

Developmental Breast Asymmetry

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■ **Abstract:** Developmental breast asymmetry (DBA) can affect psychosocial well-being in the young female. Correction of breast asymmetry may present a reconstructive challenge, especially in tuberous breasts. Fifty-two cases of DBA treated between January 2002 and January 2006 were reviewed. Preoperative clinical assessment of the specific anatomical deformity, subsequent surgical treatment modalities, esthetic outcome, and patient's satisfaction were evaluated. Surgical modalities used in our series include augmentation mammoplasty with or without tissue expansion, parenchymal scoring, nipple areola complex reduction, glanduloplasty techniques, mastopexy and reduction mammoplasty. The mean age of DBA presentation was 21 years; 69% (36/52) patients had tuberous breasts, of which 67% (24/36) were unilateral and 33% (12/36) were bilateral deformities. Patients with tuberous breast deformity presented consistently under the age of 25 years. Esthetic outcome was rated "good" in 75% (39/52), and symmetry rated as "good" in 58% (30/52) by professional evaluation. Surgical treatment is tailored to the affected esthetic units of the individual breast. In our experience, symmetry is the hardest parameter to achieve, particularly in tuberous breasts. Operative treatment is of great value to the psychosocial well-being of the patient. A conceptual approach in the assessment and treatment of DBA is emphasized by this series. ■

Key Words: breast asymmetry, breast development, congenital breast anomalies, congenital breast deformity, tuberous breast

The female breast is an important symbol of femininity. Socio-cultural influences motivate individuals to seek surgical intervention for "imperfections" of the breasts (1,2). Although some degree of breast asymmetry is almost universal, developmental breast asymmetry (DBA) has a significant psychosocial effect. Breast shape, volume, size, location and shape of the nipple areola complex (NAC) affect overall breast esthetics. Correction of breast asymmetries, especially in tuberous breasts, may present a reconstructive challenge for the surgeon. This is reflected in the plethora of techniques described in the literature for treatment of these deformities. These include augmentation with or without tissue expansion, NAC reduction, parenchymal scoring, and a variety of glanduloplasty techniques. (3–27) Careful assessment and an individualized surgical treatment plan are required for each case. A retrospective review of developmental breast

asymmetries cases was carried out. The aim was to analyse the clinical patterns of DBA and the precise anatomical deformity associated with breast asymmetry. The surgical modalities used to treat the various group of DBA were assessed by esthetic outcome and patient satisfaction.

MATERIALS AND METHODS

Records of all patients referred with breast asymmetry under the care of the senior author from January 2002 to January 2006 were reviewed for this study. Patients with breast asymmetry resulting from trauma, burns, neoplasia, severe chest wall deformities and involutional hypoplasia were excluded. Other exclusion criteria included cases with incomplete records and patients who did not proceed to surgery (because of NHS funding issues or pregnancy).

A total of 52 patients with DBA were suitable for our review. A number of classifications of breast asymmetry have been described (28–38). The von Heimburg *et al.* classification of tuberous breast (33) was used for the purposes of this study. The postoperative parameters (size, shape, symmetry, NAC, scars, and overall) assessed were graded as poor, fair, good,

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or very good. Two evaluators (a plastic surgery trainee and a plastic surgery staff nurse) assessed the patient's esthetic outcome in clinic. A further two evaluators (a breast reconstruction nurse and a surgical care practitioner) assessed six standard view pre- and post-operative photographs. The operating surgeons were excluded from performing the postoperative evaluation. Satisfaction questionnaires were completed by patients in the outpatient setting.

Operative procedures were performed by the same surgeon or under supervision of the senior author. Seven types of surgical treatment modalities in various combinations were used: augmentation with subglandular implants alone, augmentation with tissue expander followed by replacement prosthesis, reduction mammoplasty and mastopexy. All implants were placed subglandular to achieve good projection of the breast and symmetry in all breast quadrants. In selected cases parenchymal scoring, areolar complex reduction ("donut procedure"), and glanduloplasty were performed.

Parenchymal scoring of glandular tissue was performed by sharp dissection in radial fashion to release the constricted fibrous areas. Severe nipple areolar herniation was corrected by donut excision of areolar skin.

Glanduloplasty was performed by Wise pattern skin incision and medial transposition of the lateral breast pillar.

Of all the patients, 60% (31/52) were able to come to the clinic for full evaluation. For the remaining 40% (21/52) patients, photographic assessments were performed by two independent evaluators.

Individual breasts were assessed for glandular volume, base constriction and skin deficit, level of inframammary fold (IMF), degree of ptosis, NAC size and herniation. Criteria for tuberous deformity were based on features described in literature: lower quadrant hypoplasia (medial, lateral, or entire), subareolar skin deficiency resulting in elevated IMF, breast base constriction, large NAC and breast parenchyma herniation (11,32–34).

Measurements of pre-and post-operative sternal notch to nipple (SN-N) distance, NAC to IMF distance and areola diameter were performed. Bra cup size differences, augmentation volumes, and resected tissue weights were also recorded. Postoperative complications including pain and altered nipple sensation were noted. Descriptive statistics were obtained using SPSS and Sfnx Survey Plus (2).

RESULTS

A total of 88 breasts in 52 patients underwent surgery. The mean age was 21 years (range 15–34 years); 79% (41/52) of the patients were under the age of 25 years; 27% (14/52) were under 18 years.

There were no common combinations of breast deformity in this series. Significant tuberous breast deformity was present in 69% (36/52) of the patients, of which 33% (12/36) of cases had bilateral tuberous breasts; 50% (44/88) of operated breasts had tuberous deformity. Patients with tuberous breast deformity presented consistently under the age of 25 years. Seventeen percent (9/52) had hypoplastic breasts, either unilateral or bilateral with differential sizes; 13% (7/52) patients had unilateral hyperplastic breasts.

Objective Asymmetry

Volume Difference

Objective asymmetry defined by bra size showed a difference of two to four cup sizes with two bra cup sizes being the most frequent. A mean augmentation volume of 250 mL (range 95–410 mL) and a mean reduction mammoplasty weight of 319 g (range 189–691 g) were observed.

Positional Differences

Metric measurements of SN-N discrepancy between the breasts ranged from 1 to 12 cm (mean 3.8 cm) preoperatively and 0–1 cm (mean 0.7 cm) postoperatively. Although there was no statistical significant correlation between objective metric asymmetry and esthetic outcome, the improvement in SN-N discrepancy postoperatively was reflected in patients' satisfaction. The entire infra-mammary fold (from medial to lateral) was elevated by 2–5 cm in 92% (33/36) of tuberous breast patients; 8% (3/36) of patients had a medial raised IMF.

Treatment of Types of Deformity

Seven types of deformity were found in our group of patients, including tuberous breasts using the von Heimburg (33) classification [Table 1].

Hypoplastic breasts were essentially treated with subglandular implants alone; 13% (2/16) patients had tissue expansion followed by replacement implant.

Tuberous type 1 breasts were treated with implants, mastopexy or glanduloplasty depending on glandular volume. Parenchymal scoring was required in selective cases of inferomedial quadrant deficiency; 27% (4/15) patients with type 1 tuberous breasts had no surgery

Table 1. Types of Deformity of Operated Breasts

	Number of operated breasts
Hypoplasia	16
Hyperplasia	13
Ptosis	15
Tuberous type I	11
Tuberous type II	14
Tuberous type III	8
Tuberous type IV	11
Total operated breasts	88

for this deformity, but had correction of contralateral tuberous type 4 breast (two cases) or contralateral breast reduction (two cases). [Fig. 1] One patient had tissue expansion with implant to allow a bigger prosthesis to be inserted at her request.

In tuberous type 2 breasts, most patients required implants. In one case (1/15), there was no surgery performed on the tuberous type 2 breast, but glanduloplasty of the contralateral tuberous type 4 breast. [Fig. 2] Parenchymal scoring was used more frequently in tuberous type 3 breasts (4/8 patients) and tissue expansion (5/8 patients). [Fig. 3] In tuberous type 4 breasts, tissue expansion, parenchymal scoring and NAC reduction were the key operative techniques used. [Fig. 4]

Tuberous breasts can be associated with NAC herniation. Donut procedure of the NAC was performed in selected cases with significantly enlarged and herniated

NAC. Hyperplastic breasts were corrected with Wise pattern inferior pedicle reduction mammoplasty.

Esthetic Outcome

Patients

Clinical evaluation took place at a mean of 2 years postoperatively (range 6–53 months). Of all the patients, 60% (31/52) completed a satisfaction questionnaire and were also clinically assessed in the same clinic. These patients represented the range of breast deformities, i.e., there was equal distribution of each type and combination. Only 9% (3/31) of this group had a follow-up (of less than 12 months). A similar distribution in number (seven to nine patients) were followed up for each year thereafter. Interestingly, patient satisfaction with the overall esthetic outcome was poorer than professional evaluation; 68% (21/31) of the patients were “happy” or “very happy” with the overall outcome. Patients who were unhappy about the symmetry of their breasts were also “unhappy” with the size and shape.

A mean of 70% (22/31) of patients “agreed” or “strongly agreed” that the operation had met their desired goals to improve their psychosocial well-being. [Fig. 5] Symmetry correlated significantly with improvement in bra comfort and clothing ($p < 0.02$) and confidence ($p < 0.01$).

Altered nipple sensation was reported in 74% (23/31) patients and 55% (17/31) patients had some

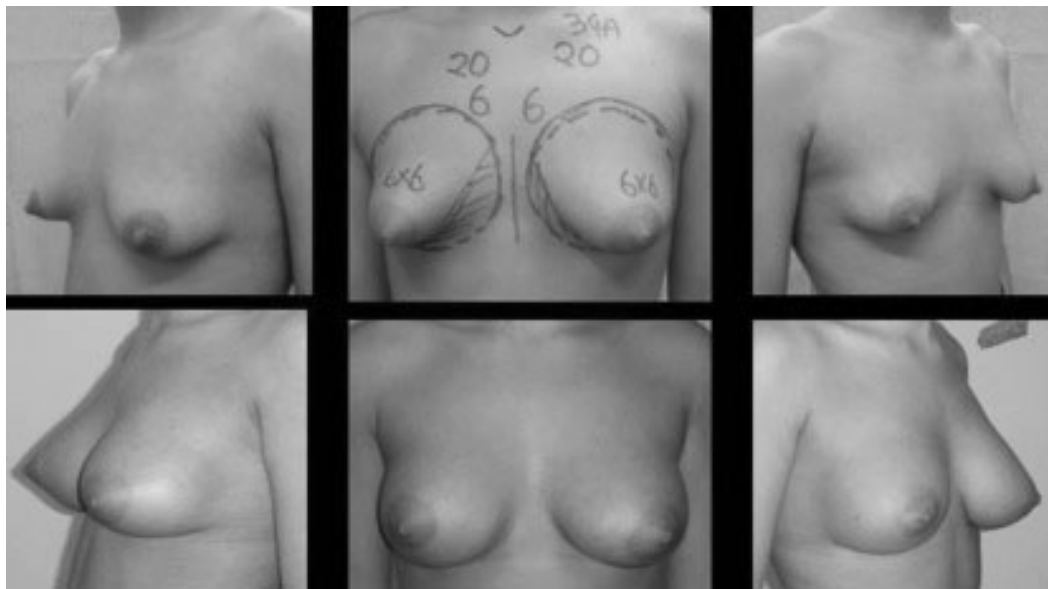


Figure 1. Tuberous type I [25 year old patient with bilateral tuberous type 1 breasts. Preoperative and 6 months postoperative result following bilateral inferomedial quadrant parenchymal scoring and differential subglandular augmentation with 335 and 295 cc implants.]

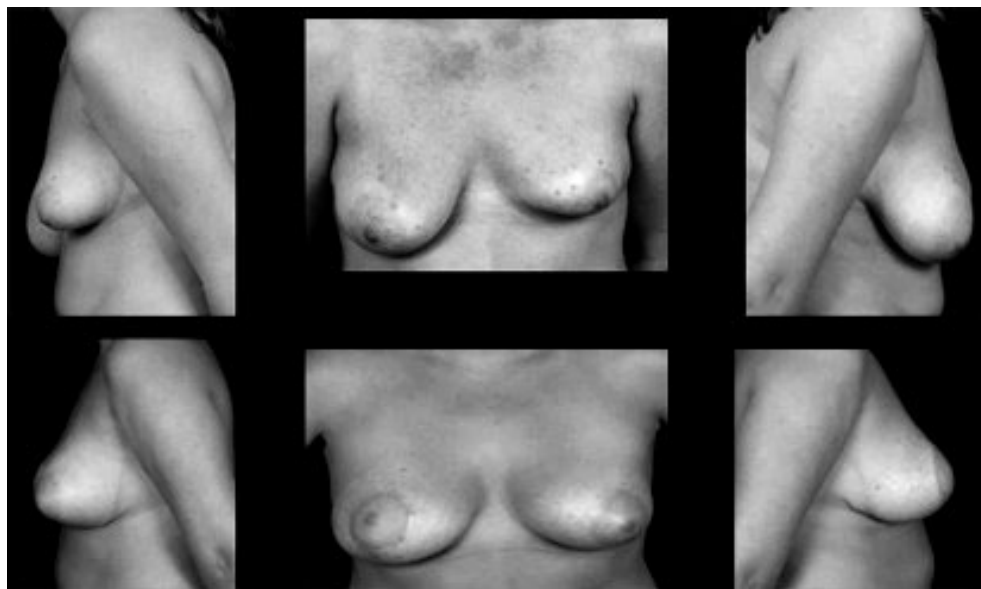


Figure 2. Tuberous type II [22-year-old patient with ptotic right breast and tuberous type 2 deformity in the left breast, for which right sided Wise-pattern mastopexy and parenchymal scoring and placement of a 190 cc implant on the left breast was performed. She continued to be very happy about the result 45 months postoperatively.]

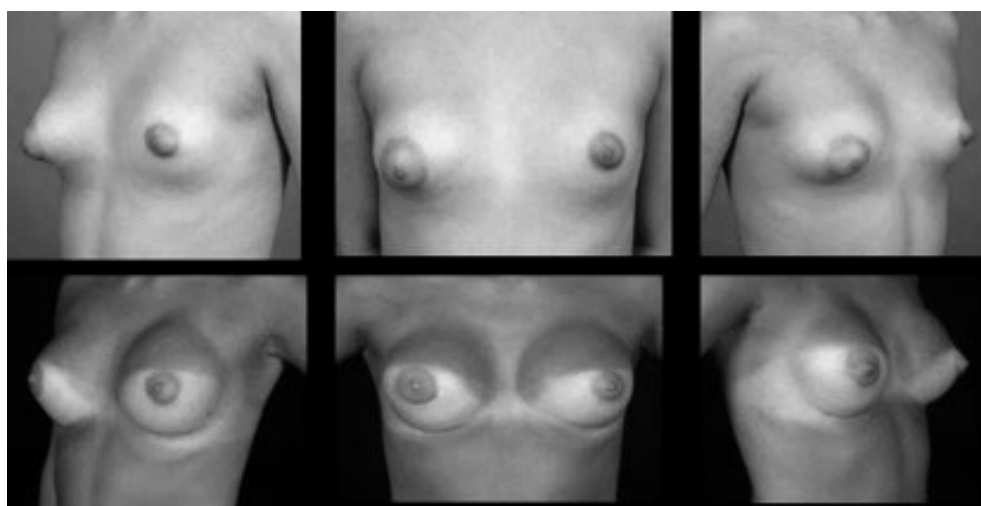


Figure 3. Tuberous type III [Preoperative and 6 months postoperative results of a 16-year-old girl with bilateral tuberous type 3 breasts. Tissue expansion was performed on the left breast, followed by subglandular implants placement of 305 cc on the left side and 195 cc on the right in combination with a “donut procedure”.]

degree of pain, but these symptoms did not interfere with their daily life.

In the questionnaire, 39% (12/31) patients expressed a desire for further improvement. These were concerned with scar, size symmetry, and shape. Interestingly, during the clinical assessment of these patients, preoperative photographs were seen by the patients themselves and 67% (8/12) realized their significant esthetic improvement and were not keen to have further surgery. Four patients who were keen on

further revision, were offered surgery to improve symmetry and NAC appearance. This involved bilateral mastopexy with donut-procedure in one patient, bilateral revision mastopexy in another patient and one patient required a donut-procedure.

Evaluators

There was no significant inter-evaluator variability. Overall outcome was rated good – very good in 75% (39/52) of patients. Good – very good symmetry was

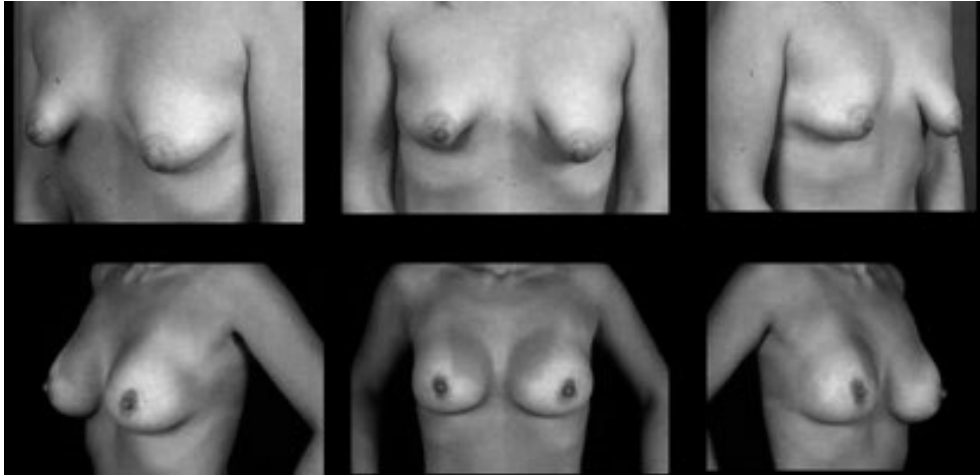


Figure 4. Tuberous type IV [This 22-year-old lady with bilateral tuberous type 4 breasts had severe breast constriction, for which bilateral parenchymal scoring and tissue expansion was performed initially, followed by 305 cc implants placements and bilateral nipple areola complex reduction. The result 22 months postoperatively was rated “very good”.]

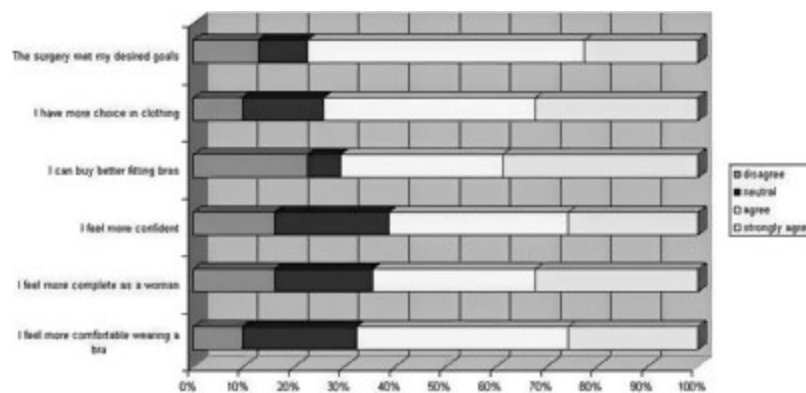


Figure 5. Psychosocial outcome.

achieved in 58% (30/52) of patients. Clinical scar assessment (using Vancouver Scar Scale) showed 79% (41/52) normal pliability, vascularity, height, and pigmentation of the scar.

There was no significant correlation between the severity of breast deformity and surgical treatment with the outcome.

In this series, it was, however, noted that 6% (2/31) patients with severe ptosis in combination with contralateral tuberous breast had the poorest esthetic outcome. Both patients had simultaneous single-stage surgical correction for the deformities. Significant weight changes had occurred in 10% (3/31) patients resulting in only fair esthetic outcome. Complications were found in 7% (6/88) breasts: 1% (1/88) hematoma, 4% (4/88) superficial wound infections requiring oral antibiotics, and 1% (1/88) severe scar hypertrophy. There was no skin or soft tissue necrosis

with the radial scoring technique used and donut procedure.

DISCUSSION

The female breast starts to grow in early puberty and is an important phase in the development of femininity and sexual confidence. The external appearance of the breast from childhood to maturity has been divided into five phases by Tanner (39). Some degree of breast asymmetry is present in most individuals with normal breast development. Congenital anomalies of the breast vary from nipple abnormalities to polymastia, amastia or in association of chest wall deformities such as Poland syndrome.

Hueston recognized the varied causes of breast asymmetry and its psychosocial impact (3). Numerous classifications of breast asymmetry have been

described since, based on etiology, anatomical abnormality or treatment modality. Tuberous breast deformity represents a significant proportion of DBA (69% in our series). This deformity was first described by Rees and Aston (1976) (11). Originally named for its similarity to a tuber root, this deformity has also been known as snoopy breast (19), tubular breast (12), herniated areolar complex (13), domed nipple, lower-pole hypoplasia (40), and narrow-based breast (20). The tuberous breast deformity is characterized by base constriction and herniation of breast tissue through the areola. Other features include elevated IMF and relative hypoplasia in one or more quadrants. Rees and Aston defined two distinct entities of this deformity, the tuberous and tubular. In their opinion, the “tuberous” breast has glandular deficiencies in both vertical and horizontal dimensions with a concentric small base and a large nipple-areola complex because of herniation. The tubular breast, however, has a deficient vertical axis. The breast is ptotic without apparent herniation and hence the NAC could be normal in size (11). NAC herniation is considered to be a key feature in tuberous breast (11,41). However, in our series, 43% (21/49) of tuberous breasts involved NAC herniation; 12% (6/49) required NAC reduction; 57% (28/49) of breasts were tuberous, but without NAC herniation. This correlates well with the study by von Heimburg *et al.*, which noted areolar prolapse in 44% of the 68 deformed breasts in their study (32).

The most widely used classification to date (Von Heimburg) divides this deformity into four categories based on glandular and skin deficiency (32,33). There has been a proposal to merge types II and III into one category, thereby reducing the classification to three categories (34).

Tuberous breast deformity is quoted as a rare disorder in literature and several theories on aberrant breast development have been postulated (10,11,27,34,42). The exact incidence and prevalence of this disorder and DBA are unknown. Rohrich *et al.* found some degree of asymmetry in 88% women in their retrospective analysis of patients with breast augmentation (43). Breast asymmetry has strongly been associated with tuberous breast deformity with a prevalence of up to 89% (32,44). A multitude of operative procedures have been suggested to correct the deformities including Maillard Z-plasty (45), dermoglandular flaps (15,34), musculocutaneous flaps (14), various glanduloplasty techniques (20,24,25,27), implant augmentation with or without tissue expanders (10,18).

Circumareolar, inframammary approaches in single or two-stages have been described. Techniques of parenchymal radial incision to release of the constricting fascial ring have been described by Rees and Aston. (11) The enlarged NAC can be corrected using the circumareolar incision (13,19,22,23,46,47).

There is no consensus on timing of surgical correction of DBA. Some advocate postponing surgery until breast development is complete (8,48,49), others would treat patients in their teens (50–52). In our study, 25% of our patients were under 18 years age. Although they had not reached adulthood and completed breast development, surgical correction of asymmetrical breast deformity was indicated to reduce psychological distress. Surgery can be carried out at 15 years of age, as long as these patients are fully able to understand the procedure to be undertaken including handling the surgical outcome as well as the possibility of complications.

An algorithmic approach to the treatment of DBA may be useful. However, in our series we did not feel that this approach was useful. The main reason for this is the variety of combination of developmental breast deformity. A classification provides a rough grid to discuss the deformities, but it is difficult to provide the best surgical solution using an algorithmic approach as patients do not fit into just the one category of classification. Each individual breast treatment needs to be tailored to the esthetic deformities while achieving the best symmetry. Other factors such as body habitus and patient's specific wishes need to be considered in the treatment plan. It is also important to exclude chest wall anomalies (43).

Of the 31 patients, 7 (22%) were “unhappy” with their breast symmetry in the questionnaires. However, 13% (6/52) of patients had poor symmetry on clinical evaluation. There was no significant correlation between this symmetry evaluation by both patients and evaluators, i.e., these groups involved different patients. Only one patient had a poor symmetry outcome as evaluated by both patient herself and the evaluators. The difference between patient and evaluator esthetic outcome scores was not statistically significant, but does reflect the high expectation of this particular group of patients. It is therefore extremely important to thoroughly counsel this group of patients with regard to the limitations of surgery.

A variety of glanduloplasty techniques have been reported for the treatment of tuberous breast deformities (14,15,20,25,34). Six percentage (3/52) of our

patients underwent glanduloplasty with transposition of lateral glandular tissue to the medial deficient quadrant. None of our patients had postaugmentation "double-bubble" deformity of the breast. Both glanduloplasty and tissue-expansion are techniques proposed in the literature to prevent this complication (18,20).

In this series, the majority of patients with tuberous breast deformity desired an increase of breast volume as well as improvement in shape. This is reflected in the number of expansion/augmentation procedures performed. Glanduloplasties were reserved for patients with sufficient glandular volume.

We would like to highlight two techniques, which are key to the management of tuberous breast deformity. Parenchymal scoring using radiate incisions to release the constricted breast and increase the diameter of the breast base. Secondly, NAC reduction for herniated NACs using the donut procedure technique.

We recommend NAC reduction take place secondarily for accurate symmetrical placement of the NACs.

In the follow-up period ranging from 6 to 53 months, there have been significant esthetic breast changes in some patients because of weight fluctuations, pregnancies, and breastfeeding. Asymmetry may recur many years later (53). It is therefore important to counsel patients with regards to these possible future changes.

Overall, our series of DBA show a high proportion of tuberous breast deformities. There is, however, no significant correlation between the severity of the deformity, metric differences, and surgical treatment with the outcome as evaluated by both patients and evaluators. This demonstrates the importance of clear assessment of the breast esthetics, thorough preoperative counseling and the appropriate timing and staging of surgical procedures. In particular, where DBA occurs because of different pathologies (e.g., unilateral ptosis and contralateral tuberous breast), staged surgery with correction of the tuberous deformity primarily is recommended.

CONCLUSION

A significant proportion of our patients with DBA have tuberous breast deformity. Perfect symmetry may be difficult to achieve, particularly in cases where the deformities of each breast are entirely different, e.g., ptosis and tuberous in combination. An algorithmic approach is not recommended in our experience. We propose a conceptual approach in the assessment and

treatment of DBA. In our study, each breast was quadrantly assessed for skin envelope and glandular volume as well as the level of IMF. The techniques used were tailored to the anatomical deformities. Parenchymal scoring was more frequently performed in severe tuberous breasts. The position and herniation of the NAC were also addressed accordingly by performing a donut procedure. In our experience, this is best done secondarily to ensure accurate symmetrical placement of the NAC, particularly in cases where each breast deformity is very different.

The overall esthetic outcome was rated "good" by both professional evaluators and patients. Improvement in psychosocial well-being following surgery was high. However, this patient group has high esthetic expectations. It is therefore important to consider the indication and timing of surgical techniques and counsel the patients thoroughly.

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