A Comparative Analysis of Patient Satisfaction and Cosmetic Outcomes after Breast Reconstruction through BREAST-Q and the Judgment of Medical Panels: Does it Reflect Well in Terms of Aesthetics in Korean Patients?

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Abstract

Background   Currently, the BREAST-Q can effectively measure patient's satisfaction on the quality of life from the patient's perspective in relation to different type of breast reconstruction. However, evaluation of patient satisfaction and cosmetic outcomes in breast reconstruction may have potential to led bias.

Methods   To maximize the benefits of using BREAST-Q to evaluate clinical outcome, we performed comparative study focused on the correlation between postoperative BREAST-Q and cosmetic outcomes assessed by medical professionals. For the current analysis, we used three postoperative BREAST-Q scales (satisfaction with breast, psychosocial well-being, and sexual well-being). The Ten-Point Scale by Visser et al was applied to provide reproducible grading of the postoperative cosmetic outcomes of the breast. The system includes six subscales that measured overall aesthetic outcome, volume, shape, symmetry, scarring, and nipple-areolar complex. The photographic assessments were made by five medical professionals who were shown photographs on a computer screen in a random order. Obtained data were stored in Excel and evaluated by Spearman's correlations using SPSS Statistics.

Results   We enrolled 92 women in this study, 10 did not respond to all scales of postoperative BREAST-Q, the remaining 82 women had undergone breast reconstruction. The correlation between BREAST-Q score and aesthetic score measured by Ten-Point Scale for the three BREAST-Q scales all show positive values in Spearman's correlation coefficient.

Conclusion   A significant correlation without any bias observed was found between the patient's satisfaction measured by BREAST-Q after breast reconstruction and the medical expert's aesthetic evaluation.

Keywords
► BREAST-Q
► breast reconstruction
► patient-reported outcome

Introduction

The incidence of breast cancer is increasing and over 20,000 women are diagnosed with breast cancer every year in South Korea.[1] In 2017, breast cancer, the most common cancer in women, accounted for 23.8% ($n = 24,010$) of all new cancer cases in women.[2] Breast reconstruction rate after mastectomy increased from 19.4% in 2015 to 53.4% in 2018. Reconstruction using implant was increased from 1,366 cases to 3,703 cases and autologous reconstruction from 905 to 1,570.[3] Following this increasing number of breast surgery, evaluation of breast surgery outcome has become necessary. Outcome research in plastic surgery not only examines mortality or morbidity but patient's satisfaction of the results of surgery. Evaluation of the patient's experience in breast surgery is particularly important, the goal of which is to satisfy the patient with minimal psychosocial sequelae, physical function, and aesthetic consequences.[4]

It is important to use reliable, valid, and clinically useful method to measure patient-reported outcome measures in decision-making process. Currently, the BREAST-Q, first introduced in 2009 by Pusic et al,[4] is thought to effectively measure patient's satisfaction on the quality of life from the patient's perspective in relation to different types of breast surgery.[5–8] Although BREAST-Q reflects patient satisfaction well, there are few studies on whether it reflects medical professionals' assessment. Eltahir et al, their Strasser score assessed by medical professionals, could not reflect the differences in satisfaction among patients, measured by BREAST-Q.[9]

Since BREAST-Q was made for the North American population, and whether it properly reflects the evaluation of medical experts, we conducted a study on how well BREAST-Q reflects the satisfaction of Korean patients and the evaluation of medical experts.[10] Prior to the study, no research on this subject was done in Korea.

Methods

Study Design

Institutional review board approval and informed consent were obtained for the retrospective chart review of consecutive, breast reconstruction surgery cases performed at a single academic medical center (IRB file No. 2017–09–020 SCHUH). After a retrospective chart review of breast reconstruction surgery between 2006 and 2019, an analysis was performed.

Patient satisfaction was measured by the Korean version of the BREAST-Q reconstruction module version 2.0, and aesthetic outcomes were assessed by five medical professionals using the Ten-Point Scale by Visser et al.[11] The system includes six subscales that measured overall aesthetic outcome, volume, shape, symmetry, scarring, and nipple-areolar complex, scored from 1 to 10 each.

The BREAST-Q

We used BREAST-Q reconstruction module version 2.0 (Korean version), and patient presenting for breast reconstruction from 2011 to 2019 were asked to complete the BREAST-Q postoperatively. For the current analysis, we used three postoperative BREAST-Q scales (satisfaction with breast, psychosocial well-being, and sexual well-being).

Each scale contains approximately 10 questions, and after calculating the sum of the scores given by patients for these questions, the conversion score was calculated through the conversion score table.

Medical Professional Panels

Five independent medical professionals were organized, composed of three plastic surgeons, one breast oncology surgeon, and one breast nurse practitioner (►Table 1). The senior staff who conducted all surgeries was excluded.

Photographs

Photographs were taken by the medical photographer of our department according to standardized guidelines introduced by Persichetti in 2007. Five view images which composed of one front, two lateral, and two oblique views were taken at average postoperative time of 20.1 (3–94) months. These photographs sets were added to PowerPoint creating a slide show hiding patients' identities and information.

Image Assessment

Before the assessment, we gave information to the panels how to assess with the Ten-Point Scale. Each panel was shown photographs of patient individually on a screen in a random order, and asked to fill the survey form (►Fig. 1).

Statistical Analysis

Total visual scores (TVS) were made by adding all six categories of the Ten-Point Scale. Distribution of data was quantified using Kolmogorov–Smirnov tests. In normality test, not all variables were shown to follow a normal distribution.

Table 1 Details of the panels and their TVS for patients

Panel	Sex	Age	Profession	Total visual score (TVS)
1	Male	34	Plastic surgeon	42 (26–54)
2	Female	43	Oncological surgeon	49 (7–60)
3	Male	28	Plastic surgeon	40 (30–47)
4	Female	27	Specialist breast nurse	58 (47–60)
5	Male	33	Plastic surgeon	42 (17–54)

Note: TVS is the average TVS which panel scored to 82 patients.

Please rate the followings between 1~10

Category	Score
Overall aesthetic outcome	
Volume	
Shape	
Symmetry	
Scarring	
Nipple-areolar complex	
*Total Visual Score (TVS)	

*TVS is a sum of 6 scales above

Fig. 1 Ten-Point Scale used for panel's assessment.

Average of BREAST-Q and TVS with ranges (min–max) were found for each type of surgery (immediate and delayed, unilateral and bilateral, autologous and alloplastic) and compared by Mann–Whitney U tests. Interobserver agreements for panels were evaluated by calculating the relatedness based on the interclass correlation coefficients (ICCs) with 95% confidence interval (CI). About ICC, < 0.40 was considered as a "poor" agreement, 0.40 to 0.59 as "fair," 0.60 to 0.74 as "good," and 0.75 to 1.00 as "excellent."[12] Correlation between TVS and each of the three BREAST-Q scales was evaluated using Spearman's correlation. Statistical significance was defined as $p < 0.05$. We performed all statistical analysis using IMB SPSS, version 26 (IBM Corp., Armonk, NY).

Results

Population

A total 92 women were enrolled in this study, 10 of them who did not answer to all BREAST-Q scale were excluded (►**Table 2**).

Table 2 Characteristics of patients by surgery type

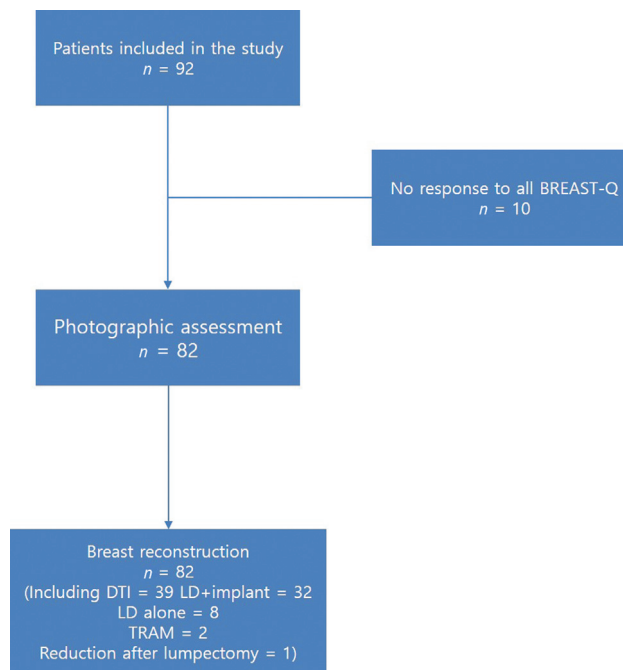| Characteristics		Reconstruction (n = 82)
Age		48 (22–71)
Interval between operation and BREAST-Q survey (mo)		20.1 (3–94)
Surgery	Unilateral	61 (74.4%)
	Bilateral	21 (25.6%)
Reconstruction time	Immediate	79 (96.3%)
	Delayed	3 (3.7%)
Reconstruction type	Autologous	43 (52.4%)
	Alloplastic	39 (47.6%)

Note: n (%) or average (min-max).

Fig. 2 Flowchart.

The average age at the time of breast reconstruction was 48 years and BREAST-Q questionnaire was collected from all patients in the outpatient clinic at follow-up average of 20.1 months after operation. In 82 patients who had undergone breast reconstruction, there were 39 direct-to-implants, 32 latissimus dorsi (LD) musculocutaneous flaps with implant, 7 LD musculocutaneous flaps alone, 1 LD musculocutaneous flap with contralateral direct-to-implant, 2 transverse rectus abdominis musculocutaneous flap, and 1 reduction after lumpectomy (counted as reconstruction) (►**Fig. 2**).

BREAST-Q and Panel Assessment

The number of patients with each type of reconstruction and their BREAST-Q score and TVS are shown in ►**Table 2**. The average of BREAST-Q score shows that the overall results were satisfying. There is a tendency that patients were more satisfied with sexual well-being scale of BREAST-Q if they had immediate, bilateral, or autologous breast reconstruction when compared with delayed, unilateral, or alloplastic breast reconstruction. But only sexual well-being in immediate versus delayed reconstruction showed statistical significance (95% CI, $p = 0.033$). TVS tended to be high when patients had immediate breast reconstruction and they showed statistical significance (95% CI, $p = 0.006$) (►**Table 3**).

Interobserver agreement for TVS evaluated by ICC, among panels was 0.838 (95% CI: 0.776–0.888), showing excellent interobserver agreements (►**Table 4**). The correlation between BREAST-Q score and TVS measured by the Ten-Point Scale, all showed positive values in Spearman's correlation coefficient. Each correlation coefficient was 0.243 ($p = 0.028$) in satisfaction with breast and TVS, 0.242 in psychosocial well-being and TVS ($p = 0.029$), and 0.293 in sexual well-being and TVS. ($p = 0.008$) (►**Table 5**).

Table 3 Comparison of BREAST-Q score and TVS stratified for type of surgery

Breast surgery	N	%	Satisfaction ($n = 82$)	Psychosocial ($n = 82$)	Sexual ($n = 82$)	TVS ($n = 82$)
Total	82	100	58 (0–100)	64 (18–100)	43 (0–100)	46.0 (25.8–54.6)
Immediate	79	96	58 (0–100)	64 (18–100)	44 (0–100)	46.3 (25.8–54.6)
Delayed	3	4	56 (52–59)	61 (52–66)	12 (0–36)	36.1 (25.8–42.4)
p-Value			0.871	0.889	0.033	0.006
Unilateral	61	74	58 (0–100)	64 (18–100)	39 (0–100)	46.2 (25.8–54.6)
Bilateral	21	26	59 (41–86)	65 (18–100)	52 (0–100)	47.1 (40.4–52.2)
p-Value			0.890	0.682	0.055	0.823
Autologous	43	52	58 (0–100)	65 (18–100)	46 (0–100)	46.7 (31–54.6)
Alloplastic	39	48	58 (39–75)	62 (18–100)	39 (0–84)	46.2 (25.8–52.2)
p-Value			0.959	0.683	0.312	0.856

Abbreviation: TVS, total visual score.
Note: Results are given as average and range. p-Values are based on Mann–Whitney U tests. The photographs were taken when patients completed the BREAST-Q.

Table 4 Interobserver reliability of TVS ($n = 82$)

	ICC[a]	95% CI
TVS		
Panels ($n = 5$)	**0.84**	(0.78–0.89)

Abbreviations: CI, confidence interval; ICC, interclass correlation coefficient; TVS, total visual score.
[a]We consider ICC values < 0.40 as "poor" agreement, 0.40–0.59 as "fair" agreement, 0.60–0.74 as "good" agreement, and 0.75–1.00 as "excellent" agreement.

Table 5 Correlation coefficient between BREAST-Q scores and TVS

BREAST-Q scale	Spearman's correlation coefficient with TVS
Satisfaction with breast	0.230[a]
Psychosocial well-being	0.208[a]
Sexual well-being	0.278[b]

Abbreviation: TVS, total visual score.
[a]Correlation is significant at the 0.05 level (two-tailed).
[b]Correlation is significant at the 0.01 level (two-tailed).

Discussion

BREAST-Q is a reliable and effective evaluation method for breast surgery worldwide. But there are few studies about the correlation between panels' assessment and BREAST-Q score. The aim of this study is to evaluate the correlation between medical professionals' assessment and BREAST-Q score.

In our study, we found that the difference of satisfaction in patients, measured by BREAST-Q, was reflected by TVS, sum of all six scales assessed by medical professional panels. TVS showed correlation with satisfaction with breast ($p < 0.01$),

psychosocial well-being ($p < 0.01$), and sexual well-being ($p < 0.01$) in BREAST-Q.

The panels found that immediate reconstruction had aesthetic advantage than delayed reconstruction ($p = 0.006$). But patients who had delayed reconstruction were more satisfied with their sexual well-being than patients with immediate reconstruction ($p = 0.033$). There were tendency that bilateral and autologous reconstruction had higher score than unilateral and alloplastic reconstruction in sexual well-being but not statistically significant. It suggests that sensitivity of Ten-Point Scale we used as a method for measuring outcomes is doubtful.

Systemic review by Maass et al showed that there is no well-established, validated, or reproducible scoring system for medical professionals to assess the aesthetic outcome of breast surgery postoperatively. But among 12 different assessment scales they reviewed that the ten-point professional aesthetic assessment scale was the most accurate measurement.[13]

Aesthetic outcome with regard to volume, shape, symmetry, scars, and nipple-areolar complex was rated on a 5-point scale using standardized photographs and total score was calculated by summing points of five categories. And it showed high interobserver reliability as 0.82 (ICC) while our interobserver reliability to TVS was 0.84 (ICC), showing that TVS is as reliable as AIS.

In ►**Fig. 3**, we can see this scale we used is rigid and able to discriminate between cases.

We found that among panels, female panels were more generous about the aesthetic outcome than male panels conflicting with previous studies. And differences in work in the hospital can affect the assessment.

Going furthermore from the ideal scoring system, in combination with the latest three-dimensional (3D) technology, we can invent a more objective and reliable evaluation method analyzing images with the computer, not by a clinician. Lee et al, comparing with classical water-displacement technique and magnetic resonance imaging-based

Fig. 3 Postoperative photographic finding. Left was graded highest total visual score (TVS) (54.6 of 60) and right was graded lowest (25.8 of 60) by medical panels. BREAST-Q score is 61 and 52 for satisfaction with breast, 62 and 64 for psychosocial well-being, and 41 and 36 for sexual well-being, out of 100 on each scale.

volumetry, 3D scanning showed significant and consistent association with those two methods[14] and successfully used after autologous breast reconstruction as a postoperative volume evaluation method.[15] We can expect to apply this technique to evaluate not only volume but symmetry, ptosis, shape, and other aesthetic components. It will allow clinicians to make a more objective prediction of outcome and inform what additional management is needed for patients postoperatively.

There are some limitations of this study. It is a retrospective study and we only used postoperative BREAST-Q, so could not compare patients' satisfaction with breast pre- and postoperatively. Also, we only use three scales of BREAST-Q in this study and studies for other scales are needed in the future. About BREAST-Q, some of the questions in BREAST-Q were difficult to convey correctly while translating. And in the case of the 10 patients who were excluded because they did not complete the BREAST-Q, considering that all of them did not answer to the sexual well-being scale, it can be thought that the question itself may be difficult to answer due to cultural character and we can assume that the score may not reflect the patient's satisfaction well.

It is possible that the patient's individual satisfaction with the medical staff and hospital was reflected in the BREAST-Q score, resulting in a bias. Although the senior surgeon was excluded from the medical panel to reduce the bias, it is possible that panels gave generous scores for the surgical result because they work in the same hospital. Further study may need more panels like laypeople to have reliability with their assessment. And panels' assessment was only conducted once so repeatability (intraobserver agreement) was not assessed. All patients underwent surgery in a single medical center which can lead to bias although we excluded the senior staff from the panel who conducted all surgeries.

The strong point of this study is that it is the first study investigating the correlation between BREAST-Q and cos-

metic outcome assessed by medical professionals in Korea, and we found a correlation although it is weak.

In this study, we find a correlation between TVS with all three scales of BREAST-Q, and all are statistically significant, but the degree of correlation is not strong. It means TVS, the assessment of medical professionals, reflects patients' satisfaction and quality of life. And TVS can be a reliable tool to evaluate postoperative outcome of breast surgery for medical professionals. Further prospective and large number studies are needed to find more effective and reliable assessment tool for aesthetic outcome. We hope the information from this tool could help clinicians to support patients making decisions about optimal way of breast surgery and improve their quality of life.

Author Contributions
Conceptualization: S.G.K. and W.J.S. Data curation: W.J.C. Formal analysis: S.G.K. and W.J.S. Methodology: S.G.K. Project administration: W.J.C. Writing- original draft: W.J.C., S.G.K., and W.J.S. Writing-review & editing: W.J.S.

Ethical Approval
Institutional review board approval and informed consent were obtained for the retrospective chart review of consecutive, breast reconstruction surgery cases performed at a single academic medical center (IRB file No. 2017-09-020 SCHUH).

Patient Consent
The patient provided written informed consent for the publication and the use of his images.

Conflict of Interest
None declared.

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