

# The Prevalence of Tuberos/Constricted Breast Deformity in Population and in Breast Augmentation and Reduction Mammoplasty Patients



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## Abstract

**Background** The exact prevalence of tuberous breast deformity (TBD) has not been properly investigated and still remains undetermined. We report our data about TBD prevalence with the aim of demonstrating its high prevalence.

**Materials and Methods** A retrospective analysis was performed on preoperative photographs of 1600 Caucasian female patients admitted to our department from January 2009 to July 2014 for augmentation or reduction mammoplasty and other breast clinical conditions. The main features of TBD included a contracted skin envelope, a reduction in breast parenchyma of the lower medial and lateral quadrants, a constricted breast base, abnormal elevation of the inframammary fold, herniation of the breast into the areola with a constricted breast base, and nipple areola complex herniation with a normal breast base. Patients were classified into three groups: breast augmentation group (AUG group), breast reduction group (RED group), and general population group (POP group).

**Results** Four hundred patients were analyzed for each group (AUG and RED group); 194 patients (48.5 %) and 189 cases (47.3 %), respectively, demonstrated at least one tuberous breast deformity; in 800 patients of the POP

group, we found 221 patients (27.6 %) with at least one tuberous breast deformity.

**Conclusions** Retrospective analysis reveals a high prevalence of TBD in the general population and in particular in women seeking breast augmentation or breast reduction (about 50 %). TBD is characterized by a wide range of clinical features with a spectrum of degrees. Preoperative evaluation is crucial to achieve an optimum outcome and patient satisfaction.

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**Keywords** Tuberous breast deformity · Constricted breast · Stenotic breast · Reduction mammoplasty · Augmentation mammoplasty · Prevalence

## Background

Tuberous breast is a deformity of the breast primarily observed in young females, even though it has been described also in males [1]. Since the first report by Ress and Aston [2] in 1976, a spectrum of clinical features has been described. A standardized nomenclature for tuberous breast deformity (TBD) has not been published and different authors still refer to this condition using a great deal of terms including tubular breast, constricted breast, doughnut breast, nipple breast, breast with narrow base and dome nipple. They provide a mere description of the main morphologic features observed mostly because the anatomical and histopathological background underlying the deformity remains unclear [3].

The precise prevalence of TBD is unknown and probably impossible to ascertain, since most women show mild

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degrees of the deformity and they are not usually aware of their condition; we refer to this slight deviation from normal anatomy as “constricted breast.”

TBD key features include the following:

1. Contracted skin envelope (horizontally and vertically),
2. Constricted breast base,
3. Breast parenchyma volume reduction,
4. Abnormal elevation of the inframammary fold, and
5. Areolar herniation of the breast parenchyma.

Von Heimburg et al. [4] in 1996 and Grolleau et al. [5] in 1999 proposed their own classification systems for TBD that are routinely employed in clinical practice.

According to Von Heimburg and colleagues, four main types of TBD exist:

- Type I: Hypoplasia of the lower medial quadrant;
- Type II: Type I with sufficient skin in the subareolar region;
- Type III: Type I with no sufficient skin in the subareolar region; and
- Type IV: Severe breast constriction with minimal breast base.

An additional type of TBD is characterized by nipple areola complex (NAC) herniation with a normal breast base observed mostly in patients with normal or hypertrophic breast that can be evaluated through manual compression or mammostat.

Nevertheless, the classification system previously mentioned is based on a subjective clinical assessment of the deformity and inevitably results in substantial interobserver variability. Standardized assessment systems have been proposed, such as the Northwood index (N/D index: areolar diameter/breast parenchyma ratio determined in lateral view). A N/D index greater than 0.4 is considered positive [6].

Even though the presence of a periareolar constricting ring has been reported, the precise pathogenetic mechanisms remain unclear [3, 7–13].

The exact prevalence of TBD in the population has not been investigated and still remains undetermined.

In our experience, the presence of at least one of the typical features characterizing TBD is extremely common, especially in women seeking augmentation mammoplasty.

We report our data about TBD prevalence, with the aim of demonstrating its high prevalence in the general population and in patients admitted for breast surgery.

## Materials and Methods

We performed a retrospective analysis on standard preoperative photographs of Caucasian female patients admitted to our plastic surgery department from January 2009 to July 2014 for augmentation mammoplasty, reduction mammoplasty, and other breast conditions. We reviewed data from

1600 consecutive patients, where 25 % ( $n = 400$ ) presented for breast augmentation mammoplasty, 25 % ( $n = 400$ ) for breast reduction mammoplasty, and 50 % ( $n = 800$ ) were affected by different breast clinical conditions requiring preoperative breast photograph collection. To increase data uniformity, we stopped the analysis at 400, 400, and 800 cases for the three groups, respectively.

Women with Poland syndrome, infection, radiation, chest wall deformities, breast cancer skin or parenchyma retraction/deformity, previous breast surgery, or incomplete chart data were excluded.

After an informed consent was acquired, standard preoperative photographs were taken as follows:

- Lateral view (right and left),
- Oblique view (right and left),
- Anterior–posterior view.

When a severe ptosis or hypertrophy was observed, we took an additional anterior–posterior view photograph asking the patient to elevate her arms above the head in order to evaluate the inframammary fold position.

At least, three different observers (the senior author and two senior residents) performed a blinded analysis of the photographs according to the following features:

- Contracted skin envelope (shortened lower pole),
- Breast parenchyma volume reduction (particularly on the lower medial and lateral quadrants),
- Constricted breast base,
- Abnormal elevation of the inframammary fold,
- Areolar herniation of the breast parenchyma associated with a constricted breast base, and
- NAC herniation associated with a normal breast base.

All patients analyzed were aged between 18 and 65.

Borderline cases were assessed by two additional observers, and they were classified as TBD when a minimum of four evaluations were concordant.

We divided our population into three groups as follows:

- breast augmentation group (AUG group),
- breast reduction group (RED group),
- patients admitted for different breast conditions (POP group).

We included also patients with unilateral TBD features.

## Results

In the AUG group ( $n = 400$ ), 194 patients (48.5 %) demonstrated at least one TBD feature. The most common deformity observed was a constricted breast base (82 %,  $n = 159$ ), followed by a breast parenchyma volume reduction of the lower medial and lateral quadrants (77.8 %,  $n = 151$ ),

abnormal elevation of the inframammary fold (70.6 %,  $n = 137$ ), a contracted skin envelope with shortened lower pole (63.4 %,  $n = 123$ ), and areolar breast parenchyma herniation associated with a constricted breast base (53.1 %,  $n = 103$ ); NAC herniation with a normal breast base was the least common feature (8.8 % of the patients,  $n = 17$ ). In 18.6 % of patients ( $n = 36$ ), TBD was unilateral.

In the RED group ( $n = 400$ ), we found TBD in 189 cases (47.3 %). The most frequent feature was a contracted skin envelope with short lower pole (77.2 %,  $n = 146$ ), followed by a reduction in the volume of the breast parenchyma of the lower medial and lateral quadrants (62.4 %,  $n = 118$ ), a constricted breast base (52.9 %,  $n = 100$ ), and abnormal elevation of the inframammary fold (37.6 %,  $n = 71$ ). No cases of herniation of the breast parenchyma into the areola with a constricted breast base or NAC herniation with a normal breast base were found. In 20.6 % of patients ( $n = 39$ ), TBD was unilateral.

Finally, in the POP group ( $n = 800$ ), 221 patients (27.6 %) demonstrated at least one of the TBD hallmarks. In particular, in 150 patients, we observed a reduction in the volume of the breast parenchyma of the lower medial and lateral quadrants (67.9 %), in 117 patients a contracted skin envelope with short lower pole (52.9 %), in 98 a constricted breast base (44.3 %), and in 79 patients abnormal elevation of the inframammary fold (35.7 %). Herniation of the breast parenchyma into the areola with a constricted breast base was observed in 14 patients (6 %). No case of NAC herniation with a normal breast was described in this group. Unilateral tuberous breast deformity has been observed in 66.5 % of cases ( $n = 147$ ) (Table 1).

## Discussion

This is the first study investigating the prevalence of constricted breast. Retrospective analysis of this large series of patients reveals a high prevalence of TBD in the general population and in particular in women seeking breast augmentation and breast reduction (about 50 %).

Our study confirms that an unneglectable percentage of women has some degree of tuberous breast deformity (Figs. 1, 2, 3, 4).

These epidemiological findings suggest that a scrupulous preoperative evaluation of TBD is crucial, in particular, in patients requiring breast implants. The presence of one of the key TBD features previously described introduces additional difficulties to be considered during preoperative planning, often requiring surgical maneuvers aimed at correcting the constricted gland, including an extensive lysis of adhesions between the gland and fascia, widening the breast base, repositioning of the inframammary fold with a preparation of an adequate prosthetic pocket, the use of glandular flaps and fat grafting.

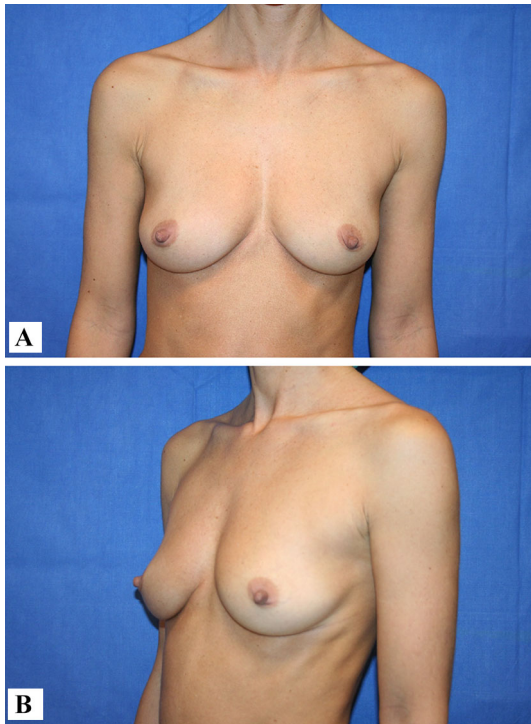
Furthermore, in patients requiring breast reduction, attention needs to be paid to the high incidence of a shortened lower pole; in fact, unlike the hypoplastic breast, when a contracted skin envelope and shortened lower pole occur on tuberous hypertrophic breasts, it will result in a retraction of the skin between the inframammary fold and areola, without an actual reduction in distance centimeters.

We believe that our study underlines the importance of assessing the presence of TBD in all women requiring reduction or augmentation mammoplasty. Increased awareness of the spectrum of this breast deformity will facilitate thorough preoperative planning to optimize surgical approaches. The correct preoperative identification of constricted breast makes surgery easier and avoids performing surgical maneuvers that may further complicate the anatomical anomalies. In our opinion, to have natural results, each memory of the constricted breast should be corrected during surgery before placing a breast implant. For this reason, we believe that the presence of a single deformity is more important to identify than the overall degree of stenosis.

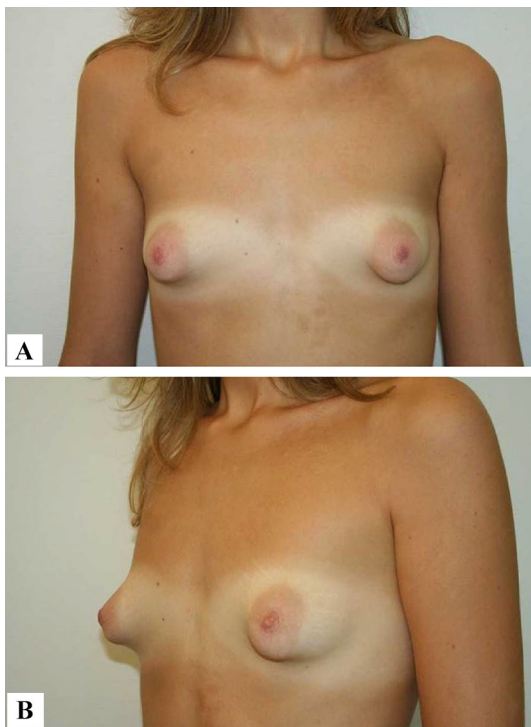
In the experience of the senior author, the incidence of TBD has progressively increased in recent years, even though it is not possible to make comparisons with previous data because of the lack of epidemiological studies in the literature. It can be hypothesized that there is a correlation between environmental factors (pollution, exposure

**Table 1** Prevalence of tuberous/constricted breast deformity in the population and in breast augmentation and reduction mammoplasty patients

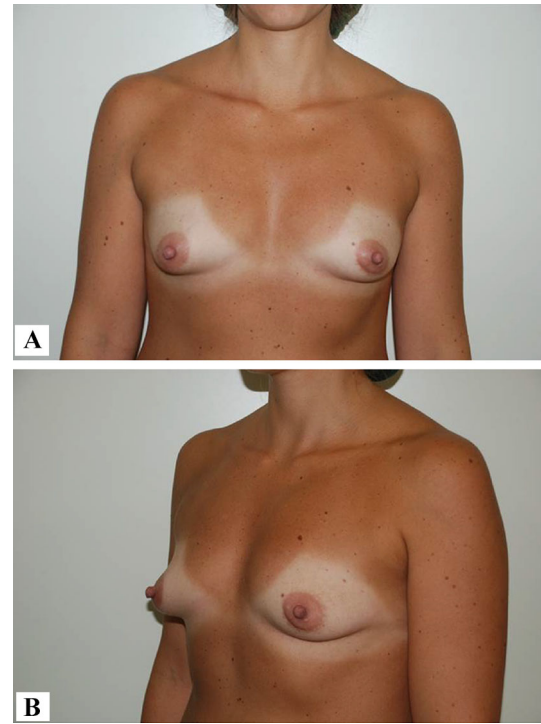
	AUG group ( $n = 400$ )	RED group ( $n = 400$ )	POP group ( $n = 800$ )
At least one tuberous breast deformity	194 (48.5 %)	189 (47.3 %)	221 (27.6 %)
A contracted skin envelope (short lower pole)	123 (63.4 %)	146 (77.2 %)	117 (52.9 %)
A reduction in the volume of the breast parenchyma of the lower medial and lateral quadrants	151 (77.8 %)	118 (62.4 %)	150 (67.9 %)
A constricted breast base	159 (82 %)	100 (52.9 %)	98 (44.3 %)
Abnormal elevation of the inframammary fold	137 (70.6 %)	71 (37.6 %)	79 (35.7 %)
Herniation of the breast parenchyma into the areola with a constricted breast base	103 (53.1 %)	0 (0 %)	14 (6 %)
Nipple areola complex herniation with a normal breast base	17 (8.8 %)	0 (0 %)	0 (0 %)



**Fig. 1** Normal breast shape. **a** Anterior–posterior view. **b** oblique view



**Fig. 2** Tuberous breast. A typical TBD with all key features. **a** Anterior–posterior view. **b** Oblique view



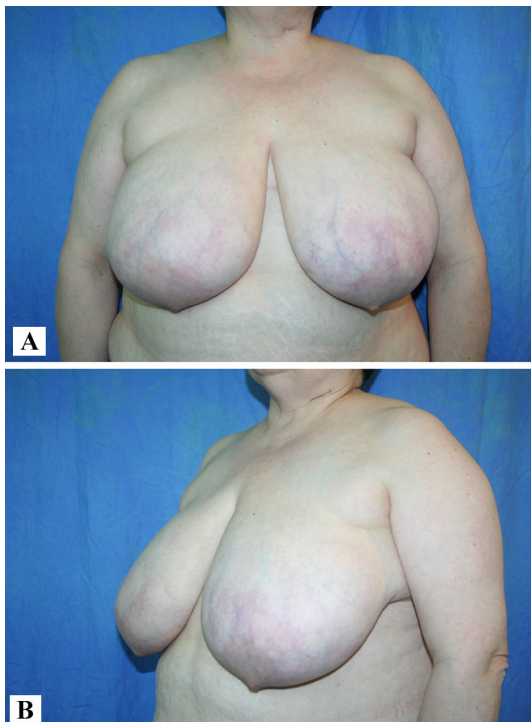
**Fig. 3** Constricted breast. Some of the key features are shown (short lower pole, a reduction in the volume of the breast parenchyma of the lower medial and lateral quadrants, abnormal elevation of inframammary fold). **a** Anterior–posterior view. **b** Oblique view

to ionizing radiation, diet, and hormones) and the presence of a stenotic mammary gland. This observation can be justified by the fact that even in cases of male gynecomastia, we have observed the presence of tuberous breast [1] and the lack of knowledge regarding this deformity. Further studies are needed to confirm or refute this hypothesis.

Moreover, the author's interest in TBD has substantially increased in recent years emphasizing the need for appropriate and effective surgical strategies to correct this deformity and achieve a satisfying cosmetic or reconstructive outcome.

Additionally, we assume that we are not been able to highlight precisely the presence of TBD in the past (excluding cases of real snoopy breast) because of insufficient attention and lack of understanding of this condition. It is possible that with growing experience and advances in breast surgery, the authors have become more aware of the multiple subtle clinical presentations and deformities of breast anatomy.

Finally, we believe that it would be more appropriate to use terms such as stenotic breast or constricted breast to indicate those cases without all the characteristic hallmarks



**Fig. 4** Hypertrophic tuberous breast. The rotation of the NAC down is partly due to a stenosis of the lower pole which is associated with the typical elevation of the inframammary fold (visible in relation to the humerus); also the wide areola with an important concentration of retroareolar breast parenchyma is suggestive of abnormal breast development. **a** Anterior–posterior view. **b** Oblique view

of the TBD. For this reason, we are working on a new all-encompassing classification system of constricted/stenotic breast deformity spectrum.

## Conclusions

This is the first epidemiological study on TBD demonstrating its high prevalence and wide spectrum of degrees and clinical presentation that should be identified and thoroughly analyzed as a standard part of the preoperative evaluation. Surgical planning of all tuberous breast cases is crucial to ensure optimal outcome and patient satisfaction.

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