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## **Severe burns: Prevention and treatment for multiple-organ failure**

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### **Abstract**

**Aims:** This study was to improve the results of treatment of burn patients through the prevention and correction of multiple organ failure syndromes.

**Material and Methods:** The courses of the study were patients aged 18 to 74 years who were treated at the of the Centre of Emergency Medical Care Samarkand Uzbekistan from 2008 to 2018. All patients during the observation period were divided into 2 groups regardless of treatment methods. The first (control) group consisted of 313 (48.67%) patients treated in the burn department during in 2008-2013, who underwent complex treatment with traditional anti-shock infusion-transfusion therapy and conventional methods of treating burns. The second (basic) group consisted of 330 (51.33%) patients treated in the burn department during in 2013-2018, who were offered shock infusion-transfusion therapy with improved inotropic and organoprotective support in connection with dysfunction of vital organs. Surgical treatment plays a leading role in the prevention and treatment of POE. These include necrotomy, multiple micro perforations for dry scabies, and necrectomy with simultaneous autodermoplasty.

**Results:** The presented results indicate that the proposed method and early surgical tactics for treating burns are undoubtedly effective in patients with severe burn injury. Concomitant early necrectomy with autodermoplasty decreased EPO in severe burns from 94.2% to 60.9% and mortality from 27.47% to 19.39%, which led to the length of hospital stay by  $42.5 \pm 1.3$  beds per  $33.3 \pm 1.0$  bed-days.

**Conclusions:** SPOI dysfunction is very serious: in dysfunction of two organs lethality makes 30-40%, in dysfunction of four or more organs or systems convalescence is practically impossible. However if active treatment of preventive character is provided, the patients life can be saved.

**Keywords:** burns, syndrome of poly organ insufficiency (SPOI) and treatments

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### **Introduction**

Burns are the fourth most common type of trauma world wide, after traffic injuries, falls, and interpersonal violence [1]. An estimated 11 million people worldwide sought medical care for burns in 2004. The risk of burns tends to increase with lower socioeconomic status, and up to 90% of burns occur in low-middle income countries. Annually, burns result in more than 7.1 million injuries, the loss of almost 18 million disability adjusted life years and more than 250,000 deaths worldwide [2].

In spite of great success achieved in burn treatment, a lethal outcome among severely burnt patients remains high even in specialized hospitals. Lethality is particularly high in critical (40-50% of body surface) and extra critical (over 50%) deep burns [3, 4].

The origin of multiple organ failure syndromes in patients with severe burns is practically not covered in domestic and foreign literature. It is known that burn disease is accompanied by multiple organ failure, but its pathogenesis, structure, and clinical and morphological features have not been studied [5, 6].

According to some authors, the most recent scientific concepts of burn disease can serve as a model for the syndrome of systemic reaction to inflammation resulting from severe trauma or infection. According to this theory, important signs of a systemic response to inflammation lead to impaired microcirculation and the blood coagulation system, increased vascular permeability, hypoxia, degeneration and destruction of cells against the

background of activation of phagocytic cells and immuno deficiency [7-10]. In this regard, the role of the systemic response to inflammation in the pathogenesis of burns and the origin of multiple organ failure has not been studied methods for the prevention of multiple organ failure and its correction in burn patients have not been developed.

The aim of the study was to improve the results of treatment of burn patients through the prevention and correction of multiple organ failure syndrome.

### **Materials**

The courses of the study were patients aged 18 to 74 years who were treated at Burn Department of the Centre of Emergency Medical Care, Samarkand Uzbekistan from 2008 to 2018. All patients during the observation period were divided into 2 groups regardless of treatment methods. The first (control) group consisted of 313 (48.67%) patients treated in the burn department during in 2008-2013, who underwent complex treatment with traditional anti-shock infusion-transfusion therapy and conventional methods of treating burns. The second (basic) group consisted of 330 (51.33%) patients treated in the burn department during in 2013-2018, who were offered shock infusion-transfusion therapy with improved inotropic and organoprotective support in connection with dysfunction of vital organs. An early active surgical intervention was

performed.

### Methods and Results

Patients underwent clinical, instrumental (X-ray, electrocardiography, endoscopy, echocardiography), laboratory (CBC, blood biochemistry, coagulogram). In addition, the histology and bacteriology of autopsy materials (burn wound extracts, blood) were studied.

Analyzing the etiological causes of burn injuries, the largest number of gunshot injuries (461 patients - 71.70%), which led to an increase in the number of deep burns in this group of patients. Burns with boiling water and hot liquids were reported in 140 patients (21.77%), sandal burns <sup>[11, 12]</sup> in 22 patients (3.42%), electric shock burns in 15 patients (2.33%), and contact burns in 5 patients (0.78%).

In 625 (97.2%) patients, deep burns of IIIB-IV degree accounted for more than 10% of the body surface area, and in 18 (2.8%) patients, deep burns accounted for less than 10% of the body surface area.

According to the Frank index (FI), the patients were divided into 4 groups: Group I - FI <30 units - 36 patients (5.59%), II - FI 30-60 units - 412 (64.07%), III - FI 61 - 90 units - 53 (8.24%), VI - FI > 90 units - 142 (22.08%). 69.67% of patients with a relatively positive prognosis (up to 60 FI units), doubtful and negative (more than 60 FI units) - 30.32%.

Localization of the burn was most often observed on the body and limbs (32.5% of patients), head and limbs (27.22%) and body (14.62%). Numerous localizations of burns from fire and boiling water were recorded in 126 (19.59%) patients. Inhalation trauma with skin burns was observed in 87 patients (13.53%). In most cases, the burn shock in these patients was severe. There was no significant difference in the location of burn injuries between the groups.

Based on clinical data and forensic medical examination of 140 corpses, a retrospective analysis of 150 deaths from severe burns and the structure of multiple organ failure syndrome was carried out, as well as a histological study of organ autopsy materials from 52 patients who died from multiple organ failure (group I - 15, in group II - 37).

Examination of 313 patients in the control group showed that 185 (59.1%) patients were admitted the period of burn shock, and 128 (40.9%) patients - during the period of acute shock. burn toxemia. 217 (69.32%) patients (out of 313) were under observation and were treated at the stage of septicotoxemia.

The study of the number of organo-systemic changes in patients of the control group with burn shock showed that EPO was diagnosed in all (100%) burns. Moreover, in most cases, 296 (94.57%) patients were diagnosed with dysfunction of three or more organs and systems.

Encephalopathy was observed in 51 (27.57%) patients with burn shock and POE syndrome, which proved the dominance of the central nervous system (MAC) in the regulation of the body's vital functions. MAC deficiency in most patients in this group manifested itself in the form of intoxicating delirium or impaired consciousness (agitation, apathy, stupor, coma).

The defeat of the respiratory system was observed in 55 (29.72%) patients and in 50 (27.03%) patients with clinical manifestations of gastrointestinal tract damage, leading to hypoxia, metabolic processes and disorders of water and electrolyte metabolism, affecting the severe course of burns. shock.

Secondly, damage to the cardiovascular system (CVD) was detected in 56 (30.25%) patients. In most cases, they do not belong to the hypoxic-metabolic genesis, since they occur in the early stages of burn shock. Renal failure occurred in 54 (29.19%) patients, liver failure syndrome - in 42 (22.7%) patients.

It is reported that in patients with intestinal insufficiency syndrome (IES) during the outbreak of PVE, it is the leading syndrome. Functional insufficiency of the gastrointestinal tract, according to our clinical observations, toxic paresis of the stomach and intestines in the form of acute erosions or lesions of the esophagus, stomach, duodenum and small intestine, rarely bleeding (12 patients). All this confirms that, according to many previous authors, the intestine is the most frequently injured target organ during burn shock. The intestine, which is prone to ischemia at an early stage, is an additional gateway for infections in addition to burns. Analysis of the symptoms of intestinal dysfunction in patients with thermal trauma of the gastrointestinal tract in the control group revealed 4 main symptoms of IES: multiple recording (46.33%), stress curling ulcer (19.49%), paresis of the gastrointestinal tract (24.6 %). and multiple diarrhea (11.18%).

In the course of these studies, the following pattern was revealed: the longer the burn shock lasts, the greater the severity of the lesions according to MIT. With a shorter duration of shock, when in fact with more notes, Curling causes stress ulcers when the shock lasts longer, resulting in bleeding and persistent intestinal paresis, which interferes with oral and enteral nutrition of patients (12 cases).

Studies of this category of patients show that the severity of burn injury is the main factor in the occurrence of burn shock and changes in vital organs and systems, determining the duration of burn shock and POE, as well as higher treatment results. The presence of intestinal dysfunction, in turn, indicates the severity of the burn disease.

The syndrome of multiple organ failure ranged from 2 to 7 lesions of systems and organs, while the severity of the burn injury, as well as the number of affected systems and organs, increased. 2-4 systemic and organ lesions were observed in 250 (79.87%) patients, 5-7 systemic and, less often, organ lesions - in 63 (20.12%) patients. However, both dysfunctional symptoms and signs of deficiency were observed in patients with diffuse dystrophic and destructive organ changes against the background of a simultaneous response to systemic inflammation. Mortality increased sharply when 4-5 systems and organs were affected, while dysfunctions of only 3-4 organs were observed.

Adequate infusion-transfusion therapy of shock according to the Evans formula (1952) was started in a conventional medical complex with 185 patients with burn shock in the control group. The main treatment of patients in a state of burn shock, in the opinion of us and many other researchers, is to carry out adequate infusion-transfusion therapy on the first day of hospitalization.

It should be noted that the recipes for infusion therapy from different authors are not clear and are not needed. These empirically oriented recipes are intended for the initial treatment period as a "general guideline".

When analyzing the structure of lethal outcomes in this contingent, respiratory failure (88.89%), cardiovascular system (77.78%), MAC (66.67%), in rare cases - renal failure (33.34%) and MIT failure (22.23%), however, the occurrence of irreversible multiple organ failure is observed in most cases of

respiratory failure and bleeding from the gastrointestinal tract. Analysis of the results of treatment of burn shock in patients of the control group showed that with traditional anti-shock infusion-transfusion therapy, shock relief and elimination of POE failed in 9 (11.9%) patients, which led to death in burn shock.

With this in mind, it is necessary to improve the infusion-transfusion therapy with inotropic and organotropic adjuvants in the arsenal of combustiologists.

Results of surgical treatment of patients in the control group.

Of 313 patients in the control group who underwent deep IIIB-IV degree burns, 227 required further surgery. Surgical treatment of the severity of the burn condition (with significant manifestations of POE symptoms) was carried out on average  $26.5 \pm 1.0$  days after the patient was admitted to the hospital. In the operated patients, the burn area ranged from 2 to 40% of the body surface, of which the degree of deep IIIB-IV burns ranged from 3 to 30% of the body surface.

Of the 227 patients who underwent autodermoplasty (ADP), 81 (35.68%) completed stage I, and 146 (64.32%) - stage II. The area of careful necrectomy was  $11.7 \pm 0.7\%$  on average.

The results of the analysis of postoperative complications and causes of death of patients in the control group (227), where the burn surface was prepared conservatively and surgically, showed that pneumonia is the most frequent purulent-infectious complication. At the same time, pneumonia was focal in 23.0% of cases, and in 2.4% of cases there was a tendency towards abstraction. In 11.86% of patients, septic complications in the early postoperative period ended in the development of sepsis. In 8.47% of patients, purulent-infectious complications developed at the site of the injury.

The unsatisfactory results obtained in the treatment of patients in the control group lead to a deeper study of the pathogenesis of the development of burn shock with the identification of the most important criteria for assessing the patient's condition. However, the development and study of high-tech schemes for infusion-transfusion therapy required adequate correction of the severity of POE for early surgical access.

All fire victims in the main group were listed during the burn shock period. He underwent anti-shock infusion-transfusion therapy, preoperative preparation and early active surgical tactics in a modified form for shock and toxemia.

For a more objective diagnosis of burn shock in patients of the main group, we monitored laboratory parameters depending on the level of burn shock. Clinical and laboratory parameters of patients in this group at the time of admission to the hospital did not practically differ from those of patients in the control group. Studying the pathogenesis of burn shock in 330 patients of the main group, we tried to identify a number of objective criteria based on clinical and laboratory data, on the basis of which it is possible to achieve optimal options for infusion-transfusion therapy for a more accurate assessment of the weight status of patients. and fix the identified changes. We included the following indicators: heart rate (HR), AB, MVB, microcirculation, body temperature ( $t^{\circ}$ ), urine output, presence of POE, hemoglobin level, hematocrit, etc.

The results obtained were statistically processed, respectively, the severity of burn shock (mild, severe and very severe) was determined in patients of this contingent, standard values and reliable intervals for each of the above criteria were established.

The leading clinical and physiological symptom of burn shock is

hypovolemia, the main manifestations of which are hemoconcentration and oligoanuria.

In this contingent, as a result of the influence of the inflammatory factor in patients: increased permeability of the vascular membrane (syndrome of "capillary fluid leakage"), spasm of microtubules and deterioration of coagulability and rheological properties of blood (DVS-syndrome), slowing down and cessation of blood flow in the microvasculature (accumulation syndrome and sequestration of blood). Serotonin, histamine, quinine, free radicals, prostaglandins, lipases, endoperoxidases, etc., responsible for these changes, have always been significantly higher in burn shock. This worsened the course and consequences of the disease.

Our clinical and laboratory data showed that the most indicative in assessing the severity and effectiveness of burn shock was a mild form: blood hematocrit (detected every 8 hours), hourly diuresis, acid-base status of blood (once a day), blood pressure and central it is desirable to determine the venous pressure (MVP) (per hour).

The use of these objective diagnostic criteria in clinical practice made it possible to more adequately select the necessary scheme of anti-shock infusion-transfusion therapy, which not only corrects patients with POE, but also reduces the number of patients in the intensive care unit by 2 people. -3 days.

Therefore, early diagnosis and adequate intensive care for burn shock is a prerequisite for preventing the development of severe shock and POE, as well as improving the results of treatment of patients in this contingent. The key link in such a pathogenetic chain is the selection of the required amount and the optimal composition of infusion therapy for shock.

Therefore, the quantitative and qualitative composition for infusion-transfusion therapy was optimized and individualized in the course of these studies.

With rehydration (According to Parcland),  $2/3$  of the infusion volume is retained for the first 8 hours. Depending on the degree of shock, the crystalloids were  $2/3 - 1/2$  of the indicated volume, and the colloidal preparations were, respectively,  $1/3 - 1/2$  of the indicated volume.

Anti-shock infusion-transfusion therapy also included intravenous administration of a mixture of glucose and novocaine (0.25% novocaine solution and 5% glucose solution 1: 1) intravenously.

On the 2nd day of burn shock, intravenous infusions were reduced by 2 times, on the 3rd day - by  $1/3$  of the initial calculated volume. To comply with these rules, central venous catheterization was performed on all burns with moderate and severe burn shock.

Subsequently, the rate and volume of drug administration were adjusted taking into account diuresis, hematocrit, hemoglobin, pulse dynamics, as well as central venous and arterial pressure, blood electrolyte composition and acid-base balance.

The introduction of protein colloidal solutions was started 12-16 hours after the start of infusion therapy, while some internal and external sectors were balanced. The placement of native plasma, which contains all protein fractions and affects the osmotic and oncotic properties of blood, turned out to be more effective. Albumin solution was used to reduce vascular permeability and stop tumor growth in the burn area. The infusion rate of protein preparations was 1-2 ml / kg / hour. To improve the rheological properties of ions, protein-free medium and low-molecular

colloidal solutions with a volume of 400-800 ml at a rate of 2 ml/kg / h are recommended.

In severe burn shock with late initiation of infusion therapy, blood pressure rises by 90 mm Hg. Art. With the introduction of calculated amounts of crystalloid and colloidal solutions. mouth can't keep high.

In these cases, we do not consider it advisable to increase the volume of injected fluid, since this leads to an increase in interstitial and intracellular fluid, which leads to myocardial insufficiency, which indicates the high importance of MBP, and in this case inotropic drugs (dopamine 5- At a dose of 10 µg / kg / min). At this dose, dopamine improves myocardial contractility and increases blood flow to the heart. At a dose of 1-3 µg / kg / min, it improves renal perfusion.

In addition to adequate anesthesia, during the infusion we have a 6% vitamin B1 solution - 1.0; vitamin B6 2.5% - solution - 1.0; We consider it necessary to add 200 µg of vitamin B12 solution. In order to preserve the duration of anesthesia, transfer energy, and prevent fat embolism, 77 patients with pneumonia were injected intravenously with a 33% solution of 20-30 ml of alcohol 3 times a day.

Vitamin therapy is widely used:

- vitamin S - 5% solution, 20 ml 2-3 times a day;
- vitamin B1 6% -, B6 - 2.5% solutions, 5 ml 2 times a day;
- vitamin V12 - 200 mcg once a day;
- Riboxin - 2% solution, 10 ml 3-4 times a day.

The results of a retrospective analysis showed that in many patients, given the efficacy of stabizol, succinazole, refortan and rheosorbilact, there is no need for blood transfusion to normalize AKH (circulating blood volume) and relieve shock. Today, it is advisable to donate blood and its components only in severe forms of shock that cannot be eliminated with polyglucinol, HES drugs, vasopressors and hormones, with blood loss in severe burn injury, severe anemia, hemostasis disorders accompanied by hypotension.

In myocardial insufficiency (MVB > 12 cm above sea level, signs of lung tumor), cardiac glycosides and hormones have been used to improve the functioning of the cardiovascular system.

81 patients with oliguria were prescribed 2.4% aminophylline solution and 20% glucose solution against the background of adequate infusion therapy to influence microcirculation.

A special place in our practice is occupied by intravenous administration of HES preparations and novocaine solution (250-100 ml of 0.125% solution) in order to combat vascular permeability and plasma loss. Intravenous administration of a weak solution of novocaine not only reduces vascular permeability, but also improves microcirculation.

It should be noted that in 32 patients with burns at a depth of 30-45% of the body surface persistent hypotension and excessive plasma loss (refractory shock) persisted despite the normalization of AKH. In such cases, we used intravenous prednisone and dopamine instillation.

In 39 patients with oliguria on the background of infusion therapy and AQH replacement, osmotic diuretics: mannitol (1 g dry matter per 1 kg of body weight) 15-30% solution was injected intravenously, and then recommended for ring diuretics (laxate 3-5 mg / kg per day). It should be noted that the earlier diuretics are used, the more pronounced the effect.

Our studies have shown that metabolic acidosis occurs in patients

with severe shock. Such a shift was necessarily taken into account when carrying out complex therapy. It is advisable to use buffer solutions to compensate for hypovolemia after the introduction of a 0.125% solution of novocaine and a 2.4% solution of aminophylline, as well as after reducing the spasm of peripheral vessels, which occurs after the restoration of peripheral circulation.

We believe oxygen therapy is essential in all cases.

Correction of electrolyte disturbances was calculated depending on the severity of the burn shock and the patient's body weight. However, the patient's daily sodium intake and weight loss were taken into account.

Considering the onset of hyperkalemia ( $6.9 \pm 0.05$  mmol / L according to our data) on the first day of burn shock, new blood components were placed 2 days after the injury.

In 88 patients with extensive body burns, cocarboxylase was administered intravenously at a dose of 100-150 mg per day to improve metabolism. To prevent the development of tissue erosion, 82 patients were injected intravenously with a protease inhibitor - a contraceptive (200-300 IV per kg of body weight per day) or Gordox 100,000-200,000 IU.

Summarizing the above, it should be noted that our studies allowed us to develop a working scheme for infusion therapy for mild, severe and very severe burn shock.

Therefore, patients with mild burn shock should receive fluids within 48 hours of injury. After the second day, the total fluid intake can be reduced by 1/3. That is, if on the first day the emphasis is on crystalloid solutions, the ratio of infusions of crystalloids, colloids and unsalted solutions will be (1: 1: 1), taking into account the loss of plasma from the burn wound at the end of the first day and the second day.

Therefore, infusion therapy should be carried out within 3 days after injury in severe burn shock. As a rule, on the second and third days after the injury, the volume of fluid decreases by 1/3 compared to the first day. So, on the first day, the ratio of crystalloid, colloidal and unsalted solutions is 2:1:1, on the second and third days-1:1:1.

Studies have shown that the proposed infusion therapy regimen, which includes the introduction of crystalloid, colloidal and unsalted solutions, provides adequate standardization of electrolyte imbalance, which plays an important role in shock, which has been proven by clinical and laboratory studies.

Clinical and laboratory indicators of the dynamics of treatment of anti-shock infusion-transfusion therapy in the main group of patients showed that the number of erythrocytes decreased from the first day until recovery from shock (2-3 days) ( $5.0 \pm 100 \times 10^{12} / l$ ), which is associated with moderate hemodilution after therapy. On the second day after the injury to the MVD, the water level was even, that is, this indicator returned to normal. In addition, after 3 days of treatment, there was an increase in total protein ( $59.5 \pm 1.5$  g / l) and albumin ( $52.1 \pm 0.1\%$ ). Total and free cholesterol levels doubled from baseline after 2 days of treatment, indicating recovery in liver function and metabolism.

Thus, the results of clinical and laboratory studies have confirmed the effectiveness of infusion-transfusion therapy, carried out according to the improved Parkland formula.

In the course of treatment, this was reflected in the normalization of the BMI ( $9.16 \pm 1.98$ ,  $r < 0.05$ ), the normalization of blood pressure and laboratory parameters.

Sixty-five patients of the main group received intravenous

complex-enteral compound Probe III. This type of artificial feeding is more effective - the enteral mixture Probe III, created in the Burn Department of the Centre of Emergency Medical Care. We were given from 2 to 2.5 liters daily for 7-9 days with a break of 2-3 hours periodically for 4-6 hours. No complications were observed with enteral nutrition. When studying the amount of damage to organ systems in patients with burn shock, POE was recorded in all 330 (100%) patients of the control group, and damage to three or more organs and systems in 161 (48.78%) cases. The defeat of the respiratory system in 32 (9.69%) burn patients, damage to the central nervous system in the form of encephalopathy syndrome in 104 (31.51%) decreased by 10-11 points on the Glasgow scale, in 34 (10.3%) cases - in the form of toxic paresis of the gastrointestinal tract MIT. The cardiovascular system was observed in 49 (14.84%) patients with renal impairment, in 85 (25.75%) with hepatic impairment and in 64 (19.39%) with hepatic impairment.

It should be noted that in recent years we have managed to reduce the number of Kurling stress wounds, which are a serious complication of burn shock, including complete anesthesia with organoprotective therapy, normalization of volemic and rheological parameters, and the use of histamine receptor N2-blockers, especially in the first hours after injury.

Results of active surgical tactics in the main group of injuries.

The modified method of anti-shock infusion-transfusion therapy makes it possible to exclude patients from burn shock (Group I -  $26.6 \pm 1.1$ ; Group II -  $20.2 \pm 0.92$ ;  $R < 0.05$ ), thus, early stage that queue is a POE warning.

In total, during the study, 330 patients underwent 88 necrotomies, 191 early surgical necrectomies, and 75 delayed necrectomies. Simultaneous early surgical necrectomy (EXN) was performed on 9-15% of the body surface area with an average burn area of  $12.5 \pm 0.5\%$ . Closure of all deep defects of stage I was performed in 192 (72.18%) patients. In 74 (27.82%) patients, pacemaker was performed in 2 stages. The deep burn area in this group ranged from 9 to 35%.

Simultaneous wound closure with pacemaker and autoplasty was performed in 167 (86.97%) patients.

Autograft lysis was observed in 9 patients.

Comparing the clinical and laboratory data of patients who underwent early surgery (before 2003), with active surgical tactics, a rapid and noticeable decrease in intoxication and general inflammatory response, normalization of metabolism and restoration of homeostasis are achieved. The average duration of hospitalization of patients in the main group was  $32.2 \pm 1.0$  days. Of the 330 patients in this group, 64 (19.39%) died. All deceased patients showed damage to 3-5 organs in various combinations.

## Discussion

The World Health Organization (WHO) broadly defines a burn as an injury caused by heat (hot objects, gases, or flames), chemicals, electricity and lightning, friction, or radiation. More than 90% of the burden of burn injury is borne by low- and middle-income countries<sup>[13]</sup>.

The ABA reports that 40,000 patients were hospitalized with burns in 2016, and 30,000 of those patients were admitted to the 128 burn centers in the United States<sup>[14]</sup>. The mean burn size has been decreasing, especially in high-income countries, but despite these encouraging statistics, large burns still occur.

The estimated total number of deaths per year in all low- and

middle-income countries is 180,000. Death rates rise with increasing burn size and depth, older age, and smoke inhalation. Critical condition, developing in patients with burns during the burn shock more often produce the development of nonspecific reactions in the body, manifested as the system or the organ insufficiency and are determined by the term syndrome of poly organ insufficiency (SPOI). Independent of patient's age consequence of SPOI formation is the following: encephalopathy → gastrointestinal dysfunction → acute injury of the lungs → cardiovascular dysfunction → DBC → Hepatic dysfunction → renal dysfunction [15, 16]. SPOI dysfunction is very serious: in dysfunction of two organs lethality makes 30-40%, in dysfunction of four or more organs or systems convalescence is practically impossible. However if active treatment of preventive character is provided, the patients life can be saved<sup>[17, 18]</sup>.

A hospital stays for a patient with massive burnsis usually long because weeks to months are required to close the wounds. A typical length of stay is approximately 1 day for every percent of the total body-surface area that is burned, although major burns require longer stays.

During this prolonged inpatient stay, there are three main tasks: close the wound, deal with the hypermetabolic response, and treat the almost inevitable bouts of sepsis and multiple organ dysfunctions.

## Conclusion

Thus, the presented results indicate that the proposed method and early surgical tactics for treating burns are undoubtedly effective in patients with severe thermal injury. Prevention of POE syndrome is important in patients with severe burns. These include intensive transfusion therapy, combined antibiotic therapy, organoprotective therapy, correction of the premorbid background, and a complex of nutritional support in the prevention of EO in burns.

Surgical treatment plays a leading role in the prevention and treatment of POE. These include necrotomy, multiple microperforations for dry scabies, and necrectomy with simultaneous autodermoplasty. It is known that burn injury is the source of sepsis and POE syndrome, which can be considered as a pathogenetically justified option for surgical treatment.

Concomitant early necrectomy with autodermoplasty decreased EPO in severe burns from 94.2% to 60.9% and mortality from 27.47% to 19.39%, which led to the length of hospital stay by  $42.5 \pm 1.3$  beds per  $33.3 \pm 1.0$  bed-days.

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