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Enhancing aesthetic and functional outcomes in mastopexy: A modified Pitanguy-Ribeiro technique

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Abstract. One of the unresolved issues in aesthetic mammoplasty remains the prevention of gravitational ptosis in the long-term postoperative period. The aim of this study was to improve the outcomes of mastoptosis treatment by refining classical surgical techniques to help prevent recurrent ptosis in the long term. The main group consisted of 50 patients diagnosed with mastoptosis. These patients underwent surgery using a modified Pitanguy-Ribeiro method, which included fixation to reduce cranial displacement and anchoring to the fascia of the pectoralis major muscle. The study results highlight the importance of individually selecting mastopexy techniques for each patient to achieve sustained aesthetic and functional outcomes. This paper presents the distribution of patients according to the mastopexy technique used, as well as a comparison of early and late postoperative ptosis indicators across each group. It was found that mastopexy performed using the Pitanguy-Ribeiro technique is effective in the short term but carries a significant risk of late postoperative ptosis. Reduction mastopexy shows a high risk of ptosis in the long-term postoperative period. In contrast, the modified Pitanguy-Ribeiro technique proves to be an effective approach, offering more stable results compared to the other techniques considered in preventing postoperative ptosis – demonstrated by the complete absence of early ptosis and the lowest incidence of late ptosis, indicating its superiority. This study identifies the modified Pitanguy-Ribeiro technique as the most effective for mastopexy correction, ensuring long-term stability, prevention of ptosis recurrence, and a high level of patient satisfaction. The proposed modification can be recommended as the optimal technique for performing mastopexy. The study findings may be used to refine surgical techniques, support the development of personalised recommendations for mastopexy method selection, and inform planning of long-term postoperative preventive measures

Keywords: breast ptosis; surgical correction; fascia fixation; aesthetic mammoplasty

INTRODUCTION

Breast ptosis is one of the most common conditions resulting from a decrease in tissue elasticity and represents a natural process in women typically after the age of 30-40. In such cases, the mammary glands decrease in size and descend, often leading to aesthetic discomfort. According to O. Khrapach [1], breast ptosis can be categorised into several types of defects: pseudoptosis, partial ptosis, and true ptosis. As described by B. Atiyeh *et al.* [2], the chosen correction methods vary depending on the specific type of ptosis and its potential association with different forms of hypoplasia. The authors classified breast ptosis into true ptosis, glandular ptosis, and abnormal parenchymal distribution (or pseudoptosis), which allowed for more consistent results and fewer complications. 85% of patients who had experienced at least one pregnancy reported changes in breast shape post-pregnancy; 35% noted a decrease in size, while 30% reported an increase. Lifetime weight fluctuations, such as significant weight loss or high body mass index, larger bra cup size, number of pregnancies, and smoking history have all been identified as significant risk factors for ptosis.

According to F. Pazhoohi *et al.* [3], ptosis can occur in women of all ages and with varying breast sizes, and is commonly associated with ageing, macromastia, weight loss, pregnancy, and hormonal changes. Obesity contributes to ptosis, as the accumulation of adipose tissue increases the volume of the mammary glands and overstretches the supporting ligaments. The shape of the breast can also

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influence the condition of the supporting structures; for example, in rounded breast shapes, the Cooper's ligaments are arranged in a way that optimally redistributes weight and surface area. During pregnancy and breastfeeding, breast volume increases substantially, and the stretched skin does not always return to its former state. If breastfeeding was predominantly from one breast, asymmetry may also develop. According to official statistics from the American Society of Plastic Surgeons (ASPS), 280,121 mastopexy procedures were performed in the United States in 2020 [4], with ptosis diagnosed in 65% of women in the post-lactation period. As noted by S.J. Lee *et al*. [5], ptosis is often linked to genetic predisposition, associated with individual variations in collagen and elastin synthesis, and is frequently observed in family history. Additionally, M.L. Mangialardi *et al*. [6] report that beyond causing psychological discomfort, ptosis may lead to physical complications such as submammary eczema and cervicodynia.

Secondary breast ptosis may occur as a complication of augmentation mammoplasty. Its development is primarily due to an initial weakness of the breast's supportive and suspensory structures, as well as technical imperfections in the surgical approach. This is often linked to the surgeon's attempt to address the mismatch between stretched skin and reduced glandular tissue volume solely through augmentation, without the mastopexy that would be necessary in such cases. According to A. Hoyos [7], the incidence of recurrent ptosis following mastopexy combined with augmentation mammoplasty ranges from 9.3 to 36%. Mesh allografts have been proposed as a means to prevent recurrent ptosis by reinforcing the sutures and the natural supporting structures of the breast. Contemporary surgical correction methods for breast ptosis include mammoplasty with augmentation and mastopexy. Mammoplasty with augmentation is frequently performed using endoprostheses, although not all women are willing to undergo implant placement. Mastopexy remains the procedure of choice, though it carries certain risks, such as the development of recurrent ptosis or hypertrophic scarring [8]. J. Gunn *et al*. [9] observed that a significant drawback of mastopexy is the unavoidable need for incisions on the chest, which may be visible depending on their placement.

L.C. Nuzzi *et al*. [10] described the four principal mastopexy techniques: periareolar, vertical, inverted T-shaped, and L-shaped scar patterns. Modern mastopexy methods employ various surgical strategies, including the fixation of displaced breast tissue to the chest's denser structures using strong sutures – a critical element of the procedure – as well as excision of excess skin in the gland's lower segment, with superior repositioning of the nipple-areolar complex. To enhance breast contour, a flap of tissue from the lower pole of the gland is often transposed upward and secured in the retromammary space to the anterior chest wall. This approach not only contributes to a fuller upper pole but also extends the longevity of the surgical outcome. Additional techniques aim to avoid scarring in the area between the gland and the sternum.

One of the persistent challenges in aesthetic mammoplasty is the prevention of gravitational ptosis in the long-term postoperative period. Plastic surgeons must carefully evaluate the benefits and limitations of each technique to effectively address breast ptosis. The objective of the present study was to improve surgical outcomes in patients with mastoptosis by advancing surgical methods aimed at preventing breast ptosis in the long-term postoperative phase.

MATERIALS AND METHODS

The study was conducted at one of the leading medical centres in the city of Kremenchuk – LLC "Medical Centre 'Doctor Droga'", specialising in plastic surgery. Surgical interventions were performed over a 24-month period, from September 2022 to September 2024. All operations were carried out under general anaesthesia in accordance with standard surgical protocols. The appropriate method for performing mastopexy depends on an individualised approach for each patient, particularly through the assessment of the degree of ptosis. In this study, ptosis grading was determined using anatomical landmarks, specifically the position of the nipple-areolar complex relative to the inframammary fold (the fold beneath the breast). According to the classification by R. Regnault [11], the degrees of ptosis in women are categorised as follows: Grade 0 – No ptosis: the nipple is located at or above the level of the inframammary fold. Grade 1 – Mild ptosis: the nipple is at the level of or slightly below the inframammary fold, but still above the most projecting part of the breast. Grade 2 – Moderate ptosis: the nipple lies below the inframammary fold, but remains above the lower contour of the breast. Grade 3 – Severe ptosis: the nipple is significantly below the inframammary fold and falls beneath the most projecting part of the breast. Pseudoptosis: the upper breast appears flat, while the nipple remains at or above the inframammary fold, but the main glandular tissue is displaced downward. Glandular ptosis: characterised by a reduction in breast tissue volume, with the nipple still positioned at or above the inframammary fold.

A total of 90 patients with a confirmed diagnosis of mastoptosis participated in the study. The average age of the patients was 36 years, ranging from 19 to 54 years. All patients underwent mastopexy for the first time. They were divided into three groups based on the surgical technique employed: Group 1: 30 patients underwent surgery using the Pitanguy-Ribeiro technique [14]; Group 2: 10 patients underwent classical reduction mastopexy (inverted T-shaped technique) [12]; Group 3: 50 patients underwent a modified Pitanguy-Ribeiro technique, which included cranial displacement shortening and fixation to the fascia of the pectoralis major muscle. Postoperative follow-up was conducted over a period ranging from 2 to 24 months, with the average follow-up duration being approximately 9.5 months. Postoperative photographs were taken at 3-month intervals. All 90 patients provided consent for photographic follow-up within 24 months after surgery, and 8 of them provided long-term follow-up images extending beyond one year. To ensure the reliability of the results, standardise surgical procedures, and minimise variations that could influence outcomes, all operations were performed by a single surgeon and his dedicated team. None of the patients had serious comorbid conditions that might have impacted the study results.

All patients involved in this study provided informed written consent for the use of their personal data and photographs for scientific purposes, in accordance with the principles of confidentiality and personal data protection.

Reports of the study were prepared with full regard for participant confidentiality, in compliance with the Declaration of Helsinki of the World Medical Association [13] and the Law of Ukraine No. 2297-VI "On the Protection of Personal Data" [14]. Adherence to ethical standards in the conduct of scientific research ensures appropriate protection of the rights and interests of all participants and upholds high standards of research practice. Data collected from all participants were processed using statistical methods to identify differences in patient condition, the frequency of postoperative complications, and levels of satisfaction with surgical outcomes. The study findings were systematised and summarised to draw conclusions regarding the effectiveness of surgical treatment for patients with mastoptosis, as well as methods for preventing breast ptosis in the long-term postoperative period.

RESULTS AND DISCUSSION

The results of the study highlight the importance of selecting an appropriate mastopexy technique to achieve optimal aesthetic and functional outcomes. Table 1 presents the distribution of patients across the groups based on the mastopexy techniques utilised, along with diagnostic indicators of early and late postoperative ptosis.

Table 1. Division of patients into groups according to the method of mastopexy and diagnosis of early and late postoperative ptosis

Patient group	Surgery technique	Early postoperative ptosis								Late postoperative ptosis	
		1 month (after surgery)		3 months (after surgery)		6 months (after surgery)		1 year (after surgery)		from 1 year	
		n	%	n	%	n	%	n	%	n	%
1	Pitanguy-Ribeiro, n = 30	-	-	-	-	1	3.33	3	10	21	70
2	Classic reduction mastopexy (inverted T-shaped), n = 10	-	-	1	10	1	10	3	30	6	60
3	Pitanquy-Ribeiro with modification, n = 50	-	-	-	-	-	-	2	4	3	6

Source: provided by the author

The analysis of patient distribution by mastopexy technique, along with indicators of early (within 1 year) and late (beyond 1 year) postoperative ptosis for each group, demonstrates the following findings: In Group 1 – patients who underwent mastopexy using the Pitanguy-Ribeiro technique – no cases of early postoperative ptosis were recorded at 1- and 3-months post-surgery. Ptosis was observed in one patient (3.33%) at 6 months, and in three patients (10%) at 1 year. However, late ptosis (occurring more than 1 year after surgery) was identified in 21 patients (70%). These findings suggest that, while the Pitanguy-Ribeiro technique is associated with a relatively low incidence of early ptosis, its long-term outcomes indicate a high risk of recurrent ptosis two years after surgery.

In Group 2 – patients who underwent classical reduction mastopexy (inverted T-shaped) – early postoperative ptosis was observed in one patient (10%) at 3 months, one patient (10%) at 6 months, and three patients (30%) at 1 year. Late postoperative ptosis was recorded in six patients (60%). These results indicate that the classical reduction mastopexy technique carries a comparatively higher risk of ptosis, particularly in the late postoperative period, suggesting the need to consider alternative techniques or modifications to mitigate this risk. In Group 3 – patients who underwent mastopexy using the modified Pitanguy-Ribeiro technique – no cases of early postoperative ptosis were recorded at 1-, 3-, or 6-months following surgery. Ptosis was observed in two patients (4%) at 1 year, while late postoperative ptosis (beyond 1 year) was noted in three patients (6%). These outcomes demonstrate that the modified technique offers superior long-term stability with minimal incidence of both early and late postoperative ptosis. Thus, mastopexy performed using the Pitanguy-Ribeiro technique demonstrates short-term effectiveness but is associated with a significant risk of developing late postoperative ptosis (70%). Reduction mastopexy also shows a high likelihood of ptosis, particularly in the late postoperative period. In contrast, mastopexy using the modified Pitanguy-Ribeiro technique yields the most favourable outcomes in both the early and late postoperative phases, indicating its superiority over the other methods. This analysis supports a reasoned selection of mastopexy technique in favour of the modified Pitanguy-Ribeiro approach for effective correction of mastoptosis and prevention of breast ptosis in the long-term postoperative period.

Patient selection for mastopexy techniques took into account the need to reduce the risk of complications, as the chosen method should minimise the likelihood of postoperative ptosis, tissue necrosis, scar formation, and asymmetry. The effectiveness of each mastopexy technique is evaluated by its ability to prevent recurrent ptosis and maintain a stable aesthetic contour of the mammary glands over time. Successful mastopexy also contributed to improvement in the patients' physical and psychological well-being. During the surgical procedure using the Pitanguy-Ribeiro technique, the operation began with deepithelialisation of the designated skin area of the mammary glands, according to the appropriate marking. This was followed by excision of the cutaneous-glandular flap. A retromammary pocket was prepared cranially, based on the Pitanguy-Ribeiro pedicle, creating a bed for repositioning and fixation of the cutaneous-glandular flap, which was secured with Prolene sutures to the pectoralis major muscle. The deep layer of the superficial fascia was then sutured and cranially anchored to the fascia of the pectoralis major muscle a few millimetres above the cutaneous-glandular flap fixation site. These ligatures were additionally tied together, providing enhanced correction of mastoptosis, improved upper pole fullness, and more secure fixation of the breast.

Figure 1 shows the postoperative appearance of the breasts in a 34-year-old patient diagnosed with stage III breast ptosis. The procedure was performed using the Pitanguy-Ribeiro technique on 06.10.2023. At the 6-month postoperative evaluation, ptosis was noted to have recurred, though to a lesser degree. The upper pole of the breast remained insufficiently filled. Figure 2 presents the postoperative result in a 19-year-old patient diagnosed with stage III breast ptosis, who underwent classical reduction mastopexy (inverted T-shaped technique) on 19.06.2024. At the 3-month postoperative follow-up, the patient exhibited recurrent ptosis of the mammary glands, with "bottoming out" deformity – manifested as elongation of the lower breast pole due to the inability of the lower pole tissues (skin-glandular flap) to withstand gravitational forces.

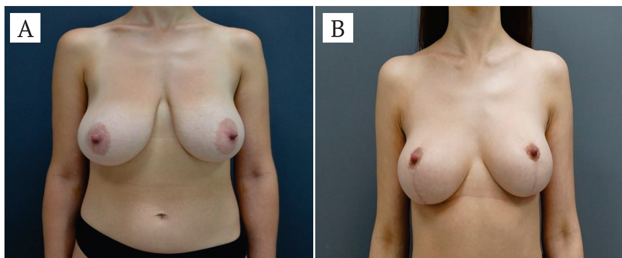

Figure 1. Appearance of the breast of a 34-year-old patient who was diagnosed with stage III breast ptosis
Notes: A) before surgery; B) 6 months after surgery
Source: author's photo

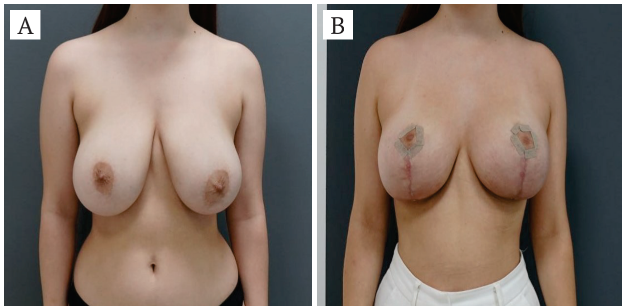

Figure 2. Appearance of the breast of a 19-year-old patient who was diagnosed with stage III breast ptosis
Notes: A) before surgery; B) 3 months after surgery, ptosis of the mammary glands developed "bottoming out"
Source: author's photo

Figure 3 shows the clinical appearance of the breasts in a 45-year-old patient diagnosed with Grade 3 breast ptosis. Surgical intervention using the modified Pitanguy-Ribeiro technique was performed on 16 October 2023. At the one-year postoperative follow-up, the development of breast ptosis was observed; however, its severity was significantly lower compared to patients in other groups who underwent surgery using alternative techniques. The reduced severity of ptosis highlights the high effectiveness of the modified technique in achieving long-term aesthetic and functional outcomes, as well as improved stability of surgical results due to the modification implemented.

Figure 4 presents the clinical outcome in a 34-year-old patient diagnosed with Grade 3 breast ptosis. The modified Pitanguy-Ribeiro technique was applied during surgical intervention in March 2023. After one year of follow-up, no signs of recurrent breast ptosis were observed. The results demonstrated stability in the aesthetic appearance of the breasts, with preservation of anatomical position and contour. No secondary complications were reported, and no further surgical intervention was required.

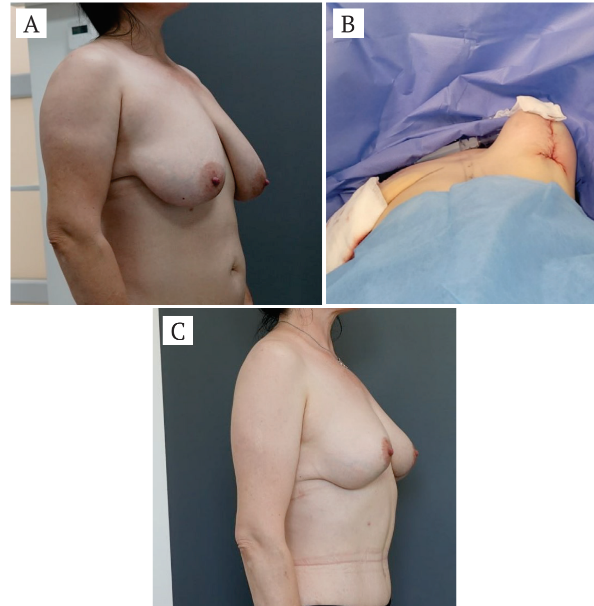

Figure 3. Appearance of the breast of a 45-year-old patient who was diagnosed with Grade 3 breast ptosis
Notes: A) before surgery; B) appearance of the breast immediately on the operating table; C) 1 year after surgery
Source: author's photo

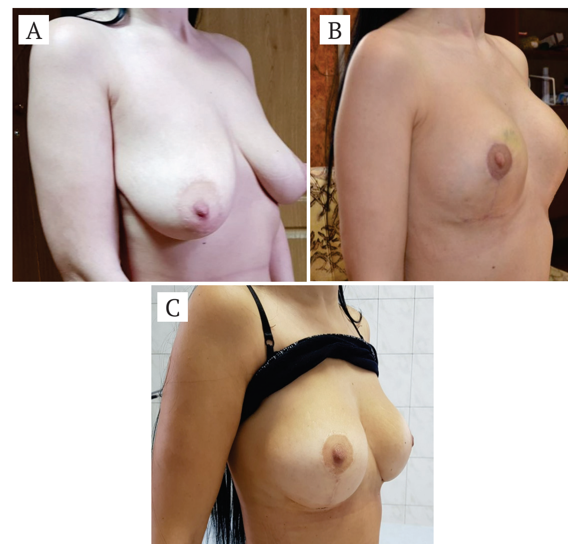

Figure 4. Appearance of the breast of a 34-year-old patient who was diagnosed with Grade 3 breast ptosis
Notes: A) before surgery; B) 1 month after surgery; C) 1 year after surgery
Source: author's photo

Thus, the modified Pitanguy-Ribeiro technique demonstrated clinical superiority, confirming its feasibility for achieving long-term aesthetic outcomes and reducing the likelihood of ptosis recurrence. No deaths, pulmonary embolism, deep vein thrombosis, or postoperative complications were recorded during the surgical interventions. Overall, the effectiveness of mastopexy techniques depends on appropriate selection based on the degree of ptosis, individual anatomical features of the mammary glands, and the presence of comorbidities. The growing application of mastopexy techniques is associated with the development and implementation of various surgical approaches employing autologous tissues and allomaterials. Among the widely recognised and relevant mastopexy techniques in plastic surgery are the methods developed by J.O. Strombeck [15] and L. Ribeiro [16].

R. Abdelkader *et al*. [17] proposed augmentation mastopexy using a five-stage standardised strategic approach. The authors presented a retrospective study involving 50 patients seeking both breast lifting and volume enhancement, requiring augmentation combined with mastopexy to achieve the desired aesthetic outcomes. The classical Pitanguy-Ribeiro technique, employed in the present study, remains one of the safest techniques for treating mastoptosis. It is applicable to women with varying breast sizes and degrees of ptosis. However, it does have certain contraindications and is not suitable for patients with gigantomastia or severe mammary ptosis [18]. H. Zavrides [19] reported a study involving 140 women with mastoptosis who underwent surgical treatment using the Pitanguy-Ribeiro technique, which by 2025 had evolved into two modified forms. The first modification, described in the works of E. Swanson [20], D.A. Hidalgo [21], and A. Kostenko *et al*. [22], involves vertical dissection of the upper breast pole down to the pectoralis major fascia. Following this, the medial flap is elevated cranially, rotated 90 degrees, and sutured, while the lateral flap is placed beneath the medial flap.

S. Wall *et al*. [23] described the combined procedure of breast augmentation and mastopexy. This approach is often considered complex, as it essentially involves two surgical interventions in one. The authors reviewed the principles and guidance for various mastopexy techniques, as well as the associated methods of breast augmentation. In cases of mastopexy with adequate breast volume, satisfactory surgical outcomes may be achieved through recombination of breast tissue and elevation of the lower pole without the use of implants, as reported by H. Jian *et al*. [24] and E.J. Moya-Rosa & Y. Moya-Corrales [25]. The circumvertical technique is typically employed for patients with moderate ptosis [26], defined by a vertical excess of 3-4 cm accompanied by significant horizontal laxity.

R. Cohen-Shohet *et al*. [27] examined the performance of mastopexy in both private clinical settings and academic institutions. They identified seven main indications for mastopexy: ptosis, postpartum atrophy, non-surgical weight loss, surgical weight loss, breast asymmetry, reconstruction, and revision of previous augmentation. The second modification of the classical Pitanguy-Ribeiro technique involves the separation of the lower flap from surrounding structures while preserving its attachment to the vascular network of the chest wall, thereby maintaining the necessary breast volume. This approach is discussed in the work of P.G. di Summa *et al*. [28]. In this technique, the upper flap of the breast is used to cover the lower flap.

The classical Pitanguy-Ribeiro technique and its two modifications offer a versatile, well-vascularised pedicle, enabling reliable repositioning of the nipple-areola complex to the desired height. The selection of a mastopexy technique should be guided by a comprehensive analysis of the patient's individual characteristics, the degree of ptosis, and any accompanying pathologies. The application of the classical Pitanguy-Ribeiro technique and its modifications confirms their high effectiveness in delivering both aesthetic and functional results. The proposed approach, which enhances tissue fixation to the pectoralis major fascia, addresses the limitations of conventional techniques by providing longer-lasting outcomes and reducing the risk of recurrence. The innovations presented in this study are aimed at maximising aesthetic results, preserving breast functionality [29], and minimising postoperative complications, making this method a promising option for widespread adoption in surgical practice. The proposed technique for counteracting postoperative mammary ptosis – through shortening, reinforcement, cranial repositioning, and fixation of the inner layer of the superficial breast fascia to the deep fascia of the pectoralis major muscle – based on the modified Pitanguy-Ribeiro method, demonstrated positive outcomes.

CONCLUSIONS

The study revealed significant differences in the outcomes of various mastopexy techniques in the correction of mastoptosis and the prevention of postoperative ptosis. The results confirm the importance of an individualised approach to the selection of surgical technique – particularly with reference to the degree of ptosis, as classified by the Pitanguy-Ribeiro scale – in order to achieve optimal aesthetic and functional outcomes. Mastopexy performed using the Pitanguy-Ribeiro technique demonstrated a low incidence of early postoperative ptosis (13.33%) but showed a high rate of late ptosis (70%), thereby limiting its long-term effectiveness. Reduction mastopexy (inverted T-shaped) was associated with a higher incidence of early ptosis (50%) but demonstrated greater long-term stability, with a lower incidence of late ptosis (6%). The most favourable results were achieved with the modified Pitanguy-Ribeiro technique. Early postoperative ptosis at one year was observed in only two patients (4%), and the incidence of late ptosis was the lowest among all groups (6%). The incorporation of a modification involving fixation of the cutaneous-glandular flap to the pectoralis major muscle, along with additional anchoring of the deep sheet of the superficial fascia, significantly improved the stability of surgical outcomes, reduced complication rates, and ensured an excellent aesthetic appearance of the mammary glands. The proposed surgical refinement – involving the application of additional ligatures to the inner sheet of the superficial fascia with cranial repositioning – enhances the projection of the upper breast contour and substantially reduces the incidence of recurrent ptosis in the late postoperative period. All patients experienced improvements in both physical and psychological well-being. No cases of serious complications, such as pulmonary embolism, deep vein

thrombosis, or tissue necrosis, were reported. Based on the analysis, it can be concluded that the modified Pitanguy-Ribeiro technique is the most effective approach for the correction of mastoptosis, providing long-term stability, preventing recurrence of ptosis, and ensuring a high level of patient satisfaction. The direction of future research should focus on further enhancing the prevention of recurrent breast ptosis in the late postoperative period.

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Модифікована методика Pitanquy-Ribeiro у мастопексії: перспективи покращення естетичних і функціональних результатів

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Анотація. Однією з невирішених проблем в естетичній мамопластиці залишається профілактика гравітаційного птозу в віддаленому післяопераційному періоді. Метою дослідження було покращити результати лікування мастоптозу шляхом удосконалення класичних операційних методів, які сприяють профілактиці повторного птозу у віддалений післяопераційний період. До основної групи увійшло 50 пацієнток з діагнозом мастоптоз. Пацієнткам була проведена операція за методикою Pitanguy-Ribeiro з модифікацією: фіксації укорочення краніального переміщення та фіксація до фасції великого грудного м'яза. Результати дослідження показують необхідність підбору методик мастопексії для кожної пацієнтки індивідуально, щоб отримати естетичні і функціональні результати на тривалий період. В роботі представлено розподіл пацієнток за методикою проведення мастопексії та порівняння показників раннього і пізнього післяопераційного птозу для кожної групи. Встановлено, що мастопексія проведена за методикою Pitanquy-Ribeiro є ефективною на короткостроковий період і має значний ризик розвитку пізнього післяопераційного птозу. Редукційна мастопексія має високий ризик розвитку птозу в пізній післяопераційний період, а мастопексія за методикою Pitanquy-Ribeiro з модифікацією є ефективною технікою, що дає стабільні результати в порівнянні з іншими розглянутими методиками щодо профілактики післяопераційного птозу, а саме – повну відсутність раннього птозу та мінімальну частоту пізнього птозу, що свідчить про її перевагу. Проведене дослідження дозволяє виділити методику Pitanquy-Ribeiro з модифікацією як найбільш ефективну для корекції мастоптозу, забезпечуючи довгострокову стабільність, профілактику рецидиву птозу та високий рівень задоволеності пацієнтів. Запропонована модифікація може бути рекомендована як оптимальна техніка для проведення мастопексії. Результати дослідження можуть бути використані для вдосконалення хірургічних технік, розробки рекомендацій щодо індивідуального підбору методик мастопексії та планування профілактичних заходів у віддаленому післяопераційному періоді

Ключові слова: птоз молочних залоз; хірургічна корекція; фіксація фасції; естетична мамопластика