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Contralateral Botulinum Toxin Type A Injections for Facial Symmetry in Patients with Complete Facial Nerve Paralysis

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Abstract

Facial nerve paralysis may cause marked facial asymmetry and functional and social difficulties. Contralateral injection of botulinum toxin type A (BTX-A) is used to weaken the muscles on the unaffected side and improve facial balance. The objective of this study was to assess changes in facial asymmetry and facial disability after contralateral BTX-A injections in patients with facial nerve paralysis. This prospective study was conducted from November 2017 to December 2018 and included 15 patients with unilateral, complete facial paralysis (House–Brackmann grade VI). The patients were 11–65 years old; nine were male and six were female. BTX-A was injected into selected facial muscles on the unaffected side. Facial asymmetry was assessed using a visual analogue scale (VAS), and functional and social disability were assessed using the Facial Disability Index (FDI). Follow-up assessments were performed after one week and at two, four, and six months. The mean patient-rated VAS decreased from 8.5 ± 1.18 before injection to 2.93 ± 0.88 after one week and 3.66 ± 1.54 after four months (P = 0.001 for both comparisons). The surgeon-rated VAS decreased from 8.5 ± 1.18 to 2.73 ± 1.09 and 3.46 ± 1.24, respectively (P = 0.001). The mean functional FDI score increased from 33.66 ± 5.49 before injection to 71.46 ± 7.75 at two months and 61.73 ± 10.31 at four months. The social FDI score increased from 28.33 ± 4.08 to 63.33 ± 7.94 and 55.33 ± 10.08, respectively (P = 0.001 for the reported comparisons). Mild injection pain was reported in all patients; drooling and difficulty speaking were also recorded. In this group of patients with complete facial paralysis, contralateral BTX-A injections were associated with improved facial symmetry scores and higher functional and social FDI scores during follow-up. The observed improvement was still present at four months, although the scores had moved away from their best post-treatment values.

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Introduction

Facial nerve paralysis is associated with changes in facial movement that can be evident both at rest and during expression. Because facial expression depends on coordinated activity of several muscle groups, weakness on one side may leave the movements of the unaffected side relatively unopposed. The resulting asymmetry can become particularly noticeable during smiling and other lower facial movements. In addition to its visible appearance, facial nerve dysfunction may affect everyday activities and the way patients feel about social interaction. These concerns make restoration of facial balance an important part of the management of patients with long-standing facial paralysis [1,2].

Facial paralysis has different causes, including trauma, neoplastic disease, and idiopathic conditions. The clinical presentation and degree of dysfunction vary between patients, and assessment of severity is commonly supported by a grading system such as the House–Brackmann facial nerve grading system [3]. In patients with complete paralysis, the difference between the affected and unaffected sides may remain substantial even when the underlying cause has been treated. Management therefore may need to address not only the paralysed side but also the activity of the muscles on the opposite side that contributes to visible asymmetry [1,2].

Several surgical and nonsurgical approaches have been described for managing the paralyzed face. Surgical procedures may be

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considered to restore movement or support facial function, while nonsurgical methods can be used to address selected aspects of asymmetry. The literature cited in the thesis describes a multimodality approach to management and discusses smile restoration in permanent facial paralysis, reflecting the fact that no single approach is suitable for every patient [5,6]. The choice of treatment depends on the clinical problem being addressed and the patient's functional and aesthetic concerns.

Botulinum toxin type A (BTX-A) has been used to reduce excessive activity in selected facial muscles. In facial paralysis, injections may be directed to the contralateral, unaffected side to reduce the stronger muscular pull and improve balance between the two sides of the face. The aim is not to restore nerve function directly, but to modify muscle activity so that facial movements appear more symmetrical. Previous work cited in the thesis has specifically described contralateral BTX-A treatment for facial palsy and its use to improve lower facial symmetry [5,6].

The selection of injection sites is important because facial expression involves several muscles that contribute differently to movement of the mouth, cheek, and upper face. The thesis describes clinical assessment of facial movements, including smiling and whistling, to identify muscles that contribute most to asymmetry. The muscles considered for treatment included the zygomaticus major and minor, levator anguli oris, levator labii superioris, levator labii superioris alaeque nasi, risorius, depressor labii inferioris, and mentalis; the frontalis and orbicularis oculi were also injected in some patients. This targeted approach was intended to reduce the dominant pull on the unaffected side while maintaining a clinically appropriate balance.

The effect of treatment can be assessed from more than one perspective. A visual analogue scale (VAS) provides a rating of perceived facial asymmetry, while the Facial Disability Index (FDI) records the patient's experience of physical functioning and social well-being. The FDI was developed as a disease-specific instrument for disorders of the facial neuromuscular system, and its functional and social components capture difficulties that may not be fully represented by appearance alone [3,7]. Using both types of measures allows treatment outcomes to be described in terms of perceived symmetry and the impact of facial dysfunction on daily life.

Previous studies cited in the thesis have reported improvements in facial symmetry after botulinum toxin treatment, including in patients with long-standing facial paralysis and in patients treated for lower facial asymmetry [4,5,8]. Other cited work has addressed post-paralytic synkinesis and the use of botulinum toxin in facial nerve disorders [6,9-12]. These reports provide the clinical background for evaluating contralateral injection in patients with persistent facial paralysis. However, the response observed in an individual clinical series should be interpreted in relation to its patient group, outcome measures, follow-up period, and study design.

The present study evaluated 15 patients with unilateral complete facial paralysis who received BTX-A injections into selected muscles on the unaffected side. Facial asymmetry was assessed by both the patient and the examining surgeon using the VAS, while functional and social outcomes were assessed using the FDI. Follow-up observations were used to document changes after injection and to record reported adverse effects. The objective was to describe the changes in facial symmetry and disability scores observed after contralateral BTX-A treatment in this group of patients.

Material and Methods

Study design and setting

This prospective clinical case series was conducted from November 2017 to December 2018 at Al-Shaheed Ghazi Al-Hariri Hospital, Medical City, Baghdad, Iraq. Fifteen patients with unilateral complete facial nerve paralysis were enrolled and received contralateral botulinum toxin type A (BTX-A) injections. The cohort comprised nine males and six females; participants were 11–65 years old (reported mean age, 39.8 ± 15.53 years). All patients were classified as House–Brackmann grade VI, and the reported duration of paralysis was more than one year (range, 1–4 years; mean, 2.26 ± 0.88 years).

Eligibility criteria and clinical assessment

The reported causes of paralysis were trauma (6 patients), parotid tumour (6), idiopathic paralysis (2), and neurofibromatosis (1). Inclusion criteria were unilateral facial paralysis of more than one year's duration in either sex. Patients were excluded if they had bilateral facial paralysis or a stated contraindication to BTX-A treatment. The listed contraindications were neuromuscular disorders (including myasthenia gravis), body dysmorphic disorder, immunocompromised status, dermatoses or infection at the proposed injection site, keloid scarring, pregnancy or breastfeeding, and allergy to the product constituents.

A standardized case record was used to document demographic details, occupation, presenting complaint, cause, severity and duration of paralysis, medical and surgical history, social and family history, drug allergies, previous treatment, clinical findings, treatment details, follow-up assessments, and adverse events. Clinical examination included assessment of facial symmetry at rest and during smiling, the side and completeness of paralysis, and recorded ocular, posterior auricular pain, taste, and hearing symptoms. Imaging and other investigations were documented when available.

Pre-injection assessment and materials

Before treatment, patients underwent history-taking and clinical assessment, with severity graded using the House–Brackmann facial nerve grading system. Photographs at rest and during smiling were specified in the thesis as part of the pre-treatment assessment. Patients were counselled about the injection procedure, expected timing of effects, possible adverse effects, and complications. The thesis also lists pre-treatment investigations comprising a complete blood count, virology testing, random blood glucose, serum creatinine, blood urea, chest radiography, prothrombin time, partial thromboplastin time, and international normalized ratio. The clinical records should be checked to confirm which investigations and photographs were completed for each participant.

The materials listed in the thesis were a BTX-A vial identified as Botox (manufacturer details transcribed in the thesis as ADODERM Ltd, Germany), a 5-mL reconstitution syringe with a 23-gauge, 1.25-inch needle, 0.9% sodium chloride, and a 1-mL insulin syringe with a 25-gauge, 1-inch needle for injection. The product name and manufacturer should be checked against the original vial or clinical records before submission.

BTX-A preparation and injection procedure

Patients were seated upright on a dental chair with the head supported. The skin was disinfected with povidone–iodine, and injections were administered without anaesthesia; the thesis describes the injection pain as mild. Injection sites were selected clinically after asking patients to perform facial movements, particularly smiling and whistling, to identify areas where activity of the unaffected side contributed most to the asymmetry. The thesis notes that precise attribution of the observed movement to an individual muscle could be difficult. The thesis reports that 100 units of BTX-A were reconstituted with 2.5 mL of 0.9% sodium chloride. It also gives a concentration of 40 units per 0.1 mL, which is mathematically inconsistent with that dilution; therefore, the concentration and actual administered volume must be verified from the treatment records and are not assumed here. The reported individual-muscle doses ranged from 20 to 40 units, with a mean dose of 31.6 units. The records should clarify whether these values refer to each muscle, each injection site, or the total dose per patient before the dose information is finalized.

The muscles considered for contralateral injection were the zygomaticus major and minor, levator anguli oris, levator labii superioris, levator labii superioris alaeque nasi, risorius, depressor labii inferioris, and mentalis. The frontalis and orbicularis oculi were injected in some patients, reportedly in small doses, when considered relevant to facial balance or rhytids. The thesis indicates that follow-up assessment could be used to determine whether doses at selected sites required adjustment; patient-level details of any repeat or adjusted injections should be confirmed from the records.

Post-injection instructions and follow-up

After treatment, patients were instructed to avoid massaging the injection sites and applying heat, lying supine, consuming alcohol, and undertaking strenuous exercise on the day of treatment. Follow-up visits were scheduled at one week and at two, four, and six months after injection. At follow-up, the clinical response and any adverse effects or complications were assessed. Although six-month follow-up was scheduled in the thesis, numerical six-month outcome data are not presented in the Results tables of the current manuscript; these data should be added only if they can be retrieved from the original records.

Outcome measures

Facial asymmetry was assessed using a 10-cm visual analogue scale (VAS), anchored at 0 for complete symmetry and 10 for complete asymmetry. Scores were recorded independently by the patient and the examining surgeon. The Facial Disability Index (FDI) was used to assess patient-reported physical function and social well-being. The physical-function subscale included five areas: eating, drinking, speech, eye tearing or dryness, and oral hygiene. The social well-being subscale included calmness, social isolation, irritability, sleep disturbance, and restriction of social activities. The thesis describes the two subscales as independently scored from 0 to 100, with lower scores indicating greater disability. Scores were calculated using the scoring approach described in the thesis; the original scoring sheet and calculations should be checked against the validated FDI instrument before final submission.

The adverse effects recorded included pain during injection, drooling, and difficulty speaking. Adverse events were summarized as counts and percentages. The reported number and percentage for drooling are inconsistent in the source material (three cases among 15 patients); the numerator and denominator should be verified against the individual case records.

Ethical considerations

The thesis states that patients were counselled and that consent forms were to be obtained. Before submission, the authors must confirm and report the name of the approving ethics committee and approval/reference number, if approval was granted, as well as the consent process actually followed. Because one participant was 11 years old, the records should specifically confirm parental or legal-guardian consent and age-appropriate assent, as applicable. No ethics approval number or completed consent details are provided in the current article file, so these details must not be invented.

Statistical analysis

Data were analysed using SPSS version 25. Continuous variables were summarized as means and standard deviations, and categorical variables as frequencies and percentages. Paired, two-tailed t-tests were used to compare pre-injection and post-injection scores, with statistical significance defined as $P < 0.05$. The manuscript should identify the exact time-point comparisons tested and verify the reported P values against the original dataset; the present article reports P = 0.001 for several comparisons but does not provide the complete test statistics or confidence intervals.

Results

Patient characteristics

Fifteen patients with unilateral complete facial paralysis were included. Nine were male and six were female. Age ranged from 11 to 65 years, with a mean of 39.8 ± 15.53 years. Every participant was classified as House–Brackmann grade VI, and the reported duration of paralysis was one to four years (mean 2.26 ± 0.88 years). Trauma and parotid tumour were each recorded in six patients; two cases were idiopathic, and one was associated with neurofibromatosis. The small sample and the restriction to grade VI paralysis mean that these results describe a specific clinical group and should not be assumed to represent all patients with facial nerve palsy.

Table 1. Demographic and clinical characteristics of the study patients.

Characteristic	N
Male	9
Female	6
Trauma	6
Parotid tumor	6
Idiopathic	2
Neurofibromatosis	1

The clinical characteristics and treatment details are presented descriptively because the study involved a single group of 15 patients and did not include a comparison group. The recorded causes were heterogeneous, although trauma and parotid tumour were the most frequent. All patients had long-standing complete paralysis, which is important when interpreting the observed changes after treatment.

Patient- and surgeon-rated facial asymmetry

The patient-rated VAS mean decreased from 8.5 ± 1.18 before injection to 2.93 ± 0.88 at one week ($P = 0.001$). At four months, the mean was 3.66 ± 1.54, remaining below the baseline score ($P = 0.001$). Thus, the lowest recorded patient-rated asymmetry score occurred at the first follow-up, while the four-month score suggested that some of the initial improvement had diminished.

The surgeon-rated VAS mean followed the same pattern, decreasing from 8.5 ± 1.18 before treatment to 2.73 ± 1.09 at one week ($P = 0.001$). At four months, the mean was 3.46 ± 1.24, which remained lower than baseline (reported $P = 0.001$). The direction of change was therefore consistent between the patients' ratings and the surgeon's assessment.

The agreement in direction between patient and surgeon ratings provides complementary evidence that the change was not limited to one assessor's perception. Nevertheless, the VAS is a subjective measure, and the absence of a control group means that the observed pre–post differences cannot by themselves establish the comparative efficacy of BTX-A.

Functional and social outcomes

The mean functional FDI score increased from 33.66 ± 5.49 before injection to 71.46 ± 7.75 at two months and 61.73 ± 10.31 at four months. The social FDI mean increased from 28.33 ± 4.08 at baseline to 63.33 ± 7.94 at two months and 55.33 ± 10.08 at four months. The thesis reports $P = 0.001$ for baseline comparisons. For both domains, the highest mean was recorded at two months, followed by a lower score at four months; however, both four-month means remained above their respective baseline values.

These findings suggest that the changes recorded on the VAS were accompanied by changes in patient-reported function and social well-being. The timing differed between outcome measures: the lowest VAS means were recorded at one week, whereas the highest FDI means were recorded at two months. The measures capture different aspects of the patient experience and should not be treated as interchangeable.

Adverse events

Mild pain during injection was recorded in all 15 patients. Drooling was recorded in three patients, and difficulty speaking in one patient. Drooling resolved within two weeks. No other listed potential complications were reported in this series.

Discussion

The principal finding of this prospective case series is that contralateral BTX-A injection was followed by lower patient- and surgeon-rated facial asymmetry scores, together with higher functional and social FDI scores during follow-

up. The consistency in the direction of change across the two VAS assessments supports the view that facial balance was perceived to improve after treatment in this group. However, because all participants received the intervention and there was no untreated or alternative-treatment group, the findings should be interpreted as observed within-group changes rather than proof of superiority over other approaches.

The timing of the VAS response deserves attention. Both patient and surgeon scores reached their lowest means at one week, with some increase by month four. This pattern suggests that the initial improvement was not fully maintained at the later assessment. It is compatible with a treatment effect that changes over time, but the study design does not allow the duration or cause of the score changes to be determined precisely. The thesis discussion reports that the effect was observed for approximately four to five months and was no longer apparent at six months; this clinical observation should be interpreted cautiously because detailed six-month outcome values are not presented in the tables.

The rationale for contralateral injection is to reduce the relative pull of selected muscles on the unaffected side, thereby improving balance between the two sides without claiming to restore the damaged facial nerve. Earlier studies cited in the thesis have examined contralateral BTX-A for lower facial symmetry and long-standing paralysis, including Sadiq et al. and Salles et al. [4,5]. A systematic review also concluded that BTX-A may be useful for facial palsy-related asymmetry, while noting that the available evidence base and consistency of protocols have limitations [13–16]. The present results are directionally consistent with this literature, but the small sample prevents robust subgroup analysis or conclusions about the best injection pattern.

The FDI findings broaden the interpretation beyond appearance alone. Functional scores increased from 33.66 at baseline to 71.46 at two months, then decreased to 61.73 at four months. Social scores increased from 28.33 to 63.33 and then decreased to 55.33. As the FDI assesses daily physical function and social well-being, these changes suggest that patients reported improvements in areas affected by facial dysfunction. Nevertheless, the study did not report item-level responses, so it is not possible to identify which specific activities accounted for the changes. The observed decline between months two and four also indicates that the maximum recorded improvement was not maintained at the same level.

With respect to safety, mild injection pain was universal in this series, while drooling and difficulty speaking were less frequently recorded. These observations underline the importance of documenting adverse events alongside aesthetic and functional outcomes. The reported drooling percentage is internally inconsistent with the stated numerator and denominator and must be checked before submission. In addition, the thesis describes the dilution of a 100-unit vial with 2.5 mL saline but labels the resulting concentration as 40 units per 0.1 mL; those figures do not agree mathematically. The actual preparation and administered doses must therefore be verified from the clinical records, and the disputed concentration should not be used as a publishable protocol until confirmed.

Several limitations affect interpretation. The sample included only 15 patients, all with complete paralysis, and there was no comparison group. The study therefore cannot establish whether the observed changes were greater than those that might occur with other care or over time. The etiologies were mixed, and the sample was too small to examine outcomes separately by cause, age, sex, or muscle pattern. We also lack detailed numerical six-month outcomes despite the stated follow-up schedule. These limitations should be acknowledged transparently rather than addressed through unsupported assumptions.

Future studies should recruit larger, clearly characterized cohorts, report dose and dilution details unambiguously, use consistent follow-up time points, and include a comparison group where feasible. Standardized photographic documentation and validated outcome measures would improve comparability across studies. Recording patient-reported outcomes and adverse events at every follow-up would also help define the balance between benefit and temporary treatment-related effects.

Conclusion

Contralateral injections of botulinum toxin type A were associated with improved patient- and surgeon-rated facial symmetry and increased functional and social Facial Disability Index scores in this series of patients with complete facial nerve paralysis. Improvement remained evident at four months, although the scores were less favourable than at the earlier follow-up assessments. Mild injection pain, drooling, and difficulty speaking were the adverse effects recorded.

Recommendations

The outcomes of this study support documenting both patient-rated and surgeon-rated facial asymmetry, together with the functional and social components of the Facial Disability Index, during follow-up after contralateral BTX-A injection. Patients should be followed treatment to document the duration of the observed effect and any adverse effects, particularly drooling and difficulty speaking, which were recorded in this study. Further assessment involving a larger number of patients and a comparison group would help clarify the findings observed in this case series. This recommendation reflects the small sample size and the absence of a comparison group in the present study.

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Table 2. Visual analogue scale scores before and after contralateral BTX-A injection. Reported comparisons with baseline had P = 0.001.

Outcome	Before injection	1 week	4 months
Patient-rated VAS	8.5 ± 1.18	2.93 ± 0.88	3.66 ± 1.54
Surgeon-rated VAS	8.5 ± 1.18	2.73 ± 1.09	3.46 ± 1.24

Table 3. Functional and social Facial Disability Index scores during follow-up.

FDI component	Before injection	2 months	4 months
Functional	33.66 ± 5.49	71.46 ± 7.75	61.73 ± 10.31
Social	28.33 ± 4.08	63.33 ± 7.94	55.33 ± 10.08

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