[ORIGINAL RESEARCH]

Impact of Botulinum Toxin A on the Quality of Life of Subjects Following Treatment of Facial Lines

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ABSTRACT

Objective: To investigate quality of life and its correlation to patient satisfaction before and after treatment with botulinum toxin A. **Methods:** Quality of life was assessed using the Schedule for the Evaluation of Individual Quality of Life Direct-Weighting tool. Patients identified the five areas of their life of the greatest importance to them, weighted the areas as to their relative importance, and rated their status in each area on a visual scale before treatment (old cues) and 28 days later (using both old cues and newly defined and weighted cues). At both visits, patients also rated their overall quality of life using a visual analogue scale. Patient satisfaction with their appearance was measured using a 10-point scale in conjunction with standardized photographs taken at each visit. **Results:** Fifty-three patients (median age 39.5 years; 87% women) with moderate-to-severe wrinkles of the glabella, forehead, or crow's feet were enrolled. Treatment with incobotulinumtoxinA consistently resulted in a significant improvement in quality of life according to Schedule for the Evaluation of Individual Quality of Life Direct-Weighting tool index scores (old cues, P=0.0006; new cues P=0.0235) and patient assessment of their overall quality of life (P<0.0001 for both old and new cues). Family, work, finance, relationships, and health were the five most frequently identified cues at each assessment. No correlation between quality of life and satisfaction scores was found, although both were significantly increased after treatment. **Conclusion:** These results support the contention that quality of life is significantly improved following botulinum toxin A treatment and that consideration should be given to incorporating the measurement of quality of life as an outcome measure following botulinum toxin A treatment, especially as satisfaction does not correlate to quality of life.
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Escalating demand for cosmetic treatment to facial lines has stimulated a growth in the use of botulinum toxin A (BoNT-A) in developed countries due to its efficacy, tolerability, and minimally invasive nature.[1,2] BoNT-A is now used in a wide range of aesthetic applications including, but not limited to, the smoothing of glabellar lines, forehead wrinkles, and crow's feet.[3] As such, full quantification of the benefits of BoNT-A treatment is becoming increasingly important. A key area of interest is whether treatment actually improves a patient's day-to-day life. Improvements in satisfaction, appearance, mood, and related outcomes have been well reported,[4–13] but to date, data on whether these improvements translate to or correlate with changes in quality of life (QoL) are scarce.

Dayan et al[14] recently reported that onabotulinumtoxinA treatment of facial wrinkles significantly improved QoL and self-esteem as compared to both treatment with placebo and pretreatment baseline values using the Quality of Life Enjoyment and Satisfaction Questionnaire—Short Form and the Heatherton and Polivy State Self-Esteem measurement. In the present study, an investigation of QoL in patients treated with BoNT-A was undertaken by using patient- rather than questionnaire-defined criteria to measure

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TABLE 1. Frequency of nomination as areas of importance

CUE AREA	VISIT 1	VISIT 2
Family	96.2%	90.6%
Work	62.3%	69.8%
Finance	52.8%	58.5%
Relationships	52.8%	45.3%
Health	50.9%	60.4%
Appearance	43.4%	43.4%
Social life	35.8%	13.2%
Living conditions	34.0%	20.8%
Leisure activities	32.1%	13.2%
Marriage	13.2%	7.5%
Pets	13.2%	7.5%
Partner	11.3%	11.3%
Divorce	3.8%	1.9%
Religion	3.8%	0.0%
Education	1.9%	1.9%
Friends	1.9%	1.9%
Mother	0.0%	1.9%

QoL, before and after treatment, using the Schedule for the Evaluation of Individual Quality of Life Direct-Weighting (SEIQoL-DW) tool.[15] Furthermore, the hope was to establish whether there is any correlation between patient satisfaction and changes in QoL.

METHODS

The study prospectively measured patient QoL data using the SEIQoL-DW tool[15] immediately before and 28 days after treatment with BoNT-A (Bocouture®, Merz Pharmaceuticals GmbH, Frankfurt, Germany). Satisfaction with treatment was also assessed by patients using standardized photos taken during pre- and post-treatment assessments. All new patients aged 18 to 65 years presenting at the Jandhyala Institute for incobotulinumtoxinA treatment for moderate-to-severe wrinkles of the glabella, forehead, or crow's feet (as measured by Carruthers' Scale[16,17]) were eligible for inclusion. Patients were excluded on the basis of previous treatment with or contraindications to BoNT-A treatment or a history of migraine. Patient history was taken and routine assessment carried out at the initial visit, and standardized photos were taken at both visits. Ethical review was deemed unnecessary according to the National Research Ethics Service (NRES) guidance document, and the study was considered a service evaluation.[18]

The SEIQoL-DW tool was administered according to protocol.[15] At the first visit, a standardized question was used to stimulate patients to independently identify the five life areas (cues) of most importance to them at that time. A list of potential areas was available for use as a prompt with patients who had difficulty completing this task. Patients then quantified their present status in each of their five identified cue areas by drawing a bar for each area against a 100mm scale, with a taller bar indicating better current status (the cue score). Finally, the patients weighted the five areas as to their relative importance using the direct weighting instrument; effectively producing a five-segment pie chart, with each segment indicating the importance of the corresponding cue area (cue weight). Patients were also asked to assess their overall QoL using a visual analogue scale (VAS) of 0 to 100 (0 being the worst possible, 100 the best possible). To produce the final SEIQoL-DW index score, which provides an overall measure of QoL for comparison, each of the five cue scores was multiplied by the corresponding cue weight and the products of these calculations summed together. The cue score (range 0–100) was derived from the length of the bar (in millimeters) drawn by the patient for that particular cue. The cue weight was derived from the proportion of weighting the patient had assigned, using the direct-weighting instrument, to that particular cue (range 0.00–1.00).

At the follow-up visit, patients completed the SEIQoL-DW procedure using both newly defined cues (subsequently labelled "new cues") and the cues defined at their pre-treatment visit (subsequently labelled "old cues"). Cues are defined at each visit to ensure that the QoL scores derived are maximally relevant to the patient at that time. As a consequence, it is possible that a patient may define markedly different cues at the follow-up visit as compared to the initial visit. To account for this, the SEIQoL-DW protocol also recommends assessment of the patients using the old cues as defined at the initial visit.[15] The use of new cues gives a measure of QoL using the cues that the patient feels are of greatest importance to them currently, while the use of the old cues facilitates direct comparison of QoL at each visit. Marked differences in the cues identified or the importance ascribed to these cues may necessitate further investigation and consideration in the interpretation of the results. However, some variation is inevitable as patients' priorities and concerns inevitably

TABLE 2A. Mean weight ascribed to nominated areas at Visit 1

CUE	NUMBER OF PATIENTS WHO NOMINATED CUE AT VISIT 1	MEAN WEIGHTING VISIT 1
Family	51	33.9
Appearance	23	21.5
Health	27	19.8
Relationships	28	18.5
Finance	28	18.3
Work	33	13.9
Living conditions	18	13.6
Social life	19	12.9
Leisure activities	17	11.7
Marriage	7	22.2
Pets	7	16.6
Partner	6	14.7
Friends	1	17.0
Religion	2	21.0
Divorce	2	20.0
Education	1	11.0
Mother	0	0.0

TABLE 2B. Mean weight ascribed to nominated areas at Visit 2

CUE	NUMBER OF PATIENTS WHO NOMINATED CUE AT VISIT 2	MEAN WEIGHTING VISIT 2
Family	48	31.5
Health	32	19.8
Appearance	23	18.2
Relationships	24	17.6
Finance	31	16.3
Work	37	15.3
Living conditions	11	14.9
Social life	16	11.8
Leisure activities	7	14.1
Partner	6	11.2
Pets	4	16.3
Marriage	4	24.0
Education	1	22.0
Friends	1	12.0
Mother	1	30.0
Divorce	1	28.0
Religion	0	0.0

change over time, and a key strength of the SEIQoL-DW approach is its ability to take account of these changes.

Patients also assessed their satisfaction with their appearance before and after treatment from the standardized digital photographs taken at each visit using a VAS ranging from 0 (not satisfied at all) through 10 (completely satisfied).

STATISTICAL ANALYSIS

SEIQoL indices and QoL scores before and after treatment were analyzed using paired *t*-tests following an assessment of normality using the Kolmogorov–Smirnov test. The change in patient satisfaction following treatment was assessed using the Wilcoxon Rank Sum test. The relationships between the satisfaction and QoL scores at each visit were investigated using simple linear regression correlation. In addition, the relationship between the change in satisfaction score and the changes in the QoL measures between Visit 1 and Visit 2 were analyzed using simple linear regression correlation and exploratory hierarchical cluster analysis. All data were analyzed using SPSS software (version 15).

RESULTS

Fifty-three patients (aged 22–62 years [median age: 39.5 years]; 87% women) were enrolled in this study. All

TABLE 3. Quality-of-life scores pre- and post-treatment

MEASURE	COMPARISON	VISIT 1 MEAN	VISIT 2 MEAN	*P*-VALUE
QoL (VAS) scores	vs. old cues	58.7	72.3	$P<0.0001$
	vs. new cues		70.6	$P<0.0001$
SEIQoL indices	vs. old cues	63.7	70.1	$P=0.0006$
	vs. new cues		67.9	$P=0.0235$

patients successfully completed the independent nomination of five important areas of their lives and allocated current status and relative importance to each. Family, work, finance, relationships, and health were the five most frequently identified cues at each assessment (Table 1). According to the cue weights ascribed (and considering only those cues identified by more than 10 patients), the five cues deemed to be most important were family, appearance, health, relationships, and finance at both visits (Table 2).

QoL before and after treatment was significantly improved following incobotulinumtoxinA treatment according to the SEIQoL index scores generated using both the old ($P=0.0006$) and new cues ($P=0.0235$) (Table 3). Overall QoL as measured by VAS following identification and weighting of the SEIQoL cue areas was also found to be significantly improved after treatment when assessed after consideration of both the old ($P<0.0001$) and new cues ($P<0.0001$) at Visit 2 (Table 3).

Satisfaction increased significantly following treatment (median satisfaction score post vs. pretreatment: 9.2 vs. 4.3, $P<0.0001$), but evidence of any positive correlation between satisfaction score and QoL or SEIQoL score was minimal. Only QoL as defined by VAS following the use of the old cues at Visit 2 was found to significantly correlate to satisfaction score at the same visit ($P=0.0404$, all other correlations $P>0.05$). When considering the change in these scores, 100 percent of patients indicated that their satisfaction with their appearance had increased. However, not all patients indicated that their QoL had increased. Following elicitation of the new cues, 79 and 64 percent rated their QoL as improved according to their overall assessment and using SEIQoL, respectively. Using the old cues, these figures increased to 91 and 75 percent. No evidence of any correlation between the change in satisfaction score and the change in QoL (as measured by VAS or SEIQoL) was found (all $P>0.05$).

DISCUSSION

The results of this study demonstrate that QoL is significantly improved following incobotulinumtoxinA treatment. Both overall QoL as assessed by VAS and SEIQoL scores were consistently higher following treatment, irrespective of whether the old or new cues had been considered during the SEIQoL process. While the recognized procedure is to elicit new cues at the second visit, but to also use the old cues to facilitate direct comparison,[15] it is reassuring to note that overall, the same cue areas were identified as being most important at Visit 1 and Visit 2, suggesting that as a whole, the patient population was relatively stable in terms of non-treatment influences on their QoL. It is also interesting to note that while, perhaps surprisingly, "appearance" was not one of the five most frequently selected cues in determining QoL, among those patients who did identify it as important, it could be considered a fundamental driver of QoL, as evidenced by its prominent weighting.

The results of the present study support and complement those reported by Dayan et al[14] in the United States from a double-blind study of 100 patients randomized to receive either placebo or onabotulinumtoxinA. Following this study, which utilized standardized, predefined QoL tools in the form of the Quality of Life Enjoyment and Satisfaction Questionnaire—Short Form and the Heatherton and Polivy State Self-Esteem Scale, the authors concluded that onabotulinumtoxinA treatment improved QoL parameters related to the enjoyment of and satisfaction with life and self-esteem based on observed significant improvements two weeks and three months after treatment.[14]

Such assessment of the effects of aesthetic use of BoNT-A on QoL remains an important area of research. Studies have reported consistently high levels of satisfaction following treatment,[4–6] positive effects on mood,[7–9] and positive patient-reported outcomes relating to aspects of appearance and its perception by the patient and other people.[10–13] However, none of these studies include an objective assessment of QoL utilizing a validated measure. Therefore, while the results are undoubtedly suggestive of improved QoL, this cannot be assumed. The results of Dayan et al[14] clearly demonstrate that treatment improves certain aspects of QoL related to appearance, self-perception, and perception of how others see the patient. The author's findings add further support to these findings by demonstrating that overall QoL is

improved by aesthetic treatment with BoNT-A. Importantly, the author's use of the SEIQoL-DW score means that they can be confident this improvement in QoL reflects changes in parameters of genuine importance to the patient. It is also of interest to note that all patients with migraine were specifically excluded from the study as onabotulinumtoxinA treatment has been associated with significant reductions in headache and improvement in health-related QoL.[19] Therefore, although these patients were not excluded from the U.S. study,[14] it is reassuring that the present study's results confirmed the QoL benefit observed by Dayan et al.

Perhaps surprisingly, the present study found no consistent evidence of correlation between the level of patient satisfaction and their SEIQoL or overall QoL scores at either visit, despite all patients having an increase in satisfaction and the majority showing an improvement in QoL, particularly when assessed following use of the old cues at their follow-up visit. It is also of interest to note that when the change in satisfaction score following treatment was analyzed against change in SEIQoL or overall QoL, there was no evidence of a correlation in the size of the change of the two measures. This may in part be explained by the fact that satisfaction with appearance is one of many factors that contribute to QoL and, as already alluded to, less than half of patients identified appearance as a major determinant of their QoL. As such, it is clear that while appearance is undoubtedly important to many patients receiving BoNT-A, the use of satisfaction scores alone may be an unreliable surrogate for QoL in day-to-day practice.

While the present study was limited by small patient numbers recruited from a single center and the lack of a control group, the results support the contention that QoL is significantly improved following BoNT-A treatment. These results, in combination with those of Dayan et al,[14] suggest that serious consideration should be given to incorporating the measurement of QoL as an outcome measure following BoNT-A treatment. Further research is warranted in this area to further quantify the impact BoNT-A treatment has on patients beyond the observed changes in appearance.

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