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ORIGINAL ARTICLE

Association of botulinum toxin treatment for facial aesthetic corrections with levels of happiness, anxiety and depression

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ABSTRACT

Aim Any aesthetic procedure in the head and/or in the face might have an impact on psychological status of the treated participants. The aim of this study was to investigate whether botulinum toxin treatment for facial aesthetic purpose influences the level of happiness, depression and anxiety.

Methods This prospective cohort observational study included 30 participants, who were treated by botulinum toxin (Botox) due to aesthetic corrections. The treatment included laugh lines, frown lines and horizontal forehead lines. The participants were assessed by the Oxford Happiness Questionnaire (OHQ), the Beck Depression Inventory (BDI) and the Beck Anxiety Inventory (BAI) before the procedure, and at three and six months after the treatment to evaluate the levels of happiness, anxiety and depression was used.

Results Three months after the treatment by Botox the level of happiness was significantly increased (5.26±0.43 vs 4.3±0.34; p<0.0001). The levels of depression (7.6±6.0 vs 14.2±8.3; p<0.0001) and anxiety (8.8±6.3 vs 16.4±8.8; p<0.0001) were significantly decreased compared with the preprocedural level. Significantly increased level of happiness and decreased levels of depression and anxiety remained at six months after the treatment though attenuated. A dose of applied botulinum toxin was negatively correlated with the level of depression (r = -0.394; p=0.0421) and anxiety (r = -0.387; p=0.0302).

Conclusion Botulinum toxin treatment for facial aesthetic purpose positively influences psychological status of the treated individual in the short-therm.

Keywords: Botox, psychological factors, questionnaire

INTRODUCTION

Happiness is a permanent, positive emotional state that includes calmness and self-satisfaction with one's life and achievements. Nowadays, there is a debate about the use of botulinum toxin injections. There are differences in the understanding of its usage in different cultures. It is closely related to well-being and overall life satisfaction (1).

Botulinum toxin is a neurotoxin A (BoNT/A) secreted by *Clostridium botulinum*. It belongs to the group of the most potent biological poisons, which achieves its paralytic effect by rapidly and irreversibly blocking neuromuscular transmission and inhibiting the release of acetylcholine in neuromuscular synapses (2). That is the reason why botulinum toxin, Botox (Botox®) or Dysport (Dysport®), has been used in medicine in small doses for about two decades as a medicine to relax muscles, originally for the treatment of strabismus in children (3), blepharospasm (4), facial spasm (5), myokymia (6), dystonia (7), bruxism (8), muscle spasms (9), premature ejaculation (10), and hyperhidrosis (11,12). Benefits of this toxin regarding quality of life and patient satisfaction have been reported (13). Botulinum toxin is also used to reduce migraine symptoms (14), which is often comorbid with anxiety and other psychiatric diseases (15), as well as tension-type headaches (16),

First used to remove wrinkles "without a scalpel", until today Botox type-A treatment has been the most frequent procedure applied in cosmetology. However, it has been observed that Botox has a positive effect on mood as well during such procedures. Such finding has prompted several other studies investigating the effect of Botox on psychological state (17). It was observed that people who received Botox for aesthetic reasons in four different locations, not only in the forehead, showed a significant reduction in anxiety compared to those who were treated with alternative treatments for the same indications (18). People treated with Botox also show significantly less depression compared to those treated for aesthetical or neurological indications. Therefore, the application of botulinum toxin in the glabella area of the face is recommended as a new approach for the treatment of depression (19).

According to the theory of a possible association between emotional state and proprioception, the contractions of mimic muscles and consequent facial expressions send signals to the

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neurophysiological circuits in the brain functioning as an emotional centre (20). Wrinkles in the face are developed during chronic and frequent contraction of the mimic musculature. The neurophysiological association between the corrugator muscles and the amygdala suggests that botulinum toxin treatment may improve emotional state (21). Dysfunction of the amygdala is present in the pathogenesis of several psychiatric diseases. In addition, botulinum toxin modulates amygdala activity thus making it potentially a good base for its use in the treatment of depression (21).

Relying on the theory of facial feedback, it has been observed that the patients with major depressive disorder, due to bad mood and sadness and consequent facial expression, develop deep vertical frown lines between the eyebrows. Injections of botulinum toxin into these structures improved and attenuated symptoms of depression (22).

At the Dermatology Centre Farah, we have significant experience in the treatment of aesthetic issues by Botox injections. So far, we have treated several hundred patients, and during the treatment we have observed short-term significant positive changes in the level of happiness, depression and anxiety in those patients.

According to our knowledge, no study has investigated the influence of botulinum toxin used for aesthetic reasons on the levels of depression and anxiety in healthy subjects.

This research aimed to explore whether botulinum toxin treatment for aesthetic purposes in the face influences the levels of happiness, depression and anxiety.

PARTICIPANTS AND METHODS

Participants and study design

This prospective consecutive cohort longitudinal observational research included 30 healthy individuals, who were treated by botulinum toxin (Botox) at the Farah Dermatology Centre, Tuzla, Bosnia and Herzegovina between 1 January 2023 and 30 September 2024.

The participants were treated by botulinum toxin, range 25 to 60 IU (Botox, Allergan, AbbVie d.o.o Sarajevo, Bosnia and Herzegovina) for aesthetic corrections. The treatment included laugh lines, frown lines and horizontal forehead lines. A dose of Botox was determined depending on the number of injection sites, 4 IU per site (22).

The inclusion criteria were: healthy individuals aged 20 to 60, no previous treatment by botulinum toxin or fillers at least 12 months, no malignant or dermatological disease, no previous depression, no previous anxiety, no deformities of the face. The exclusion criteria were: previous treatment by botulinum toxin or fillers within last 12 months, treatment by antidepressive drugs, anxiolytics and antipsychotics.

The participants underwent a clinical follow-up for the period of six months.

Clinical follow-ups were conducted through office visits. The levels of happiness, anxiety, and depression were determined before the procedure, and 3 and 6 months after the treatment.

Each individual was voluntarily included in the study (written consent). The study was approved by the Ethical Committee of Farah Dermatology Centre Tuzla (Approval No. 16/2022).

Methods

The Oxford Happiness Questionnaire (OHQ) (23) was used to determine the level of happiness. The final score is scaled from 1 to 6.

The Beck Depression Inventory (BDI) (24) was used in the analysis of the degree of depression. The BDI contains 21-question multiple-choice self-report, ranked in the following range: normal ups and downs and minimal depression (0-10), mild mood disturbance (11-16), borderline clinical depression (17-20), moderate depression (21-30), severe depression (31-40), extreme depression (41-63).

The Beck Anxiety Inventory (BAI) (25) was used to analyse the level of anxiety. The BAI is ranked in the following range: non-anxious (0-9), mildly anxious (10-16); moderately anxious (17-29), severely anxious (30-63).

Statistical analysis

Values of OHQ, BAI and BDI scores were presented as the mean±SD. For statistical calculations, statistical methods for non-parametric tests were used, Wilcoxon's Signed-Rank Test (when assessing statistical differences in psychological parameters within the same group), Spearman's Rho Correlation (r) calculator (when assessing the connection between differences in psychological parameters), and if $p<0.05$ difference was considered statistically significant.

RESULTS

This study included 30 healthy individuals with mean age of 40.1±9.65 (minimum 24 and maximum 58) years, 27 (90%) females and three (10%) males. All participants were treated with botulinum toxin for aesthetic corrections of the face with an average dose of 38.7±11.1 IU (range 25–60 IU). The treatment included laugh lines, frown lines and horizontal forehead lines. The participants were assessed using a questionnaire to determine the level of happiness, anxiety and depression preprocedurally, three and six months after the treatment.

The level of happiness determined by the OHQ score was significantly increased 3 months after the treatment, 5.26±0.43 ($p<0.0001$) and 6 months after the treatment, 4.82±0.34 ($p<0.0001$) compared with the preprocedural level of happiness, 4.3±0.34. There was no significant difference between the levels of happiness 3 and 6 months after the treatment (Table 1).

Table 1. The level of happiness, depression and anxiety in individuals treated with Botulinum toxin

Questionnaire	Preprocedural level	3 months after	6 months after	p 1	p 2	p 3
Happiness (OHQ score)	4.3±0.34	5.26±0.43	4.82±0.34	0.00001	0.00001	0.00001
Depression (BDI score)	14.2±8.3	7.6±6	9.6±6.8	0.00001	0.00001	0.00001
Anxiety (BAI score)	16.4±8.8	8.8±6.3	12.0±7.3	0.00001	0.00001	0.00001

OHQ, Oxford Happiness Questionnaire; BDI, Beck Depression inventory: BAI, Beck Anxiety inventory;
p 1, comparison of values of preprocedural level and 3 months after the treatment; p 2, comparison of values at 3 months after the treatment and 6 months after the treatment; p 3, comparison of values at 6 months after the treatment and before the treatment

The level of depression determined by the BDI score was significantly decreased 3 months after (7.6±6.0; p<0.0001) and 6 months after the treatment (9.6±6.8; p<0.0001) compared to the preprocedural level of depression, 14.2±8.3. There was a significant difference between the level of depression 3 and 6 months after the treatment, 7.6±6.0 vs. 9.6±6.8 (p<0.0001) (Table 1). A significant lower level of depression was maintained after 6 months compared to the level measured before the Botox application.

The level of anxiety determined by the BAI score was significantly decreased 3 months after, 8.8±6.3 (p<0.0001) and 6 months after the treatment, 12.0±7.3 (p<0.0001) compared to the preprocedural level of anxiety, 16.4±8.8. There was a significant difference in the level of depression 3 and 6 months after the treatment, 8.8±6.3 vs. 12.0±7.3 (p<0.0001) (Table 1). A significantly lower level of anxiety was maintained after 6 months compared to the level measured before the Botox application.

A number of IU of applied botulinum toxin was negatively correlated with the level of depression (BDI score), r= -0.394 (p=0.0421) and anxiety (BAI score), r= -0.387 (p=0.0302). There was no significant correlation between the dose of botulinum toxin and the level of happiness, r = 0.251 (p=0.1620). No significant correlation was observed between the increased level of happiness during the maximally manifested aesthetic effect of the substance and decreased level of depression, r= -0.143 (p=0.4491) and decreased level of anxiety, r= -0.021; (p=0.9125) 3 months after the treatment by Botulinum toxin.

DISCUSSION

The results of our study showed a significant increase in the level of happiness though a significant decrease in the levels of depression and anxiety 3 months after the Botox treatment compared to the preprocedural level. A significantly increased level of happiness and decreased levels of depression and anxiety were maintained six months after the treatment though attenuated. The number of IU of applied Botox was negatively correlated with the levels of depression (BDI score) and anxiety (BAI score). There was no significant correlation between the Botox dose and the level of happiness. To the best of our knowledge, although there are no studies investigating the influence of botulinum toxin for aesthetic reasons on the levels of depression and anxiety in healthy subjects, a significant number of studies have shown that botulinum toxin can be used for the treatment of severe depression (19,26). Patients suffering from unipolar depression may experience a rapid, strong, and sustained improvement in the symptoms of depression after a single glabellar treatment with 20 IU of botulinum toxin (22). Botulinum toxin therapy of 32 IU may also be effective in the treatment of other mental disorders characterized by an excess of negative emotions, such as borderline personality disorder (27).

The mood-lifting effect of botulinum toxin therapy is probably mediated by the interruption of a proprioceptive feedback loop from the facial musculature to the limbic system (28). Our study demonstrated an objective and convincing indication of the beneficial effect of botulinum toxin on the reduction of a depression degree. The degree of depression is the lowest during the maximum aesthetic effect of the substance, but with the disappearance of the aesthetic effect, it remains significantly lower than before the application of the substance. Additionally, a significant correlation was observed between the decrease in the depression level and the increase in the dose of botulinum toxin during the maximum aesthetic manifestation of the substance. Based on the theory of emotional proprioception (21,29), a possible explanation for this finding is that botulinum toxin, by causing transient paralysis of corrugators muscles and consequently elimination of wrinkles, prevents the transmission of “bad signals” to the neurophysiological circuits of the amygdala thereby improving emotional state of an individual (21). After treatment with botulinum toxin, some patients suffering from bipolar depression showed disease remission (19), and some showed reduced intensity of depression symptoms (26). When the effect of botulinum toxin on the frown muscles decreased and diminished after six months, all symptoms fully returned, and a new application of botulinum toxin once again successfully alleviated the symptoms of depression (27). The fact that botulinum toxin is effective in treating depression reveals the potential importance of cranial nerves as a target in the treatment of depression (19, 26). Injection of botulinum toxin (BoNT) into the glabellar region of the face is a novel therapeutic approach in the treatment of depression. This treatment method has several advantages, including few side effects and a long-lasting, depot-like effect (27).

In this study the effect of botulinum toxin on reducing the level of anxiety was most pronounced during the maximum aesthetic effect after three months, but even after the aesthetic effect of the toxin disappeared after six months, a significantly lower level of anxiety remained compared to the one measured before its application. Similar results were found in our study. In addition, during the maximum aesthetic manifestation of the effect of the substance, there was a significant correlation of the decrease in anxiety level with a higher dose (IU) of Botox. Several studies have shown that Botulinum toxin injections reduce the level of anxiety in different neurological diseases (30-32). Thus, benign essential blepharospasm (BEB) may lead to psychological diseases such as anxiety (31). Botulinum toxin injections can significantly improve motor and non-motor symptoms of BEB and decrease the level of anxiety (31). Anxiety is present in 30-40% of patients with cervical dystonia (CD); Botulinum toxin can improve both motor activity and anxiety in CD patients (32). A poor correlation between motor activity and anxiety was observed both at the time of injection and during the time of peak effect after six weeks. The improvement in trait anxiety suggests that Botulinum toxin has a direct beneficial effect on anxiety (32).

Our study has two limitations: a relatively small number of patients was enrolled in the study, and it was conducted in a single-centre.

Botulinum toxin (Botox) treatment for facial aesthetic purposes positively influences the psychological status of a treated individual by increasing the level of happiness and, in the short-term, decreasing levels of both depression and anxiety.

AUTHOR CONTRIBUTIONS STATEMENT

Conceptualization, O.S. and E.T.; Methodology, O.S., E.T., K.LJ., F.S., N.LJ.; Investigation, O.S., E.T., K.LJ., F.S., N.LJ.; Formal analysis, O.S. and E.T.; Writing, O.S., E.T., K.LJ., F.S., N.LJ.

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SPARENCY DECLARATION

Competing interests: None to declare.

REFERENCES

1. Demchenko I, Swiderski A, Liu H, Jung H, Lou W, Bhat V. Botulinum Toxin Injections for Psychiatric Disorders: A Systematic Review of the Clinical Trial Landscape. Toxins (Basel) 2024; 16(4):191-212.
2. Marinelli S. BoNT/Action beyond neurons. Toxicon 2025; 255:108250.
3. Nguyen MTB, Cheung CSY, Hunter DG, Wan MJ, Gise R. Three-year Outcomes of Botulinum Toxin Versus Strabismus Surgery for the Treatment of Acute Acquired Comitant Esotropia in Children. Am J Ophthalmol 2025; 272:1-7.
4. Contento RJ, Anderson CJ, Hill RH, Carruth BP, Salloum G, Bersani TA. Exploratory Prospective Randomized Controlled Study to Evaluate a Modified Botulinum Toxin Injection Pattern for Treatment of Benign Essential Blepharospasm. Cureus 2025; 17(1):e76905.
5. Kurtkaya Koçak Ö, Bora Tokçaer A. Botulinum toxin modulates the blink reflex via the trigeminal afferent system in hemifacial spasm: an early and late-term effect. Neurol Sci 2024. Online ahead of print. doi: 10.1007/s10072-024-07947-1.
6. Yousaf MIK, Ghani MR, D'Aguiar Rosa T, Holiday V, Brown M, Hedera P. Treatment of segmental continuous hypertrophic myokymia of the limb with botulinum A toxin. SAGE Open Med Case Rep 2022; 10:2050313X221137214.
7. Bessemer RA, Jog M. Botulinum Toxin Injections to the Obliquus Capitis Inferioris Muscle for Dynamic Cervical Dystonia Improves Subjective Patient Outcomes. Toxins (Basel) 2024; 16(2):76.
8. Yacoub S, Ons G, Khemiss M. Efficacy of botulinum toxin type A in bruxism management: A systematic review. Dent Med Probl 2025; 62(1):145-60.
9. Zhou J, Jia F, Chen P, Zhou G, Wang M, Wu J, Yang S. Localisation of the centre of the highest region of muscle spindle abundance of anterior forearm muscles. J Anat 2024; 244(5):803-14.
10. Gao D, Li C, Jin Y, Sun D, Chen Z, Tang B, et al. Clinical Efficacy and Safety of Botulinum Toxin A Injection into the Bulbospongiosus Muscle for Treating Lifelong Premature Ejaculation: A Systematic Review and Meta-Analysis. Am J Mens Health 2025; 19(2):15579883251328312.
11. Drexel SC, Klietz M, Kollewe K, Paracka L, Kutschenko A, Kopp B, et al. Caregiver burden and health-related quality of life in idiopathic dystonia patients under botulinum toxin treatment: a cross-sectional study. J Neural Transm (Vienna) 2020; 127(1):61-70.
12. Nawrocki S, Cha J. Botulinum toxin: pharmacology and injectable administration for the treatment of primary hyperhidrosis. J Am Acad Dermatol 2020; 82:969-79.
13. Ceylan D, Erer S, Zarifoğlu M, Türkeş N, Özkaya G. Evaluation of anxiety and depression scales and quality of LIFE in cervical dystonia patients on botulinum toxin therapy and their relatives. Neurol Sci 2019; 40(4):725-31.
14. Cheema S, Lagrata S, Rantell KR, Ahmed M, Kamourieh S, Matharu MS. OnabotulinumtoxinA for primary new daily persistent headache and comparison to chronic migraine. Cephalalgia 2025; 45(2):3331024251317448.
15. Lehnert F, Neumann I, Krüger THC, Wollmer MA. Botulinum Toxin Therapy for Psychiatric Disorders in Clinical Practice: A Retrospective Case Study. Toxins (Basel) 2023;15(6):385.
16. Bruloy E, Sinna R, Grolleau JL, Bout-Roumazeilles A, Berard E, Chaput B. Botulinum toxin versus placebo: a meta-analysis of prophylactic treatment for migraine. Plast Reconstr Surg 2019; 143:239-50.
17. Avelar R. Post Hoc Analysis Comparing the Safety and Efficacy of Prabotulinum toxin A in Millennials and Nonmillennials with Moderate to Severe Glabellar Lines. Dermatol Surg 2024; 50(9S): S42-S47.
18. Blumenfeld AM, Tepper SJ, Robbins LD, Manack Adams A, Buse DC, Orejudos A, et al. Effects of onabotulinumtoxinA treatment for chronic migraine on common comorbidities including depression and anxiety. J Neurol Neurosurg Psychiatry 2019; 90(3):353-60.
19. Wollmer MA , Magid M, Kruger THC, Finzi E. Treatment of Depression with Botulinum Toxin. Toxins (Basel) 2022; 31;14(6):383.
20. Yuan K, Négyesi J, Okuyama T, Nagatomi R. The influence of emotional states induced by emotion-related auditory stimulus on ankle proprioception performance in healthy individuals. Sci Rep 2025; 15(1):4586.
21. Finzi E. Botulinum Toxin Treatment for Depression: A New Paradigm for Psychiatry Toxins (Basel) 2023;14 (5):336.
22. Gold M, Taylor S, Mueller DS, Adelglass J, Kaufman-Janette J, Cox SE, et al. Efficacy and Safety of LetibotulinumtoxinA in the Treatment of Moderate and Severe Glabellar Lines in Females 35 to 50 Years of Age: Post Hoc Analyses of the Phase 3 Clinical Study Data. Aesthet Surg J Open Forum 2024; 6: ojae010.
23. Elkin N, Mohammed AK, Kılınçel Ş, Soydan AM, Tanrıver *SÇ, Çelik Ş, Ranganathan M. Mental health literacy and happiness among university students: a social work perspective to promoting well-being. Front Psychiatry 2025;* 16:1541316.
24. Seppänen M, Lankila T, Niemelä M, Rautio N, Korpisaari M, Timonen M, Korpelainen R, Farrahi V. Compositional associations of 24-h physical activities, sedentary time and sleep with depressive symptoms in urban and rural residents: a cross-sectional study. BMC Med 2025; 23(1):219.
25. Arévalo-Martínez A, Barbosa-Torres C, García-Baamonde ME, Díaz-Muñoz CL, Moreno-Manso JM. Symptoms of prolonged grief in chronic pain patients: Results of a cross-sectional study. Death Stud 2025:1-11.
26. Wollmer MA, Magid M, Kruger THC, Finzi E. The Use of Botulinum Toxin for Treatment of Depression. Handb Exp Pharmacol 2021; 263:265-78.
27. Wollmer MA, Neumann I, Jung S, Bechinie A, Herrmann J, Müller A, et al. Clinical effects of glabellar botulinum toxin injections on borderline personality disorder: A randomized controlled trial. J Psychopharmacol 2022; 36(2):159-69.
28. Fu G, Yu Y, Ye J, Zheng Y, Li W, Cui N, Wang Q. A method for diagnosing depression: Facial expression mimicry is evaluated by facial expression recognition. J Affect Disord 2023; 323:809-18.

29. Japee S. On the Role of Sensorimotor Experience in Facial Expression Perception. J Cogn Neurosci. 2024; 36(12):2780-92.
30. Feng XY, Shen TT, Wu QC, Wang J, Ni P, Liu J, et al. A novel approach to treating post-stroke depression: administration of Botulinum Toxin A via local facial injection. Front Neurol 2024; 15:1372547.
31. Zhang HN, Gao Q, Xie JJ, Ye J. Correlation between blepharospasm and psychological diseases: the anxiety, depression and sleep disorder study. Int J Ophthalmol 2024; 17(11):2007-13.
32. Sugar D, Patel R, Comella C, González DA, Gray G, Stebbins GT, et al. The effect of botulinum toxin on anxiety in cervical dystonia: A prospective, observational study. Parkinsonism Relat Disord 2023; 114:105792.