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# Curative effect of botulinum toxin-A injection in myopia treatment: Two case reports

Jianjun Liu<sup>\*</sup>, Shurong Ji

The Children Rehabilitation Department, China Rehabilitation Research Centre, Capital Medical University School of Rehabilitation Medicine, Beijing, China

## Email address:

LJJ990@163.com (Jianjun Liu)

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**Abstract:** *Purpose:* To study the curative effect of botulinum toxin-A injection in myopia treatment and whether this method can promote the vision of the patients with myopia. *Methods:* The left visual acuity of a 37 years old woman was improved from 0.5 to 0.8 after cosmetic injection in July 2011. Another 9 years old girl with pseudomyopia was treated by bilateral ciliary injection in September 2012, and the doses were 2.5IU respectively. *Results:* The woman was true myopia, and her left visual acuity was lasting at 0.8 for 5 months. The left visual acuity of the girl was enhanced from 0.6 to 0.8, and the right was improved from 0.7 to 1.0. And the improvement is for more than 18 months. *Conclusions:* BTX-A injection can relax the ciliary muscle tension and promote the myopic vision, especially in pseudomyopia patients.

**Keywords:** Myopia, Pseudomyopia, True Myopia, Botulinum Toxin-A, Ciliary Muscle

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## 1. Introduction

Myopia is a worldwide common eye disease (1). Though the condition of everywhere is different, the disease incidence is all high (2,3). One study in South Korea showed that 19-year-old male incidence of myopia was up to 96.5% in Seoul (4). The incidence of children is relatively low, but the incidence of myopia had a significantly higher trend as ages goes by (5,6). As is known, the way to treat myopia is mainly by wearing glasses. Though atropine and pirenzepine can reduce the myopic tendency, they cannot cure myopia completely (7).

In this study, we casually found that Botulinum Toxin-A (BTX-A) injection can promote the myopic vision. The possible reason might be that this method can relax the ciliary muscle and change the diopter further.

## 2. Case 1

A 37 years old woman was treated by BTX-A injection for the forehead and crow's feet cosmetology in July 2011. BTX-A (BOTOX) was made by GlaxoSmithKline. Disposable sterile syringe is 1ML LS 25GA 5/8IN(0.5×16), made by Becton Dickinson Medical(S) Pte. Ltd.

Forehead total dose was 20IU (50IU/ml), injected by 8

points (2.5IU respectively). Crow's feet total dose was 30IU, separated averagely in every side, and injected by 3 points (5IU respectively).

After 3 days, both of forehead and crow's feet wrinkle were reduced. Interestingly, the vision was also improved. She was myopia for 22 years (the left vision was 0.5 and the right was 0.6). After 7 days, the left vision was diagnosed to be 0.8 and the right was unchanged. After 5 months, the left vision was back to be 0.5 without any adverse reaction. The possible reason of this unexpected effect might be that BTX-A diffused into ciliary muscle, caused it spasm and changed diopter lens further.

## 3. Case 2

A 9 years old girl, who started myopia before 2 years and was treated by atropine mydriasis experiment, was diagnosed to be pseudomyopia (the left vision was 0.6 and the right was 0.7).

With the consent of her parents, she was injected by BTX-A in September 2012. The disposable sterile syringe and the consistency of BTX-A were as consistent as the first patient. The total dose was 5IU. The injection point was at the 0.3cm from eye outer corners in every side (2.5IU respectively).

The total dose at forehead was 20IU, separated averagely

by 8 points (2.5IU each point). Crow's feet total dose was 15IU, separated averagely in every side, and injected by 3 points (5IU respectively).

After 2 days, the vision was similarly improved sensuously. After 7 days, the left vision was diagnosed to be from 0.6 to 0.8 and the right was from 0.7 to 1.0. The visual improvement lasted more than 18 months without any adverse reaction.

#### 4. Discussion

Myopia is controlled by both of the genetic factor and environment. The main visual factor is that overused eyes render the ciliary muscle sustained contraction. Especially in the youngster, overused eyes can cause pseudomyopia (accommodative myopia) (8). Sustained contraction of ciliary muscle can increase the lens thickness, promote diopter of lens and lead to true myopia (9). BTX-A acts as the motor nerve ending and blocks the release of acetylcholine vesicles, then relax the muscle (10). BTX-A was used to treat strabismus and diplopia, but never reported in myopic treatment (11,12).

For the first patient, we chose three injection points outside the outer canthus, and the middle of which was close to ciliary muscle (nearly 1cm). So the BTX-A might diffuse into the ciliary muscle through the blood circulation and relax it, rendering the diopter changed. After injection, the left vision was promote from 0.5 to 0.8. However, the normal cosmetic injection point is at approximately 1cm of outer corners. So the BTX-A can hardly diffuse into the ciliary muscle.

For the second patient, in order to enhance the dose of diffusion, we intentionally injected near the outer canthus (the distance might be 0.3cm). After 7 days, the left vision was diagnosed to be from 0.6 to 0.8 and the right was from 0.7 to 1.0. As is shown in the result, the effect was better than the first patient clearly, indicating that this method might be available. Nevertheless, whether injecting more close to or directly injecting into the outer canthus can improve the therapeutic effect needs to study further.

The improved vision time of the first patient with true myopia was as long as the effect of BTX-A, while the improved vision time of the second patient with pseudomyopia was considerably extended. So this method might be more effective to pseudomyopia. The injection dose should be adjusted by the weight and diopter of the patient. So, how to measure the best dose needs to study further. And this easy and safe method needs to test and verify further by double-blind grouping controlled study.

We hope this method will promote vision of millions of people, especially the children. That is the importance of the study.

To sum up, we consider that BTX-A injection can relax

the ciliary muscle tension and promote the myopic vision, especially in pseudomyopia patients.

#### Declaration of Interests

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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