

# Patient-reported Outcomes of Scar Impact: Comparing of Abdominoplasty, Breast Surgery, and Facial Surgery Patients

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**Background:** Scarring negatively impacts patient mental health, causing worsened self-confidence, body image, and social interactions, as well as anxiety and depression. The objective of this study is to evaluate the scarring impact after facial surgery, breast surgery, and full abdominoplasty for symptoms, appearance, psychosocial health, career, and sexual well-being using validated patient-reported outcome measures.

**Method:** A total of 901 patients from five providers completed the SCAR-Q (covering symptoms, appearance, and psychosocial) and Career/Sexual Well-being assessments via phone or email where a higher score indicated a more positive scar perception.

**Results:** Of the 901 patients, 38.1% had abdominoplasty surgery, 38.1% breast reduction, 15.3% facial surgery, 4.7% breast lift, and 3.9% breast augmentation. The differences in SCAR-Q, appearance, and symptom scores between the five procedures were statistically significant. Breast augmentation SCAR-Q scores (median = 256) and facial surgery (median = 242) were significantly higher than those of abdominoplasty patients (median = 219;  $P = 0.003$  and  $P = 0.001$ , respectively). Duration after surgery was positively correlated with improved symptom scale scores for abdominoplasty ( $r = 0.24$ ,  $P < 0.001$ ), breast augmentation ( $r = 0.71$ ,  $P = 0.015$ ), and facial surgery patients ( $r = 0.28$ ,  $P = 0.001$ ), but not for other procedures.

**Conclusions:** This study is the first to show that breast augmentation and facial surgery patients have a more positive perception of their scars in terms of appearance, symptoms, psychosocial, career, and sexual well-being impact than abdominoplasty patients. Furthermore, the data suggest that symptoms may improve over time for abdominoplasty, breast augmentation, and facial surgery patients. This study highlights the need for further follow-up, counseling, or other improvements to postoperative scar care. (*Plast Reconstr Surg Glob Open* 2022;10:e4574; doi: 10.1097/GOX.0000000000004574; Published online 12 October 2022.)

## INTRODUCTION

Skin scars are normal outcomes of tissue repair. Scarring covers a wide spectrum of clinical phenotypes

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ranging from small, fine lines to hypertrophic and keloid scars.<sup>1</sup> Despite commonly arising after most dermal injuries, scars can be aesthetically unpleasant and cause severe pain, tenderness, sleep disturbances, anxiety, and depression.<sup>2,3</sup> Importantly, scar formation has been shown to negatively impact a patient's psychological, social, physical, and sexual well-being.<sup>4–6</sup>

Within plastic surgery, the aim of most surgical procedures is to enhance patient quality of life with outcomes research largely focused on patient satisfaction.<sup>7,8</sup> Patient-reported outcome measures (PROMs) are rating scales that analyze outcomes based on the patient perspective.<sup>9</sup> Several generic assessment tools have been designed for surgical and traumatic scars; however, these mainly highlight only the patient's symptoms and psychological issues without incorporating the entire patient psychosocial experience.<sup>10–13</sup> The SCAR-Q is an assessment scale that

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has been internationally validated in adults and children.<sup>14</sup> In addition to symptoms and psychological issues, the scale comprehensively measures scar appearance (eg, size, shape, color, and contour). Likewise, the Career/Sexual Well-being (CS) scale has been recently developed from a previously established framework of scar themes from qualitative patient interviews.<sup>15</sup> It adds specific outcome factors such as career outlook as well as sexual well-being that previous PROMs have failed to cover.

Currently, there remains a need to better understand and quantify how the presence of scars affects patients based on procedure type and scar location. The objective of this study is to compare patient perceptions of the impact of their abdominoplasty, breast surgery, and facial surgery scars on symptoms, appearance, psychosocial health, sexual well-being, and career outlook utilizing the SCAR-Q and CS scales. Differences in outcome will be reported based on procedure type, duration after surgery, and age. Comparing data across different plastic surgery procedures may better inform clinicians and patients about which procedures and subsequent scars are more likely to cause negative patient-reported outcomes.

## METHODS

### Study Participants

Patients from four providers who had undergone abdominoplasty, cosmetic breast surgery, or cosmetic facial surgery at Northwestern Memorial Hospital were recruited via phone call or email. Chinese patients who were treated at Shanghai New Hongqiao Healthchoice Clinic for blepharoplasty, rhinoplasty, and other cosmetic procedures were also recruited via email. Only patients who had undergone abdominoplasty, cosmetic breast surgery, or cosmetic facial surgery were included in this study. Breast augmentation procedures were performed using inframammary incisions. Transaxillary and circumareolar incisions were not used. For breast reduction and breast lift, both wise and vertical patterns were used equivalently. Breast lift scar assessment did not include crescent or circumareolar incisions. Mastopexy augmentation procedures were excluded. Keloid excision, dermabrasion, and other scar treatment cases were excluded in this study. Patients who were 18 years of age or older were invited to participate in the study. The study was reviewed and approved by the Northwestern University IRB (STU00213090).

### Scar Assessment Scales

Use of the SCAR-Q, authored by Drs. Klassen and Pusic, was made under license from McMaster University, Hamilton, Canada. The SCAR-Q contains a 12-item appearance scale, 12-item symptom scale, and five-item psychosocial impact scale.<sup>14,16,17</sup> Patients answered questions for all three scales and a standardized Rasch score out of 100 was calculated for each scale. A higher Rasch score indicated a better scar perception. The CS questionnaire containing four questions was developed from Hsieh et al's<sup>15</sup> framework of scar themes, which were extracted

### Takeaways

**Question:** What are the differences in scar impact for different procedure types?

**Findings:** Through completion of the SCAR-Q and Career/Sexual Well-being scar scales, we found that breast augmentation and facial surgery patients scored higher than abdominoplasty patients on the scales covering scarring appearance, symptoms, psychosocial impact, career impact, and sexual well-being impact.

**Meaning:** Breast augmentation and facial surgery patients are more likely to have a more positive perception of their scars in terms of appearance, symptoms, psychosocial impact, career impact, and sexual well-being impact than abdominoplasty patients, which highlights the need for further follow-up, counseling, or other improvements to postoperative scar care.

from patient interviews discussing the quality-of-life impact of their scars. The CS scale discusses scar impact in a career setting as well as during sexual encounters, which came directly from the patient experiences from Hsieh et al's study. Specifically, the scale asks whether the scar has caused hindrances in the patient's career due to insecurities about the scar and whether the patient feels that the scar has caused them to appear unprofessional. The CS scale also asks patients whether they feel self-conscious during sexual encounters due to the scar and whether they make attempts to cover the scar or make it less visible during sexual encounters. The CS scale is out of 16 points, and a higher CS score indicates a better scar perception.

### Questionnaire Distribution

The questionnaire consisted of the SCAR-Q and CS scales. Patients who met the inclusion criteria were administered the questionnaire via email or phone and completed online consent forms or gave verbal consent, respectively. A Qualtrics link was used to distribute the questionnaire to 2036 patients via email, with several follow-up emails. Responses were collected 2 weeks after the final reminder email. One hundred forty-two patients were also contacted by phone and sent follow-up emails. Three trained interviewers conducted phone interviews. The online survey was completed by 44% of patients and phone interview by 58%, for a total of 904 patients who are presented in this study.

### Statistical Analysis

Deidentified questionnaires were reviewed and analyzed by the standardized Rasch scores that each patient received for the SCAR-Q and CS scales. Scores for the five procedures were compared for each questionnaire using a Kruskal-Wallis test and post hoc Dunn's test to find significant differences between specific procedures. A separate test was performed for each of the appearance, symptoms, psychosocial, CS, and SCAR-Q scale scores. Patients who had undergone multiple procedures took the same questionnaire for each surgery they received. Scores from the same questionnaire were used to determine whether there

**Table 1. Outcomes by Procedure Type**

	No. Patients	Appearance	Symptoms	Psychosocial	SCAR-Q	CS
Abdominoplasty	343	62	77	77	219	16
Breast reduction	343	64	89	77	227	15
Breast lift	42	64	85.5	82	246.5	16
Breast augmentation	35	72	100	87	256	16
Facial surgery	138	62	89	87	242	16
Total	901	62	82	77	229	16

was a median difference in perception of scars between two procedures. A Wilcoxon signed-rank test was conducted to determine the effect that different procedures had on the same patients who received multiple procedures.

The Spearman correlation test was used to determine the correlation between the age of patients and Rasch scores for each questionnaire. Additionally, Spearman correlation tests were used to determine the correlation between patients’ time since surgery for each procedure and each Rasch score.

**RESULTS**

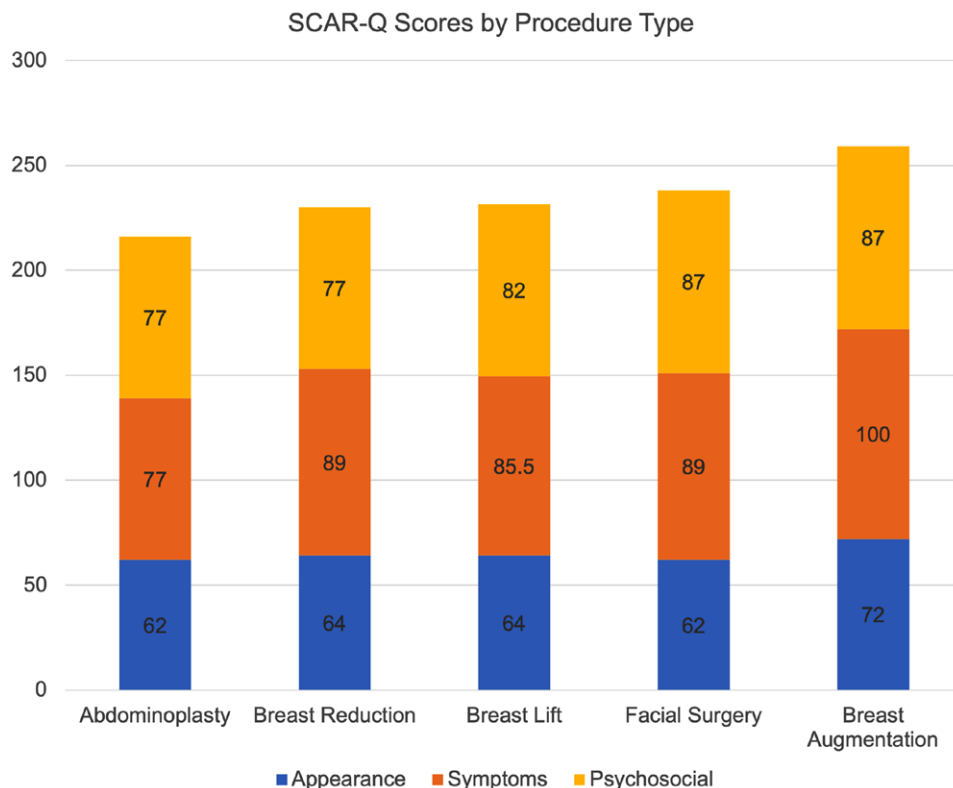
**Patient Characteristics**

Of the 901 patients, 38.1% underwent traditional abdominoplasty, 38.1% breast reduction, 15.3% facial surgery, 4.7% breast lift, and 3.9% breast augmentation (Table 1). Patients with facial surgery scars underwent

blepharoplasty (n = 59), chin augmentation (n = 7), eyelid revision (n = 21), face lift (n = 23), rhinoplasty (n = 20), or other procedures (n = 8) such as mole removal. Fifty-one percent of facial procedures were performed in China and 49% were in the USA.

**SCAR-Q and CS Scales**

Figure 1 shows the appearance, symptoms, and psychosocial scales’ median scores for different procedures (Table 1). SCAR-Q scores were statistically different between the five different procedures ( $\chi^2 = 25.04, P < 0.001$ ), while CS scores were not. Pairwise comparisons using the Dunn’s procedure revealed that breast augmentation patients’ SCAR-Q scores (median = 256) were significantly higher than those of abdominoplasty patients (median = 219;  $P = 0.003$ ). Furthermore, facial surgery patients’ SCAR-Q scores (median = 242) were significantly higher than those of abdominoplasty patients (median = 219;  $P = 0.001$ ).



**Fig. 1.** Outcomes by procedure type.

**Table 2. Paired Procedure Comparisons**

Paired Procedures	No. Patients	Appearance	Symptoms	Psychosocial	SCAR-Q	CS
Abdominoplasty Breast lift <i>P</i> value	18 18	51 69.5 0.022	75 89 0.002	70 87 0.109	193.5 248.5 0.005	14 16 0.15
Abdominoplasty Breast augmentation <i>P</i> value	12 12	31.5 45.5 0.191	45 48 0.007	16.5 18.5 0.389	196 264 0.007	15 16 0.276
Abdominoplasty Breast reduction <i>P</i> value	40 40	59 64 0.362	73 82 0.004	77 73 0.603	207 223.5 0.06	15 15 0.55

**Symptoms, Appearance, and Psychosocial Scales**

Symptom scores were statistically different between the five different procedures ( $\chi^2 = 72.96, P < 0.001$ ). Pairwise comparisons revealed that breast augmentation patients had the highest symptom scores (median = 100), which were significantly higher than abdominoplasty patients (median = 77;  $P < .001$ ) and breast reduction patients (median = 89;  $P = 0.021$ ). Abdominoplasty patients had the lowest symptom scores (median = 77), which were significantly lower than breast lift patients’ (median = 85.5;  $P = 0.005$ ), breast reduction patients’ (median = 89;  $P < 0.001$ ), and facial surgery patients’ (median = 89;  $P < 0.001$ ).

Appearance scores were statistically different between the five different procedures ( $\chi^2 = 12.91, P = 0.012$ ). Pairwise comparisons revealed statistically significant differences between breast augmentation appearance scores (median = 72) and abdominoplasty appearance scores (median = 62;  $P = 0.037$ ). Finally, psychosocial scores were not statistically different between the five different procedures.

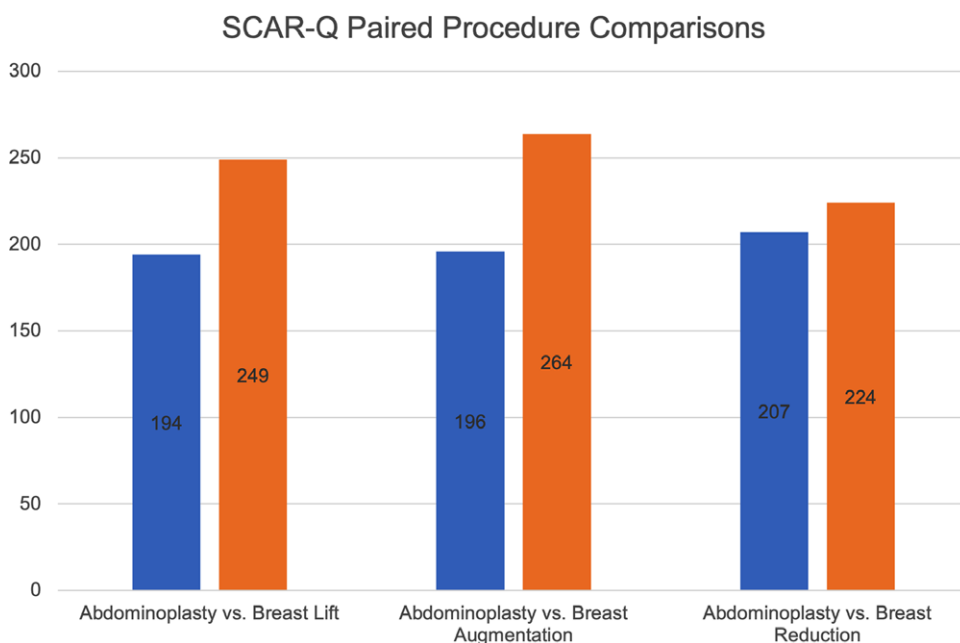
**Paired Comparisons**

Comparisons were made for patients who completed the questionnaire for more than one cosmetic

procedure. Pairs with greater than 12 patients were included. Comparison of responses from the same patient included abdominoplasty versus breast reduction (n = 40), abdominoplasty versus breast lift (n = 18), and abdominoplasty versus breast augmentation (n = 12) (Table 2; Fig. 2).

Among the 40 patients who underwent both an abdominoplasty and breast reduction, breast reduction procedure elicited an increase in SCAR-Q scores for 25 patients compared with abdominoplasty, whereas one patient saw no difference and 14 patients saw a higher score for the abdominoplasty procedure. Breast reduction had significantly higher symptoms (median = 82) and SCAR-Q (median = 223.5) scores than abdominoplasty symptoms (median = 73) and SCAR-Q (median = 207) scores ( $z = 2.90, P = .004; z = 1.88, P = .060$ ).

Among the 18 patients who underwent both an abdominoplasty and breast lift, the breast lift procedure elicited an increase in SCAR-Q scores in 14 patients compared with abdominoplasty, whereas four patients saw a higher score for the abdominoplasty procedure. Breast lift had significantly higher appearance (median = 51), symptoms (median = 75), and SCAR-Q (median = 193.5) scores than



**Fig. 2.** Paired procedure comparisons.

abdominoplasty appearance (median = 69.5), symptoms (median = 89), and SCAR-Q (median = 248.5) scores ( $z = 2.30, P = .022; z = 3.13, P = .002; z = 2.79, P = .005$ ).

Among the 12 patients who underwent both an abdominoplasty and breast augmentation, the breast augmentation procedure elicited an increase in SCAR-Q scores in ten patients compared with abdominoplasty, whereas one patient saw no difference and one patient saw a higher score for the abdominoplasty procedure. There was a statistically significant difference in symptoms and SCAR-Q scores between the abdominoplasty (median = 45, 196, respectively) and the breast reduction (median = 48, 264) procedures ( $z = 2.68, P = 0.007; z = 2.71, P = 0.007$ ).

**Age**

The average age of patients at the time of surgery was 43.4 years, and the ages range between 18.1 and 78.6 years. There was a significant positive correlation between age of patient and CS scores ( $r = 0.18; P < 0.001$ ), whereby older age was correlated with more positive scores on the CS scale. There was no significant correlation between age of patients and appearance, symptoms, psychosocial, or SCAR-Q scores.

**Duration after Surgery**

Figure 3 shows the distribution of symptom scores across varying durations after surgery for abdominoplasty, breast augmentation, and facial surgery patients. Duration after surgery was positively correlated with improved symptom scale scores for abdominoplasty ( $r = 0.24, P < 0.001$ ), breast augmentation ( $r = 0.71, P = 0.015$ ), and facial surgery patients ( $r = 0.28, P = 0.001$ ). However, in breast lift and breast reduction patients, there was no significant correlation between the symptom

scale scores and duration after surgery. There was a weak positive correlation between duration after surgery and increased SCAR-Q scores for facial surgery patients only ( $r = 0.17, P = 0.05$ ). In addition, there were no significant correlations between time after surgery and psychosocial, appearance, or CS scale scores for any procedures. The average time for completion of the questionnaire after surgery was 4.5 years (median = 3.3 years) for all patients, 3.8 years (median = 2.9 years) for abdominoplasty patients, 7.1 years (median = 5.4 years) for breast augmentation, 6.8 years (median = 6.3 years) for breast lift, 5.0 years (median = 4.0 years) for breast reduction, and 4.9 years (median = 3.3 years) for facial surgery.

**DISCUSSION**

This study evaluated the differences in scarring impact among various plastic surgery procedures. Understanding which surgical operations may lend themselves to better or worse patient-reported outcomes will help provide both patients and surgeons with more informed and realistic expectations. Here, we examined patients’ perceptions of their own scarring through the SCAR-Q and CS scales. The SCAR-Q is an internationally validated, scar-specific PROM that addressed previous limitations in other outcome tools (ie, lack of generalizability to all scar types and age groups).<sup>14</sup> The CS scale further investigates the impact of scars on a patient’s sexual and career well-being, topics not previously investigated in scar-based outcomes.<sup>15</sup> Scar outcomes are dependent on numerous factors, both genetic and environmental. Scars are inevitable outcomes of surgical repair, but can often result in an array of aesthetic, symptomatic, and psychosocial concerns.<sup>4,18</sup>

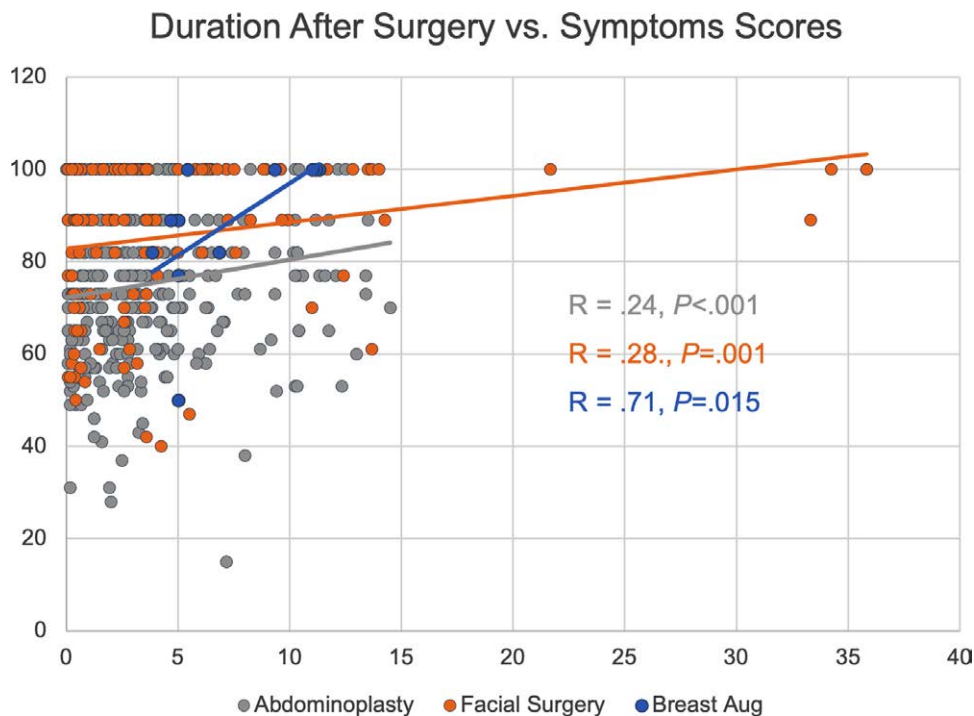


Fig. 3. Duration after surgery vs symptom scores.

### SCAR-Q and CS Scales

Overall, we found that patients who underwent breast augmentation or facial surgery tended to have significantly better scores on the SCAR-Q and CS scales, while those who underwent abdominoplasty had lower scores on average. In addition to a patient's own self-perception, factors that may influence results include scar location and size as well as operative technique. For example, the choice of abdominoplasty technique has been shown to have a significant effect on aesthetic and functional complications such as differences from the fleur-de-lis and belt lipectomy techniques.<sup>19</sup> Some of these complications include wound dehiscence, infection, and seromas.<sup>20</sup> Therefore, the choice of surgical technique as well as thorough examination on follow-up visits should be heavily emphasized throughout the medical course and discussed in great detail with the patient to ensure their personal expectations, and goals are being respected. Additionally, abdominoplasty scars are generally much larger than scars resulting from the other included procedure types, which may also lead to lower overall patient-reported outcomes.

Interestingly, facial scars were rated the second highest across the SCAR-Q scale only behind breast augmentation. Despite the visibility and location of these scars, patients reported having better scarring outcomes for both the SCAR-Q and CS scales compared with the majority of body procedures, which may be explained by the smaller size of the facial scars relative to the body scars. Thus, it may be that the visibility of scars to others matter less to patients than the size and appearance of the scar itself.

Career and sexual well-being are important aspects of scar impact that must be considered when measuring scar outcome. Scarring can potentially affect a patient's career in the form of emotional suppression and alienation in the workplace. Patients who scored worse on career and sexual well-being questions may have feelings of insecurity surrounding their scar, which can cause a shift in typical social behavior, including sexual encounters. To combat this shift in social patterns, patients may benefit from seeking treatment such as cognitive behavioral therapy that could improve their self-perception and decision-making capacity.<sup>21</sup>

### Symptoms, Appearance, and Psychosocial Scales

It has been well-established that scars can have appearance-based and physical impact, such as pain and physical discomfort.<sup>22</sup> However, there remains a need to characterize scar impact across different procedures. The symptoms questionnaire included components such as scar sensitivity, pain, itchiness, and numbness. Our findings indicate breast augmentation and facial surgery patients scored the best in regard to scar symptoms. Facial surgery patients also scored higher on the questions regarding scar appearance, color, noticeability, and contour than abdominoplasty patients. The smaller scar sizes of facial surgery and breast augmentation procedures relative to others such as abdominoplasty may have contributed to these results.

From a psychosocial perspective, scars can have a significant impact on patient well-being, as the presence of scars

has been reported to significantly decrease the perception of a patient's outlook on their future.<sup>23</sup> In our study, facial surgery patients scored much higher in regard to embarrassment and happiness surrounding the scar than abdominoplasty patients. It is likely that appearance, symptoms, and psychosocial factors are intertwined and affect one another. Scar pain and sensitivity may contribute to overall unhappiness, and negative perceptions of scar appearance may lead to embarrassment in social settings.

### Age

Our results highlighted that there was a significant positive correlation between age of patient and CS scores. Unrealistic expectations set forth by social media, which may affect patients of younger age, could certainly play a role in patient perceptions after surgery. The differences in scar perception between younger and older patients may further be due to the difference of importance of career and sexual well-being stages in their life.

### Time after Surgery

When considering postoperative healing duration and aesthetic visibility, procedure type should be taken into consideration. In the present study, improved symptom scale scores correlated positively with duration after surgery for abdominoplasty, breast augmentation, and facial surgery patients, but not for breast lift or breast reduction patients. Minimal scarring from breast augmentation has been considered to have an impact on improved healing time as well as patient satisfaction.<sup>24</sup> When appropriate for the specific surgery and patient presenting for consultation, minimal techniques should be reasonably considered for these potential clinical and psychological benefits. Psychological worries that arise from scars are severe enough to be considered a significant barrier in patients' postoperative paths to healing and return to their desired lifestyle.<sup>25</sup> However, in our study, there was no significant correlation between psychosocial scores and time after surgery. The lack of a significant correlation could be due to the patient's belief that the scar is a permanent part of their body and may be difficult to accommodate psychologically moving forward in their lives. They may also note the slow-changing nature of scars, which may make their effects on happiness, social embarrassment, and overall psychosocial well-being more salient. Another possibility is that it may take a much longer time after surgery before any significant change in psychosocial well-being is noted, as this is a complex and multifactorial concept that may require several years for them to be more accepting of their scar. Patients may also modify their goals of self-image to bring the two conflicting concepts more in line with one another. Appearance scores may not have correlated with time after surgery for a similar reason of the slow-changing nature of scars. Regardless of the specific reasoning for each individual case, the interplay between the surgical scar and postoperative well-being should be thoroughly discussed throughout the entire process between physician and patient to increase transparency and manage expectations to address postoperative patient satisfaction.

## LIMITATIONS

The cross-sectional nature of this study only allows for comparisons after procedures but prevents us from making comparisons before and after specific procedures. There are also different techniques and incision types for each procedure that were not factored into our analysis that may have altered our results. We aimed to mitigate this by including only one specific procedure variation for each procedure. For example, only full abdominoplasty was included for our patients rather than miniabdominoplasty or other variations. We cannot consider the scar of a belt lipectomy and a fleur de lis abdominoplasty in the same group just as the different procedures. Third, facial surgery encompasses a few different procedures in which some operations may result in a seemingly unnoticeable scar, whereas others may leave a more substantial scar. Another limitation exists in that scar outcomes are multifactorial. They depend on many predisposing factors, such as skin type, racial factors, individual wound healing, and site of surgery. The high SCAR-Q and CS scores for patients who had surgery on the face may be the result from patients who had mild operations. Furthermore, another limitation of the study is that the CS scale has not been validated. It could be that the CS scale does not fully capture the impact of scarring on career and sexual well-being. However, the CS scale is new in scope and covers important domains of patients' lives that have not been studied before. A future validation study would strengthen the scale. In addition, it is possible that patient responses were influenced by their overall appreciation of the surgical result rather than solely the scar. The SCAR-Q and CS scales do not account for satisfaction with surgical results, and thus, are a limitation of the study. However, all patients in this study underwent cosmetic procedures and, therefore, may have had similar psychological impact than those who have medically necessary reconstructive procedures. Finally, the duration after surgery analysis was not performed for follow-up scores from the same patient over time. Assessment of scar perception at multiple follow-ups would allow for the comparison of scar improvement across various procedure types as well as comparison controlled for the same time follow-up point. Varying average durations after surgery for each procedure type could also have affected analyses between procedure types, as varying healing time can affect scar characteristics.

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