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Original article

Prepectoral Versus Subpectoral Implant-based Breast Reconstruction: Evaluation of the Aesthetic Outcomes by Plastic Surgeons and General Practitioners

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Abstract. *Background:* In breast reconstruction after skin or nipple sparing mastectomy, breast implants may be placed in a subpectoral or prepectoral position. In the literature a comparative evaluation of aesthetic outcomes after these two techniques is lacking. *Aim:* This study aims to evaluate the aesthetic outcomes of breast reconstruction surgery after these reconstructive techniques by mean of a questionnaire. *Methods:* This retrospective observational study concerns patients receiving breast implant reconstruction from 2018 to 2021, after a skin or nipple sparing mastectomy. The inclusion criteria were the presence of pre- and postoperative breast measurements, and preoperative and one year follow-up photographs. An aesthetic assessment was done by a panel of Plastic Surgeons and General Practitioners by mean of a questionnaire, inquiring the overall aesthetic aspect of the breast area pre and postoperatively. The judgment of general practitioners and surgeons were statistically analyzed. The correlation between individual points single items and the overall aesthetic outcome was analyzed and the inter-observer variability was assessed. *Results:* Twenty-six breast reconstructions (14 prepectoral and 12 subpectoral) were considered. The mean ratings of plastic surgeons were higher than those of General Practitioners. No statistically significant differences were found between the postoperative ratings of the two techniques. Volume and shape were found to be most correlated with the overall level of satisfaction. The degree of intraclass correlation was generally high, but it was higher for general practitioners. *Conclusions:* Subpectoral and prepectoral techniques were superimposable to achieve satisfying aesthetic outcomes. The General Practitioners' ratings were lower on average, showing a difference in the aesthetic evaluation criteria between the two categories.

Key words: Breast implants, DTI reconstruction, Skin Sparing mastectomy, Nipple sparing mastectomy, Aesthetic assessment, Questionnaire

Introduction

The constant evolution of surgical techniques has implied the comeback of a formerly used procedure in the field of plastic surgery: the prepectoral breast reconstruction. Used in the past, it was eventually abandoned due to its frequent complications[1].

In the last decades, subpectoral breast reconstruction has become the most common technique, despite the complications it involves, such as animation deformity, increased postoperative pain, and breast discomfort[2, 3].

The evolution of surgical procedures and the introduction of Acellular Dermal Matrices (ADMs)

Figure 1. A): Card with preoperative aspect of a 36 years old patient, having had a bilateral prophylactic NSM and prepectoral reconstruction. B) Postoperative card of the same patient as in 1A.

have brought back the a subcutaneous approach for breast implant positioning[4].

In the literature, the up mentioned techniques have been compared in terms of outcomes and complications[5–9]; however, a comparative evaluation of the aesthetic outcomes is lacking.

The purpose of this study is to compare the aesthetic outcomes of subpectoral and prepectoral breast reconstruction techniques by mean of a questionnaire submitted to a panel of Plastic Surgeons (PS) and General Practitioners (GP). A further evaluation studied whether there were differences in score between GP and PS.

Materials and methods

Case series

Medical records of patients undergoing breast reconstruction with prosthetic devices at the Breast Unit of Policlinico Umberto I, Rome, Italy, from January 1, 2018 to December 31, 2021 were selected. Both unilateral and bilateral reconstructions, performed following therapeutic and prophylactic skin and nipple sparing mastectomies were considered.

All subjects with a complete preoperative and one year follow up assessment with a set of 5 standardized photographs, taken before and after reconstruction, were enrolled, leading to a total of 26 patients.

Cases that did not meet the previous criteria, or having diabetic and vascular comorbidities, or a smoking habit were excluded.

Evaluation of the aesthetic outcomes

The patients' photographs captured the breast region, framed between the shoulders and the navel, with five angles: frontal view, two lateral views, and two oblique views.

The five photographs were combined into a visual evaluation card, as shown in Figure 1A and B, and the 52 cards, 26 preoperative and 26 postoperative were then presented in a random order on a screen for a thorough evaluation to each panelist.

Two groups of evaluators were recruited, including three GP and three PS who were not directly involved with the study group. All panelists were not informed on the surgical technique used for breast reconstruction. Each panelist was asked to fill out a purpose-made questionnaire using Google Forms to evaluate the photographs according to the Aesthetic

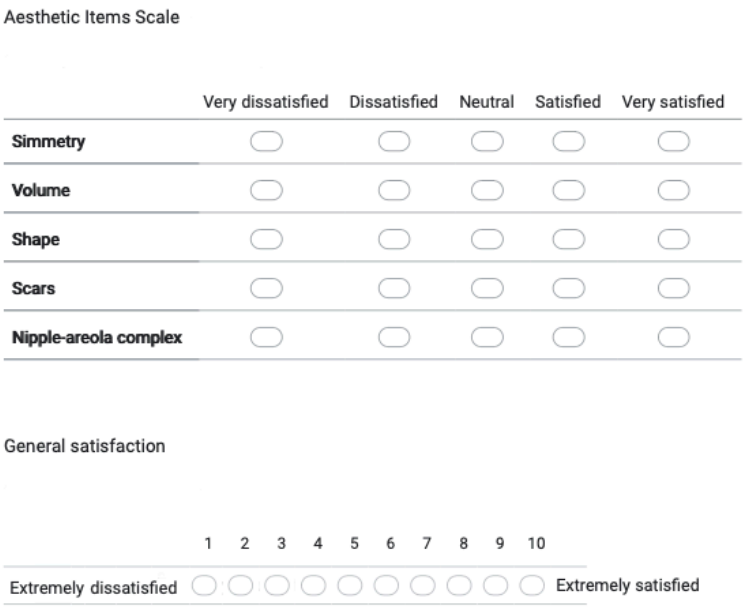


Figure 2. Questionnaire administered to the panelists.

Items Scale (AIS)[10,11]. The questionnaire consisted of a preoperative and a postoperative section for each of the 26 patients (Figure 2).

The survey covered five aspects: Breast Symmetry; Breast Volume; Breast Shape; Scars; Areola-nipple complex. Each item was assigned a score according to the Likert graded scale[12] from 1 to 5 points, corresponding to: "Very Dissatisfied" (1), "Dissatisfied" (2), "Neutral" (3), "Satisfied" (4) and "Very Satisfied" (5).

Furthermore, the degree of overall satisfaction with the preoperative appearance and postoperative aesthetic outcome was assessed using a 10-point scale, from 1 (Extremely Dissatisfied) to 10 (Extremely Satisfied).

Statistical Analysis

The patients' data, including age at the time of reconstruction, BMI, type of reconstruction, and size of prostheses used, were analyzed. To compare the ratings of the GP with those of the PS, the mean and standard deviation of the collected scores were computed. The preoperative and postoperative ratings of all the cases were compared using a Wilcoxon rank sum test, and the postoperative ratings of the subpectoral group were compared with those of the prepectoral group.

The correlation between the ratings of the individual aspects of the aesthetic evaluation and the rating of the overall aesthetic outcome was also calculated, using the Spearman correlation test.

Inter-observer variability was assessed by calculating the Intraclass Correlation Coefficient (ICC) for both GP and PS, analyzing any differences existing between the subpectoral and the prepectoral groups. All statistical analyses were performed using R software (R Core 2022). A value of $p < 0.05$ was considered statistically significant.

Results

Twenty-six breast reconstructions were eligible for the study, including 14 prepectoral and 12 subpectoral. The reconstructive surgeries which were analyzed followed two different types of mastectomies: a nipple-sparing mastectomy was performed in 20 cases (77%), a skin-sparing in 6 cases (23%). Additional characteristics are shown *in Table 1*.

Evaluation of aesthetic outcomes

Mean values and standard deviation for each item on the AIS scale were calculated for both subpectoral reconstructions (Table 2) and prepectoral reconstructions (Table 3), differentiating between GP and PS scores.

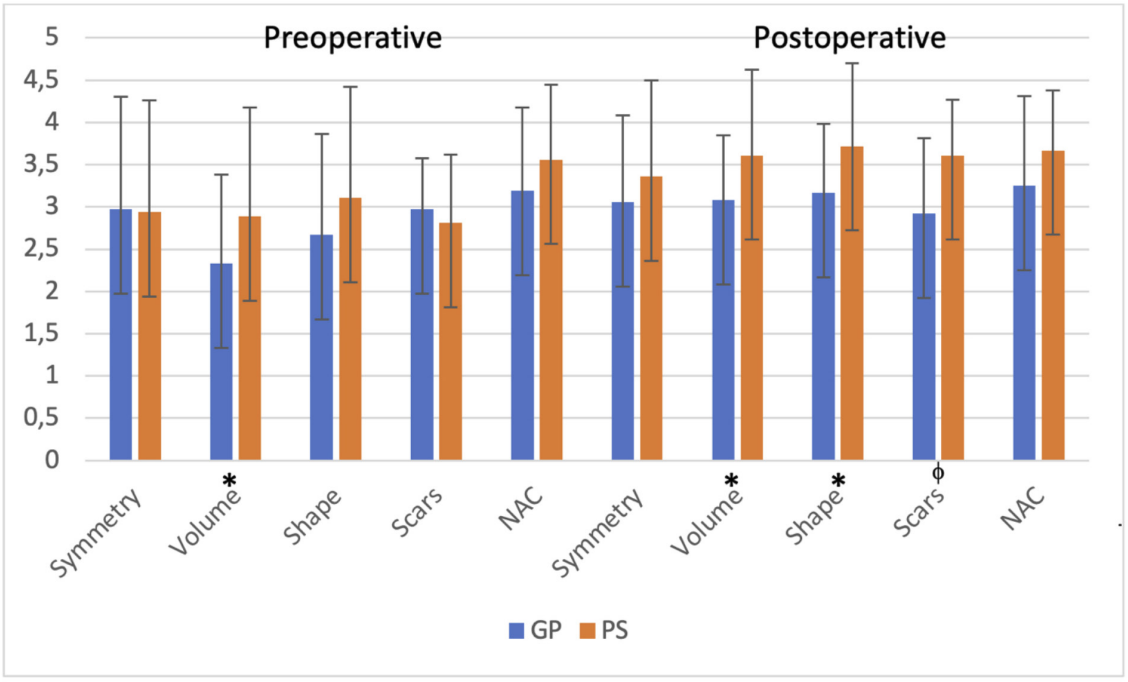
The mean ratings of PS were higher than those of GP for the following characteristics: volume, shape and scars in subpectoral reconstructions. When evaluating prepectoral reconstructions group, PS assigned higher scores for all the items.

A statistical comparison of preoperative and postoperative ratings in subpectoral reconstructions shows a statistically significant increase in scores for volume

Table 1. Patients' characteristics.

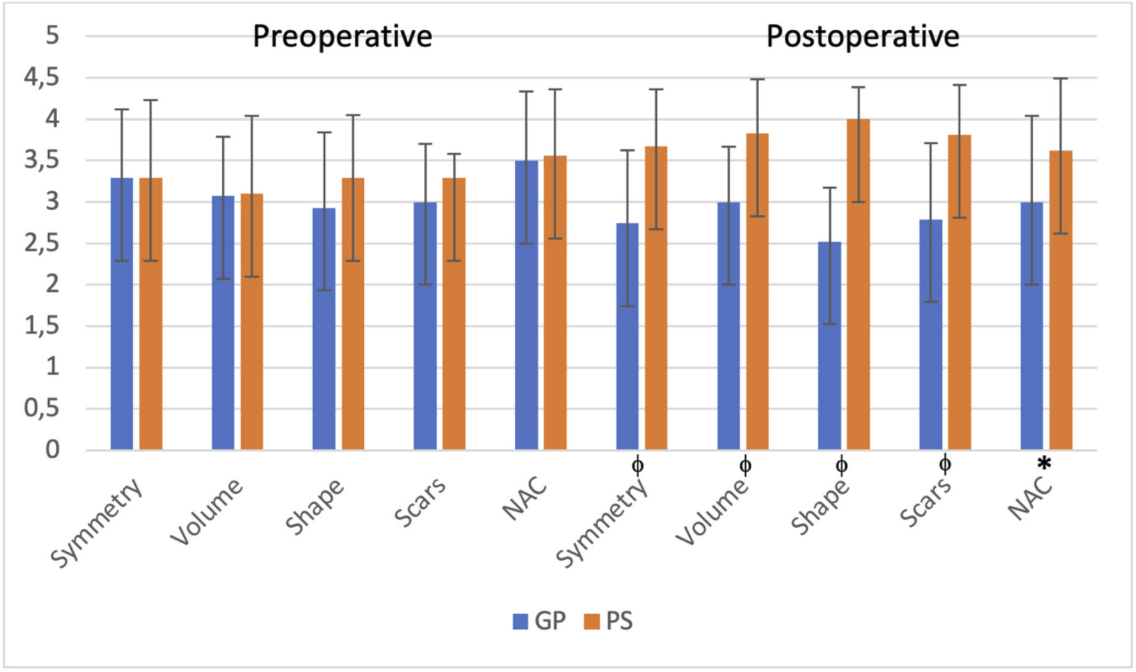
Characteristics	**Value**
N of Patients	26
Mean age at time of reconstruction	51,7 (range 36-70)
BMI	22.8 (range 19-29)
Prepectoral	54 % (n°14)
Subpectoral	46% (n°12)
Unilateral reconstruction (%)	65% (n°17)
Bilateral reconstruction (%)	35% (n°9)
Mean protheses size in cc	235 (125-400cc)

Table 2. Subpectoral reconstruction scores.



*Mean and SD of pre- and postoperative values in subpectoral reconstructions, as valued by General Practitioners (GP) and Plastic Surgeons (PS). Data were compared by Wilcoxon rank sum test, showing statistically significant differences between GP and PS. * p<0.05; ƒ p<0.001*

Table 3. Prepectoral reconstruction scores.



*Mean and SD of pre-and postoperative values in subpectoral reconstructions, as valued by General Practitioners (GP) and Plastic Surgeons (PS). Data were compared by Wilcoxon rank sum test, showing statistically significant differences between GP and PS. * p<0.05; ƒ p<0.001.*

Table 4. Comparison of preoperative and postoperative judgements in subpectoral reconstructions

	Preoperative	Postoperative	Z	p
Symmetry				
GP	2.97 ± 1.33	3.06 ± 1.02	0.271	0.786
PS	2.94 ± 1.32	3.36 ± 1.14	1.056	0.291
Volume				
GP	2.33 ± 1.05	3.08 ± 0.77	2.768	**0.006**
PS	2.89 ± 1.29	3.61 ± 1.01	2.184	**0.029**
Shape				
GP	2.67 ± 1.19	3.17 ± 0.81	2.231	**0.026**
PS	3.11 ± 1.31	3.72 ± 0.98	2.203	**0.028**
Scars				
GP	2.97 ± 0.61	2.92 ± 0.89	0.267	0.789
PS	2.81 ± 0.81	3.61 ± 0.66	2.550	**0.011**
NAC				
GP	3.19 ± 0.99	3.25 ± 1.06	0.114	0.909
PS	3.56 ± 0.89	3.67 ± 0.71	0.971	0.332
Overall				
GP	5.17 ± 2.14	5.78 ± 1.42	1.498	0.134
PS	6.11 ± 2.17	6.75 ± 1.62	2.435	**0.015**

Data were compared by Wilcoxon rank sum test. Z score displayed differences between preoperative and postoperative scores; the related p-value is shown in the last column. A value of p<0.05 is considered statistically significant. GP: General practitioners; PS: Plastic surgeons; NAC: Nipple-areola complex.

Table 5. Comparison of preoperative and postoperative judgements in prepectoral reconstructions.

	Preoperative	Postoperative	Z	p
Symmetry				
GP	3.29 ± 0.83	2.74 ± 0.88	2.243	**0.025**
PS	3.19 ± 0.94	3.67 ± 0.69	2.202	**0.028**
Volume				
GP	3.07 ± 0.72	3 ± 0.67	0.269	0.788
PS	3.10 ± 0.94	3.83 ± 0.65	3.342	**0.000**
Shape				
GP	2.93 ± 0.91	2.52 ± 0.65	1.929	0.054
PS	3.29 ± 0.76	4 ± 0.39	3.369	**0.000**
Scars				
GP	3 ± 0.70	2.79 ± 0.92	0.971	0.331
PS	3.29 ± 0.29	3.81 ± 0.60	2.858	**0.004**
NAC				
GP	3.5 ± 0.84	3 ± 1.04	2.413	**0.016**
PS	3.56 ± 0.80	3.62 ± 0.87	1.092	0.275
Overall				
GP	6 ± 1.43	5.19 ± 1.29	2.048	**0.041**
PS	6.36 ± 1.36	7.02 ± 0.84	4.266	**0.000**

Data were compared by Wilcoxon rank sum test. Z score displayed differences between preoperative and postoperative scores; the related p-value is shown in the last column. A value of p<0.05 is considered statistically significant. GP: General practitioners; PS: Plastic surgeons; NAC: Nipple-areola complex.

and shape for both categories of panelists. PS panelists were the only ones rating better scores for scars and overall satisfaction in the subpectoral reconstruction group, as shown in Table 4.

A comparison of preoperative and postoperative evaluations in prepectoral reconstructions reveals a substantial difference between the ratings made by GP and plastic surgeons. The scores of GP decrease in a statistically significant way in the postoperative for symmetry and overall satisfaction. Conversely for plastic surgeons, the scores for symmetry, volume, shape, scarring, and general satisfaction increase in a statistically significant way in the postoperative, as reported in Table 5.

A comparison of postoperative ratings of subpectoral and prepectoral reconstructions shows no statistically significant differences between the two types of surgical techniques in either the ratings of GP and PS, assessed by the Wilcoxon rank sum test.

The correlation between individual AIS items and overall satisfaction, shown in Table 6, is strong (>0.7)

Table 6. Correlation between each item and overall satisfaction for both reconstructive techniques.

	GP		**PS**	
	Spearman correlation coefficient	**p**	**Spearman correlation coefficient**	**p**
Symmetry	0.632	0.000*	**0.708**	0.000*
Volume	**0.729**	0.000*	**0.721**	0.000*
Shape	**0.771**	0.000*	**0.791**	0.000*
Scars	0.593	0.000*	0.679	0.000*
NAC	0.673	0.000*	0.564	0.000*

*Data were analyzed using Spearman's correlation coefficient. *p<0.001. GP: General practitioners; PS: Plastic surgeons; NAC: Nipple-areola complex.*

Table 7. Interobserver variability in general practitioners and plastic surgeons' judgements.

		Subpectoral		**Prepectoral**	
		ICC pre	ICC post	ICC pre	ICC post
Symmetry	GP	0.9404	0.8489	0.7554	0.6593
	PS	0.8393	0.7931	0.7438	0.3482
Volume	GP	0.8477	0.5193	0.4828	0.3750
	PS	0.8031	0.7795	0.7896	0.5974
Shape	GP	0.8518	0.7269	0.8028	0.2558
	PS	0.8908	0.8179	0.5791	0.0476
Scars	GP	0.8668	0.5879	0.8276	0.7387
	PS	0.7741	0.3492	-1.5882	0.7086
NAC	GP	0.6758	0.8118	0.7494	0.8248
	PS	0.8517	0.1650	0.7242	0.5643
Overall	GP	0.8280	0.7637	0.7230	0.6281
	PS	0.8593	0.7009	0.6640	0.1550

Interobserver variability in general practitioners and plastic surgeons' judgments.
Data were analyzed using Intraclass Correlation Coefficient. 0-0.49: Poor reliability; 0.5-0.74: Moderate reliability; 0.75-0.89: Good reliability; 0.9-1: Excellent reliability. GP: General practitioners; PS: Plastic surgeons; NAC: Nipple-areola complex

with volume and shape for both GP and PS, and with symmetry, only within the PS group. The other variables show a lower degree of correlation.

The level of agreement in judgments is high overall for both categories of professionals, but higher in general practitioners than in plastic surgeons. In fact, the frequency of correlation coefficients from Good to Excellent[13] is 12/24 for the former and 10/24 for the latter, as shown in Table 7. The frequency of items with a Poor concordance is 3/24 for GP and 6/24 for PS.

Prepectoral breast reconstruction demonstrates less Good/Excellent values of ICC (5/24), as compared to subpectoral (17/24).

Discussion and conclusions

Previous studies comparing the two techniques, object of this study, have shown a superiority of prepectoral reconstruction from the point of view of aesthetic outcomes (Bernini et al.[14], Ribuffo et al.[15]).

However, both Authors focused their studies on the various outcomes and complications of the two reconstructive techniques, devoting a single question administered to the evaluators regarding the subjective evaluation of the aesthetic outcomes.

The originality of the present study consists in comparing the judgments of GP and PS on the aesthetic outcomes of the two types of reconstructive techniques, using a validated semi-quantitative scale[10,11], applied to pre- and postoperative conditions, which analyzes different aspects of aesthetic outcomes.

The results of this study show that the ratings of PS are higher than those of GP in both subpectoral and prepectoral reconstructions, in accordance with what was reported in the study by Siqueira et al.[16], in which, however, a comparison was made between the ratings of plastic and non-plastic surgeons.

This difference is probably due to the higher expectations of GP on the aesthetic outcomes of reconstructive surgery compared to PS, and also to the lower experience of the former regarding the outcomes of reconstructive surgery.

An increase in ratings between the preoperative and postoperative was also found in the PS category, as reported by Visser et al.[10]. Specifically, an increase was observed in all scores except those related to the areola-nipple complex in pre-pectoral reconstruction. In subpectoral reconstruction, an increase was observed in volume, shape, scarring, and overall satisfaction scores.

Conversely an increase in ratings between preoperative and postoperative in subpectoral reconstructions regarding volume and shape items was given by GP; while symmetry, areola-nipple complex, and general satisfaction scores in prepectoral reconstructions were found to have decreased.

The latter result could be related to the presence in the case series of four patients, including three in the prepectoral group and one in the subpectoral group in whom the postoperative assessment had been performed before the reconstruction surgery of the areola-nipple complex was completed. This may have influenced the evaluation of GP, who would have considered the surgery to be incomplete, therefore resulting in lower ratings.

In addition, there might be a bias in the judgment of the aesthetic outcomes of reconstructive surgery by GP related to a different aesthetic criterion, which would lead to evaluate the reconstructive outcomes assimilating them to cosmetic breast surgery. This would explain the decrease in scores between preoperative and postoperative cards.

An analysis of the correlation between individual items and the overall satisfaction showed results in agreement with Visser's observations[10]: the items with a higher correlation were symmetry, volume, and shape making them the items most considered to judge the overall aesthetic outcome.

In the GP panel, symmetry was associated with a lower R-value (Spearman's correlation coefficient), however confirming the relevance of shape and volume for this category of evaluators as well.

In the analysis of the level of agreement between panelists, lower values of ICC were observed in prepectoral reconstructions, particularly for shape and general satisfaction in PS panelists. This would seem to be justified by the high influence of shape in judging the overall satisfaction, as shown by the high Spearman correlation coefficient.

The present study has shown, albeit with its limitations due to the small sample size, that it is possible to use a semiquantitative scale such as Visser's Aes-

thetic Items Scale to compare the aesthetic outcomes of two reconstructive techniques and two categories of observers.

Based on the obtained results, the subpectoral and prepectoral reconstructive techniques were found to be superimposable from an aesthetic point of view. Therefore, on account of the low complication rate observed in the literature for the prepectoral technique, the latter can be considered a viable treatment option.

Furthermore, the scores given by general practitioners were lower on average than those of plastic surgeons, both preoperatively and postoperatively. This demonstrates how adequate training is needed, in relation to non-specialist physicians, to obtain a more suitable evaluation of the outcomes of reconstructive surgery.

Conflict of interest: The authors declare that they have no conflict of interest.

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