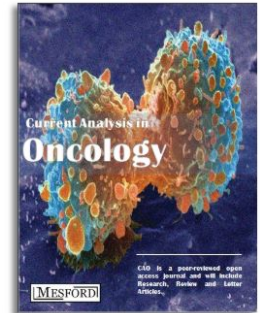


## Preliminary Lipografting in Projection of Future Thoracodorsal Flap to Increase its Volume and Plasticity in Reconstructive Mammoplasty

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### Abstract:

**Premise:** Modern approaches to skin-sparing mastectomy produce impressive esthetic results with a high degree of symmetry. However, functional properties of the reconstructed breast (haptic properties, consensual mobility) often leave much to be desired. The article presents an original technique of skin-sparing surgeries for breast cancer with immediate reconstruction using a thoracodorsal flap pre-modified by lipofilling.

**Methods:** The study included 18 patients with breast cancer who underwent skin-sparing mastectomy for breast cancer with immediate breast reconstruction using a thoracodorsal flap pre-modified by lipofilling. The article determines indications for this surgical intervention and describes lipofilling technique within the projection of the future thoracodorsal flap, breast tissue removal, flap dissection and formation of a symmetrical breast.

**Results:** The results were assessed using the BCCT.core 3.0 software, and the numbers of excellent and good results were similar. In 5 cases (27.8%), breasts were absolutely symmetrical not only visually, but haptically as well. A small percentage of complications allowed considering the suggested surgical intervention to be an effective method for breast reconstruction.

**Conclusions:** Breast reconstruction with a thoracodorsal flap which was previously subjected to lipografting, as well as disuse of combination of a tissue flap with an implant, provide consensual breast mobility and better breast symmetry both visually and haptically.

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### Keywords:

Breast cancer; skin-sparing mastectomy; reconstructive mammoplasty; thoracodorsal flap; lipografting; intramuscular lipofilling; tissue engineering.

## 1. INTRODUCTION

In the past three decades, breast reconstruction after radical mastectomy has been considered not only desirable, but in some cases as obligatory stage of medical and social rehabilitation, acceptable according to oncological requirements.

The breast skin is considered the optimal cover for the reconstructed organ [1]. An impressive international experience of organ-sparing surgeries such as radical resections tolerates preservation of the intact skin tissues as it does not affect the outcomes of special cancer treatment [2-6]. In these circumstances, primary breast reconstruction with immediate skin-sparing mastectomy should be considered as the best technique. It preserves the original shape and size of the skin cover, allowing reconstruction of a breast practically symmetrical to the healthy organ [7]. In 1991, Toth and

Lappert [8] introduced a new term “skin-sparing mastectomy” for immediate breast reconstruction. This started riveting debates on the improvement of aesthetic results of such surgeries [9].

Skin-sparing mastectomy can be performed via minimal surgical approaches with the en block dissection of axillary lymph nodes, which does not contradict the principles of oncology. The amount of residual breast tissue on adipodermal flaps and possible reduction of the surgeon volume are still discussed in modern scientific literature [5, 10-12].

The advantages of reconstruction mammoplasty using autologous tissues include refusal to implant enthetic synthetic materials. This excludes complications common for implants: chronic seromas, implant displacement, rotation or overturn, capsular contracture, implant extrusion. Moreover, the presence of a foreign material under a thin tissue cover makes

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adjuvant radiation therapy inadvisable. The disadvantages of autoplasmic surgical interventions include additional surgical trauma at the donor site with all that it implies: duration of surgery and general anesthesia, blood loss, additional surgical scars and visible deformations at the donor site, dysfunction of the muscle in case of its transplantation. Using a thoracodorsal flap is a reliable way of breast tissue reconstruction. A high potential of blood supply virtually eliminates necrotic complications associated with a transplanted tissue flap. However, this method has a drawback – in the vast majority of cases, the flap volume is insufficient for breast reconstruction. Combination of a tissue graft with a silicone implant is a common approach; however, it combines the disadvantages and complications of autoplasmic and alloplastic approaches. Thus, Hurley, McArdle and O'Broin [13] reported 31% capsular contractures in complex plastic reconstruction with a thoracodorsal flap and an implant.

The purpose of the study was to develop a technique of skin-sparing mastectomy for breast cancer with immediate breast reconstruction using a thoracodorsal flap preliminarily subjected to lipofilling. This approach was designed to improve aesthetics and functional results of reconstructive mammoplasty.

## 2. MATERIAL AND METHODS

Our experience of reconstructive mammoplasty (2014-2016) after radical skin-sparing mastectomy with a thoracodorsal flap pre-modified by lipofilling includes 18 patient observations. All women were 23-52 years old.

The study eligibility criteria and indications for the proposed surgery approach were the following:

1. Nodular monocentric type of the tumor growth
2. Cancer stage: T2N1M0 and lower
3. The distance between the skin surface and tumor: 1.5 cm and more (ultrasound results)
4. Small or average breasts
5. Mastoptosis grade II and lower
6. Body mass index: 20 - 33
8. Patient's consent for the surgery (written informed consent).

The surgical intervention was approved by the ethical committee of the Institute. All patients were informed in details of the surgery, its potential risks and expected results, and signed the patient's informed consents. The principles stated in the Declaration of Helsinki were complied with.

Prior to the surgery, all patients underwent a traditional physical, laboratory and instrumental examination. Pre-surgical verification of malignant process was performed by trepanobiopsy.

Augmentation (lipografting) of soft tissues of the thoracic wall within the projection of the future thoracodorsal flap was performed 7 days prior to the main surgery. De novo cancer

induction or acceleration of the existing tumor growth due to the fat transplantation still raises questions. Today, no safety guarantee can be provided to cancer patients receiving autotransplantation of fat tissue [14]; however, no scientific evidence confirms increased growth or recurrence of breast cancer associated with fat transplantation [15-18].

Adipose grafts were obtained from donor sites with excess body fat – at flank areas. Then the fat tissue was subjected to decantation, and the transplantation was immediately started. The autotransplantation of adipose tissues was performed to three layers: into the subcutaneous tissue over the Scarpa's fascia, under the Scarpa's fascia and to the latissimus dorsi. The muscular tissue has a high carrying capacity due to its elasticity. Strong blood flow is essential for good conditions of replantation of lipografts. Muscle mobilization leads to reduction of its motor performance and improves autolipotransplantation conditions. Intramuscular introduction of adipose tissue is surgically and ethically acceptable [19]. Thickening of the suprafascial adipose tissue layer by lipografting is intended to compensate for the loss of the latissimus dorsi in the posterolateral compartments of the thoracic wall. We managed to transplant from 220 to 460 ml of adipose tissue. Lipofilling was performed using a long cannula with a fan-shaped pattern of injections parallel to the fibers of the latissimus dorsi (Fig. 1).



**Fig. (1).** 7 days after lipografting of the thoracodorsal area on the right. Bruises can be seen at flank (donor) sites.

Skin-sparing mastectomy was performed 7-8 days after lipografting. This period was enough to secure the lipografts in tissues and initiate neoangiogenesis processes (proven by morphological examination).

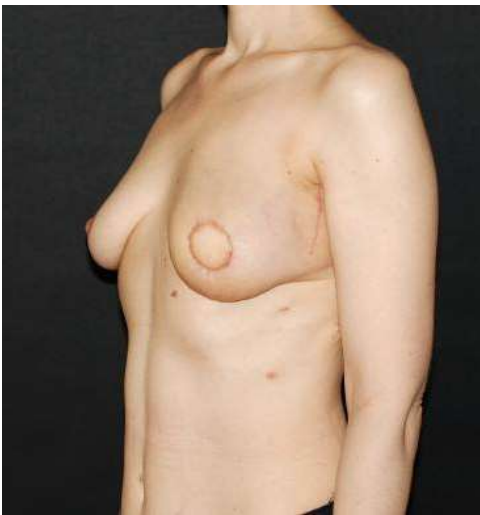
The midline was marked before skin-sparing mastectomy, and then breast boundaries and the submammary fold symmetrical to the healthy one were drawn on the sore side. Tumor projection and the lines of surgical approach to breast tissue and axillary region were marked on the skin.

The following surgical interventions were performed depending on the approach to the skin and nipple-areola complex:

- mastectomy with removal of the nipple-areola complex (2 patients)
- nipple-sparing mastectomy (16 patients)



**Fig. (2).** Reconstruction of the left breast with removal of the nipple-areola complex



**Fig. (3).** The same patient. View from the left.



**Fig. (4).** The same patient. View from the right.

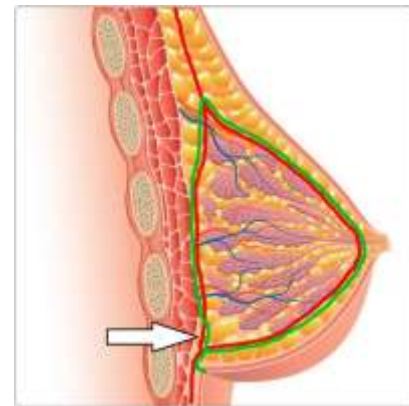
The first mentioned strategy involved circular dissection of the skin around the areola, isolation and removal of breast tissue together with the nipple-areola complex. This technique was used in 2 cases, when malignant tumors located in the central (subareolar) area. This strategy was aimed at preventing possible tumor recurrence (Figs. 2-4).

Skin-sparing and nipple-sparing mastectomy was performed through a limited inframammary linear incision.

The inframammary fold is an important breast anatomical structure, and its preservation is crucial for good aesthetic outcomes after reconstructive breast surgery [20-22], provided that it is oncologically safe [23]. Thomas inframammary (submammary) incision [24] is considered one of the optimal ones. It allows preservation of the intact skin envelope of the breast, providing sufficient exposition of dissected tissues and manipulation angle. In patients with breast ptosis (the majority of patients), the postoperative scar becomes located in the submammary fold and is completely covered under the breast. Incision that is parallel to the Langer lines facilitates creation of a good thin scar. However, as a rule, such an access leads to the destruction of anatomic structures of the inframammary area, requiring special surgical techniques during the wound closure. Moreover, the dissection of the posterior lamina of the superficial fascia can lead to the downward tissue flap displacement into the loose adipose tissue under the Scarpa's fascia [25].

**Surgery technique.** The infiltration of the subcutaneous layer of the breast with the saline solution and epinephrine (1:200 000) was performed in a supine position. This procedure provided the vessel constriction and, as a result, prevented the tissues from bleeding. The visualization of such anatomical constructions as Scarpa's fascia and Cooper's ligament improved. After the 10-minute exposition, the surgery was started. After the dissection of the skin and superficial adipose layer in the inframammary fold, the surgeons identified superficial (Scarpa's) fascia, separated the adipose layer above it up to the area of fascia bifurcation into the anterior and posterior layer. Further, the anterior layer was dissected and the mammary tissue separated. The posterior layer was dissected horizontally 2 cm above the bifurcation trying to preserve its fusion with the fascia pectoralis, i.e. the place of fusion of the deep layer of the superficial fascia and superficial layer of the deep fascia.

During the proposed surgery approach, the surgeons did not need to dissect the deep adipose subcutaneous layer under the breast, which prevented further downward flap displacement (Fig. 5).



**Fig. (5).** Sagittal projection of the incision and dissection of the tissues (green line). Scarpa's fascia is shown in red. The place of fusion of the deep layer of the superficial fascia and superficial layer of the deep fascia is marked with a white arrow [26] (modified by Y.V. Przhedetskiy).

Further, standard skin and nipple sparing mastectomy was performed: breast dissection was performed along the border of the glandular tissue and adipose layer, dissecting the Cooper's ligaments as close to the derma as possible. The conventional border of the dissection had a polycyclic outline. This approach allowed minimization of the mass of residual breast tissue and preservation of the blood circulation and covering properties of the skin and adipose flap. The anterior lamina of the mammary superficial fascia is very thin; it can be rarely identified in the operational wound, so we do not recommend to be guided by it. This data agrees with the results of the study conducted by Beer G.M., Varga Z., Budi S. et al. [27].

Breast tissue removal was performed without affecting the area beyond the breast footprint mark, and especially the submammary fold, so as not to damage the fascial system of inframammary region at the site of the superficial fascia splitting into the front and rear leaves (Figs. 6-8). A deep dissection below the level of the submammary fold results in its harder restoration during the reconstruction stage of surgical intervention; the fold may become contour-deficient which reduces the general aesthetics effect of the reconstruction. However, these principles were neglected in cases of tumors in the lower quadrants of the breast, so as not to reduce the oncologic radicality of the surgical intervention, and the submammary fold was reconstructed by the fixation of the superior border of the dissected Scarpa's fascia to the superficial layer of the deep fascia.



**Fig. (6).** Reconstruction of the right breast after skin-sparing and nipple-sparing mastectomy.



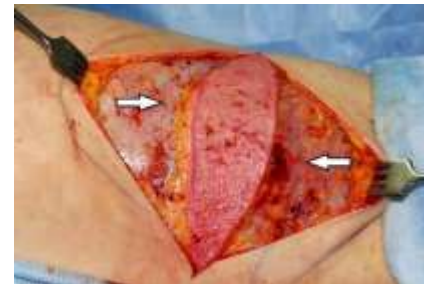
**Fig. (7).** The same patient. View from the right.



**Fig. (8).** The same patient. View from the left.

In case of a superficial tumor, dissection of tissues over it was performed in subcutaneous tissue layer involving superficial fascia and adipose tissue up to the lower derma. Limited subcutaneous dissection did not result in ischemic injuries in this skin area. During the dissection, special attention was paid to the hemostasis, otherwise tense hematomas and deficient flap perfusion could develop in the postoperative period.

After the breast mobilization up to the axillary tail, the skin was dissected in the axillary area, and the adipodermal flap was dissected over the axillary tail; the breast was transposed into the axillary wound and, if necessary, axillary lymph node dissection en block was performed. After positioning the patient in the lateral position, formation of a thoracodorsal flap was started. Initially, we aimed for obtaining the maximal flap volume, so the dissection was performed over the Scarpa's fascia (Fig. 9). Limited marginal necrosis of the skin 0.3 and 0.5 cm wide developed in the postoperative period in two of five patients.



**Fig. (9).** Thoracodorsal flap dissection over the Scarpa's fascia (white arrows).



**Fig. (10).** Thoracodorsal flap dissection under the Scarpa's fascia (white arrows).

Flap dissection was performed under the Scarpa's fascia during the next surgery series, and no ischemic injuries of skin flaps were observed in 13 successive patients (Fig. 10).

The pedicle (the broadest muscle) was isolated above the site of introduction of the thoracodorsal neurovascular bundle. This technique allowed a full axillary cavity myoplasty after the lymph node dissection in the muscle rotation and prevented unwanted impaction of tissues.

The flap was put through the subdermal tunnel into the formed breast pocket, modeled by excision of the excess, then fixed with three stitches in superior medial, inferior medial and inferior lateral portions of the breast. Two active drainages were placed at the recipient and donor sites; then layered closure of wounds was performed with intradermal suturing.

12 patients (66%) received adjuvant distant gamma therapy. A transient hyperpigmentation of the skin in irradiation fields was observed.

### 3. RESULTS

Aesthetic evaluation of the results was performed using the BCCT.core 3.0 software (Portugal) [28]. Excellent (9) and good (9) results were obtained for all patients. The shape and volume of the reconstructed breasts were similar to the contralateral ones. Perfectly symmetrical breasts were obtained in 5 patients (27.7%), and the symmetry was both visual and haptic. Importantly, this surgery technique allowed consensual (symmetrical) breast mobility in body position changes (Figs. 11-13).



**Fig. (11).** Program evaluation of aesthetic and functional results of reconstructive autammoplasty on the right breast, standing position (Excellent).

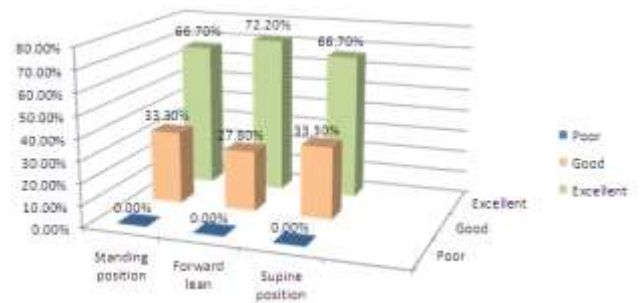


**Fig. (12).** Program evaluation of aesthetic and functional results of reconstructive autammoplasty on the right breast, supine position (Excellent).



**Fig. (13).** Program evaluation of aesthetic and functional results of reconstructive autammoplasty on the right breast, forward lean (Excellent).

The distribution of aesthetic and functional results is shown in Fig. (14).



**Fig. (14).** Evaluation of aesthetic and functional results in patients

Dynamic follow-up demonstrated induration of the thoracodorsal flap 5-7 days after the surgery and its softening in 1.5-2 months. The resulting consistency of the flap and the reconstructed breast did not differ from the contralateral one. Such behavior of the flap was probably caused by its previous modification by lipofilling. Replantation of autolipografts is usually accompanied by tissue oedema; besides, formation of a thoracodorsal flap results in a moderate disruption of venous return (venous stasis), which contributes to its swelling. The flap acquired its natural haptic properties after the development of collateral vessels, normalization of blood circulation and lymphatic drainage.

Analysis of complications showed 2 cases (11.1%) of marginal necrosis of superior border of the donor wound skin; the patients received conservative treatment up to the crust rejection. As noted above, this phenomenon was caused by the flap dissection over the Scarpa's fascia with thinning of the remaining part. Long-term seromas of the donor site (more than 1 month) were observed in 6 cases (33%); the seromas were eliminated by repeated punctures. Accumulation of the serous fluid in thoracodorsal flap dissection, especially in combination with axillary lymph node dissection, is common. Massive damage to large lymphatic vessels coming from the corresponding hemithorax half to the axillary lymph node basin leads to significant lymph accumulation in the wound.

In one case, development of a lipogranuloma 2 cm in diameter was observed 5 months after the surgery in distal portions of the thoracodorsal flap. It remains unclear whether this complication was the result of radiation therapy or local ischemic injuries.

No local tumor recurrence or other cases of disease progression were observed. Unfortunately, the limited number of patients and the follow-up period (44 months max) prevented us from drawing any final conclusions relating to the response to cancer treatment.

**4. DISCUSSION**

Special attention should be paid to aesthetics and functional aspects of the method. Undoubtedly, the reconstructed breast should be maximally symmetric to the contralateral one. We believe that breast symmetry has two components, visual and functional. Visual symmetry means the identity of the volume, shape and color of the healthy and reconstructed breast. Functional aspects of the reconstructed breast imply:

1. Compensatory function
2. Haptic function
3. Movement function.

Compensatory function of the breast is the simplest to achieve. This function can be implemented by any transplanted tissue flap with its weight similar to the weight of the healthy organ.

Haptic similarity can only be achieved by using autogenous tissues pre-modified by lipofilling. Large amounts of intramuscular fat changes the haptic properties of the flap which becomes softer and more flexible. The use of implants never results in complete haptic correspondence.

By movement or mobility function we mean similar changes in the breast shape and their sliding along the chest wall when changing the body position. This function can be achieved by preserving the breast skin cover and by using the autogenous tissues as “filler” (Figs. 10-19).



**Fig. (15).** Three months after reconstruction of the right breast. At the stage of adjuvant radiation therapy.



**Fig. (16).** The same patient. View from the right.



**Fig. (17).** The same patient. View from the left.



**Fig. (18).** The same patient. Nine months after reconstruction of the right breast. Similar changes in the breast shape when leaning forward.



**Fig. (19).** The same patient. Similar changes in the breast shape in supine position.



**Fig. (20).** Aesthetic results 1.5 months after reconstruction of the right breast.



Fig. (21). The same patient. View from the right.



Fig. (22). The same patient. View from the left.



Fig. (23). The same patient. The breast at medial displacement.



Fig. (24). The same patient. The breast at lateral displacement.

Adaptation of the flap, as a filler, to the adipodermal cover is an interesting characteristic of the suggested surgical technique. In breast reconstruction with a silicone implant, the skin envelope usually adapts to the volume and shape of the implant, while in this case the skin envelope forms the breast in accordance with previous shape (shape memory). The reasons for such conformity of a thoracodorsal flap modified by lipofilling are vague; however, we suppose that different pressure of skin cover on the flap allows lipografts to survive in areas of minimal impact and urges them to resorb in areas of maximal pressure (Fig. 20).



a



b



c

Fig. (25). (a,b,c). Changes in the shape of the right breast 5 (a), 10 (b) and 45 (c) days after reconstructive mammoplasty.

The proposed method is a tissue engineering one [18], as it allows creation of a completely new tissue type not existing in nature – a muscle richly filled with adipose tissue, and in some

cases the ratio of adipose and muscle tissues can reach 1:1. Anatomical and morphological structure of a musculocutaneous flap modified by preliminary lipografting predetermines its remarkable plastic and elastic properties and causes tactile similarity and even identity of healthy and operated breasts.

Literature data on lipografting of a thoracodorsal flap is very poor: we are aware of two papers on this subject [4,29]. The authors performed autolipotransplantation simultaneously with the flap dissection. Their reasonable concerns on the possible development of compartment syndrome with compression of the pedicle vessels and occurrence of ischemic disorders caused by the introduction of adipose tissue limited the surgeons: lipografting was performed at distal muscle sections behind the skin island projection. Our method involves introduction of adipose tissue proximal to the skin island, under it and distal to it, as the blood supply in this area prior to the flap dissection from the latissimus dorsi is not disturbed and a large number of collateral vessels does not allow the development of compartment syndrome. 7 days after lipografting, the edema regressed; lipografts were reliably fixed in tissues not least because of neoangiogenesis, and did not leak out of the flap as in simultaneous surgery during involuntary muscle contraction. Thus, the 7-day adaptation of lipografts and anatomical area of the future thoracodorsal flap allows introduction of a significantly larger amount of adipose tissue over a larger area without the risk of postoperative complications, such as the loss of lipograft volume due to muscle contraction and ischemic disorders.

Advantages of the method:

1. Preliminary increase in the flap volume by lipografting allows replacing defective breast tissues without an implant.
2. Larger amounts of adipose tissues can be introduced, compared to simultaneous surgery.
3. Flexible adaptation of a modified flap to the shape of adipodermal envelope allows reconstruction of initial breast shape.
4. Immediate axillary cavity myoplasty is performed after lymph node dissection.
5. Improved resistance of the breast skin to the damaging effect of adjuvant radiation therapy, compared to alloplastic surgeries.
6. Improved aesthetics of donor sites due to body contouring (liposuction).

Unfortunately, we are not aware of the perfect method of breast reconstruction. However, today, in our opinion, skin-sparing mastectomy with immediate breast reconstruction with a thoracodorsal flap preliminarily subjected to lipografting is an effective surgical technique to achieve aesthetics (symmetry) and functionality of the result. With the correct selection of patients, this approach in some cases leads to remarkable results.

## CONCLUSIONS

1. Preservation of the breast skin implies an immediate reconstructive mammoplasty. Replacement of the lost breast volume with a thoracodorsal flap pre-modified by lipografting instead of combining tissue graft with an implant allows for better visual symmetry and similar tactile and movement characteristics of the breasts.
2. Suggested technique has some advantages in comparison with traditional methods: adipodermal envelope shapes the modified tissue flap according to the shape memory principle, and it helps to achieve better aesthetics and functional breast symmetry.

## CONFLICT OF INTEREST

Yury V. Przhedetskiy declares that he has no conflict of interests.

Oleg I. Kit declares that he has no conflict of interests.

Viktoria Y. Przhedetskaya declares that she has no conflict of interests.

Arthur V. Borlakov declares that he has no conflict of interests.

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## REFERENCES

- [1]. Simmons RM, Adamovich TL. Skin-sparing mastectomy. *Surg Clin North Am* 2003; 83: 885-99.
- [2]. Ho CM, Mak CK, Lau Y, Cheung WY, Chan MC, Hung WK. Skin involvement in invasive breast carcinoma: safety of skin sparing mastectomy. *Ann Surg Oncol* 2003; 10: 102-7.
- [3]. Kroll SS, Schusterman MA, Tadjalli HE, Singletary SE, Ames FC. Risk of recurrence after treatment of early breast cancer with skin-sparing mastectomy. *Ann Surg Oncol* 1997; 4: 193-197.
- [4]. Santanelli di Pompeo F, Laporta R, Sorotos M, Pagnjini M, Falesiedi F, Longo B. Autologous immediate breast reconstruction without implants. *Plast Reconstr Surg* 2014; 134: 871-9.
- [5]. Simmons RM, Brennan M, Christos P, King V, Osborne M. Analysis of nipple-areole involvement with mastectomy: can the areole be preserved? *Ann Surg Oncol* 2002; 9: 165-8.
- [6]. Sotharan WJ, Rainsbury RM. Skin-sparing mastectomy in the UK – a review of current practice. *Ann R Coll Surg Engl* 2004; 86: 82-6.
- [7]. Przhedetskiy YV, Kachanov IV. Skin-sparing mastectomy with single-step reconstruction of the organ. *Ann Reconstr Plas Aes Surg* 2011; 2: 31-43.
- [8]. Toth BA, Lappert P. Modified skin incision for mastectomy: the need for plastic surgical input in preoperative planning. *Plast Reconstr Surg* 1991; 87: 1048-53.
- [9]. Gonzales EG, Rancati AO. Skin-sparing mastectomy. *Gland Surg* 2015; 4: 541-53.
- [10]. Carlson GW, Styblo TN, Lyles RH, et al. Local recurrence after skin-sparing mastectomy: tumor biology or surgical conservatism? *Ann Surg Oncol* 2003; 10: 108-12.
- [11]. Medina-Franco H, Vasconez LO, Fix RJ, et al. Factor associated with local recurrence after skin-sparing mastectomy and immediate breast reconstruction for invasive breast cancer. *Ann Surg* 2002; 235: 814-9.
- [12]. Simmons RM, Kersey FS, Gayle L, et al. Local and distant recurrence rates in skin sparing mastectomies compared with non- skin-sparing mastectomies. *Ann Surg Oncol* 1999; 6: 676-81.
- [13]. Hurley CM, McArdle A, Joyce KM, O'Broin E. Skin sparing mastectomy with immediate nipple reconstruction during autologous latissimus dorsi breast reconstruction: a review of patient satisfaction. *Arch Plast Surg* 2018; 45: 534-41.



- [14]. Chan CW, McCulley SJ, Macmillan RD. Autologous fat transfer—a review of the literature with a focus on breast cancer surgery. *J Plast Reconstr Aesthet Surg* 2008; 61: 1438-48.
- [15]. Hamza A, Lohsiriwat V, Rietjens M. Lipofilling in breast cancer surgery. *Gland Surg* 2013; 2: 7-14.
- [16]. Largo RD, Tchang LA, Mele V, et al. Efficacy, safety and complications of autologous fat grafting to healthy breast tissue: a systematic review. *J Plast Reconstr Aesthet Surg* 2014; 67: 437-48.
- [17]. Rietjens M, De Lorenzi F, Rossetto F, et al. Safety of fat grafting in secondary breast reconstruction after cancer. *J Plast Reconstr Aesthet Surg* 2011; 64: 477-83.
- [18]. Simonacci F, Bertozzi N, Grieco MP, Grignaffini E, Raposio E. Autologous fat transplantation for breast reconstruction: a literature review. *Ann Med Surg* 2016; 12: 94-100.
- [19]. Ono MCC, Graf RM, de Paula DR, Lupion FG, Freitas RDS. Extended chest wall based flap and lipofilling for immediate breast reconstruction for obese. *J Plast Reconstr Aesthet Surg* 2018; 71: 1664-78.
- [20]. Boutros S, Kattash M, Wienfeld A, Yuksel E, Baer S, Shenaq S. The intradermal anatomy of the inframammary fold. *Plast Reconstr Surg* 1998; 102: 1030-33.
- [21]. Buccheri EM, Zoccali G, Costantini M, De Vita R. Breast reconstruction and inframammary fold reconstruction: a versatile new technique. *J Plast Reconstr Aesthet Surg* 2015; 68: 742-43.
- [22]. Calobrace MB. *Plastic Surgery; Volume 5: Breast Forth Edition*. 2018: P.49-69.
- [23]. Bogetti P, Cravero L, Spagnoli G, et al. Aesthetic role of the surgically rebuilt inframammary fold for implant-based breast reconstruction after mastectomy. *J Plast Reconstr Aesthet Surg* 2007; 60: 1225-32.
- [24]. Zoltan J. *Female breast reconstruction*. Budapest, 1989; P. 237
- [25]. Przhedetskiy YV, Khokhlova OV, Przhedetskaya VY. Method of inframammary approach in case of skin-sparing mastectomy with single-step reconstruction by means of a silicone implant. Patent of Russian Federation 2545431, 2015.
- [26]. Link:available from:<https://i.pinimg.com/originals/79/fb/dd/79fbdde039c8378f146c2915369eece0.jpg>
- [27]. Beer GM, Varga Z, Budi S, et al. Incidence of the superficial fascia and its relevance in skin-sparing mastectomy. *Cancer* 2002; 94: 1619-25.
- [28]. Cardoso MJ, Cardoso J S, Oliveira HP, Gouveia P. The breast cancer conservative treatment. Cosmetic results – BCCT.core – Software for objective assessment of esthetic outcome in breast cancer conservative treatment: a narrative review. *Computer Methods and Programs in Biomedicine* 2016; 126: 154-9.
- [29]. Zhu L, Mohan AT, Vijayasekaran A, et al. Maximizing the volume of latissimus dorsi flap in autologous breast reconstruction with simultaneous multisite fat grafting. *Aesthet Surg J* 2016; 36: 169-78.