

Oncoplastic Surgery: Does Patient and Medical Specialty Influences the Evaluation of Cosmetic Results?

Idam de Oliveira-Junior,^{1,2} Fabíola Cristina Brandini da Silva,^{2,3} Flávio Nazima,⁴
 José Carlos Ribeiro Jr,² Laurinda Castellani,⁵ Gustavo Zucca-Matthes,²
 Maria do Socorro Maciel,⁶ Gabriele Biller,^{3,7} Jonathas José da Silva,^{2,3}
 Almir José Sarri,² René Aloísio da Costa Vieira^{1,3}

Abstract

Oncoplastic surgery (OS) has established itself as a safe treatment for breast cancer; however, its cosmetic evaluation remains little explored. After evaluating 300 patients undergoing breast-conserving treatment, with or without OS, we found that patients are more satisfied with the cosmetic outcome compared to observers (software and surgeons), and OS did not affect these results.

Background: Oncoplastic surgery (OS) has added plastic surgery concepts and techniques to the breast cancer surgery. However, reports of the impact of OS on cosmesis after breast-conserving surgery (BCS) are limited in the literature. **Patients and Methods:** This cross-sectional prospective study included patients who underwent BCS. The patients self-evaluated the cosmetic outcome of the breasts and had them photographed. The photos were evaluated by BCCT.core software and by 6 breast surgeons (mastologists and plastic surgeons) using the Harvard, Garbay, and Fitoussi scales. Kappa and weighted kappa tests were used to analyze agreement for categorical variables; for continuous variables, the interclass correlation index and the chi-square test to analyze the association between the OS and the symmetrization. **Results:** A total of 300 patients were evaluated: 228 (76.0%) underwent traditional BCS and 72 (24.0%) underwent OS, and of these, 37 (51.4%) underwent contralateral symmetrization surgery. In the evaluation of the cosmetic result, the correlation between patients and observers (BCCT.core and surgeons) was weak; between the 2 groups of surgeons, the correlation was moderate (Fitoussi scale) and excellent (Garbay scale). Plastic surgeons are more critical for evaluating cosmetic results; they considered it good or excellent in 30.0% whereas patients, mastologists, and BCCT.core results considered it so in 78.8%, 34.0%, and 30.0%, respectively. In terms of cosmesis, OS and symmetrization did not influence the results in this study with long follow-up. **Conclusion:** Patients' self-evaluation reported better cosmesis than surgeons' analyses. Plastic surgeons were the most critical. OS and symmetrization did not influence the results.

Clinical Breast Cancer, Vol. ■, No. ■, ■-■ © 2020 Elsevier Inc. All rights reserved.

Keywords: Breast cancer, Conserving surgery, Conserving treatment, Cosmetic techniques, Oncoplastic

Introduction

Breast-conserving surgery (BCS) associated with radiotherapy has been established as an oncologically safe treatment for breast cancer.^{1,2} BCS is associated with a higher quality of life than

mastectomy³⁻⁵; it ensures local control and has a survival rate equivalent to that of radical treatment. However, BCS often provides an unsatisfactory final cosmetic result, which has contributed to the development of oncoplastic surgery (OS). This modality adds

¹Postgraduate Program of Tocogynecology, Botucatu Medical School, Sao Paulo State University, UNESP, Sao Paulo, Brazil

²Nucleous of Mastology, Barretos Cancer Hospital, Sao Paulo, Brazil

³Postgraduate Program of Oncology, Barretos Cancer Hospital, Sao Paulo, Brazil

⁴Londrina Cancer Hospital, Parana, Brazil

⁵Cancer Unit, Santa Casa de Misericórdia de Itapeva, Sao Paulo, Brazil

⁶Oswaldo Cruz German Hospital, Sao Paulo, Brazil

⁷FACISB School of Medicine, Sao Paulo, Brazil

Submitted: Aug 31, 2020; Revised: Sep 21, 2020; Accepted: Sep 26, 2020

Address for correspondence: Idam de Oliveira Jr, Rua Antenor Duarte Villela, 1331, Bairro Dr Paulo Prata, Barretos, SP, Brazil

E-mail contact: idamjr88@gmail.com

COSMETIC RESULTS IN ONCOPLASTIC SURGERY

plastic surgery concepts and techniques to the surgical treatment of breast cancer and allows relatively large tumors to be treated in a conservative manner.^{6,7}

Due to the diversity of widely available procedures, many different cosmetic outcomes can be expected after BCS.⁸ To evaluate outcomes, there are objective or subjective tools. The subjective methods consider the analysis of the professionals involved in the treatment, the patient's self-evaluation, or the results of quality-of-life questionnaire domains.⁹⁻¹² Thus, there are a variety of subjective methods, which can evaluate anywhere, using for analysis 4 to 15 categories,¹³⁻¹⁷ and which may be associated with a specific type of treatment¹⁷ or group of variables.¹⁸ In comparison, objective methods consider the measurement of asymmetry between the treated and untreated breast. In this regard, the BCCT.core (Breast Cancer Conservative Treatment Cosmetic Results) software was created to evaluate patients who have undergone BCS using symmetry algorithms. The results were calibrated by European experts and are divided into 4 points; the methodology is reproducible and is the most widely used approach in research.^{19,20}

The lack of standards for the evaluation of cosmetic results²¹ directly influences the reproducibility and validity of the methods.^{9,10} Comparisons have been reported among patients evaluating themselves²² or other patients²³ and doctors at different stages of training,² in different areas of work,²⁴ and with different levels of experience and specialties (plastic surgeons, mastologists and radiotherapists).^{14,24,25} Similarly, there are studies of patients who underwent BCS^{14,15,18,19,22-24} and studies of patients who underwent reconstruction with flaps and/or implants.²¹

In this context, the role of oncoplasty, an area of expertise for breast surgeons, in the cosmetic outcome of BCS patients is unknown, a fact that motivated the present study.

Patients and Methods

This was a cross-sectional prospective study approved by the research ethics committee under protocol 782/2014. It randomly included patients treated for breast cancer who visited the Outpatient Clinic of Mastology and Breast Reconstruction of the Barretos Cancer Hospital (Hospital de Câncer de Barretos) for follow-up from May 2015 to June 2016.

Patients who had undergone BCS associated with adjuvant radiotherapy at least 1 year previously were included. We excluded the following: male patients; patients with bilateral breast cancer, a high number of comorbidities, metastatic disease, or recurrence; and those undergoing chemotherapeutic treatment. Other analyses of this population were presented in previous publications.^{12,26}

All patients agreed to and signed the free and informed consent protocols, allowing us to photograph them and use the results for research. The participating women performed a self-assessment of the breasts to determine the cosmetic outcome (excellent, good, fair, bad/poor). Their breasts were photographed in a frontal orthostatic position from 1 m away, with one mark on the sternal furcula and another 20 cm below (at the level of the sternum) to calibrate distances (Supplementary Figure 1A in the online version). Photographs were taken in a standardized manner by two researchers (F.B.B.C., J.J.S.). The data from the medical records were retrospectively evaluated using a standardized form.

The photos were analyzed in a blinded manner by another researcher (G.B.) using the BCCT.core software, which evaluates breast symmetry through objective measurements and presents results on a 4-point scale (1 = excellent, 2 = good, 3 = fair, 4 = poor). For patients with no areola, a breast center was marked when possible²⁷ (Supplementary Figure 1B in the online version).

Six medical professionals with extensive breast surgery experience were registered on a web platform (Supplementary Figure 2 in the online version) and divided into two groups (mastologists and plastic surgeons). For the plastic surgeons (P1, P2, and P3), their experience with mastology was assessed, and for the mastologists (M1, M2, and M3), their area of expertise (breast surgery, oncologic surgery, breast reconstruction/OS) was noted (Table 1). In Brazil, mastology is a medical specialty dedicated to breast disease treatment, which can be practiced by general surgeons or gynecologists after 2 years of specific training (medical residency), or by oncologic surgeons, general surgeons, or gynecologists after obtaining the approval of the Brazilian Society of Mastologists.

The professionals independently answered questions related to their professional experience and evaluated the patients' photographs. For each photo, the breast cosmetic outcome was classified using the criteria proposed by Harris et al, also called the Harvard Breast Cosmesis Scale,^{13,14} Fitoussi et al,¹⁶ and Garbay.¹⁷ The Harvard classification is divided into 4 categorical variables (excellent, good, reasonable, bad/poor), the same values used in BCCT.core software and performed in self-evaluation. The Fitoussi scale¹⁶ classifies breast asymmetry and the type of repair into 5 categorical variables (I to V), and smaller values are associated with greater symmetry and less need for repair. The Garbay classification¹⁷ evaluates 5 domains (breast volume, breast shape, breast symmetry, inframammary groove, scars); for each one, a score of 0, 1, or 2 is given, and the final score is a continuous variable between 0 and 10 for which larger values are associated with better symmetry. We also identified the use of OS and the presence of symmetrization (Supplementary Figure 1C in the online version).

These evaluations were performed in a systematic manner and recorded in a database in SPSS for Mac 20 (IBM, Armonk, NY). The professionals' responses were analyzed individually and by group (plastic surgeons and mastologists). For group responses, the most frequent outcome was selected for categorical variables (Harvard and Fitoussi classification results), and in the absence of a higher frequency, a drawing was performed to select the group's response. For numerical variables (Garbay), the mean value was calculated. Figure 1 present consensus results.

Statistical Analysis

Frequency and percentages were calculated for the categorical variables. Numerical variables were calculated as the mean, median, standard deviation, and minimum and maximum values. For the evaluation of agreement,²⁸ kappa and weighted kappa (WK) tests were used for the categorical variables; the intraclass correlation coefficient (ICC) was used for continuous variables; and the chi-square test was used to determine the association between the results for OS and symmetrization.

Table 1 Profile of Professional Evaluators

Evaluator	Gender	Primary Training	Primary Training Time (Years)	Experience in Other Specialty	Time in Other Specialty (Years)	Workplace
P1	F	Plastic surgery	19	Mastology	10	Public
P2	M	Plastic surgery	10	Mastology	1	Private
P3	M	Plastic surgery	5	Absent	0	Private
M1	F	Oncologic surgery	25	Absent	0	Private
M2	M	Mastology	24	Oncoplasty	2	Public
M3	M	Mastology	13	Oncoplasty	13	Public

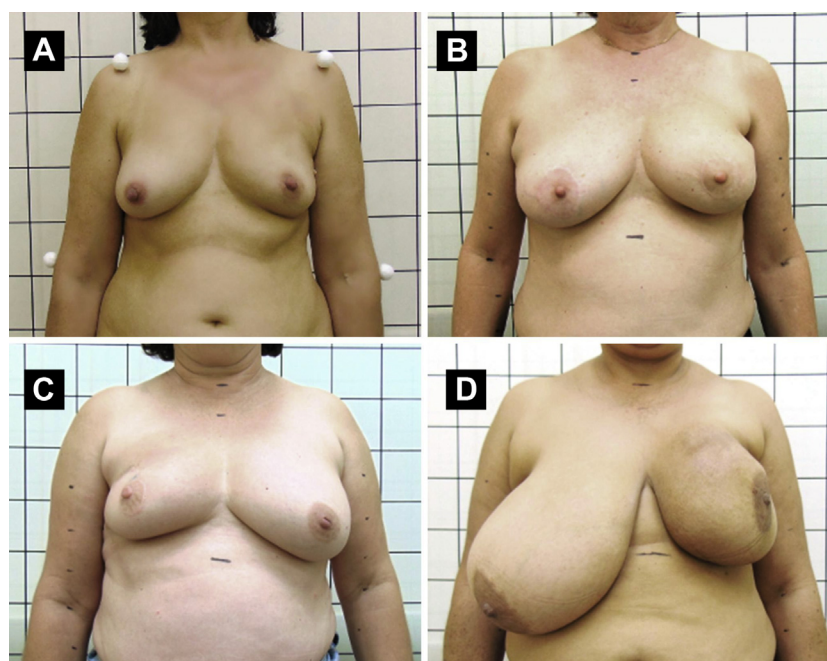
Results

Of the 300 evaluated patients, 228 (76.0%) underwent traditional BCS and 72 (24.0%) underwent OS. Of those who underwent OS, 37 (51.4%) underwent contralateral symmetrization surgery. The mean follow-up time from the first medical evaluation to participation in the study was 7.4 years (1.2-20.6). The mean follow-up for patients not submitted to OS, submitted to OS, and submitted to symmetrization was 7.7 ± 4.3 , 6.5 ± 4.1 , and 6.1 ± 4.2 years, respectively.

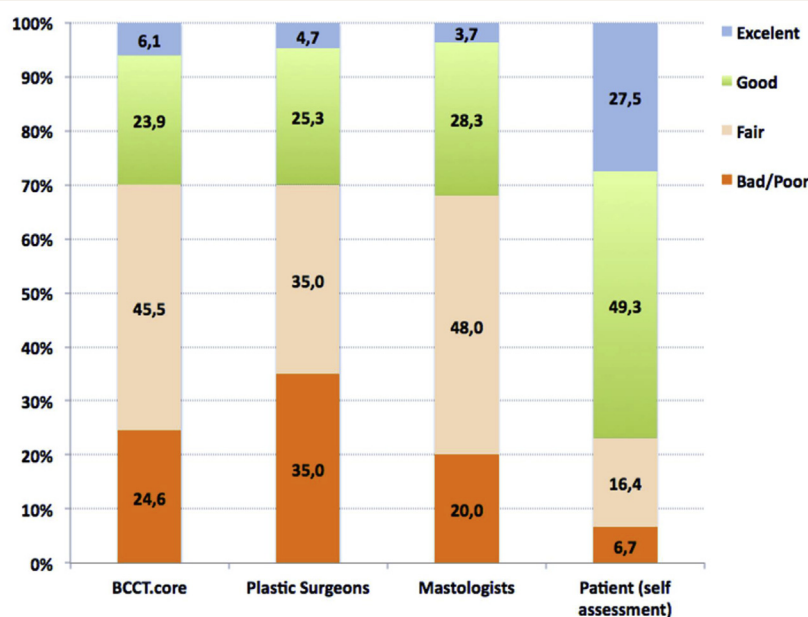
Regarding the experience of the surgeons involved in the study, the mastologists had an average training time of 20.7 years (standard deviation 6.7 years, minimum 13, maximum 25 years), compared to 11.3 years for the plastic surgeons (standard deviation 7.1, minimum 5, maximum 19 years). Two mastologists had experience in OS; the surgeon with more expertise had initial training with plastic surgeons, and the second with plastic surgeons and mastologists. Some of the professionals showed different degrees of expertise regarding the treatment of breast cancer (Table 1).

Regarding the overall cosmetic results (Figure 2), the patients tended to provide the most favorable evaluations, with 78.8% considering their results good or excellent; they were followed by the mastologists (34.0%), the BCCT.core software (30.0%), and plastic surgeons (30.0%). The plastic surgeons were the most critical of the results; they evaluated the results as poor/bad in 35.0% of cases. Poor/bad results were reported by the software for 30.0% of the cases, by the mastologists for 20.0%, and by the patients for 6.7%.

Regarding the comparison of agreement of the cosmetic result between patients and observers (Table 2 and Supplementary Table 1 in the online version),²⁸ the correlation was weak for mastologists, plastic surgeons, and BCCT.core, regardless of the main or secondary area of specialization. Between BCCT.core and the surgeons, the correlation was fair for both mastologists and plastic surgeons regardless of area of expertise; a moderate correlation was found for only one mastologist and one plastic surgeon. When professionals in the same field were compared, the correlation was moderate; however, the correlation was strong among

Figure 1 Consensus Results (BCCTcore-Patient-Surgeons). (A) Excellent; (B) Good; (C) Fair; (D) bad/poor

COSMETIC RESULTS IN ONCOPLASTIC SURGERY

Figure 2 Evaluation of General Results in Relation to Breast Cosmesis

mastologists with knowledge of OS ($WK = 0.611$). In terms of patient satisfaction, 6.7% (20/300) of the patients self-rated their cosmetic result as bad/poor; however, 11 of these patients had an excellent/reasonable result according to BCCT.core, which represents a low degree of dissatisfaction (3.6%, 11/300).

According to the methodology proposed by Fitoussi et al¹⁶ (Table 3 and Supplementary Table 2 in the online version), the correlation was reasonable/moderate for the assessment of asymmetry and repair, and a strong correlation was observed only among mastologists with experience in OS ($WK = 0.7$ and $WK = 0.657$, respectively). When the plastic surgeons were compared to the mastologists, the correlation was reasonable.

When symmetry was quantitatively classified using the Garbay scale (Table 4), the correlation was satisfactory for all comparisons and was excellent between two of the plastic surgeons (P1 and P3; $ICC = 0.766$) and between the groups of professionals ($ICC = 0.856$).

In the analysis of the potential influence of OS and the symmetrization of the final cosmetic result (Table 5), it was observed that both of them did not influence the results. When the surgeons' findings were analyzed individually, symmetrization positively influenced the assessments of the mastologists, with the results for oncoplasty and symmetrization, respectively (P value; chi-square): M1 (.041; 0.029), M2 (.280; 0.050), M3 (.390; 0.004), P1 (.703; 0.376), P2 (.212; 0.200), and P3 (.601; 0.799).

Discussion

The search for a better aesthetic outcome in the surgical treatment of breast cancer has been the driving force behind the development and consolidation of BCS, especially with OS.^{8,29} Despite the evolution of the techniques, the best way to evaluate

such results remains controversial according to the literature. It is known that there is interobserver variability, including among patients,³⁰ a fact that was observed in the present study. Patients, regardless of the type of surgery performed, regarded the cosmetic outcomes of their breasts more positively than did the mastologists, plastic surgeons, and the BCCT.core software.

The subjective assessment performed by breast surgeons is related to professional expertise regarding breast cancer treatment, particularly BCS. Surgeons become judicious over the years and analyze the same cosmesis outcome differently depending on their area of expertise. The concept of cosmesis for the plastic surgeon is primarily aesthetic and does not into account the area of oncologic resection and some asymmetries inherent to oncologic treatment. For the mastologist, cosmesis is associated with the oncologic treatment performed and the difficulty of the case, which makes them more tolerant of asymmetries in clinical practice.

In choosing the methodology used to evaluate patients undergoing BCS, the BCCT.core software has an established role,²⁰ mainly because of its standardization and reproducibility in research. Other parameters are reported in the literature, such as the Objective Breast Cosmesis Scale (OBCS),²⁴ the Breast Retraction Assessment,³¹ the Sneeuw questionnaire,²³ and classifications using anywhere from 4 to 10 categories.^{4,12} In the present study, the Harvard (4 points), Garbay (15 scores; 10 points), and Fitoussi [cosmetic evaluation (5 points) associated with the proposed repair (5 points)] classifications were used; however, few studies have used multiple parameters,^{14,32} which adds to the value of the present study. However, the greater the number of parameters involved and the greater complexity of the evaluation method, the worse the reproducibility of the method.¹⁹

Table 2 Comparison of Cosmetic Results Using Harvard Scale Between Different Evaluators

Characteristic	Professionals	Expertise	Similar Answer (%)	Kappa	P	Weighted Kappa	95% Confidence Interval	P
Plastic surgeons	P1 × P2	PM × PM	39.60	0.179	<.001	0.376	0.315-0.436	<.001
	P1 × P3	PM × P	59.00	0.373	<.001	0.5	0.432-0.569	.035
	P2 × P3	PM × P	25.00	0.017	<.001	0.025	0.167-0.264	<.001
Mastologists	M1 × M2	COM × M	58.00	0.373	<.001	0.503	0.431-0.575	<.001
	M1 × M3	COM × OPM	60.40	0.399	<.001	0.524	0.452-0.596	<.001
	M2 × M3	M × OPM	69.10	0.523	<.001	0.611	0.582-0.680	<.001
Mastologists × plastic surgeons	3M × 3P	—	60.60	0.429	<.001	0.528	0.457-0.598	<.001
Patients	Pt × M	—	24.80	0.009	.009	0.065	0.013-0.117	.014
	Pt × M1	Pt × COM	29.10	0.034	.036	0.076	0.019-0.132	.008
	Pt × M2	Pt × M	26.90	0.046	.159	0.077	0.023-0.131	.004
	Pt × M3	Pt × OPM	24.60	0.001	.041	0.066	0.014-0.117	.014
	Pt × P	—	22.40	0.007	.144	0.063	0.015-0.112	.012
	Pt × P1	Pt × PM	21.80	0.016	.032	0.071	0.27-0.115	.002
	Pt × P2	Pt × PM	35.90	0.07	.149	0.117	0.044-0.189	.001
	Pt × P3	Pt × P	16.40	0.003	.164	0.039	0.010-0.68	.27
	B × M	—	47.80	0.212	<.001	0.360	0.286-0.434	<.001
	B × M1	B × COM	42.00	0.145	<.001	0.302	0.227-0.376	<.001
BCCT.core	B × M2	B × M	52.10	0.276	<.001	0.426	0.353-0.499	<.001
	B × M3	B × OPM	47.10	0.202	<.001	0.343	0.270-0.417	<.001
	B × Pt	—	28.80	0.08	.004	0.072	0.018-0.127	.007
	B × P	—	49.80	0.275	<.001	0.406	0.331-0.480	<.001
	B × P1	B × PM	52.10	0.294	<.001	0.434	0.361-0.508	<.001
	B × P2	B × PM	37.70	0.135	<.001	0.276	0.208-0.344	<.001
	B × P3	B × P	46.10	0.212	<.001	0.32	0.250-0.390	<.001

Abbreviations: 3M = all mastologists; 3P = all plastic surgeons; B = BCCT.core; COM = mastologist trained in cancer surgery; M = mastologist; OPM = mastologist with experience in oncoplastic surgery; P = plastic surgeon; PM = plastic surgeon with experience in mastology; Pt = patient.

Statistical analysis was performed using kappa tests^{14,18,32} and WK tests⁹ to determine the correlation of categorical variables and the intraclass correlation coefficient^{15,23} to determine the correlation of continuous variables. However, other studies have used different methods, such as Spearman rho¹⁴ and Mann-Whitney tests,³² which hinders potential comparisons.

In a study with 513 patients, the initial assessment used a 4-point scale, and the results were then grouped into two points. The best kappa value was observed between the specialists and BCCT.core (0.57), while slight agreement was found between the patient and the physicians/BCCT.core (0.12 to 1.15).¹⁸ In the present study, a lower correlation was found, and the variables were not grouped, a fact that will allow better comparisons in future studies.

Patients tend to feel more satisfied with the remodeling/reconstruction of their breasts than observers do.³² In a study of 108 women who underwent BCS, the patients were photographed and performed a self-evaluation. The photographs were then evaluated by 5 observers (2 breast surgeons, 1 plastic surgeon, 1 radiologist, 1 oncology nurse). Approximately 44.4% of the patients and all the professionals evaluated the final cosmetic result using 3 scales (Harvard, Sneeuw, and a 10-point numerical scale), and the correlation was excellent among all the professionals but was poor between professionals and patients.²³ In this study, all patients self-evaluated their cosmetic results using the Harvard scale, and their

degree of satisfaction was high; in the presence of good results, only 3.6% were dissatisfied (Supplementary Figure 1D in the online version).

Some analyses of the association between cancer stage and patient satisfaction with the cosmetic outcome show that the majority of patients with advanced disease stages (II/III) are more focused on the oncologic outcome than the cosmetic result alone and thus exhibit higher satisfaction rates.³³ In the present analysis, 72.3% of the patients rated their results good or excellent; however, the literature conflict regarding the association between staging and patient satisfaction.^{34,35} Usually long-term patients exhibit greater satisfaction with the cosmetic result than patients immediately after treatment.^{36,37}

Another factor that may influence the results is the type of professional evaluator. A study in which the results of 109 patients who underwent BCS were analyzed by 4 surgeons (breast and plastic surgeons) with long-term experience in breast reconstruction found good to moderate interobserver correlation, in disagreement with the recommendations for reconstruction.¹⁵ In the present study, the agreement between the examiners regarding asymmetry and repair was reasonable to moderate; agreement was only strong among surgeons with experience in OS, whose views of treatment and repair may have influenced the outcome. Although this correlation may be questioned, other studies involving surgeons with experience in OS are necessary.

Table 3 Comparison of Cosmetic Results Using Fitoussi Scale Among Professionals With Different Expertise

Assessment	Characteristic	Professionals	Expertise	Similar Answers (%)	Kappa	P	Weighted Kappa	95% Confidence Interval	P
Asymmetry	Plastic surgeons	P1 × P2	PM × PM	46.30	0.25	<.001	0.437	0.368-0.506	<.001
		P1 × P3	PM × P	42.60	0.174	<.001	0.355	0.292-0.419	<.001
		P2 × P3	PM × P	25.00	0.044	<.001	0.264	0.209-0.319	<.001
	Mastologists	M1 × M2	COM × M	50.80	0.307	<.001	0.471	0.406-0.535	<.001
		M1 × M3	COM × OPM	55.80	0.388	<.001	0.516	0.449-0.583	<.001
		M2 × M3	M × OPM	71.90	0.591	<.001	0.7	0.641-0.758	<.001
	Mastologists × Plastic surgeons	3M × 3P		51.0	0.293	<.001	0.464	0.391-0.537	<.001
Repair	Plastic surgeons	P1 × P2	PM × PM	68.30	0.474	<.001	0.547	0.468-0.625	<.001
		P1 × P3	PM × P	54.00	0.249	<.001	0.367	0.298-0.437	<.001
		P2 × P3	PM × P	55.30	0.336	<.001	0.469	0.397-0.541	<.001
	Mastologists	M1 × M2	COM × M	59.50	0.389	<.001	0.472	0.392-0.552	<.001
		M1 × M3	COM × OPM	54.80	0.317	<.001	0.426	0.346-0.506	<.001
		M2 × M3	M × OPM	79.20	0.604	<.001	0.657	0.574-0.740	<.001
	Mastologists × Plastic surgeons	3M × 3P		71.7	0.519	<.001	0.578	0.502-0.654	<.001

Abbreviations: 3M = all mastologists; 3P = all plastic surgeons; COM = mastologist trained in cancer surgery; M = mastologist; OPM = mastologist with experience in oncoplastic surgery; P = plastic surgeon; PM = plastic surgeon with experience in mastology.

Table 4 Comparison of Assessments by Garbay Classification

Characteristic	Professionals	Expertise	ICC	95% Confidence Interval	P	Cronbach α
Plastic surgeons	P1 \times P2	PM \times PM	0.611	0.535-0.678	<.001	0.759
	P1 \times P3	PM \times P	0.712	0.652-0.764	<.001	0.832
	P2 \times P3	PM \times P	0.632	0.558-0.695	<.001	0.774
Mastologists	P1 \times P2	COM \times M	0.711	0.650-0.763	<.001	0.831
	P1 \times P3	COM \times OPM	0.776	0.726-0.817	<.001	0.874
	P2 \times P3	M \times OPM	0.741	0.685-0.788	<.001	0.851
Mastologists \times Plastic surgeons	3M \times 3P	—	0.856	0.822-0.884	<.001	0.922

Abbreviations: 3M = all mastologists; 3P = all plastic surgeons; COM = mastologist trained in cancer surgery; ICC = intraclass correlation coefficient; M = mastologist; OPM = mastologist with experience in oncoplastic surgery; P = plastic surgeon; PM = plastic surgeon with experience in mastology.

A cross-sectional study conducted in Brazil with 270 BCS patients with a mean follow-up time of 63.7 months sought to compare different professional practices using different assessment methods. On the basis of the Harvard classification, the best correlation was found among breast surgeons, who nonetheless had a poor correlation (0.35); according to the Garbay classification, the best score was a mild correlation (0.16) among plastic surgeons. When comparing senior surgeons, junior surgeons, and residents, there was in general a greater correspondence with BCCT.core among surgeons with a longer duration of practice in the specialty. Similarly, the results showed that the breast surgeons had a better correlation with BCCT.core than the plastic surgeons did.¹⁴ In the present study, we considered the professionals according to their training and expertise and found reasonable correlations, which were higher when the Fitoussi and Garbay classifications were used.

Finally, for the patient, the concept of cosmesis involves more than symmetry, and symmetrical breasts do not always guarantee a satisfactory cosmetic outcome, which may hinder comparisons between objective and subjective assessment methods.³³ We believe that oncoplastic and symmetrization surgery would influence the results; however, this association has not yet been elucidated in the literature. OS did not influence the cosmetic results, as it represents a group surgical techniques that allow increases in breast-conserving therapy, and it was not always associated with symmetrization. Symmetrization does not imply symmetry but rather improves the cosmetic results. The operated breast can be asymmetrical simply by tumor resection. In addition, the breast submitted to radiotherapy may have local alterations related to breast fibrosis or hardening, which can lead to asymmetry. Also, in the contralateral breast, changes in weight and breast density can modify the volume and shape of the breast. As a

Table 5 Influence of Oncoplastic Surgery and Symmetrization on Cosmetic Results

Evaluator	Evaluation	Oncoplastic Surgery			Symmetrization		
		No	Yes	P	No	Yes	P
Patients (self-assessment)	Excellent	59 (26.1)	23 (31.9)	.507	70 (26.8)	12 (32.4)	.847
	Good	117 (51.8)	30 (41.7)		131 (50.2)	16 (43.2)	
	Fair	36 (15.9)	13 (18.1)		43 (16.5)	6 (16.2)	
	Bad/poor	14 (6.2)	6 (8.3)		17 (6.5)	3 (8.1)	
BCCT.core ^a	Excellent	13 (5.8)	5 (6.9)	.391	15 (5.8)	3 (8.1)	.100
	Good	55 (24.4)	16 (22.2)		60 (23.1)	11 (29.7)	
	Fair	97 (43.1)	38 (52.8)		115 (44.2)	20 (54.1)	
	Bad/poor	60 (26.7)	13 (18.1)		70 (26.9)	3 (8.1)	
Mastologists	Excellent	7 (3.1)	4 (5.6)	.219	9 (3.4)	2 (5.4)	.077
	Good	61 (26.8)	24 (33.3)		69 (26.2)	16 (43.2)	
	Fair	109 (47.8)	35 (48.6)		128 (48.7)	16 (43.2)	
	Bad/poor	51 (22.4)	9 (12.5)		57 (21.7)	3 (8.1)	
Plastic surgeons	Excellent	12 (5.3)	2 (2.8)	.629	13 (4.9)	1 (2.7)	.562
	Good	58 (25.4)	18 (25.0)		64 (24.3)	12 (32.4)	
	Fair	76 (33.3)	29 (40.3)		91 (34.6)	14 (37.8)	
	Bad/poor	82 (36.0)	23 (31.9)		95 (36.1)	10 (27.0)	

Data are presented as n (%).

^aExcluded 3 patients because photos were absent.

COSMETIC RESULTS IN ONCOPLASTIC SURGERY

long follow-up occurred, these facts may have influenced symmetrization results. BCCT.core and plastic surgeons were more critical about symmetry, and mastologists (individually) were more flexible. Possibly dissatisfied patients had their breasts submitted to symmetrization. The long follow-up may therefore have influenced the results, given the lack of agreement about the proper role of symmetrization and the high acceptance of the results for the patients. Future and prospective studies are necessary.

Among this study's limitations are the retrospective and cross-sectional nature of the study and the performance of evaluations after a long follow-up period. In contrast, the inclusion of different professionals who were not directly involved in surgery, mainly plastic surgeons, and who performed assessments in a blinded and sequential manner, as well as the use of patient self-assessment and different methodologies, were advantages of the present study. Longitudinal and long-term studies are needed.

Conclusion

Patients tend to self-evaluate the cosmetic results after BCS better than software and health care professionals. Plastic surgeons are the most critical. Given the differences in training and experience, the correlations between surgeons of different specialties were acceptable. Although OS has been reported with better cosmetic results, it was not observed in this study with a long follow-up.

Clinical Practice Points

- Oncoplastic surgery (OS), which is widely used for breast cancer, provided new surgical options, with the aim of better cosmetic results.
- The patient self-rated cosmetic results after BCS better compared to medical observers.
- Regardless of medical specialty, which led to different tendencies when evaluating cosmetic results, plastic surgeons tended to be the most critical.
- OS did not influence the cosmetic results in Brazilian public patients with long follow-up evaluation.

Acknowledgments

Supported in part by Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP), grant 2014/08197-0. We acknowledge the work of the late Gilberto Uemura, MD, PhD, mastologist, who was one of the professionals who analyzed the entire series of patients. Statistician Marcos Alves de Lima (Barretos Cancer Hospital) provided orientation regarding the methodology to be used and the evaluation of the results.

Disclosure

The authors have stated that they have no conflict of interest.

Supplementary Data

Supplementary tables and figures accompanying this article can be found in the online version at <https://doi.org/10.1016/j.clbc.2020.09.012>.

References

1. Fisher B, Anderson S, Bryant J, et al. Twenty-year follow-up of a randomized trial comparing total mastectomy, lumpectomy, and lumpectomy plus irradiation for the treatment of invasive breast cancer. *N Engl J Med* 2002; 347:1233-41.
2. Veronesi U, Cascinelli N, Mariani L, et al. Twenty-year follow-up of a randomized study comparing breast-conserving surgery with radical mastectomy for early breast cancer. *N Engl J Med* 2002; 347:1227-32.
3. Curran D, van Dongen JP, Aaronson NK, et al. Quality of life of early-stage breast cancer patients treated with radical mastectomy or breast-conserving procedures: results of EORTC trial 10801. The European Organization for Research and Treatment of Cancer (EORTC), Breast Cancer Co-operative Group (BCCG). *Eur J Cancer* 1998; 34:307-14.
4. Sneeuw KC, Aaronson NK, Yarnold JR, et al. Cosmetic and functional outcomes of breast conserving treatment for early stage breast cancer. 2. Relationship with psychosocial functioning. *Radiother Oncol* 1992; 25:160-6.
5. Waljee JF, Hu ES, Ubel PA, Smith DM, Newman LA, Alderman AK. Effect of esthetic outcome after breast-conserving surgery on psychosocial functioning and quality of life. *J Clin Oncol* 2008; 26:3331-7.
6. Vieira RA, Carrara GF, Scapulatempo Neto C, Morini MA, Brentani MM, Folgueira MA. The role of oncoplastic breast conserving treatment for locally advanced breast tumors. A matching case-control study. *Ann Med Surg (Lond)* 2016; 10:61-8.
7. Weber WP, Soysal SD, El-Tamer M, et al. First international consensus conference on standardization of oncoplastic breast conserving surgery. *Breast Cancer Res Treat* 2017; 165:139-49.
8. Al-Ghazal SK, Blamey RW. Cosmetic assessment of breast-conserving surgery for primary breast cancer. *Breast* 1999; 8:162-8.
9. Cardoso MJ, Cardoso J, Santos AC, Barros H, Cardoso de Oliveira M. Interobserver agreement and consensus over the esthetic evaluation of conservative treatment for breast cancer. *Breast* 2006; 15:52-7.
10. Cardoso MJ, Cardoso JS, Vrieling C, et al. Recommendations for the aesthetic evaluation of breast cancer conservative treatment. *Breast Cancer Res Treat* 2012; 135:629-37.
11. Chen CM, Cano SJ, Klassen AF, et al. Measuring quality of life in oncologic breast surgery: a systematic review of patient-reported outcome measures. *Breast J* 2010; 16:587-97.
12. Brandini da Silva FC, Jose da Silva J, Sarri AJ, Paiva CE, Aloisio da Costa Vieira R. Comprehensive validation study of quality-of-life questionnaire using objective clinical measures: Breast Cancer Treatment Outcome Scale (BCTOS), Brazilian Portuguese version. *Clin Breast Cancer* 2019; 19:e85-100.
13. Harris JR, Levene MB, Svensson G, Hellman S. Analysis of cosmetic results following primary radiation therapy for stages I and II carcinoma of the breast. *Int J Radiat Oncol Biol Phys* 1979; 5:257-61.
14. Bayeh HA, Paulinelli RR, Soares LR, et al. The cosmetic outcome of breast reconstruction: reproducibility of different methods assessed by different professionals. *Mastology* 2019.
15. Negenborn VL, Volders JH, Krekel NMA, et al. Breast-conserving therapy for breast cancer: cosmetic results and options for delayed reconstruction. *J Plast Reconstr Aesthet Surg* 2017; 70:1336-44.
16. Fitoussi AD, Berry MG, Couturaud B, Falcou MC, Salmon RJ. Management of the post-breast-conserving therapy defect: extended follow-up and reclassification. *Plast Reconstr Surg* 2010; 125:783-91.
17. Veiga DF, Veiga-Filho J, Ribeiro LM, et al. Evaluations of aesthetic outcomes of oncoplastic surgery by surgeons of different gender and specialty: a prospective controlled study. *Breast* 2011; 20:407-12.
18. Merie R, Browne L, Cardoso JS, et al. Proposal for a gold standard for cosmetic evaluation after breast conserving therapy: results from the St George and Wollongong Breast Boost trial. *J Med Imaging Radiat Oncol* 2017; 61:819-25.
19. Cardoso MJ, Cardoso J, Amaral N, et al. Turning subjective into objective: the BCCT.core software for evaluation of cosmetic results in breast cancer conservative treatment. *Breast* 2007; 16:456-61.
20. Cardoso MJ, Cardoso JS, Oliveira HP, Gouveia P. The breast cancer conservative treatment. Cosmetic results—BCCT.core—software for objective assessment of esthetic outcome in breast cancer conservative treatment: a narrative review. *Comput Methods Programs Biomed* 2016; 126:154-9.
21. Maass SW, Bagher S, Hofer SO, Baxter NN, Zhong T. Systematic review: aesthetic assessment of breast reconstruction outcomes by healthcare professionals. *Ann Surg Oncol* 2015; 22:4305-16.
22. Sayan M, Hard D, Wilson K, et al. Long-term cosmesis following a novel schedule of accelerated partial breast radiation in selected early stage breast cancer: result of a prospective clinical trial. *Radiat Oncol J* 2017; 35:325-31.
23. Brands-Appeldoorn A, Maaskant-Braat AJG, Zwaans WAR, et al. Patient-reported outcome measurement compared with professional judgment of cosmetic results after breast-conserving therapy. *Curr Oncol* 2018; 25:e553-61.
24. Lancellotta V, Seipelt L, Hannoun-Levi JM, et al. Multi-institutional evaluation of the reproducibility and the accuracy of the objective breast cosmesis scale. *Brachytherapy* 2018; 17:944-8.
25. Cardoso MJ, Santos AC, Cardoso J, Barros H, Cardoso De Oliveira M. Choosing observers for evaluation of aesthetic results in breast cancer conservative treatment. *Int J Radiat Oncol Biol Phys* 2005; 61:879-81.
26. Oliveira-Junior I, Silva IA, Silva FCB, et al. Oncoplastic surgery in breast-conserving treatment: patient profile and impact on quality of life

- treatment: patient profile and impact on quality of life. *Breast Care* 2020. <https://doi.org/10.1159/000507240>, accessed: October 19, 2020.
27. Heil J, Carolus A, Dahlkamp J, et al. Objective assessment of aesthetic outcome after breast conserving therapy: subjective third party panel rating and objective BCCT.core software evaluation. *Breast* 2012; 21:61-5.
 28. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics* 1977; 33:159-74.
 29. Rew DA. Towards a scientific basis for oncoplastic breast surgery. *Eur J Surg Oncol* 2003; 29:105-6.
 30. Leonardi MC, Garusi C, Santoro L, et al. Impact of medical discipline and observer gender on cosmetic outcome evaluation in breast reconstruction using transverse rectus abdominis myocutaneous (TRAM) flap and radiotherapy. *J Plast Reconstr Aesthet Surg* 2010; 63:2091-7.
 31. Vrieling C, Collette L, Bartelink E, et al. Validation of the methods of cosmetic assessment after breast-conserving therapy in the EORTC "boost versus no boost" trial. EORTC Radiotherapy and Breast Cancer Cooperative Groups. European Organization for Research and Treatment of Cancer. *Int J Radiat Oncol Biol Phys* 1999; 45:667-76.
 32. Santos G, Urban C, Edelweiss MI, et al. Long-term comparison of aesthetical outcomes after oncoplastic surgery and lumpectomy in breast cancer patients. *Ann Surg Oncol* 2015; 22:2500-8.
 33. Ho PJ, Hartman M, Young-Afat DA, Gernaat SAM, Lee SC, Verkooijen HM. Determinants of satisfaction with cosmetic outcome in breast cancer survivors: a cross-sectional study. *PLoS One* 2018; 13: e0193099.
 34. Falk Dahl CA, Reinertsen KV, Nesvold IL, Fossa SD, Dahl AA. A study of body image in long-term breast cancer survivors. *Cancer* 2010; 116:3549-57.
 35. Pikler V, Winterowd C. Racial and body image differences in coping for women diagnosed with breast cancer. *Health Psychol* 2003; 22:632-7.
 36. Figueiredo MI, Cullen J, Hwang YT, Rowland JH, Mandelblatt JS. Breast cancer treatment in older women: does getting what you want improve your long-term body image and mental health? *J Clin Oncol* 2004; 22: 4002-9.
 37. Harcourt D, Russell C, Hughes J, White P, Nduka C, Smith R. Patient satisfaction in relation to nipple reconstruction: the importance of information provision. *J Plast Reconstr Aesthet Surg* 2011; 64:494-9.

Supplementary Data

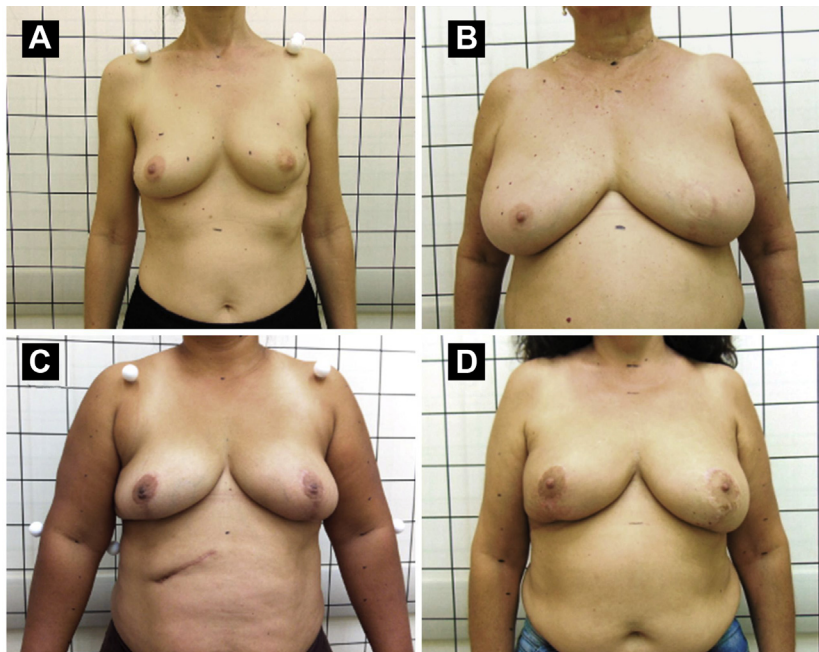
Supplementary Table 1 Results of Cosmesis Using Harvard Scale According to Different Groups of Evaluators						
Evaluator	Professional Evaluation	Patient Evaluation, N (%)				Kappa/WK
		Excellent	Good	Fair	Bad/Poor	
Plastic surgeons	Excellent	4 (4.9)	8 (5.4)	2 (4.1)	0	0.007/0.063
	Good	28 (34.1)	36 (24.5)	10 (20.4)	2 (10.0)	
	Fair	28 (34.1)	55 (37.4)	15 (30.6)	6 (30.0)	
	Bad/poor	22 (26.8)	48 (32.7)	22 (44.9)	12 (60)	
Mastologists	Excellent	1 (1.2)	7 (4.8)	2 (4.1)	1 (5.0)	0.009/0.065
	Good	35 (42.7)	38 (25.9)	9 (18.4)	2 (10.0)	
	Fair	35 (42.7)	74 (50.3)	26 (53.1)	8 (40.0)	
	Bad/poor	11 (13.4)	28 (19.0)	12 (24.5)	9 (45.0)	
BCCT.core	Excellent	5 (6.2)	10 (6.8)	2 (4.2)	1 (5.0)	0.08/0.072
	Good	23 (28.4)	39 (26.7)	5 (10.4)	4 (20.0)	
	Fair	33 (40.7)	63 (43.2)	32 (66.7)	6 (30.0)	
	Bad/poor	20 (24.7)	34 (23.3)	9 (18.8)	9 (45.0)	
BCCT.core						
Plastic surgeons	Excellent	4 (22.2)	8 (11.3)	2 (1.5)	0	0.275/0.406
	Good	12 (66.7)	30 (42.3)	26 (19.3)	6 (8.2)	
	Fair	1 (5.6)	26 (36.6)	62 (45.9)	15 (20.5)	
	Bad/poor	1 (5.6)	7 (9.9)	45 (33.3)	52 (71.2)	
Mastologists	Excellent	1 (5.6)	8 (11.3)	2 (1.5)	0	0.212/0.36
	Good	14 (77.8)	31 (43.7)	36 (26.7)	2 (2.7)	
	Fair	3 (16.7)	29 (40.8)	75 (55.6)	36 (49.3)	
	Bad/poor	0	3 (4.2)	22 (16.3)	35 (47.9)	
Mastologists						
Plastic surgeons	Excellent	4 (36.4)	9 (10.6)	1 (0.7)	0	0.429/0.528
	Good	4 (36.4)	47 (55.3)	24 (16.7)	1 (1.7)	
	Fair	3 (27.3)	22 (25.9)	76 (52.8)	4 (6.7)	
	Bad/poor	0	7 (8.2)	43 (29.9)	55 (91.7)	

Abbreviation: WK = weighted kappa.

Supplementary Table 2 Comparison Between Different Professionals According to Fitoussi Scale

Plastic Surgeons	Mastologists, N (%)						Kappa/WK
	I	II	III	IV	V	Total	
Asymmetry							
I	17 (41.5)	11 (15.3)	0	0	0	28 (9.3)	0.293/0.464
II	14 (34.1)	32 (44.4)	33 (24.1)	2 (4.3)	0	81 (27)	
III	10 (24.4)	29 (40.3)	76 (55.5)	17 (36.2)	0	132 (44)	
IV	0	0	27 (19.7)	26 (55.3)	1 (33)	54 (18)	
V	0	0	1 (0.7)	2 (4.3)	2 (66.7)	5 (1.7)	
Total	41 (13.6)	72 (24)	137 (45.7)	47 (15.7)	3 (1)	300 (100)	
Repair							
I	48 (65.8)	8 (4.4)	0	0	0	56 (18.7)	0.519/0.578
II	22 (30.1)	145 (80.1)	0	6 (18.8)	0	173 (57.7)	
III	2 (2.7)	8 (4.4)	8 (57.1)	5 (15.6)	0	23 (7.7)	
IV	1 (1.4)	20 (11)	5 (35.7)	14 (43.8)	0	40 (13.3)	
V	0	0	1 (7.1)	7 (21.9)	0	8 (2.7)	
Total	73 (24.3)	181 (60.3)	14 (4.7)	32 (10.7)	0	300 (100)	

Abbreviation: WK = weighted kappa.

Supplemental Figure 1 Photographs Used in Primary Assessment of Cosmesis (A) Primary Photography. (B) OS With Plug Flap Surgery. (C) OS With Symmetrization. (D) Dissatisfactory Results (Good Results by BCCT.core and Surgeons, Bad/Poor Result by patients)

Supplemental Figure 2 Web-Based Platform for Cosmetic Evaluation

A

Pesquisa 1 - 1 a 50

Visão geral Editar questões Modelos Análise Mostrar respostas Mostrar não respondentes

Pesquisa 1 - 1 a 50

sábado, 5 março 2016, 15:13 (Gilberto Uemura)

Dados do Pesquisador:

(P1) Qual sua especialidade?*

Mastologia

(P2) Anos de experiência em mastologia* (0 - 99)

24,00

(P3) Anos de experiência em Cirurgia Plástica/Oncoplastia* (0 - 99)

2,00

Paciente 1

**B**

Sabendo-se que a mama tratada foi a esquerda, responda as perguntas abaixo.

(M0011) De uma maneira geral, o resultado da mama ficou:*

Bom

Considerando a classificação de Garbay (abaixo), categorize:

	Categoria 0	Categoria 1	Categoria 2
Volume da mama	Marcada diferença de volume	Leve diferença de volume	Mamas simétricas
Forma da mama	Marcada deformidade no contorno ou forma assimétrica	Leve deformidade no contorno ou forma assimétrica	Mamas simétricas
Simetria da mama	Marcada assimetria	Leve assimetria	Mamas simétricas
Sulco Inframamário	Pouco definido ou não definido	Definido, mas assimétrico	Definido e simétrico
Cicatrizes	Resultado pobre (hipertrofia ou contratura da cicatriz)	Resultado médio (cicatrizes largas, má correspondência de cor, mas sem hipertrofia ou contratura)	Resultado bom (cicatrizes finas, coloração adequada)

(M0012a) Volume da Mama:*

Categoria 1

(M0012b) Forma da mama:*

Categoria 1

(M0012c) Simetria da Mama:*

Categoria 1

(M0012d) Sulco Inframamário:*

Categoria 1

(M0012e) Cicatrizes:*

Categoria 2

Considerando a classificação de Fituosi, classifique em função de:

(M0013) Tipo de defeito e necessidade para Cirurgia*

III - Aspecto razoável, porém claramente diferente da tratada.

(M0014) Metodologia de reparo:*

I - Deformidade ipsilateral mínima

C<http://www.hcancerbarretos.com.br/ead/moodle/mod/feedback/>