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Tactics of Surgical Treatment of Patients with Consequences of Cranial Value Burns

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Abstract: The authors presented the first clinical experience of using a new method of plastic surgery to eliminate the consequences of burns in the cranial vault area. 32 patients were operated on using the new method. The proposed method of plastic surgery of the cranial vault with stretched tissues in 28 (87.5%) patients out of 32 allowed to achieve good functional and aesthetic results.

Keywords: cranial vault, consequences of burns, alopecia, scar deformity, method of plastic surgery, result of plastic surgery, functional and aesthetic results.

Actuality of the problem. It is known that the lack of systematization of existing methods for eliminating soft tissue defects of the cranial vault often contributes to the unsatisfactory outcome of surgical interventions [6, 7]. To date, there are no clearly developed indications for the use of various types of local plastic surgery, tissue expansion, or combined plastic surgery for post-burn scar deformities and calvarial defects [5]. The possibility of using local plastic surgery is limited by the size of the defects, and with large defects, their use becomes impossible. Traditional methods of covering defects of the calvarium make it possible to get rid of wound defects for a short time [2, 4]. However, the frequent occurrence of secondary complications (necrosis of skin grafts, marginal necrosis of displaced flaps due to excessive tension, wrinkling of skin grafts, the occurrence of trophic ulcers, etc.) negatively affect the results of treatment [1, 8].

A brief review of modern traditional methods of plastic surgery for post-burn scar deformities of the skin of the cranial vault shows that none of them is ideal and none solves the problem of fully replacing scarred skin and underlying tissues of this aesthetically significant area of the human body. Therefore, restoration of the skin of the cranial vault deformed by scars using traditional methods remains a difficult and often insoluble problem for surgeons [3, 9].

The introduction into widespread surgical practice in the last decade of the last century of the method of balloon stretching of the skin (expander dermotension) and microsurgical autotransplantation of flaps made it possible to more successfully rehabilitate patients with post-burn scar deformities and defects of the cranial vault.

The purpose of the study is to improve the results of surgical treatment of post-burn scar alopecia by developing a new plastic method.

Materials and methods of research. Using the above-described technique, the developed method of long-term preliminary balloon stretching of tissues and suturing the wound (using the “lock” type), we operated on 32 patients. 27 rectangular and 6 round expanders were used.

Results and its discussion. The distribution of patients by number and volume of expanders used is presented in Table. 1. As can be seen from the table, in only one case were 2 expanders used

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in one patient, which amounted to 6.3%. In other cases, one expander was used for each patient. Expanders with a volume of 100 ml are most often used (71.8%).

Table 1

Distribution of patients by number and volume of expanders used

Number of expander (per patient)	Expander volume (ml)			Total %
	100±5,2	160±8,2	200±10,1	
One	21	3	6	30 (93,7%)
Two	1	-	-	1 (6,3%)
Total	23 (71,8%)	3 (9,3%)	6 (18,7%)	32 (100%)

In the area of the cranial vault, the average increase in the area of soft tissues after stretching (Sp) compared to the initial dimensions of the expander base (Se) was 124.8±6.6% (Table 2).

Table 2

Average increase in soft tissue area in the cranial vault as a result of balloon stretching (M±m)

Cranial vault area	Initial Se (cm2)	S p after stretching (cm 2)	Sp tissue growth (%)
Frontal	77,2±3,8	157,1±7,4	121,7±6,1
Parietal	78,3±3,7	164,1±8,1	123,2±6,4
Temporal	82,9±4,1	167,7±8,4	126,9±6,6
occipital	84,3±4,3	187,1±9,2	130,6±6,5

Notes: *Se - area at the base of the expander Sp - area after stretching the expander Sp - area of stretched tissue

As in the comparison subgroup, the largest average increase in the area of the soft tissues of the cranial vault relative to other areas prevailed in the occipital region and amounted to 130.6 ± 6.5.

During the period of fluid introduction into the expander, the average oxygen tension in the tissues above it decreased from 123.7 ± 6.4 (Chi-square test was 5.419; P = 0.421) to 8.7 ± 0.4 mmHg. (χ^2=23.8; P=1), 3 hours after the procedure, this indicator began to increase and on days 2-3 reached a value close to the original: 119.4±5.9 mmHg. (Fig. 1).

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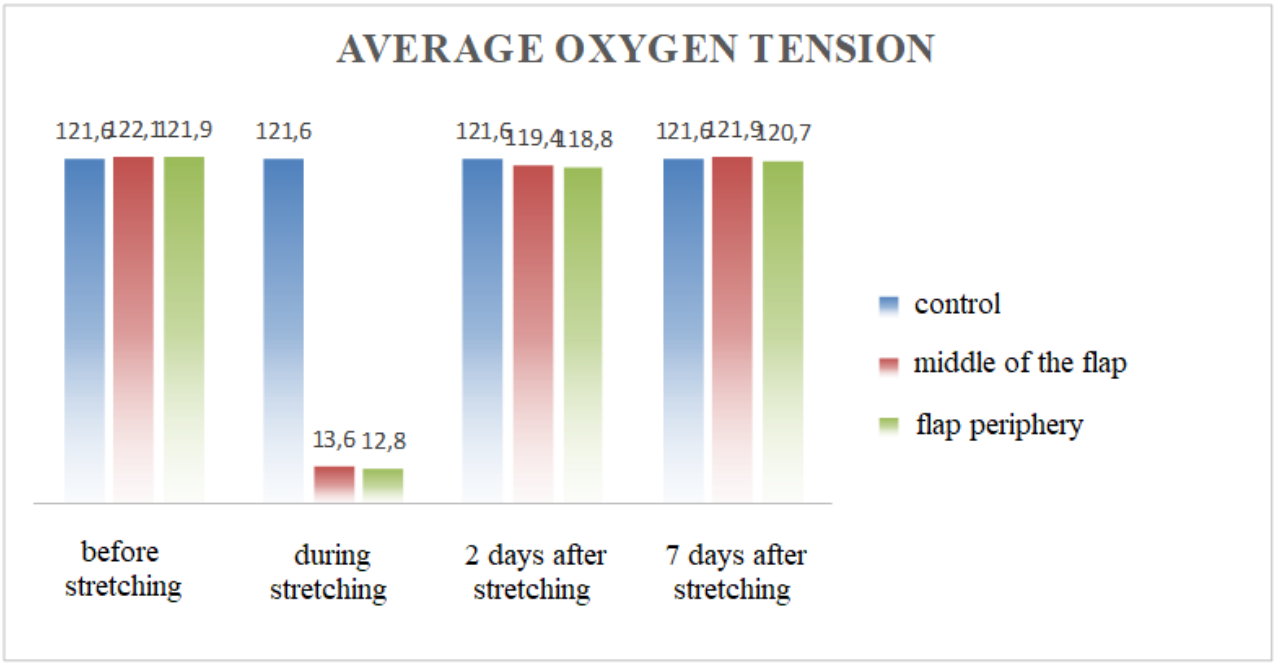

Figure 1. Change in oxygen tension (PtcO2) in the tissues of the cranial vault area before and after tissue stretching.

This diagram shows comparative indicators of oxygen tension in the middle, in the periphery of the flap, as well as in the control area (frontal region). As you can see, oxygen tension indicators in the tissues of the flap are already approaching control values on the second day.

Clinical example: Patient A-va., 2008. Case history No. 1153/141 Date of burn injury – 2010. Diagnosis: Post-burn scar deformity (alopecia) of the left parietotemporal region (Fig. 2). Operation No. 203 – Plastic surgery of post-burn scar deformity (alopecia) according to the clinic method.

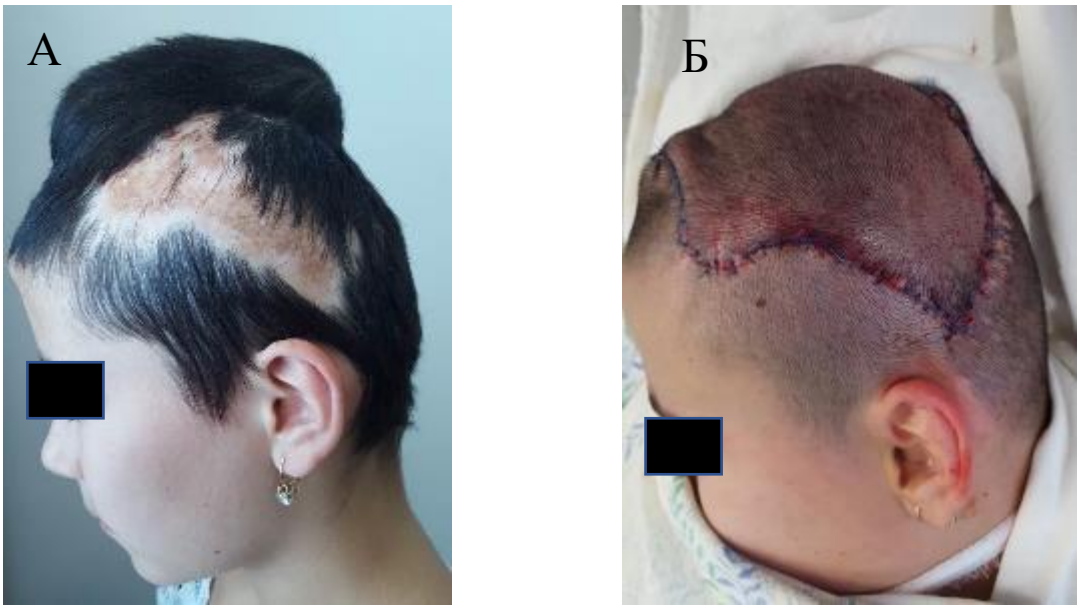

Figure 2. Patient A-va., A. Post-burn cicatricial alopecia of the left parietotemporal region. Long-term expanding dermotension.
B. Immediate result of plastic surgery

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Results. 28 patients (87.5%) had a positive result. Complications were observed in 4 cases (12.5%). Thus, infection of the expander bed was noted in 3 patients (9.3%). At the same time, the use of local irrigation of the expander bed with antiseptic solutions, as well as regional lymphotropic antibiotic therapy, made it possible to stop the inflammation, and the expanders were preserved. In 1 patient (3.2%) after the final stage of plastic surgery, marginal necrosis of the flap was noted.
Long-term results were studied in all 32 operated patients of the main subgroup. At the same time, good and satisfactory results were recorded in 28 (87.5%) and unsatisfactory results in 4 (12.5%) patients

Conclusion. An effective tactic for eliminating medium and large cicatricial alopecia, as well as deep post-burn scar defects with exposure of the bones of the cranial vault, is the planned use of balloon stretching of intact tissues. The use of the developed dermotension expander in combination with the developed type of “lock” suture allows to improve long-term results compared to the traditional method by 8.6%.

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