

A Potential New Indication for Botulinum Toxin Injection: A Case Study of Spasticity with Mirror Movements

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To the Editor: Mirror movements (MMs) are an interesting phenomenon characterized by simultaneous, involuntary movements of one limb mirroring intentional, voluntary movements of the other limb.^[1] To date, it is still a challenge in the treatment of MM, in particular, for those with cerebral palsy.^[2]

A 17-year-old male patient who was diagnosed with spastic cerebral palsy in his childhood came for seeking management of spasticity in his right upper limb. We found that he had typical presentations of MM in his right upper limb. Every time, when he was trying to extend his left wrist and fingers, his right wrist and fingers extended simultaneously. However, active motion of the right wrist and fingers was limited. He also had a flexed spastic elbow. Botulinum toxin type A (BTA, Botox, Allergan) was injected into the affected muscles, including the right biceps brachii, brachioradialis, flexor digitorum superficialis and profundus, as well as flexor carpi ulnaris and radialis, 50 units per muscle (300 units in total) under electromyographic guidance. Following the injections, stretching and extensive physical and occupational therapy were performed for 4 weeks. After these treatments, the spasticity in his right limb reduced, from modified Ashworth scale Grade 1+ to 1 in the elbow, Grade 2 to 1 in the wrist, and Grade 1+ to 1 in the fingers. The active range of motion improved significantly in his right elbow extension, from 30° to 10°, and in his right wrist extension, from 20° to 30°. Moreover, he was capable of extending his right wrist independently, released from the control of the left limb. By using the Quality of Upper Extremity Skills Test scale,^[3] obvious functional improvements were observed with an increase of 20 points in the total score (from 48.89 to 67.67). For each subdomain, the score increased from 53.12 to 62.50 in dissociated movement, from 44.44 to 50.00 in grasps, from 48.00 to 79.00 in weight bearing, and from 50.00 to 79.16 in protective extension.

The functional magnetic resonance imaging (fMRI) studies before and after the treatment were conducted with a 1.5 Tesla (T) GE MRI system. It was found that more cortical activations were present on the right hemisphere after treatments when he extended his left wrist; while at the same time, the abnormal activations in the left hemisphere shown previously were diminished [Figure 1a post-therapy]. On the other hand, when his right wrist was extended, more contralateral cortical activations were shown, which were on the left primary motor and perilesional cortices [Figure 1b post-therapy]. The

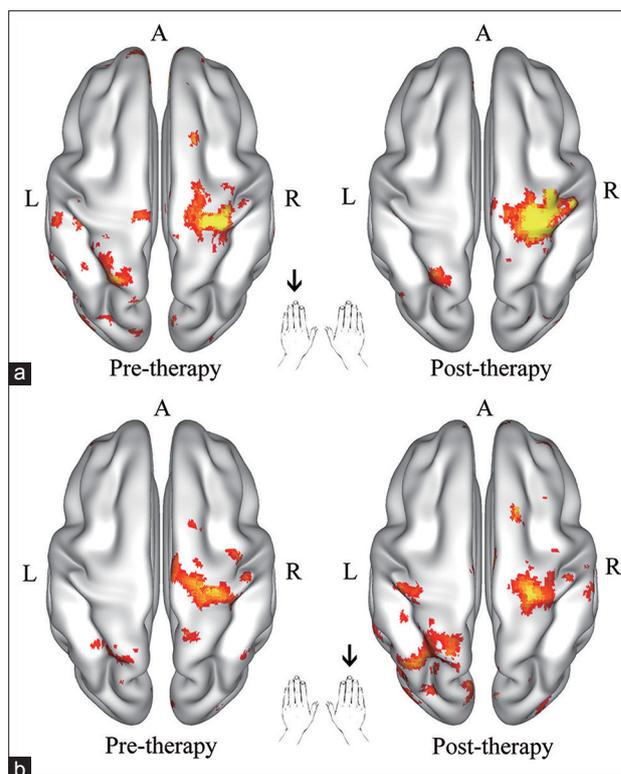


Figure 1: (a) Cortical activation with the left wrist extension before and after botulinum toxin type A therapy. Cortical activation was more lateralized to the right hemisphere after the therapy. (b) Cortical activation with right wrist extension before and after botulinum toxin type A therapy. After the therapy, more activation was shown in the left hemisphere; however, ipsilateral activation could still be observed.

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fMRI results could be explained by that movement of his right limb was connected with his left limb because of insufficient contralateral motor control or cerebral lateralization before the treatment. However, after BTA injection and intensive therapies, lateralization of the cerebral motor control was facilitated in the hemispheres, although ipsilateral cerebral activation could still be observed. Following brain lesions, MM is considered to be a re-organization of the brain for recovery.^[4,5] From the current case, it is postulated that BTA injection plus intensive therapies improved the balance between the tone of the agonists and the antagonists. This may induce re-organization of the brain, thus yielding favorable functional outcomes.

In conclusion, BTA injection may be a new therapeutic modality for MM.

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Conflicts of interest

There are no conflicts of interest.

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