplant was performed because of raised bleeding of dermal layer of skin or presence of wound with bottom consisted from subcutaneous flat.

In 37 burned children after surgical necrectomy skin defect was closed using temporary "Foliderm" wound covering. Afterwards final closing of skin defect was performed with perforated autograft at perforation coefficient 1:2.

In 81 patients on 5-7 days after necrectomy combined closing of wound surface with split reticulate autograft at perforation coefficient 1:4 and transplantation of cultivated allofibroblasts fixed on the substrate of polyvinylchloride were performed.

In 32 patients with large deep burn wounds and deficits of donor resources of skin on 7-9 days after necrectomy combined auto- and allodermplasty were performed.

Thermometry using dermal thermometer was used for detection of surface of deep burn wounds.

All victims were got medical therapy which was due to severity of thermal injury, time of delivery of patient to the hospital, the period of burn disease, presence of complications and concomitant disease.

Indications to early and postponed necrectomy were passage of traumatic shock, stable severe condition of patient, preference localization of deep wounds at extremities, period after injury is no more 5-7 days, absence of acute inflammation in wound and its surrounded tissues.

Contraindication to early and postponed necrectomy were extreme severe condition of patient, severe damage of respiration organs and complications at burn shock period, acute renal, hepatic and heart failures, development of colliquative necrosis of burn wound.

Criteria of evaluation of treatment efficiency were term of skin restoration and rate of postoperative complications.

## RESULTS AND DISCUSSION

In all patients area of deep burn IIIB-IV grade was differentiated with method of thermometry using dermal thermometer developed in the clinic. The temperature of skin at the area of deep lesions was 1.5-3.0 °C, which was lower than undamaged skin.

In 32 children with deep burns at 5 to 16% of body surface, which had early bleeding of dermal layer of skin after early and postponed necrectomy, autodermplasty with split reticulate transplant at perforation coefficient 1:2 was performed on 10-12 days after necrectomy. In all cases satisfactory engraftment was registered, which certificates about reasonability of waiting optimal readiness of recipient transplant's bed. In case of using the mentioned technique the average term of final restoration of skin cover was 28.2±3.1 days.

In 37 children with large deep burn on 15 to 30% body surface due to unreadiness of wound surface and deficit of donor resources, defect of skin cover after necrectomy was closed with synthetic temporary "Foliderm" wound covering, which is polymer from hydrophobic material and has multiple micropores permeable for gases and impermeable for microorganisms. Special technology of processing provides high electrostatic surface potential of wound covering; because of that it will has high adhesiveness to wound. On 5-7 days after necrectomy "Foliderm" wound covering was removed. Covering of wound surface with healthy granulation tissue was detected, which is suitable ideally for autotransplantation. Closing of these surfaces was performed with split reticulate autotransplant at perforation coefficient 1:2. Preliminary using synthetic temporary "Foliderm" wound covering provides decrease of loss from

large wound surface and improving of quality of granulation cover. In postoperative period there was no lysis of transplant. Term of restoration of skin cover was  $29.8 \pm 3.6$  days.

In 81 children with large deep burns on 15 to 40% surface of body on 5-7 days after early and postponed necrectomy combined closing of skin defect with split reticular autotransplant at perforation coefficient 1:4 and transplantation of cultivated allofibroblasts fixed on the substrate of polyvinylchloride were performed. Maximal area, on which matrix with cell culture, was 800-1000 cm<sup>2</sup>. Epithelization of cells of reticulate autotransplants with perforation coefficient 1:4 and intervals between autografts ends to 5-6 days after surgery. Term of final closure of wound surface was  $36.8 \pm 3.3$  days. Transplantation of allofibroblasts in patients with deep burns not only improves treatment outcome and hasten healing of cells of reticulate transplants, but also provides to use higher coefficient of expansion. Consequently, rationality of using of autotransplant raised and surface of donor wound shortened.

In 32 victims with large burns at 20 to 35% surface of body and deficit of donor resources of skin on 7-9 days

combination of autodermoplasty with transplantation of alloskin was used after necrectomy. Donors of skin were nearest relatives. The obligatory component of preoperative examination of donors was assessment of compatibility of blood groups and rhesus, analysis of RW, HBs Ag and HIV. Maximal area of transplantation of allograft was 1200 cm<sup>2</sup>. Application this method of plastic covering of granulating wounds provides performing multi-stage autodermoplasty surgery at more favorable conditions without development of local purulent complications. Restoration term of skin was  $39.0 \pm 3.8$  days after using that method.

## CONCLUSION

1. Active surgical management in complex treatment of severe burned children provides improving results of surgical treatment of that kind of patients significantly.
2. Method of active surgical management by using different types of temporary wound covering and cultivated allofibroblasts in severe burned children permits shorten of restoration term of skin and contributes to favorable outcome of burn disease.

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