

## *Original Articles*

# **Reduction Mammoplasty and Mastopexy Using the Vertical Scar and Thoracic Wall Flap Technique**

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**Abstract.** Breast surgery has been greatly modified in the past few years as surgeons sought to shorten scars and improve and maintain of breast shape in the late postoperative period. Working with both the periareolar technique and vertical scar technique, it is possible to reduce scar length, avoiding the area below the inframammary crease by compensating skin excess around the areola. From January 2001 to July 2002, 53 patients underwent reduction mammoplasty and/or mastopexy using the vertical scar technique associated to a thoracic-based flap kept under a bipediced flap of the pectoralis major muscle. The goal of this combination is to achieve a good aesthetic result: a reduced scar, minimal breast descent, and good upper pole fullness.

**Key words:** Mammoplasty—Mastopexy—Breast surgery

Initially, reduction mammoplasties were performed using the inverted-T technique [23,26]. However, besides producing a long scar, the breast ended up with no projection or shape. After 22 years, the authors started to perform oblique, or L, incisions, which eliminated the medial branch of the scar, quite often the one with the worst aesthetic quality [3,7–9,12, 21,24].

Many authors made efforts to reduce scar length by utilizing only a vertical scar that extended to the

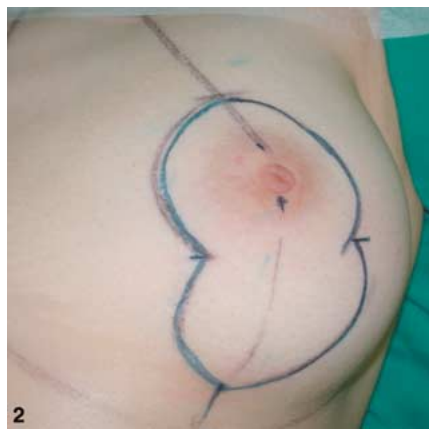
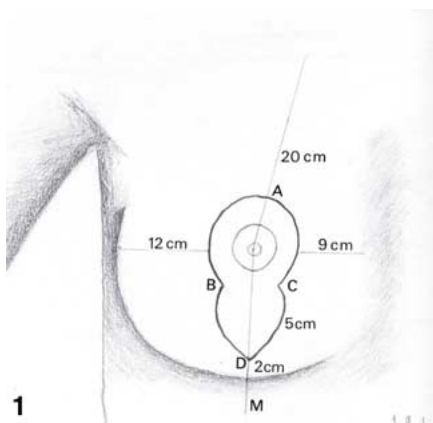
inframammary crease [10,11,13–19,22]. This technique had the disadvantage of skin redundancy at the level of this crease. Periareolar incision techniques allow the excess skin to be resected, however, the breast shape is not good and has only moderate areolar projection, unless a mesh is fixated over the breast tissue [1,5,6]. Currently, by working with the periareolar technique associated to the vertical scar technique, it is possible to reduce the scar length by compensating for the excess skin around the areola, thus avoiding the scar's elongation across the inframammary crease.

It was observed that in every single technique the breast lost fullness in the upper pole after its descent. Some authors used tissue from the inferior portion of the breast to fill out the upper pole or the areola and achieve a better shape [2,4,25]. In addition to scar improvement, a technique using a flap from the chest wall and that is placed under a section of major pectoralis muscle has been developed, allowing long-term maintenance of upper pole volume.

In order to obtain a better long-term outcome, breast shape must be redefined with internal tissue, not with skin sutures, therefore avoiding exaggerated scar tension. Performing the chest-wall flap/major pectoralis technique maintains this restructuring.

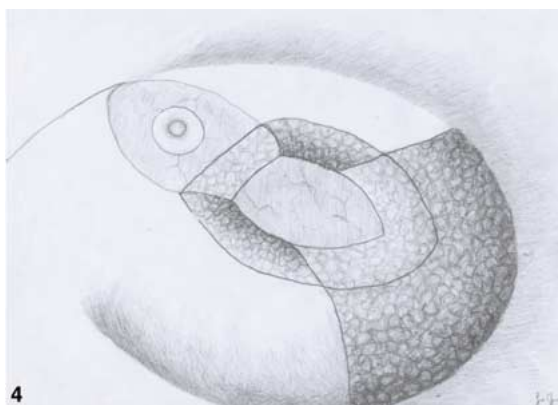
## **Materials and Methods**

Between January 2001 and July 2002, 53 patients underwent reduction mammoplasty and/or mastopexy using the vertical scar technique associated to a thoracic wall flap. The patient ages ranged from 17 to



**Fig. 1.** Basic markings of vertical technique. Point A, 20 cm from the clavicle; points B and C, pinching maneuver; point D, 2 cm above the inframammary crease.

**Fig. 2.** Skin demarcation before surgery.



**Fig. 3.** Deepithelization and dermis incision following demarcation to 2 cm above points B and C.

**Fig. 4.** Schematic view of thoracic-based flap.

70 years, with the highest proportion of patients being between 20 to 40 years of age.

### Marking Technique

Similar skin markings can be used to perform either the breast reduction or the mastopexy: The only difference is the amount of tissue removal indicated.

1. A line from the sternal notch to the xiphoid process is drawn (midline).

2. The middle mammary line is drawn from the midclavicle to the nipple-areola complex (NAC), crossing the inframammary crease (point M), which is 12 cm or more away from the midline.

3. 18 to 20 cm from the midclavicle point, or 20 to 22 cm from the sternal notch is measured the point A, which will be the future superior part of the areola.

4. With a horizontal pinching maneuver, two points (points B and C) are marked, using the vertical line that is inferior to the areola as a central reference which indicates the excess cutaneous tissue. Using these three points (A, B, and C) as a reference, an oval is drawn around the areola, similar to that in the periareolar technique. On average, the medial portion of this line is 9 cm from the midline and the lateral portion is 12 cm from the anterior axillary line.

5. Point D is marked 2–4 cm above point M. A curved line, approximately 5–7 cm long, is drawn

connecting points B and D and points C and D (Figs. 1 and 2).

### Operative Technique

Surgery is begun by performing the Schwartzman maneuver within the area previously described.

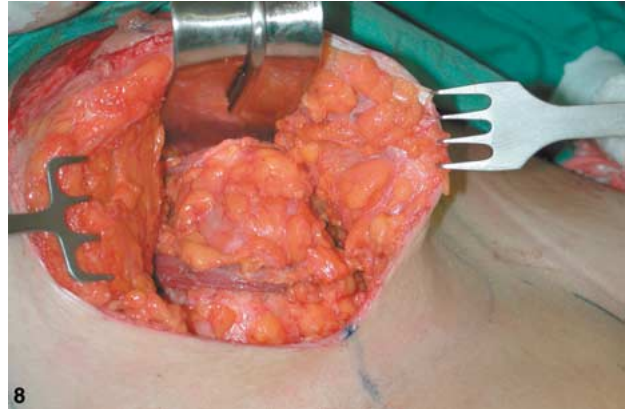
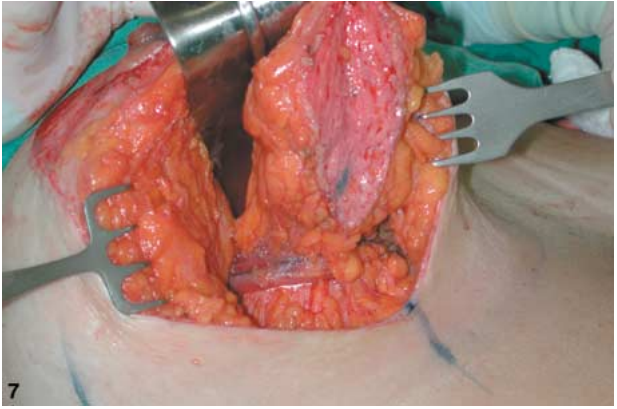
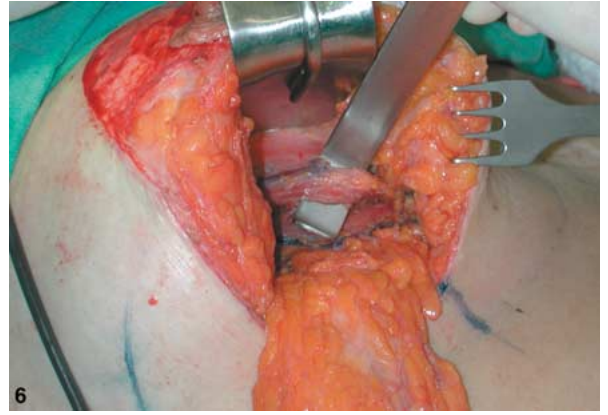
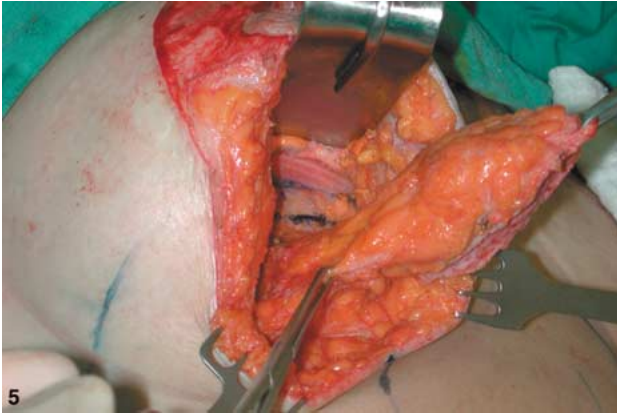
1. The dermis is incised along the demarcation until it is 1.5–2 cm above points B and C, sparing the upper portion of the areola which will be the pedicle for the NAC (Fig. 3).

2. The dermis is also incised horizontally, 1 cm below the areola, perpendicular to the plane of the thoracic wall until the incision meets it at the fourth intercostal space.

3. An incision is then made obliquely in the upper portion of the flap, leaving intact tissue for the breast pillars, laterally and medially (Fig. 4).

4. The breast tissue is undermined to the second intercostal space, detaching the gland from the major pectoralis muscle fascia.

5. The lower portion of the flap is meticulously dissected down to the original inframammary crease, widening its base, and a chest wall flap, approximately 6–8 cm wide and 4 cm thick, is made based on the arteries of the fourth and fifth intercostal spaces (Fig. 5).



**Fig. 5.** Undermining of thoracic-based flap, lateral view.

**Fig. 6.** Bipedicled muscular flap.

**Fig. 7.** Passage of thoracic-based flap under the bipedicled muscular flap.

**Fig. 8.** Cranial fixation of thoracic-based flap to major pectoralis muscle fascia.

6. A 2-cm-wide, bipedicled flap of major pectoralis muscle is dissected directly above the base of the chest wall flap. The muscle flap should be of partial thickness (two-thirds superficial) and wide enough to accommodate the thoracic-based flap with no compression at all (Fig. 6).

7. After the flap is passed under the muscle sling (Fig. 7), the donor area of the muscle is sutured with two separate stitches (2.0 nylon). Next, the thoracic flap is fixed in the thoracic wall with a continuous suture of 2.0 nylon, beginning laterally, continuing until reaching the second intercostal space, and finishing medially. The size of this flap is similar to a 100–200 g implant, so it gives volume to the upper pole of the breast (Fig. 8).

8. After suturing, wedges of breast tissue are removed—medially, laterally and from the breast base (Fig. 9). As much tissue as necessary is removed to achieve the desired breast size and shape.

9. The upper portion of the gland is sutured to the muscle plane at the second intercostal space, bringing together the medial and lateral pillars to improve breast shape (Fig. 10).

10. The dermis and skin are sutured plane-by-plane, joining points B and C together as well as the columns of the vertical scar.

11. Point D is fixed to the deep plane so that the vertical suture is kept at the same level as the new inframammary crease (Fig. 11).

12. A subcuticular suture (4.0 monocryl) is then made in the vertical scar to shorten this branch.

13. A round block suture is made in the areola to compensate the skin resected around it (Fig. 12).

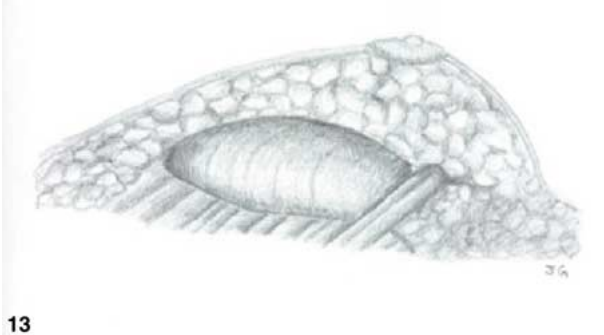
14. Suction drainage is used.

Figure 13 shows the stage after the final suture, with the thoracic-based flap passing through the loop of the bipedicle muscular flap.

## Results

From January 2001 to July 2002, 53 patients underwent vertical scar mammoplasty associated to a thoracic wall flap and supported by a bipedicled major pectoralis muscle flap. The follow-up period was 18 months during which the majority of the patients were pleased with their outcomes. When we presented a series of our early use of this technique, we had encountered some degree of steatonecrosis in the initial cases, but no similar complications presented in this series, maybe because we now have more experience. Seroma and hematoma were avoided





**Fig. 9.** Resection of breast tissue.

**Fig. 10.** Medial and lateral breast columns.

**Fig. 11.** Cranial suture of point D after approximation of breast columns.

**Fig. 12.** Final skin closure with shortening of vertical incision and round block suture around the areola.

**Fig. 13.** Schematic view of flap sutures.

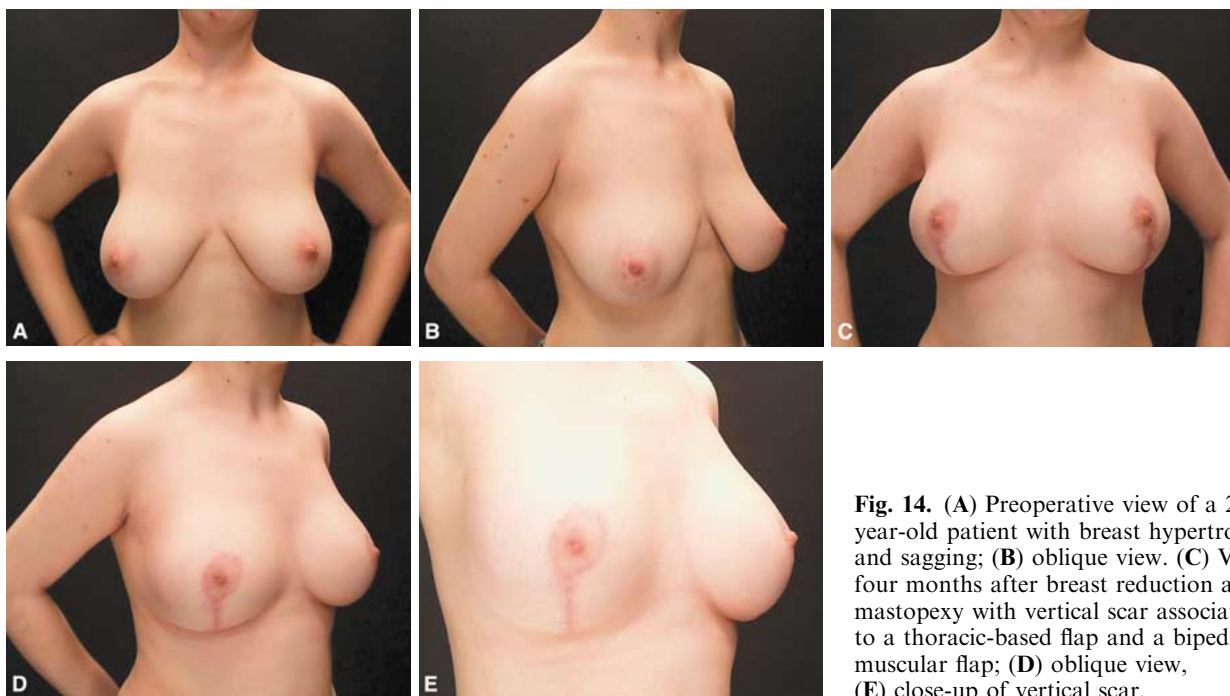
with rigorous hemostasis during the surgery and the use of drains during the first 24 hours after the procedure.

The vertical technique was performed in patients with various degrees of breast hypertrophy and ptosis (Figs. 14 and 15), but as in any other technique, the best results were achieved in those patients with mild breast ptosis. Good results can also be accomplished in patients with great hypertrophy, especially those with good skin quality. In these cases of severe breast ptosis, point D must be marked further from point M, a distance of up to 4 cm, leaving the skin and subcutaneous tissue of the lower pole of the breast as part of chest wall, therefore elevating the inframammary crease and also decreasing the skin compensation of the vertical scar.

In some cases, the lower end of the vertical appeared to have excess skin. Over the first two post-operative months, some settling scar was noticed and there was no need to resect the scar. In only one case did the excess skin not subside and a surgical revision was performed after six months (a horizontal resection of the excess skin in the lower end of the scar), resulting in a short horizontal scar.

## Discussion

The desire to shorten scar length has prompted the development of new breast surgery techniques. The widely used vertical scar technique was first used by



**Fig. 14.** (A) Preoperative view of a 28-year-old patient with breast hypertrophy and sagging; (B) oblique view. (C) View four months after breast reduction and mastopexy with vertical scar associated to a thoracic-based flap and a bipediced muscular flap; (D) oblique view, (E) close-up of vertical scar.

Lassus [13,14] and Lejour has described it [15–19]. The authors observed that with this technique, breast descent and the loss of upper pole fullness were too common. Ribeiro's inferior pedicle flap technique was then used [4]. This technique was modified by Daniel who associated a bipediced flap of major pectoralis muscle to keep Ribeiro's flap in a higher position [2].

Starting in 1994, these associated flaps were performed with the inverted T, oblique, or L scars and more recently, with vertical scar mammoplasties. This approach has been altered from using inferior pedicle flaps to using flaps based only in the thoracic wall vasculature, completely detached from structures around. This also allows to preserve the overlaying dermis which gives better shape and support to the flap fixation to the muscle sling. Figure 16 shows the extent of the scar reduction this technique provides when compared with the inverted-T technique, or the Wise pattern.

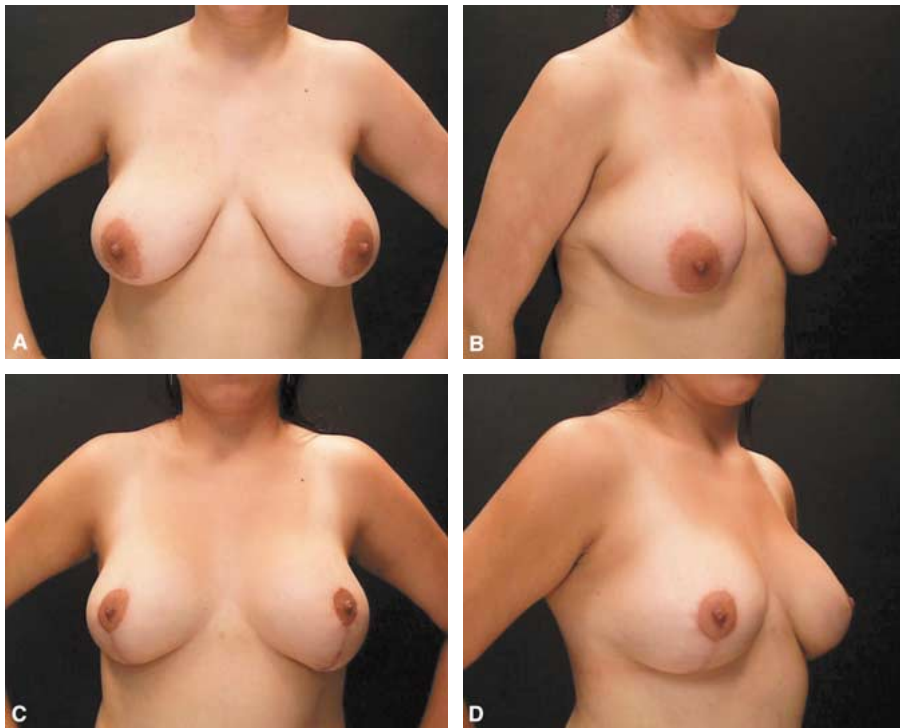
We have performed vertical mammoplasty with a thoracic-based flap and bipediced major pectoralis flap in the last 53 cases due to the nice, long-term results: The upper pole of the breast maintains a good volume and the vertical scar is located above or at the level of the new inframammary crease with minimal breast descent.

The length of the thoracic-based flap changes according to the distance between the areola and inframammary crease. Its upper limit is located 1 cm below the inferior edge of the areola, and the lateral borders extend to the medial and lateral breast contours. The flap is 6–8 cm wide and 4 cm thick and its base extends to the inframammary crease. Its vascu-

lar pedicle is based on the vessels of the fourth and fifth intercostal spaces. The bipediced muscle flap is 2 cm wide and 8–10 cm long and is situated right above the base of the breast tissue flap. It should be dissected in the same direction of the muscle's fibers, taking care to elevate just two-thirds of the muscle's thickness, superficially. This is done to leave the ganglionic chain (responsible for part of breast lymphatic drainage) intact between the minor and major pectoralis muscles.

It is possible to use this association of techniques for mastopexy only, in which there is no breast tissue in excess to be removed, or for breast reductions, in which the resection of excessive breast tissue is done in the column or base of the breast, after the thoracic wall flap is fixed. We have found that we remove less breast tissue with this technique (250 g, on average) than with other techniques that do not use the thoracic flap. In great hypertrophies or severe ptosis, point D should be marked further from point M, up to 4 cm away. This maneuver is done to leave the skin and subcutaneous tissue of the lower breast pole as part of the thoracic wall, create a new, higher inframammary crease, and decrease skin compensation in the vertical scar.

The excess skin in the vertical branch observed during surgery can be compensated for with a subcuticular suture that shortens this scar. During the first two months of postoperative period, this scar accommodates the skin and no resection is needed to remove the excess, as suggested by Marchac [20]. A round block suture is done around the areola to further reduce the length of the vertical scar by compensating skin excess around the areola.



**Fig. 15.** (A) Preoperative view of a 37-year-old patient with breast hypertrophy and sagging; (B) oblique view. (C) View one year after breast reduction and mastopexy with vertical scar associated to a thoracic-based flap and a bipediced muscular flap; (D) oblique view.

The most common complication related to the thoracic wall flap is fat necrosis in the distal portion of this flap. This can be solved with serial aspirations or surgical revision to remove this tissue.

Among the advantages of this technique are: creation of fullness in the upper pole of the breast when the patient is supine; maintenance of the breast position with dorsal decubitus; creation of adequate breast projection when the patient is supine; maintenance of the areola in a good location with a minimal breast descent; creation of a vertical scar that does

not cross the new inframammary crease and that has improved quality due to reduced skin tension.

### Conclusions

The achievement of a good aesthetic result in mammoplasty requires an adequate shape, nice skin coverage, and a nipple-areola complex on the top of the breast projection. With the traditional techniques, the breast was shaped with dermal sutures that would relax over the years, resulting in the descent of all breast tissue.

We observed minimal breast descent when performing the vertical scar technique associated with a thoracic-based flap and a bipediced major pectoralis muscle flap, providing better, long-term, aesthetic outcome. With this technique, breast tissue is divided and repositioned where desired, maintaining breast shape with the internal structures, with no tension over the dermal sutures.

### References

1. Benelli L: A new periareolar mammoplasty: round block technique. *Aesth Plast Surg* **14**:93, 1990
2. Cerqueira AA: Mammoplasty: breast fixation with dermogladular mono upper pedicle under the pectoralis muscle. *Aesth Plast Surg* **22**:276, 1998
3. Chiari JA: The L short-scar mammoplasty: a new approach. *Plast Reconstr Surg* **90**:233, 1992
4. Daniel MJB: *Mammoplasty with pectoral muscle flap*. Presented at the 64th American Annual Scientific Meeting, Montreal, 1995



**Fig. 16.** The skin resection using the vertical scar technique (red ink) compared to using the inverted-T or Wise pattern (blue ink).

5. Góes JCS: Periareolar mammoplasty with mixed mesh support: the double skin technique. *Plastic Surgery* **2**:575, 1992
6. Góes JCS: Periareolar mammoplasty: double skin technique with application of polyglactine or mixed mesh. *Plast Reconst Surg* **97**:959, 1996
7. Graf R, Auersvald A, Bernardes A, Biggs TM: Reduction mammoplasty and mastopexy with shorter scar and better shape. *Aesth Surg J* **20**:99, 2000
8. Graf R, Biggs TM: In search of better shape in mastopexy and reduction mammoplasty. *Plast Reconst Surg* **110**:309, 2002
9. Graf R, Biggs TM, Steely RL: Breast shape: a technique for better upper pole fullness. *Aesth Plast Surg* **24**:348, 2000
10. Hall-Findlay E: A simplified vertical reduction mammoplasty shortening the learning curve. *Plast Reconst Surg* **104**:748, 1999
11. Hall-Findlay E: Vertical breast reduction with a medially-based pedicle. *Aesth Plast Surg* **22**:185, 2002
12. Hollander E: Die operation der mammahypertrophie und der hangebrust. *Dtsch Med Wochenschr* **50**:1400, 1924
13. Lassus C: A technique for breast reduction. *Int Surg* **53**:69, 1970
14. Lassus C: Update on vertical surgery. *Plast Reconst Surg* **104**:2289, 1999
15. Lejour M: Vertical mammoplasty and liposuction of the breast. Quality Medical Publishing, St. Louis, 1993
16. Lejour M: Vertical mammoplasty and liposuction of the breast. *Plast Reconst Surg* **94**:100, 1994
17. Lejour M: Vertical mammoplasty: early complications after 250 personal consecutive cases. *Plast Reconst Surg* **104**:746, 1999
18. Lejour M, Abboud M: Vertical mammoplasty without inframammary scar and with breast liposuction. *Perspect Plast Surg* **4**:67, 1990
19. Lejour M, Abboud M, Decléty A, Kertesz P: Reduction des cicatrices de plastie mammaire: de l'ancre courte a la verticale. *Ann Chir Plast Estht* **35**:369, 1990
20. Marchac D, Olarte G: Reduction mammoplasty and correction of ptosis with a short scar. *Plast Reconst Surg* **69**:45, 1982
21. Meyer R, Keselring UK: Reduction mammoplasty with an L-shaped suture line. *Plast Reconst Surg* **55**:139, 1975
22. Peixoto G: Reduction mammoplasty: a personal technique. *Plast Reconst Surg* **65**:217, 1980
23. Pitanguy I: Surgical correction of breast hypertrophy. *Br J Plast Surg* **20**:78, 1967
24. Regnault P: Reduction mammoplasty by the B technique. *Plast Reconst Surg* **53**:19, 1974
25. Ribeiro L: A new technique for reduction mammoplasty. *Plast Reconst Surg* **55**:330, 1975
26. Wise RJ: A preliminary report on a method of planning the mammoplasty. *Plast Reconst Surg* **17**:367, 1956