Treatment of Deep Burns with Human Fetal Tissues

S. V. Smirnov, M. V. Shakhlamov, Yu. A. Blidchenko, E. M. Molnar, G. T. Sukhikh, and M. Yu. Sutyrin

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Treatment of third (AB) degree burns by applying a suspension prepared from human placenta and fetal skin proves as effective as plastic surgery. This approach is particularly helpful when supplies of donor skin are limited, in the therapy of patients with polyvalent allergy, elderly and senile patients with a severe somatic pathology hampering autodermaplasty, in the therapy of children, and in cases of untreatable infected burns.

Key Words: *transplantation of human fetal tissues; neurosurgical treatment of deep burns; application of fetal skin and placenta*

Although there is a wide variety of drugs and dressings applied in burn therapy, the search for new preparations, which can locally stimulate reparative processes not only in subdermal but also in dermal burns, is ongoing. It should be emphasized that such preparations must not produce in the short or long term rough keloid scars which may lead to contractures.

Human and animal fetal tissues serve as a source of biological substances capable of restoring skin and providing optimal conditions for epithelialization.

In Russia, the third (AB) degree burns were treated with subdermal injections of amnion and amniocene suspension [1,2]. The efficacy of this method proved to be high. Animal fetal tissues have found a wide application in burn therapy in the West. F. Schmidt provides a comprehensive report on the use of animal tissue suspensions in pediatrics, including treatment of burns, and in the treatment of wounds and trophic ulcers of various etiology in adult patients [3].

The efficacy of suspensions prepared from fetal tissues in the treatment of deep burns was evaluated at the Burn Center of the N. V. Sklifosovskii Institute for Emergency Care in a joint study with the International Institute of Biological Medicine.

Suspensions of fetal skin and placenta (17th-18th week of gestation, 30:70 and 50:50, respectively) were used in complex therapy of patients with deep burns.

The suspensions were stored in liquid nitrogen until use. They were thawed at room temperature immediately before application to the burn surface. Sterile gauze was soaked with the suspension and fixed on the burn with a bandage. In most cases, the suspension was applied on days 1-3 after burn, and applications were terminated after complete epithelialization.

The efficacy of treatment was evaluated by the scab rejection period, the start and completion of epithelialization, nature of the exudate, growth of granulation tissue, changes occurring in the burn-populating microflora, etc. Some peripheral blood parameters, individual tolerance, side reactions and complications, convenience of application, and the period of hospitalization were taken into account.

Ten patients (8 males and 2 females, aged 15-53) with the third (AB) degree burns were treated with human fetal tissue suspensions (HFTS). The

N. V. Sklifosovskii Institute for Emergency Care; International Institute of Biological Medicine, Moscow

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TABLE 1. Changes in Some Hematological Parameters and Homeostasis during Treatment of Burns with a Human Fetal Tissue Suspension

Parameter	Prior to treatment	Middle of treatment	End of treatment
Hemoglobin, g/liter	140	125	134
Erythrocytes, 10^{12} cells/liter	4.6	4.1	4.5
Stab neutrophils, %	4.2	6.5	4.3
Lymphocytes, %	11	15.5	26
Fibrinogen, g/liter	6.4	5	5
TPG, sec	570	660	480
Fibrinolysis, %	13	10	8.3
Prothrombin, %	81	71	86
AST, μmol/liter	0.99	–	0.36
ALT, μmol/liter	1.6	0.6	0.42
Total protein, g/liter	72.2	72	70
Albumins, g/liter	33	31.5	32
Globulins, g/liter	39	37	37
Potassium, mmol/liter	4.5	4.9	4.8
Sodium, mmol/liter	138	140	140

damaged skin area constituted 0.5-8% of the total skin area (TSA). There was no predominance in localization of the burns. All the patients received complex therapy in accordance with their general condition. The control group consisted of 10 patients matched in terms of burn severity, age, and sex. These patients received routine therapy, including autodermaplasty.

Application of HFTS was well tolerated by the patients and induced no local or general complications. In a patient who had suffered from psoriasis for 15 years, HFTS produced a positive effect not only on the burn but also on the psoriatic syndrome, which was manifested as a reduction in itching, hyperemia, and desquamation.

A strong tendency toward accelerated formation of the scab, its drying and better removal, a decrease in the amount of pus exudate, and a more rapid growth of the granulation tissue and formation of focal and marginal epithelialization zones occurred in all the patients. By the end of the treatment, the initially polymorphous microflora populating the burn site (3-4 types of bacteria, including *Streptococcus* sp. in 3 patients) in most cases was replaced by *St. aureus*.

Case report No. 44126, 1993: patient K., 52 years old, admittted with second-third (AB)degree burns of the feet and lower shins (11% TSA) and third (B) degree (2% TSA) caused by boiling water. The second degree surface burns were completely epithelialized by the 10th day. The deep burns were supposed to be treated by autodermaplasty, however, the presence of pathogenic microorganisms in the wound precluded this. Daily application of HFTS during a one-week period completely inhibited *St. pyogenes* (<10 CFU/ml in a *Staphylococcus* sp. culture), and complete epithelialization was attained in 2 weeks. The patint was dismissed in satisfactory condition.

Autodermaplasty was performed only in one patient in whom deep burns were localized in the joint area. Deep burns outside this area were epithelialized without autodermaplasty.

Analysis of some hematological parameters showed that treatment with HFTS caused no deviations from the changes in these parameters usually observed in patients with deep burns (Table 1).

There were no marked differences in the hospitalization period, which may be explained by the small number of patients. It is noteworthy that HFTS with different percentages of fetal skin and placenta (30:70 and 50:50) may produce different effects on the reparative processes in burned skin. At the initial stage of this process (degenerative-inflammatory), we applied a 30:70 HFTS with a view to most effectively treating the necroses with lysing, bactericidal, and other factors from the placenta, while at later stages we stimulated reparative-inflammatory and reparative processes with the growth factors of fetal skin, and therefore the 50:50 HFTS was used. We think that this approach provided the maximum effect in the therapy of patients with skin burns.

In summary, it should be mentioned that despite the high efficacy of the method, its clinical application is limited by the availability of mate-

rial and by the complexity of its processing and storage. However, these limitations should not be the determining factors in such situations as insufficient supply of donor skin, treatment of patients suffering from polyvalent allergy, elderly and senile patients with severe somatic pathology hampering autodermal plasty, treatment of children, and cases of incurable infections. This study does not deal with the mechanisms underlying the reparative effects of human fetal tissues on deep burns. We hope that the data collected during our further observations and the use of immunological and histological methods will allow us to characterize the positive effect of human fetal tissues on burn healing and the whole body.

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Opioid Peptides Improve Human Fetal Nervous Tissue Survival after Cryopreservation in Culture

A. Yu. Anikin, M. V. Kozlova, Yu. A. Blitchenko, G. T. Sukhikh, and E. M. Molnar

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The study was carried out on the 18-20-week human fetal brain by culturing organotypic and dissociated cells of the cerebral cortex and the corpora quadrigemina area. Tissue viability was assessed from the formation of growth cones and neuroglial bundles, as well as of glial cell formation. The study showed that after tissue freezing in organotypic cultures, viable cells were detected in not more than 10% of grafts. The addition of opioid peptides noticeably (by 1.3-2 times) increased the number of surviving cells. This regularity was not observed in dissociated cultures.

Key Words: *nervous tissue culture; human fetus; cryopreservation; opioid peptides*

Problems of fetal tissue transplantations for therapeutic purposes are no longer an object solely of basic research, but a procedure attracting the most active attention of clinicians. Human fetal nervous tissue transplantations are now quite often resorted to in some neurological diseases. Obviously, both the potentials and efficacy of this method when used clinically depend on a number of factors, and primarily on the choice of the optimal method for donor tissue preservation to maximally retain its viability. According to previous reports, freezing and storage of the material in liquid nitrogen is the most convenient and effective method [10,13]. This technique ensures a high share of surviving cells, whose value, however, varies within a wide range and depends on the procedure used [5].

We have developed in the last two years and are implementing at present a research program aimed at the creation of a bank of frozen fetal tissues; this program has helped introduce fetal

International Institute of Biological Medicine; Cardiology Research Center, Russian Academy of Medical Sciences, Moscow

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