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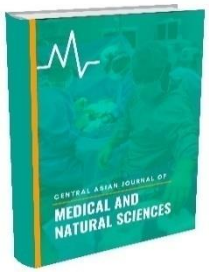

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Changes of Hemostatic Bed Parameters in the Healing Process Postoperative Facial Scars

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Abstract: Surgical attention to the problem of facial scarring has increased due to the development of plastic surgery, as well as increasing understanding by the society of civilized countries of the crucial role of appearance in human life. A study by Monstrey S., Middelkoop E., Vranckx J.J. (2014) indicated that every year 100 million people worldwide have scars after trauma and surgery, and 15 million of them will have non-aesthetic or hypertrophic and keloid scars. This paper looked at the treatment analysis of 50 patients (18 to 40 years old) with posttraumatic scar deformities. An algorithm for scar treatment and prophylaxis was also developed [10].

Key words: hemostasis, succinate sodium, scar, vascular and thrombocytic indexes, kelloid scar.

Introduction: Surgical attention to the problem of facial scarring has increased due to the development of plastic surgery, as well as an increasing awareness in civilized societies of the crucial role of appearance in human life [9]. A study by Monstrey S., Middelkoop E., Vranckx J.J. (2014) indicated that every year, 100 million people worldwide develop scars after trauma and surgery, and 15 million of them will have non-aesthetic or hypertrophic and keloid scars. According to Nelga I.O., Petinati J.A., Tkachenko S.B.(2014), appearance has a significant impact on social well-being, adaptation in society and quality of life. At the same time, the occurrence of rough scars often leads to the development of neuropsychiatric disorders up to cases of severe depression and the development of permanent disability [1,3]. The prevention and treatment (correction) of abnormal facial scars (surgical procedures) is an important medical and social problem [2].

Numerous studies and research by domestic and foreign scientists have been devoted to the prevention and treatment of keloid and hypertrophic scars [7]. These studies include the use of modern physical treatments, new local preparations, ointments, and their combination. However, an important condition of success in surgical interventions is effective diagnosis, prevention, and treatment of pathological cicatricial lesions. Based on the above, the aim of the present study was to develop

diagnostic criteria as well as ways of prevention and treatment of postoperative facial scars on the basis of studying some aspects of the wound healing mechanism[8,11]

Material and methods: The work was based on the analysis of the treatment of 50 patients with posttraumatic scar deformities. The patients' age ranged from 18 to 40 years. The average age was 34+0.6 years. We considered scars resulting from surgical procedures performed on the face. To verify the scar, determine its depth and connection with the underlying anatomical structures, as well as to dynamically monitor the pathological scarring of tissues, we performed an ultrasound examination of the scars.

We also developed an algorithm for scar treatment and prophylaxis, where patients after the operation in hemostasis stage were prescribed sodium succinate 0.5 g twice a day for 10 days, which reduces and prevents thrombosis, decreases vascular resistance, increases tissue blood flow, increases oxygen utilization and tissue metabolism, corrects metabolic acidosis, increases tissue resistance to damaging influences, promotes better penetration of drugs through biological membranes and reduces their toxicity. In addition, to reduce systemic complications, the immunomodulator hyaluronic acid was injected as the main component of the skin intercellular matrix, to regulate inflammation, regeneration, to provide immunological tolerance and immunomodulation. Hyaluronic acid also participates in growth and regeneration processes, reduces the permeability of barrier tissues, prevents the formation of granulation tissue and scarsThe examination of the patients included analysis of complaints, medical history, objective examination data, and standard laboratory and instrumental examinations. In all examined patients the number of platelets was counted in a hematological analyzer, adhesive and aggregation properties of platelets using ADP inducer were determined visually using a phase-contrast microscope according to Shitikova T.A. (1997). Coagulometric method was used to determine prothrombin time, PTCT using reagents from RENAM (Russia). The level of vasculoendothelial growth factor in blood serum was determined by enzyme immunoassay using BioChemMac reagent kit (Russia). The amount of interleukins (IL-1,-6,8) was determined by ELISA using reagent kit "Vector-Best" (Novosibirsk) according to the manufacturer's instructions. The results were statistically processed using Microsoft Excel 2002. Sample mean and error of the mean ($M \pm m$) were calculated. Significance of differences between dependent and independent samples between two averages was estimated according to Student's f-criterion. Differences of the compared indicators were taken as reliable results at $p < 0.05$

Research results and discussion: Studying the mechanism of wound healing using diagnostic markers of all stages of this process and on this basis developing a treatment method for keloid and hypertrophic scars is one of the most difficult problems of plastic and reconstructive surgery. Therefore, we decided to study the mechanism of the wound process stage by stage according to the stages of wound healing using pathogenetic grounded diagnostic methods and on the basis of the obtained research results to use scientifically grounded complex approach in the wound process treatment and thereby to counteract the development of keloid and hypertrophic scars.

It is known that each stage of the wound process - hemostasis, inflammation, proliferation, epithelialisation and scar reorganisation - is characterised by morphological, pathophysiological and biochemical features. In the hemostasis stage, immediately after trauma resulting in vascular injury and wound bleeding, vasoconstriction and blood clot formation occur. The initiation of the hemostasis stage, in our studies in patients after surgery, is due to the effects of blood components on endothelial cells and on the subendothelial layer of the vessel walls. As noted in the findings presented in Table 1, circulation of increased numbers of desquamated endothelial cells was noted. In the examined patients after surgical intervention there is adhesion, activation and aggregation of platelets on collagen fibres of the subendothelial layer of the vascular walls on the background of endothelial cell dysfunction. Adhesion and aggregation of platelets leads to the release of large amounts of bioactive substances

into the bloodstream. Activation of the vascular-platelet link of the haemostasis system also triggers coagulation hemostasis due to thromboplastic substances released from the surrounding damaged blood vessels. This leads to prothrombin activation with the formation of thrombin, which then increases the uptake of fibrinogen and its conversion into fibrin fibres. The blood clot formed during haemostasis consists of cross-linked fibrin, red blood cells, platelets and extracellular matrix proteins such as fibronectin, vitronectin and thrombospondin. The blood clot formed during hemostasis serves as a protection against microbial invasion and as a matrix for cell attachment. As one can see from the obtained results of the researches, the activation of the coagulation link of the hemostasis system, expressed in the reduction of readings of ABTV in the blood of the examined subjects in the postoperative period with the readings of healthy subjects, is accompanied by the lengthening in time of the Hageman-dependent fibrinolysis.

Table 1: Indices of the vascular-platelet link of the haemostasis system in patients after facial trauma in the hemostasis stage

Indicators	Healthy persons n=	After injury n=
Desquamated endotheliocytes	2,34±0,21	4,89±0,34*
(cl./100µl)	232,18±9,51	257,18±13.7
Platelets, -×109/l	12,42±0,79	24,13±1,34*
Sum of platelet active forms	34,18±2,14	47,69±3,12*
(%)	3,24±0,27	3,31±0,29
Platelet aggregation to inducer	31,83±2,17	24,78±1,34*
ADP (Tma%)	7,24±0,64	14,32±1,17*

*Note: *- significance of differences P < 0.05 relative to the control group*

The complex therapy, when compared with the conventional therapy, was accompanied by changes in the parameters of the haemostasis system, which is presented in Table 2. As can be seen from the findings, in patients in the main group decreased the number of desquamated endotheliocytes, which led to a decrease in platelet activity. It was expressed in a significant decrease in the amount of active forms of platelets, a decrease in their aggregation activity when exposed to the inducer ADP. Also, in patients in the main group who received the complex therapy, there was a decrease in the consumption of fibrinogen, prolongation in time of the index ACTV, indicating an improvement of haemorheological properties of the blood.

Table 2: Indices of the vascular-platelet link of the hemostasis system in patients with postoperative facial scarring in the hemostasis stage

Indicators	Treatment of post-operative individuals with facial scarring n=	
	Traditional therapy n=	Comprehensive therapy n=
Desquamated endotheliocytes	3,78±0,16	2,47±0,21*
(cl./100µl)	174.23±11,9	229,45±12.81
Platelets, -×109/l	19,11±1,24	13,56±1,48
Sum of platelet active forms	40,12±2,78	35,09±3,43
(%)	4,21±0,38	3,08±0,27
Platelet aggregation to inducer	26,58±2,81	31,13±2,51
ADP (Tma%)	12,17±0,84	8,17±0,73

*Note: *- significance of differences P<0.05 relative to the control group*

It is known that for the healing of wounds of soft tissues after their damage the necessary condition for the free movement of blood cells, in particular micro and macrophages, is the presence of a support matrix consisting of hyaluronic acid in the wound. Taking this circumstance into consideration we included the introduction of hyaluronic acid into the arsenal of complex therapy.

As can be seen from the results of our research, an acute phase of inflammation begins in the wound surface immediately after surgical intervention and lasts on average 4-5 days. In this stage of inflammation, when the skin cells are damaged, the body is exposed through cellular hormones (interleukins) to the signals of the acute phase. As can be seen from the findings shown in Table 3, in this stage there is secondary vasodilation near the surgical trauma, due to bioactive peptides and complement components C3a and C5a, which increase the permeability of blood vessels and attract neutrophils and monocytes to the wound, and stimulate the release of histamine and leukotrienes from mast cells. Neutrophils rush to the injury site, activate the phagocytosis process and release pro-inflammatory cytokines and thereby enhance the inflammatory response.Analysis of the findings showed an increase in pro-inflammatory cytokines in the blood of patients in the inflammatory stage. It should be noted that the prolonged presence of neutrophils in the wound may be a factor in the conversion of acute wounds to chronic wounds. Therefore, after a short period of time, circulating monocytes and mast cells migrate to the site of injury and differentiate into macrophages. Macrophages, in turn, remove apoptotic neutrophils and other dead cells, and secrete cytokines and growth factors. Phagocytosis of apoptotic neutrophils by macrophages leads to removal of chemokines from the area of inflammation, preventing further leukocyte influx. Cytokines and growth factors secreted by macrophages activate and attract endothelial cells, fibroblasts and keratinocytes, causing cell proliferation and synthesis and triggering the process of angiogenesis.

Table 3: Blood values in the inflammatory stage in patients after facial trauma

Indicators	Healthy persons n=	After injury n=
Complement component C3 mg/dL	65,4±3,81	84,1±5,32*
Complement component C5a (mg/dL)	2,33+0,11	3,28+0,13*
Phagocytic activity %	46,7±1,48	68,4±2,0*
IL-1, pg/ml	5,29±0,38	8,81±0,61*
IL-6, pg/ml	4,05±0,31	9,87±0,72*
IL-8, pg/ml	1,74±0,13	6,28±0,53*

Note: *- significance of differences $P < 0.05$ relative to the control group

The complex therapy we carried out in the stage of inflammation was accompanied by changes in the studied blood parameters in the examined subjects. It is necessary to note, that introduction of hyaluronic acid possessing anti-inflammatory effect, led to decrease in level of proinflammatory cytokines, phagocytic activity and thereby played an important role in maintenance of immune system and shortening of the stage of inflammation, resisting its transition into the chronic form. The importance of this complex therapy in reducing the level of hypoxia by administering succinate should also be noted, since hypoxia enhances the inflammatory response by increasing the level of oxygen radicals and products of peroxidation.

Table 4: Blood values in the inflammatory stage in patients with postoperative facial scarring on the background of therapy

Indicators	Treatment of post-operative individuals with facial scarring n=	
	Traditional therapy n=	Comprehensive therapy n=
Complement component C3 mg/dL	74,1±4,42	67,3±3,02
Complement component C5a (mg/dL)	3,07+0,18	2,42+0,14*
Phagocytic activity %	65,01±4,32	48,1±2,67*
IL-1, pg/ml	7,93±0,54	5,33±0,42*
IL-6, pg/ml	7,04±0,63	4,17±0,34*
IL-8, pg/ml	4,97±0,38	1,86±0,14*

*Note: *- significance of differences P < 0.05 relative to the control group*

As can be seen from the results of the studies presented in Table 4, a decrease in the activity of the complement system, phagocytic activity of neutrophils as well as pro-inflammatory cytokines in the blood is observed against the background of the complex therapy.

Thus, one of the key factors in the transition from the stage of inflammation to the stage of proliferation is the proper functioning of macrophages, against the background of the introduction of antihypoxant and hyaluronic acid.

The proliferation stage is known to last on average 2-4 weeks. Sometimes, the regeneration process starts from the third day after the wound and its duration depends on the size of the wound defect. The proliferation stage "layers" on top of the inflammation stage, rather than replacing it. This stage begins with the degradation of fibrin-platelets in the initial matrix and invasion of fibroblasts and endothelial cells. The proliferation stage is characterised by the influx of fibroblasts, the formation of new blood vessels and epithelialisation. Based on the literature, the most important factors that increase the risk of scarring hypertrophy are prolonged inflammatory process in the wound, decreased microcirculation and tissue hypoxia. Therefore, hemic hypoxia is one of the important causes of keloid and hypertrophic scars. It should be noted that facial wound healing has a number of peculiarities due to the superficial location of vessels, the presence of mimic muscles whose movement makes it difficult to create "rest" in the area of postoperative wounds. However, healing of wounds in the maxillofacial region has a high regeneration potential due to the increased blood supply and good innervation. The healing of soft tissue wounds requires conditions for free cell movement, one of them being the presence of a support matrix in the wound, consisting of hyaluronic acid, which is synthesized by fibroblasts.

During the formation of granulation tissue, new blood vessels develop from existing vessels (angiogenesis). The healing of postoperative wounds requires blood flow to the site of injury. Angiogenic factors, which include vascular endothelial growth factor (VEGF), are secreted by fibroblasts, macrophages, keratinocytes and endothelial cells. Prolonged hypoxia caused by inadequate perfusion and inadequate angiogenesis is a major factor leading to impaired wound healing. As can be seen from the data presented in Table 5, the level of vascular endothelial growth factor is significantly reduced in patients with posttraumatic facial injury.

Table 5: Blood values in patients after facial trauma in the proliferation stage

Indicators	Healthy persons n=	After injury n=
Vasculoendothelial growth factor	0,92±0,06	0,68±0,05*

*Note: *- significance of differences P < 0.05 relative to the control group*

In the group of persons treated with conventional therapy, as can be seen from the findings presented (Table 6), vasculoendothelial growth factor levels were slightly elevated compared to the healthy individuals group. Complex therapy with the antihypoxant sodium succinate and hyaluronic acid. There was a significant increase of the endothelial growth factor level in the blood, indicating the activation of the angiogenesis process in the wound cavity. At the stage of proliferation favourable effect on the healing process was mediated not only by the influence of endothelial growth factor, but also by a substantiated complex therapy.

Table 6: Blood values in patients with postoperative facial scarring in the proliferation stage on the background of therapy

Indicators	Treatment of post-operative individuals with facial scarring n=	
	Conventional therapy n=	Complex therapy n=
Vasculoendothelial growth factor (VEGF) (ng/ml)	1,22±0,09	2,64±0,17*

*Note: *- significance of differences P < 0.05 relative to the control group*

Conclusions. Thus, according to the clinical and laboratory findings, the use of sodium succinate and hyaluronic acid influenced changes in the width of postoperative scars, leading to a decrease in the expansion in the dynamics of healing and had a positive effect on the appearance of the scars - colour, thickness, height and contours. Optimisation of healing of postoperative facial soft tissue wounds was detected at all stages of the wound healing process. All this allows us to conclude that the methods developed by us for the diagnosis, treatment and prevention of scars are effective and can be recommended for widespread clinical use.

Literature

1. Adamyan R.T. Complex approach to facial soft tissues rejuvenation / R.T. Adamyan, K.B. Lipsky, T.P. Litvitskaya // Annals of Plastic, Reconstructive and Aesthetic Surgery. - 2004. - №4. - C. 33-37.
2. Vladimirova O.V. Complex approach to primary and secondary prevention of posttraumatic scars: abstract of dissertation .... D. in medical sciences. - Stavropol, 2011.- 20p.
3. Ishmametev I.L. Local microcirculatory characteristics of postoperative period in patients with facial rejuvenation operations / I.L. Ishmametev, N.A. Danilin, E.I. Deryabin // Annals of Plastic, Reconstructive and Aesthetic Surgery. - 2001. - № 3. - C. 13-15.
4. Khaidarov Nodir Kadyrovich, Shomurodov Kahramon Erkinovich, & Kamalova Malika Ilhomovna. (2021). Microscopic Examination of Postcapillary Cerebral Venues In Hemorrhagic Stroke. The American Journal of Medical Sciences and Pharmaceutical Research, 3(08), 69–73.
5. Karajan A.S. Planning of one-stage reconstructive interventions at posttraumatic deformities of the middle zone of the face / A.S. Karajan et al. // Annals of plastic, reconstructive and esthetic surgery. - 2004. - №4. - C. 84-85.
6. Kuprin P.E. Correction of keloid and hypertrophic scars and ways of their prevention in plastic surgery: Ph. - Velikiy Novgorod, 2003. - 22c.
7. P. Parshikova S.A., Parshikov V.V., Potekhina Y.P. Prediction of postoperative complications in the treatment of extensive bite wounds in children using infrared thermography // Bulletin of experimental and clinical surgery. - 2012. - №2. - C. 339-246.
8. Romanets O.P. Methods to optimize scar treatment and prevention: Dissertation for the degree of Candidate of Medical Sciences. Moscow: 2016 - 179 p.

9. Filippova O.V., Krasnogorskiy I.V. Structural changes in scar tissue in children at different stages of scar maturation and against the background of collagenolytic therapy // Clinical Dermatology and Venereology. - 2013. - №1. - C.22-30.
10. Shomurodov , K., Khaidarov , N., & Kamalova , M. (2021). The formation and eruption of baby teeth in children. Збірник наукових праць SCIENTIA. вилучено із https://ojs.ukrlogos.in.ua/index.php/scientia/article/view/14724
11. Shirko O.I. Prediction and optimization of tissue regeneration process after surgical interventions in maxillofacial area. Dissertation for the degree of candidate of medical sciences. Yarkutsk: 2006 - 149 p.