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ORIGINAL ARTICLE BREAST

Autoaugmentation Mastopexy Modification Prevents Bottoming-Out Deformity and Areola Distortion: A Preliminary Report

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Abstract
Background Ptotic breast deformity results from involution of breast parenchyma and leads to a loss of volume, along with a converse laxity of the skin envelope. As the breast tissue descends inferiorly with gravity, there is an apparent volume loss in the upper pole and the central breast, and the lower pole becomes fuller and often wider. This study presents modifications for a well-known mastopexy technique which provides not only autoaugmentation for the breast but also suspension for the breast parenchyma and reduces bottoming-out deformity, and also obtains a regular areola shape in all types of breasts.
Patients and Methods The modifications involve 2–4 cm subareolar crescentic incisions for regular areolas and cylindrical excision of the recipient area in the superior medial and lateral pillars for wide flaps in medium and large-size breasts.
Results The present study included 63 female patients, with an average body mass index of 25.5 ± 2.0 kg/m^2, aged 26–47 years (average 35 years). The author performed vertical scar mastopexy and augmented the breasts with a distal-based flap of deepithelialized dermoglandular tissue inserted beneath the breast parenchyma of a superior-based nipple-areolar complex pedicle.
Conclusions In this study, modifications included subareolar crescentic incisions and cylindrical excisions in the superior medial and lateral pillar regions. This technique produced satisfactory results for all types of breasts in terms of good breast shape, natural image at the upper pole of the breast, good projection, and reduced bottoming-out deformity. This simple modified technique maintained the size of the breasts and avoided augmentation by breast implants.
Level of Evidence V This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266.

Keywords Mastopexy · Autoaugmentation mastopexy · Breast implant · Reduction mammoplasty

Introduction

Mastopexy of small ptotic breasts presents one of the greatest challenges to plastic surgeons. Esthetic goals of this procedure include obtaining a more youthful appearance, reduced ptosis, and improved projection. Breast ptosis can be due to several factors, of which gravity seems to be the most common. Aging, peripartum enlargement, postpartum involution, and several other factors may contribute to the diminished elasticity of breast tissue over time, and the end result of which is a ptotic breast [1, 2]. Gonzalez-Ulloa [3] and Regnault [4] first advocated mastopexy with augmentation for the correction of ptosis with hypoplasia. Eventually, mastopexy augmentation with mammary implants became the most popular technique for small and medium-size breasts [5–7]. Johnson [8] and others [9–13] have used polygalactin or marlex mesh to lift the breast parenchyma to obtain a long lasting breast lift. Benelli [14] reported the use of the periareolar round block or purse string mammoplasty. Different techniques aiming to recreate breast fullness by utilizing autologous tissue

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have been described by Weiss and Ship and Flowers [15, 16]. Hall-Findlay [17] used a medial-based pedicle modification of the vertical scar approach which was first described by Lejour [18]. Graf and Biggs described a modification of the vertical approach that places an autologous tissue flap deep into a strip of pectoralis muscle to improve the shape and maximize the longevity of the mastopexy [19]. Suspension techniques using the pectoral fascia have also been tried [20].

Mastopexy of small, medium, and large-size breasts is more challenging to plastic surgeons when patients seek to lift their ptosed breast while maintaining their present breast size, without the use of a breast implant. In these circumstances, mastopexy, combined with autoaugmentation, is an alternative method. Franz Hönig and his colleagues [21] used an inferior-based flap of deepithelialized dermoglandular tissue inserted beneath the breast parenchyma of a superior-based nipple-areolar complex (NAC) pedicle to autoaugment the breast. In this study, the author implemented this method to autoaugment the breast, improve breast projection, and enhance the desired fullness in the upper pole of the breast. Nazım Gümüs has reported a versatile modification of the dermoglandular hammock flap for mastopexy referred to as "extended hammock." His technical modification involves a hammock flap extended in both width and length [22].

Nonetheless, if the central portion of the breast tissue is not supported sufficiently, breast tissue will sag from the upper pole to the lower pole and a bottoming-out deformity will be formed. The upper pole is also emptied. Additionally, when the hammock flap is folded under the NAC, changes in tension may result in elliptical-shaped areolas in medium and small-size breasts. In this study, we discussed some modifications that contribute to prevent such deformities.

Patients and Methods

This study was conducted with 63 female patients, with an average body mass index (BMI) of 25.5 ± 2.0 kg/m^2, between April 2009 and December 2013. The first 23 patients underwent conventional autoaugmentation mastopexy, whereas the remaining 40 patients underwent the aforementioned modified technique. All patients had small (n: 27), medium (n: 23), or large-size (n: 13) breasts with different degrees of ptosis. The age of the patients ranged from 25 to 47 years with an average age of 35 years. The cause of breast ptosis for 50 of the patients was postpartum involution changes; for the remaining 13 patients, it occurred following weight loss. They had minimal, moderate, and severe ptosis. The patients with small and medium-size breasts requested lifting of their breasts, improvement of projection, and maintenance of size and natural image at the upper pole of the breasts. The large-size breast patients requested lifting of their breasts, improvement of projection, reduction in size (total: 350 ± 75 grams), and fullness at the upper pole of the breasts. Routine preoperative assessment of the breasts was carried out and included measurement of the degree of ptosis, skin elasticity, and evaluation of the status of the breast parenchyma. The number of the patients, average follow-up time, and amount of resected tissue and ptosis type are shown in Table 1. Standard preoperative and postoperative photographs were taken. Marking of the Lejour technique for vertical scar mastopexy was drawn, while the patient was in the standing position. The distance between the nipple and the sternal notch, as well as the distance between the nipple and the inframammary fold, were measured on both sides. Any degree of asymmetry was adjusted in the marking of the newly positioned nipple (Table 2). All patients were operated on under general anesthesia. First generation cephalosporin was given intravenously at the start of surgery.

Surgical Technique

Ten minutes after infiltration of 1:500,000 adrenaline/saline, the overlying skin of the marked superior pedicle and the lower segment of the dermoglandular flap was deepithelialized. With the use of diathermy connected to a fine Colorado needle, the cutting and dissection of the pedicle was carried out creating a superior pedicle with the NAC. The lower segment dermoglandular flap was dissected from the medial and lateral pillars of the breast as well as deeply from the pectoral fascia (Fig. 1). Dissection was continued underneath the medial and lateral flaps, as well as deep to the superior pedicle to create a pocket. After completion of hemostasis, the NAC was transposed superiorly to the proposed new site. The inferior dermoglandular flap attached superiorly at the NAC was turned over and attached to the pectoral fascia underneath the superior pedicle. Three stitches of 2/0 absorbable sutures were placed deep into the dermoglandular flap and fixed to the pectoral fascia opposite the third rib (Fig. 1). Before the temporary closure of the medial and lateral pillars was done (in medium and large breast patients), tissue 2 cm in diameter and 4-5 cm in length was excised from the upper side of the lateral pillar flap. In addition, subareolar crescentric incisions were made for relaxed and regular areolas. Schematic illustration of the surgical plan is seen in Fig. 2. With the patient in the sitting position, the shape, projection, and symmetry were evaluated. A suction drain was inserted in all patients. The deep layers of the medial and lateral flaps were then gathered by 2/0 PDS sutures and then the subcutaneous layer with 3/0 PDS sutures. The skin was closed with 4/0 Monocryl

Table 1 Number of the patients, average follow-up time, amount of the resected tissue, and ptosis type

Number of the patients n: 63	Complication	Follow-up time	Amount of tissue resected	Ptosis type
Small-size n: 27	Bottoming-out n: 4	12–30 months	Large-size: 350 ± 75 g	Nipple ptosis n: 45 Glandular ptosis:18
Medium-size:23	Seroma:1		Medium-size: 35 ± 10 g	
Large-size n: 13	Suture reactions: 4		Small-size: only skin	

Table 2 Pre- and postoperative evaluation of the NAC position ($N = 63$)

Distance	Preoperative	Postoperative 10 days	Postoperative 6 months	Postoperative 12 months
N-SN	25.5 ± 1 cm	19.5 ± 0.5 cm	19.8 ± 0.9 cm	20.8 ± 0.7 cm
N-IMF	11.2 ± 0.8 cm	5.5 ± 0.6 cm	6.8 ± 0.6 cm	7.1 ± 0.5 cm
IMD	18.1 ± 0.7 cm	18 ± 0.4 cm	18.3 ± 0.8 cm	18.5 ± 0.9 cm

N-IMF distance between the nipple and the inframammary fold, *IMD* intermammary distance, *N-SN* distance between the nipple and the sternal notch

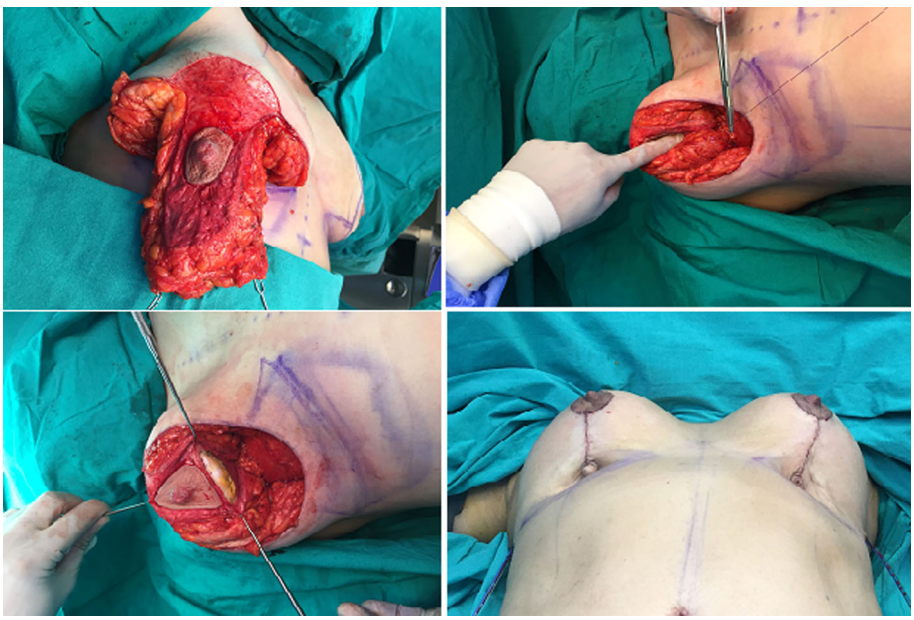

Fig. 1 Intraoperative images of 45-year-old female patient. Extended hammock flap, *upper left*. Flap sutured to pectoral fascia, *upper right*. Crescentic incision, *lower left*. Closure, *lower right*

intradermal sutures. The areola was adjusted to a rounded circle with diameter of 4.5 cm, and any excess skin was trimmed with sharp scissors. Skin of the areola was closed using 4/0 PDS subcutaneous and 4/0 monocryle intradermal sutures (Fig. 1).

Results

This study included 63 female patients with small, medium, or large-size breasts with variable degrees of breast ptosis. Postoperative follow-up periods ranged from 14 to 30 months, with an average of 24 months. Fifty-nine patients were highly satisfied in terms of size, shape, projection, and natural image at the upper pole of the breasts. Pre- and postoperative evaluation of the nipple projection is shown in Table 3. However, four patients neither achieved good projection nor natural image at the upper pole of the breasts. Four patients developed bottoming-out at 6–8-month postoperatively and a secondary mastopexy was not performed. Patients did not accept revision because they were satisfied. One patient developed seroma which was resolved after repeated aspiration. Three patients developed suture reactions. Preoperative and postoperative images of the patients are shown in Figs. 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, and 14.

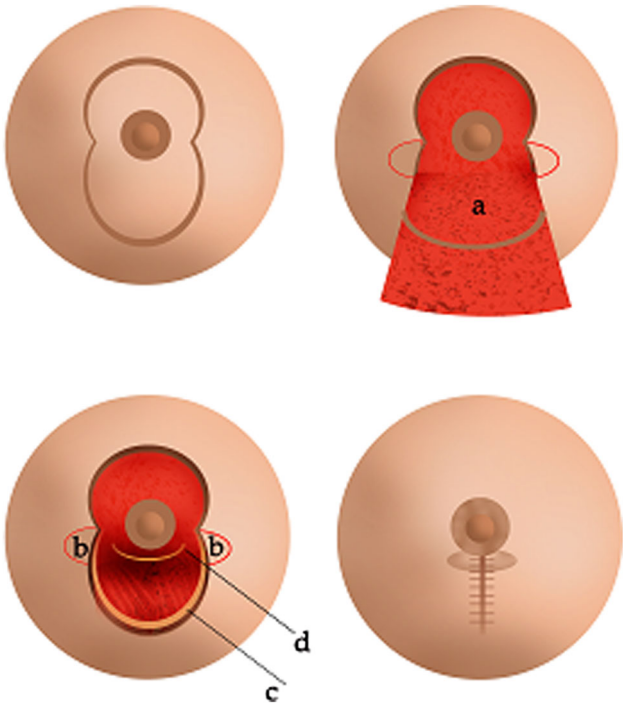

Fig. 2 Schematic illustration of the surgical plan. **a** Extended hammock flap. **b** Semicircle excised tissue from the upper part of the lateral pillar flap to support the central portion. **c** Lateral pillar flaps. **d** Crescentic incision including only the dermis, to relax the areola. *Lower right view* after the incisions were sutured: semicircle excised area support the central portion covering from the inferior

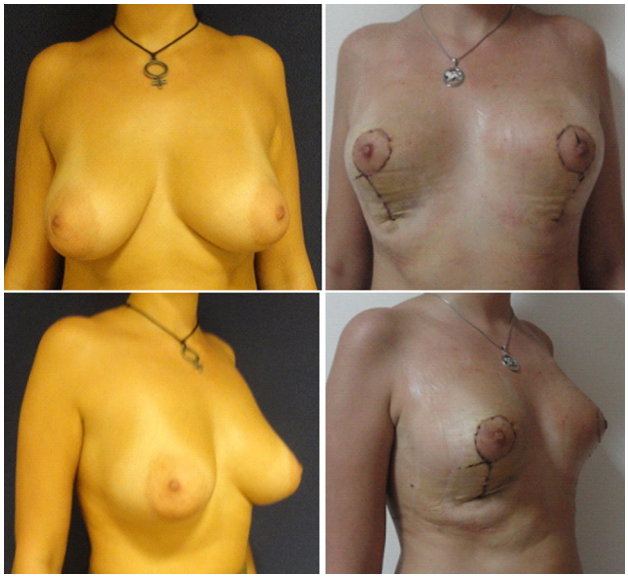

Fig. 3 Images of a 28-year-old single female patient. Preoperative appearance, *left column*. Postoperative 10-day appearance, *right column*

Discussion

Mastopexy of small and medium-size breasts without a decrease in size, while improving projection, and maximizing fullness of the upper pole, has always been a great challenge. In such cases, mastopexy with augmentation of the breast by mammary implant was a logical solution. Gonzales-Ulloa, followed by others, introduced the concept of combined augmentation and mastopexy [3–7]. Over the past few years, there has been an increase in the discussion of augmentation combined with mastopexy in the literature. Bottoming-out of the breast, asymmetry, and implant capsular contracture have been seen as drawbacks of this combined technique [7, 23–26]. Recently, women have developed a silicone phobia throughout the world and subsequently reject the use of mammary implants. Due to these circumstances, autologous soft tissue autoaugmentation has become an alternative. Autoaugmentation mammaplasty dates back to Ribeiro's report [27] and was revised with his collogues [28]. This procedure removes breast tissue from an area with excessive tissue and places it in an area with a deficit. This tissue works as a natural prosthesis and provides good fullness at the upper pole of the breast.

This idea stimulated other surgeons to use the vascularized dermoglandular flaps to autoaugment the breasts. From South Africa, Fayman [29] published his own technique for autoaugmentation. He used an inferiorly based dermoglandular flap and transposed it behind the NAC

Table 3 Pre- and postoperative evaluation of the nipple projection ($N = 63$)

Breast type	Preoperative NC	10-day postoperative NC	6-Month postoperative NC	12-Month postoperative NC
Small-size	3.9 ± 0.5 cm	5.3 ± 0.5 cm	5.1 ± 0.7 cm	4.8 ± 0.6 cm
Medium-size	4.4 ± 0.4 cm	6.2 ± 0.5 cm	5.8 ± 0.5 cm	5.5 ± 0.4 cm
Large-size	4.7 ± 0.5 cm	6.3 ± 0.5 cm	6.1 ± 0.5 cm	5.9 ± 0.4 cm

Projection of nipple to a perpendicular line of the chest wall in patients standing erect in a series of autoaugmentation mammaplasties before and after surgery

NC distance from nipple to chest wall

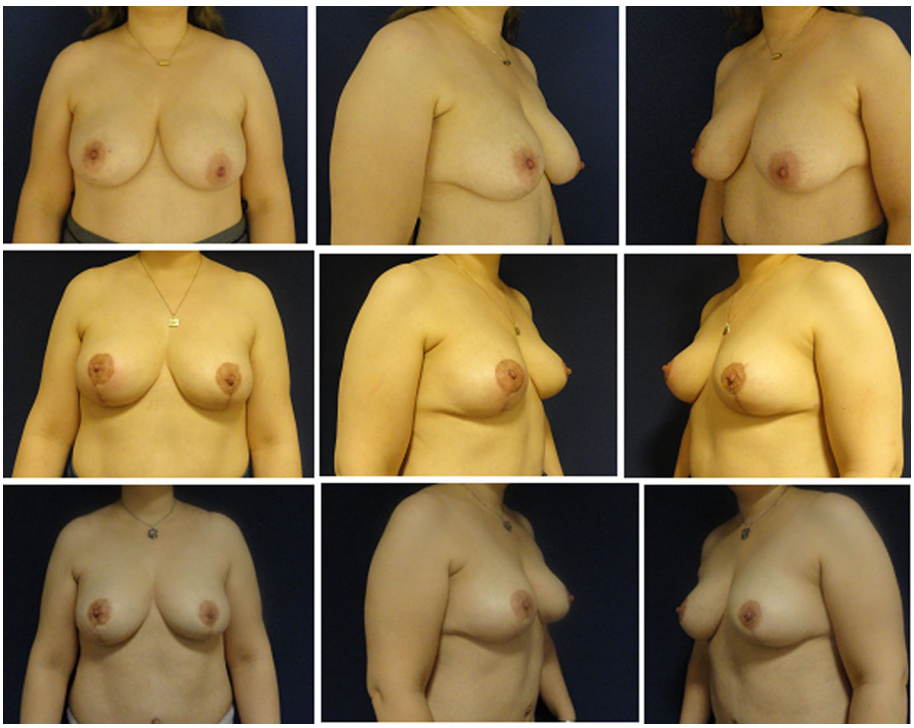

Fig. 4 Images of 37-year-old nullipar patient. *Upper* preoperative, *middle* 1-year postoperative, *lower* 3-year postoperative appearance

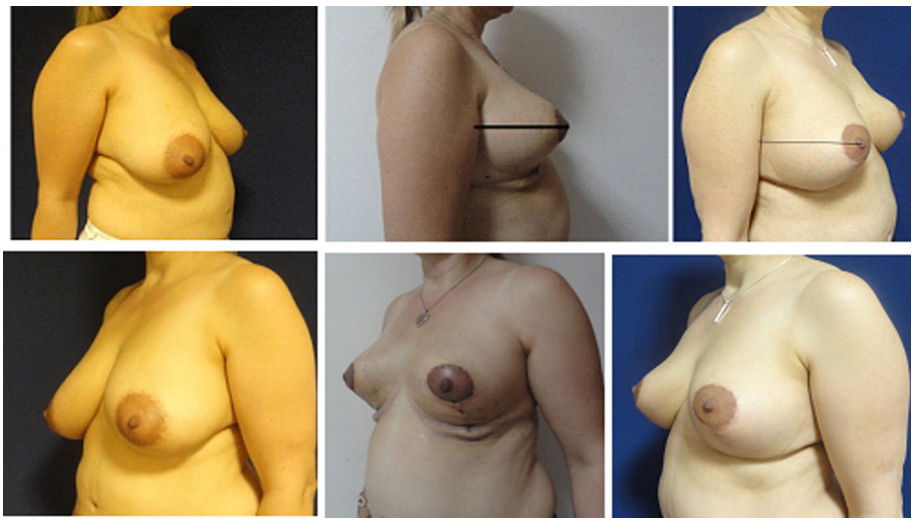

Fig. 5 Images of 33-year-old nullipar female patient. Preoperative and 10-day, 30-day postoperative, and 12-month postoperative appearance

suturing it to the pectoralis fascia. Hönig and his collogues [21] used the same technique and published their positive results. The dermoglandular hammock flap was described by de la Plaza et al. in 2005 [12]. This technique uses a transposition flap to fill the upper and central breast by relocating the lower breast tissue. An upper-pedicle dermoglandular flap is raised from the lower pole of the breast and transposed to the upper pole. The flap is fixed like a hammock to the pectoral fascia, and the donor defect, which extends laterally, is closed by approximation of the medial and lateral pillars. This makes it possible to augment the upper pole with sagging lower breast tissue and to suspend the whole breast on the pectoral muscle with dermis, improving long-term breast projection and upper pole fullness. In the Gümüş modification, the hammock flap design involves a longer and broader flap, so that it can reach more easily and effectively to the upper pole through the prepectoral pocket. It also carries more tissue from the lower pole of the breast to the upper pole, increasing the capacity of filling-out both the breast cone behind the NAC and the upper pole of the breast. With this modification, the dermoglandular suspension flap has

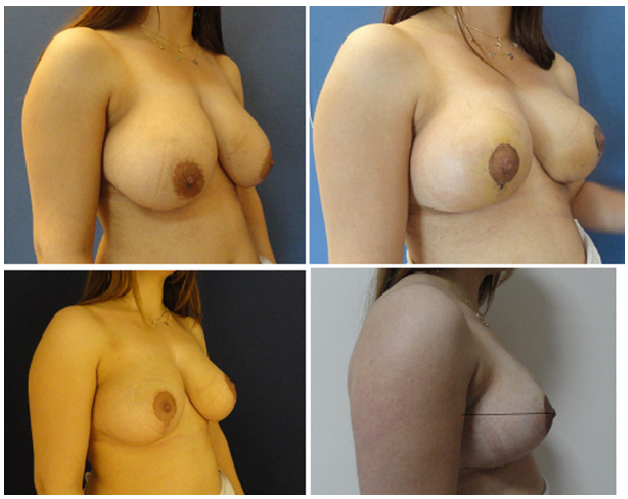

Fig. 6 Images of 26-year-old single patient. Preoperative appearance, *upper left*; 10-day postoperative appearance *upper right*. *lower right*; 14-month postoperative appearance, *lower left*

become a more effective procedure and suitable for all types of ptosis, except for cases of insufficient mammary volume.

In our study, we performed this innovative technique on a select group of patients who had small, medium, or large-size ptotic breasts, and who did not want to receive mammary implants. After gaining experience, we began using this technique with large breast patients, as well. With the exception of five patients, all patients showed satisfactory results in terms of breast shape, projection, and fullness at the upper pole. Furthermore, the size of the breast did not change. The physiological basis for this technique is based on the utilization of the breast tissue as a biological breast implant to increase breast projection. Flap support behind the nipple and areola seems to reduce the risk of retracted nipple. Three to six months are required for the final shape of the breast to be observed.

In medium and small-size breasts, when the hammock flap is folded under the NAC, changes in tension may result in elliptical-shaped areolas. A subareolar 2–4 cm crescentic incision (including only the dermis) relaxes the areola and regular areolar shape can be attained. A deformed areola image is seen in Fig. 5 when the crescent incision was not made. In medium and large-size breasts, a semicircle of tissue was removed from the upper part of the lateral pillar flap. When the lateral pillar flap was sutured, a cylindrical cavity with a diameter of 4 cm and height of 4 cm was created. The bulky hammock flap was placed comfortably in this space. The cylindrical space area is "$A = \pi r^2 h$; $3.14 \times 2^2 \times 4 \approx 50$" cm^3. This space area, in medium and large-size breasts, reduces the flap pressure and tension and allows the formation of a better shape.

In classical methods, although the inferior and medial part of the lateral pillar flaps are easily sutured, the superior flap cannot be sutured end-to-end due to the bulky hammock flap. Therefore, recurrence of ptosis and bottoming-

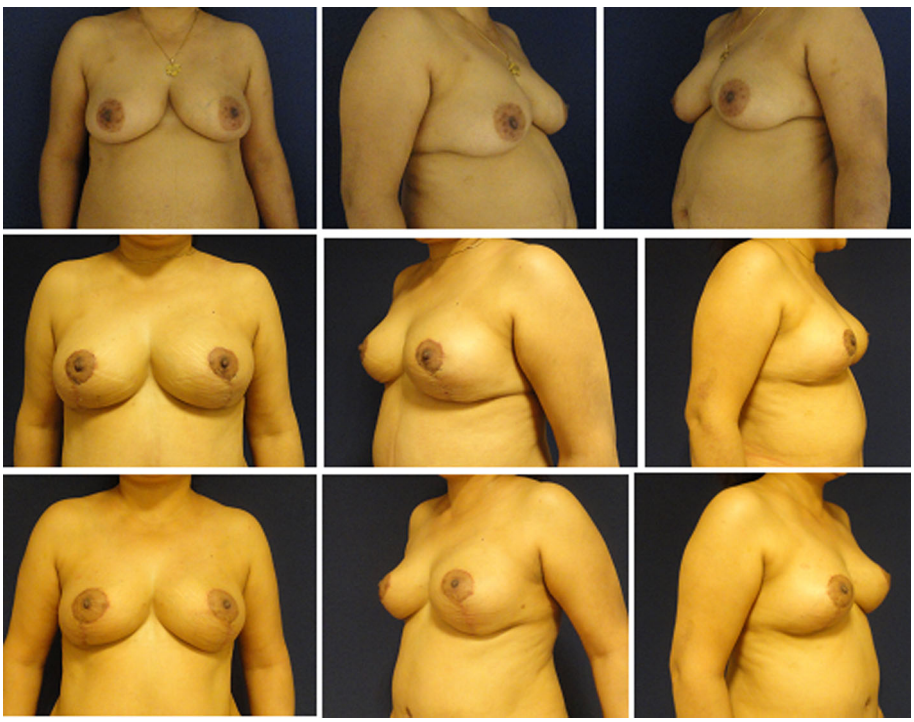

Fig. 7 Images of 42-year-old nullipar female patient. *Upper* preoperative, *middle* 1-year postoperative, *lower* 2-year postoperative appearance

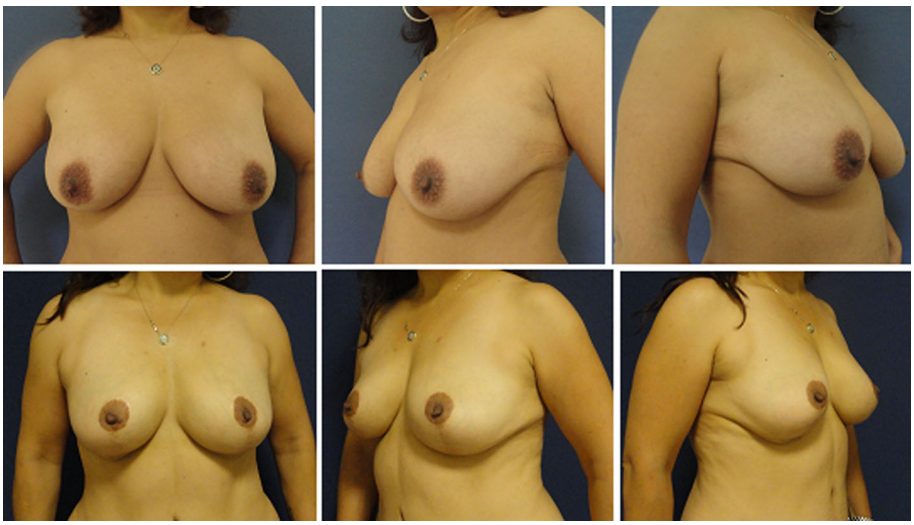

Fig. 8 Images of 38-year-old nullipar female patient. *Upper* preoperative, *lower* 5-year postoperative appearance

Fig. 9 Images of 46-year-old nullipar patient. *Upper* preoperative, *lower-middle* 7-year postoperative appearance

out deformities in large and medium-size breast patients is common. With superior lateral pillar saturation, the hammock flap below is very well supported, while the patient is in the standing position. In this way, bottoming-out deformity and risk of recurrence are eliminated. After closing the lateral pillar flaps and skin, we drew an imaginary straight line from the nipple to the submammary midline. This imaginary line had to be straight, while the patient was in the standing or sitting position. The length of the straight line was gradually extended and a convex line

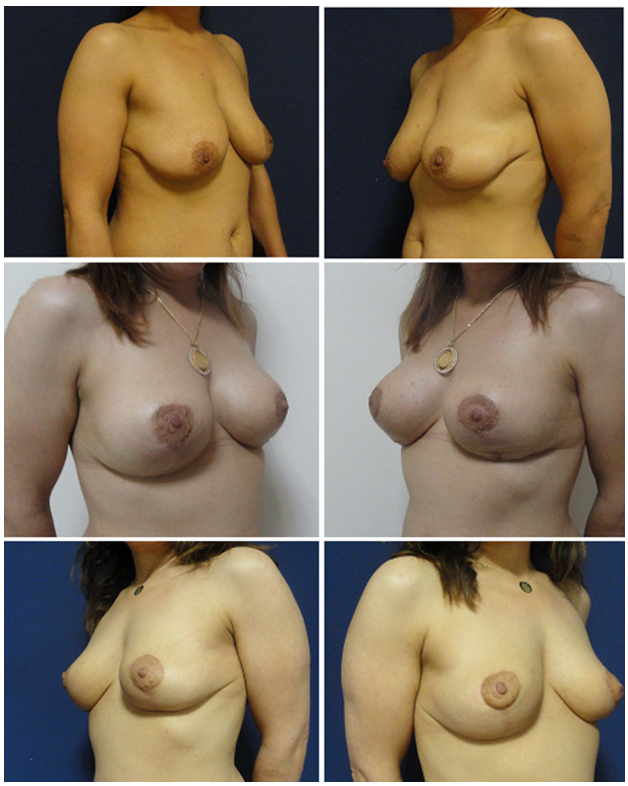

Fig. 10 Images of 36-year-old nullipar patient. *Upper* preoperative, *middle* 3-months postoperative and *lower* 2-year postoperative appearance

Fig. 11 Images of 32-year-old nullipar patient. *Upper* preoperative, *middle* 1-month postoperative and *lower* 3-year postoperative appearance

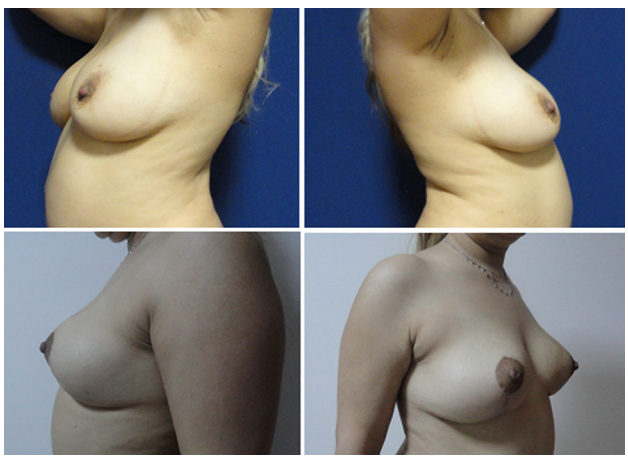

Fig. 12 Images of 44-year-old nullipar patient. *Upper* preoperative, *lower* 2-year postoperative appearance

between 2 and 4 months. This method of closure is another important means to prevent bottoming-out deformity (Figs. 4, 5).

In the early postoperative period, if we draw a horizontal line from the nipple to breast base (chest wall), either the upper or below part of the horizontal line contains 50 percent of the breast tissue. However, at postoperative 6–12 months, this balance changes, the upper part of the horizontal line contains 45 %, and the below part of the line 55 % of breast tissue. For a natural breast image, the upper-lower percent is 55–45 %, same as anatomical implants (Figs. 5, 6).

Different authors have suggested that a hammock flap be attached to the pectoral fascia with permanent sutures to prevent bottoming-out deformities. However, skin and lateral pillar tissue relaxation are the main reasons for bottoming-out deformities. We use anchoring sutures to accomplish temporary shift only, not for suspension. We think that anchoring sutures do not reduce the hammock flap load, so something needs to be done to strengthen the resistance of the load. Therefore, we use absorbable PDS sutures rather than permanent. The first 23 patients underwent conventional autoaugmentation mastopexy. Bottoming-out occurred in 4 of these 23 patients. In these 4 patients, we were unable to provide adequate support to the hammock flap load resistance. Therefore, the recurrence rate was 17 %. In the last 40 cases, when the modified technique was used, recurrence was observed in only 1 patient (2.5 %). The distance between the areola-

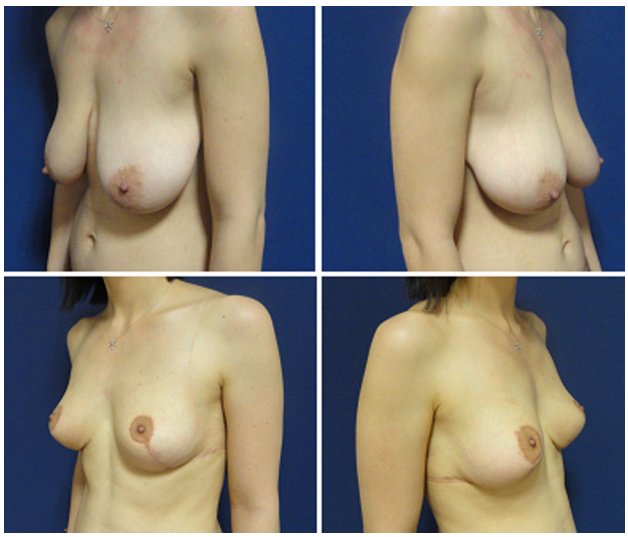

Fig. 13 Images of 27-year-old nullipar patient. *Upper* preoperative, *lower* 2-year postoperative appearance

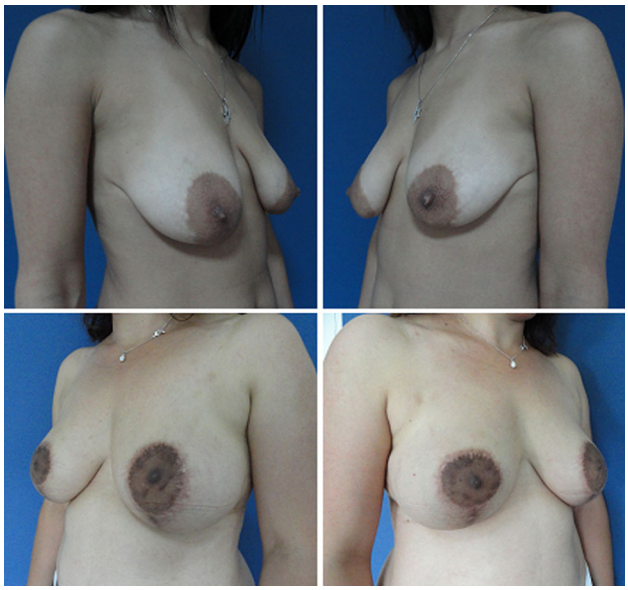

Fig. 14 Images of 35-year-old nullipar female patient. *Upper* preoperative, *lower* 5-year postoperative appearance

submammary line was extended postoperatively at a 6 month average of 50 % in the conventional autoaugmentation mastopexy method. The modified technique was extended at 30 %. Therefore, there appears to be a significant difference between the results of the modified technique and those of conventional methods.

In conclusion, these modifications provide enough central and upper pole fullness, and create enough support for the hammock flap wrapping from the bottom. Also they contribute to the protection of regular shape areola. With these modifications, mastopexy autoaugmentation with autologous dermoglandular flap is an innovative but simple technique that can be used in the lifting of small, medium, and large-size breasts.

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References

1. Regnault P (1976) Breast ptosis. Definition and treatment. Clin Plast Surg 3(2):193–203
2. Wueringer E, Tschabitscher M (2002) New aspects of the topographical anatomy of the mammary gland regarding its neurovascular supply along a regular ligamentous suspension. Eur J Morphol 40:181–189
3. Gonzales-Ulloa M (1960) Correction of hypotrophy of the breast by exogenous material. Plast Reconstr Surg 25:15
4. Regnault P (1966) The hypoplastic and ptotic breast: a combined operation with prosthetic augmentation. Plast Reconstr Surg 37:31
5. Owsley JQ Jr (1975) Simultaneous mastopexy and augmentation for correction of the small, ptotic breast. Ann Plast Surg 2:195
6. Elliott LF (2002) Circumareolar mastopexy with augmentation. Clin Plast Surg 29:337–347
7. Spear SL, Pelletiere CV, Menon N (2004) One-stage augmentation combined with mastopexy: aesthetic results and patient satisfaction. Aesthet Plast Surg 28(5):259–267
8. Johnson GW (1981) Central core reduction mammoplasties and Marlex suspension of breast tissue. Aesthet Plast Surg 5(1):77–84
9. Goés JCS (1992) Periareolar mammplasty: double-skin technique with application of Polyglactine 910 mesh. Rev Soc Bras Cir Plast. 7:1–341
10. Goés JCS (1996) Periareolar mammaplasty: double skin technique with application of polyglactine or mixed mesh. Plast Reconstr Surg 97:959–968
11. Goés JCS (1998) Periareolar mastopexy and reduction with mesh support. Breast Surg 51:697–708
12. Goés JCS (2003) Periareolar mastopexy: double skin technique with mesh support. Aesthet Surg J 3:129–135
13. de Bruijn HP, Johannes S (2008) Mastopexy with 3D preshaped mesh for long-term results: development of the internal bra system. Aesthet Plast Surg 32:757–765
14. Benelli L (1990) A new periareolar mammaplasty: the "round block" technique. Aesthet Plast Surg 14(2):93–100
15. Weiss PR, Ship AG (1995) Restoration of breast contour with autologous tissue after removal of implants. Ann Plast Surg 34(3):236–241
16. Flowers RS, Smith EM Jr (1998) "Flip-flap" mastopexy. Aesthet Plast Surg 22(6):425–429
17. Hall-Findlay EJ (1999) A simplified vertical reduction mammaplasty: shortening the learning curve. Plast Reconstr Surg 104(3):748–759
18. Lejour M (1993) Vertical mammaplasty. Plast Reconstr Surg 92:985–986
19. Graf R, Biggs TM, Steely RL (2000) Breast shape: a technique for better upper pole fullness. Aesthet Plast Surg. 24:348–352
20. Ritz M, Silfen R, Southwick G (2006) Fascial suspension mastopexy. Plast Reconstr Surg 117:86–94
21. Hönig JF, Frey HP, Hasse FM, Hasselberg J (2009) Autoaugmentation Mastopexy with an Inferior-Based Pedicle. Aesthet Plast Surg. 33:302–307
22. Gümüş N (2013) A versatile modification of dermoglandular hammock flap for mastopexy: extended hammock. J Plast Surg Hand Surg 47(4):252–257

23. Brink RR (2000) Evaluating breast parenchymal maldistribution with regard to mastopexy augmentation mammaplasty. Plast Reconstr Surg 106(2):491
24. Scott LS, Gerald HP, Sharon YG (2000) Simultaneous breast augmentation and mastopexy. Aesthet Surg J. 20(2):155–164
25. Spear SL, Low M, Ducic I (2003) Revision augmentation mastopexy: indications, operations, and outcomes. Ann Plast Surg 51:540–546
26. Spear SL, Pelletiere CV, Menon N (2004) One-stage augmentation combined with mastopexy: aesthetic results and patient satisfaction. Aesthet Plast Surg. 28:259–267
27. Ribeiro L (1975) A new technique for reduction mammaplasty. Plast Reconstr Surg 55:330–334
28. Ribeiro L, Accorsi A Jr, Buss A, Marcal-Pessoa M (2002) Creation and evolution of 30 years of the inferior pedicle in reduction mammaplasties. Plast Reconstr Surg 110:960–970
29. Fayman MS (1998) Short Scar Mastopexy with Flap Transposition. Aesthet Plast Surg. 22:135–141