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Assessing Improvement of Facial Appearance and Quality of Life after Minimally-Invasive Cosmetic Dermatology Procedures Using the FACE-Q Scales

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Abstract

Background—Detecting clinically meaningful change from the patients' perspective is critical to evaluating a successful cosmetic procedure. FACE-Q is a patient-reported outcome instrument for use in patients undergoing cosmetic procedures.

Objective—We sought to determine the impact of laser resurfacing and injectable treatment (neurotoxin or fillers) on patient perceived improvement in facial appearance.

Methods and Materials—Patients were asked to complete FACE-Q scales (*Satisfaction with Facial Appearance*, *Satisfaction with Facial Skin*, and *Appraisal of Facial Lines*) at their pre-procedure consultation and/or at post-procedural follow-up. Item means (range 1-4) and Rasch transformed scores (range 0-100) were compared pre to post-procedure using two sample t-tests. Higher FACE-Q scores indicated greater satisfaction.

Results—Overall, patients experienced a statistically significant improvement in all three scales pre- to post-procedure ($P < 0.05$). Subgroup analysis showed statistically significant improvement in *Satisfaction with Facial Appearance* and *Satisfaction with Facial Skin* for both the laser resurfacing group and injectables group with moderate effect sizes. Improvement on *Appraisal of Facial Lines* trended toward improvement but did not reach statistical significance.

Conclusion—Our results support the ability to directly measure and quantify meaningful improvement in appearance among facial cosmetic dermatology patients using FACE-Q scales. Reporting this data is important, as this is the first step towards evidence-based cosmetic procedures in dermatology.

Introduction

The demand for cosmetic dermatologic procedures is continuing to increase. In a 2013 survey conducted by the American Society for Dermatologic Surgery, the top cosmetic procedures performed were laser/light/energy-based, wrinkle-relaxing injections, and soft-tissue fillers.¹ Compared to data from 2012, the number of these procedures was up 34%, 20%, and 8.6%, respectively.¹ With advances being made in laser technology, botulinum

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toxin, and injectable fillers, dermatologists are better able to refine and customize their treatments to best meet the needs of individual patients.

A main outcome of a successful cosmetic dermatologic procedure is patient satisfaction. The ability to detect clinically meaningful change from the perspective of the patient is critical to evaluating satisfaction levels. Furthermore, both patients and physicians may desire a metric from which they can ascertain expected outcomes. As a result, health related quality of life (QOL) based assessments are critical to objectively demonstrate the impact and efficacy of cosmetic dermatology procedures.

A recent systematic review of the literature found that psychosocial QOL factors improve after facial cosmetic procedures; however, this evidence is limited.² The lack of data regarding outcomes on psychosocial functioning after minimally invasive facial procedures underscores the importance for better metrics to assess outcomes and the need for additional studies in this field.

A number of patient-reported outcome (PRO) instruments have been developed to measure a range of outcomes related to cosmetic procedures; however, a review by Kosowski et al in 2008 found all PRO assessments at that time had limitations in their development, validation, or content.³ In response, a comprehensive set of scales used to measure outcomes in facial aesthetic patients was developed to fill this void of reliable and valid PRO instruments, named the FACE-Q⁴.

The conceptual framework for the FACE-Q scales was developed based on an extensive literature review, patient interviews, and input from an expert panel of physicians.⁴ Separate scales were developed to measure outcomes for patients undergoing any type of surgical and/or non-surgical facial cosmetic procedure. The scales can be independently scored with pre-procedure and post-procedure versions. The initial development and validation processes, including extensive psychometric evaluation for individual FACE-Q scales, have been previously reported⁵⁻⁷.

The purpose of this study was to explore the utility of the FACE-Q scales in assessing the impact and effectiveness of non-surgical facial cosmetic interventions in dermatology, focusing on some of the most commonly performed procedures: laser resurfacing, injectable neurotoxin, and injectable fillers. This is the first study of its kind to use the FACE-Q scales among this patient population. Comparison of pre-procedure and post-procedure scores allow for analysis of how these interventions impact patient's lives, helping to contribute to the paucity of data regarding psychosocial outcomes after minimally invasive cosmetic procedures and improving our ability to identify patients who would benefit most.

Methods

Study Design, Setting, and Subjects

Local institutional review board approval was obtained before commencing this study. This was an open, prospective, clinical study, as part of a larger validation study, to evaluate QOL in patients who underwent minimally-invasive facial cosmetic procedures. All participants

underwent cosmetic procedures using laser treatment or injectable neurotoxin or fillers. Procedures were performed by a board-certified dermatologist (AMR) during one calendar year. The FACE-Q scales were administered to consecutive patients willing to participate at either pre-procedure consultation and/or post-procedure follow-up evaluation. The questionnaires were completed in-office and were administered by an assistant who did not participate in any part of the cosmetic encounter.

Data Collection and Measures

Individuals participating in this study were asked to complete the following FACE-Q scales: *Satisfaction with Facial Appearance*, *Satisfaction with Skin*, and *Appraisal of Facial Lines*. Responses to the questions were scored based on the Likert scale, with “very dissatisfied” being given a score of 1, “dissatisfied” scoring 2, “satisfied” scoring 3, and finally “very satisfied” scoring 4. The overall responses to items within each scale were then standardized to a Rasch transformed summary score of 0-100, where higher scores reflect a greater satisfaction with appearance.

Other metrics collected included demographic and clinical information. Demographic variables included: age, gender, marital status, level of education, work situation, annual income, and ethnicity. Clinical variables comprised previous facial cosmetic procedures including type and number of treatments and how long ago they were performed. Because not all individuals completed both the pre- and post-treatment questionnaires, the demographics of the pre-treatment group was compared against the post-treatment group to show they were clinically similar and thus were able to be compared. Age was compared using a two sample t-test for equal means. Other demographic variables were compared using Pearson's Chi-square test.

Statistical Analysis

Summary statistics were computed for each item on the FACE-Q, as well as standardized scores for each of the individual scales. Higher FACE-Q scores, either individual item responses or Rasch transformed, indicated greater satisfaction with facial appearance. Mean overall Rasch transformed scores (range 0-100) were compared using independent sample t-tests. Subgroup analysis was performed for the injectable group (neurotoxin or filler) and the laser resurfacing group to evaluate for change in FACE-Q scores within each group pre-versus post-treatment. Additionally, the two groups were compared against each other pre-procedure and post-procedure to assess for any differences in overall scores on each scale. A *P*-value less than 0.05 was deemed significant.

The degree of change from pre-treatment to post-treatment was also evaluated at the group level using effect size calculations (Kazis' effect size).⁸ The magnitude of change was interpreted using Cohen's arbitrary criteria (small: 0.20; moderate 0.50; large 0.80)⁹.

Results

Patient Characteristics

The FACE-Q was completed by 31 patients a total of 38 times (N=23 pre-procedure, N=15 post-procedure) (Table 1). Sixteen patients (51.6%) received injectable treatment, fourteen (45.2%) underwent laser resurfacing treatment, and one patient (3.2%) underwent both. Patients ranged in age from 19 to 68 (mean 43.0, standard deviation 13.6 years), tended to be female (93.5%), and White ethnicity (64.5%). The majority of participants had at least a college degree or higher (64.5%), were employed full-time (64.5%), and earned at least 100k annually (48.4%).

Pre- vs. Post- Groups

Mean age of the pre- and post-treatment groups was 40.7 years and 40.9 years, respectively ($P = 0.97$) (Table 2). Other demographic variables were not statistically significant between the two groups either, including gender ($P = 0.79$), marital status ($P = 0.43$), education level ($p = 0.48$), employment status ($P = 0.43$), income ($P = 0.24$), and race ($P = 0.69$).

FACE-Q Scales

Overall—Patients experienced a statically significant improvement in all three FACE-Q scales pre- to post-treatment (Table 2). *Satisfaction with Facial Appearance* scores increased from 48.4 to 73.4 (+25.0; $P < 0.01$). *Satisfaction with Facial Skin* scores increased from 43.7 to 66.9 (+23.2; $P < 0.01$). *Appraisal of Facial Lines* scores increased from 55.2 to 66.8 (+11.6; $P = 0.04$).

Injectable Group Scores

Subgroup analysis was performed for the injectable group and demonstrated statistically significant improvement on two of the scales pre-procedure to post-procedure (Table 3): *Satisfaction with Facial Appearance* scores improved from 48.0 to 69.3 (+21.3; $P = 0.01$). *Satisfaction with Facial Skin* scores increased from 47.1 to 67.5 (+20.4; $P = 0.01$). *Appraisal of Facial Lines* scores trended toward improvement with an increase from 56.1 to 63.3 (+7.2; $P = 0.4$).

Laser Resurfacing Group Scores

Subgroup analysis of the laser resurfacing group also showed statistically significant improvement pre-procedure to post-procedure (Table 3) on the *Satisfaction with Facial Appearance* scale (48.9 to 75.6; +26.7; $P < 0.01$) as well as the *Satisfaction with Facial Skin* scale (39.3 to 65.4; +26.1; $P = 0.02$). The *Appraisal of Facial Lines* scores approached but did not reach significance, increasing from 53.9 to 70.9 (+17.0; $P = 0.06$).

Comparison of Groups Pre and Post-procedure

The injectable group and laser resurfacing group were compared pre-procedure and post-procedure to evaluate for any significant differences between the overall Rasch transformed scores at baseline and after their respective procedures (Table 4). Pre-procedure *Satisfaction with Facial Appearance* scores were 48.0 for the injectable group and 48.9 for the laser

resurfacing group ($P = 0.90$). Post-procedure, the scores were 69.3 and 75.6, respectively ($P = 0.46$). For the *Satisfaction with Facial Skin* scale, pre-procedure scores were 47.1 for the injectable group and 39.3 for the laser resurfacing group ($P = 0.35$). Post-procedure, the scores for this scale were 67.5 and 63.4, respectively ($P = 0.79$). *Appraisal of Facial Lines* scores pre-procedure were 56.2 for the injectable group and 53.9 for the laser resurfacing group ($P = 0.73$). Post-procedure, the scores were 63.3 and 70.9, respectively ($P = 0.50$).

Effect Size

Effect sizes were calculated to allow for a comparison of the observed improvement in health status for each intervention (Table 5). Changes in scores on the FACE-Q scales were associated with moderate effect sizes for the Satisfaction with Facial Appearance (resurfacing: 0.63; injectables: 0.56; overall: 0.62) and Satisfaction with Facial Skin scales (resurfacing: 0.56; injectables: 0.57; overall: 0.56). Lower effect sizes were observed for both interventions on the Appraisal of Facial Lines scale (resurfacing: 0.45; injectables 0.20; overall: 0.33).

Discussion

Increasing demand for facial cosmetic procedures reinforces the need for evidence-based aesthetic dermatology practices to ensure safety, maintain ethical standards, and uphold the integrity of the medical profession.¹⁰ In an objective study using a validated patient reported outcome instrument, we were able to quantify differences in clinically meaningful change among patients undergoing non-surgical facial cosmetic procedures, including laser resurfacing, injectable neurotoxin, and injectable fillers. As minimally invasive procedures now account for the majority of all cosmetic procedures, it is important to determine whether or not these interventions have a positive impact on patient's QOL beyond aesthetic transformation.² Our study is the first to utilize the FACE-Q scales to demonstrate significant self-reported improvement in facial appearance among patients undergoing cosmetic dermatology procedures.

Assessing pre- and post-procedure patient satisfaction with facial appearance and health-related QOL studies is a dynamic method to show the impact of these procedures in a quantifiable manner. In this study, patients saw a significant improvement overall in facial appearance, facial skin, and facial lines after injectable treatment or laser resurfacing using these previously validated scales. There was no significant difference between outcomes for laser procedures versus injectable treatment. The one patient to have both procedures performed was eliminated from the analysis; however, with a larger sample population it would be noteworthy to evaluate if having both procedures performed has a synergistic effect on quality of life.

The results presented here corroborate other studies showing improvement in facial attractiveness and QOL after cosmetic procedures.¹¹⁻¹⁴ Standardized mean difference effect sizes are a readily interpretable method to quickly compare the degree of change seen after each intervention in this study using the different FACE-Q scales. Interestingly, the moderate effect sizes seen with these minimally-invasive, non-surgical interventions are within the range of effect sizes observed using similar FACE-Q scales after facelift surgery.⁵ The

ability to demonstrate a similar effect size after an office-based non-surgical cosmetic intervention as that observed by a face-lift surgery suggests we may be able to obtain similar improvements in quality of life after non-surgical procedures. Further research is needed to evaluate how long the effects last, if there is a certain group in which one procedure is better than the other, if there is a certain age at which improvements are no longer significant, or if repeated treatments have a marked effect on satisfaction.

The most cited reasons for dissatisfaction after cosmetic surgery have been categorized into three groups: technically poor outcome, unrealistic expectations, and poor rapport between patient and physician.^{15,16} It is likely that these same reasons are directly translatable to the nonsurgical setting, as both surgical and nonsurgical cosmetic procedures are often elective, not covered by insurance, and largely hinge on patient expectations of outcome and physician expertise. Subgroup analysis using the FACE-Q scales can provide feedback on individual interventions and guide on-going practitioner education of technique-dependent procedures. As seen in this preliminary study, patients saw similar improvements in facial appearance and facial skin between injectable treatment and laser resurfacing. Individually, neither group was able to demonstrate significant improvement in appraisal of facial lines; however, this is likely due to the small sample size and lack of adequate power to show significance. Additionally, the lack of statistical significance after injectable treatment may have resulted from short follow-up time. We know dynamic rhytids respond quickly to neurotoxin; however, static, more etched in rhytids may take longer to improve. Also, the FACE-Q represents a unique opportunity for a patient perspective evaluation of cosmetic procedures and is therefore subject to individual nuances in appreciation of cosmetic procedure results. Patients may not have had adequate time to appreciate their change in appearance. Nevertheless, the laser resurfacing group was approaching significance. Further advances in technology will allow for physicians to better cater to the specific requests of the patient to best meet their desired outcome while minimizing complications. The FACE-Q scales may help shape patient expectations and better screen for patients who will derive the greatest improvement. Lastly, although not used in this study, FACE-Q scales do exist to assess areas for improving the patient experience and relationship with their physician.

An advantage of the FACE-Q is the ability to use only the relevant scales to provide objective data for evaluation of these minimally-invasive procedures beyond aesthetic restoration, including assessments of overall self-image, relationships, confidence, and sense of well-being. This PRO instrument provides direct, quantifiable feedback, which can be used to accurately identify areas for improvement and impact the treatment of subsequent patients. Aesthetic procedures are highly personalized services where patients often have high expectations and different end goals, including the desire to look younger, to feel more attractive, or to look less tired or stressed.¹⁷ Utilizing the FACE-Q scales pre-procedure can help physicians identify patient ambitions to better tailor their treatments to meet their needs. Utilizing these QOL life scales pre- and post-procedure engages the patient and enhances the physician-patient dynamic. It allows the physician to better assess the patient's aesthetic concerns and what he or she hopes to achieve vis-à-vis the procedure.

There are a few limitations to this study, which must be addressed. First, nearly all patients were female, which classically reflects the demographic most seen in clinical practice for

cosmetic services. Further study of the scales and evaluation of subjective outcomes in men are needed to effectively screen them pre-procedure. Secondly, there was an overall small patient sample population and ideally every patient would have completed both a pre- and a post-treatment questionnaire. Nevertheless, statistical analysis of the pre- and post-treatment groups demonstrated they were clinically similar and thus could be compared. Lastly, the post-procedure questionnaire was administered at short-term follow-up. We were therefore unable to assess for the longevity of the improvements seen after these types of cosmetic procedures. However, what we feel is most important is documentation of successful enrichment in self-image and health-related QOL with the understanding that the interventions are not permanent and may require future procedures. An area of future study is to assess for the sustain-ability of improvement after long-term follow-up or repeated cosmetic interventions.

The data here represent a subset of a larger validation study, and is meant to serve as an initial, prospective outcomes study. As cosmetic procedures are highly technique-dependent, we wished to minimize variation in performance by using data obtained from one site and all procedures performed by the same dermatologist. This study shows how individual dermatologists can use a patient-reported outcomes instrument to obtain objective data demonstrating patient satisfaction and change in quality of life and is the first of its kind in this patient population. Reporting this data is important, as this is the first step towards evidence-based cosmetic procedures in dermatology. Larger studies are currently underway to demonstrate generalizability of our results.

Conclusion

The FACE-Q scales are a validated and consistent outcomes measurement tool used to provide objective data evaluating the effectiveness of aesthetic procedures. As patient satisfaction is a key endpoint of dermatologic cosmetic procedures, we recommend using the FACE-Q scales as a method to assess patient improvement. The use of this model supports the successful outcomes possible in this group of patients, and the continued use of FACE-Q may help support ongoing improvement in techniques, better identification of patients most likely to benefit from procedures, provide reasonable expectations, and enhance overall patient experience.

The demand for minimally invasive cosmetic procedures in dermatology continues to dramatically increase. In addition to a complication-free procedure with an aesthetically pleasing result, an important metric to evaluate in these procedures is the impact that they have on the patient's health-related quality of life. We demonstrated the improvement in patient's satisfaction with facial appearance, satisfaction with facial skin, and appraisal of facial lines after undergoing minimally invasive (nonsurgical) facial cosmetic procedures in a dermatology clinic using the FACE-Q scales.

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Table 1
Demographics

Characteristic	Frequency [n(%)]
Gender	
Female	29 (93.5%)
Male	1 (3.2%)
Not reported	1 (3.2%)
Marital Status	
Married or living with significant other	12 (38.7%)
Separated, divorced, or single/never married	17 (54.8%)
Not reported	2 (6.5%)
Education Level	
College graduate	20 (64.5%)
Non-college graduate	8 (25.8%)
Not reported	3 (9.7%)
Employment Status	
Employed Full-time	20 (62.5%)
Other (volunteer, student, homemaker, retired, etc.)	8 (25.8%)
Not reported	3 (9.7%)
Income	
Over \$100,000 / year	15 (48.4%)
Less than \$100,000 / year	13 (41.9%)
Unreported	3 (9.7%)
Race	
White non-Hispanic	20 (64.5%)
Other	8 (25.8%)
Not reported	3 (9.7%)

Table 2
Overall Change in FACE-Q Score

Validated Scale	Pre-procedure	Post-procedure	Mean Difference	P-value
Satisfaction with Facial Appearance	48.4	73.4	25.0	< 0.01
Satisfaction with Facial Skin	43.7	66.9	23.2	< 0.01
Appraisal of Facial Lines	55.2	66.8	11.6	0.04

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Table 3

Change in FACE-Q Score by Treatment

Validated Scale	Injectables			Laser Resurfacing			P-value
	Pre-procedure	Post-procedure	Mean Difference	Pre-procedure	Post-procedure	Mean Difference	
Satisfaction with Facial Appearance	48.0	69.3	21.3	48.9	75.6	26.7	< 0.01
Satisfaction with Facial Skin	47.1	67.5	20.4	39.3	65.4	26.1	0.02
Appraisal of Facial Lines	56.1	63.3	7.2	53.9	70.9	17.0	0.06

Table 4

Comparison of Scores Pre- and Post-procedure by Treatment

Validated Scale	Pre-procedure			Post-procedure		
	Injectables	Laser Resurfacing	P-value	Injectables	Laser Resurfacing	P-value
Satisfaction with Facial Appearance	48.0	48.9	0.90	69.3	75.6	0.46
Satisfaction with Facial Skin	47.1	39.3	0.35	67.5	65.3	0.79
Appraisal of Facial Lines	56.2	53.9	0.73	63.3	70.9	0.50

Table 5
Effect Size of Treatments by FACE-Q Scale

FACE- Q Scale	Procedure	Effect Size
Satisfaction with Facial Appearance	Overall Pre vs Post	0.62
	Injectable Pre vs Post	0.56
	Resurfacing Pre vs Post	0.63
Satisfaction with Facial Skin	Overall Pre vs Post	0.56
	Injectable Pre vs Post	0.57
	Resurfacing Pre vs Post	0.56
Appraisal of Facial Lines	Overall Pre vs Post	0.33
	Injectable Pre vs Post	0.20
	Resurfacing Pre vs Post	0.45

Effect sizes show a moderate effect size after both laser resurfacing and injectable treatments on the Satisfaction with Facial Appearance and Satisfaction with Facial Skin scales. A smaller effect size was seen for these interventions for the Appraisal of Facial Lines scale.