

## The use of Lacrimal Gland Botulinum Toxin injection for the treatment of Epiphora in canalicular blocks

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### Abstract

**Context:** Canalicular blocks or stenosis lead to epiphora which affects the quality of life. The treatment is primarily surgical which however has a high rate of failure and patient dissatisfaction.

**Aim:** The aim of this study was to find out the effects of botulinum toxin injected in the lacrimal gland in patients with epiphora due to canalicular block.

**Setting and Design:** Department of Ophthalmology and a prospective non comparative interventional study was carried out.

**Patients and Method:** Patients with epiphora due to canalicular block were included in the study. Transconjunctival injection of Botulinum toxin was given in the palpebral lobe of lacrimal gland under local anaesthesia. Epiphora scoring was done with a Schirmer's test and Munk's scoring (subjective test) both indoors and outdoors at baseline and at 1,4,12 and 24 weeks. The mean score for symptoms was calculated.

**Statistical Analysis used:** The mean decrease in scores was compared by student t test.

**Result:** 12 patients were included in the study. Subjective epiphora scoring (Munk's scoring) improved in 11 out of 12 patients (92%) at 24 weeks follow-up. Objective epiphora scoring (Schirmer's test) also showed similar results and correlated well with Munk's scoring. Mild ptosis and diplopia was seen in 3 patients.

**Conclusion:** The results of this study were favorable and botulinum toxin can be a good alternative to surgery in patients suffering from epiphora due to canalicular block with minimal side effects and optimal patient satisfaction.

**Keywords:** Canalicular block, Epiphora, Botulinum toxin, Munk's score, Schirmer test

### Introduction

Canalicular blocks or stenosis lead to epiphora, which affects the quality of life by causing blurred vision, irritation of eye and social embarrassment. The treatment is primarily surgical which includes canalicular stenting and intubation, dacrocystorhinostomy, balloon canaliculoplasty, canaliculodacrocystorhinostomy and commonly done, conjunctivodacrocystorhinostomy. A high rate of anatomic success can be achieved with this procedure, however patient dissatisfaction and complications have also been reported.<sup>(1)</sup>

Main and accessory lacrimal glands both significantly contribute to basal and reflex tear production. Injection of botulinum toxin-A (BTX-A) in the lacrimal gland blocks the presynaptic release of acetylcholine by cleaving SNAP 25 protein, which is involved in the fusion of synaptic vesicles with the presynaptic membrane and causes functional denervation of neuromuscular endplates.<sup>(2)</sup> The nerve fibers to the lacrimal gland use acetylcholine as a transmitter. Local injection of BTX-A into the gland corrects the hyperlacrimation by blocking the release of acetylcholine.<sup>(3)</sup>

BTX-A has been effectively used for the treatment of gustatory hyperlacrimation ('crocodile tears') following seventh cranial nerve palsy.<sup>(4,5,6,7)</sup> To our knowledge only three publications report its use in either functional epiphora<sup>(8)</sup> or lacrimal obstruction.<sup>(7,9)</sup>

The aim of this study was to find out the effect of BTX-A injected into the lacrimal gland in patients with epiphora due to canalicular block.

### Materials and Method

Patients with epiphora due to canalicular block who presented to the outpatient department between Aug 2013 to Jan 2017 were included in the study. None of these patients had received a surgical treatment for correction of canalicular block. They were given a choice between surgery and injection and those willing for the later were included in the study and an Informed consent were obtained from them. The study was approved by the internal review board of the hospital.

Epiphora was graded subjectively before treatment and after treatment at 1,4,12 and 24 weeks with Munk's scoring<sup>(10)</sup> (Table 1) and objectively with Schirmer's test with anaesthesia. Schirmer's test was performed in the standard fashion,<sup>(11)</sup> placing a 4millimeter (mm) wide and 41 mm long Schirmer strip in the lower conjunctival sac after instilling topical 0.5% proparacaine for 5 minutes. The strip was removed after 5 minutes and the amount of wetting was noted in millimeters.

**Table 1: Munk's Scoring**

Grade 0	Absence of epiphora
Grade 1	Occasional epiphora requiring minor drying twice a day
Grade 2	Epiphora requiring drying between 2 and 4 times a day
Grade 3	Epiphora requiring drying between 5 and 10 times a day
Grade 4	Epiphora requiring drying more than 10 times a day

In the treatment 2.5 units of BTX-A was injected into the lacrimal gland of the affected eye. BTX-A was reconstituted with sterile, preservative free 0.9% sodium chloride solution diluted to a concentration 50 units/2 ml. Topical 0.5% proparacaine was instilled in the affected eye. Patient was asked to look inferonasally towards the opposite shoulder and the upper lid was retracted but not everted. BTX-A, 2.5 units (0.1ml) was then injected transconjunctivally in the palpebral lobe of the lacrimal gland using an insulin syringe.

After BTX-A injection, patients were reviewed at 1, 4, 12 and 24 weeks. At each visit, the severity of epiphora was assessed with Munk's scoring and Schirmer's test. Data obtained was analysed using the paired t- test.

## Result

12 patients (7men and 5 women) with a mean age of 65.7 years were included in the study (Table 2). 5

patients had bilateral epiphora due to canalicular block, but received BTX-A on the worst effected side. 5 patients had to be given the second dose of 2.5 units BTX-A. The procedure was easy to perform and well tolerated by all patients.

On analyzing the indoor Munk's score (Table 4) 9 out of 12 patients (75%) had a significant reduction in epiphora scores at 1 week. 11 out of 12 patients (91.7%) at 4 weeks. 10 out of 12 patients (83.3%) at 12 weeks and 11 out 12 patients (91.7%) at 24 weeks. On analyzing the outdoor Munk's score, 10 out of 12 patients (83.3%) had reduction in epiphora scores at 1 week and hence forth 11 out of 12 patients (91.7%) had consistent reduction in epiphora at 4, 12 and 24 weeks.

The Schirmer's test result (Table 3) showed a reduction in tearing in 9 out of 12 patients (75%) at 1 week, 12 out of 12 patients (100%) at 4 weeks, 8 out of 12 patients (66.7%) at 12 weeks and 9 out of 12 patients (75%) at 24 weeks. Side effects were reported in 3 patients with complaints of ptosis and diplopia, 2-3 days after the injection and resolved by 3-4 weeks. In spite of the complaints 2 of these patients took a second dose of 2.5 units of BTX-A as they experienced a good response in terms of epiphora reduction. The third patient refused further injections even though she had a good response in terms of epiphora reduction.

Out of 12 patients, 5 patients were given a second dose of 2.5 units BTX-A between 12 – 20 weeks as they complained of reduced effect of BTX-A. There were no signs of dry eyes in any of the patients.

**Table 2: Background Variable**

Variable	Frequency (n)	Mean	SD	Range
Age (in Years)	12	65.75	9.03	52 to 80
	<b>Frequency (n)</b>			<b>Percentage</b>
<b>Sex</b>				
Male	7			58.3%
Female	5			41.6%
<b>Eye</b>				
Left	6			50 %
Right	6			50 %
<b>No. of Injections</b>				
1	7			58.3 %
2	5			41.6 %

**Table 3: Schirmers Test**

Timeline	Mean	SD	Compared to baseline value				Compared to previous reading			
			Mean Reduction	95% CI of Mean Reduction	Paired t Test (p Value)	Number Improved	Mean Reduction	95% CI of Mean Reduction	Paired t Test (p Value)	Number Improved
Baseline	14.67	3.7	-	-	-	-	-	-	-	-
1 Week	11.08	3.5	3.58	1.6 to 5.6	0.002	9 (75%)	3.58	1.6 TO 5.6	0.002	9 (75.0%)
4 Week	9.25	2.2	5.42	3.4 to 7.4	< 0.001	12 (100%)	1.83	0.6 TO 3.1	0.008	9 (75.0%)
12 Week	11.83	2.7	2.83	1.0 to 4.7	0.006	8 (66.7%)	- 2.58	- 4.2 TO	0.005	1 (8.3%)

24 Week	11.50	1.9	3.17	1.4 to 5.0	0.003	9 (75%)	0.33	- 1.0 - 1.5 TO 2.1	0.689	4 (33.3%)
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Table 4: Munk Score

Timeline	Mean	SD	Compared to Baseline Value				Compared to Previous Reading			
			Mean Reduction	95% CI of Mean Reduction	Paired t Test (p Value)	Number Improved	Mean Reduction	95% CI of Mean Reduction	Paired t Test (p Value)	Number Improved
<b>Indoor</b>										
Baseline	3.42	0.7	-	-	-	-	-	-	-	-
1 Week	1.50	1.5	1.92	1.0 TO 2.9	0.001	9 (75.0%)	1.92	0.9 TO 3.0	0.001	9 (75.0%)
4 Week	1.33	0.9	2.00	1.5 TO 2.7	< 0.001	11 (91.7%)	0.17	- 0.5 TO 0.9	0.615	4 (33.3%)
12 Week	1.92	1.0	1.50	0.8 TO 2.2	0.001	10 (83.3%)	- 0.58	- 1.0 TO - 0.2	0.012	0 (0%)
24 Week	1.58	1.0	1.83	1.2 TO 2.4	< 0.001	11 (91.7%)	1.58	- 0.1 TO 0.7	0.104	5 (41.6%)
<b>Outdoor</b>										
Baseline	3.83	0.4	-	-	-	-	-	-	-	-
1 Week	1.67	1.3	2.17	1.3 TO 3.1	< 0.001	10 (83.3%)	2.17	1.3 TO 3.1	< 0.001	10 (83.3%)
4 Week	1.42	0.9	2.42	1.8 TO 3.0	< 0.001	11 (91.7%)	0.25	- 0.3 TO 0.8	0.339	4 (33.3%)
12 Week	1.83	1.0	2.00	1.4 TO 2.6	< 0.001	11 (91.7%)	- 0.41	- 0.7 TO - 0.1	0.017	0 (0%)
24 Week	1.58	1.0	2.25	1.6 TO 2.9	< 0.001	11 (91.7%)	0.25	- 0.1 TO 0.6	0.191	4 (33.3%)

## Discussion

The present study brought out the effect of 2.5 units of BTX-A injected in the lacrimal gland in patients with epiphora due to canalicular block. Presently there are 2 studies on the application of BTX-A in lacrimal gland obstruction by Wojno<sup>(7)</sup> and K. Ziahosseini et al.<sup>(9)</sup> Wojno did a retrospective review of 46 patients treated with BTX-A injection in palpebral lobe of lacrimal gland for epiphora due to lacrimal obstruction. 74% patients mostly or completely improved with 2.5 units of BTX-A. K. Ziahosseini et al did a retrospective review of 17 patients (22 eyes) with epiphora in lacrimal out flow obstruction. A mean of 3.5 injections of BTX-A (1.25 – 7.5 units) were given per eye. The mean Munk score improved significantly after treatment. Karl W et al<sup>(8)</sup> did a prospective interventional case study on 14 patients who were managed for functional epiphora with BTX-A injected in the palpebral lobe of lacrimal gland. Subjective epiphora improved in 8 out of 11 patients (72.7%) who completed 13 weeks of follow up. Our study seems to be the third exploring the affect of BTX-A injection in lacrimal gland for lacrimal out flow obstruction and the first study dealing specifically with treatment of canalicular block with BTX-A.

Our results were similar to the above mentioned 3 studies with improvement in epiphora over a follow up of 24 weeks. On analyzing both the subjective scoring (Munk's score) and the objective scoring (Schirmer's

test) we concluded that post BTX-A injection, the maximum rate of epiphora reduction was at 1 week which maximized at 4 weeks. Between 12 to 24 weeks improvement diminished marginally, however the epiphora score remained less than baseline value. Both the tests correlated well with each other. Hence a repeat dose of 2.5 units of BTX-A at 12 – 20 weeks would improve the symptoms in the same magnitude.

It can be concluded that BTX-A injection into the lacrimal gland of patients with canalicular block to reduce epiphora had a favorable response as seen in a follow-up over 24 weeks. The advantages of giving BTX-A over surgery are that it is an easy procedure, relatively inexpensive, non-invasive and with few short lasting side effects. The disadvantages are that it provides temporary relief and has to be repeated. The results of this study are encouraging and management of canalicular blocks with BTX-A seems to be a good alternate treatment. However a larger controlled trial needs to be carried out to assess the optimal dose, number of doses, long term efficacy and safety of BTX-A.

## References

1. Rosen N, Ashkenazi I, Rosner M. Patient dissatisfaction after functionally successful conjunctivodacryocystorhinostomy with Jones tube. *Am J Ophthalmol.* 1994;117:636–642.
2. Osaka M, Keltner JL. Botulinum-A toxin (Oculinum) in ophthalmology. *Surv Ophthalmol* 1991;36:28-46.

3. Boroojerdi B, Ferbert A, Schwartz M. Botulinum toxin treatment of synkinesia and hyperlacrimation after facial palsy. *J Neurol Neurosurg Psychiatry* 1998;65:111-114.
4. Riemann R, Pfennigsdorf S, Riemann E, Naumann M. Successful treatment of crocodile tears by injection of botulinum toxin into the lacrimal gland: a case report. *Ophthalmology*. 1999;106:2322–2324.
5. Hofmann RJ. Treatment of Frey's syndrome (gustatory sweating) and 'crocodile tears' (gustatory epiphora) with purified botulinum toxin. *Ophthal Plast Reconstr Surg*. 2000;16:289–291.
6. Falzon K, Galea M, Cunniffe G, Logan P. Transconjunctival botulinum toxin offers an effective, safe and repeatable method to treat gustatory lacrimation. *Br J Ophthalmol*. 2010;94:379–380.
7. Wojno TH. Results of lacrimal gland botulinum toxin injection for epiphora in lacrimal obstruction and gustatory tearing. *Ophthal Plast Reconstr Surg*. 2011;27:119–121.
8. Whittaker KW, Matthews BN, Fitt AW, Sandramouli S. The use of botulinum toxin A in the treatment of functional epiphora. *Orbit*. 2003;22:193–198.
9. K Ziahosseini, Z AL-Abbadi, R Malhotra. Botulinum toxin injection for the treatment of epiphora in lacrimal outflow obstruction. *Eye*. 2015;29: 656-661.
10. Munk PL, Lin DT, Morris DC. Epiphora: treatment by means of dacryocystoplasty with balloon dilation of the nasolacrimal drainage apparatus. *Radiology*. 1990;177:687–690.
11. Goren MB, Goren SB. Diagnostic tests in patients with symptoms of keratoconjunctivitis sicca. *Am J Ophthalmol*. 1998;106:570-574.