



# Profile of breast augmentation surgery in Brazil

## *Perfil da cirurgia de aumento de mama no Brasil*

LUIZ CHARLES-DE-SÁ<sup>1\*</sup>  
NATALE FERREIRA GONTIJO-DE-AMORIM<sup>2</sup>  
JUAN PABLO ALBELAEZ<sup>3</sup>  
PAULO ROBERTO LEAL<sup>4</sup>

Institution: Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

Article received: June 28, 2018.  
Article accepted: April 21, 2019.

Conflicts of interest: none.

DOI: 10.5935/2177-1235.2019RBCP0132

### ■ ABSTRACT

**Introduction:** The latest research by the International Society of Aesthetic Plastic Surgery (ISAPS) showed that 2,524,115 plastic surgeries were performed in Brazil in 2017. Breast augmentation has been one of the most commonly-performed plastic procedures in Brazil, totaling more than 200,000 surgeries in 2016. The objective is to evaluate the current practices and trends in breast augmentation in Brazil. **Methods:** A 31-item questionnaire was constructed and sent to 6,200 active members of the Brazilian Society of Plastic Surgery (SBCP). The research addressed some current trends and controversial practices in five areas: current controversies, new technologies, breast implants, technical considerations in secondary procedures, and demographic aspects. The questionnaire was designed to profile practices, procedures, and beliefs among plastic surgeons regarding the use of breast implants in Brazil.

**Results:** A total of 505 responses were collected, representing a response rate around 10%, which is well above the average response rate for Brazilian Society of Plastic Surgery (SBCP) questionnaires. The results were distributed in five tables by area of interest. **Conclusion:** In this study, the most common practices included the use of microtexture round implants and polyurethane-coated silicone as the primary procedure, a subglandular pocket, inframammary incisions, preoperative sizing with round implant samples, intravenous and oral antibiotics, double irrigation antibiotics, an implant size that was generally less than 325 cc, and without drainage. There is no consensus on breast lip balancing and the management of capsular contracture and double bubble deformity.

**Keywords:** Mammoplasty; Breast; Capsular contracture in implants; Breast implants; Break.

<sup>1</sup> Universidade Estadual do Rio de Janeiro, Rio de Janeiro, RJ, Brazil.

<sup>2</sup> Universidade de Verona, Verona, Italy.

<sup>3</sup> Instituto Ivo Pitanguy, Rio de Janeiro, RJ, Brazil.

<sup>4</sup> Instituto Nacional de Câncer, Rio de Janeiro, RJ, Brazil.

## ■ RESUMO

**Introdução:** A última pesquisa da Sociedade Internacional de Cirurgia Estética (ISAPS) mostrou que 2.524.115 cirurgias plásticas foram realizadas no Brasil em 2017. O aumento de mama tem sido um dos procedimentos plásticos mais comumente realizados no Brasil, totalizando mais de 200.000 cirurgias no ano de 2016. O objetivo é avaliar as práticas e tendências atuais em aumento de mama no Brasil. **Métodos:** Um questionário de 31 itens foi construído e enviado para 6.200 membros ativos da Sociedade Brasileira de Cirurgia Plástica (SBCP). A pesquisa abordou algumas tendências atuais e práticas controversas considerando cinco áreas: controvérsias atuais, novas tecnologias, implantes mamários, considerações técnicas em procedimentos secundários e aspectos demográficos. O questionário foi desenhado para delinear o perfil das práticas, procedimentos e crenças entre os cirurgiões plásticos sobre o uso dos implantes mamários no Brasil. **Resultados:** Foram coletadas 505 respostas, representando uma taxa de resposta em torno de 10%, bem acima da taxa média de resposta de um questionário da SBCP. Os resultados foram distribuídos em 5 tabelas de acordo com as áreas de interesse. **Conclusão:** Nesta pesquisa, as práticas mais comuns incluíram o uso de implantes redondos de microtextura e silicone revestido com poliuretano no procedimento primário, poket subglandular, incisões inframamárias, dimensionamento pré-operatório com amostras de implante redondas, antibióticos intravenosos e orais, irrigação com duplo antibiótico, implante faixa de tamanho geralmente menos 325cc e sem drenagem. Não há consenso sobre a lipotransferência mamária e o manejo da contratura capsular e da deformidade da bolha dupla.

**Descritores:** Mamoplastia; Mama; Contratura capsular em implantes; Implante mamário; Ruptura.

## INTRODUCTION

Brazil is one of the world leaders in the number of plastic surgery procedures performed annually. Considering its area and population (207 million inhabitants), Brazil is the fifth largest country in the world. In a recent survey, the International Society of Aesthetic Plastic Surgery (ISAPS) showed that in 2017, 2,524,115 plastic surgeries were performed in Brazil for aesthetic purposes<sup>1</sup>.

Surgery for breast augmentation has been one of the most commonly-performed procedures, totaling more than 200,000 surgeries in 2016. Two major factors have contributed to this scenario: the large number of plastic surgeons in Brazil (6,200 active members of the Brazilian Society of Plastic Surgery - SBCP), and the availability of various implant brands, including domestic manufacturers such as Silimed<sup>®</sup> and LifeSil<sup>®</sup>, and different international brands, such as Allergan<sup>®</sup>, Mentor<sup>®</sup>, Polytech<sup>®</sup> and Motiva<sup>®</sup>, among others.

Many clinical studies have been conducted to understand the effects of silicone implants on breast

tissue, along with approaches to resolve complications or other unexpected occurrences<sup>2-9</sup>. Different criteria and methods can be applied in the selection of an ideal implant in terms of design, shape, and volume, including incisions, breast contour, and the anatomy of the nipple areola complex (NAP)<sup>10-12</sup>.

A meticulous analysis of breast characteristics and patient cooperation during surgical planning is the key to achieving a pleasing outcome. Tebbetts & Adams<sup>13</sup> have established an important protocol by adopting five anatomical measurements of the chest wall and breast to guide the planning of breast augmentation surgery. However, there is no consensus among plastic surgeons about breast augmentation, such as the best approach to rippling and capsular contracture, optimal implant design, and other controversial issues. In a recent study, Hidalgo & Sinno<sup>14</sup> analyzed the profile of US plastic surgeons in relation to breast augmentation and showed some current tendencies in the US surgery.

Despite a great interest among surgeons and patients regarding breast enlargement, certain issues remain undefined, such as the “ideal” technique and

the type of implant, including determination of the best brand, incisions, and use of the acellular dermal matrix (ADM), among others.

## OBJECTIVE

The objective of this study is to evaluate current practices and trends in breast augmentation surgery in Brazil.

## METHODS

A 31-item questionnaire was prepared and sent to all associate and full members of the SBCP. The research addressed current trends and controversial practices considering five areas: current controversies, new technologies, breast implants, technical considerations in secondary procedures, and demographic aspects.

The questionnaire was prepared to outline the knowledge of the plastic surgeon and their practices, procedures, and beliefs regarding the use of breast implants in Brazil. The questions were multiple choice, with variables extracted from the Hidalgo & Sinno questionnaire,<sup>14</sup> for subsequent data comparison. The survey was sent via email, WhatsApp, and Facebook from May to June 2017. The survey was conducted using the site, [www.junkmonkey.com](http://www.junkmonkey.com) (SurveyMonkey, Microsoft Corporation, USA).

## RESULTS

A total of 505 questionnaires were collected (representing a response rate of approximately 8%). The results were distributed in five tables, by the major area of interest. Table 1, which expresses current controversies, shows that 50% of respondents do not use any protocol guidelines, basing their procedures simply on their own experience. In particular, they do not use anatomical implants. The reasons given for this were mainly the unproven aesthetic superiority of the anatomical prosthesis when compared to round implants, the possibility of rotation, and the higher cost.

Breast implants were used for primary increase (78.13%), mastopexy (18.29%), and in-breast reconstruction (3.58%).

Autologous fat grafting was mentioned by 29.08% of the surgeons interviewed, while 68.92% had never used it for this purpose. The fat grafting technique, as a complementary procedure, was employed by 54.9%. The main concerns regarding lipotransfer in the breasts as a primary augmentation procedure were (in order of importance): the possible need for multiple grafting sessions, the limited potential for augmentation, and interference with the breast cancer screening (imaging analysis).

Some surgeons reported cases of anaplastic large cell lymphoma (ALCL), but this represented an extremely low incidence among Brazilian plastic surgeons (0.08%).

The media technology, currently used surgical planning for educational and marketing purposes, does not consider breast imaging as a suitable method to achieve these goals (Table 2). The majority of surgeons do not use ADM; few use a plastic device in the funnel for implant placement. Adhesive plastic film, as a skin protector, is not routinely used. However, there have been reports of matrix indications for the treatment of capsular contracture, contour deformities, and undulations.

The results obtained demonstrate that round silicone implants are prevalently used. Depending to the coverage area of the implant, more than half of the surgeons (52.51%) preferred micro-precision implants; 26.46% used polyurethane implants when the implants were placed in the subpectoral plane. On the other hand, when the plane was subglandular, microtextured implants were most commonly used (45.36%), followed by macrotecture (25.64%) and polyurethane (23.33%). The most prevalent volume ranges were between 275-325 mL (39.17%) and 250-300 mL (31.41%).

The most commonly used silicone implant brands were Silimed® (54.69%), Mentor® (44.71%), Allergan® (31.74%), Polytech (23.95%), LifeSil® (11.78%), and others (20.16%) (Table 3).

Inframammary incisions were most preferred by the majority of surgeons (89;66), and the subglandular pocket (54.78%) was the most frequently used approach for implant placement. The irrigation of the pouch with a double antibiotic solution was used by 38.25% of surgeons and more than half used intravenous (94.22%) and oral (65.74%) antibiotic prophylaxis. Drains were used for 18.53%.

Considering the capsular contracture approach, more than half of the surgeons (52.89%) never used any pharmacological agent to prevent or treat this complication. In 33.93% of the cases, immunological modulators were used at the first sign of capsular contracture.

The most frequent motives for secondary surgery were included contracture (49.80%) and change in implant size (35.14%) (Table 4). Primary capsular contracture was more commonly treated with total capsulectomy (39.88%), capsulotomy (22.65%), and anterior capsulectomy (18.64%). Recurrent contractures in the subpectoral pocket were treated through pocket exchange (47.15%) and previous capsulectomy (15.86%).

Recurrent contractures in the subglandular pocket were treated with a surgical change from the implants to the subpectoral pocket (51.56%) and total

**Table 1.** Current Controversies.

	Total of responses (%)
<b>Concern with practice and expertise</b>	
The surgeon follows his own experience	48.01
There are different approaches to the same problem.	20.72
No protocol developed by SBCP	3.57
There is some protocol by SBCP	5.78
Not informed	4.58
<b>Use of anatomical implants</b>	
Never	46.52
Uses in <50% of cases	47.32
Uses in 50% of cases	1.79
Uses in > 50% of cases	358
Always	0.80
<b>Concerns about anatomical implants</b>	
Aesthetic result is not superior to round implants	55.49
Rotational potential	34.93
No limitations	11.38
High cost	23.95
Larger incisions	3.99
Problems with texturing (late seroma, ALCL)	2.00
Limited incision options	1.80
Others	17.56
<b>Use of autologous fat in the primary augmentation procedure</b>	
Never	98.92
<50% of cases	29.08
Uses in 50% of cases	1.20
> 50% of cases	0.60
Always	0.20
<b>Concerns about use of fat grafting in the primary procedure</b>	
Limited growth potential	43.17
May require multiple procedures	43.80
Potential to interfere with imaging exams	27.31
No worries	26.91
Cost	1165
Complexity of the procedure	5.02
Others	10.04
<b>Use of autologous fat as a supplementary technique</b>	
<50% of cases	54.91
Never	35.67
> 50% of cases	7.01
Always	2.4
<b>Presented one case of ALCL in their practice</b>	
No	99.20
Yes	0.80
<b>I use breast implants in your current practice</b>	
Primary breast augmentation	78.13
Mastopexy	18.29
Breast reconstruction surgery	3.58
Does not use breast implants	0.00

SBCP: Sociedade Brasileira de Cirurgia Plástica (Brazilian Society of Plastic Surgery); ALCL: Anaplastic Large Cell Lymphoma.

**Table 2.** New Technologies.

	Total of responses (%)
Use of three-dimensional technology	
No	96.41
Yes	3.59
Evaluates the role of tridimensional imageology in their practice	
It has not proved that it is worth the cost and effort	61.11
It is an effective marketing tool	11.73
It made the consultation process too complex	11.73
It is an effective sizing tool	11.10
It is an effective educational tool	6.79
Other	7.90
Use of ADM in secondary cases	
No	98.40
Yes	1.60
If yes, use ADM, for which purpose it is proposed	
Rippling or fine tissues	24.44
Contour deformities	17.78
Capsular contracture	15.56
Post-capsulotomy	6.67
Other	48.89
Use of funnel for placement of the implant	
Never	90.64
<50% of cases	5.38
Only for small incisions/large implants	1.20
50% of cases	0.40
> 50% of cases	0.80
Always	1.59
Why not use the funnel?	
Not Needed	76.43
Additional cost	34.14
Adds extra time	6.17
Use of plastic adhesives to protect the skin before insertion of the implant	
I don't use	90.60
Yes, over the nipple-areola complex	6.60
Yes, over the incision	1.80
Yes, on the nipple-areola complex and incision	1.00

ADM: Acellular Dermal Matrix

capsulectomy (29.46%). The most common treatment for double-bubble deformity is the change of pocket (54.04%), the exchange of the implant using the same pouch (22.13%), pocket, the exchange of implant, and rescaling of the pocket with inframammary sutures to create a new groove (16.60%) (Table 4).

Three questions were drafted to analyze general demographic aspects. Regarding the surgeon's experience, it was shown that 26.24% presented 0-5 years of practice in plastic surgery (Table 5), and

most interviewees reported that they had experience in aesthetics. The mean number of mammoplasties performed annually ranged from 11-30 cases (34.26%) to 31-60 (31.27%) (Table 5).

## DISCUSSION

The scenario of breast augmentation mammoplasty presents great diversity in its practices and trends in different countries. It is extremely important to evaluate

**Table 3.** Implant Protocol.

Method for selecting the implant	Total of responses (%)
Sizing with silicone molds	47.40
Dimensioning with round silicone implants	31.80
“High-five” or other system of evaluation of the tissues	13.20
“Rice bags” or other “sizers” preoperative	4.60
Imaging technology	2.60
None	9.80
<b>Implant Fill Type</b>	
100% Silicone	98.60
Mostly silicone/some saline solution	1.40
Equal amounts	0.00
Mostly saline solution/some silicone	0.00
100% Saline solution	0.00
<b>Submuscular Implant Coverage</b>	
Microtexture	52.51
Polyurethane cover	26.46
Macrotexture	19.64
Foam	1.00
Smooth	0.40
<b>Subglandular Implant Coverage</b>	
Microtexture	45.36
Polyurethane cover	23.33
Macrotexture	25.64
Foam	0.00
Smooth	0.66
<b>Usual size of the implant</b>	
< 250 mL	3.18
250 – 300 mL	31.41
275 – 325 mL	39.17
300 – 350 mL	24.06
> 350 mL	2.19
<b>Manufacturer of the implant</b>	
Silimed	54.69
Mentor	44.71
Allergan	31.74
PolyTech	23.95
LifeSil	11.78
Motiva	2.00
Others	20.16
<b>Site of the incision</b>	
Infrared	89.66
Periareolar	8.75
Axillary	1.59
Periumbilical	0.00
<b>Pocket Pocket</b>	
Subglandular	54.78
Subfascial	26.49
Partial submuscular	14.14
Complete submuscular	4.58

continue...

continue...

**Table 3.** Implant Protocol.

Antibiotic Prophylaxis	
Intravenous anesthetic induction	94.22
Post-operative oral antibiotics	65.74
Double-antibiotic irrigation	38.25
Povidone-iodine Irrigation (only)	0.60
Povidone-iodine/bacitracin or neomycin	1.59
Classic Triple-Antibiotic Irrigation	3.19
Other type of irrigation	8.17
Never uses antibiotic prophylaxis	0.80
Post-operative suction drains	
No	81.47
Yes	18.53
Draining periods	
Less than 24 hours	31.58
1 day	30.08
2 days	18.80
3-5 days	18.05
> 5 days	1.50
Pharmacological agents for capsular contraction	
Yes, prophylactically in all cases	3.79
Yes, only at the first sign of initiation	33.93
Yes, as first option in the establishment of contraction	9.38
Never	52.89
Did these agents effectively reduce capsular contraction?	
Yes	10.39
Only if initiated precociously	17.39
Not sure	57.00
No	15.22
Non-surgical methods for the treatment of capsular contracture	
Leukotriene inhibitors	42.07
Massage	32.77
External ultrasound	11.42
Closed capsulotomy	6.55
COX-2 inhibitors	5.92
Pulsed Electromagnetic Therapy	1.27
Papaverine	0.42
None	35.94
Other	4.65

these differences and standardize those most accepted by these surgeons, thus increasing the level of safety of the surgery and the quality of the results. This present study aims to analyze the current practice of Brazilian plastic surgeons in relation to breast augmentation surgery, representing the practice of Brazilian plastic surgeons.

Almost half of these plastic surgeons (48%) follow their own experience as guidelines, ruling out

any SBCP protocol. Most used breast implants for primary enlargement (78.13%) and mastopexy (18.29%), reflecting an international consensus.

Most surgeons do not use anatomical implants because they consider their esthetic result equivalent to the round implant, but with a higher rate of poor positioning and higher anatomical cost – which influenced the choice of the round implant. However,

the choice was also based on personal expertise rather than clinical data.

In fact, no prospective study has yet been disseminated related to this subject. The consensus observed is that there is no ideal implant that meets the needs of all patients. Experienced surgeons suggest that both round and anatomical implants can bring successful results, regardless of implant shape<sup>15</sup>.

There is little difference in the final result between anatomical and round implants in some conditions, such as in patients with good coverage and tissue thickness. Considering the inclination and volume of the upper pole, round and anatomical implants may produce an overly full or empty upper pole if placed too high or too low, respectively.

Some conditions, such as tuberous breasts, in which there is a deficiency of glandular and cutaneous tissue in the lower pole, with a risk of contour deformities such as the “double-bubble” silhouette, are greater with round implants; in such cases, anatomical implants are an appropriate alternative<sup>16</sup>. An algorithm for selecting anatomical or round implants, based on clinical data applied by American plastic surgeons for many years, reports low rates of capsular contracture and other complications, as well as high rates of patient satisfaction<sup>15-17</sup>.

Regarding the use of lipotransfer-primary breast augmentation, it was determined that most plastic surgeons have never used it (68.92%) because of the low potential for augmentation and the need for multiple sessions.

The incidence of ALCL associated with the implants among surgeons presented a low index (0.80%), probably due to the lack of adequate diagnostic protocol and the use of polyurethane coated implants in Brazil. This object seems to be a novelty of multifactorial causation, related to the texture of the implants; it is more frequent than what was previously been believed. If texturization proves to be a factor that contributes to, or specifically causes, ALCL, the continued use of textured implants would logically increase the number of patients at risk of developing this tumor<sup>19-25</sup>.

Annually, new technologies have arisen, with new generation implants and new protocols. Regarding the use of the three-dimensional breast exam study, 96.41% of the interviewees did not use this tool because they felt that the high cost and time spent did not justify the investment (61.11%). Many attribute the use of this device as a marketing tool, with value added limited to preoperative evaluation. This latter belief is corroborated by recent studies showing that its use remains controversial<sup>26</sup>.

Methods based on the assessment of local tissues provide critical information on the size restrictions

imposed by individual anatomy<sup>13</sup>. The role of local tissue-based methods may be more suitable as a complement to sizing methods, whereby patient size preference is modified based on the anatomical limitations revealed through tissue-based analysis<sup>27</sup>.

The characteristics of the breast implant are analyzed in this questionnaire. Most plastic surgeons preferred silicone gel implants (98.60%). As for the surface of the implant shell, microtexture implants represent a preference of more than 50%, followed by polyurethane- and macrotexture-coating in the case of subglandular implants. Smooth surfaces are often indicated in the subpectoral or submuscular technique.

Brazil has two factories that supply the domestic market, disseminating the use of polyurethane implants (Silimed®) and foam implants (LifeSil®). There are many brands of implants available, with good features for safe practice. Classification of the brand used showed the following in descending order: Silimed® (54.69%); Mentor® (44.71%); Allergan® (31.74%); Polytech® (23.95%); LifeSil® (11.78%), Motiva® (2.0%) and others (20.16%). The volume of implants most commonly used was in the range of 275-325 mL.

The use of microtextured or coated silicone round implants with polyurethane inserted in the submuscular plane (52.51% and 26.46%, respectively) (Table 3) represents the majority in this study<sup>22</sup>. However, microtexture coatings were preferred by 45.36%, followed by macrotexture (25.64%) and polyurethane (23.33%) in the subglandular plane.

Several comparative studies reveal the low rate of capsular contracture when polyurethane and textured implants are used, which would justify this practice, regardless of the benefits proclaimed by users of smooth implants<sup>23,24</sup>. On the other hand, research by Hidalgo & Sinno<sup>14</sup> suggests that it is currently possible to observe a US preference for smooth silicone implants inserted in the submuscular plane, probably due to the prevalence of ALCL among macrotextured prostheses.

Regarding the types of incision for the placement of implants, a vast majority opted for the inframammary incision (MFI) (89.66%), confirming a historical preference that is currently encouraged, based on the risk of infection when the periareolar technique is employed. In relation to the implant cavity, 54.78% of the surgeons declared their preference for the subglandular space, followed by the subfascial (26.49%) and partially submuscular (“dual plane”) spaces (14.14%). This profile has been observed in other studies<sup>24-27</sup>. However, Singh et al.<sup>22</sup> portrayed a different scenario, pointing to a significant preference (58.9%) for “dual plane” and subglandular (11.2%) pockets. Namnoun et al.<sup>25</sup> showed an incidence of 83% and 14% for the “dual plane” and subglandular planes, respectively<sup>26</sup>.



**Table 4.** Secondary mammoplasty.

Most common reasons for late recovery	Total % of responses
Capsular contracture	49.80
Change of size	35.14
Malposition	7.83
Rupture of the implant	1.00
SEROMA	2.81
Rippling	3.41
Surgical technique most commonly used in capsular contracture	
Total capsulectomy	39.88
Capsulotomy	22.65
Anterior capsulotomy	18.64
Change of pocket	18.64
ADM	0.20
Technique for treatment of recurrent capsular contracture in subglandular implant	
Change of pocket	51.56
Total Capsulectomy	29.46
Anterior Capsulectomy	8.48
No change and consider withdrawal of implants	2.68
Open capsulotomy	0.67
Capsulectomy + ADM	1.69
No surgical treatment if the contracture is bilateral and symmetrical	0.22
Technique for treatment of recurrent capsular contracture in submuscular implants	
Change of pocket	47.15
Total capsulectomy	17.1
Anterior capsulectomy	15.86
Open capsulotomy	7.40
Capsulectomy + ADM	1.69
No surgical treatment if the contracture is bilateral and symmetrical	1.06
No change and consider withdrawal of implants	9.73
Most common treatment for <i>double-bubble deformity</i>	
Change of pocket	54.04
Replacement of implant in the same existing pocket	22.13
Percutaneous suture or external support for an early appearance	16.60
Capsulorrhaphy only	5.32
Capsulorrhaphy and support with ADM	0.85
Removal of implants	1.06

The use of aspiratory drainage is still a controversial topic, and its benefit ratio remains undefined. In the sample analyzed, more than 80% do not use drains. Of those who used suction drains (18.53%), most did not maintain their use for more than 48 hours (61.66%). These surgeons justify the routine use of drains because of their low hematoma/seroma indices (lower inflammatory response, lower infection rates, and reduced skin fistulae, leading to implant exposure and, virtually, capsular

contracture). A vast majority (94.22%) use intravenous prophylactic antibiotics for anesthetic induction and oral administration in the postoperative period (65.74%)<sup>28</sup>.

In addition, 38.25% of the interviewees favor irrigation of the prosthesis pocket with saline added to the double antibiotic therapy scheme (aminoglycoside and cephalosporin). Liquid bacitracin is not available in Brazil, but it is widely used in the triple antibiotic therapy scheme in other countries. A recent survey by

**Table 5.** General demographic aspects.

Years of practice	Total of responses (%)
0-5	26.24
6-10	19.48
11-15	15.11
16-20	12.72
21-25	8.15
>25	18.29
Nature of practice	
100% reconstructive	0.20
25% esthetic, 25% reconstructive	5.79
50% esthetic, 50% reconstructive	16.77
75% esthetic, 75% reconstructive	50.70
100% aesthetic	26.55
Annual number of primary breast augmentation surgeries	
1 – 10	11.35
11 - 30	34.26
31 - 60	31.27
61-100	15.34
> 100	7.77

the American Society of Plastic Surgeons showed the same protocol, except for irrigation with triple antibiotic therapy in the implant pocket<sup>14</sup>.

The use of perioperative intravenous antibiotics and intraoperative antibiotic irrigation is predominantly prescribed, but the use of oral antibiotics in the postoperative period is defended by only half of the American surgeons<sup>14,29</sup>. Implant pocket irrigation has been extensively studied and recommended for many years but has never been investigated in a randomized trial.

In addition, the specifications of this technique still need to be defined<sup>31</sup>. Many of the irrigation solutions used by surgeons have proved to be inadequate to significantly reduce capsular contracture. *In vitro* research on the efficacy of pocket irrigations, including with povidone-iodine, double antibiotic solution (polymyxin B and gentamicin), cefazolin, and bacitracin have shown that all these irrigations provide inadequate protection against bacteria, which are involved in the subclinical infectious process, producing a biofilm and capsular contracture<sup>30,31</sup>.

Unfortunately, plastic surgeons tend to use prophylactic antibiotics inappropriately. Although there are evidence-based guidelines for selection of proper prophylaxis, and the time and duration of administration of antibiotic agents, many plastic surgeons ignore them<sup>32,33</sup>.

Generally, the use of prophylactic antibiotics is frequent and prolonged. In recent decades, the use of prophylactic antibiotics in plastic surgery, especially

for aesthetic procedures, has increased dramatically, despite the absence of clinical evidence demonstrating a drastic reduction in infection rates or antibiotic efficacy<sup>34</sup>.

The rates of capsular contracture after breast implants range from 1.3-17%<sup>35-38</sup>. Several studies have demonstrated that capsular contracture has a multifactorial cause and is not fully characterized<sup>36</sup>. Studies have shown that capsular contracture is one of the main causes of breast implant replacement<sup>37</sup>, showing several rates, with variables of 1.9%, 5.3%, 19.1%, 52.6% and 58%<sup>38-42</sup>.

These rates are inconsistent, since the studies are extremely heterogeneous and follow-up is highly inconsistent. When these studies are compared, we notice a lack of standardization of surgical techniques involving various types of implants and incisions, favoring the heterogeneity of results. In a recent British study by Headon et al.<sup>39</sup>, the authors analyzed several studies, covering 3716 patients, and demonstrated an average of 10% capsular contracture.

Factors associated with reduced rates of capsular contracture are related to the handling of implants during surgery<sup>43</sup>, pocket irrigation with triple antibiotic therapy during surgery<sup>29</sup>, the use of implants coated with polyurethane<sup>44</sup>, steroid and vitamin E irrigation around the implant<sup>3,45</sup>, systemic leukotriene antagonists<sup>46,47</sup>, localization of locally active anti-inflammatory adhesives<sup>48</sup>, topical application of 5-fluorouracil<sup>49</sup>, and photochemical tissue treatment<sup>50</sup>.

Pharmacological agents for the prevention of capsular contracture are not popular in Brazil, since 52.89% of respondents had never used them because of unclear evidence to prove their effectiveness<sup>51</sup>. Non-surgical methods for approaching capsular contracture were investigated, revealing that 35.94% did not use any clinical methods (e.g. massage, closed capsulotomy, use of leukotrienes, etc.).

Leukotriene antagonists (42.7%), massage (32.77%) and external ultrasound (11.42%) were used by the interviewees. Many plastic surgeons believe that pharmacological agents are more likely to work early in the contraction process and that leukotriene inhibitors are the best agents<sup>52</sup>.

The main causes of late replacement of breast implants in this study involved capsular contracture and the size change of the implant, representing indices of 49.80% and 35.14%, respectively. This high incidence of implant volume change surgeries observed in the study seems likely to improve with more adequate preoperative management. On the other hand, the atrophy of the breast tissue related to continuous pressure produced by the implant against glands should be considered<sup>53</sup>.

Regarding the surgical approach of primary capsular contracture, the most-used method was total capsulectomy (39.88%), followed by capsulotomy (22.65%), anterior capsulectomy/site change (18.6%), and ADM (Table 4). There is no consensus that prior capsulectomy alone is a better treatment for primary capsular contracture over total capsulectomy.

A systematic review was conducted by Wan & Rohrich<sup>37</sup>, attesting to limited clinical evidence regarding the surgical treatment of capsular contracture. Location change and implant replacement were associated with reduced rates of contracture recurrence, and probably played a beneficial role in the treatment of capsular contracture. The data on capsulectomy were less conclusive. The ADM was considered useful, but long-term data is still required<sup>54</sup>.

Regarding the surgical approach of recurrent capsular contracture, in cases of subpectoral or subglandular implants, there was a preference for a change to implant pocket (47.15% and 51.56%) and total capsulectomy (17.1% and 29.46%), followed by anterior capsulectomy (15.86% and 8.48%), respectively (Table 4). Among US plastic surgeons, the use of ADMs alone or in combination with the techniques discussed above is gaining popularity<sup>54-58</sup>.

As shown earlier in this study, most Brazilian plastic surgeons do not opt for the subpectoral pocket in primary surgery and capsulectomy plus site; and the exchange of implants is referred to by many as the gold standard treatment for clinically significant capsular contracture<sup>59-61</sup>.

The demographic pattern found in this research provided a broad view of the surgeons', experience, with a homogeneous distribution between 1 and 25 years of practice, lending balance and credibility to this survey. The profile found was distributed among different groups, and aesthetic procedures are the most frequent among plastic surgeons in Brazil.

## CONCLUSIONS

The research pointed out that Brazilian plastic surgeons have notable preference for silicone implants with microtextures and polyurethane for use in primary procedures. The subglandular pocket and incision in the inframammary groove are also preferred by the majority of the surgeons. Sizing with round molds is also preferred as an important measure in the preoperative period. Intravenous antibiotics are recommended in the perioperative period and oral in the postoperative period.

During surgery, the irrigation of the pocket with a double antibiotic solution is routine. Implant sizes less than 325 mL are usually used. Drainage is not considered to be an effective tool by most of the surgeons. Finally, there is no consensus about lipotransfer in the breasts, management of capsular contracture, and double bubble deformity.

## ACKNOWLEDGEMENTS

We thank the LifeSil company, which sponsored and provided the application used in this research.

## REFERENCES

1. International Society of Aesthetic Plastic Surgery - ISAPS. 2016 Global Statistics [Internet]. Hanover, NH: ISAPS. Disponível em: <https://www.isaps.org/medical-professionals/isaps-global-statistics/>
2. Spear SL. Capsulotomy, capsulectomy, and implantectomy. *Plast Reconstr Surg.* 1993;92(2):323-4.

## COLLABORATIONS

- |             |   |
|-------------|---|
| <b>LCS</b>  | Conception and design study, data curation, methodology, project administration, realization of operations and/or trials. |
| <b>NFGA</b> | Analysis and/or data interpretation, conceptualization, writing - review & editing.                                       |
| <b>JPA</b>  | Data Curation, investigation.   |
| <b>PRL</b>  | Final manuscript approval, supervision, validation, writing - review & editing.   |

3. Araco A, Caruso R, Araco F, Overton J, Gravante G. Capsular contractures: A systematic review. *Plast Reconstr Surg.* 2009;124(6):1808-19.
4. Lee HK, Jin US, Lee YH. Subpectoral and precapsular implant repositioning technique: Correction of capsular contracture and implant malposition. *Aesthetic Plast Surg.* 2011;35(6):1126-32.
5. Handel N, Cordray T, Gutierrez J, Jensen JA. A long-term study of outcomes, complications, and patient satisfaction with breast implants. *Plast Reconstr Surg.* 2006;117(3):757-67.
6. Tebbetts JB. "Out points" criteria for breast implant removal without replacement and criteria to minimize reoperations following breast augmentation. *Plast Reconstr Surg.* 2004;114(5):1258-62.
7. Freeman BS. Successful treatment of some fibrous envelope contractures around breast implants. *Plast Reconstr Surg.* 1972;50(2):107-13.
8. Hippias CJ, Raju R, Straith RE. Influence of some operative and postoperative factors on capsular contracture around breast prostheses. *Plast Reconstr Surg.* 1978;61(3):384-9.
9. Sugimoto T. Open capsulotomy for capsular contracture: a new procedure for the prevention of recurrence. *Aesthetic Plast Surg.* 1982;6(4):225-30.
10. Chang JB, Small KH, Choi M, Karp NS. Three-dimensional surface imaging in plastic surgery: foundation, practical applications, and beyond. *Plast Reconstr Surg.* 2015;135(5):1295-304.
11. Del Vecchio DA, Bucky LP. Breast augmentation using preexpansion and autologous fat transplantation: a clinical radiographic study. *Plast Reconstr Surg.* 2011;127(6):2441-50.
12. Khouri R, Del Vecchio D. Breast reconstruction and augmentation using pre-expansion and autologous fat transplantation. *Clin Plast Surg.* 2009;36(2):269-80.
13. Tebbetts JB, Adams WP. Five critical decisions in breast augmentation using five measurements in 5 minutes: the high five decision support process. *Plast Reconstr Surg.* 2005;116(7):2005-16.
14. Hidalgo DA, Sinno S. Current Trends and Controversies in Breast Augmentation. *Plast Reconstr Surg.* 2016;137(4):1142-50.
15. Friedman T, Davidovitch N, Schefflan M. Comparative double blind clinical study on round versus shaped cohesive gel implants. *Aesthet Surg J.* 2006;26(5):530-6.
16. Hedén P. Breast augmentation with anatomic, high-cohesiveness silicone gel implants (European experience). In: Spear SL, Willey SC, Robb GL, Hammond DC, Nahabedian MY, eds. *Surgery of the Breast: Principles and Art.* 3rd ed. Philadelphia: Lippincott Williams & Wilkins; 2011. p. 1322-45.
17. Hedén P, Montemurro P, Adams WP Jr, Germann G, Schefflan M, Maxwell GP, et al. Anatomical and Round Breast Implants: How to Select and Indications for Use. *Plast Reconstr Surg.* 2015;136(2):263-72.
18. Bronz G. A comparison of naturally shaped and round implants. *Aesthet Surg J.* 2002;22(3):238-46.
19. Hu H, Jacobs A, Vickery K, Merten SL, Pennington DG, Deva AK. Chronic biofilm infection in breast implants is associated with an increased T-cell lymphocytic infiltrate: implications for breast implant-associated lymphoma. *Plast Reconstr Surg.* 2015;135(2):319-29. DOI: 10.1097/PRS.0000000000000886
20. Kim B, Roth C, Chung KC, Young VL, van Busum K, Schnyer C, et al. Anaplastic large cell lymphoma and breast implants: a systematic review. *Plast Reconstr Surg.* 2011;127(6):2141-50.
21. Lechner MG, Megiel C, Church CH, Angell TE, Russell SM, Sevell RB, et al. Survival signals and targets for therapy in breast implant-associated ALK-anaplastic large cell lymphoma. *Clin Cancer Res.* 2012;18(17):4549-59.
22. Singh N, Picha G, Murphy D. Natrelle Silicone Breast Implant Follow-Up Study. *Plastic and Reconstructive Surgery.* 2016;137(1):70-81.
23. Montandon RE. Estudo de complicações em próteses mamárias: avaliação de 546 casos em oito anos. *Rev Bras Cir Plást.* 2014;29(3):352-60.
24. Hedén P, Bronz G, Elberg JJ, Deraemaecker R, Murphy DK, Slicton A, et al. Long-term safety and effectiveness of style 410 highly cohesive silicone breast implants. *Aesthetic Plast Surg.* 2009;33(3):430-6.
25. Namnoum JD, Largent J, Kaplan HM, Oefelein MG, Brown MH. Primary breast augmentation clinical trial outcomes stratified by surgical incision, anatomical placement and implant device type. *J Plast Reconstr Aesthet Surg.* 2013;66(9):1165-72.
26. Strasser EJ. Results of subglandular versus subpectoral augmentation over time: one surgeon's observations. *Aesthet Surg J.* 2006;26(1):45-50.
27. Cheng A, Lakhiani C, Saint-Cyr M. Treatment of capsular contracture using complete implant coverage by acellular dermal matrix: a novel technique. *Plast Reconstr Surg.* 2013;132(3):519-29.
28. Hunter JG. Appropriate prophylactic antibiotic use in plastic surgery: the time has come. *Plast Reconstr Surg.* 2007;120(6):1732-4.
29. Adams WP Jr, Rios JL, Smith SJ. Enhancing patient outcomes in aesthetic and reconstructive breast surgery using triple antibiotic irrigation: six-year prospective clinical study. *Plast Reconstr Surg.* 2006;118(7 Suppl):46S-52S.
30. Adams WP Jr, Conner WC, Barton FE Jr, Rohrich RJ. Optimizing breast pocket irrigation: an in vitro study and clinical implications. *Plast Reconstr Surg.* 2000;105(1):334-8.
31. Lyle WG, Outlaw K, Krizek TJ, Koss N, Payne WG, Robson MC. Prophylactic antibiotics in plastic surgery: trends of use over 25 years of an evolving specialty. *Aesthet Surg J.* 2003;23(3):177-83.
32. Grunebaum LD, Reiter D. Perioperative antibiotic usage by facial plastic surgeons: national survey results and comparison with evidence-based guidelines. *Arch Facial Plast Surg.* 2006;8(2):88-91.
33. Perrotti JA, Castor SA, Perez PC, Zins JE. Antibiotic use in aesthetic surgery: a national survey and literature review. *Plast Reconstr Surg.* 2002;109(5):1685-93.
34. Peled IJ, Dvir G, Berger J, Ramon I, Ullmann Y, Nachlieli T. Prophylactic antibiotics in aesthetic and reconstructive surgery. *Aesthetic Plast Surg.* 2000;24(4):299-302.
35. Stump A, Holton LH 3rd, Connor J, Harper JR, Slezak S, Silverman RP. The use of acellular dermal matrix to prevent capsule formation around implants in a primate model. *Plast Reconstr Surg.* 2009;124(1):82-91.
36. Araco A, Gravante G, Araco F, Delogo D, Cervelli V, Walgenbach K. A retrospective analysis of 3,000 primary aesthetic breast augmentations: postoperative complications and associated factors. *Aesthetic Plast Surg.* 2007;31(5):532-9.
37. Wan D, Rohrich RJ. Revisiting the Management of Capsular Contracture in Breast Augmentation: A Systematic Review. *Plast Reconstr Surg.* 2016;137(3):826-41.
38. Maxwell GP, Van Natta BW, Bengtson BP, Murphy DK. Ten-year results from the Natrelle 410 anatomical form-stable silicone breast implant core study. *Aesthet Surg J.* 2015;35(2):145-55.
39. Headon H, Kasem A, Mokbel K. Capsular Contracture after Breast Augmentation: An Update for Clinical Practice. *Arch Plast Surg.* 2015;42(5):532-43.
40. Pitanguy I, Amorim NFG, Ferreira AV, Berger R. Análise das trocas de implantes mamários nos últimos cinco anos na Clínica Ivo Pitanguy. *Rev Bras Cir Plást.* 2010;25(4):668-74.
41. Martins MRC, Hakme F, Garofo FLE, Rosa LA, Carreiro M, Shugen C. Estudo retrospectivo sobre implantes mamários em nosso serviço. *Rev Bras Cir Plást.* 2012;27(3 Suppl.1):71.
42. Collis N, Coleman D, Foo IT, Sharpe DT. Ten-year review of a prospective randomized controlled trial of textured versus smooth subglandular silicone gel breast implants. *Plast Reconstr Surg.* 2000;106(4):786-91.
43. Adams WP Jr. Capsular contracture: what is it? What causes it? How can it be prevented and managed? *Clin Plast Surg.* 2009;36(1):119-26.

44. Vázquez G, Pellón A. Polyurethane-coated silicone gel breast implants used for 18 years. *Aesthetic Plast Surg.* 2007;31(4):330-6.
45. Seckel BR, Costas PD. Total versus partial musculofascial coverage for steroid-containing double-lumen breast implants in augmentation mammoplasty. *Ann Plast Surg.* 1993;30(4):296-301.
46. Spano A, Palmieri B, Taidelli TP, Nava MB. Reduction of capsular thickness around silicone breast implants by zafirlukast in rats. *Eur Surg Res.* 2008;41:8-14.
47. Scuderi N, Mazzocchi M, Rubino C. Effects of zafirlukast on capsular contracture: controlled study measuring the mammary compliance. *Int J Immunopathol Pharmacol.* 2007;20(3):577-84.
48. Le Louarn C, Buis J, Auclair E. Flector tissugel used to treat capsular contracture after breast augmentation surgery. *Aesthetic Plast Surg.* 2008;32(3):453-8.
49. Ibrahim Canter H, Konas E, Bozdogan O, Vargel I, Ozbatur B, Oner F, et al. Effect of slow-release 5-Fluorouracil on capsule formation around silicone breast implants: an experimental study with mice. *Aesthetic Plast Surg.* 2007;31(6):674-9.
50. Fernandes JR, Salinas HM, Broelsch GF, McCormack MC, Meppelink AM, Randolph MA, et al. Prevention of capsular contracture with photochemical tissue passivation. *Plast Reconstr Surg.* 2014;133(3):571-7.
51. Cheng HT, Lin FY, Chang SC. The effects of antileukotriene agents on capsular contracture: an evidence-based analysis. *Plast Reconstr Surg.* 2012;129(6):1018e-20.
52. Huang CK, Handel N. Effects of Singulair (montelukast) treatment for capsular contracture. *Aesthet Surg J.* 2010;30(3):404-8.
53. Roxo AC, Nahas FX, Bazi F, de Castro CC, Aboudib JH, Marques RG. Evaluation of the effects of silicone implants on the breast parenchyma. *Aesthet Surg J.* 2015;35(8):929-35. DOI: 10.1093/asj/sjv120
54. Maxwell GP, Gabriel A. Acellular dermal matrix for reoperative breast augmentation. *Plast Reconstr Surg.* 2014;134(5):932-8.
55. Costagliola M, Atiyeh BS, Rampillon F. An innovative procedure for the treatment of primary and recurrent capsular contracture (CC) following breast augmentation. *Aesthet Surg J.* 2013;33(7):1008-17.
56. Spear SL, Carter ME, Ganz JC. The correction of capsular contracture by conversion to "dual-plane" positioning: technique and outcomes. *Plast Reconstr Surg.* 2003;112(2):456-66.
57. Hidalgo DA, Spector JA. Breast augmentation. *Plast Reconstr Surg.* 2014;133(4):567e-83.
58. Rohrich RJ, Parker TH 3rd. Aesthetic management of the breast after explantation: evaluation and mastopexy options. *Plast Reconstr Surg.* 2007;120(1):312-5.
59. Maschio AG, Graf RM, Mascante RFR, Paula DR, Masi FDJ, Varaschin BFB. Mamoplastia de aumento - dicas para melhor adaptação da prótese na loja subfascial. *Rev Bras Cir Plást.* 2018;33(Suppl.1):18-9.
60. Mansur JRB, Bozola AR. Mastopexia e aumento das mamas com proteção e suporte inferior da prótese com retalho de pedículo inferior. *Rev Bras Cir Plást.* 2009;24(3):304-9.
61. Sperli A Jr. AB, Freitas JOG, Michalany N. Complicações com Próteses Mamárias. *Rev Bras Cir Plást.* 2000;15(3):33-46.

---

**\*Corresponding author:****Luiz Charles-de-Sá**

Rua visconde Pirajá, 351, Sls 1211-1212, Ipanema, Rio de Janeiro, Brazil.

CEP: 22410-003

E-mail: clinicaperforma@uol.com.br