

# A description of ophthalmic management of late recovered facial paralysis with patient-tailored procedures: a case report

Hui-Na Zhang, Jia-Jun Xie, Qi Gao, Juan Ye

Eye Center, the Second Affiliated Hospital, School of Medicine, Zhejiang University, Zhejiang Provincial Key Laboratory of Ophthalmology, Zhejiang Provincial Clinical Research Center for Eye Diseases, Zhejiang Provincial Engineering Institute on Eye Diseases, Hangzhou 310003, Zhejiang Province, China

**Co-first authors:** Hui-Na Zhang and Jia-Jun Xie

**Correspondence to:** Juan Ye. Eye Center, the Second Affiliated Hospital, School of Medicine, Zhejiang University, Zhejiang Provincial Key Laboratory of Ophthalmology, Zhejiang Provincial Clinical Research Center for Eye Diseases, Zhejiang Provincial Engineering Institute on Eye Diseases, Hangzhou 310003, Zhejiang Province, China. yejuan@zju.edu.cn

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**Dear Editor,**

We reported a case of a multidisciplinary therapy for late recovered facial paralysis 2y after the initial diagnosis. Facial paralysis has an incidence of 20-30 people out of 100 000 per year, and up to 1 in 60 people will be affected during their life time<sup>[1]</sup>. The causes of facial paralysis include infection, trauma, iatrogenic, and most commonly idiopathic, referred as Bell's palsy<sup>[2]</sup>. Bell's palsy is usually transient and it heals spontaneously within 6mo. However, up to 30% of patients will have incomplete functional or aesthetic recovery. Despite of residual nerve dysfunction which leads to brow ptosis, inadequate eye closure, or facial asymmetry, it is not rare that sequelae occur after the onset of Bell's palsy. Hemifacial spasm (HFS), synkinesis, blepharospasm, and hyperkinesis was observed in 10% of the patients with Bell's palsy<sup>[3]</sup>.

Many treatment options are available to improve facial function and appearance for patients with late recovered Bell's palsy. The surgical options include dynamic reanimation such

as muscle transfer procedures, and static procedures such as oculoplasty and browlift. The nonsurgical options can be electrotherapy and botulinum toxin type A (BoNT/A) injection<sup>[4]</sup>. Both surgical and nonsurgical procedures were performed to improve the facial symmetry in this case. Written informed consent was obtained from the patient. The study was in accordance with the tenets of the Declaration of Helsinki, and was approved by the Institutional Review Boards of the Second Affiliated Hospital, Zhejiang University School of Medicine (No.20220155).

A 57-year-old female patient was admitted for further clinical evaluation of facial asymmetry. The patient had unilateral facial nerve paralysis for the previous 2y with no obvious cause. Two years earlier, the patient was diagnosed with Bell's palsy with deviated mouth and lagophthalmos on the right side in the department of neurology, and was prescribed methylprednisolone 50 mg per day for 10d. The lagophthalmos of the right eye was improved within a month. The patient was otherwise healthy. However, she noticed that her right eye was smaller and the eyebrow was drooping on the right side. She was then referred to our department because of cosmetic concerns. Physical examination revealed weakening of the right facial muscles and a distinct asymmetrical facial appearance. The palpebral fissure height of the right eye was 3 mm with a levator function of 8 mm. Brow ptosis was noticed with brow height 8 mm lower on the right side. An inability to raise the right side of the eyebrow and an inability to move the right side of the lips when attempting to smile were observed as well (Figure 1A). Electromyogram (EMG) results indicated that the amplitude of the right side was significantly lower than that of the left side, but the latency was not significantly different, with no "lateral spread" observed (Tables 1 and 2). A direct brow lifting surgery was performed to correct the brow ptosis of the right side. The palpebral fissure height was improved to 6 mm (Figure 1A and 1C), however, with HFS of the involved side noticed two weeks after surgery. A total dose of 5 units of BoNT/A (2.5 units per site for two sites) was injected intramuscularly into the superior and 3 units into the inferior orbital orbicularis oculi muscle of the right side. A total dose of 4 units of BoNT/A (2.0 units per site on two sites) was injected

**Table 1 Motor conduction function of facial nerve**

Direction	Branch of facial nerve	Point of stimulation	Point of recording	Latency (ms)	Amplitude (mV)
Right	Temporal branch	Earlobe anterior	Orbicularis oculi muscle	2.35	0.75
Right	Temporal branch	Earlobe anterior	Frontalis	2.58	0.33
Right	Buccal branch	Earlobe anterior	Orbicularis oris muscle	2.76	1.36
Right	Zygomatic branch	Earlobe anterior	Nasalis	2.51	1.96
Right	Marginal mandibular branch	Earlobe anterior	Depressor labii inferioris	5.11	0.57
Left	Temporal branch	Earlobe anterior	Orbicularis oculi muscle	2.67	2.3
Left	Temporal branch	Earlobe anterior	Frontalis	2.53	1.32
Left	Buccal branch	Earlobe anterior	Orbicularis oris muscle	3.08	2.5
Left	Zygomatic branch	Earlobe anterior	Nasalis	2.71	3.3
Left	Marginal mandibular branch	Earlobe anterior	Depressor labii inferioris	4.21	1.29

**Table 2 Blink reflex measurement**

Nerve	Direction	Stimulation point	Measurement point	R1 latency (ms)	R2 latency (ms)	R3 latency (ms)
Supraorbital nerve	Right	Superior orbital fissure	Orbicularis oculi muscle	14.3	Not detected	37.6
Supraorbital nerve	Left	Superior orbital fissure	Orbicularis oculi muscle	10.7	37.6	39.4

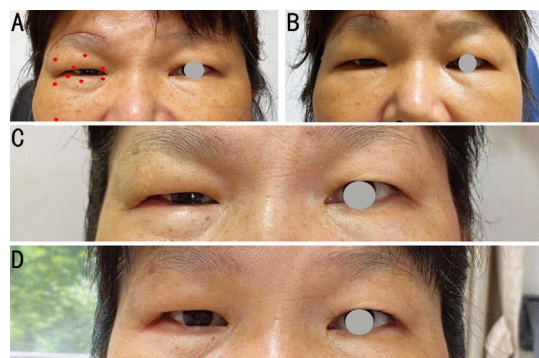
into the right superior palpebral orbicularis oculi muscle. A total dose of 3.5 units of BoNT/A (0.5, 1.0, and 2.0 units from medial to lateral per site on the three sites) was injected into the right inferior palpebral orbicularis oculi muscle. Two units of BoNT/A was injected into zygomaticus major (Figure 2A). The palpebral fissure height of the right eye was 8 mm after injection (Figure 2B). Eight months post-BoNT/A injection, the patient showed up with recurrence of tiring opening her right eye and angular blepharitis of the lateral canthus (Figure 2C). A second injection of BoNT/A was performed with the same regimen of the first injection, and an overall function and aesthetics improvement was achieved. The scar of eyebrow lift surgery was barely noticed (Figure 2D).

Late recovered Bell's palsy can result in aesthetic, psychological, and functional problems. The patient characteristics, medical history, duration of the situation, and recovery level should be taken into account for appropriate treatment<sup>[1]</sup>. As the most common ophthalmic signs caused by facial nerve palsy are lagophthalmos, corneal epithelium defect and conjunctival injection, most patients are referred to an ophthalmologist for expert opinion on inadequate eye closure or secondary exposure keratitis<sup>[5]</sup>. However, the medium disease period until initial ophthalmologic evaluation is 0.8y<sup>[6]</sup>. Not many late recovered patients consult their ophthalmologists for cosmetic concerns. In this case, the patient had never visited an ophthalmologist until she was referred by her neurologist for surgical help with facial asymmetry 2y after her initial diagnosis.

There were two major issues which lead to aesthetic problems in our patient. The first one was eyebrow ptosis. To differentiate from blepharoptosis, levator function should be evaluated. In this case, although the palpebral fissure height of the right eye was 3 mm, the levator function was not weakened as of 8 mm. However, the frontalis function of the right side was significantly decreased, which could be proved by an inability



**Figure 1 Before and after direct brow lifting surgery** A: Brown ptosis with angular blepharitis of the lateral canthus was observed on the right side; B, C: 1 and 4wk after direct brow lifting surgery of the right side, the palpebral fissure height was improved from 3 to 6 mm.



**Figure 2 Before (A, C) and after (B, D) botulinum toxin A injection treatment** A: Botulinum toxin A injection was applied to the orbital orbicularis oculi muscle and zygomaticus major as a total dosage of 17.5 units; B: The palpebral fissure height of the right eye was improved from 6 to 8 mm 1wk after injection; C: recurrence of tiring opening in the right eye of the patient with angular blepharitis of the lateral canthus; D: An overall function and aesthetics improvement was achieved 1wk after the second injection. Minimal scar was noticed.

to raise the right side of the eyebrow and disappeared forehead wrinkles. As the eyebrow complex is an integral aesthetic

portion of the upper third of the face, techniques should be carefully selected based on each patient's individual attributes. The common and current techniques in the management of the eyebrow include nonsurgical methods and surgical methods. The nonsurgical method refer to BoNT/A or filler injection, which is temporary with limited lift, however, less invasive. On the other hand, surgical methods, for example, direct and transforehead approaches, are generally with comparatively permanent and remarkable effect but more sophisticated complications<sup>[7]</sup>. In this case, direct eyebrow lifting was particularly suitable for our patient, who needed maximal elevation of the ptotic brow and was able to accept the scar. It was also noticed that our patient, who was initially looking for blepharoplasty procedure, may have a major component of eyebrow ptosis with asymmetry. To achieve a precise and long-lasting result, blepharoplasty surgery should be performed only when the eyebrow and forehead issue is addressed and stable, if any is needed<sup>[8]</sup>.

The other major issue was the HFS secondary to facial paralysis. HFS is not a dystonia but a peripheral myo-colonus of the orbicularis oculi muscle, which can involve ipsilateral lower facial muscles<sup>[9]</sup>. In our patient, involuntary twitches of the right eye and angulus oris were noticed, as the orbicularis oculi muscle and zygomaticus major involvement was indicated. The most currently acceptable explanation of HFS in patient with late recovered facial paralysis is myelin breakdown and ephaptic transmission caused by dilated or aberrant vessel at or near the root entry of the recovering facial nerve<sup>[4]</sup>. The EMG of primary HFS generally shows a shortened latency and accompanied by obvious "lateral spread", which were not observed in our case, further explaining the difference between secondary and primary hemifacial spasm. Although primary hemifacial spasm is operable, secondary hemifacial spasm cannot be cured by surgery. BoNT/A injection is the most commonly adopted treatment not only for HFS but also for other neuromuscular sequelae in late recovered facial paralysis due to its minimal invasion and favorable outcomes<sup>[10]</sup>. With targeted injection in the affected or normal side, commonly on the periocular, perioral, and cervical muscles, BoNT/A application aims to relieve involuntary muscle movement and to restore facial symmetry. In this case, periocular and zygomaticus major injection was applied to address HFS developed after Bell's palsy, and achieved satisfactory results combined with surgical intervention.

In conclusion, facial paralysis requires a multidisciplinary therapy. In this case, we performed direct eyebrow lifting surgery and nonsurgical BoNT/A injection procedure in our ophthalmology outpatient clinic successively. A satisfactory treatment result was obtained, which markedly improved the

patient's self-esteem. Treatment options should base on full consideration of each patient's condition and demands, which will optimize the therapeutic regime and allow for maximum aesthetic benefit. Ophthalmologists seem to be acquiring a more important role in the treatment of late recovered facial paralysis.

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**Authors' contributions:** Zhang HN: Conception and design the research, draft the manuscript; Xie JJ: Acquisition of data, analysis and interpretation of data; Gao Q: Revise the manuscript critically for important intellectual content; Ye J: Give final approval of the version to be published.

**Conflicts of Interest:** Zhang HN, None; Xie JJ, None; Gao Q, None; Ye J, None.

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