Inadvertent Intraocular Injection of Botulinum Toxin A

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ABSTRACT
This report describes an inadvertent perforation of the globe while injecting botulinum toxin A into the medial rectus muscle without electromyography guidance. Botulinum toxin A does not appear to have toxic effects on the human retina. Close observation and necessary measures to treat any retinal breaks and control increased intraocular pressure should be undertaken. [J Pediatr Ophthalmol Strabismus 2011;48:e1-e3.]

INTRODUCTION
Botulinum toxin A is one of the most potent neurotoxins known. It has been used in ophthalmology for various indications. In strabismus, it is used for paralytic cases to prevent contracture of the antagonist muscle while waiting for spontaneous recovery of the affected muscle.1

There is limited literature about the effects of intraocular injection of botulinum toxin A. Two case reports described decreased vision, increased intraocular pressure (IOP), temporary mydriasis, and rhegmatogenous retinal detachment.2,3 Animal studies using electrophysiological tests and light microscopy have shown that it does not have any toxic effect on the retina at doses ranging from 1.25 to 25 units.4-6

We describe an inadvertent intraocular injection of botulinum toxin A (Botox; Allergan, Inc., Irvine, CA) and its management in a patient with paralytic strabismus.

CASE REPORT
A 56-year-old man with diabetes mellitus presented with left sixth nerve palsy of the ischemic type of 5 days’ duration. He was advised to undergo botulinum toxin A injection into the left medial rectus muscle while awaiting any spontaneous recovery of the sixth nerve. After informed consent, 0.1 mL (2.5 units) of botulinum toxin A was injected into the medial rectus muscle transconjunctivally, under topical anesthesia, using a 29-gauge needle and 1.0-mL tuberculin syringe. The injection was administered under direct visualization of an operating microscope in the minor operating room in the outpatient department under sterile conditions using povidone-iodine scrub and povidone-iodine eye drops. After penetration of the conjunctiva and positioning of the needle in the region of the medial rectus muscle, the surgeon felt substantial resistance to the injection of botulinum toxin A, so the needle was withdrawn and the injection was given in the sub-Tenon space near the medial rectus muscle followed by instillation of povidone-iodine 2.5% eye drops.

The patient was examined by a retina specialist immediately afterward. On indirect ophthalmosco-
A retinal break was seen nasally at the 9-o’clock position anterior to the equator (Figure) and a small air bubble was noted in the vitreous cavity. There was no evidence of diabetic retinopathy. In view of the available literature about botulinum toxin A being non-toxic to the retina, it was planned in consultation with the patient to defer any vitrectomy procedure to wash out any toxic drug. We planned to perform a baseline flash, pattern, and multifocal electroretinogram and pattern visual evoked potential, and to keep the patient under observation for any elevation of the IOP, intraocular infection, and retinal detachment.

Barrage laser photocoagulation was done around the break (Figure). Best-corrected visual acuity (BCVA) 1 hour after the injection was 20/20 in both eyes and IOP was 21 mm Hg in the affected eye and 14 mm Hg in the fellow eye. He was given topical ciprofloxacin 0.3% eye drops four times a day as per protocol after any intraocular injections in the hospital.

On the next day, BCVA was 20/20 and IOP was 16 mm Hg in both eyes. Electroretinogram and visual evoked potential were normal and similar in both eyes. Subsequently, when the patient was seen at 1 week, the BCVA and IOP were the same as at the last visit and there were no signs of intraocular infection. On both visits, no change in pupillary diameter was observed. At the 1-month visit, the diplopia had reduced significantly. BCVA was 20/20 in both eyes and IOP was 14 mm Hg in both eyes. The retinal break had healed and only retinal pigment epithelial changes were seen at that site. Electroretinogram and visual evoked potential were repeated and were the same as the baseline recordings. Color vision was normal by Ishihara’s chart at all visits.

**DISCUSSION**

Our report describes an inadvertent intraocular injection of botulinum toxin A. The case shows that the intraocular injection of less than 0.1 mL (< 2.5 units) of botulinum toxin A was well tolerated. The injection was done without any electromyography control. It is possible that this inadvertent globe perforation could be prevented by using electromyography during this procedure or by an open-sky technique where the muscle is hooked and exposed and injection is given.

Hoffman et al. studied the effects of intravitreal injections of botulinum A toxin in two doses, 1.25 and 2.5 units, in two rabbit eyes. The fellow eyes were injected with an equal volume of saline, as controls. The visual evoked potential was unchanged at 1 and 2 weeks post-injection when compared to pre-injection recordings in eyes injected with both botulinum toxin A and saline. In a similar study by Wienkers et al., the external examination, intraocular pressure, ophthalmoscopy, electroretinography, and light microscopy showed no significant difference between botulinum toxin A injected and control eyes over a 2-month period. Kutluk et al. also reported similar findings using visual evoked potentials. Our clinical findings and electrophysiological tests concur with these studies.

Liu et al. described retinal detachment following inadvertent intraocular injection of botulinum toxin A. The patient was treated conservatively and laser demarcation was done. The retinal detachment resolved spontaneously. Leung et al. reported a case of thyroid-related ophthalmopathy for whom 7.5 units of botulinum toxin A was given under general anesthesia during orbital decompression. Immediate pupillary dilatation, rise in IOP, and retinal tear were noted. The IOP was controlled medically and barrage laser was done for the tear. Pupil size returned to baseline in 2 weeks. In our case, there was a slight rise in IOP (21 mm Hg), which reduced spontaneously on the next day to 16 mm Hg. No change in pupillary diameter was noted.

Botulinum toxin A exerts its action by blocking release of acetylcholine at the presynaptic nerve terminal at the neuromuscular junction. Inside the eye, the sphincter pupillae is the only site having these receptors, which can cause pupillary dilatation. Ab-
sence of these receptors on the retina can explain the lack of retinotoxicity of this drug.

This report shows that intraocular injection of botulinum toxin is well tolerated, although the needle penetration itself can cause retinal injury that would need intervention. Use of electromyography during this procedure may avoid such incidences.

REFERENCES