



# A Pilot Assessment of Ethnic Differences in Cosmetic Outcomes following Breast Conservation Therapy

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**Background:** One of the primary benefits of breast conserving therapy (BCT) is the potential ability to preserve the aesthetic appearance of the breast. However, current literature and clinical experience suggest that the aesthetic benefits of BCT may not be equally shared among ethnic groups. This is a pilot study that uses novel techniques to evaluate the cosmetic outcomes of African American and white women following BCT.

**Methods:** A total of 21 participants (10 African American and 11 white) completed the study. Cosmetic outcomes following BCT were evaluated by a multidisciplinary team using both quantitative and qualitative measures, including 3-dimensional photographic analysis and a pilot questionnaire. Preliminary measures were taken to evaluate the validity of the questionnaire.

**Results:** There were no statistically significant differences in objective measures of breast symmetry between African American patients and white patients ( $P > 0.05$  in all cases). However, all raters reported the African American patients to have worse breast symmetry and appearance when compared with white patients. Interrater reliability was found to be fair with regard to the nipple complex questions [intraclass correlation (ICC), 0.56], good with regard to the breast mound questions (ICC, 0.66), and poor with regard to the scar appearance questions (ICC = 0.32).

**Conclusions:** Although generalizing the results of this study is limited by the small sample size, it seems that there is a difference in the perception of cosmetic outcomes between white and African American patients. The novel techniques of cosmetic evaluation used in this study show promise toward identifying variables that can affect cosmetic outcome following BCT. (*Plast Reconstr Surg Glob Open* 2013;1:e94; doi: 10.1097/GOX.0000000000000013; Published online 6 January 2014.)

Preservation of the aesthetic appearance of the breast is one of the primary goals of breast conserving therapy (BCT) for breast cancer. This approach spares a significant percentage of the native breast tissue, which increases the potential for

improved cosmetic outcomes. However, there are reports in the literature that the aesthetic benefits of BCT may not be shared equally among ethnic groups as both clinical experience and limited evidence in the literature suggest that African American women

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may experience worse postoperative cosmesis than white women.<sup>1-3</sup> For example, previous studies have identified 19–28% of African American patients as having fair/poor outcomes (72–81% with excellent/good outcomes) compared with 5–18% of white patients who have fair/poor outcomes (82–95% with excellent/good outcomes).<sup>1-3</sup>

However, these studies are hampered by 2 main issues: first, there is no consensus as to what constitutes an optimal aesthetic result following BCT, and second, no validated assessment instrument of aesthetic outcomes exists to help form such a consensus.<sup>4,5</sup> Although it is likely that there are many factors that affect aesthetic outcomes following BCT such as scarring and reaction to radiation, these variables are not captured in existing assessments.<sup>1-3,6</sup> This lack of specificity is significant given that preserving breast aesthetics is one of the primary goals of BCT. If the factors that influence aesthetic outcomes following BCT can be established, it may be possible to tailor treatment regimens to optimize aesthetics while preserving oncologic efficacy.

Therefore, both to evaluate cosmetic differences between African American and white patients following BCT and to take an initial step toward the development of a consensus-driven evaluation to define optimal cosmetic outcome in BCT, we propose a multimodal approach to assessment that includes patient- and clinician-reported outcome measures and objective measurements. To this end, this study reports on the outcome data from a pilot study of African American and white women who underwent BCT at the Lynn Sage Comprehensive Breast Center at Northwestern Memorial Hospital.

## METHODS

This study received institutional review board approval from Northwestern University before the conduct of any study-related activities.

### Participants

Potential participants were prospectively identified as they presented to the Lynn Sage Comprehensive Breast Center at Northwestern Memorial Hospital. Patients were eligible if they were English-speaking, over 21 years old, and had completed unilateral BCT at least 1 year before study enrollment.

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**Fig. 1.** Example of 3D image of surgical site in an African American patient.

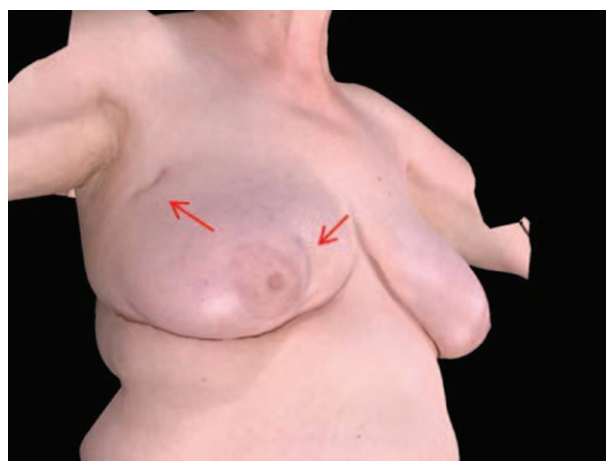
Patients were not eligible if they had undergone any reconstructive or cosmetic procedures on either breast at any point in the past or if the patient had previously undergone any surgical procedures on the nontreated breast. A total of 21 patients (10 African American and 11 white) provided informed consent and completed the study.

### Biometric Measurements

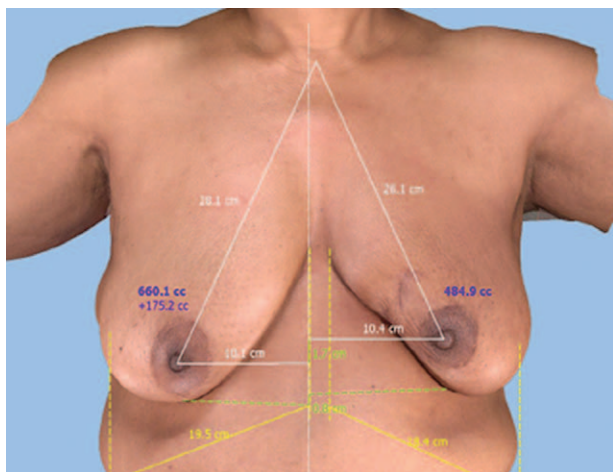
To obtain objective measurements of the symmetry between the treated and untreated breasts, the following measurements were made bilaterally for each patient: nipple to inframammary fold distance, mid-clavicle to nipple distance, and nipple to the center of the sternum distance. In addition, the 3-dimensional Vectra camera (Canfield Imaging Systems, N.J.) was used to calculate the breast volume of the treated and untreated sides as demonstrated in Figures 1–4.

### Qualitative Ratings

The patient and a plastic surgeon, a breast oncologic surgeon, and a trained clinical research as-

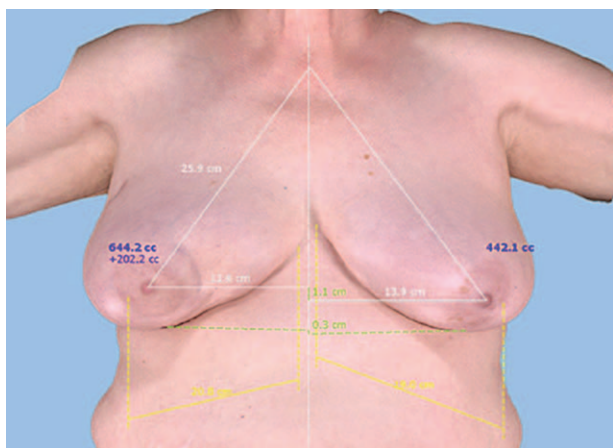


**Fig. 2.** Example of 3D image of surgical site in a white patient.



**Fig. 3.** Example of 3D image of quantitative measurements of breast symmetry in an African American patient.

sistant filled out a questionnaire that evaluated both the appearance of the breast that had undergone BCT and the untreated breast. The questionnaire was developed by these investigators and an expert in patient-reported outcomes and was specifically designed to evaluate 13 aspects of breast cosmesis. The areas of breast cosmesis were divided into 4 categories: nipple complex, breast mound, scar, and skin (Table 1). Each of these variables was rated on a 5-point scale, with 1 = poor and 5 = excellent. The plastic surgeon and the breast oncologic surgeon rated the patient based on photographs taken with a 3-dimensional Vectra camera (Canfield Imaging Systems), whereas the research assistant rated the patient based on the clinical examination. The research assistant and patient evaluated all 4 categories, whereas the plastic surgeon and the breast oncologic surgeon evaluated 3 categories: nipple complex, breast mound, and scar.



**Fig. 4.** Example of 3D image of quantitative measurements of breast symmetry in a white patient.

**Table 1. Classification of Cosmetic Variables Assessed in This Study**

Variables of Cosmesis	
Nipple complex	
Nipple projection	
Areola shape	
Areola texture	
Breast mound	
Breast size	
Breast height	
Breast projection	
Skin	
Skin texture	
Firmness	
Tenderness	
Scar	
Surgical site	
Scar elevation	
Scar width	
Scar color	

**Data Analysis**

Patient health history and demographic information was obtained through interview and through the review of electronic medical records. Table 2 summarizes the patient demographic characteristics. IBM SPSS version 20 predictive analytics software was used in the analysis of all the statistical tests. Because multiple raters (plastic surgeon, breast oncologic surgeon, and research assistant) independently assessed all patients, agreement in the observational ratings was tested via interrater reliability (IRR). Specifically, IRR was interpreted by calculating intraclass correlation (ICC) for interval variables in a 2-way, mixed-effect model. Student’s *t* test with

**Table 2. Patient Demographic Characteristics**

Characteristic	African American		White		P
	n	%	n	%	
Age (yr)					>0.05
<50	2	20.0	1	9.1	
50–59	5	50.0	6	54.5	
60–69	2	20.0	3	27.3	
70–79	1	10.0	1	9.1	
BMI					>0.05
18.5 to <25	1	10.0	4	36.4	
25 to <30	5	50.0	1	9.1	
30 to <40	3	30.0	6	54.5	
≥40	1	10.0	—	—	
Time since last radiation treatment (mo)					>0.05
0–25	7	70.0	4	36.4	
26–50	2	20.0	1	9.1	
51–75	—	—	1	9.1	
76–100	—	—	1	9.1	
100–125	—	—	1	9.1	
Unknown	1	10.0	3	27.3	

BMI, body mass index.

**Table 3. Biometric Measures**

	African American	White	P
Average volume difference between the treated and untreated breast (cm <sup>3</sup> )	90.4	101.3	>0.05
Average difference in distance of inframammary fold to treated breast vs untreated breast (cm)	0.9	0.9	>0.05
Average in distance of mid-clavicle to nipple of treated breast vs nipple of untreated breast (cm)	1.9	1.1	>0.05
Average difference between medial areolar border of treated vs untreated breast to midsternum (cm)	1.5	1.5	>0.05

a 95% confidence interval was used to evaluate the biometric measures.

**RESULTS**

Results from the objective measurements of breast symmetry are displayed in Table 3. The average volume of the treated breast vs the untreated breast in African American patients was 530.3 cm<sup>3</sup> vs 617.5 cm<sup>3</sup>, with an average difference of 90.4 cm<sup>3</sup>. The average volume of the treated breast vs the untreated breast in white patients was 512.7 cm<sup>3</sup> vs 541.5 cm<sup>3</sup>, with an average difference of 101.3 cm<sup>3</sup>. There were no statistically significant differences either in breast volume or in any of the symmetry measurements between African American patients and white patients (*P* > 0.05 in all cases).

Results of the qualitative scores of breast cosmesis are displayed in Table 4. Regarding the qualitative measures, both the research assistant and patient reported a better nipple complex score for white

patients than for African American patients, whereas the plastic surgeon and breast oncologic surgeon rated the appearance of the nipple complex as being better in African American patients (Table 4). There was fair IRR in this section as indicated by the ICC of 0.56.<sup>7</sup> For the breast mound category, all observers were in good agreement that the results of white patients were better than that of African American patients (ICC = 0.663). When evaluating the appearance of the scar, both the plastic surgeon and the breast oncologic surgeon reported better scarring results in African American patients than white patients, whereas the research assistant rated scar result as worse in African American patients. The ICC for this category was 0.316, showing poor IRR. Finally, both the research assistant and patients rated the appearance and feel of the skin as being better in white patients. Although the difference in research assistant’s scores between African American and white was not significant (*P* > 0.05), there was a statistically significant difference between the self-reported scores provided by the patients (*P* < 0.05); that is, African American patients consistently reported their skin as having a worse appearance than the white patients. Overall, the differences in the ratings between patient groups provided by the plastic surgeon, breast oncologic surgeon, and independent observer were not statistically significant with the exceptions as noted above (*P* > 0.05 in all cases).

**DISCUSSION**

The existing literature does not provide a clear picture regarding ethnic differences in cosmetic outcome following BCT. This is in large part due to the fact that currently there is no consensus regarding optimal methods of measurement of cosmetic outcome following BCT.<sup>4,5</sup> Numerous researchers from

**Table 4. Interrater Reliability for Measures of Cosmesis**

Cosmetic Parameter	Rater	Average Score (Scale 1–5, with 1 = Poor and 5 = Excellent)		Reliability/Significance
		African American	White	
Nipple complex	Patient	4.10	4.48	ICC = 0.56
	Plastic surgeon	3.77	3.66	
	Breast oncologic surgeon	4.67	4.66	
	Research assistant	4.10	4.16	
Breast mound	Patient	3.52	3.92	ICC = 0.66
	Plastic surgeon	3.57	4.09	
	Breast oncologic surgeon	3.89	4.58	
	Research assistant	3.70	4.13	
Scar	Patient	3.76	4.56	ICC = 0.32
	Plastic surgeon	3.20	3.14	
	Breast oncologic surgeon	4.53	4.48	
	Research assistant	3.38	4.07	
Skin	Research assistant	3.33	3.74	<i>P</i> = 0.33 <i>P</i> = 0.003
	Patient	3.76	4.66	

different disciplines, including plastic surgery,<sup>8,9</sup> surgical oncology,<sup>10</sup> radiation oncology,<sup>1,3,11–15</sup> and even multidisciplinary teams,<sup>16–20</sup> have assessed cosmetic outcomes, using a variety of techniques. The vast majority of studies have evaluated results using some variation of a 4-point rating scale, frequently in conjunction with a questionnaire that evaluates a global form of cosmesis. Although investigators have used validated instruments to evaluate BCT outcomes,<sup>19</sup> these measures only provided a general measure of patient satisfaction with their results and did not allow for specific identifiers in cosmesis, which could reveal dissatisfaction with the surgical scar, breast symmetry, or other variables. It remains that there is no consensus regarding optimal methods of measurement of cosmetic outcome,<sup>4,5</sup> and the question of ethnic differences in cosmetic outcome remains unanswered.

Other techniques that have been used by researchers include directly measuring anatomic differences between the patient's treated and untreated breasts, then using these measurements to extrapolate the relative symmetry between the breasts. In the past, these measurements were made on postoperative pictures<sup>11–13,15</sup> and patients were given symmetry scores. In addition, researchers evaluated the breasts for the presence of visible changes after BCT, such as telangiectasias or nipple retraction, which were also assigned scores. In more recent studies, 3-dimensional photographic analysis<sup>20</sup> and sophisticated computer programs<sup>21</sup> have been developed to evaluate breast symmetry and cosmesis. Although these objective forms of measurement are clearly effective in identifying breast asymmetry after BCT, they cannot assess breast texture, sensitivity, or fibrosis. Perhaps most importantly, they only provide an objective measure of results and do not take into account the patient's opinion of their cosmesis, which arguably may provide the most important perspective.

This study represents an attempt to not only identify the factors that contribute to specific differences in cosmetic outcome between African American and white patients but also to quantify these differences and include the patient's opinion in the rating of the appearance of the breasts. Given our small cohort, we cannot provide a definitive statement regarding causation for perceived differences in cosmetic outcomes. With a larger sample size, it may be possible to identify subtle differences in rating that could identify areas of poor cosmesis that may be amenable to surgical correction. However, it is interesting to note that the objective measurements of breast volumetric differences and breast symmetric differences are similar between the white and African American groups (less than 20 cm<sup>3</sup> volume and less than 1 cm difference between the 2 groups), yet all 4 observers

(plastic surgeon, breast oncologic surgeon, research assistant, and patient) consistently rated the African American patients as having worse results with regard to breast mound symmetry and appearance. Moreover, there was also a statistically significant difference in the way that African American patients rated the appearance of their skin when compared with white patients. It is possible that despite having similar objective measures of cosmesis, African American patients themselves perceive and are perceived by others as having worse cosmetic outcomes than white patients. This is an interesting finding as it implies that surgical technique may not be enough to achieve better outcomes—a psychological component may play a role as well. As this study progresses and the measures used to evaluate cosmesis become more clearly defined, these findings can be further investigated. The ICC rating of the nipple-areola complex and breast mound demonstrated fair to good IRR, which indicates the effectiveness of the questionnaire that was developed for this study. With continued validation techniques and the acquisition of more data, this questionnaire could become a valuable tool in helping quantify cosmetic outcomes following BCT. In the areas of the questionnaire relating to scarring and response to radiation, the difference between white and African American patients was larger than in the other measures of cosmesis that were evaluated in this study. This finding agrees with the clinical experience of the investigators and reports in the literature, which suggests that African American patients experience more severe physical reactions to radiation than white patients, including hyperpigmentation and adverse scarring.<sup>1–3</sup> It has been suggested that these differences in response to radiation may have a genetic basis as single nucleotide polymorphisms may potentially play a role in radiation toxicity.<sup>22</sup> Again, without a clear measure of cosmesis, it is difficult to quantify adverse outcomes and therefore identify candidate patients for genetic analysis. Moreover, the ICC rating was poor for the scar ratings, so further steps could include the application of existing scar rating instruments to help further evaluate the variables examined in this study.

Limitations of this study include its small sample size and the fact that the questionnaire has not been subject to rigorous analysis concerning its validity. Additionally, the small sample size precludes evaluations on additional variables such as body mass index. However, this study is a pilot study and the results are not intended to be generalized to the larger patient population. With continued patient enrollment and data analysis, this study could represent an important first step in optimizing cosmetic outcomes following BCT.

## CONCLUSIONS

This study evaluates differences in cosmetic outcome between African American and white women who have undergone BCT for breast cancer and begins the process of developing qualitative measures to evaluate cosmetic outcome in this patient population. It is important to identify which factors contribute to poor cosmesis as there is evidence that suggests body image, psychosocial morbidity, and self-esteem influence cosmetic results following BCT.<sup>16,23,24</sup> Thus, by evaluating specific causes of poor cosmesis, it may be possible to modify treatment regimens to maximize quality of life outcomes while still maintaining oncologic efficacy.

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