Original Article

Evaluation of nipple–areola complex position after breast augmentation surgery

Avaliação do posicionamento do complexo aréolo-papilar na evolução pós-operatória da cirurgia de mamoplastia de aumento

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ABSTRACT

Introduction: Patients submitted to augmentation mammoplasty are often concerned about the possibility of sagging breasts. Although plastic surgeons usually respond that this is unlikely, this is not supported by the literature. This study aimed to precisely understand the changes in nipple–areola complex position after breast implantation, especially phenomena of "tendency to ptosis" and "bottoming out." **Methods:** Medical and photographic records were selected from among patients operated on at the Ivo Pitanguy Institute – 38th Infirmary of the Santa Casa de Misericordia of Rio de Janeiro from January 2009 to December 2010 and analyzed, and a literature review was performed. **Results:** Among 20 breasts in 10 patients, bottoming out was observed in 9 breasts in 6 patients, including 5 moderate and 4 mild. There was tendency to ptosis in 9 breasts in 5 patients, including 3 mild and 6 moderate. Only one breast did not present changes in the nipple–areola complex. **Conclusion:** Bottoming out and tendency to ptosis occur frequently after breast augmentation and require further study.

Keywords: Breast. Mammoplasty. Breast Implant.

RESUMO

Introdução: A mastoplastia de aumento, muito comumente, gera na paciente indagações acerca da possibilidade de queda das mamas. A resposta do cirurgião plástico é geralmente afirmativa, porém, este não encontra respaldo na literatura. Neste trabalho, objetivamos justamente entender a variação de posição do Complexo aréolo-papilar pós-inclusão de implantes mamários observando, principalmente, os fenômenos de "tendência à ptose" e "bottoming out". **Métodos:** Seleção de prontuários dentre as pacientes operadas no Instituto Ivo Pitanguy - Enfermaria 38 da

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Santa Casa de Misericórdia do Rio de Janeiro de jan/2009 a dez/2010, com base em critérios de inclusão e exclusão, utilizando-se para esta pesquisa de revisão dos prontuários, registro fotográfico e revisão da literatura. Resultados: Dentre as 20 mamas (10 pacientes) analisadas observamos "bottoming out" em nove mamas (seis pacientes), das quais cinco de graus moderados e quatro leves. Houve "tendência à ptose" em nove mamas (cinco pacientes) sendo três leves e seis moderadas. Apenas uma mama não apresentou variação do CAP. **Conclusão:** Os fenômenos "bottoming out"e tendência à ptose" são uma realidade que precisa ser amplamente estudada para melhor esclarecimento das pacientes.
Descritores: Glândulas Mamárias Humanas. Mamoplastia. Implantes de mama.

INTRODUCTION

Breast augmentation surgery with implants is one of the most commonly performed surgical procedures today in Brazil and worldwide. The significant increase in the number of procedures is likely because the breasts play an important role in female sexuality and psychosocial well-being [1].

Surgery is mainly indicated for breast asymmetry, hypomastia, congenital abnormalities of the chest wall, breast ptosis, deformity secondary to breast surgery, and the simple desire to increase breast volume [2,,3].

In daily clinical practice, patients frequently ask surgeons if their breasts may sag after breast implantation. Although surgeons usually respond that this is unlikely, there is insufficient published evidence supporting this statement.

"Tendency to ptosis" is the negative vertical change of the nipple–areola complex (NAC). Meanwhile, "bottoming out" is the increase in the distance between the NAC and the mammary crease due to the caudal migration of the implant, distorting the lower pole of the breast [4].

In addition, many patients may report discomfort, heaviness, and even pain in the breasts after surgery. The observation of rippling due to the thin tissue at the inferior pole of the breast is also not unusual in such cases [5].

Accordingly, the present study analyzed changes in the position of the NAC as well as the presence bottoming out and tendency to ptosis after breast augmentation surgery.

METHODS

The information contained in this study was obtained from medical records, interviews with patients, photographs, and literature review.

We retrospectively evaluated the medical records of all patients undergoing surgical breast implantation at the Ivo Pitanguy Institute – 38th Infirmary of the Santa Casa de Misericordia of Rio de Janeiro from January 2009 to December 2010. From a total of 368 patients, we selected those that met the following inclusion and exclusion criteria:

Inclusion and exclusion criteria

The inclusion criteria were breast augmentation with breast implants and aesthetic indications for the retro-glandular or retro-muscular plane through lower peri-areolar, trans-areolar, or mammary fold incisions; polyurethane-coated or textured breast silicone implants; and patient able to be located using data from medical records and photographs taken 1 month postoperatively.

The inclusion criteria

Were breast augmentation with breast implants for breast reconstruction or in association with mastopexy; no photographs taken 1 month postoperatively; or unable to be located.

Ten patients met the inclusion criteria and were subjected to a physical examination, photography, and an interview; their characteristics are shown in Table 1.

Photographic analysis

Photographic analysis was performed by comparing the photographs of patients in the early postoperative period (within 1 month postoperatively) and late postoperative period (1–3 years); follow-up ranged from 18–33 months.An automatic 10-megapixel digital camera with a focal range of 35–105 mm equivalent and 1× optical zoom was used. A comparative photographic method was then performed by a single medical professional

Table 1 – Characteristics of patients who received mammoplasty and met the inclusion criteria.

No.	Color	Age (years)	Implant Volume	Implant Type	Breast feeding	Complica-tions	Incision	Plane	Smoker
1	White	42	230 mL	Textured	Before	No	Periareolar	Subglandular	No
2	White	40	285 mL	Polyurethane	Before	No	Periareolar	Subglandular	No
3	White	44	235 mL	Textured	Before	No	Fold	Subglandular	No
4	White	30	285 mL	Textured	Before	Late seroma	Fold	Subglandular	No
5	White	31	305 mL	Polyurethane	Before	No	Fold	Subglandular	No
6	White	39	235 mL	Polyurethane	Before	No	Periareolar	Subglandular	No
7	White	43	195 mL	Polyurethane	Before	Unsightly scar	Fold	Subglandular	No
8	White	31	285 mL	Textured	Before	No	Periareolar	Subglandular	No
9	White	21	255 mL	Textured	No	No	Fold	Subglandular	No
10	White	26	255 mL	Textured	No	No	Periareolar	Subglandular	No

with surgical training by direct visualization with the naked eye. Fixed variables were defined on the chest of the patient, and ratios of measures were established for analysis (Figures 1 and 2). Measurements were made manually using a ruler and protractor. Computer graphics were also used as an auxiliary tool.

Definitions of variables

Fixed points of reference on the patient's chest were assessed with the patient in an upright posture with arms back. Some of these points and measures are cited in the work of Westreich [6]the others were made on the basis of observations in the present study. The measurement points were a folows:

- POINT A: Center of the sternal notch.
- POINT B: Tangential point of the line from the nipple to the midline
- POINT C: Tangential point of the maximum projection of the lower pole of the breast to the midline
- POINT D: Point of maximum projection of the lower pole of the breast [6].
- POINT E: , center of the nipple [6].

Comparative measurements (Figure 1)

The AC:ED ratio was defined as the distance between the center of the sternal notch and the tangential point of maximum projection of the lower pole of the breast to the middle line divided by the distance between the center of the nipple and the point of maximum projection of the lower pole of the breast [6].

An increase in this ratio from the early to late postoperative period indicated the presence of bottoming out.

· The ACE angle was defined as the angle whose vertex is point C formed by straight lines that intersect points A and E.

When comparing early and late postoperative photographs, an increase in this angle indicated tendency to ptosis, while a decrease indicated sliding of the NAC.

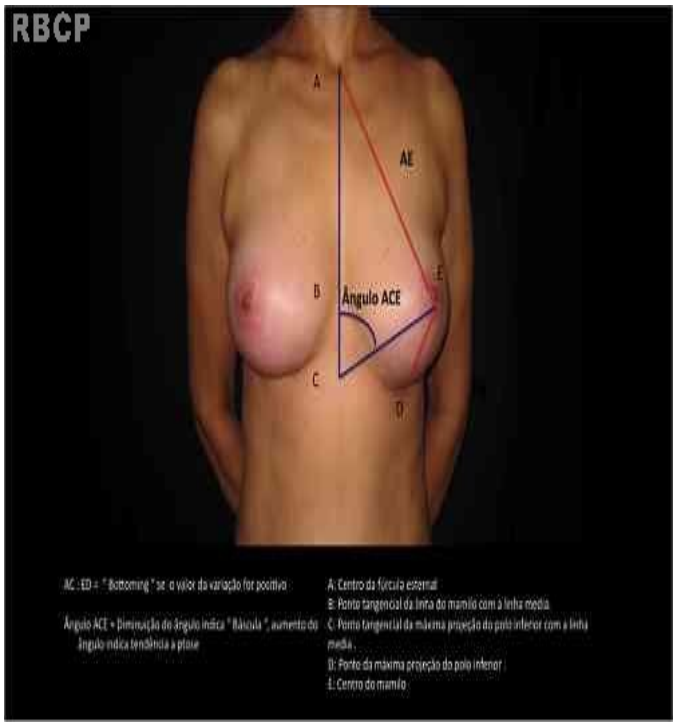


Figure 1 – *Photographic analysis method, showing the fixed points used as references, front view*

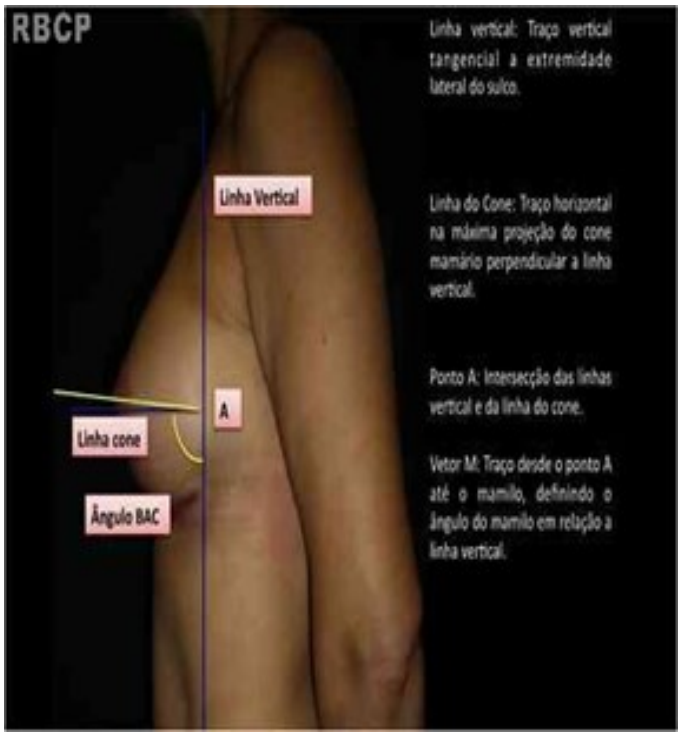


Figure 2 – *Photographic analysis, profile view*

Fixed points of reference on the chest in profile view (Figure 2)

· The vertical line was defined as a straight vertical line tangential to the lateral edge of the mammary crease .

· The cone line was defined as the straight horizontal line passing through the maximum projection of the breast cone, perpendicularly intersecting the vertical line.

· Point A was defined as the intersection point of the vertical line with the cone line.

· Vector M was defined as the straight line that intersects point A and the center of the nipple.

Comparative measurements (Figure 2)

The BAC angle was defined as the angle whose vertex is point A, being formed by vector M and the vertical line below point A. When comparing early and late postoperative photographs, an increase in this angle indicated sliding, while a decrease indicated tendency to ptosis.

In this analytical method, the AC:ED ratio and ACE angle best detected bottoming out and tendency to ptosis, respectively. Therefore, through clinical perception and comparison of these parameters between the early and late postoperative periods, we classified changes <5%, 5–30%, and >30% as mild, moderate, and severe, respectively

RESULTS

Among 20 breasts in 10 patients, bottoming out was observed in 9 breasts in 6 patients (Figure 6), including 5 moderate and 4 mild (Table 2, Figure 1). This analysis was performed by comparison of the AC:ED ratio (Figure 3).

Considering the NAC as a parameter, in the front view, 9 breasts in 5 patients exhibited tendency to ptosis, including 3 mild and 6 moderate. Meanwhile, 11 breasts in 6 patients exhibited a rise of the NAC; ; only 1 breast exhibited no change in NAC positioning (Tables 2 and 3, Figure 2). This analysis was performed by comparison of the ACE angle (Figure 3).

In the profile view, in 11 breasts in 6 patients, the NAC exhibited tendency to ptosis; meanwhile, in 9 breasts in 5 patients, the NAC exhibited a tendency to rise (Figure 5, Table 2). This analysis was performed by comparison of the BAC lateral angle (Figure 4).

There were no associations of the general characteristics of the patients, including age, implant type or volume, smoking, or prior breastfeeding (Table 1), with the phenomena mentioned above.

Furthermore, 7 breasts in 4 patients exhibited neither bottoming out nor tendency to ptosis. Meanwhile, 12 breasts in 7 patients exhibited either

bottoming out or tendency to ptosis.

Table 2.

PATIENT 1	1 month D	>33 months D	% Change	1 month E	>33 months E	% Change
AC:ED	3.54	3.45	2.5	3.07	2,63	14.3
ACE ANGLE	66	57	13.6	56	53	5.4
BAC lateral angle	82	103	21°	96	109	13°

Result: The right and left breasts exhibited mild (change < 5%) and moderate (change 5–30%) bottoming out, respectively. Both breasts exhibited a rise of the NAC.

PATIENT 2	1 month D	>24 months D	% Change	1 month E	>24 months E	% Change
AC:ED	1.88	1.76	6.4	2.18	3	37.6
ACE ANGLE	56	59	−5.4	57	60	−5.3
BAC lateral angle	85	103	18°	90	98	8°

Result: The right and left breasts showed moderate and no bottoming out, respectively. Both breasts exhibited tendency to ptosis (mild to moderate).

PATIENT 3	1 month D	>21 months D	% Change	1 month E	>21 months E	% Change
AC:ED	3.54	3.53	0.3	3.54	3.38	4.5
ACE ANGLE	60	66	−10.0	59	63	−6.8
BAC lateral angle	88	98	10°	90	99	9°

PATIENT 4	1 month D	>18 months D	% Change	1 month E	>18 months E	% Change
AC:ED	2.26	2.63	−16.4	2.26	2.63	−16.4
ACE ANGLE	55	58	−5.5	55	60	−9.1
BAC lateral angle	95	90	−5°	99	98	−1 degree

Result: Neither breast exhibited bottoming out. Moderate tendency to ptosis was observed in the lateral view.

PATIENT 5	1 month D	>24 months D	% Change	1 month E	>24 months E	% Change
AC:ED	2.14	2.29	−7.0	2.41	2.38	1.2
ACE ANGLE	53	51	3.8	57	48	15.8
BAC lateral angle	98	106	8°	90	104	14°

Result: The right and left breasts exhibited no and mild bottoming out, respectively. Both exhibited a rise of the NAC.

PATIENT 6	1 month D	>17 months D	% Change	1 month E	>17 months E	% Change
AC:ED	4.71	3.6	23.6	4.12	3.6	12.6
ACE ANGLE	67	69	−3.0	70	71	−1.4
BAC lateral angle	90	82	−8°	85	83	−2°

Result: Both breasts exhibited moderate bottoming out and mild tendency to ptosis.

PATIENT 7	1 month D	>24 months D	% Change	1 month E	>24 months E	% Change
AC:ED	2.28	-7.9	2.46	2.29	2.46	−7.4
ACE ANGLE	56	55	1.8	56	54	3.6
BAC lateral angle	90	93	3°	90	91	degrees

Result: Neither breast exhibited bottoming out or tendency to ptosis.

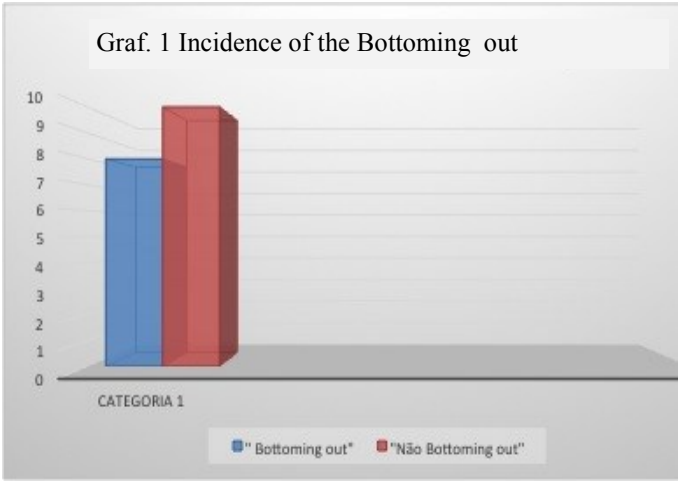
PATIENT 8	1 month D	>33 months D	% Change	1 month E	>33 months E	% Change
AC:ED	3.36	5	−48.8	3.2	4.85	−51.6
ACE ANGLE	69	68	1.4	70	69	1.4
BAC lateral angle	90	87	−3°	90	85	−5°

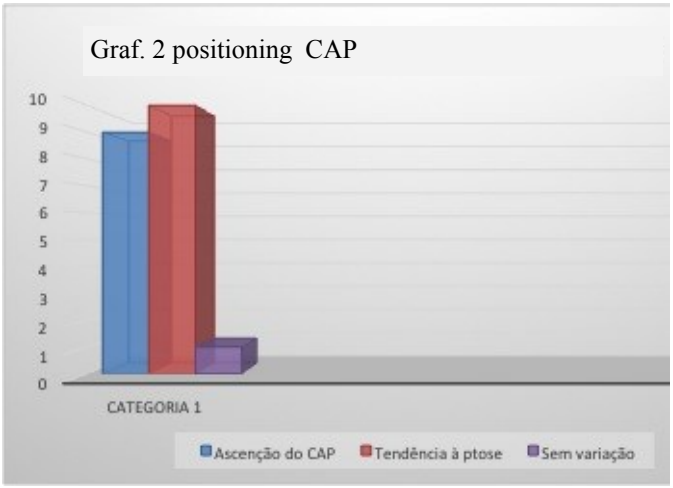
Result: Neither breast exhibited bottoming out or tendency to ptosis (ACE angle) in the frontal view but exhibited tendency to ptosis in the profile view (BAC angle).

PATIENT 9	1 month D	>28 months D	% Change	1 month E	>28 months E	% Change
AC:ED	2.5	2.9	−16	3.1	3.71	−19.7
ACE ANGLE	68	65	4.4	69	69	0.0
BAC lateral angle	90	95	5°	90	84	-6°

PATIENT 10	1 month D	>24 months D	% Change	1 month E	>24 months E	% Change
AC:ED	2.78	3.33	−19.8	3.25	3.6	−10.8
ACE ANGLE	67	70	−4.5	68	70	−4.4
BAC lateral angle	90	87	−3°	90	80	−10°

AC:ED	Positive change indicates bottoming out; negative change indicates no bottoming out
ACE ANGLE	Negative change indicates tendency to ptosis; positive change indicate a rise of the NAC
BAC lateral angle	Positive change indicates a rise of the NAC; negative change indicates tendency to ptosis





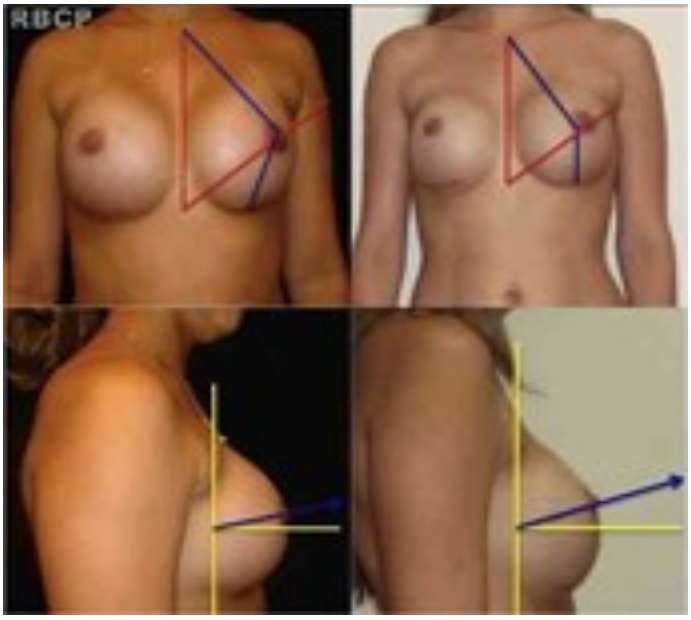


Figure 3 – PATIENT 5: *photographs 1 month (left) and 24 months (right) postoperatively demonstrating the phenomenon of bottoming out on the left breast (front view) and rise of the NAC in the right breast (profile view).*

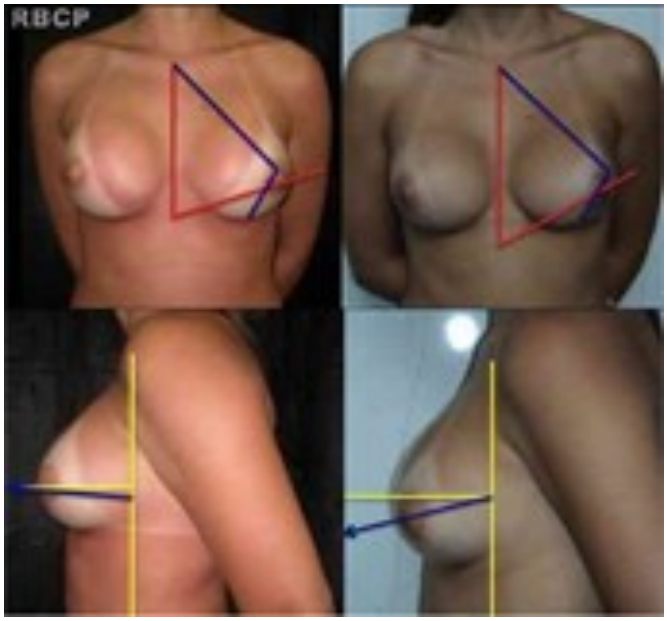


Figure 4 – PATIENT 10: *photograph showing the fall of the NAC in the left breast (profile view) 24 month postoperatively (bottom left).*

Table 3 – Patient- and surgery-related factors that may affect implant–tissue dynamics (from Tebbetts, 2002 [10])

Patient-related factors	Surgery-related factors
Genetic factors	Type of incision
Hormonal factors	Detachment plane
Previous pregnancy	Detachment technique
Previous disease	Degree of tissue trauma
Age	Intraoperative bleeding
Weight loss or gain	Size of the implant pocket
Lack of tissue	Implant placement method
Tissue elasticity	Implant positioning method
Appearance of the breast parenchyma	Construction method
Appearance of the capsule	Postoperative healing methods
Level of postoperative activity	Volume of implant
Use of certain medication	Type of implant

DISCUSSION

When breast augmentation surgeries were first performed, there was little control over the results. The surgeon could only guarantee breast augmentation itself. Assumptions and generalizations were employed to circumvent ignorance of tissue dynamics and their relation to the implants. Surgeons now have some tools to quantify simple parameters previously treated subjectively [7]. In 2001, Dr. Tebbetts published "TEPID," which is a selection algorithm for breast implants based on tissue characteristics and the dynamic relationship of the implant with breast tissue [8]. TEPID aims to reduce complications such as skin stretching, ptosis, parenchymal atrophy, implant visibility and palpability, rippling phenomenon, and bottoming out among others.

Numerous factors related to breast tissue and the surgeon (Table 3) can affect the outcome of augmentation mammoplasty [8-11]. Therefore, it is difficult to explain why these phenomena occur

over time after implant placement, including the changes demonstrated herein. However, objectively and quantitatively, statistical evidence demonstrating the incidence of such phenomena as well as related implant and patient characteristics may contribute to better preoperative guidance.

Breast ptosis is an aesthetic complication characterized by sagging of the breast due to the relaxation of their support. The following 6 classifications of breast ptosis were found through an electronic search in LILACS and MEDLINE from 1951 to 2008: Binet (1951), Robutti & Lupo (1970), Regnault (1976), Bozola (1990) Chekkour et al. (1991), and Oliveira Jr et al. [12]. However, none of them mention breast implants The existence of multiple grades shows that none of these classifications is fully satisfactory; all apply to restricted situations according to case history and the experience or convenience of the classifier. However, it is notable that the most valid parameter is ptosis of the nipple [12]. Consequently, at no point did we aim to classify the operated breasts according to the degree of ptosis. Instead, we used the nipple as a parameter to try to clarify if the breast was sagging or not. Therefore, we cautiously used the term "tendency to ptosis" and graded it as mild, moderate, or severe. We also proposed an objective classification for the phenomenon of bottoming out.

Both the tendency to ptosis and phenomenon of bottoming out were clearly evident in this study. One explanation is that the framework of the breast is designed to support up to a certain weight. Therefore, negative effects may occur when genetic or hormonal influence, weight gain, pregnancy, or breast implants exceeds this capacity [8,13,14]. Nevertheless, no effect by itself significantly influenced these phenomena.

The prediction of the postoperative positions of the nipple and NAC remains difficult. Several variables are involved, including the degree and type of previous ptosis, quality of the skin envelope, gland/fat ratio of the breast tissue, and breast behavior in the postoperative course [15]. However, the present study demonstrates the postoperative assessment of such changes is easy.

It is very clear how dynamic changes occur in breasts. The behavior of the breasts can vary considerably within a patient, as demonstrated in patient 10; in this patient, one of the breasts exhibited bottoming out with a rise in the NAC, while the other did not bottom out but with tendency to ptosis (Table 2).

Bottoming out is one way by which breasts sag and occurs as a result of the migration of the implant to the inferior pole of the breast .

The nipple–papillary complex is arguably the best parameter for assessing breast ptosis; its fall is associated with the perception of sagging breasts. In this study, 12 breasts in 7 patients exhibited some degree of breast sagging; this is a very significant number that justifies the concerns and questions of patients before surgery.

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CONCLUSION

The tendency to ptosis after the placement of breast implants and the phenomenon of bottoming out must be reported and responded to in preoperative consultation.In short, there is a high probability of sagging breasts after the placement of implants.

In the present study, the degree of ptosis was mild to moderate.

Several factors may contribute to ptosis but none of them alone are strongly associated with ptosis except for placement of the breast implant. The rise or fall of the NAC was also very common in the present study.

Even following the principle of matching the center of the implant with the nipple during surgery, the postoperative positioning of the NAC was uninfluenced by the direction of the implant or rest of the breast framework.

Thus, the present results were unexpected, making these complications even more challenging to the surgeon. Further studies involving histological analysis of breast tissue are required to further improve predictability and surgical approaches, and thus improve results.

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