

Breast Reconstructive Surgery in Cicatricial Deformity

Samoilenko Gennady Evgenyevich*, Zharikov Stanislav Olegovich, Klimanskyi Ruslan Petrovich

Department of Surgery, Endoscopy and Recovery Surgery, Donetsk National Medical University, Kramatorsk, Ukraine

ABSTRACT

Aim: To analyze the results of surgical treatment of cicatricial post-traumatic deformities of the breasts.

Methods: There has been presented treatment experience of 149 patients with cosmetic and post-traumatic changes of the breasts in the clinical base of the Department of Surgery, Endoscopy and Reconstructive Surgery of DNMU. The number of the patients treated for post-traumatic cicatricial deformity was 34 patients (22.8%) aged 7 to 62 years. There were 27 injured of them (79.4%) with the consequences of burns, 2 (5.9%) after the complications of cosmetic surgeries, 5 patients (14.7%) were operated on for the consequences of cancer treatment and three of them (8.8%) were hospitalized for radiation ulcers. The patients underwent 54 surgical interventions: Free autodermaplasty-13 (24.1%); local flaps grafting-14 (25.9%); combined plastic surgery and endoprosthesis-13 (24.1%); expander dermatotension-5 (9.3%); plastic surgery with complex composite flaps-9 (16.7%).

Results: The article gives a historical overview of breast reconstructive operations and the classification of their post-traumatic injuries. Depending on the anatomy of cicatricial damage to the chest wall and the breast an algorithm for reconstructive mammoplasty is generalized. When performing surgical interventions in patients with the consequences of any type of the injury the main task was to eliminate scar-modified skin, correct the elevation of the breast, functional disorders such as contractures and make normal development of breast tissue possible. In any case, the operation is aimed at releasing the breasts from scars and creating the conditions for their normal development in adolescents, as well as restoring the shape, size and the appearance of already formed breasts in case of the patients' late appointment with a doctor. When eliminating breast deformities in women of mature age it is often rational to separate the nipple-areolar complex from cicatricial tissue and transpose it to its usual location.

Conclusion: Good cosmetic results, stable restoration of the shape, position and the skin of the breasts deformed by scars were obtained during all surveys. Reconstructive operations contribute to a significant regression of psychological and social disorders in patients with cicatricial deformities after a burn injury, and therefore they improve their overall rehabilitation result. If it's possible surgical treatment of cicatricial deformities of the anterior surface of the chest wall should be started before breast development in adolescent girls and they should be followed-ups.

Keywords: Breast; Cicatricial deformity; Mammoplasty; Reconstructive surgery; Treatment; Cosmetic defect; Rehabilitation

INTRODUCTION

Post-traumatic and burn deformities of the anterior chest wall account for about 6% of injured and about 60% of the patients are people of working age so the need for social, labor and psychological rehabilitation of such patients is great [1]. The elimination of burn wounds does not mean complete recovery and scar-modified tissue forms after surgical restoration of the skin with deep burns that leads to significant deformity. Cicatricial deformities of the breasts are found in 9.0%-10.9% of the women who suffered deep and

extensive body burns [2]. The severity of the deformity largely depends on the area and depth of the burn, the age at which it was received and it also depends on the adequacy of the treatment [3].

Post-burn deformities of the breasts are rarely isolated as in most cases they are associated with some damage to adjacent areas: the neck, shoulder joints and the trunk. Cicatricial deformities, the absence of the breast or only the nipple with the areola are cosmetic and functional defects, they cause the women's psychoemotional disturbance, their social dysadaptation [4,5].

Correspondence to: Samoilenko Gennady Evgenyevich, Department of Surgery, Endoscopy and Recovery Surgery, Donetsk National Medical University, Kramatorsk, Ukraine, Tel: 38 (050)-626-49-98; E-mail: combustiology@gmail.com

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The scars on the anterior chest wall after burns received in the childhood can interfere with normal development of the breasts during puberty. Post-burn cicatricial deformities of this area in girls are accompanied by a sense of inferiority, lack of confidence; they lead to isolation, estrangement, loneliness [6].

According to Mikhalchenko, the first breast reconstruction was historically performed in 1895 by Czerny who removed fibroadenoma and then filled the tissue defect with lipoma taken from the same patient with a good result [7].

Nowadays due to increase in knowledge in the field of anatomy and physiology of the breasts and the improvement of surgical methods, in the era of the development of microsurgery and cellular technologies in many cases it is possible to restore a good form of the breast while keeping its function. However, the problems of treatment of post-traumatic cicatricial deformities remain relevant and unfortunately they aren't properly discussed. Some aspects of this problem have not been sufficiently developed until now. The unresolved issue has been the time of the beginning of surgical treatment of breast deformities after burns received in the childhood. The indications for various methods of surgical treatment have not been specified depending on the degree of the deformity, localization and the nature of the scars that form it as well as the age and related diseases. There hasn't been developed the policy of surgical treatment for breast deformities associated with the contractures of the neck, shoulder joints, anterior abdominal wall. There haven't been properly developed the questions of surgical correction of cicatricial breast deformities in patients who have suffered extensive burns and have a shortage of donor resources [8,9].

The results of surgical treatment of post-burn cicatricial deformities of the breasts are not always satisfactory. The need to eliminate cicatricial deformities in the conditions of a pronounced shortage of donor resources, the absence of common views on the methods and age periods for the beginning of surgical treatment, as well as increasing demands on aesthetic results of plastic surgeries precondition the topicality of the search and further improvement of surgical treatment of this pathology [10].

The objective of the research is to analyze the results of surgical treatment of cicatricial post-traumatic breast deformities.

SUBJECTS AND METHODS

When performing surgical interventions in the patients with the consequences of any type of the injury the main task was to eliminate scar-modified skin, correct breast elevation, functional disorders such as contractures and make normal development of breast tissue possible.

149 patients with cosmetic and post-traumatic breast changes were operated on in the clinical base of the Department of Surgery, Endoscopy and Reconstructive Surgery, DNMU. The number of the patients treated for post-traumatic cicatricial deformity was 34 patients (22.8%) aged 7 to 62 years. There were 27 injured of them (79.4%) who had the consequences of burns, 2 (5.9%) after the complications of cosmetic surgeries, 5 patients (14.7%) were operated on for the consequences of cancer treatment and three of them (8, 8%) were hospitalized for radiation ulcers. The patient underwent 54 surgical interventions: free autodermoplasty-13 (24.1%); local flaps grafting-14 (25.9%); combined plastic surgery and endoprosthesis-13 (24.1%); expander dermatotension-5

(9.3%); plastic surgery with complex composite flaps-9 (16.7%) (Tables 1 and 2).

We divided post-traumatic deformities of formed breasts into:

A. The prevalence of the cicatricial process:

1. isolated deformities of both breasts;
2. Combined breast deformities and nearby areas of the neck, shoulder joints, chest, abdomen.

B. Regarding the form and the volume of the breasts:

1. single or multiple scars that do not affect the volume and shape of the breasts;
2. partial compression of the breast tissue because of a cicatricial process with or without reduction in organ volume;
3. Compression and flattening of the breast by a solid scar mass.

C. According to the state of breast function:

1. preservation of lactation and the nipples (excretory ducts of the breasts);
2. Disturbance of lactation, deformation or absence of the nipples.

In order to arrange tactical approaches to surgical correction we conventionally divided breast deformities into the following types:

1. the displacement of the breasts only downward;
2. the displacement of the breasts outward and partially upward and downward;
3. the displacement of the breasts inwards and partially upwards;
4. Cicatricial breast changes in the area of the nipple-areolar complex (NAC).

Depending on the type of breast deformity the policy (algorithm) of surgical interventions have been also determined.

Table 1: Incidence and causes of breast deformities (n=149 patients).

Deformity	No. of patients	Incidence percentage
Total post-traumatic and burn deformities		6% (injured) 60% (working age group) [1]
Cicatricial deformity		9%-10.9% of all reported cases
Post-traumatic cicatricial deformity	34	22.8%
Burns	27	79.4%
Cosmetic surgery complication	2	5.9%
Consequence of cancer treatment	5	14.7%
Radiation ulcer treatment	3	8.8%

Table 2: Reconstructive cosmetic and surgical interventions for cicatricial deformities (n=54).

Intervention type	No. of patients	Percentage
Free autodermoplasty	13	24.1%
Local flaps grafting	14	25.9%
Combined plastic surgery and endoprosthesis	13	24.1%
Expander dermatotension	5	9.3%
Plastic surgery with complex composite flaps	9	16.7%

RESULTS

56 patients (37.6%) had breast displacement downward caused by scar retraction in the lower parts of the anterior thoracic and anterior abdominal walls that were usually eliminated by semilunar dissection and scar excision in the lower poles of the breast. Glandular tissue was separated from the chest wall, displaced upward and fixed to the lower pole to the chest wall to form an inframammary fold. Plastic surgery of a postoperative wound defect was performed using a free skin graft.

Breast displacement to the outside and partially downward or upward caused by retraction of scar-modified skin in the shoulder joint and the lateral surface of the anterior chest wall was detected in 38 women (25.5%). Surgical correction was performed by dissection and excision of the scars in the axillary region, on the inner surface of the shoulder, the lateral surface of the trunk and on the lateral surface of the anterior chest wall. If the glandular tissue was flattened its posterior wall was separated from the tissues of the anterior chest wall and moved inwards and the wound defect was replaced by a free skin graft. Bands of scar tissue were sometimes dissected along the entire anterior chest wall, shoulder and the forearm performing local flaps grafting.

The tissues of the breasts were moved upward or inward in 21 women (14.1%) having breast deforming scars located on the anterior chest wall above or between the breasts. Scar tissue was dissected and excised and the resulting postoperative wounds were covered with free skin grafting or combined plastic surgery is performed along them.

NAC was carefully separated and then replaced with free skin grafts in 15 women (10.1%) with extensive scars of the breast. Local flaps grafting was performed in the place of limited scars after their excision.

The surgery is recommended to 19 patients (12.8%) with breast deformities because of a suffered burn in early childhood at the age of 9-11 years before the growth of the breasts begins. Late elimination of such deformities leads to hypotrophy and gross distortion of breast form because of their flattening or protrusion in those places where bands of scar tissue is less pronounced. Delayed correction is more difficult and less successful.

In any case, the operation is aimed at releasing the glands from the scars and creating the conditions for their normal development in adolescents, as well as restoring the shape, size and the appearance of already formed breasts in case of the patients' late appointment with a doctor (Table 3).

DISCUSSION

The choice of the method of the operation is determined by the nature of the deformity and its anatomical modification. If the scars begin to impede breast growth the corrective operation consists in dissecting dense wound cover making two semilunar incisions

converging in the middle of the chest. The lower boundary of the incisions should correspond to the intended location of the inframammary fold. The tightening scars are dissected between the breasts along the midline, and the scars going into the armpit are separated along the outer margin eliminating adduction contracture of the shoulder at the same time.

The location, shape and the volume of the breast tissue are specified after the wound dehiscence. If necessary, it is partially separated, the lower pole is lifted, moved from the axillary region closer to the center and it is given a natural domed shape.

If bilateral bordering incisions are connected along the midline then the lower margin of the wound is strongly displaced in the direction of the pelvis, so before the implants are placed the skin is moved upward and fixed to the fascia of the chest with the sutures.

Postoperative wounds are closed using split skin grafts which are 0.4-0.6 mm thick with rare perforations applied to them. The dressings in the form of thick cotton-gauze rollers are fixed with stretching sutures.

Severe retraction of skin grafting can be reduced using full-layer skin grafts. Skin grafting must be performed taking into account skin tension lines (Langer) while paying attention to exceptional mobility of the breasts. Despite it grafting should be performed with some hypercorrection. Later when the girls grows the transplanted skin is stretched according to the enlargement of the breast, but at the same time new cicatricial contractions may appear that require surgical removal. The described operation technique is also used in most adult patients in cases when the mass of one of the breasts is preserved in bilateral damage and also, when unilateral arrangement of scars deformity is not clearly expressed.

Cicatricial bands on one or both breasts displacing them upward, downward or to the sides are corrected the same. Rough tightening scars are excised, soft ones are dissected releasing the parenchyma from the contraction, and then the breasts are given the same shape by moving and fixing soft tissues with the sutures. Wounds are closed with split skin grafts.

Taking into consideration the difficulties associated with breast growth under dense wound cover we believe that the girls should be performed preventive removal of the scars on the anterior chest wall in the area located from the midline to the anterior edge of the armpit. The nipple with the areola or the corresponding area of the scar must be preserved and sewn to the skin graft. Prior to the growth of the breast it is also advisable to eliminate combined deformities - adduction of the shoulder, contracture of the neck, contraction in the abdominal area, etc.

If after deep burns the mass of one of the breasts (because of severe deformity) is significantly decreased, then it is necessary to restore breast size and shape performing distant flaps grafting in addition to excision of tightening scars. In cases where the skin in the back

Table 3: Breast deformities and surgical treatments.

Type	No. of patients	Percent	Method
Downward breast displacement	56	37.6%	Semilunar dissection and scar excision in the lower poles
Breast displacement to the outside	38	25.5%	Dissection and excision of the scars in the axillary region
Breast tissue moved (upward or downward)	21	14.1%	Dissection and excision, free skin grafting or combined plastic surgery
Breast scars	15	10.1%	Free skin grafts of Nipple-areolar complex
Suffered burns	19	12.8	Elimination before breast growth

area and the lateral surface of the chest wall or the abdomen is not damaged by scars a typical musculocutaneous flap is cut out from the area of latissimus dorsi with the inclusion of thoracodorsal vessels in this pedicle flap. This flap has axial blood supply, it is stable and it well survives in the scar region, and both a massive muscle and a layer of fatty tissue can restore a large defect in the gland. Due to good tissue mobility a donor wound is closed by the approximation of the margins. If the tissue defect is small and it is located below the nipple, and the skin on the abdomen or the chest near the gland is not damaged then it can be replaced with a fasciocutaneous flap cut out from the anterolateral surface of the chest wall. It is possible to restore the most frequently affected lower pole of the breast using rotated flap. If one flap was not enough a plastic surgery was performed with two simultaneously cut out fasciocutaneous flaps-abdominal and thoracic ones. In such cases free skin grafting for donor wound closing is not required.

First of all, prevention of breast deformities includes rational restoration of the skin on a burnt surface and early elimination of developed deformities. A regular medical check-up should be carried out and operative correction should be performed at the first signs of the disturbance of the growth and development of the breasts in adolescent children. Prevention of relapse deformities involves a new breast location and, in particular, the nipple-areolar complex taking into account presumable retraction of the tissues and in postoperative treatment physiotherapeutic procedures and massage.

When eliminating breast deformities in women of mature age it is often rational to separate the nipple-areolar complex from scars and transpose it to its usual location. Skin shortage can be filled with expander dermatotension.

Elimination of deformities using expander technique consisted of 4 stages: 1-planning of a surgical intervention; 2-expander implantation; 3-actually dermatotension; 4-reconstructive surgery. Dermotension proper was performed at an average pace when fluid introduction into the expander chamber was carried out with an interval of 2-3 days. The introduction of fluid was ceased 5 days before the reconstructive operation. Tissue growth was determined by planimetric measurements with the control of microcirculation in stretched tissues using laser Doppler flowmetry. The final stage of surgical treatment was performed when adequate tissue growth was achieved. First, the scars were excised then fasciocutaneous flaps were cut out and moved with a ratio of their length to width not more than 4: 1.

The complications in implantation of the expander on the body were observed in 2.1% of the patients after the first stage of the operation: there were hematomas in 1.4% and the threat of sore development-in 0.7% of the patient. After the second stage 1.4% of the patients had seromas that were evacuated by puncture. There was margin necrosis of stretched skin after its flattening in 0.7% of the cases (Table 4).

The treatment of the deformities after implantation of polyacrylic gel is of considerable difficulty. It is clinically manifested in the form of severe deformity and contracture of the breasts accompanied by a pain syndrome. In this case there was determined the formation of dense, painful infiltrates in the projection of gel accumulation, gel migration both along the lymphatic flow and along the subcutaneous fatty tissue, a decrease in breast volume and their sharp deformity because of the development of chronic purulent mastitis with the formation of external fistulas with serous-purulent

Table 4: Surgical complications.

Stage	Complication	Percent patients
First	Expander implantation	2.1%
	Hematomas	1.4%
	Sore development risk	
Second	Seromas	
	Necrosis	0.7%

discharge, an admixture of the gel itself and sequestration.

Both patients who underwent injection augmentation mammoplasty using polyacrylic gel did not have any medical records that would reflect the fact of the operation, type and the amount of used material, the method of administration and the information about the course of the immediate postoperative period.

Surgical interventions were performed after a thorough preoperative examination including ultrasound of the breasts. We performed gel removal operations from the access in the inframammary fold. During the operation the attention was drawn to the changes in the structure of the parenchyma of the breasts, adipose and muscle tissues: the tissues had a "boiled" appearance, fibrosis with "miliary" inclusions was pronounced that complicated the performance and increased the duration and invasiveness of the surgical intervention. Solitary glioma was removed; gel displacement was detected and drained. Extensive excision of gel-impregnated tissues inevitably led to the development of secondary deformities of the breasts which required subsequent additional correction. The migration of the gel from the injection area is an absolutely unpredictable process. During our surveys gel displacement (accumulation) was found in the region of the shoulder joint, subclavian fossa, lateral parts of the chest and below the inframammary fold, in the depth of m. pectoralis major. An attempt to remove it by resection of the muscle led to its noticeable deformity, especially pronounced when the bundles of the lower margin of the pectoralis major muscle were separated from the sternum. As the practice and tissue examination showed even the most careful removal of the gel did not guarantee its complete removal. Moreover, it was extremely difficult to determine the resection region both sonographically before the operation and visually during the operation. 2-3 months after the surgical removal of the gel the need for repeated surgical intervention sometimes arose in order to remove glioma and gel displacement. At the same time, the restoration of breast volume by performing augmentation mammoplasty using implants had to be postponed until later.

Although the patient did not notice any functional changes, during the subsequent augmentation mammoplasty we encountered muscle tissue deficiency to cover the upper margin of the implant fully. Moreover, after performing endoprosthetics on the anterior surface of the chest, in the lower quadrants of the breasts because of deficiency of integumentary tissues tuberosity and roughness of the anterior walls of the endoprostheses were palpated that significantly reduced the aesthetic effect of breast augmentation plastic surgery.

CONCLUSIONS

1. Reconstructive operations in patients with cicatricial deformities after a burn injury contribute to a significant regression of psychological and social disorders and therefore improve their overall rehabilitation result.

2. If possible surgical treatment of cicatricial deformities of the anterior surface of the chest wall in adolescent girls should be started before breast development and they should be followed-up.
3. The strategy for the operative correction of post-traumatic deformities of the breasts should be the use of intact tissues with a good blood supply into the affected area.
4. Augmentation operations on the breasts using non-envelope gels are fraught with severe complications.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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