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Original Research Article

Deep Burns in Elderly Patients and the Influence of Autoplasty on Oxidation-Reduction Process

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Abstract: Burn injuries in the elderly burn victim need to be treated as aggressively as is done in young people; yet, special considerations are necessary. In this study, we first looked at our entire cohort of 441 patients with over 60 years old. In work were used investigation methods of whole protein content and aluminous fractions, hemorheology and systems of hemostasis, hematocrit and intermediary metabolism rates. Gradual normalization of glutathione level, catalase, carbonic anhydrase, concentrations of lactic and pyruvic acids, confirm that skin defect restoration by auto grafts eliminates oxygen lack and improves liver function in the burned.

Keywords: elderly patients, deep burns and oxidation-reduction process

INTRODUCTION

According to the World Health Organization, there are an estimated 330,000 deaths per year worldwide related to thermal injury (Peden, M. *et al.*, 2002). Burn injuries are the principal reasons accounting for emergency department admissions in elderly patients. Elderly patients over 65 years of age constitute between 13% and 20% of admissions to burn units, but have the highest death rate among the overall burn population (Brigham, P. A., & McLoughlin, E. 1996).

Burn injuries in the elderly burn victim need to be treated as aggressively as is done in young people; yet, special considerations are necessary. In general, elderly, who represent the fastest growing population, have been shown to be particularly susceptible to burn injuries (Pham, T. N. *et al.*, 2009). This is due to thinning skin, decreased sensations, mental alterations, or other contributing factors.

The higher risk of suffering from a burn injury in elderly population along with the rapid growth of this population will change the burn treatment paradigms in the near future. Thus, the increased risk and heightened probability of the expanding elderly population suffering from burn injuries require burn treatment paradigms to incorporate the treatment tailored to older subjects.

The major causes of thermal trauma in elderly include flame burn (66%), cooking accidents (33%), scald burns (15%) and contact injuries (15%) (Gerstein, A. D., *et al.*, 1993; Pham, T. N., *et al.*, 2009). This is convinced by age-related changes and concomitant diseases, and also by instability of metabolic processes and low compensation abilities of organism, which determines the high percent of lethality from 24 to 63%. (DiGuiseppi, C., *et al.*, 2000; Lundgren, R. S., *et al.*, 2009).

MATERIAL AND METHODS

In this study, we first looked at our entire cohort of 441 patients with over 60 years old. In general, burn patients that were admitted to our burn center with thermal injuries were eligible for enrollment. Demographic data were collected on all patients.

A mostly frequency of early undergone myocardial infarction (18%) and cerebral stroke (15, 5%) should be noted among concomitant diseases in patients with deep burns, but insular diabetes and alcoholism were found in 12% of them. In work were used investigation methods of whole protein content and albuminous fractions, hemorheology and systems of hemostasis, hematocrit, intermediary metabolism rates (COS, residual and intermediate oxidability,

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glutathione, lactic and pyruvic acids, catalase and carbonic anhydrase of blood.)

RESULTS AND DISCUSSION

Our clinical experience shows more clearly defined influence of free flaps grafting on the level of erythrocytes, hemoglobin, hematocrit and indicators of intermediary metabolism. Significant increasing of enumerated indicators (in 157 patients) confirms the essential role of skin's lost function in burn disease pathogenesis as the organ which is participating in metabolism. The acid - alkaline state of blood was examined in 50 patients before and after skin autoplasty. Test results showed that shifts to the metabolic acidosis are less manifested in patients after surgery in terms to 1 month after the trauma. After autoplasty they go rapidly into liquidation in any cases and practically come to normal. In connection with thermal trauma elimination the quantity of unoxidized products are reduced and oxygen requirements of tissues are obtained more completely.

A definite interest presents test of intermediary metabolism indicators in 102 patients before and after free flaps grafting. Close connection emerges between engraftment of autodermic grafts and blood oxidizability level (135, 1±3.0 MGO2 goes down to 106, 15±1, 0 MGO2). Highly probable, that regeneration of cutaneous covering improves the oxygen balance in organism and can contribute to intracellular oxidation.

Glutathione takes an active part in glycolytic oxide- reduction mechanism. Being the donor of Hydrogen ions, it maintains content of biologically active sulfhydryl groups. Case monitoring of glutathione content and it's fractions in 75 patients showed, that beginning from 1-3 day after skin grafting, the reduced glutathione content was increasing (0,84 ± 0,02 to 1,35±0,02 mmol/l). Increasing of glutathione content in early period of skin grafting was more intensive than in free flaps grafting on granulating wounds (in 45 and 30 patients, respectively).

Glutathione takes an active part in oxidation-reduction processes by disulfide bonds reduction of enzymes to form SH-groups, which are necessary for manifestation, their catalytic activity.

Therefore increasing of reduced glutathione level is considered not as the result of increasing of unoxidized products content, but as organism's compensatory reaction in reply to disturbance of oxidation-reduction processes. Hence it became clear that gradual increase of total glutathione level at the expense of reduced fraction was observed under favorable postoperative course and was attended by gradual decrease of the quantity of unoxidized products of metabolism.

Restoration of skin function favours the increasing of whole protein content and reduced glutathione and gradual decrease of the quantity of unoxidized products, all these confirm improvement of oxidoreduction processes. Apparently, free flaps grafting promotes the increasing of reduced glutathione level in blood (0,51 ± 0,1 to 1,18 ± 1,01 mmol/l), which stimulates the activity of blocked enzymes and thereby improves oxidation-reduction processes.

Have studied the state of oxidation-reduction processes at deep burns in elderly people, we tried to detect diagnostic and prognostic value of investigated indicators. It became clear, that values of oxidoreduction may be used for diagnostic purposes of different complications and grafts necrosis.

Have been founded that concentrations of lactic and pyruvic acids were left too high for a long time in elderly people with bad immediate prognosis of blood oxidability. Concentration of lactic acid in blood about 3, 5 mmol/l and higher was a bad prognostic sigh (2 out of 5 patients, who has been registered with such hyperlactacidemia, are dead.

CONCLUSIONS

Gradual normalization of glutathione level, catalase, carbonic anhydrase, concentrations of lactic and pyruvic acids, confirm that skin defect restoration by auto grafts eliminates oxygen lack and improves liver function in the burned. Must reckon, that the earlier skin autoplasty was made, the more rapidly the parameters of intermediate metabolism returned to normal values.

Thus residual and intermediate oxidability of blood, concentrations of lactic and pyruvic acids, reduced glutathione content can be used as supplemental indicator for determination of the nearest and remote forecast in the burned.

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