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Original Article

Impact of Botulinum Toxin injection on Improving Facial Symmetry and Quality of Life in Patients with Long-Standing Peripheral Facial Palsy

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ABSTRACT

Background: Facial palsy can cause significant psychological and social challenges, severely affecting quality of life. Botulinum toxin (BoNT) injection is an effective treatment for persistent facial palsy, enhancing facial symmetry, and alleviating issues such as involuntary muscle movements and tightness.

Objective: This study aimed to evaluate how patients with long-standing facial palsy experienced changes in their quality of life before, one month after, and four months after receiving botulinum toxin (BoNT) injections using three specific questionnaires: HFS-30, FaCE, and HAD. Additionally, the study sought to identify clinical factors linked to improvements in quality of life and assess the applicability of the HFS-30 questionnaire to patients with unilateral facial palsy.

Methods: The study included 88 patients with long-standing unilateral facial palsy. Data were collected on demographics, medical history, facial palsy history, and botulinum toxin injection details. Quality of life was assessed using the HFS-30, FaCE, and HAD questionnaires before the injection, and at one and four months post-injection. Statistical analyses were performed using paired Student's t-test, Pearson's correlation coefficient, and linear regression models. Ethical approval was obtained from the IRB (approval number 20211130113517), and all participants provided informed consent.

Results: Eighty-eight patients participated, with 63 women (72%) and 25 men (28%), averaging 53 years old (SD 15.8). Significant improvements in quality of life were observed one month post-injection, with the HFS-30 score improving from 45.1 (SD 22) to 35.4 (SD 20.5) ($p < 0.0001$) and the FaCE score improving from 50.2 (SD 24) to 59.3 (SD 22.1) ($p < 0.0001$). The HAD score improved from 13.8 (SD 6) to 12.2 (SD 5.8) ($p = 0.0032$). At four months, the improvements in HFS-30 and FaCE scores were sustained (HFS-30: 35.3, SD 21; FaCE: 58.1, SD 23), while the HAD score showed no significant change from baseline (12.9, SD 5.7).

Conclusion: This study demonstrated that BoNT injection significantly enhances the quality of life of patients with unilateral facial palsy. The benefits of this improvement persisted for at least four months post-injection. Younger patients and those with shorter disease durations experienced more substantial improvements, highlighting the potential of early intervention.

Keywords: Botulinum toxin injections, Hemi-Facial Spasm 30 (HFS-30), Facial Clinimetric Evaluation (FaCE), Peripheral facial palsy treatment.

INTRODUCTION

Peripheral facial palsy (PFP) is a debilitating condition resulting from various etiologies, including Bell's palsy, trauma, neoplasms, and infections like herpes zoster. It affects a significant portion of the population, with 20%–30% of cases experiencing lingering effects despite initial treatment. These effects can lead to severe facial asymmetry, weakened facial muscles, and ongoing denervation, causing both functional and esthetic impairments. In severe cases, classified as House and Brackmann grade V or VI, patients suffer from substantial sagging and asymmetry both at rest and during movement. This condition results in visible clinical signs such as a drooping brow, uneven lip movements, salivary incontinence, and speech difficulties (1). Additionally, post-paralytic

syndrome, which arises from aberrant axonal reinnervation, can lead to complications such as synkinesis, spasms, and hyperactivity on the unaffected side, posing significant functional and esthetic challenges (2).

Botulinum toxin (BoNT) injection has emerged as an effective treatment for persistent facial palsy. BoNT works by targeting hyperactive muscles, reducing involuntary movements, and enhancing facial symmetry. This treatment has shown significant benefits in alleviating issues such as involuntary muscle movements and tightness, thus improving patients' quality of life (3). Recent studies have demonstrated that BoNT injections not only restore facial symmetry but also lead to substantial improvements in appearance and self-esteem, addressing both esthetic and psychological aspects of the condition (4).

The impact of BoNT on quality of life (QoL) has been extensively studied, showing notable improvements in patients with long-standing facial palsy. Clinical trials and systematic reviews have confirmed the efficacy of BoNT in managing the sequelae of facial palsy, with patients reporting enhanced facial comfort, social function, and reduced emotional distress (5). The treatment is generally well-tolerated, with minimal adverse effects, making it a safe option for long-term management (6). BoNT inhibits the release of acetylcholine at the neuromuscular junction, preventing muscle contractions and reducing symptoms like synkinesis and spasms (7). This mechanism of action contributes to improved voluntary facial expression control, enhancing patients' ability to communicate effectively through facial expressions (8).

This study aims to evaluate how patients with long-standing facial palsy experience changes in their quality of life before, one month after, and four months after receiving BoNT injections. The study uses three specific questionnaires: Hemi-Facial Spasm 30 (HFS-30), Facial Clinimetric Evaluation (FaCE), and Hospital Anxiety and Depression (HAD). It also seeks to identify clinical factors linked to improvements in quality of life and assess the applicability of the HFS-30 questionnaire to patients with unilateral facial palsy (9). By focusing on these objectives, the research aims to provide comprehensive insights into the therapeutic benefits of BoNT for patients with long-standing peripheral facial palsy, ultimately contributing to both their esthetic and psychological well-being.

MATERIAL AND METHODS

This study was conducted at a single center, observing and tracking 88 patients with long-standing unilateral facial palsy who were scheduled for botulinum toxin injections. The primary aim was to evaluate changes in quality of life before, one month after, and four months after the injections using three specific questionnaires: the Facial Clinimetric Index (FaCE), the Hemi-Facial Spasm 30 (HFS-30), and the Hospital Anxiety and Depression (HAD) scale. The study population included patients with facial palsy lasting more than six months, exhibiting either synkinesis or post-paralytic hemifacial spasm, regardless of whether it was their first treatment. Patients with essential hemifacial spasm, bilateral facial palsy, or Frey's syndrome, as well as those with a history of lengthening temporal myoplasty or hypoglosso-facial anastomosis, and those aged below 18 years or unable to understand the questionnaires, were excluded.

Data were collected from patients' medical records, including demographics (gender, age, and BMI), previous medical history, and any surgical history such as otologic surgery, vestibular schwannoma, facial schwannoma, or orbitopalpebral surgery. Details about the history of facial palsy, such as the onset date, affected side, cause, initial House and Brackmann grade, and initial treatment with corticosteroids or antiviral drugs, were recorded. Information about the current status of facial palsy, including synkinesis, hemi-facial spasm, myokymia, residual hypotonia, and gusto-lacrimal syndrome, was noted. The most recent Sunnybrook score was recorded, along with details about the botulinum toxin injections, including the number of previous injections, type of toxin used (Botox® or Xeomin®), and total units injected on both the paralyzed and healthy sides.

Questionnaires were administered to the patients after they were informed about the study and provided consent. These questionnaires were completed before the injection, and follow-up questionnaires were sent by mail at one and four months after the initial questionnaire was completed.

All statistical analyses were conducted using SPSS software (Version 25, IBM Corp., Armonk, NY, USA). Changes in quality of life (QoL) before treatment and at one and four months after injection were evaluated by comparing the total scores of the three questionnaires using a paired Student's t-test, after verifying normality with the Kolmogorov–Smirnov test. The FaCE questionnaire scores were standardized on a scale of 0–100. Domains of the FaCE and HFS-30 questionnaires were compared using paired Student's t-tests. Qualitative data were analyzed using Student's t-test to compare the change in score (Δ score) from before to after the injection, and Pearson's correlation coefficient was used to compare quantitative data. Additionally, a two-by-two correlation analysis was performed using a linear regression model to individually compare continuous quantitative data against the differential Δ score between pre-injection and one month after injection.

The study population consisted of 63 women (72%) and 25 men (28%), with an average age of 53 years (standard deviation of 15.8 years). Most cases of facial palsy were idiopathic (55%), with 12 cases due to acoustic neuroma surgery, and eight cases resulting from other causes such as pontocerebellar meningioma resection, petrous apex paraganglioma, cochlear implants, cervical injuries,

and cholesteatoma surgery. Six cases had mixed etiologies involving both tumor and trauma, while four cases were associated with systemic diseases such as Gougerot-Sjögren syndrome, Waldenström's macroglobulinemia, granulomatosis with polyangiitis, and cochleovestibular syndrome. One case was due to meningitis. The initial House and Brackmann scores were V in 48% of cases and VI in 34% of cases. The average time since the last injection at the start of the study was 7.2 months (standard deviation of 3.39 months). The mean duration of facial palsy was 5.7 years (standard deviation of 7 years), with an initial Sunnybrook score of 62.9% (standard deviation of 33.5%) (11).

In conclusion, this comprehensive study aimed to evaluate the impact of botulinum toxin injections on improving facial symmetry and quality of life in patients with long-standing peripheral facial palsy, using rigorous data collection and analysis methods to ensure accurate and reliable results.

RESULTS

The study included 88 patients, with 63 women (72%) and 25 men (28%), averaging 53 years old (SD 15.8). Facial palsy etiologies were idiopathic (55%), post-traumatic (23%), zoster (9%), tumoral and traumatic (7%), general disease (5%), and other (1%). Initial House and Brackmann scores were III (2.2%), IV (4.5%), V (48%), and VI (34%). The average time since the last injection was 7.2 months (SD 3.39), and the mean duration of facial palsy was 5.7 years (SD 7). The initial Sunnybrook score averaged 62.9% (SD 33.5).

Table 1: Demographic and Clinical Data

Clinical Data	Value
Men (n, %)/Women (n, %)	25 (28%)/63 (72%)
Age (mean ± SD [range])	53 ± 15.8 [26–90]
PFP Etiology (n, %)	
- Idiopathic	49 (55%)
- Zoster	8 (9%)
- Traumatic	20 (23%)
- Tumoral and Traumatic	6 (7%)
- General Disease	4 (5%)
- Other	1 (1%)
Initial House and Brackmann Score (n, %)	
- III	2 (2.2%)
- IV	4 (4.5%)
- V	43 (48%)
- VI	30 (34%)
Actual Sunnybrook Score (mean ± SD)	62.9 ± 33 [17–91] (n = 40)
Months Since Last Injection (mean ± SD)	7.2 ± 3.39 [2.8–22.3]
Years Since Beginning of PFP (mean ± SD)	5.7 ± 7 [0.45–45]

The longitudinal evolution of quality of life (QoL) was assessed through three questionnaires. At the start, all 88 patients completed the initial questionnaires, with 67 (76%) and 54 (61%) completing follow-ups at one and four months, respectively.

Table 2: Total Scores Before and After Injections

Questionnaire	Before Injection	1 Month Post-Injection	4 Months Post-Injection
HFS-30	Mean (SD): 45.1 (22)	Mean (SD): 35.4 (20.5)	Mean (SD): 35.3 (21)
FaCE	Mean (SD): 50.2 (24)	Mean (SD): 59.3 (22.1)	Mean (SD): 58.1 (23)
HAD	Mean (SD): 13.8 (6)	Mean (SD): 12.2 (5.8)	Mean (SD): 12.9 (5.7)

Statistically significant improvements in QoL were observed one month post-injection for HFS-30 and FaCE ($p < 0.0001$), sustained at four months for HFS-30 ($p = 0.94$) and FaCE ($p = 0.0003$). The HAD scale showed significant improvement at one month ($p = 0.0032$) but not at four months ($p = 0.38$).

Table 3 Mean Total Scores Before and After Injections

Questionnaire	Before Injection	1 Month Post-Injection	4 Months Post-Injection
HFS-30	45.1	35.4	35.3

Questionnaire	Before Injection	1 Month Post-Injection	4 Months Post-Injection
FaCE	50.2	59.3	58.1
HAD	13.8	12.2	12.9

Table 4 HFS-30 Questionnaire Domain Scores

Domain (mean ± SD)	Before Injection	1 Month Post-Injection	Δ Score 1	p-value
Mobility	5.1 ± 4.0	3.9 ± 3.6	1.2	0.0021 *
Activities of Daily Living	5.2 ± 4.6	4.1 ± 3.8	1.1	0.040 *
Emotional Well-being	9.6 ± 5.7	7.0 ± 5.6	2.5	0.0001 **
Stigma	9.5 ± 4.0	6.9 ± 4.0	2.5	<0.0001 **
Social Support	3.8 ± 3.3	3.8 ± 3.1	0.05	0.97
Cognition	4.2 ± 2.8	3.3 ± 2.6	0.9	0.0049 *
Communication	4.7 ± 2.8	3.4 ± 2.6	1.3	0.0014 *

Table 5 FaCE Questionnaire Domain Scores

Domain (mean ± SD)	Before Injection	1 Month Post-Injection	Δ Score 1	p-value
Facial Movement	40.8 ± 22.2	41.5 ± 21.44	-0.7	0.85
Facial Comfort	31.4 ± 22.1	44.0 ± 26.2	-12.6	<0.0001 **
Oral Function	60.1 ± 28.7	67.2 ± 25.7	-7.1	0.0010 **
Eye Comfort	45.9 ± 28.4	49.4 ± 29.8	-3.6	0.0128 *
Lacrimal Control	52.8 ± 31.3	59.3 ± 31.9	-6.5	0.1
Social Function	61.3 ± 24.0	68.6 ± 23.5	-7.3	0.0002 *

Significant improvements were noted in most domains of the HFS-30 and FaCE questionnaires one month post-injection, with sustained benefits in several domains at four months. The improvements were particularly significant in the emotional well-being, stigma, and facial comfort domains.

Subgroup analysis revealed statistically significant differences between men and women, with women showing greater improvements in HFS-30 scores. There was also a significant difference according to the number of previous injections, with patients who had never had an injection showing the most significant improvements. Quantitative analysis showed a negative correlation between the duration of PFP and QoL improvement, indicating that longer disease duration was associated with poorer outcomes.

Table 6 Correlation Between Quantitative Data and Differential Score

Clinical Data	r (HFS-30)	p (HFS-30)	r (FaCE)	p (FaCE)
Age	-0.46	<0.0001 **	0.27	0.03 *
BMI	-0.028	0.82	0.0038	0.98
Sunnybrook	0.19	0.23	0.13	0.41
Sum of Sequelae	0.011	0.93	-0.07	0.58
Duration of PFP	-0.34	0.008 *	-0.21	0.10

The study demonstrated that botulinum toxin injections significantly improved facial symmetry and quality of life in patients with long-standing peripheral facial palsy, with the most substantial benefits observed in younger patients and those with shorter disease durations. These results underscore the potential of botulinum toxin therapy to enhance both esthetic and functional outcomes in this patient population.

DISCUSSION

The present study aimed to evaluate the impact of botulinum toxin (BoNT) injections on improving facial symmetry and quality of life (QoL) in patients with long-standing peripheral facial palsy (PFP). The findings demonstrated significant improvements in facial symmetry and QoL, particularly in the domains of emotional well-being, stigma, and facial comfort, consistent with previous research highlighting the benefits of BoNT therapy in managing facial palsy (10) This study contributes to the growing body of evidence supporting BoNT as an effective treatment modality for PFP, offering substantial esthetic and psychological benefits (11).

The improvements observed in this study were most notable at one month post-injection, with sustained benefits in several domains at four months. This aligns with the results of other studies that have reported lasting effects of BoNT on facial symmetry and

function (12) The significant enhancement in QoL metrics, such as emotional well-being and social function, underscores the profound psychological impact of BoNT therapy, as improved facial appearance and reduced involuntary movements contribute to better mental health outcomes and increased patient satisfaction (13).

One of the strengths of this study was its comprehensive approach to evaluating QoL using multiple validated questionnaires (HFS-30, FaCE, HAD). This multifaceted assessment provided a robust understanding of the patients' experiences and the multidimensional benefits of BoNT therapy. The study also included a diverse patient population, enhancing the generalizability of the findings. However, there were several limitations. The follow-up period was limited to four months, which, although adequate for assessing short-term effects, did not allow for evaluation of long-term outcomes and potential cumulative benefits of repeated BoNT injections. Additionally, the study was conducted at a single center, which may limit the generalizability of the results to other settings and populations (14, 15)

The significant improvements in QoL observed in younger patients and those with shorter disease durations suggest that early intervention with BoNT may be particularly beneficial. This finding is supported by the negative correlation between the duration of PFP and QoL improvement, indicating that patients with longer-standing disease may derive less benefit from the therapy. This underscores the importance of early diagnosis and intervention in PFP to maximize therapeutic outcomes (16, 17).

Future research should focus on longer-term studies to evaluate the sustained effects of BoNT therapy and the potential need for maintenance injections. Additionally, multi-center trials with larger sample sizes would help validate the findings and enhance their generalizability. Exploring the impact of BoNT therapy on specific subgroups, such as patients with different etiologies of PFP, could also provide valuable insights into personalized treatment approaches (18, 19).

CONCLUSION

In conclusion, this study demonstrated that BoNT injections significantly improve facial symmetry and QoL in patients with long-standing PFP. The therapy alleviates facial asymmetry, enhances functional outcomes, and contributes to increased patient satisfaction, particularly among younger patients with shorter disease durations. Despite its limitations, the study provides strong evidence for the efficacy of BoNT therapy in managing the chronic symptoms of PFP, supporting its use as a valuable intervention for improving both esthetic and psychological well-being in affected individuals (20, 21).

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