

Contralateral botulinum injections in patients with residual facial asymmetry and contralateral hyperkinesis after primary facial palsy surgery



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AIM: In patient with facial paralysis, facial appearance and muscular ability are impaired, and the psychological integrity is affected. Botulinum toxin A may be used to improve facial symmetry in patients suffering with facial palsy reducing the progressive contralateral hyperkinesis and facial asymmetry after primary surgery for facial paralysis.

MATERIAL OF STUDY: Six patients, whom have been suffering unilateral facial palsy with an House-Brackmann score grade from III to VI, were included in this study for a residual facial asymmetry and contralateral hyperkinesis after previous facial reanimation. They were treated with 50 units of botulinum toxin type A injected in muscles of the unaffected side of face to improve muscular ability and facial symmetry.

RESULTS: This study demonstrated reduction in contralateral hyperkinesis and facial asymmetry that lasted approximately 120 days. All patients reported satisfactory results with the treatment.

COMMENTS: Botulinum toxin type A injections improved facial asymmetry and muscular function in all patients.

DISCUSSION AND COMMENTS: Botulinum toxin type A injections may be an indispensable technique as a nonsurgical treatment or as a complementary measure in postsurgical treatments and should be certainly considered for temporary or permanent asymmetries in patients who suffer from facial palsy.

CONCLUSIONS: Contralateral botulinum toxin type A injection was useful in reducing muscular hyperkinesis in patients with residual facial asymmetry after primary surgery for facial palsy, improving aesthetic and functional facial recovery with not widely common adverse events.

KEY WORDS: Botulinum toxin type A, Contralateral muscular hyperkinesis, Facial palsy

Introduction

The facial nerve innervates the mimic muscles responsible for facial movements and consequently for representing emotions. The facial nerve is necessary for the equilibrium between synergistic and antagonistic strengths that act on facial structures, for the muscular tonus and trophism

and both for voluntary and involuntary muscles contractions on each side of the face.

Facial nerve damages can result from: intracranial causes (cerebellar pontine angle tumors, meningitis, vascular disorders, skull base fractures), infratemporal causes (petrous bone fractures, middle ear carcinomas, type II of Ramsay Hunt syndrome, Bell's palsy), extracranial causes (parotid tumors, iatrogenic or noniatrogenic injuries occurred during surgical procedures or traumas).

Resulting VIIth nerve palsy can alter facial aesthetics and facial deformity is often accompanied by functional difficulties like eating, drinking, blinking, and smiling, affecting negatively the patients selfimage and their ability to express emotion.

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Patients with unilateral facial paralysis present common characteristics: less wrinkles in the affected side (due to the lack of muscular traction on the dermis), frequently palpebral ectropion with lagophthalmos, ephiphora and corneal exposure, a reduction in nasolabial fold and a global tissue ptosis of affected hemiface. The muscles of unaffected side having no contralateral muscular opposition, respond to facial paralysis with overcontraction and hyperkinetic reaction. This disproportion of vectorial forces produces facial deviation of the nasal and labial areas, even when muscles are in a static state.

Treatment of facial paralysis attempts to restore facial symmetry and symmetric contraction of oral and palpebral sphincters. Current techniques, which are able to treat facial paralysis include: neurotomy, local muscles transfer, myofunctional approaches, and microsurgical free flaps¹⁻³.

Various procedures have been utilized to reduce hyperkinesis of the unaffected side such as selective myotomy, myectomy, or neurectomy⁴. Addition of rhytidectomy, blepharoplasty, correction of lagophthalmos and ectropion and others anchillary techniques can further improve global results^{5,6}.

Botulinum toxin type A blocks the release of neurotransmitters required to allow muscles contraction⁷ and when injected into facial muscles contralateral to facial paralysis reduces synkinesis, hyperlacrimation and hyperkinesis, improving facial symmetry⁸⁻¹².

The objective of this study was to evaluate the role of botulinum toxin type A in contralateral facial muscular hyperkinesis in patients with residual facial asymmetry, whom have previously underwent a primary surgery for facial palsy. We treated six patients reporting an improved aesthetic and functional facial recovery after botulinum injections in contralateral side of face.

Material and Methods

Patients, with a mean age of 44,5 years (range 22 to 66 years), whom have been suffering from unilateral facial paralysis for a period (range 8 months - 36 months) were included in this study.

They have been classified with an House-Brackmann score grade from III to VI (Table I)¹³, and before facial reanimation surgery they all did an electromyography and an electroneurography to evaluate the residual nerve function. None of these patients received simultaneous treatment on the opposite side of paralyzed face.

PATIENT 1

A 42-year old woman had undergone previous surgery for acoustic neuroma. The patient was distressed by her facial appearance and functional deficit (Fig. 1A). After 13 months of nerve palsy, she was treated for reinnervation of left paralyzed side with a direct facial nerve-motor nerve to masseter neurotomy, simultaneous cross face nerve graft, fascia lata graft for left inferior eyelid suspension, transconjunctival medial canthopexy and indirect brow lift. (Fig. 1B)

PATIENT 2

A 66 year-old woman was referred for a right VIIth nerve palsy and corneal exposure due to a previous surgery for acoustic neuroma. After 36 months, the patient underwent a dynamic reanimation of right facial palsy with gracilis muscle free flap transfer, reinnervated by motor nerve to masseter. One year later was realized a direct brow lift, a fascia lata graft and an auricle conchal graft on right eyelid with simultaneous medial and lateral canthopexy.

TABLE I - House-Brackmann score

Grade	Description	Characteristics
I	Normal	Normal facial function in all areas
II	Mild dysfunction	Slight weakness noticeable on close inspection; may have very slight synkinesis
III	Moderate dysfunction	Obvious, but not disfiguring, difference between two sides; noticeable, but not severe, synkinesis, contracture or hemifacial spasm; complete eye closure with effort
IV	Moderately severe dysfunction	Obvious weakness or disfiguring asymmetry; normal symmetry and tone at rest; incomplete eye closure
V	Severe dysfunction	Only barely perceptible motion; asymmetry at rest
VI	Total Paralysis	No movement.

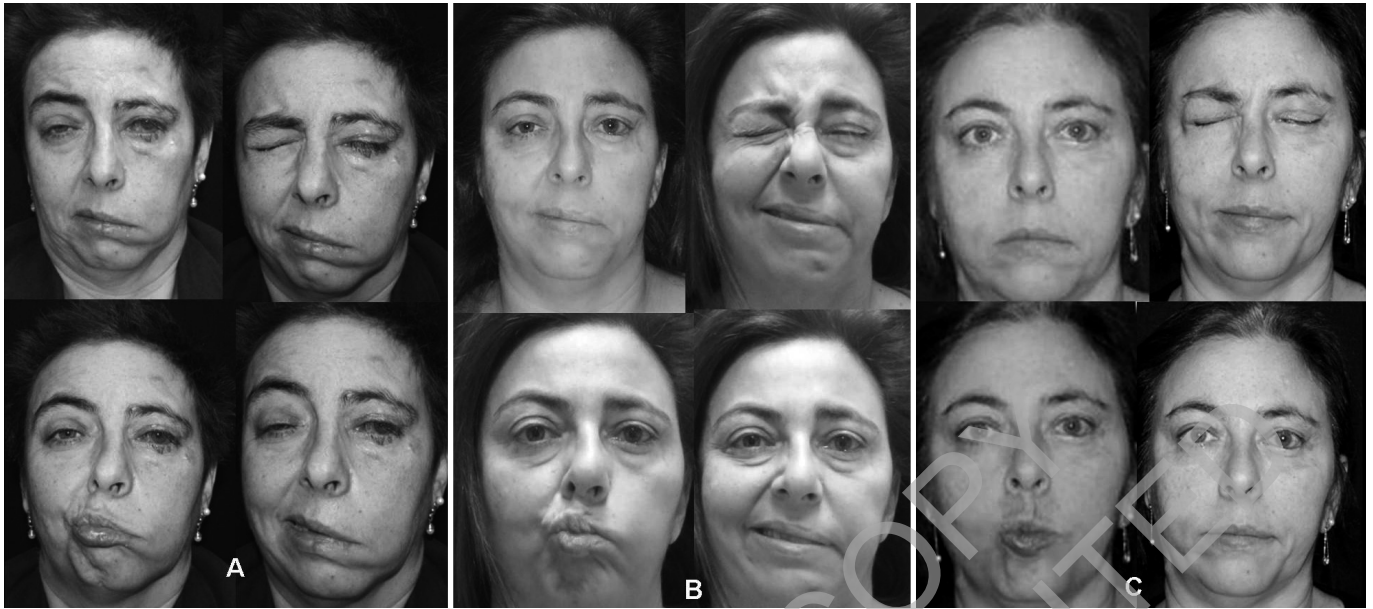


Fig. 1: Pre operative (A), post operative (B) and after botulinum toxin A injections(C) view of the patient. She had undergone previous surgery for acoustic neuroma. The patient was distressed by her facial appearance and functional deficit (A). After 13 months of nerve palsy, she was treated for reinnervation of left paralyzed side with a direct facial nerve-motor to masseter neurotomy, simultaneous cross face nerve graft, fascia lata graft for left inferior eyelid suspension, transconjunctival medial canthopexy and brow suspension. (B). Contralateral botulinum toxin injection was useful in reducing muscular hyperkinesis, improving aesthetic and functional facial recovery (C).

PATIENT 3

A 57-year-old woman, who was suffering left facial palsy for 14 months after acoustic neuroma resection. The patient underwent a lateral tarsorrhaphy in another institution due to a corneal exposure. In our department, in order to regain facial function, was realized an end to side facial nerve-motor nerve to masseter neurotomy. Four months later the result was refined with a deep face lift and a direct brow lift.

PATIENT 4

A 22-year-old female was referred for a right facial palsy caused by trauma (fall from a height). After 8 months showing signs of neurotmesis was realized a reinnervation of affected side of face with facial nerve-motor nerve to masseter neurotomy (jump graft technique).

PATIENT 5

A 43-year-old female was suffering left facial paralysis for 28 months after acoustic neuroma resection. She underwent a lengthening temporalis myoplasty (Labbé technique) with simultaneous conchal cartilage graft and 2 years later a levator palpebrae lengthening with fascia lata graft plus a medial canthopexy.

PATIENT 6

A 37 years-old man, who was treated for a combined skull base/squamous temporal bone fracture after a car

crash, showed a left VII th nerve palsy with significant corneal exposure. After 11 months of reporting facial paralysis he underwent a direct facial nerve-motor nerve to masseter neurotomy, with simultaneous auricle conchal cartilage graft on eyelid and a cantoplasty with labial commissure static suspension.

All patients also did muscles recoordination with fysiokinesis therapy after primary surgery and during Botulinum procedure.

The patients were treated with injections of botulinum toxin type A (50 units). It was reconstituted in 1,25 ml of 0.9% sodium chloride solution to obtain a concentration of 4 units of drug for each 0.1 ml of resuspended solution. The botulinum toxin was managed as an intramuscular injection with a 30½-gauge insulin needle. No topical anesthesia was necessary, although in more sensitive patients, anesthetic cream may be applied. After informed consent, a total of 50 units was injected into each patient's facial muscles on the unaffected side of the face as follows:

- 12 units into fronto-periorbital region;
- 4 units into the zygomatic major muscle;
- 3 units into the zygomatic minor muscle at level of origin;
- 4 units into the levator labii superioris alaeque nasi muscle at the point of the nasal arch;
- 4 units into the levator labii superioris muscle at the orbital margin;
- 4 units into the modiolus area 0.5 cm from the angle of the mouth;

- 7 units into the risorius muscle 2 cm from the angle of the mouth;
- 7 units into the depressor anguli oris muscle 5 cm from the corner of the mouth;
- 5 units into the depressor labii inferioris 1 cm from the muco-cutaneous transition.

Facial anatomical pointers and asking to the patients to contract and relax the facial muscles was sufficient to have the exact location of the muscles to be treated. Patients were evaluated 7, 14, 30, 60, 90, and 120 days after treatment. At the end of treatment, patients were evaluated to determine its effects and tolerability. The effect of botulinum toxin lasts about 5-6 months. The treatment may be repeated.

The objective evaluation entailed relaxed and dynamic analysis on the unaffected hemiface before and after treatment with botulinum toxin A, facial symmetry achieved and the ability to make various facial expressions. The subjective evaluation was made by the patients at all clinical controls. The degree of improvement in appearance was analyzed using the following level: nonappearance of improvement (0), slight improvement (1), modest improvement (2), or important improvement (3). The patient's satisfaction with the treatment results was undertaken through the subsequent scale: dissatisfied (0), satisfied (1), or very satisfied (2).

Results

On follow-up examination, the patients reported great improvement in both aesthetic and functional recovery. Analysis was obtained in static and dynamic state from day 0 until day 120. This study revealed changes between before and after treatment with botulinum toxin in the unaffected side; this difference improved until day 30 and started to decrease after four months. The greatest result indicative of correction of facial asymmetry and hyperkinesis was observed at day 30. Several assessments revealed important differences between aesthetic and functional features of the patients on day 0, 7, 14, 30, 60, 90, and 120 days. Before injection, there was an evident deviation of the nose and mouth. After injections, patients showed an improved facial balance in both nose and lips area, while teeth are not exposed smiling. (Fig. 1C)

Six of 6 patients (100 percent) reported a feeling alteration of muscles on day 2-5 and they were satisfied with their results on day 14. Initial signs of improvement were observed from day 5. All patients reported a very satisfactory result on days 30, 60 and 90. This result decreased to 50% for 3 of 6 patients on day 120. The improvement in appearance noted by each patient increased gradually.

Patient improvement was graded as modest or high by all patients (6 of 6) on days 30, 60, and 90. On day 120, 50% of them reported a reduction of treatment's

effect. All patients (100 percent) reported until day 14 after the injection a difficult in learning new way for drinking, chewing, talking, swallowing, trying to kiss or blow. These conditions self-resolved around day 14. By day 14, almost 100 percent of muscle relaxation was obtained and a change in muscular coordination occurred. Therefore, it was noticed great compliance in following Kabat's physiokinesis therapy both with the physician and by themselves at home.

Discussion and Comments

The process of rehabilitation in facial paralysis aims to recover facial symmetry in both relaxed and dynamic states. Facial symmetry is often enhanced in the static state, but the dynamic is still imbalanced because of lack of movement on the paralyzed hemiface and the hyperkinesis on the opposite side. Current treatments are unpredictable in terms of providing aesthetic and functional improvement to patients with facial paralysis.¹⁴ In addition to that, treatment of contralateral hyperkinesis by neurectomies, myectomies, or myotomies may produce complications such as paresthesia, hyperesthesia, partial paresis, incomplete corrections, without achieving an appropriate facial balance.

Botulinum injections have been used for years to treat facial disorders including blepharospasm and hemifacial spasm; induced paralysis of the antagonist medial rectus muscle by botulinum toxin has been used in the treatment of lateral rectus palsy¹⁵.

The injections of botulinum toxin A in facial muscles for treating facial paralysis has been variously described in literature and has been found to be very successful in terms of temporary relief of its symptoms⁸.

In this study, 6 patients were injected with a total amount of 50 units of botulinum toxin type A into the muscles that control the motility of the brow, the nasal arch, the upper and lower lips and the corners of the mouth. The goal of these injections was to create a balance with the paralyzed side of face by weakening the forces that act on oral sphincter and orbital region. All patients showed reduction in muscular activity in the treated area both in static and dynamic states at various timepoints. The improvement was observed on day 5. Optimal improvement was observed on day 30. All patients in our study reported an high satisfaction rate with treatment at all time periods. In this study, there were no showing of early complications such as hematomas, infections, or allergies to the botulinum toxin. All patients (100 percent) complained about a mild difficulty in drinking, chewing, talking, and smiling around day 14 of clinical follow up. Around this time, patients have to learn how to coordinate the muscles, and the rate of these adverse events decreased thereafter. The dosage of botulinum toxin examined in this study (a total of 50 units) it's adequate for patients to totally

control their hyperkinesis; in clinical practice, it may be prudent to begin with small doses and, if necessary, complement them after 14 days to minimize incidence of complications.

This study demonstrates that facial injection of botulinum toxin improves facial aesthetics and muscular ability in facial paralysis patients with not widely common adverse events. This treatment may be an indispensable technique as a nonsurgical treatment or as a complementary measure in postsurgical treatments and should be certainly considered for temporary or permanent asymmetries in patients who suffer from facial palsy¹⁶. The muscles injected included: frontal, orbicularis oculi, zygomaticus major, zygomatic minor, risorius, levator labii superioris alaeque nasi, levator labii superioris, orbicularis oris, depressor labii inferioris, and depressor anguli oris. Consequently, the treatment of these muscles decreases the asymmetrical elevation of brow and angulus oris, allows the lips to close and pucker more symmetrically, and reduces the wrinkles on the opposite side, giving an aspect more similar to the affected one.

Botulinum decreases the relative hyperkinesis contralateral to the paralysis leading to more symmetrical function of the cheek, oral and orbital areas. Improved facial appearance has been reported when contralateral botulinum injections have been used to treat facial nerve paralysis¹⁷.

Conclusions

Contralateral botulinum toxin type A injections improved appearance in facial paralysis and also improved muscular ability. It should be aware of this potential treatment when evaluating patients with facial nerve palsy.

Overall aesthetic appearance was improved, especially on dynamic analyses. Most of the patients had satisfactory improvements and were very satisfied with the treatment. Adverse events reduced progressively as patients adapted to their new ability to express emotion.

The results of this treatment have been so helpful in facial paralysis that botulinum toxin A is considered one of the best treatment to reduce the motor and autonomic effects caused by aberrant neural regeneration secondary to facial palsy.

Riassunto

Ogni trattamento, medico e chirurgico, della paralisi facciale è finalizzato al recupero della simmetria facciale statica e dinamica. La tossina botulinica di tipo A può essere utilizzata nei pazienti affetti da paralisi del nervo facciale, sottoposti in precedenza a chirurgia primaria, al fine di ridurre la residua asimmetria facciale e le pro-

gressive ipercinesie contralaterali al lato affetto, che caratterizzano tali soggetti.

Sono stati inclusi nel nostro studio sei pazienti (1 maschio e 5 femmine) affetti da paralisi del nervo facciale monolaterale secondaria a diverse cause, classificata secondo la scala di House-Brackmann in grado III e IV. I pazienti inclusi nello studio sono stati sottoposti in precedenza a trattamento chirurgico riabilitativo specifico per la paralisi facciale stessa; successivamente ciascuno di essi è stato trattato con 50 unità di tossina botulinica di tipo A a livello del lato non affetto del volto, al fine di ridurre le ipercinesie muscolari ed aumentare l'asimmetria e l'abilità muscolare del volto. L'età media dei soggetti era di 44,5 anni. I pazienti sono stati esaminati a 7, 14, 30, 60, 90 e 120 giorni dopo il trattamento con tossina botulinica.

Lo studio dimostra la riduzione delle ipercinesie contralaterali alla paralisi facciale ed il miglioramento della simmetria del volto nei pazienti sottoposti precedentemente a trattamento chirurgico primario per la riabilitazione del nervo facciale stesso. Tutti i pazienti si sono dimostrati soddisfatti del trattamento con tossina botulinica di tipo A.

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