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Surgical Technique

Vertical Mastopexy

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Abstract Mastopexy is surgery to correct breast ptosis. In this article we present our technique of vertical scar mastopexy relevant to breast conserving surgery for breast cancer. We also review common indications, techniques, pitfalls and complications of mastopexy that general surgeons should know.

Keywords: Vertical mastopexy

Introduction

Mastopexy is surgery to correct breast ptosis. Mastopexy focuses on raising the breast mound and leaving the scar as planned initially. In 1925 Dartigues was the first person to describe a vertical mastopexy technique, but it did not become popular. In 1969, Lassus resurrected this technique and popularized it[1,2]. In 1990, Lejour modified Lassus's technique, which became the most wide-spread to date[3].In this article we will mainly describe a modification of Lassus' vertical mastopexy technique.

Definition of ptosis

The word "ptosis" comes from the Greek meaning "Falling"[4]. "Falling of the breast" means the nipple's position is lowered compared to the inframammary crease. In normal breasts, the nipple position should be above the inframammary crease. The degree to which nipple falls below the level of the inframammary crease determines the severity of ptosis. The oldest and most recognized classification of ptosis is Regnault's classification[5]. Regnault's classification is divided into 3 degrees or grades as follows (Figure 1):

Grade 1: The position of nipple is less than 1 cm above the inframammary crease.

Grade 2: The position of nipple is 1-3 cm below the inframammary crease, but the upper contour of the breast still above the inframammary crease.

Grade 3: the position of nipple is more than 3 cm below the inframammary crease and the upper contour of the breast is below the inframammary crease.

Pseudoptosis is a condition in which the lower pole of the breast is below the inframammary crease but the nipple is still above than the inframammary crease (Figure 1).

Mastopexy and mammoplasty

Both operations are to correct ptosis by raising the nipple and areola complex, cutting off excess skin and correct contour of the breast. The only difference is that mammoplasty surgery mainly focuses on breast resection to reduce breast size, while mastopexy surgery focuses on raising the nipples and areola complex to a higher level up and correct contour of the breast.

Principles of mastopexy and mammoplasty surgery include: Nipple-Areola Complex elevation and without compromising vascularity; Excision of excess parenchyma; Skin envelope reduction; and Breast shaping.

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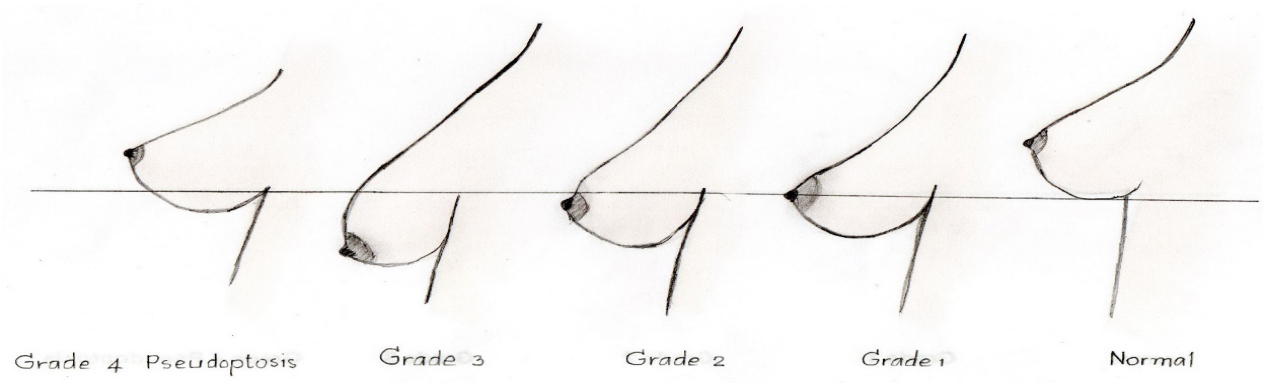


Figure 1 Showing the degree of ptosis according to Regnault's classification

1) The Nipple-Areolar Complex. The nipple-areola complex should not be raised higher than 2 to 3 cm, as this will lead to bad results[6]. Maintaining blood supply to the nipple-areola complex is the most important aspect of mastopexy and mammoplasty surgery, most of which require a pedicle to have some blood supply to the nipple-areola complex. From the study of Corduff and Taylor[7], the blood supply to the nipple-areola complex comes from the intercostal arteries, mainly the second and third branches of the intercostal arteries, which course superiorly and through the subcutaneous layer to supply the nipple-areola complex and then to the breast tissue.

The blood supply to the breast tissue is approximately 1 cm below epidermis so the dissection of a skin flap should not be deeper than 1 cm[1,2,8]. Most arteries do not come with a vein. The Venous plexus covers the skin and around Nipple-Areola Complex. If the nipple-areolar pedicle is too long, it will result in venous congestion. Lassus' studies have shown that pedicles longer than 9 cm is at risk of nipple-areola complex necrosis[2,6]. The nerve supply of the nipple-areola complex comes from the fourth branch of the anterolateral and anteromedial intercostal nerve, but there are a minority that come from the third and fifth branches of the intercostal nerve[9,10].

2) Excision of Excess Parenchyma. In mastopexy surgery, it may not be necessary to remove the breast tissue, but it is very important for Mammoplasty surgery. The nipple-areolar pedicle is very important for maintaining blood supply to the nipple-areola complex. There are many types of pedicles: superior pedicle[11-13], inferior pedicle[14,15], lateral pedicle[16], superomedial pedicle[17], central pedicle[18], vertical bipedicle (McKissock pedicle)[19,20], and horizontal bipedicle (Strombeck pedicle)[21].

Parenchymal resection is an important part of mammoplasty, which is often done in conjunction with mastopexy. The type of pedicle chosen will affect the shape of the breast after surgery. For example, if the inferior pedicle is used the parenchyma at superior pole of the breast will be removed, increasing the risk of a complication called "bottoming out phenomenon".

3) Skin Envelope Reduction. There are three basic methods of skin incision: unidimensional including the round block pattern; bidimensional including the round block pattern with a vertical pattern; tridimensional including round block pattern with a vertical pattern and a horizontal pattern. Horizontal patterns may include the inverted-T pattern (Wise pattern), short T pattern, J pattern, L pattern, or long horizontal T pattern[22]. The most popular is the inverted-T pattern (Wise pattern).

The round block pattern is a method to incise the skin in a circle around the nipple-areola complex. This technique has the advantage of being able to hide the scar, but less breast parenchyma is resected, therefore it is suitable for patients with low level breast ptosis. One important complication is widening of the scar.

The inverted-T pattern is a method for incising the skin in an upside-down T shape. More of the breast parenchyma is resected and is suitable for the treatment moderate to severe breast ptosis. The disadvantages of this technique include a long scar, especially the scar at the inframammary crease. A survey study of 94 patients found that 65% of patients were not happy with the scar[23]. Also, this technique may reduce breast projection due to the relatively short vertical scar (about 5-6 cm). Finally, there is a higher risk of bottoming-out phenomenon because of the use of the inferior pedicle, which often results in excess parenchyma at lower pole of the breast.

The vertical pattern is a method for incising the

skin leaving mainly a vertical scar. This technique is often used for correcting mild to moderate breast ptosis and results in a better breast contour than the inverted T pattern.

Some advantages of vertical patterns compared to inverted-T patterns include less scarring, with no or only a small scar at the inframammary fold, the scar is positioned where the patient cannot see, and a lower risk of hypertrophic scar. According to Lassus, in a study of 1,350 patients treated with the vertical pattern during a 40-year period (439 mastopexies and 911 mammoplasties), only 4 patients had hypertrophic scars[2].

The vertical pattern usually increases the breast projection more than inverted T pattern, as mentioned previously, as the vertical pattern favors forward breast projection. A part of the reason is that the breast parenchyma is sutured together vertically, not suture horizontally. This will also result in better breast contour. There is also less chance of "bottoming-out phenomenon". According to Lassus, the contour of the breast was still well maintained 20 years after vertical mastopexy surgery[1].

Vertical mammaplasty with a short scar is a modified technique that shortens the vertical scar, causing increase in the breast projection and decrease the width of the breast, allowing it to maintain the breast contour for longer[24,25].

4) Breast Shaping. Breast shaping can be done in several ways, such as resection of the skin, resection and suturing of the breast parenchyma, fixing it to fascia or the use of artificial materials such as synthetic mesh or acellular dermal matrix to bind the parenchyma into certain shapes[26-28].

Indications And Assessment For Vertical Mastopexy

Optimum results for vertical mastopexy require careful patient selection. Suitable patients include young patients with small or medium-sized breast, with mild to moderate breast ptosis, and with normal skin elasticity[1,2,29,30]. Patients with large breasts or severe breast ptosis are not suitable for vertical mastopexy, due to reports of higher incidence of complications[31]. Immediately after surgery, the shape of the breast and the scar are usually not being as good as they should be. Final results can be predicted after 3 months[1,3,31-34].

Preoperative assessment includes the degree of breast ptosis, breast size, and skin elasticity.

1) The degree of breast ptosis. Evaluation of breast ptosis must assess the relationship between the nipple and the inframammary crease by measuring the distance between suprasternal notch to the nipple, which averages 18 to 22 cm. Knowing this distance will allow the assessment of how much to lift the nipples and also determines the techniques for mastopexy surgery. Ptosis may also be measured from the inframammary crease or mid shaft of humerus to the nipple.

2) The degree of breast size. Assessing the patient's breast size and shape requirements is an important step in surgical planning. However, if after the surgery the patient is not satisfied with the size and shape of the breast, further corrective procedures can be performed. For example, if the breast size is too small, corrections to increase the volume, such as using breast implants or lipofilling, can be done. On the other hand, if the breast is still too large after the surgery, it can be corrected by reducing body weight or further resections of breast parenchyma.

3) The degree of skin elasticity. Normal skin elasticity will help maintain the shape of the breast in the long term, compared to high skin elasticity. Skin puckering or wrinkle wounds on the underside of the breast will subside spontaneously, usually within 2 months, with normal skin elasticity, but it might take more than 5 to 6 months if the skin is highly elastic[3]. In addition, patients with high skin elasticity are at a higher risk of bottoming-out. It should also be explained to patients that after the surgery, the results may not be satisfactory at first. The upper pole fullness might initially seem greater than normal, and the lower pole might look flat early after surgery. It takes a period of 2 to 3 months before the shape of the breast settles[2,35]. It must be explained to the patients that complications after surgery may may occur, such as breast asymmetry, changes in nipple sensation, nipple and breast necrosis, and possible scarring.

Preoperative Drawing And Marking

Drawing and markings on the patient should be done in a standing position. There are measurements and distance records of various lines. The following should be drawn or marked: a line from suprasternal notch to nipple; a line from suprasternal notch to the umbilicus to mark the midline; a line representing the inframammary crease on both sides; the breast meridian on both sides (drawn from the side of the clavicle 7 cm from

suprasternal notch through the nipple to the end of the inframammary crease, which is usually about 10 to 14 cm away from the midline).

The new position of the nipple and areola complex (point A) should be found by inserting a finger up to the inframammary crease, and lifting it forward along the midline, and marked as in Figure 2[30].

Point A represents the position of the new nipple areola complex and determines the drawing of the medial and lateral boundaries of the skin to be resected. The medial drawing is done by pushing the breast to the lateral side with one hand and using the other to draw a straight line that connects point A to the mid breast line at the level of the inframammary crease. For the lateral drawing, do a mirror-image drawing of the medial, as shown in Figure 3. The medial and lateral lines are drawn to converge and join forming a vertical oval as shown in Figure 4.

The final drawing is the location of the planned new nipple and areola complex, by marking the highest point of the oval of the new areolar, and drawing an arc or semicircle connecting the medial and lateral lines.

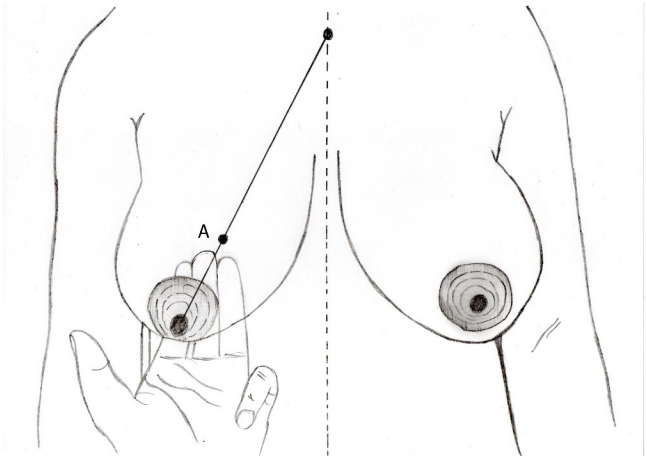


Figure 2 Marking the new nipple-areola complex location

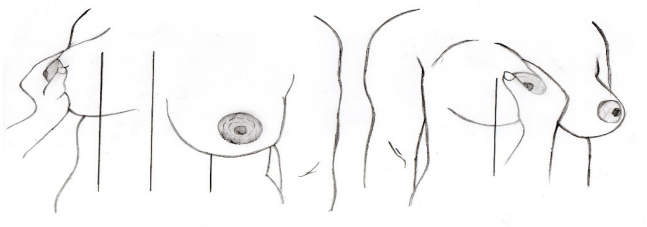


Figure 3 Marking the medial and lateral lines by pushing the breast to determine the extent of surgery

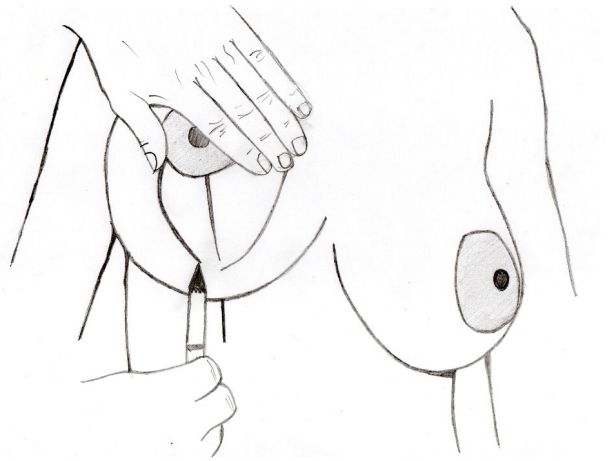


Figure 4 Joining the medial and lateral lines to determine the extent of surgery

Points that need to be marked include: point B (the highest point of the arc drawn above point A), point C (the point where the breast center intersects with the inframammary crease), point D (the point where the medial line meets the arc) and point E (the point where the lateral line meets arc); as shown in Figure 5.

It should be note that all these lines may need to be revised during surgery, especially if mastopexy procedures are to be used in conjunction with breast cancer surgery, as for the lines drawn before surgery in Figure 6.

Surgical technique

Draw the nipple and areola complex with a size 38 to 42 mm nipple sizer. Points B, C, D and E are marked with non-absorbable suture or staple (as in Figure 5). Incise the epidermis around the nipple and areola complex along the planned marked lines, as shown in Figure 7.1. Draw the boundary of the area to undermine skin or resect breast parenchyma as in Figure 7.2. Deepithelialize around the nipple and areola complex (Figure 7.2). Incise through the dermal layer, away from the edge of the epidermis by 0.5 to 1 cm, as in Figure 7.3. The depth of the undermining depends on how much the skin has to be resected, as originally planned, also taking the need to suture with minimal tension into account. Undermining of the surrounding subcutaneous layer is shown in Figure 7.4.

The highest point of the nipple areola complex is then sutured to point B with non-absorbable suture as a landmark, as in Figure 7.5. Points D and E are also sutured together with non-absorbable sutures, as in Figure 7.6.

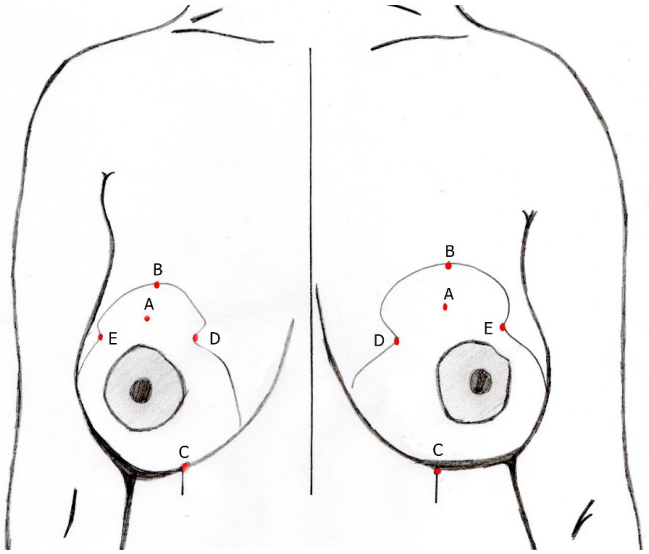


Figure 5 Showing lines around the nipple and areola complex and other important points (A, B, C, D, and E)



Figure 6 Showing a patient with breast ptosis and completed drawings for vertical mastopexy surgery

After surgery on both sides, try the patient is in a sitting position to assess the shape of the breast, whether further adjustment is needed. If the breast shape is satisfactory, then suture the wound with absorbable suture. In this patient was used Monocryl 4-0, then all non-absorbable suture was removed, shown in Figure 8.

After the operation, the lower pole of breast should be flat and the upper pole of the breast will often project. The breast regains shape due to gravity and skin elasticity, which takes approximately 2-3 months after surgery[3,33] as Figure 9.

The above picture shows the patient before the surgery.

The below picture shows the same patient three months after the surgery.

Post-Operative Care

Within 24 hours, it is important to look at the color of the nipple and areola complex for necrosis or not. Postoperative pain is usually mild to moderate and can be treated with NSAID. May be consider using opioid drugs in some patients. If the patient is awake, can eat and ambulation.

In the early postoperative period, the scar may be below the inframammary crease but this will be hide by the downward movement of the breast, taking about 2-3 months. If after 3 months the scars or breast shape are still not satisfactory, surgery may be considered for this period of time[3,33].

Complication after surgery

Several studies show that vertical mastopexy surgery has very few complications[1,3,30,31,36-39]. Risk factors will increase, corresponding to the larger breast size. Lejour reported having performed vertical mastopexy surgery in 476 patients. The most common complications are seroma, which is about 5%, Nipple and Areolar necrosis is 0.4%, infection is 0.4% and Hematomas are 1.2% which can be found after a few hours of surgery. If the breast is cut less or less under the skin, the condition can be reduced[34]. The recurrence was approximately 0.016% at 1 year after surgery[3].

According to Lassus reports, after vertical mastopexy surgery, even after 20 years, still able to maintain the contour of the breast shape[1]. Distortion areolas (teardrop-shaped areolas) are a common complication. This can be prevented by fixing suture to the vertical line of areola 2 points[40].



Figure 7 The details of Vertical mastopexy surgery

7.1 Showing the epidermal incision

7.2 Showing the deepithelialization skin around the nipple and areola complex and drawing of boundaries to undermine the subcutaneous layer

7.3 Showing the cutting through the dermis

7.4 Showing the undermine of the surrounding subcutaneous layer

7.5 Showing the suture of the highest point of the nipple and areola complex to the B point

7.6 Showing the suture of the skin together



Figure 8 Showing the patient after Vertical mastopexy surgery



Figure 9 Showing a female patient with moderate breast ptosis with vertical mastopexy surgery

In nipple sensation, Lejour reported 170 patients following the surgery for 6 months. They found that 7 patients had reduced nipple sensation and 1 lost nipple sensation completely[31].

Lactation after vertical mastopexy surgery is difficult to predict because it depends on many factors, especially breast parenchyma resection. If resecting a large amount of breast parenchyma, there is little to have a chance of lactation.

Conclusion

Mastopexy surgery and Mammoplasty surgery are both methods for collected breast ptosis. Mastopexy surgery focuses on raising the nipple and areola complex and creating a good breast contour. Vertical mastopexy surgery will leave the scar vertical, Suitable for young patients and mild to moderate breast ptosis. It also helps to reduce scarring, increase breast projection, reduce width of breast, make good breast contour in the long time and have few complications.

REFERENCES

1. Lassus C. Update on vertical mammaplasty. Plast Reconstr Surg 1999;104(7):2289-98.
2. Lassus C. Vertical scar breast reduction and mastopexy without undermining. Surgery of the Breast: Principles and Art. 3rd ed. 2011. p. 990-1006.
3. Lejour M. Vertical mammaplasty: update and appraisal of late results. Plast Reconstr Surg 1999;104(3):771-81.
4. Michelow B, Nahai F. Mastopexy. Plastic Surgery: Indications, Operations and Outcomes. 2000:2769-81.
5. Regnault P. Breast ptosis. Definition and treatment. Clin Plast Surg 1976;3(2):193-203.
6. Grotting JC, Chen SM. Control and precision in mastopexy. Art Aesthetic Surg 2005:1907-50.
7. Corduff N, Taylor GI. Subglandular breast reduction: the evolution of a minimal scar approach to breast reduction. Plast Reconstr Surg. 2004;113:175-84.
8. Hall-Findlay EJ. Vertical breast reduction. Semin Plast Surg 2004;18(3):211-24.
9. Hanna MK, Nahai F. Applied anatomy of the breast. Art Aesthetic Surg 2005:1790-815.
10. Greuse M, Hamdi M, DeMey A. Breast sensitivity after vertical mammaplasty. Plast Reconstr Surg 2001;107(4):970-6.
11. Weiner L, Aiache A, Silver L. A single dermal pedicle for nipple transposition in subcutaneous mastectomy, reduction mammaplasty, or mastopexy. Plast Reconstr Surg 1973;51(2):115-20.
12. Weiner D. Breast reduction: the superior pedicle technique (dermal and composite). Reduction Mammaplasty Philadelphia: Lippincott Williams & Wilkins; 1990. p. 233-8.
13. Arufe HN, Erenfryd A, Saubidet M. Mammaplasty with a single, vertical, superiorly-based pedicle to support the nipple-areola. Plast Reconstr Surg 1977;60(2):221-7.
14. Courtiss EH, Goldwyn RM. Reduction mammaplasty by the inferior pedicle technique. An alternative to free nipple and areola grafting for severe macromastia or extreme ptosis. Plast Reconstr Surg 1977;59(4):500-7.
15. Robbins TH. A reduction mammaplasty with the areola-nipple based on an inferior dermal pedicle. Plast Reconstr Surg 1977;59(1):64-7.
16. Skoog TD. A technique of breast reduction: transposition of the nipple on a cutaneous vascular pedicle. Acta Chir Scand 1963;126:453-65.
17. Orlando JC, Guthrie RH. The superomedial dermal pedicle for nipple transposition. Br J Plast Surg 1975;28(1):42-5.
18. Hester TR, Bostwick J, Miller L. Breast reduction utilizing the maximally vascularized central breast pedicle. Plast Reconstr Surg 1985;76(6):890-900.
19. McKissock PK. Reduction mammaplasty with a vertical dermal flap. Plast Reconstr Surg 1972;49(3):245-52.
20. McKissock PK. Reduction mammaplasty by the vertical bipedicle flap technique. Rationale and results. Clin Plast Surg 1976;3(2):309-20.
21. Strombeck JO. Mammaplasty: report of a new technique based on the two pedicle procedure. Br J Plast Surg. 1960;13:79.
22. Nahai F. Clinical decision-making in breast surgery. The Art of Aesthetic Surgery. 2005:1817-58.
23. Sprole AM, Adepoju I, Ascherman J. Horizontal or vertical? An evaluation of patient preferences for reduction mammaplasty scars. Aesthetic Surg J 2007;27(3):257-62.
24. Marchac D. Reduction mammaplasty with a short horizontal scar. Reduction Mammaplasty Boston: Little, Brown; 1990. p. 317-36.
25. Marchac D, Olarte GD. Reduction mammaplasty and correction of ptosis with a short inframammary scar. Plast Reconstr Surg 1982;69(45).
26. Benelli L. A new periareolar mammaplasty: the "round block" technique. Aesthetic Plast Surg 1990;14(2):93-100.
27. Graf R, Biggs TM. In search of better shape in mastopexy and reduction mammoplasty. Plast Reconstr Surg 2002;100(1):321-2.
28. Góes JC. Periareolar mammaplasty: double skin technique with application of polyglactin or mixed mesh. Plast Reconstr Surg 1996;97(5):959-68.
29. Hoffman A, Wuestner-Hofmann M, Basseto F. Breast reduction: modified "Lejour technique" in 500 large breasts. Plast Reconstr Surg 2007;120:1095-104.
30. Hidalgo DA. Vertical mammaplasty. Plast Reconstr Surg 2005;115(4):1179-97.
31. Lejour M. Vertical mammaplasty: early complications after 250 personal consecutive cases. Plast Reconstr Surg 1999;104(3):764-70.
32. Graf RM, Tolazzi ARD, Ono MC. Vertical mammaplasty. Techno Aesthetic Plast Surg 2009:217-27.
33. Hall-Findlay EJ. A simplified vertical reduction mammaplasty: shortening the learning curve. Plast Reconstr Surg 1999;104(3):748-59.

34. Nahai F, Boehm K. Mastopexy. Cosmetic and reconstructive Breast Surgery. 2009. p. 109-18.
35. Spear SL, Howard MA. Evolution of the vertical reduction mammaplasty. Plast Reconstr Surg 2003;112:855-68.
36. Berthe J, Massaut J, Greuse M. The vertical mammaplasty: a reappraisal of the technique and its complications. Plast Reconstr Surg 2003;111(7):2192-9.
37. Lista F, Ahmad J. Vertical scar reduction mammaplasty: a 15-year experience including a review of 250 consecutive cases. Plast Reconstr Surg 2006;117(7):2152-65.
38. Spector JA, Kleinerman R, Culliford AT. The vertical reduction mammaplasty: a prospective analysis of patient outcomes. Plast Reconstr Surg 2006;117(2):374-81.
39. Thienen CE. Areolar vertical approach (AVA) mammaplasty: Lejour's technique evolution. Clin Plast Surg 2002;29:365-77.
40. Wallach SG. Avoiding the teardrop-shaped nipple-areola complex in vertical mammaplasty. Plast Reconstr Surg 2000;106(5):1217-8.