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Botulinum toxin injection of both sides of the face to treat post-paralytic facial synkinesis

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Summary *Objective:* An attempt has been made to produce a new 'balance' in facial dynamics between a paralysed and a non-paralysed face with reduction of synkinesis, by concomitant injection of botulinum toxin A (BTX-A) on both sides in patients with long-lasting facial sequelae.
Study design: Prospective clinical study.
Setting: University hospital.
Subjects and methods: Forty-two consecutive patients who recovered partially from facial nerve paralysis were enrolled for this study. The amount injected per site of the paralysed side with synkinesis varied from 1.5 to 2.5 U, and the total dose used per patient was 10–26 U (mean 17.12 ± 5.3 U). That of the non-paralysed side with muscular hypertrophy varied from 2.5 to 5 U, and the total dose used per patient was 35–72 U (mean 52.6 ± 9.7 U). All patients had been evaluated by the Sunnybrook (SB) facial nerve grading systems and developed dynamic facial asymmetry ratio.
Results: After administration of injection of BTX-A on both sides of the face, relief of facial synkinesis and enhancement of facial symmetry were observed in all patients. Before the injection, the patients showed an SB score of 38.8 ± 10.68. After the injection, changes of synkinesis and symmetry score were 7.9 ± 1.81 and 8.4 ± 3.25, respectively, resulting in a 58.4 ± 12.46 score at the last evaluation. Before the administration, the mean ± standard deviation (SD) value of dynamic facial asymmetry was 0.83 ± 0.06 and it was increased significantly to 0.90 ± 0.05 1 month after administration.

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Conclusion: After BTX-A injection on both sides for synkinesis and contralateral hypertrophy, the patients showed significant suppression of the synkinesis and improvement of facial symmetry with resulting elevated quality of life, social interaction, personal appearance and food intake.

Facial nerve paralysis causes serious functional and psychological disorders because it alters static and dynamic facial symmetry and often produces an involuntary, unwanted effect, such as synkinesis between the orbicularis oculi and the orbicularis oris muscle, or increase in lacrimation of the affected eye.[1–3] During the initial phase of complete paralysis, complications are due to weakness of the affected muscles, but when recovery is partial, facial asymmetry and inability to refine fine movements can be caused either by prolonged paralysis or by the development of post-paralytic synkinesis.[4]

However, such patients with facial sequelae frequently have their anaesthetics compromised by asymmetry, even after modern successful procedures such as botulinum toxin injection or microsurgical muscle transplantation have been performed. The non-paralysed side, which acts chronically against the weak antagonism of the contralateral muscles, usually presents with facial muscular hypertrophy, wrinkles, furrows and deviation of the mouth. Facial changes associated with facial sequelae can be attributed to 'unbalanced' muscular activity, 'unbalanced' muscular hypertrophy and 'unbalanced' pattern of facial expression. The appearance of facial expression can be worsened as time goes on. So, for some patients, progressive facial asymmetry, more than synkinesis, can lead to low self-esteem and poor quality of life with age.[5,6]

Since botulinum toxin type A (BTX-A) was suggested for the treatment of synkinesis after it was used successfully to treat blepharospasm in 1985, it has been widely used to treat such an unwanted, involuntary movement of the affected side induced by unhealthy aberrant neural regeneration.[7,8]

At the physiologic level, BTX-A produces chemical denervation of muscle through the inhibition of acetylcholine release from somatic and autonomic nerve terminals. When using BTX-A in high dose, a balance can be achieved for treating 'voluntary' hypertrophic, non-paralysed muscles while maintaining facial expression and minimising ptosis.

In our institute, an attempt has been made to recover facial symmetry by concomitant double injection of BTX-A in patients with long-lasting facial sequelae, and the goal of this study, in addition to reduction of synkinesis, is to produce a new 'balance' in facial dynamics between the paralysed and the non-paralysed face.

Material and method

Subjects

After the degree of facial synkinesis was evaluated by a synkinesis score in the Sunnybrook (SB) facial grading system and the degree of facial asymmetry was evaluated by a developed ratio of dynamic facial asymmetry (described below), we decided to include the patients as a study group who scored over 5 in the synkinesis score and below 0.9 in the developed facial symmetry score.

Forty-two patients (22 females, 20 males, ranging from 8 to 78 years, mean: 48.3 $\pm$ 20.3 years old), observed in a 2-year time frame, who recovered partially from facial nerve paralysis (24 patients with Bell's palsy, 8 with herpes zoster oticus, 7 with traumatic facial palsy and 3 with facial nerve transection with reconstruction) were enrolled into this study. All of them were affected by obvious synkinesis on the affected side and contralateral muscular hypertrophy due to compensative facial movement on the normal side after several months or years of facial palsy. This study was approved by the Committee for Medical Ethics of Inje University Hospital, and written informed consent was obtained from all patients prior to the study.

BTX-A injection

All facial expression muscles or groups of muscles on both sides were dynamically examined. An ice pack was applied for vasoconstriction and local anaesthesia was given prior to injection. BTX-A (Botox®, Allergan Incorporated, Irvine, CA, USA) was injected using a tuberculin syringe with a 27-gauge needle. The amount injected per site of the paralysed side with synkinesis varied from 1.5 to 2.5 U, and the total dose used per patient was 10—26 U (mean 17.12 $\pm$ 5.3 U; Figure 1). That of the non-paralysed side with muscular hypertrophy varied from 2.5 to 5 U, and the total dose used per patient was 35—72 U (mean 52.6 $\pm$ 9.7 U; Figure 1).

The mean time from onset of facial palsy was 16.9 months. Injection of botulinum toxin was planned to be concomitant injection of both sides in a day, or several days-term injection after first injection of one side. Repeated injections of botulinum toxin were planned when the patients feel a lot of discomfort by facial synkinesis and contralateral hypertrophic movement or have an over 5 score in the synkinesis score and a below 0.9 score in the developed facial symmetry score after the first injection.

Evaluation of synkinesis and symmetry

All patients had severe facial palsy with evidence of denervation potentials on electromyography (EMG) and evaluated by the SB facial nerve grading systems and developed dynamic facial asymmetry ratio.

Facial photographs of pre- and post-injection were taken with Canon Mark-II and degree of facial synkinesis and facial asymmetry using a new developed facial scale after botulinum toxin injection were evaluated (Figure 2).