New Technical Trial to Treatment of Post-Paralytic Facial Synkinesis after Trauma: Combination Technique with Ultrasonography and Electromyography

- A Case Report -

Areum Han, M.D., Seungmin Kim, M.D. and Sangheon Lee, M.D., Ph.D.

Department of Physical Medicine & Rehabilitation, Korea University School of Medicine, Seoul, Korea

During the recovery from the facial muscle paralysis, some patients suffer from post-paralytic facial synkinesis. A 31-year-old woman visited our hospital with a history of hitting her left face on the steering wheel and had deep lacerations in her mouth from a traffic accident 1 year ago. Four months later, she noticed that her zygomatic area contracted spontaneously and left upper lip was drawn up with her left eye blinking. We assumed that the cause of facial asymmetry could be due to facial neuropathy and synkinesis. And we planned ultrasonography and electromyography guided botulinum toxin injection. One month later, her facial asymmetry was remarkably improved and abnormal synkinetic contractions were disappeared. To the best of our knowledge, this is the first case report of dual device guided botulinum toxin injection for post-paralytic facial synkinesis. This is more precise and safer procedure than previous methods. (Clinical Pain 2014;13:103-106)

Key Words: Facial palsy, Synkinesis, Botulinum toxins

INTRODUCTION

Facial palsy shows symptoms of facial asymmetry and involuntary movement such as post-paralytic facial synkinesis (PPFS). These symptoms impair facial expression and appearance. As a result, it can lead to severe functional and psychosocial problems. During the recovery from the complete facial palsy, some patients suffer from the remaining symptoms of facial muscle weakness and development of PPFS. PPFS was known as the uncontrolled, involuntary abnormal facial muscle contractions which usually accompany purposeful movement of another part of the face. 1, 2 Clinically, the most common types of facial synkinesis are involuntary eye closure with mouth movement and contraction of zygomatic area with voluntary eye closure. There are 3 known mechanisms for PPFS; aberrant regeneration of nerve fibers in the neural repair process, peripheral ephaptic transmissions between regenerating axons and synaptic reorganization and hyperexcitability of the facial nerve.

Botulinum toxin A (BTX-A) has been widely used as treatment options of synkinesis for decades after it was used successfully to treat blepharospasm in 1985. 3, 4 It is a neurotoxin produced by Clostridium botulinum. It attacks a neuromuscular junction and inhibits release of acetylcholine by preventing vesicles from anchoring to the membrane. As a result, target muscle is chemically denervated and excessive muscle contractions were reduced. 1 But, the effects are temporary and lasting approximately 3 months. 2, 5-6

We encountered a patient with facial muscle synkinesis that developed during the recovery from the facial palsy. And we performed ultrasonography (US) and electromyography (EMG) guided BTX injections for levator labii and zygomaticus major muscles.

To the best of our knowledge, this is the first case report
of dual device guided BTX injection for PPFS after trauma.

CASE REPORT

A 31-year old woman who complained abnormal contractions of left facial muscles visited our hospital. She hit her left face on the steering wheel and had deep laceration in the mouth from a traffic accident 1 year ago. At that time, she was diagnosed with left facial palsy at a local medical clinic. Left facial palsy was little change for the better. Four months later, she noticed that her left side of the face contracted spontaneously and left upper lip was drawn up with left eye blinking.

In neurological examination, she could wrinkle forehead

Fig. 1. Synkinesis study with left eye blinking. (A) Left levator labii superioris muscle. (B) Left orbicularis oris muscle: Bursts of MUAPs with high frequency were noted.

Fig. 2. Dual device (US + EMG) guided botulinum toxin injection. (A) EMG needle insertion into the left zygomaticus major muscle (*: zygomatic bone, arrow: EMG needle). (B) Needle EMG findings of the left zygomaticus major muscle with patient’s left eye blinking: grouped discharge of high frequency MUAPs. (C) Dual device guided botulinum toxin injection.
slightly and close eye completely with effort. Her left side of the mouth was slightly weak with maximum effort (House-Brackmann Grade III). And she suffered from subtle synkinetic contractions of left facial muscles in the zygomatic area when she blinked her eyes.

An electrophysiological study was performed. Amplitudes of compound motor action potential recorded from the left facial muscles were lower than the right side (amplitude range: 65~83%). Needle electromyography with left orbicularis oculi and orbicularis oris muscles revealed polyphasic motor unit action potentials (MUAPs) with minimally reduced recruitment patterns. And synkinesis study showed bursts of MUAPs with high frequency during her left eye blinking (Fig. 1). These electrodiagnostic findings were compatible with left facial neuropathy and PPFS.

In ultrasonographic search, we could confirm that left levator labii superioris and zygomaticus major muscles contracted spontaneously with blinking her left eye. Bilateral facial muscles were symmetric in thickness and size. Since it was difficult to define the muscles through surface anatomy, US and EMG guided BTX injection for these muscles were done. EMG needle was inserted under the guidance of US into the target muscles which led to the detection of grouped discharge of high frequency MUAPs with her left eye blinking (Fig. 2A, B). We injected 5 units of BTX (Botox, Allergan) in left levator labii superioris muscle (1IU×1 point) and left zygomaticus major muscle (2IU×2 points) (Fig. 2C).

One month later, she visited our hospital again. Complications after BTX injection, such as erythema or ecchymosis of injected region, facial weakness, were absent. Follow up neurological examination and electrophysiological study were performed. Her facial asymmetry was remarkably improved (House-Brackmann Grade I-II) and abnormal synkinetic contractions were disappeared. Three and a half months later, her facial asymmetry was disappeared but, she had a relapse of subtle synkinetic contractions. So we had second injection of zygomaticus major muscle.

**DISCUSSION**

In 2010, Toffola et al. injected BTX-A for 30 patients with PPFS and noticing a considerable improvement in symptoms. But, there are some limitations in this treatment method. First, the effects of BTX-A alone provide a temporary symptom relief. So a number of patients need to repeat injections every 3 to 4 months. Second, because many facial muscles overlap each other, it is difficult to inject BTX-A into exact target points with blind or single device guided procedure. And third, if the dosage is not carefully determined, trying to reduce synkinesis might cause increasing the facial muscle weakness. Especially, we should give better attention to the injections for zygomaticus major and the levator labii superioris muscles because of the location of these muscles; deepen the nasolabial folds when at rest.

In this case, a patient who complained abnormal contractions of left facial muscles after traffic accident was electrophysiologically diagnosed with PPFS. And we confirmed the spontaneously contractions of her left levator labii superioris and zygomaticus major muscles with her left eye blinking by US. However, it was difficult to distinguish real muscle contraction from muscle movement due to adjacent muscle contraction through the US. We performed BTX injection in the left levator labii superioris and zygomaticus major muscles under the US and additional EMG guidance. One month after the injection, abnormal synkinetic contractions were disappeared. But three and half months after injection, subtle synkinetic contraction of her facial muscles was relapsed. So we performed second injection on her zygomaticus major muscle and we kept under follow up. She didn’t encounter any of the complications reported about the treatment with BTX injection. The effects of the treatment were developed about 7 days after the injection. And the average duration of ‘well-being’ without involuntary contraction and with facial symmetry at rest, was about 3 months. This was concurrent with previous studies.

In conclusion, this case shows that US and EMG guided BTX injections are more precise and safer procedure than blind or single device guided procedure in the treatment of PPFS after trauma, especially in case of small and deep facial muscles.

**REFERENCES**

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