

# Aesthetic Reconstruction of the Tuberous Breast Deformity

Apostolos D. Mandrekas, George J. Zambacos

## 38.1 Introduction

The tuberous breast deformity is a rare entity affecting teenage women unilaterally or bilaterally [1, 2]. Its exact incidence has not been properly investigated and remains unknown [1, 2]. Nonetheless, this deformity produces much psychological morbidity and presents a reconstructive challenge for the plastic surgeon.

The tuberous breast deformity was first described in 1976 by Rees and Aston [3] and was thus named because “it resembled the shape of a tuberous plant root.” Unfortunately, in that same, seminal paper the authors described another “similar,” as they said, deformity, the “tubular breast,” and since then several papers have been published on the subject, each using its own nomenclature and producing much confusion among plastic surgeons [4].

Tuberous breasts [3, 5], tubular breasts [3, 5, 6], Snoopy breasts [5–9], herniated areolar complex [5, 6, 9, 10], domed nipple [9, 10], nipple breast [9, 11], constricted breast [6], lower-pole hypoplasia [5, 6], and narrow-based breast [5, 6] are some of the names used to describe this deformity or so-called new deformities, which under careful inspection are no different from the original one described by Rees and Aston.

The essence of the matter remains that there is deficiency in the vertical and/or horizontal dimensions of the breast (Fig. 38.1), usually underdevelopment of the breast, and often herniation of breast tissue into the areola with expansion of the areola [1–3, 6, 8–10, 12–14].

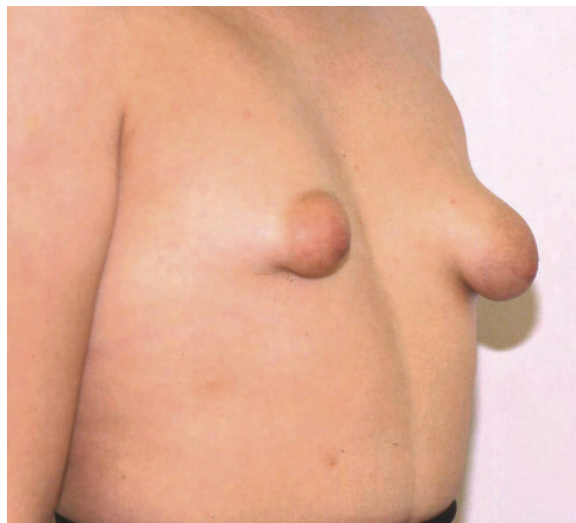
## 38.2 History

Since Rees and Aston’s description, several authors have attempted to describe, classify, and correct the problem, using various methods with varying results [1, 2, 4–21].

Rees and Aston [3] described a technique of radial incisions on the posterior aspect of the breast parenchyma to release the constriction and allow the breast

to assume a more natural shape. Vecchione, also in 1976 [22], described the donut-type periareolar excision for correcting the “domed nipple.” Williams and Hoffman [23] described a technique with periareolar excision, radial incisions on the posterior aspect of the breast parenchyma, and implant placement. Toronto [1] used a two-stage technique, with implant augmentation in the first stage and an Arie–Pitanguy type of skin–areola reduction at a second stage.

Ribeiro et al. [15] recognized the need to release the constricted breast, but they concentrated on a horizontal division of the inferior part of the breast, developing an inferiorly based flap. Puckett developed a similar “unfurling” technique (C. Gasperoni, personal communication, 1998). Dinner and Dowden [12] and Elliott [16] believed the deformity was due to skin shortage in the inferior part of the breast and followed a different



**Fig. 38.1** Typical case of bilateral tuberous breast deformity with deficiency in both the vertical and horizontal dimensions of the breast, underdevelopment of the breast, and herniation of breast tissue toward the areola and expansion of the areola on the left side

approach using skin flaps from the inframammary fold. Muti [20] also developed a technique based on inferiorly based glandular flaps coupled with the use of silicone implants.

### 38.3 Anatomy and Embryology

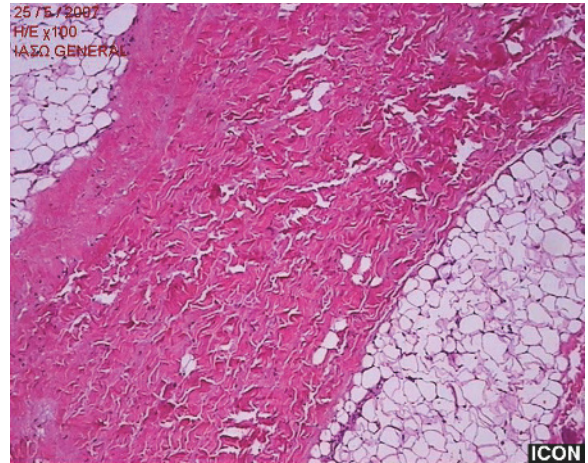
Embryologically, the breast comes from the mammary ridge that develops in utero from the ectoderm during the 5th week of gestation [24, 25]. Shortly after its formation (7th–8th weeks), most parts of this ridge disappear except for a small portion in the thoracic region that persists and penetrates the underlying mesenchyme (10–14 weeks) [25]. Further differentiation and development of the breast occurs during intrauterine life and is completed by the time of birth, after which essentially no further development occurs until puberty [24].

The next series of steps in the development of the breast is activated at puberty in the female, consisting of growth of the mammary tissue beneath the areola with enlargement of the areola until the age of 15–16, when the breast assumes its familiar shape [24–26].

As a result of the ectodermal origin of the breast and its invagination into the underlying mesenchyme, the breast tissue is contained within a fascial envelope, the superficial fascia [24, 25, 27]. This superficial fascia is continuous with the superficial abdominal fascia of Camper and consists of two layers: the superficial layer of the superficial fascia, which is the outer layer covering the breast parenchyma, and the deep layer of the superficial fascia, which forms the posterior boundary of the breast parenchyma and lies on the deep fascia of the pectoralis major and serratus anterior muscles [24, 25, 27]. The deep layer of the superficial fascia is penetrated by fibrous attachments called the suspensory ligaments of Cooper, joining the two layers of the superficial fascia and extending to the dermis of the overlying skin and the deep pectoral fascia [24, 25, 27].

A critical point in understanding the tuberous breast deformity is the fact that the superficial layer of the superficial fascia is absent in the area underneath the areola, as can easily be demonstrated by the invagination of the mammary bud in the mesenchyme [26].

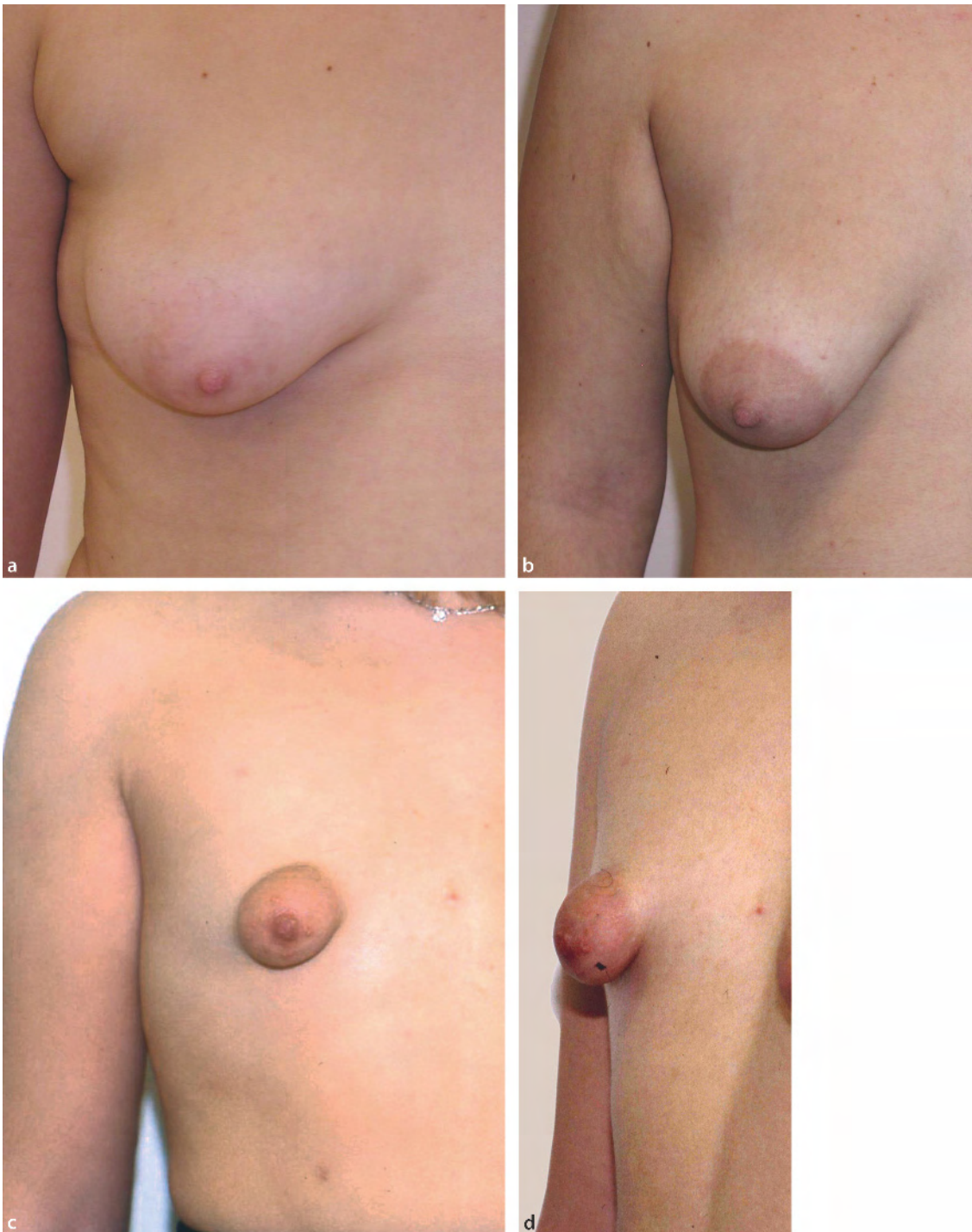
Clinical experience has shown [2, 15] that in cases of tuberous breasts there is a constricting fibrous ring at the level of the periphery of the nipple–areola complex inhibiting the normal development of the breast. This constricting ring of fibrous tissue is denser at the lower part of the breast and does not allow the developing breast parenchyma to expand during puberty. Histology has confirmed the existence of such dense fibrous



**Fig. 38.2** Hematoxyline/eosin staining of tissue taken from the clinically palpable fibrous ring ( $\times 100$ ). Dense fibrosis with stromal thickening and large concentrations of collagen and elastic fibers, arranged longitudinally

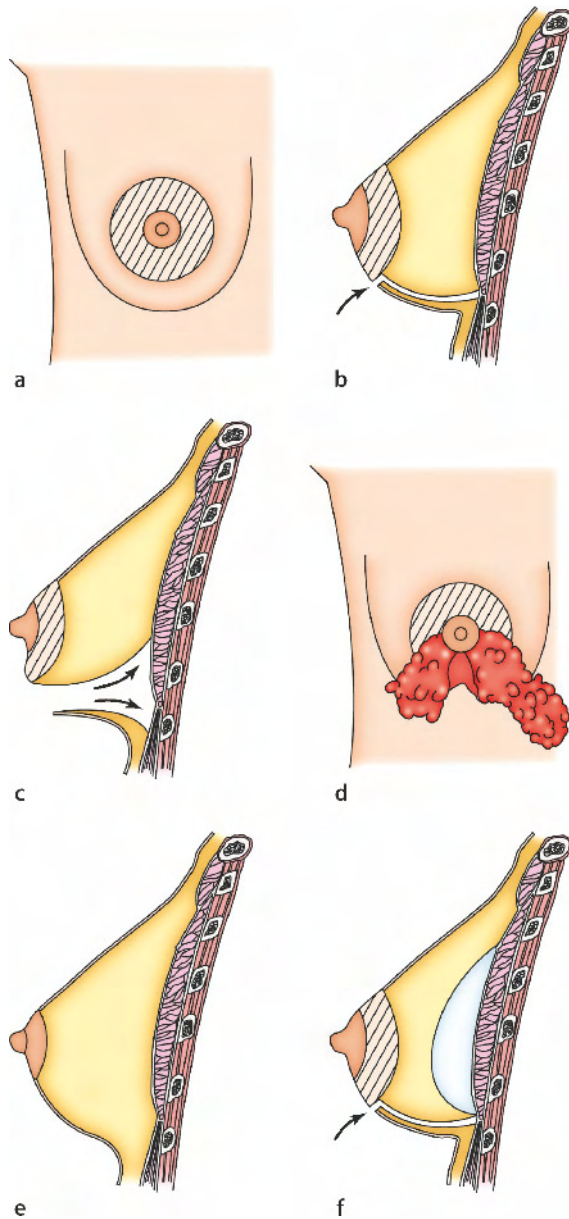
tissue in the area of this constricting ring. Specimens from two of our patients have been examined, and they showed large concentrations of collagen and elastic fibers, arranged longitudinally (Fig. 38.2). This ring represents a thickening of the superficial fascia. Perhaps the two layers of this fascia join at a higher level than usual, or the suspensory ligaments are thicker and more dense [5].

The result in either case is that the developing breast cannot expand inferiorly [5], and because there is no superficial layer of the superficial fascia under the areola, the breast parenchyma herniates toward the nipple–areola complex. The severity of the deformity depends on the severity of the malformation of the superficial fascia and ranges from slight underdevelopment of the inferior medial quadrant of the breast with near-normal breast volume, to major hypoplasia of all four quadrants with various degrees of herniation of the breast parenchyma toward the areola, as has been described in several classifications submitted over the years [5, 6, 14, 28]. The authors have adopted the classification of Grolleau et al. [5] (Fig. 38.3), according to which the deficiency of the lower medial quadrant is type I, deficiency of both lower quadrants is type II, and deficiency of all four quadrants is type III. Based on this understanding of the anatomical basis of the deformity, the authors were able to develop a protocol for treatment of the tuberous breast deformity that relies on correcting the anatomical malformations.



**Fig. 38.3** Classification of tuberous breast deformity after Grolleau et al. **a** Type I: deficiency of the lower medial quadrant. **b** Type II: deficiency of both lower quadrants. **c** Type III: deficiency of all four quadrants. **d** Lateral view





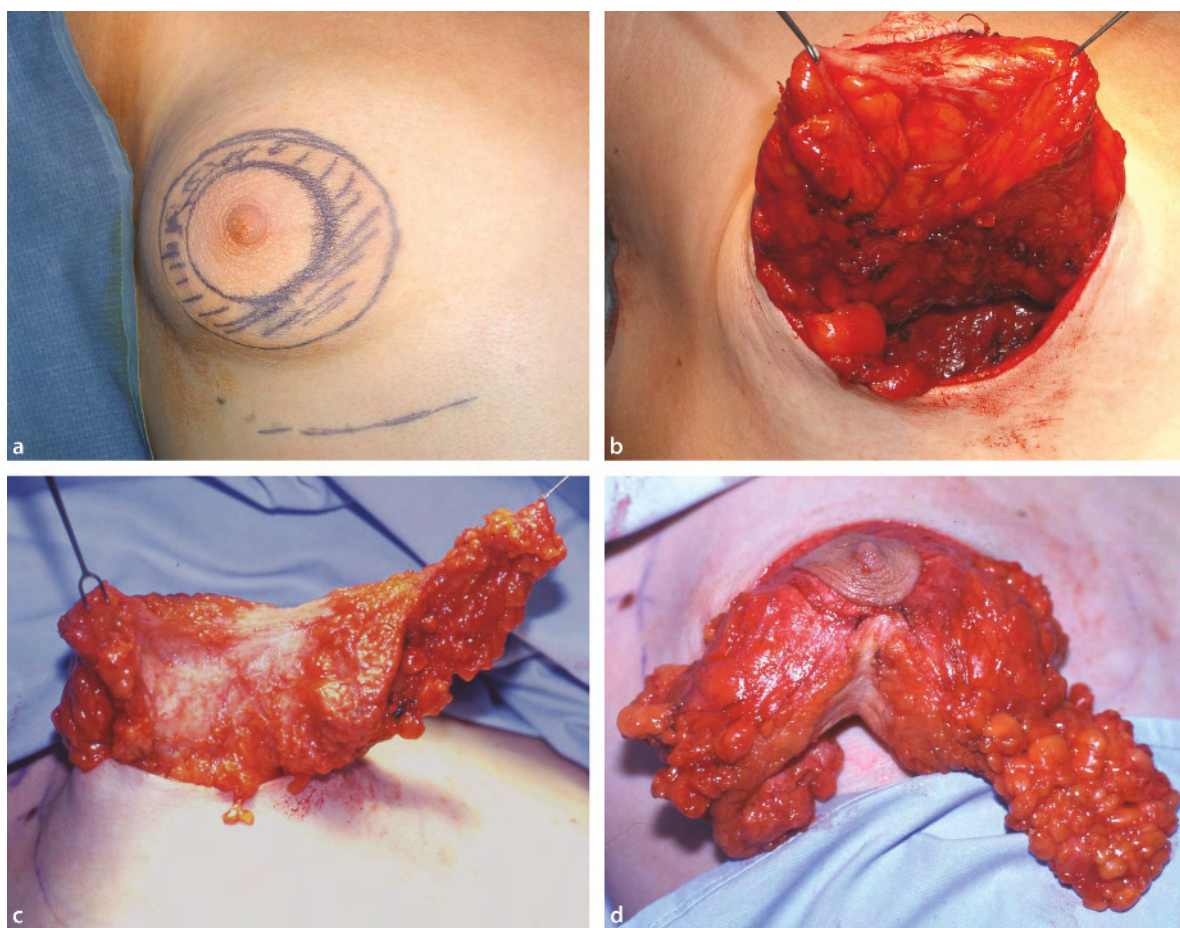
◀ **Fig. 38.4** Operative technique (schematic diagrams). **a** Periareolar donut-type skin deepithelialization. **b** The skin of the inferior half of the breast is undermined down to the pectoralis fascia with sharp dissection. **c** The dissection continues further down toward the new inframammary fold and then upward, behind the breast with blunt dissection. The breast parenchyma is dissected off the deep pectoral fascia, leaving only the superior part of the breast attached. **d** The breast parenchyma is exteriorized through the periareolar opening. The exteriorized inferior half of the breast is transected with a vertical incision along the middle. **e,f** If necessary, a silicone breast implant is used to augment the breast. The implant can be placed in a purely subglandular or a dual-plane position (upper part submuscular, lower part subcutaneous/subglandular), depending on the individual patient's configuration

docaine/epinephrine solution (20 ml of 0.5% lidocaine solution with 1:400,000 epinephrine) [29].

A periareolar donut-type skin deepithelialization is performed to reduce the areola to the desired size, usually 4–4.5 cm in diameter (Figs. 38.4, 38.5). The skin of the inferior half of the breast is undermined down to the pectoralis fascia with sharp dissection (Fig. 38.4). Once the lower border of the breast parenchyma is reached, the dissection continues further down toward the new inframammary fold and then upward, behind the breast, along the natural plane between the deep layer of the superficial fascia and the deep fascia bluntly (Fig. 38.4). The breast parenchyma is dissected off the deep pectoral fascia, leaving only the superior part of the breast attached. The dissection is also extended laterally and medially, and the breast parenchyma is exteriorized through the periareolar opening (Fig. 38.5). The exteriorized inferior half of the breast is transected with a vertical incision along the middle (Figs. 38.4, 38.5). The constricting fibrous ring is thus divided, and two breast pillars are created (Fig. 38.5), which allow the breast parenchyma to redrape, assuming a more natural shape. If the pillars are short, they are simply loosely approximated using absorbable sutures (4/0 Vicryl, Ethicon). If the two pillars are long, then the proximal parts are again approximated using absorbable sutures, and the distal parts are either allowed to redrape freely or are folded over each other like a double-breasted jacket to create added volume in the inferior portion of the breast. On rare occasions, we can secure the lower part of the pillars at the new inframammary fold with bolster-type sutures. This is the case when the pillars are very short and they do not freely reach the new inframammary fold.

### 38.4 Techniques

The procedure begins with the preoperative marking of the new inframammary fold in the standing and supine positions, by projection of the contralateral breast in unilateral cases or by using the 6th rib as a landmark in bilateral cases [8]. The breast is infiltrated with a li-



**Fig. 38.5** Operative technique, periareolar donut-type skin deepithelialization. **a** Skin markings. **b** The breast parenchyma is exteriorized through the periareolar opening. **c** The exteriorized

inferior half of the breast is transected with a vertical incision along the middle. **d** The constricting fibrous ring is divided, and two breast pillars are created

If necessary, a silicone breast implant is used to augment the breast. The implant can be placed in a purely subglandular or a dual-plane position (upper part submuscular, lower part subcutaneous/subglandular), depending on the individual patient's configuration (Fig. 38.4). Care should be taken to ensure that the pillars cover the implant in its entirety. The decision to use a breast implant is usually made at the preoperative consultation at which the physician and patient discuss whether additional volume will be required. Round tex-

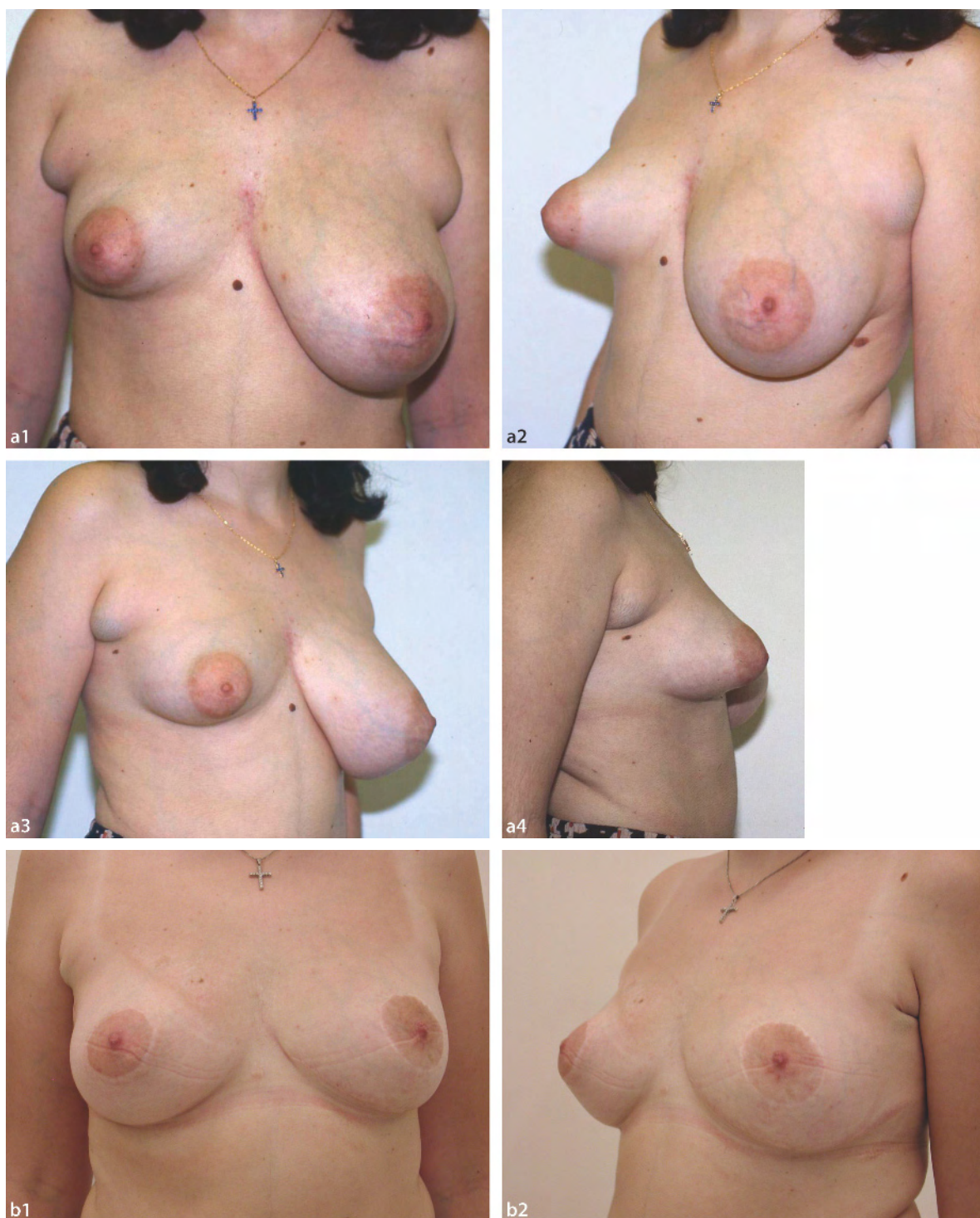
tured silicone gel implants are usually used. The periareolar incision is sutured in layers with deep subcutaneous and intradermal sutures, using long-lasting dissolvable material (4/0 PDS or Monocryl, Ethicon). So far, with a maximum follow-up of 9 years, we have not had any problems with stretching of the periareolar scar.

The resulting breast has a normal-size areola, a natural shape, a volume matching the contralateral breast, and no evidence of the "double-bubble" deformity (Figs. 38.6–38.9).





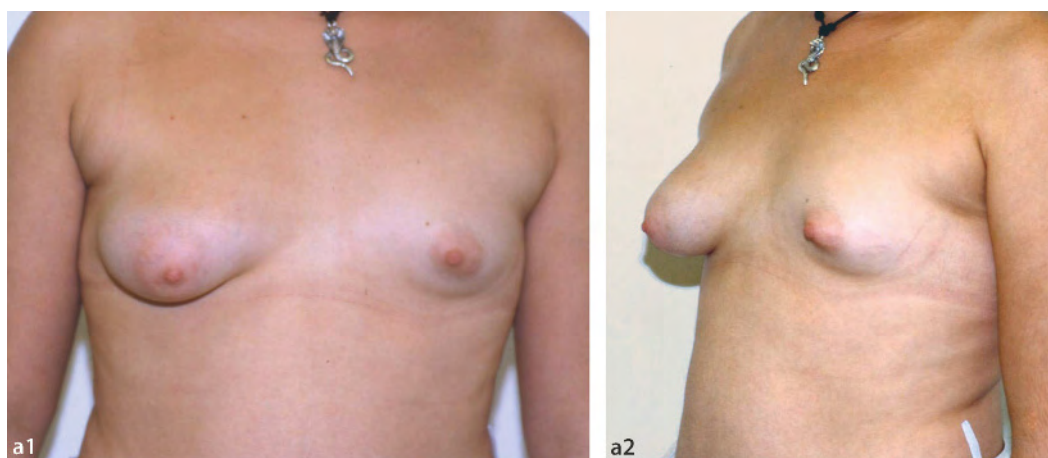
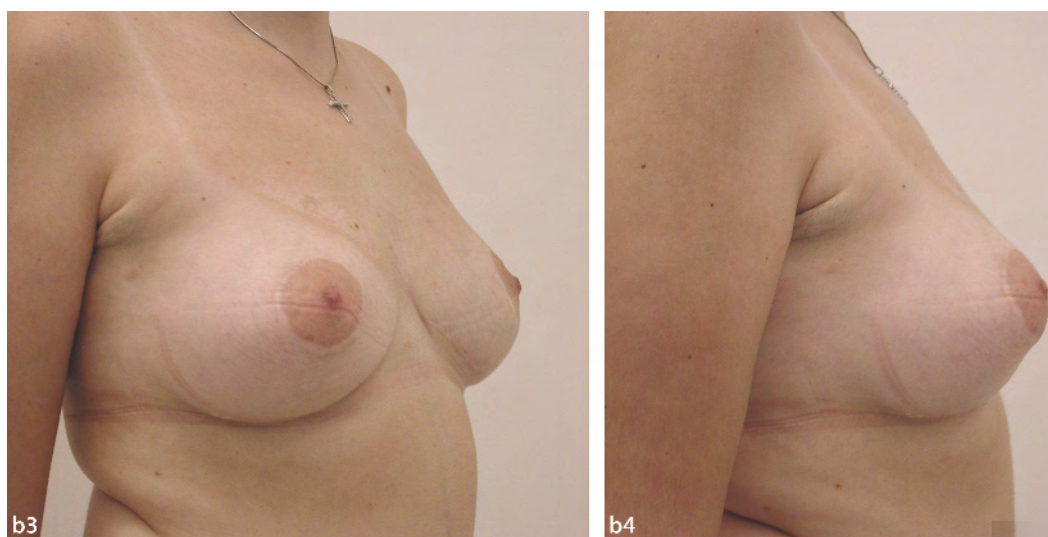
**Fig. 38.6** **a** 1 Preoperative 46-year-old woman with a previous failed attempt to reconstruct a bilateral type II tuberous breast deformity with subglandular placement of 110-ml silicone breast implants. 2 Both breasts are constricted in both the vertical and horizontal axes, with herniation of the breast parenchyma toward the nipple-areola complex and increased size of the areola. 3 Lateral view. **b** Four months after periareolar donut-type deepithelialization was followed by removal of the implants, capsulectomy, dissection of the breast parenchyma, division of the fibrous ring with development of two pillars, and placement of 275-ml implants in the same subglandular pocket. 2,3 Lateral views



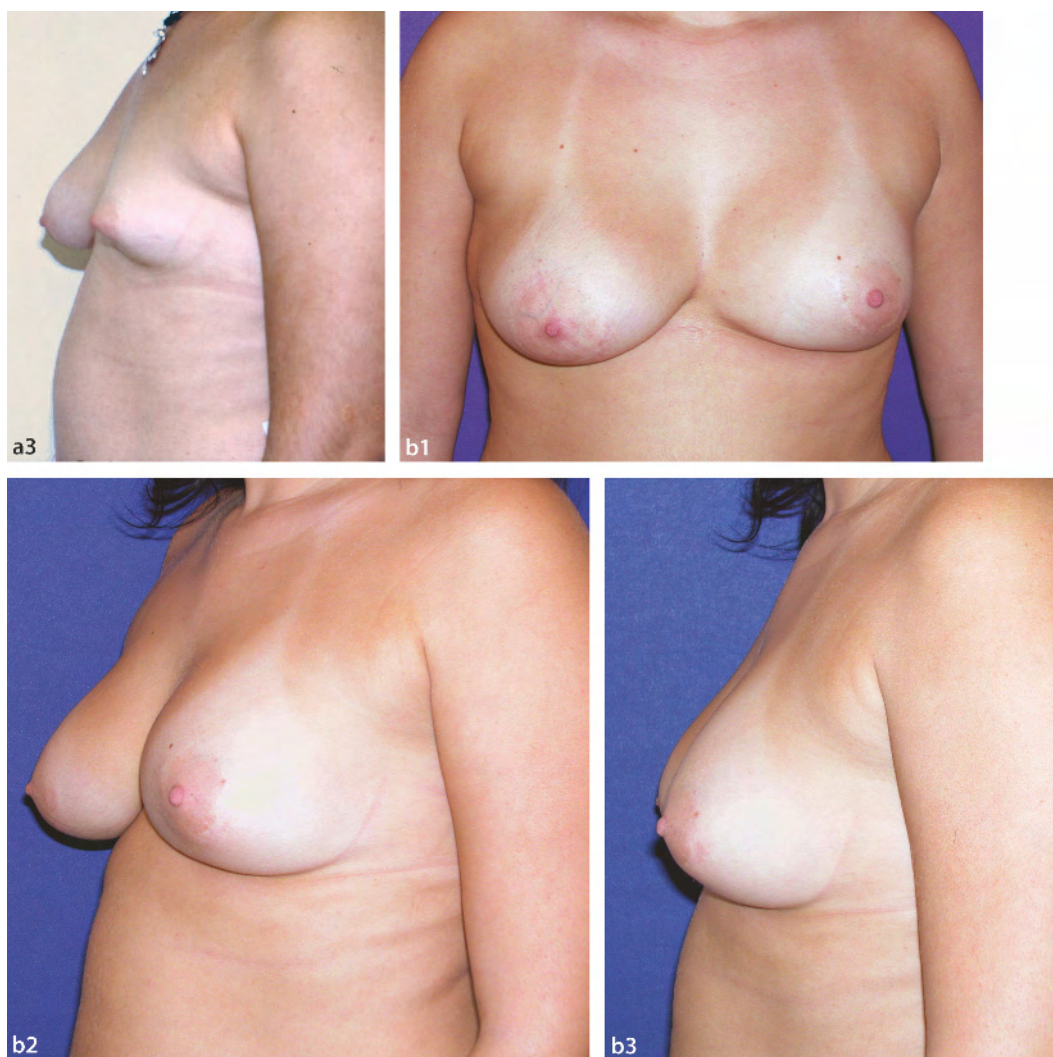
**Fig. 38.7** **a** 1–4 Preoperative photos of 23-year-old patient with type II right tuberous breast deformity with hypoplasia of the inferior pole, herniation of the breast parenchyma toward the nipple–areola complex, and moderately increased areolar diameter. The left breast is slightly large with Regnault’s class A

ptosis [31]. **b** 1–4 Photos taken 1 year after the right breast had a periareolar donut-type deepithelialization and readjustment of the breast parenchyma without the use of an implant and the left breast had an inferior pedicle-type breast reduction coupled with excision of the axillary tail of Spence

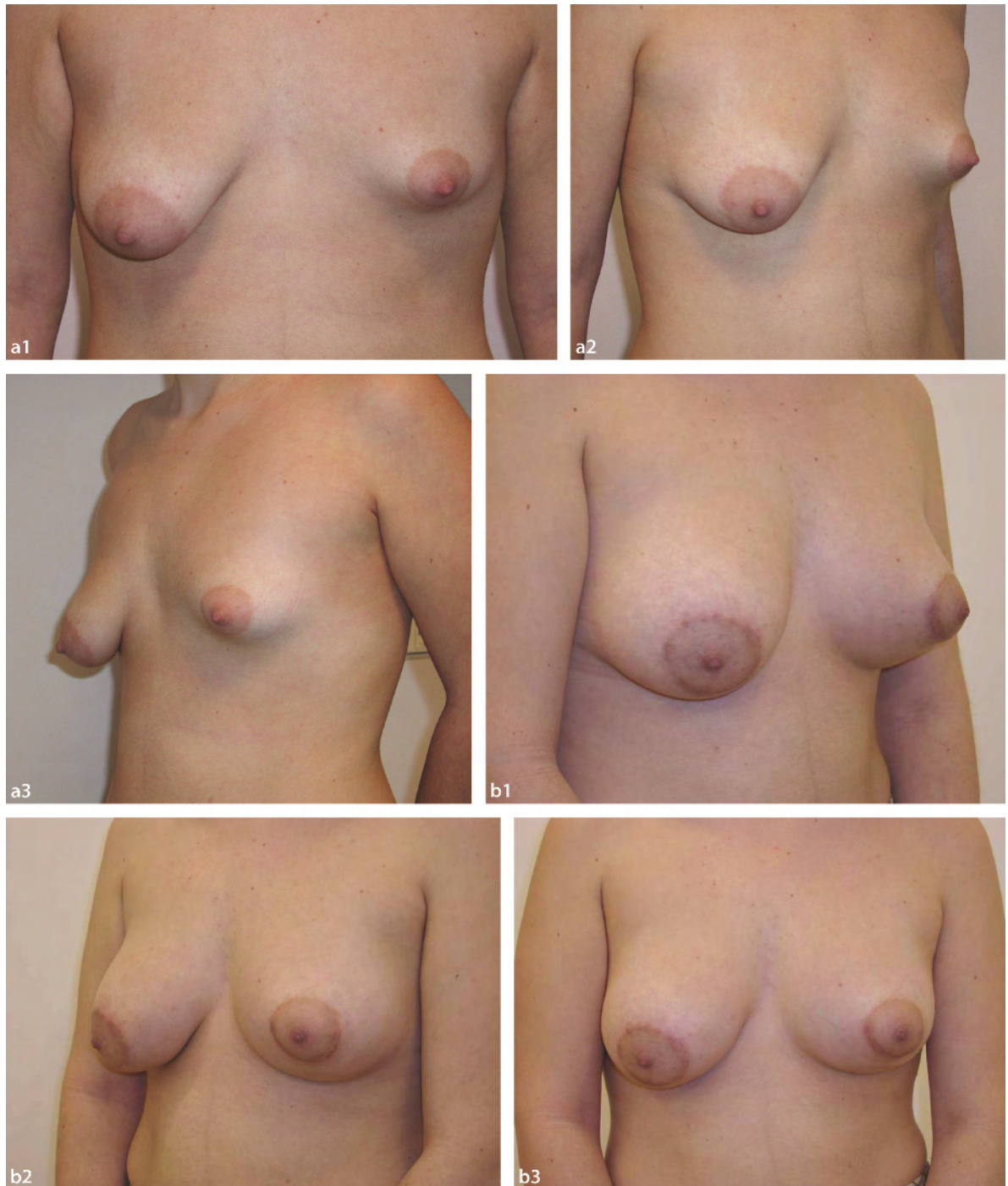








**Fig. 38.8** (continued) **a 3** On the patient's left side, there is severe hypoplasia of the whole breast (type III). **b 1** Four years postoperative. **2** Both breasts were treated with semicircular periareolar incision, readjustment of the breast parenchyma, and subglandular placement of silicone breast implants (right 200 ml, left 300 ml). **3** Lateral view



**Fig. 38.9** **a** 1 Preoperative 21-year-old patient with asymmetrical tuberous breast deformity. 2 The right breast is characterized by underdevelopment of the inferior medial quadrant (type I). 3 On the patient's left side, there is severe constriction in both horizontal and vertical axes (type III). **b** 1 Five months postoperative. 2 The right breast was treated with periareolar

donut-type deepithelialization and readjustment of the breast parenchyma without the use of an implant. 3 The left breast was treated with a semicircular periareolar incision, readjustment of the breast parenchyma, and subglandular placement of a 225-ml silicone breast implant

### 38.5 Complications

Bruising and swelling are the most common complications, are considerable, and are almost always to be expected and should be pointed out to the patient beforehand so that she will not be alarmed when she first sees her breasts.

Hematoma formation is probably the next most common complication to be expected, and meticulous hemostasis should be performed. In our series of 20 patients (37 breasts) with a maximum follow-up of 9 years, we have had one case of hematoma on the right breast of a bilateral reconstruction, which had to be evacuated. Nonetheless, we do not use drains routinely.

Another complication that should be avoided by careful technique is skin necrosis in the lower part of the breast. The technique requires subcutaneous dissection in the lower half of the breast, and care should be taken not to make the flaps too thin or to damage the skin by careless use of the electrocautery.

Nipple–areolar sensation could be affected if the subglandular dissection is extended superolaterally, and care should be taken to avoid damaging the 4th and 5th intercostal nerves.

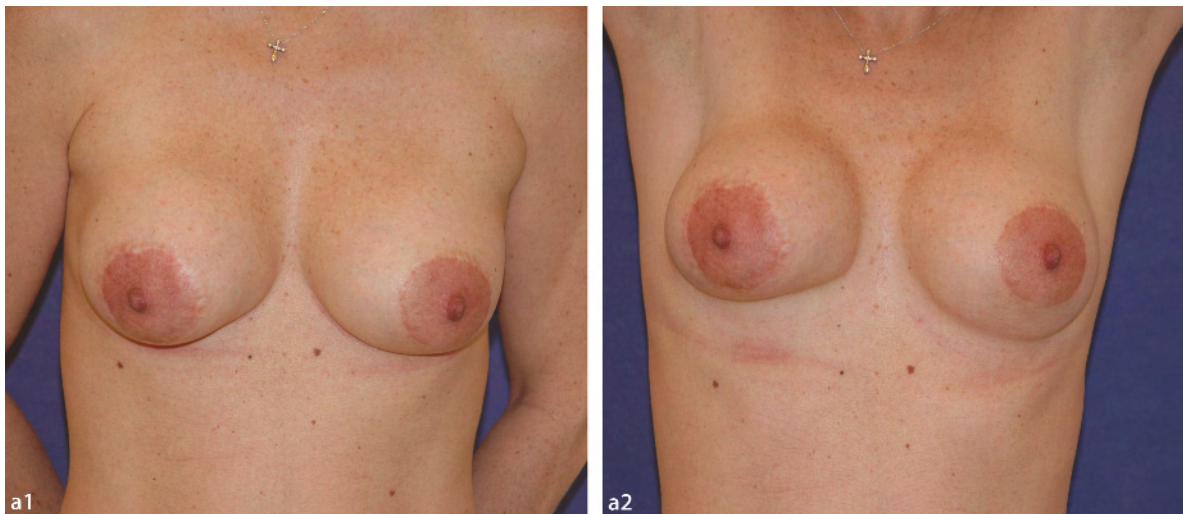
Capsular contracture was recognized in one case in our series (Baker III, in the patient who developed the hematoma and contracture on the side of the hematoma; Fig. 38.10); the risk, however, should be equal to that of breast augmentation patients if an implant has been used.

### 38.6 Discussion

The tuberous breast deformity was first described in 1976 by Rees and Aston [3]. Since then several authors have attempted to describe, classify, and correct the problem, using various methods with varying results [1, 2, 4–21]. The large number of papers published on the subject demonstrates the psychological morbidity the deformity has on patients as well as the difficulty in developing a satisfactory surgical solution to the problem.

The authors have been dealing with this problem for 10 years, and the initial unsatisfactory results using conventional methods led us back to the basics to find the answers we needed. The study of the breast's anatomy and embryology enabled us to understand the nature of the deformity and formulate a surgical approach capable of restoring normal breast aesthetics.

Other authors have also referred to the embryology of breast development, but the theories put forward are far from satisfactory. Von Heiberg et al. (1996) [6] stated that Glaesmer (1930) suggested a phylogenetic relapse and that Pers (1968) postulated that tissue differentiation fails in a limited zone of the fetal thorax. Pers's theory might be suitable to explain deformities in the line of amastia and Poland's syndrome, but as far as the tuberous breast deformity is concerned, the authors believe that things are much simpler than what both theories suggest and that the only aberration is a thickening of the superficial fascia [5], as has already been explained in detail.



**Fig. 38.10** 1 Postoperatively the patient developed a hematoma in the right breast that had to be evacuated. 2 The patient later developed Baker III capsular contracture on the side of the hematoma (shown 6 years postoperatively)



The authors' own understanding of the development of the deformity is as follows: During the 10th–14th weeks, the developing breast, which is ectodermal in origin, starts pushing inward into the underlying mesenchyme. As a result, the breast is enclosed within a fascial envelope, with the only point not covered by this fascia being the point of entry, which subsequently develops to become the nipple–areola complex.

The absence of the superficial layer of the superficial fascia underneath the areola [24, 26] coupled with the constricting ring [2] formed by the thickening of the superficial fascia [5], especially in the lower pole of the breast, inhibits the expansion of the developing breast and leads to a herniation of the breast parenchyma toward the nipple–areola complex. As already mentioned, the severity of the deformity ranges from mild hypoplasia of the inferior medial quadrant of the breast to major hypoplasia of all four quadrants, with varying degrees of herniation and areola enlargement [5, 6, 14, 28].

Many scientists have addressed the issue of this constricting ring [15, 24, 30], but nobody has actually looked into its nature until very recently, when we performed histological studies of the involved tissues of two of our most recent patients. Histology confirmed the existence of a band of dense connective tissue in the area (Fig. 38.2).

A recent study by Pacifico and Kang [31] also looked at the etiology of tuberous breasts, discarding the theory of the constricting ring and concentrating on the thickness of the skin in the nipple–areola region. They suggested that there is transient decreased thickness of the skin in the nipple–areola region due to hormonal imbalance during puberty, and that this caused the herniation of the breast parenchyma. Unfortunately, this theory is based on pure speculation with no anatomical or histological evidence to substantiate it.

Most authors acknowledge that merely placing an implant behind the deformed breast accentuates the deformity instead of correcting it [3, 5, 10, 13, 32]. Some authors advocate that there is skin deficiency in the inferior part of the breast [2, 12, 14, 16], with the inframammary fold being situated much higher than normal. But if one carefully examines the affected breast, the skin in the inferior part of the breast is lax, and the constriction lies deep within the subcutaneous tissue [2, 15].

Failure to address this problem is the main reason why the results yielded by most methods are far from satisfactory. There are, however, some authors who have focused on this point and have tried to rearrange the breast parenchyma to mold a more natural-looking breast.

Rees and Aston were the first to talk about radial incisions on the back of the breast to expand its base [3], but their technique did not actually transect the constricting ring. Dinner and Dowden realized that there

was something constricting the breast in its inferior pole, but they thought it was the skin that was responsible for this constriction and used a full-thickness incision through skin, subcutaneous tissue, and breast to release it, followed by transposition of a skin and subcutaneous tissue flap [12]. Other authors have tried to rearrange the inferior pole of the breast, transecting the breast parenchyma horizontally and then unfolding the flap inward or outward [5, 15, 33], but the results have not always been aesthetically satisfactory.

The technique developed by Ribeiro and colleagues [15, 31, 34], which in principle is very similar to the authors', recognizes the existence of the constricting ring that needs to be transected in order to allow the breast to reshape. Ribeiro transects the ring in a horizontal axis and then develops a flap from the inferior portion of the breast to enhance the projection of the hypoplastic breast, doing away with implants because his patients are not particularly concerned with large breast volumes.

The authors' approach is slightly different. The constricting ring is transected at the 6 o'clock semi-axis of the breast, thus creating two pillars in the inferior part of the breast. The pillars are then either simply loosely reapproximated using absorbable sutures or are folded over each other in the fashion of a double-breasted jacket to add volume in the inferior portion of the breast, with the optional addition of a breast implant underneath the breast or the pectoralis major muscle to correct any volume deficiency.

This technique is simple, technically easy, and yields consistently good results. The scars are confined to the periareolar margin and most of the time are virtually invisible, and there is the additional advantage of not disturbing the lactiferous ducts, thus allowing normal breast function (provided that adequate breast parenchyma was present before the procedure).

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