

LOCOREGIONAL FLAPS IN ONCOPLASTIC SURGERY AND BREAST RECONSTRUCTION

Retalhos locorregionais na cirurgia oncoplástica e reconstrutiva da mama

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ABSTRACT

Introduction: Conserving surgery in the treatment of breast cancer, in association with radiotherapy, has replaced mastectomy in most cases. However, depending on the location and size of tumor, the classic conservative surgery can present unfavourable aesthetic results and high levels of commitment of the surgical margins. The oncoplastic breast surgery can have high local control rates and cause minimum breast deformities, leading to a better aesthetic result. **Objective:** To report cases of 30 patients with primary unilateral breast carcinoma who underwent oncoplastic surgery between 2013 and 2015. **Methods:** We used local and regional dermo-glandular rotation techniques. The average age of patients was 58.9 years. The average tumor size was 2.53 cm. Three patients had close or positive surgical margins and underwent a new surgical procedure. **Results:** The aesthetic result was evaluated by the BCCT.core program and was considered excellent in 11 cases, good in 12 cases and regular in 7 cases. Six patients had postoperative complications. **Conclusion:** The use of local and regional dermo-glandular rotation techniques allows extensive resections in breast conserving surgery, leading to a satisfying symmetry and a good aesthetic result without the need of symmetrization, with low postoperative complication rates and high rates of free surgical margins.

KEYWORDS: Breast cancer; breast reconstruction; surgical flaps; surgical margins; cosmetic techniques.

RESUMO

Introdução: A cirurgia conservadora no tratamento do câncer de mama, associada à radioterapia, tem substituído a mastectomia na maioria dos casos. Entretanto, dependendo da localização e do tamanho do tumor, a cirurgia conservadora clássica pode resultar em um resultado estético insatisfatório e em altos índices de comprometimento de margens cirúrgicas. A cirurgia oncoplástica da mama pode apresentar altas taxas de controle local, causando deformidades mamárias mínimas, levando a um melhor resultado estético. **Objetivo:** Relatar casos de 30 pacientes com carcinoma mamário unilateral que foram submetidas à cirurgia oncoplástica da mama entre 2013 e 2015. **Métodos:** Foram utilizadas técnicas de rotação dermoglandular local e regional. A idade média das pacientes foi de 58,9 anos. O tamanho médio do tumor foi 2,53 cm. Três pacientes apresentaram margens cirúrgicas exíguas ou comprometidas, sendo submetidas a novo procedimento cirúrgico. **Resultados:** O resultado estético foi avaliado pelo programa BCCT.core, sendo considerado excelente em 11 casos, bom em 12 casos e regular em 7 casos. Seis pacientes apresentaram complicações pós-operatórias. **Conclusão:** A utilização de técnicas de rotação dermoglandular local e regional permite ressecções extensas na cirurgia conservadora da mama, permitindo uma simetria satisfatória e um bom resultado estético sem a necessidade de simetrização, com baixos índices de complicação pós-operatória e altas taxas de margens cirúrgicas livres.

PALAVRAS-CHAVE: Câncer de mama; reconstrução da mama; retalhos cirúrgicos; margens cirúrgicas; técnicas cosméticas.

Study carried out at the Santa Casa de Misericórdia de Belo Horizonte – Belo Horizonte (MG), Brazil.

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INTRODUCTION

Breast conserving surgery associated with radiation therapy in the treatment of breast cancer results in a long-term survival similar to those of mastectomy, whenever tumor-free surgical margins are obtained. However, depending on the volume of tumor and the volume of resection required for adequate cancer control, a negative aesthetic result may be obtained¹.

The criteria for breast conservation have expanded in recent years and have included larger tumors, traditionally treated by mastectomy. Thus, more than half of women currently diagnosed with breast cancer may have their breast preserved². One way to attenuate the conflict between obtaining a good locoregional control without compromising the aesthetic result is the application of plastic surgery techniques to mammary oncologic surgery, called mammary oncoplastic surgery. This concept is based on three fundamental points: ideal oncologic surgery, homolateral reconstruction and immediate contralateral remodeling (when necessary). Thus, it is possible to perform more extensive resections in conserving surgery without significantly compromise the final aesthetic results^{2,3}.

The techniques of oncoplastic breast surgery offer some advantages over the classic conservative treatment: oncologic safety with resection of voluminous tumors, higher index of free surgical margins, lower rates of reoperation and better aesthetic result^{1,2}. The techniques used in oncoplastic surgery can be involving volume displacement or volume replacement⁴. The volume displacement techniques are used for immediate repair in breast-conserving treatment and generally have a lower risk of complications than the techniques used for volume replacement after radical mastectomy¹.

The objective of this study is to show the results of oncoplastic techniques used in the conservative treatment of breast cancer, considering oncologic safety, free surgical margins rates and reoperation rates as well as postoperative mammary symmetry and final aesthetic results.

METHODOLOGY

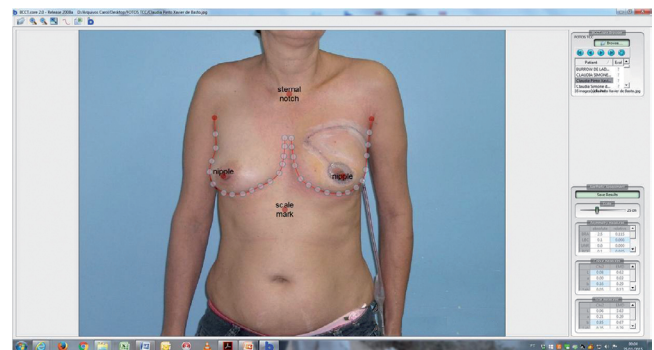
Thirty patients were included in the study between October 2013 and November 2015 at *Santa Casa de Misericórdia* in Belo Horizonte. All patients had unilateral, relatively voluminous malignant tumors in relation to their breast size (tumor/breast ratio greater than 20%) and close to the skin, requiring resection of the skin above the tumor in most cases.

Inclusion criteria were: unilateral carcinoma, tumor/breast ratio >20% and patient's desire to avoid symmetrization. Exclusion criteria were: skin involvement, tumor/breast ratio >50% and the patient's desire to perform associated contralateral mammoplasty.

The evaluated factors were: patient age, tumor's size and location, resected breast volume, surgical margins, reoperation rate for surgical margin enlargement, mastectomy rate after conservative treatment, resection or not of the nipple-areola complex (NAC), neoadjuvant chemotherapy, postoperative complications, body mass index (BMI), comorbidities and smoking.

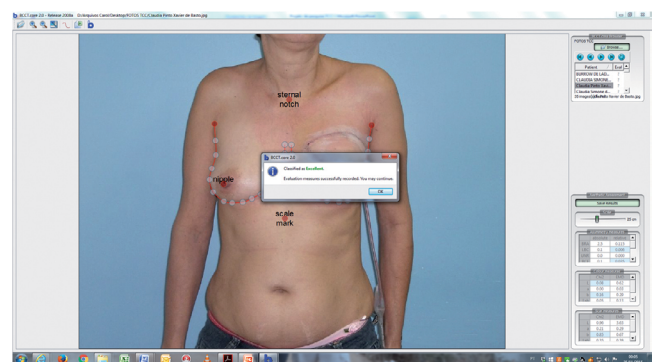
The choice of surgical technique was based on tumor location and tumor/breast ratio. Volume displacement techniques with local and regional dermo-glandular rotation were used. The techniques of local rotation were: dermo-glandular rotation flap and Burow's Triangle. On the other hand, regional rotation techniques were: lateral thoracic flap and thoracoepigastric flap.

All surgeries were performed unilaterally, only in the breast affected by the tumor. The axilla was managed as appropriate in each case. The aesthetic result was evaluated using the BCCT.core program (Breast Cancer Conservation Treatment Cosmetics Results), an objective method of evaluating the aesthetic result in breast-conserving surgery. This software simplifies and standardizes aesthetic evaluation in the conservative treatment of breast cancer, as it consists of a tool to quantify aesthetic results in breast-conserving surgery, discriminating them between four categories: excellent, good, regular and fair. BCCT.core issues its evaluation from an image database (Figures 1 and 2).



Source: BCCT.core 2.0.

Figure 1. BCCT.core software.



Source: BCCT.core 2.0.

Figure 2. BCCT.core software – excellent result.

Statistical methodology

For the characterization of the sample, frequency tables were constructed for the qualitative variables and the descriptive measures for the quantitative variables were calculated. The χ^2 test was used in order to identify possible associations of systemic arterial hypertension (SAH), *diabetes mellitus* (DM), smoking, axillary dissection (AD), NAC resection and surgical technique with aesthetic result, tested for normality (Table 1).

As the data presented normal distribution, parametric analyses were used. The comparisons of means of variables age, tumor size, part volume and BMI in relation to aesthetic

result were performed using the ANOVA (Variance Analysis) test (Table 2).

For all the statistical tests used, we will consider a significance level of 5%. Thus, statistically significant associations are those whose p-value was less than 0.05. The analyses were performed in the Statistical Package for Social Sciences (SPSS) software, version 20.0, 2012.

RESULTS

Thirty patients underwent oncoplastic breast surgery between October 2013 and November 2015, using the previously described

Table 1. Association of variables with aesthetic result – Test χ^2 .

			SAH		Total	P-value
			No	Yes		
Aesthetic result	Excellent	n	6	5	11	0.299
		%	54.5	26.3	36.7	
	Good	n	3	9	12	
		%	27.3	47.4	40.0	
	Regular	n	2	5	7	
		%	18.2	26.3	23.3	
Total		n	11	19	30	
		%	100.0	100.0	100.0	
			DM		Total	P-value
			No	Yes		
Aesthetic result	Excellent	n	7	4	11	0.160
		%	38.9	33.3	36.7	
	Good	n	5	7	12	
		%	27.8	58.3	40.0	
	Regular	n	6	1	7	
		%	33.3	8.3	23.3	
Total		n	18	12	30	
		%	100.0	100.0	100.0	
			Smoking		Total	P-value
			No	Yes		
Aesthetic result	Excellent	n	8	3	11	0.203
		%	30.8	75.0	36.7	
	Good	n	11	1	12	
		%	42.3	25.0	40.0	
	Regular	n	7	0	7	
		%	26.9	0.0	23.3	
Total		n	26	4	30	
		%	100.0	100.0	100.0	
			NAC resection		Total	P-value
			No	Yes		
Aesthetic result	Excellent	n	9	2	11	0.514
		%	36.0	40.0	36.7	
	Good	n	11	1	12	
		%	44.0	20.0	40.0	
	Regular	n	5	2	7	
		%	20.0	40.0	23.3	
Total		n	25	5	30	
		%	100.0	100.0	100.0	

Continue...

Table 1. Continuation.

			AD		Total	P-value
			No	Yes		
Aesthetic result	Excellent	n	3	8	11	0.246
		%	25.0	44.4	36.7	
	Good	n	7	5	12	
		%	58.3	27.8	40.0	
	Regular	n	2	5	7	
		%	16.7	27.8	23.3	
Total		n	12	18	30	
		%	100.0	100.0	100.0	

			Surgical technique				Total	P-value
			Burow	Rotation	Lateral thoracic	Thoracoepigastric		
Aesthetic result	Excellent	n	6	3	1	1	11	0.336
		%	40.0	27.3	33.3	100.0	36.7	
	Good	n	7	3	2	0	12	
		%	46.7	27.3	66.7	0.0	40.0	
	Regular	n	2	5	0	0	7	
		%	13.3	45.5	0.0	0.0	23.3	
Total		n	15	11	3	1	30	
		%	100.0	100.0	100.0	100.0	100.0	

SAH: systemic arterial hypertension; DM: diabetes mellitus; NAC: nipple-areola complex; AD: axillary dissection.

Table 2. Comparisons – Anova Test.

Comparisons: aesthetic result		N	Mean	Standard deviation	95% CI		Minimum	Maximum	P-value
Age	Excellent	11	57.4	13.0	48.6	66.1	41.0	76.0	0.742
	Good	12	60.7	9.2	54.8	66.5	44.0	74.0	
	Regular	7	58.3	7.5	51.3	65.2	50.0	71.0	
	Total	30	58.9	10.2	55.1	62.7	41.0	76.0	
Tumor size (in cm)	Excellent	11	2.7	0.7	2.2	3.1	1.5	3.5	0.648
	Good	12	2.4	0.9	1.8	2.9	1.0	3.5	
	Regular	7	2.6	1.0	1.6	3.5	1.2	4.0	
	Total	30	2.5	0.8	2.2	2.8	1.0	4.0	
Part volume (in g)	Excellent	11	148.9	88.0	89.8	208.0	52.0	385.0	0.991
	Good	12	145.2	104.4	78.9	211.5	38.0	431.0	
	Regular	7	150.9	76.4	80.2	221.5	53.0	268.0	
	Total	30	147.9	89.5	114.4	181.3	38.0	431.0	
BMI	Excellent	11	27.2	6.3	23.0	31.5	18.5	39.6	0.414
	Good	12	29.9	6.1	26.0	33.8	19.9	41.7	
	Regular	7	26.7	3.9	23.2	30.3	22.1	33.7	
	Total	30	28.2	5.7	26.0	30.3	18.5	41.7	

BMI: body mass index; 95%CI: 95% confidence interval.

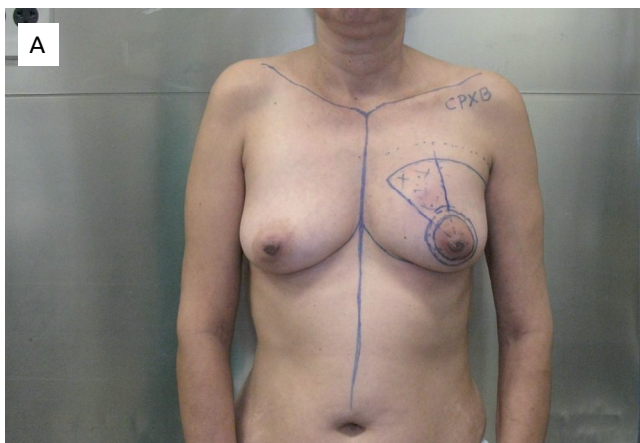
techniques. The mean age of the patients in this study was 58.9 years. The mean pathological tumor size was 2.53 cm. Twelve patients had tumors located in upper inner quadrant, two in lower inner quadrant, eight in upper outer quadrant, two in lower outer quadrant, four at 12 o'clock, one at 3 o'clock and one at 9 o'clock. The NAC was resected in five cases. Twenty-eight patients had invasive ductal carcinoma (IDC); one patient presented invasive mucinous carcinoma of the breast and one patient presented ductal carcinoma in situ

(DCIS). The mean volume of resection of breast tissue was 147.87 g. The mean BMI was 28.18 kg/m². Twenty-six patients underwent breast reconstruction with local flaps, fifteen of which were submitted to the Burow's Triangle (Figure 3) and eleven to the dermo-glandular rotation flap (Figure 4). Four patients underwent regional flap reconstruction, three of which were submitted to the lateral thoracic flap (Figure 5) and one to the thoracoepigastric flap (Figure 6). Only one patient was submitted to neoadjuvant chemotherapy. Three women

had undergone previous tumor resection by classic breast conserving surgery, without obtaining free surgical margins, and were referred for oncoplastic surgery. Surgical margins were free of neoplasia in 27 cases (90%). Two patients had close surgical margins and one had positive surgical margins. These three women underwent surgical reintervention for margin enlargement, with only one being submitted to subsequent total mastectomy. None of these patients presented residual neoplasia in the surgical specimen after margin enlargement or mastectomy. Twenty-four patients did not present postoperative complications (80%). Six women had a postoperative complication: one had epidermolysis, one had partial dehiscence of surgery incision, three had partial necrosis of the flap, and one had infection of surgery incision and subsequent fibrosis. Four patients were smokers. Twenty women were hypertensive, eleven had DM, two had cardiopathy, two had hypercholesterolemia, and four had hypothyroidism. Only six

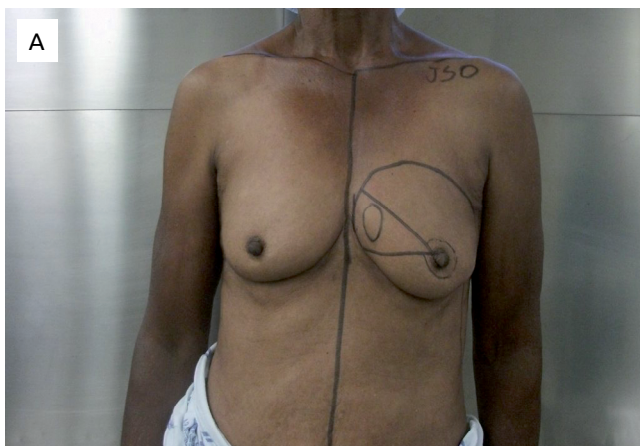
of the patients had no associated comorbidity. All six patients who presented postoperative complications were hypertensives. Three of them had DM, two had hypothyroidism and two had associated heart diseases. Sentinel lymph node biopsy was performed in fifteen patients. Four women underwent AD due to sentinel lymph node positivity, and fifteen, to AD for clinically positive nodes in the initial clinical staging. Adjuvant radiotherapy was indicated in all cases. The final aesthetic result was evaluated by the BCCT.core program. According to the software, the results were rated “excellent” in 11 cases, “good” in 12 cases and “regular” in 7 cases. No results were classified as “fair” (Table 3).

In the present study, the contralateral breast was not approached in any case. Oncoplastic surgery was performed to maintain the patient’s initial shape and aesthetics, with the lowest asymmetry rate possible, avoiding the need for symmetrization. In the statistical analysis used, there was



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Figure 3. Patient submitted to the Burow Triangle technique. (A) Preoperative and (B) postoperative.



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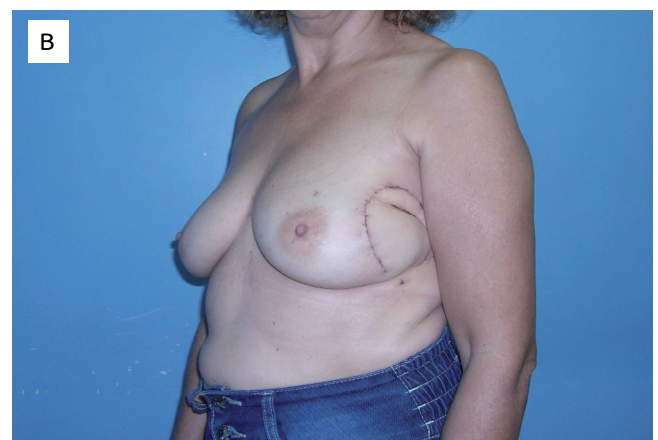
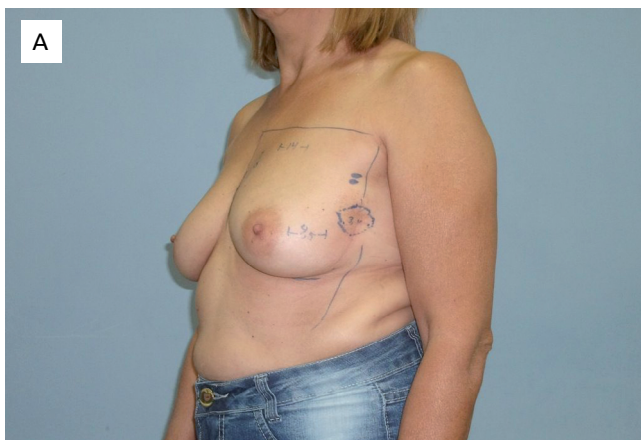
Figure 4. Patient submitted to the dermo-glandular rotation technique. (A) Preoperative and (B) postoperative.

no statistically significant difference between the possible associations of the variables SAH, DM, smoking, AD, NAC resection and surgical technique with aesthetic result. The comparison of means of variables also did not present statistically significant difference when evaluated age, size of the tumor, volume of resection of breast tissue and the BMI in relation to the aesthetic result. One theory to explain the absence of difference between the groups could be the sample size (N) analyzed.

DISCUSSION

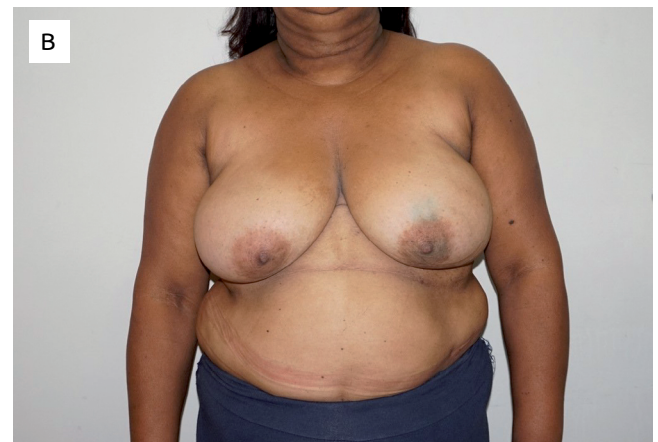
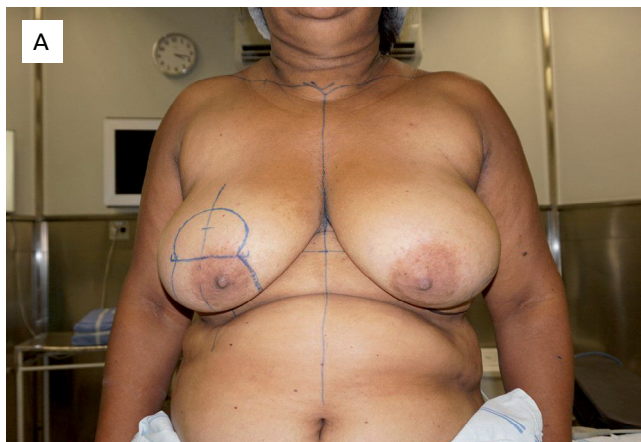
Indications for conservative surgery in the treatment of breast cancer are becoming more frequent. Randomized clinical trials show that breast conserving surgery associated with

radiotherapy has overall survival rates similar to total mastectomy. Starting from this premise, there is a greater tendency to treat large tumors conservatively. However, the greatest limitation is to perform large resections without compromising the cosmetic result^{5,6,7}. Oncoplastic breast surgery, which consists of the combination of plastic surgery techniques and oncologically safe surgical techniques in the treatment of breast cancer, is widely accepted as the alternative that allows for greater resections and less aesthetic damage, even in voluminous tumors. Increasingly indicated, it provides significant advantages, since it minimizes the psychological damage of a possible mutilating treatment^{3,6,8,9}. Thus, it is possible to perform a greater number of breast conserving surgeries in patients who would usually undergo total mastectomy, with a lower rate of postoperative complications and a higher rate



Source: own file.

Figure 5. Patient submitted to the lateral thoracic flap. (A) Preoperative and (B) postoperative.



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Figure 6. Patient submitted to the thoracoepigastric flap. (A) Preoperative and (B) postoperative.

of local disease control^{1,3,4,5,10}. In the classic breast conserving surgery, resections of more than 20% of the breast tissue affected by the disease generates both breast deconfiguration

and contralateral asymmetry. Thus, the use of some oncoplastic techniques is convenient to minimize undesirable aesthetic results³. Extensive defects after breast conserving

Table 3. Clinical and treatment characteristics of the patients (n = 30).

Tumor localization		
	n	%
LOQ	2	6.7
LIQ	2	6.7
UOQ	8	26.7
UIQ	12	40.0
9 o'clock	1	3.3
3 o'clock	1	3.3
12 o'clock	4	13.3
Total	30	100.0
Surgical technique		
	n	%
Burow	15	50.0
Rotation	11	36.7
Lateral thoracic	3	10.0
Thoracocephigastric	1	3.3
Total	30	100.0
Type of tumor		
	n	%
Invasive mucinous carcinoma	1	3.3
IDC	28	93.4
DCIS	1	3.3
Total	30	100.0
Expansion of surgical margins		
	n	%
No	27	90.0
Yes	3	10.0
Total	30	100.0
Mastectomy		
	n	%
No	29	96.7
Yes	1	3.3
Total	30	100.0
Lymph node biopsy		
	n	%
No	15	50.0
Yes	15	50.0
Total	30	100.0
Axillary dissection		
	n	%
No	12	40.0
Yes	18	60.0
Total	30	100.0
Postoperative complications		
	n	%
No	26	86.7
Yes	4	13.3
Total	30	100.0
Aesthetic result		
	n	%
Good	12	40.0
Excellent	11	36.7
Regular	7	23.3
Total	30	100.0
NAC resection		
	n	%
No	25	83.3
Yes	5	16.7
Total	30	100.0
SAH		
	n	%
No	11	36.7
Yes	19	63.3
Total	30	100.0
DM		
	n	%
No	18	60.0
Yes	12	40.0
Total	30	100.0
Neoadjuvant chemotherapy		
	n	%
No	29	96.7
Yes	1	3.3
Total	30	100.0
Smoking		
	n	%
No	26	86.7
Yes	4	13.3
Total	30	100.0

	Descriptive measures							
	n	Average	Median	Standard deviation	Minimum	Maximum	Percentils	
							25	75
Age	30	58.9	57.0	10.2	41.0	76.0	51.0	69.0
Tumor size (in cm)	30	2.5	2.6	0.8	1.0	4.0	2.0	3.0
Part volume (in g)	30	147.9	132.0	89.5	38.0	431.0	93.5	177.0
BMI	30	28.2	27.6	5.7	18.5	41.7	23.7	31.5

Source: Research data.

LOQ: lower outer quadrant; LIQ: lower inner quadrant; UOQ: upper outer quadrant; UIQ: upper inner quadrant; 9 o'clock: union of lateral quadrants; 3 o'clock: union of inner quadrants; 12 o'clock: union of upper quadrants; IDC: invasive ductal carcinoma; DCIS: ductal carcinoma *in situ*; NAC: nipple-areola complex; SAH: systemic arterial hypertension; DM: diabetes *melittus*; BMI: Body mass index.

surgery tend to require local or regional flap rotations. Due to radiotherapy, deformities tend to become more pronounced over time, as well as technical difficulties and limitations. The consequence is that the aesthetic results of a late reconstruction are more limited. Immediate reconstruction may reduce these risks and provide better results³, although the deleterious action of radiotherapy, from the aesthetic point of view, may reduce success rates after the treatment. Dermo-glandular rotation flaps are a safe locoregional alternative to repair eventual defects caused by conservative breast treatment. In the present study, local and regional rotation flaps were used to mobilize the dermo-glandular flap toward the defect caused by quadrantectomy, aiming to repair it completely. These techniques are called volume displacement techniques, and are used in immediate repair in the conservative treatment of the breast^{4,11}. They generally present a lower risk of complications than volume replacement techniques after total mastectomy^{1,11}.

Surgical margins free of neoplasia correspond to a reduction in the risk of local recurrence, independently of margin size^{4,8}. In breast oncoplastic surgery, the surgical margins are larger than in conservative surgery, and its enlargement is rarely necessary³. In this study, the surgical margins were free of neoplasia in 27 cases (90%). Two patients had close surgical margins and one, positive surgical margins, which needed surgical reinterventions: two margins enlargements and a subsequent total mastectomy. None of these patients presented residual neoplasia in the surgical specimen, demonstrating the effectiveness of oncoplastic surgery in the local control of breast cancer. The focus of oncoplastic breast surgery is to improve the quality of life of patients with treatments that may be more effective from an oncological point of view without compromising the aesthetic-functional result. It represents the major advance in the conservative treatment of breast cancer in the last decades³. Studies have shown a higher satisfaction rate with aesthetic result when using oncoplastic techniques, independently of the extent of resected breast volume tissue¹².

Thus, oncoplastic breast surgery allows the patient to leave the operating room with little or no breast asymmetry and no deformities of the breast treated by cancer^{1,4}. This study used locoregional dermo-glandular rotation flap techniques for immediate breast repair in all patients. These techniques allowed good local oncological control, with satisfactory symmetry and good aesthetic result. No contralateral breast symmetrization was indicated in any case. The rates of free surgical margins were high and the rates of postoperative complications were low, and no complications were severe or required a surgical approach to correction. No variables analyzed in relation to the characteristics of the patient seemed to influence the aesthetic result obtained.

CONCLUSION

Oncoplastic surgery represents an important evolution for breast conserving surgery, since it is an excellent option to approach breast cancer, allowing more extensive resections without compromise the final aesthetic result. Also, it contributes to the improvement of the psychological aspects of the patients with breast cancer.

The focus of oncoplastic breast surgery is to improve the quality of life of patients with treatments that may be more effective and, at the same time, less aggressive. The greatest benefit is the patients themselves, who enjoy a safe oncological treatment and a suitable aesthetic-functional treatment. The various existing techniques for immediate repair must be individualized in each specific case in order to achieve the best results in oncological-plastic integration. Immediate repair surgery usually shows better results when compared to late reconstruction. The use of local dermo-glandular rotation flap techniques allows extensive resections in breast conserving surgery. In addition, they allow good local oncological control, satisfactory symmetry and aesthetic results, without the need for contralateral breast symmetrization, with low rates of postoperative complications and high rates of free surgical margins.

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