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ORIGINAL ARTICLE – BREAST ONCOLOGY

National Survey on Attitudes of Brazilian Breast Surgeons Regarding Oncoplastic Surgery: Success of a Training Model

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ABSTRACT

Background. Historically, breast reconstruction was performed by plastic surgeons. The Brazilian Society of Mastology (SBM) implemented initiatives to improve breast surgeons' training in oncoplastic techniques; however, the current proportion of surgeons performing these techniques remained unknown. This study aimed to determine the proportion of Brazilian breast surgeons performing oncoplastic surgery, their previous training, the complexity of procedures performed, and factors influencing adoption of techniques.

Methods. In this survey, a structured questionnaire was sent to all SBM-affiliated breast surgeons between July and December 2023. Outcome proportions were estimated using binomial distribution. Adjusted proportion ratios (aPR) were calculated using robust Poisson regression.

Results. A 60.2% valid response rate was achieved (n = 1059/1759). Almost half of the respondents performed oncoplastic surgery, with most being young (< 40 years) (aPR: 1.66; 1.31–1.10; $p < 0.001$), male (aPR: 1.39; 1.22–1.59; $p < 0.001$), southern residents (aPR: 1.39; 1.18–1.63; $p < 0.001$), with a specialist degree in breast disease (aPR: 1.19; 1.00–1.42; $p < 0.004$), primarily trained in general surgery (aPR: 1.32; 1.16–1.51; $p < 0.001$) and secondarily in breast surgery (aPR: 1.41; 1.08–1.85; $p = 0.01$), and performing > 100 surgeries/year (aPR: 1.72; 1.49–1.99; $p < 0.001$). The techniques most commonly mastered were simple displacement (88.7%), therapeutic mammoplasty or contralateral symmetrization (96.4%), reconstruction with implants or tissue expanders (93.6%), extreme oncoplasty (81%), skin- and

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nipple-sparing (99%) or skin-reducing mastectomy (84.2%), and thoracoabdominal flaps (71.7%).

Conclusions. A high proportion of Brazilian mastologists perform oncoplastic surgery. These findings provide key insights to further enhance training and improve outcomes.

Keywords Breast cancer · Mastectomy · Segmental mastectomy · Subcutaneous mastectomy · Oncoplasty · Oncoplastic · Oncoplastic surgery · Mammoplasty · Implants · Breast reconstruction · Questionnaires · Survey

Breast cancer surgery has evolved substantially since radical mastectomy.[1] Breast-conserving surgery (BCS) improves quality of life, with overall survival rates being similar to those obtained with mastectomy.[2–8] Breast reconstructions have progressed from being delayed to immediate and from the use of myocutaneous flaps to implants, facilitated by skin- and nipple-sparing mastectomies.[9–14]

Historically, breast reconstruction was performed by plastic surgeons. However, growing interest from both patients and breast surgeons led to the adoption of these techniques in breast cancer surgery, giving rise to oncoplastic surgery.[15] Initially, oncoplastic surgery was associated with BCS and breast volume displacement. More recently, it has been associated with volume replacement (> 50%), using implants or myocutaneous flaps.[15–17] Moreover, it has been extended to breast conservation for patients who need mastectomy (extreme oncoplasty),[18–20] while more recently, fat grafting allows cosmetic refinement.[21,22] Oncoplastic surgery also enables major defects of the chest wall to be corrected in cases of locally advanced breast cancer (LABC).[23]

Despite a continuously growing interest,[24–30] oncoplastic techniques have yet to be fully implemented for several reasons, including surgeon training.[31–34] Various training models exist;[35,36] however, no preestablished training model has been defined in the literature, and the impact of these educational measures on breast surgeon practice is unknown. Over the years, the Brazilian Society of Mastology (SBM) has promoted hands-on courses,[37] new fellowships, and the inclusion of oncoplastic surgery in medical residency programs.[38] A considerable percentage of breast specialists may already perform oncoplastic surgery, including more complex techniques; however, the percentage of qualified breast surgeons is unknown, as is the level of complexity involved and how such skills were developed.

This study aimed to determine the proportion of Brazilian breast surgeons who perform oncoplastic surgery and the associated demographic factors. Secondary objectives were to evaluate factors associated with the different surgical techniques.

METHODS

This cross-sectional survey-based study was conducted with SBM affiliates between June and December 2023. The SBM is a medical association of Brazilian surgeons that prevents, diagnoses, and treats breast diseases, especially breast cancer. SBM full members must have obtained a specialist degree in breast disease (TEMA) through a test conducted jointly by the SBM and the Brazilian Medical Association (AMB). In the past, general surgeons or gynecologist with 4 years of training and clinical practice in breast disease were suitable for TEMA. Since 2005, certified mastologists must complete a medical residency in general surgery or gynecology, followed by a 2-year residency in mastology to be registered with state medical boards.

A structured online questionnaire was delivered using the SurveyMonkey® electronic platform between specific collection dates (intersectional) within a 6-month interval. Invitations were sent to the registered e-mail addresses and cellphones of all SBM members at weekly intervals in the first month, then every 2 weeks in subsequent months (Supplementary Material/Promotional Material). A link to the questionnaire, accessed using a QR code, was also sent to members' postal addresses. Members' contact information, last updated in 2023, was considered complete and reliable. Without prior screening, all associates were assumed to be eligible, and the concept of unknown eligibility was not applied. Members who failed to return the questionnaire were classified as nonrespondents. The updated demographic data of the 1759 SBM members (age, sex, region of residence, and whether they had been awarded a specialist degree in breast disease) were provided by the society prior to commencement. This study followed the American Association for Public Opinion Research (AAPOR) recommendations[39] and the Checklist for Reporting Results of Internet E-Surveys (CHERRIES).[40]

This study was evaluated by the internal review board of the Fortaleza General Hospital and approved under reference CAAE 70529823.3.0000.5040.

Outcomes and Questionnaire

Performing oncoplastic surgery was the primary outcome. The secondary outcomes were the performance of specific techniques.

A structured 30-item questionnaire containing three domains was designed specifically for this study (Supplementary Material/Survey Questionnaire). Part I consisted of general and demographic questions: age, divided into defined intervals as young [≤ 40 years], middle age [41–60 years], and elderly [> 60 years] surgeons, sex, affiliated societies, region of residence, whether respondent had been awarded a specialist degree in breast disease, population size in the

city of work (< 100,000, 100,000–500,000, or > 500,000 inhabitants), primary training (general surgery or obstetrics/gynecology), secondary surgical training (breast surgery, surgical oncology, plastic surgery, none), and place of work (private office, public or private institute). Part II focused on respondents' experience in breast surgery (< 5 years, 5–10 years. 10–20 years or > 20 years), estimated number of cases/year (< 10, 11–50, 51–100, or > 100 cases/year) and the professional in charge of oncoplastic surgeries (the respondent, another breast surgeon, or a plastic surgeon). That last question defined the primary outcome. Part III addressed oncoplastic surgeons only: type of training (residency, fellowships, theoretical and practical courses, observership, congresses, websites, online courses); and level of knowledge on different oncoplastic techniques, for either early-stage or LABC.

The elaborated questionnaire was initially reviewed by three mastologists with expertise in oncoplasty in Brazil (Paulinelli, R; Oliveira, V; Brenelli, F) to assess the functionality, consistency, and correlation of the questions and items, and the appropriate corrections were made to make them reliable and the answers consistent. They had at last 15 years of experience in oncoplastic surgery. We then conducted a pilot test with ten SBM members who would participate in the survey, evaluated the data obtained from this test and verified whether the respondents had difficulty answering the questions or if any item was confusing. All had at least 19 years of experience in breast surgery, and half of them had 14 years of experience in oncoplastic surgery. We eliminated redundant questions or confusing items. The estimated time required to complete the entire questionnaire was 5 min.

Response Rate

The response rate was calculated on the basis of the primary outcome: the number of responses divided by the number of eligible individuals (SBM members). Only complete questionnaires, with at least 80% of the questions answered, including question 13 ("Who performs the oncoplastic surgeries in your unit?") were analyzed. Partially complete questionnaires, with 50–79% of the questions answered, were not included in the response rate calculation; however, the information provided was analyzed. Questionnaires with < 50% of the questions answered were excluded.

Statistical Analysis

The chi-squared test was used to compare data between respondents and nonrespondents on age, sex, region of residence, and whether they had been awarded a specialist degree. Age is described by mean and standard deviation, and other variables by absolute and relative frequencies. The proportion of outcomes was calculated using binomial distribution. Associations between demographic factors (questions 2–12) and the outcomes were evaluated using Poisson models with robust variance for proportion ratios. For the secondary outcomes, question 14 was also included. For each endpoint, univariate models were first adjusted. Factors with $p < 0.20$ were entered into a multivariate model using backward stepwise regression in which only factors with $p < 0.05$ remained. The oncoplastic techniques used were described using absolute and relative frequencies.

RESULTS

Overall, 1096 breast surgeons returned the questionnaire within the established study period. Of these, 1059 questionnaires were considered complete and eligible for analysis, with a response rate of 60.2%. Most respondents were female ($n = 544$; 51.4%), aged 40–59 years ($n = 577$; 54.8%), and southeast residents ($n = 508$, 48.1%) (Table 1).

Respondents and nonrespondents were similar regarding age, region of residence, and whether they had a specialist degree in breast diseases. The proportion of males was higher among respondents compared with nonrespondents ($p < 0.001$) (Table 2).

For the primary outcome, 527 respondents (49.8%; 95% CI 46.71–52.81) performed oncoplastic surgery. The main training models used by responders were hands-on courses (36.5%), fellowships (21.4%), and residency programs (32.9%). Of these, most were of younger age (adjusted prevalence ratio [aPR]: 1.66; 1.31–1.10; $p < 0.001$ for the 27–40-year age group, and aPR: 1.42; 95% CI 1.15–75; $p = 0.001$ for the 41–60-year age group when compared with the 61–82-year age group), male (aPR: 1.39; 95%CI 1.22–1.59; $p < 0.001$), living in the south (aPR: 1.39; 95% CI 1.18–1.63; $p < 0.001$) or north+northeast+midwest (aPR: 1.23; 95% CI 1.08–1.40; $p = 0.002$) compared with the southeast, had a specialist degree in breast disease (aPR: 1.19; 95% CI 1.00–1.42; $p = 0.04$), were primarily trained in general surgery (aPR: 1.32; 95% CI 1.16–1.51; $p < 0.001$) and secondarily in breast surgery (aPR: 1.41; 95% CI 1.08–1.85; $p = 0.01$), and performed > 100 surgeries/year (aPR: 1.72; 1.49–1.99; $p < 0.001$) (Table 3).

The most common procedures were simple displacement (88.7%), therapeutic mammoplasty or contralateral symmetrization (96.4%), total breast reconstruction with implants or tissue expanders (93.6%), extreme oncoplasty (81%), skin/nipple-sparing (99%) or skin-reducing mastectomy (84.2%), and thoracoabdominal flaps (71.7%) (Table 4).

Regarding the techniques least performed (< 70%), augmentation mammoplasty (53.9%; 95% CI 50.0–58.8) was associated with male surgeons, southeast residents, cities with >500,000 inhabitants, and having a specialist degree

TABLE 1 Demographic characteristics of the survey respondents

Characteristics	Does not perform oncoplastic surgery	Performs oncoplastic surgery	Total
	n = 532 (100%)	*n* = 527 (100%)	*n* = 1059 (100%)
Age (years)			
Mean (SD)	49.1 (11.5)	46.8 (10.7)	48.0 (11.2)
27–40	144 (28.07)	162 (32.21)	306 (30.12)
41–60	272 (53.02)	285 (56.66)	557 (54.82)
61–82	97 (18.91)	56 (11.13)	153 (15.06)
Information not available	19	24	43
Sex			
Male	221 (41.62)	292 (55.51)	513 (48.53)
Female	310 (58.38)	234 (44.49)	544 (51.47)
Information not available	1	1	2
Geographic region of the country			
Midwest	44 (8.30)	49 (9.32)	93 (8.81)
Northeast	114 (21.51)	131 (24.90)	245 (23.20)
North	22 (4.15)	26 (4.94)	48 (4.55)
Southeast	285 (53.77)	223 (42.40)	508 (48.11)
South	65 (12.26)	97 (18.44)	162 (15.34)
Information not available	2	1	3
Specialization degree in breast disease			
Yes	415 (78.01)	428 (81.37)	843 (79.68)
No	117 (21.99)	428 (19.23)	215 (20.32)
Information not available	0	1	1
City of work			
Fewer than 500,000 inhabitants	140 (26.42)	165 (31.37)	305 (28.88)
Over 500,000 inhabitants	390 (73.58)	361 (68.63)	751 (71.12)
Information not available	2	1	3
Primary surgical training			
General surgery	108 (20.42)	165 (31.31)	273 (25.85)
Obstetrics/gynecology	421 (79.56)	362 (68.69)	783 (74.15)
Information not available	3	0	3
Secondary surgical training			
Breast surgery	485 (91.34)	495 (93.93)	980 (92.63)
Other	46 (8.66)	32 (6.07)	78 (7.73)
Information not available	1	0	1
Place of work			
Public hospital/institute	158 (29.70)	183 (34.72)	341 (32.20)
Private hospital/institute	83 (15.60)	92 (17.46)	175 (16.53)
Private office	291 (54.70)	252 (47.82)	543 (51.27)
Type of surgery respondent performs			
Only breast	335 (63.09)	426 (80.83)	761 (71.93)
Breast and other sites	196 (36.91)	101 (19.17)	297 (28.07)
Information not available	1	0	1
Experience			
Less than 20 years	303 (57.06)	332 (63.00)	635 (60.02)
More than 20 years	228 (42.94)	195 (37.00)	195 (37.00)
Information not available	1	0	0
Number of cases operated/year			
1–50	336 (63.40)	208 (39.47)	544 (52.31)
51–100	127 (23.96)	147 (27.89)	274 (25.87)
≥ 101	67 (12.64)	172 (32.64)	239 (21.82)

Table 1 (continued)

Characteristics	Does not perform oncoplastic surgery	Performs oncoplastic surgery	Total
Information not available	2	0	2

TABLE 2 Comparison between respondents and nonrespondents of the questionnaire

Characteristics	Respondents, *n* (%)	Nonrespondents, *n* (%)	Total, *n* (%)	*p* Value[a]
Age (years)				0.19
20–40	306 (30.12)	202 (29.4)	508 (28.9%)	
41–59	557 (54.82)	334 (48.7)	891 (50.6%)	
61–79	153 (15.06)	149 (21.7)	302 (17.1%)	
Sex				< 0.001
Male	513 (48.53)	274 (39.0)	787 (44.7)	
Female	544 (51.47)	428 (61.0)	972 (56.3)	
Geographical region				0.17
South	162 (15.34)	112 (15.9)	274 (15.5)	
Southeast	508 (48.11)	368 (52.3)	876 (49.8)	
Northeast	245 (23.20)	144 (20.4)	389 (22.1)	
North	48 (4.55)	22 (3.1)	70 (4.1%)	
Midwest	93 (8.81)	57 (8.1)	150 (8.5%)	
Specialization degree in breast disease				0.27
Yes	843 (79.68)	568 (81)	1411 (80.2%)	
No	215 (20.32)	133 (19)	348 (19.8%)	

[a]Chi-squared test

in breast disease. LD flap (65.9%; 95% CI 61.6–70.1%) was also associated with males and large cities. Use of the TRAM/VRAM flap (28.2%; 95% CI 24.3–32.2) was associated with males, large cities, performing only breast surgery, operating > 100 cases/year, and having learned the technique through residency or fellowship. Fat grafting (65.9%; 95% CI 57.2–65.9%) was not associated with sex, but with south or southeast residents and large cities (Table 5; Supplementary Tables S1–S5).

DISCUSSION

Oncoplastic surgery was first proposed in the 1990s; however, publications on the training and academic experience of breast surgeons only began to appear in 2000. Of the different training and academic learning strategies, the optimal method has yet to be established. In Brazil, the SBM encouraged training centers to be set up, where, initially, senior breast surgeons were trained. After 2008, training was extended to fellows, and the inclusion of oncoplastic surgery in residency programs in breast surgery was encouraged. Nevertheless, the impact of these multiple actions on the diffusion of oncoplastic surgery among breast surgeons remained unknown.[38]

This study highlights an important change in the attitudes of Brazilian breast surgeons. Around 50% of those surveyed here performed oncoplastic surgery. Of these, the great majority reported performing techniques such as therapeutic mammoplasty (96.4%) and reconstruction using implants or tissue expanders (93.6%). Many operate with LD flaps (65.9%) and fat grafting (61.5%). This change may reflect educational actions implemented, giving rise to a subspeciality within breast surgery.

Oncoplastic surgery is a recent phenomenon in the history of breast surgery. Actions were necessary to train older surgeons, especially those working in training services, in order to train the new generation of breast surgeons. Therefore, at first, the SBM invested in the training of senior surgeons, through practical courses,[37] valuing the training of service preceptors.[38] At the same time, it invested in the training of new surgeons, through fellowships and inclusion of oncoplasty in the regular curriculum of medical residency.[38] A previous study considered that 30% of Brazilian mastologists would have previous experience in oncoplasty,[38] and it was observed that half of the interviewees had such experience. This fact may represent a bias related to the responses; however, we can observe that the level of training is high. In this survey, three actions represented 90.8% of the training model: practical courses (36.5%), fellowships (21.4%), and residency programs (32.9%).

Indeed, there is growing interest in oncoplastic surgery among breast surgeons, not only in Brazil but worldwide. Studies in various countries have evaluated the interest in and use of these techniques.[22] The American Society of Breast Surgeons found that 99% of 708 members had at least some interest in oncoplastic surgery; however, only 10% had performed reduction mammoplasty or contralateral symmetrization.[22] A Canadian study involving 234 breast surgeons reported similar findings.[41] In a survey conducted with 208 general surgeons in Turkey, where the rate of oncoplastic procedures is low, > 50% of respondents stated that oncoplastic surgery should be provided by a general surgeon.[26] Various actions have been implemented in the UK, including training courses with cadavers, the inclusion of oncoplastic surgery in the curriculum of specialist courses on breast surgery, training in multidisciplinary teams, and the creation of fellowships. Breast surgeons and plastic surgeons collaborated in developing these skills, resulting in breast reconstruction being provided to thousands of women in 2008.[42,43] In Brazil, however, certain hurdles were encountered, with debates regarding the area in which each specialty should operate.

TABLE 3 Factors associated with performing oncoplastic surgery

Factors	Oncoplastic surgery (yes)[a] *N* = 527 (%)	Oncoplastic surgery (no)[a] *N* = 532 (%)	PR	*p* Value	aPR	*p* Value
Age (years)						
27–40	162 (52.94)	144 (47.06)	1.45 (1.14–1.83)	< 0.001	1.66 (1.31–1.10)	< 0.001
41–60	285 (51.17)	272 (48.83)	1.40 (1.12–1.75)	0.003	1.42 (1.15–1.75)	0.001
61–82	56 (36.60)	97 (63.40)	1.00		1.00	
Information not available	24	19				
Sex						
Male	292 (56.92)	221 (43.08)	1.32 (1.17–1.50)	< 0.001	1.39 (1.22–1.59)	< 0.001
Female	234 (43.01)	310 (56.99)	1.00		1.00	
Information not available	1	1				
Geographical region						
South	97 (59.88)	65 (40.12)	1.36 (1.16–1.60)	< 0.001	1.39 (1.18–1.63)	< 0.001
Others	206 (53.37)	180 (46.63)	1.21 (1.06–1.39)	0.004	1.23 (1.08–1.40)	0.002
Southeast	223 (43.90)	285 (56.10)	1.00		1.00	
Information not available	1	2				
Specialist degree in breast disease						
Yes	428 (50.77)	415 (49.23)	1.11 (0.95–1.31)	0.19	1.19 (1.00–1.42)	0.04
No	98 (45.58)	117 (54.42)	1.00		1.00	
Information not available	1	0				
City of work						
< 500,000 inhabitants	165 (54.10)	140 (45.90)	1.12 (0.99–1.28)	0.06		
> 500,000 inhabitants	361 (48.07)	390 (51.93)	1.00			
Information not available	1	2				
Primary surgical training						
General surgery	165 (60.44)	108 (39.56)	1.31 (1.16–1.48)	< 0.001	1.32 (1.16–1.51)	< 0.001
Obstetrics/gynecology	362 (46.23)	421 (53.77)	1.00		1.00	
Information not available	0	2				
Secondary surgical training						
Breast surgery	495 (50.51)	485 (49.49)	1.23 (0.94–1.62)	0.14	1.41 (1.08–1.85)	0.01
Other	32 (41.02)	46 (58.98)	1.00		1.00	
Information not available	0	1				
Place of work						
Public hospital or institute	183 (53.67)	158 (46.23)	1.16 (1.01–1.32)	0.03		
Private hospital or institute	92 (52.57)	83 (47.43)	1.13 (0.96–1.34)	0.14		
Private office	252 (46.41)	291 (53.59)	1.00			
Type of surgery respondent performs						
Only breast surgery	426 (55.98)	335 (44.02)	1.65 (1.39–1.95)	< 0.001		
Breast and other sites	101 (34.01)	196 (65.99)	1.00			
Information not available	0	1				
Experience						
< 20 years	332 (52.28)	303 (47.72)	1.13 (0.99–1.29)	0.05		
> 20 years	195 (46.10)	228 (53.90)	1.00			
Information not available	0	1				
Number of cases operated per year						
≥101	147 (68.69)	67 (32.31)	1.80 (1.56–2.07)	< 0.001	1.72 (1.49–1.99)	< 0.001
51–100	172 (57.53)	127 (42.47)	1.50 (1.30–1.74)	< 0.001	1.44 (1.24–1.67)	< 0.001
1–50	208 (38.24)	336 (61.76)	1.00		1.00	
Information not available	0	2				

Table 3 (continued)

PR prevalence ratio, *aPR* adjusted prevalence ratio

[a]Proportion that performs or not oncoplastic surgery for each factor

TABLE 4 Oncoplastic techniques in use

Respondent performs oncoplastic techniques	Yes $n = 527$ (100.0%)
Main source of training in oncoplastic techniques	
Residency program or fellowship	276 (54.54)
Hands-on course	185 (36.56)
Observership	31 (6.13)
Online courses/websites	6 (1.19)
Congresses	8 (1.58)
Information not available	21
Overall percentage of surgeries using oncoplastic techniques	
0–25% of cases	67 (13.24)
26–50% of cases	143 (28.26)
51–75% of cases	148 (29.25)
76–100% of cases	148 (29.25)
Information not available	21
Type of surgery performed	
Simple breast remodeling (level 1)	449 (88.74)
Techniques of mammoplasty and/or contralateral symmetrization (level II)	489 (96.45)
Techniques of extreme oncoplastic surgery	410 (81.03)
Immediate full breast reconstruction with implants/tissue expanders	475 (93.69)
Skin- and nipple-sparing mastectomies	500 (99.01)
Skin-reducing mastectomies	427 (84.22)
Surgeries that use meshes or dermal matrices	90 (17.79)
Augmentation mammoplasty	276 (54.44)
Reconstruction using a musculocutaneous latissimus dorsi flap	331 (65.94)
Reconstruction using a musculocutaneous transverse rectus abdominis flap	143 (28.21)
Microsurgery	6 (1.19)
Thoracoabdominal flaps	364 (71.79)
Fat grafting	312 (61.54)
Preferred flap in locally advanced breast cancer with minor defects of the chest wall	
Myocutaneous latissimus dorsi flap	164 (34.38)
Myocutaneous oblique abdominal flap	10 (2.10)
Thoracoabdominal flap	288 (60.38)
Transverse rectus abdominis myocutaneous flap (TRAM)	12 (2.52)
Vertical rectus abdominis myocutaneous flap (VRAM)	3 (0.63)
Information not available	49
Preferred flap in locally advanced breast cancer with major defects of the chest wall	
Myocutaneous latissimus dorsi flap	281 (59.53)
Myocutaneous oblique abdominal flap	36 (7.63)
Thoracoabdominal flap	74 (15.68)
Transverse rectus abdominis myocutaneous flap (TRAM)	65 (13.77)
Vertical rectus abdominis myocutaneous flap (VRAM)	16 (3.39)
Information not available	54

TABLE 5 Multivariate analysis of the factors associated with specific surgeries

	Breast augmentation Adjusted PR; *p*-value	LD Adjusted PR; *p*-value	Fat grafting Adjusted PR; *p*-value	TRAM/VRAM Adjusted PR; *p*-value
Sex				
Male	1.18 (1.01–1.39; $p = 0.04$)	1.38 (1.20–1.58; $p < 0.001$)		2.31 (1.64–3.27; $p < 0.001$)
Female	1.00	1.00		1.00
Geographical region				
South	0.90 (0.71–1.13)		1.19 (1.03–1.38; $p = 0.02$)	
Others	0.83 (0.70–0.99; $p = 0.03$)		0.78 (0.66–0.92; $p = 0.003$)	
Southeast	1.00		1.00	
City of work				
More than 500,000	1.39 (1.14–1.70; $p < 0.001$)	1.16 (1.01–1.34; $p = 0.04$)	1.23 (1.05–1.43; $p = 0.01$)	1.65 (1.14–2.39; $p = 0.008$)
Fewer than 500,000	1.00	1.00	1.00	1.00
Secondary surgical training				
Breast surgery	2.00 (1.14–3.51; $p = 0.01$)			
Others	1.00			
Type of surgery performed				
Only breast surgery				0.57 (0.42–0.80; $p = 0.001$)
Breast and others				1.00
Number of cases per year				
> 101				1.44 (1.03–2.02; $p = 0.03$)
51–100				0.76 (0.50–1.15)
1–50				1.00
Surgical training				
Residency or fellowship				1.58 (1.16–2.15; $p = 0.003$)
Courses				1.00

Historically, breast reconstruction techniques were performed by plastic surgeons. However, plastic surgeons are unavailable in many institutes and cities in Brazil and within the public healthcare network. Situations in other countries are similar.[41] Furthermore, there is concurrent demand for these surgeons in other reconstructive procedures, mainly involving sites such as skin and head/neck, as well as in cosmetic surgery. This may have resulted in varying interest in oncoplastic surgery among plastic surgeons over the years. In the UK, between 2010 and 2015, the proportion of oncoplastic procedures remained stable among plastic surgeons, even falling in cases of therapeutic mammoplasty, while the proportion of therapeutic mammoplasties conducted by breast surgeons increased from 55% to 88%, as did breast reconstruction with LD flaps (81%).[28] The interest in oncoplastic training fell among plastic surgeons from 62% to 27% compared with that of breast surgeons (75%) in 2015. Conversely, half the respondents agreed that these techniques should be available to all women, and oncological concerns and questions regarding postoperative complications decreased significantly between 2010 and 2015. Similar findings were reported with German surgeons ($n = 50$).[25]

In an international survey on breast volume replacement surgery using chest wall perforator flaps, 88% of respondents agreed that the use of these flaps is desirable; however, only one-third used them.[34] Additionally, oncoplastic surgery may allow conservative surgery to be performed in patients who need mastectomy such as in cases of T3 or multicentric tumors.[18,44] This approach offers advantages in relation to mastectomy with breast reconstruction, since the latter is associated with a higher complication rate.[45] The present survey found that 81% of surgeons who perform oncoplastic surgery routinely use this strategy.

Corroborating other studies, this survey showed that oncoplastic techniques were most commonly performed by the surgeons who performed more surgeries/year and by those working exclusively with breast surgery.[31,41] Breast surgeons in the south and in the other regions of Brazil were more likely to perform oncoplastic techniques compared with the southeast, the richest region of the country. One possible explanation is the greater availability of multidisciplinary teams in the southeast. There was a nonsignificant trend toward oncoplastic techniques being performed in cities with < 500,000 inhabitants compared with larger cities (PR: 1.12; 95% CI 0.99–1.28; $p = 0.06$). Conversely, more

complex techniques and those less commonly performed by the breast surgeons in this study such as augmentation mammoplasty, LD flaps, TRAM/VRAM, and fat grafting were more commonly performed in cities with > 500,000 inhabitants. These findings may reflect greater access to resources in these cities.

Females were associated with a lesser likelihood of performing oncoplastic techniques compared with males. In fact, the first generation of Brazilian surgeons trained in oncoplastic techniques was exclusively male. In a second phase, many Brazilian surgeons were trained as fellows at the European Institute of Oncology, and most of those were male. Many of these professionals represent the first generation of professors of hands-on courses in oncoplastic surgery,[37] which began in 2008.[38] Students were selected on the basis of their curriculum, decentralization, and being from universities in cities with a large population. This may have affected the results. The present findings, however, highlight the growing interest of women in performing oncoplastic surgery, in line with patients' preferences. Indeed, a survey assessing patient perception of surgeon gender showed that 42% of women ($n = 1413$) preferred female surgeons, 5% preferred men, and 53% had no preference.[46] Patient perception was not associated with surgery outcome.

In this survey, most surgeons performing oncoplastic surgery could treat LABC, with LD flaps being the preferred technique for the surgical correction of major chest wall defects, and thoracoabdominal flaps (71.7%) being preferred for small defects. These flaps are not universally used in many countries; however, LABC is common in countries with limited resources,[47] including Brazil.[48]

Uniformity and training in oncoplastic surgery are now a common topic of debate.[22,25,31] One survey showed that training in oncoplastic surgery was heterogeneous among European surgeons ($n = 671/3000$), with 20% having been trained through a fellowship, 30% as a trainee in a breast unit, and 21% through additional courses, while 8% had received no training.[31] The present results show that many surgeons underwent training during their medical residency program (32%) or specific fellowships (21%), while 36% underwent their training during hands-on courses. The latter are teaching models that allow all surgeons, particularly those with more experience, to incorporate specific surgical techniques into their routine. In an analysis of one such course in Brazil, 91% of the physicians evaluated replied that they had not had the skills to perform oncoplastic surgery before the course, while 96% felt that they were capable of performing oncoplastic techniques by the end of their training, with more than 90% considering that the course had had an impact on their routine and strategic vision.[38] Similarly, 92% of a group of Canadian surgeons participating in a hands-on course in Ontario stated having increased their use of oncoplastic techniques in their practice after the course, with 70% of them reporting that they would participate in another similar course.[36] Conversely, only 26% of those surgeons stated that they performed complex techniques such as mammoplasty. This differs from the present study in which > 96% of the surgeons who performed oncoplastic surgery also performed these procedures. Only TRAM/VRAM flaps were associated more with medical residency programs or fellowships than with hands-on courses (aPR: 1.58; 95% CI 1.16–2.15; $p = 0.003$). TRAM is a more complex surgery that demands longer or more intensive training, a fact potentially influenced by the number of cases per year and having undergone more intense training such as in a residency program or fellowship. This may reflect a longer learning curve for using this flap, with a negative impact on alternative teaching models. The TRAM/VRAM flap was also associated with breast surgeons who performed a greater volume of surgeries annually (aPR: 1.44; 95% CI 1.03–2.02; $p = 0.03$). There was no difference, however, in relation to augmentation mammoplasty, LD myocutaneous flap, or fat grafting.

Online teaching has been gaining in popularity for training in oncoplastic surgery, particularly after the COVID-19 pandemic, representing an excellent opportunity to share and acquire knowledge. A study involving major breast cancer treatment centers in Italy found that almost all surgeons had already watched videos on breast surgery on platforms such as YouTube.[35] American surgeons mentioned that time restraints and limited access to materials/courses constituted barriers to knowledge, with the availability of videos representing a solution to incorporate oncoplastic surgery into their practice.[22]

There are some limitations associated with this study, as attitudes stated in the answers to this survey may not fully represent the surgical practices of those interviewed. Future real-life data analysis, such as when evaluating the impact of full breast reconstruction, may help clarify this situation. This questionnaire was used for the first time in this study; therefore, its accuracy was as yet unknown. Responses were not received from all the breast surgeons, and even with the high response rate (> 60%), these data may not fully represent Brazilian practice. Although a topical subject in many countries, medical remuneration and the coding of oncoplastic techniques were not evaluated in this study. In a Canadian study, the remuneration and coding of procedures were factors that emerged as barriers to oncoplastic surgery.[49] In Brazil, there is no coding for fat grafting within the public healthcare network or even in the supplementary healthcare network. On the other hand, as far as we know, this is the largest nationwide survey in terms of the number of surgeons answering questions on this specific subject in a country of continental dimensions and immense economic disparity between regions and cities.

These results show that educational measures administered through hands-on courses allowed senior breast surgeons to be trained, with fellowships providing opportunities for more junior surgeons.[38] These measures were successful, and this model could be copied in other countries, offering perspectives of increasing the percentage of breast surgeons performing oncoplastic surgery and qualifying them to treat patients with breast cancer.

CONCLUSIONS

A high proportion of Brazilian mastologists perform oncoplastic surgery, which, ultimately, may benefit breast cancer patients, increasing the rate of breast-conserving surgery and breast reconstruction, particularly in locations where resources are sparse. These data may encourage the development of strategies aimed at improving medical education in this field and in other countries.

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DATA AVAILABILITY The raw data from this study, as well as the data generated, are available at: https://osf.io/8me97/?view_only=072e2aaac1974cc9ad7ad0bffd786859.

DISCLOSURE The authors declares that there is no conflict of interest to disclose.

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