

The Effect of Periorbital Botox Injection on the Eye

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ABSTRACT

Botox injection in the periorbital region affects the looks and the levels of the eye brows, it could cause elevation of the eye brows and could cause eye brow ptosis. This study evaluates the effects of Botox injection on the eye brows and lids and its effect on the dryness of the eye and the possible complications like bruising, ectropion and eye lid ptosis. This study is presenting the data of 150 patients who had local Botox injection in the periorbital muscles to treat wrinkles around the eye. The study showed that there was significant improvement in the level of the eye brows with an elevation of about 2.4 mm. There was no significant difference in the dryness of the eyes or in the interpalpebral distance before and after injection. The most common side effect was pain (36.6%) followed by bruising (28%), eyebrow ptosis (6%), lower lid ptosis (1.3%), lower lid puffiness (4%). There were no cases of upper eye lid ptosis.

Key words: Botox, eye brows, eye lids, eyelid ptosis, eye examination, dry eye.

INTRODUCTION

Injection of Botox in the periorbital muscles is of value in the treatment of periorbital rhytids as well as to adjust the level of the eye brows and to treat blepharospasm. The effect of injection of Botox in the area around the eye could improve the aesthetic look of the periorbital area. Undesirable side effects such as brow ptosis, eyelid ptosis, swelling of the lower lids, ectropion, dry eyes, squinting and bruising could occur.

Botulinum toxin acts by inhibiting the neuromuscular transmission by blocking the extracellular release of acetylcholine, a neuromuscular transmitter that crosses the neuromuscular junction to stimulate the muscles to contract.⁽¹⁾

Botulinum toxin is useful in correcting eyebrow ptosis by causing a chemical brow lift by weakening of the depressor supercilii and the lateral end of the orbicularis oculi muscle.

MATERIAL & METHODS

This study started with 177 patients with wrinkles in the upper face presenting for Botulinum toxin injection to treat wrinkles in the periorbital region around the eye.

27 patients were excluded from the study because of medical reasons as dry eyes or did not continue the follow up. The data of the other 150

patients were included and assessed in this study which was carried out during the period from October 2007 through October 2009.

131 (87.3%) females and 19 (12.6%) males presented to the clinic with wrinkles in the upper face (forehead and around the eyes) for Botulinum toxin injection.

The patients ages ranged from 31-72 years with a mean age of 48 years. They were examined and assessed before Botox injection, one week and 3 weeks after injection. Standardized photographs were taken of all patients before treatment, one week and 3 weeks after injection. A thorough ophthalmological examination was done.

Examination included:

1. The level of the eyebrows was measured and marked from the tail of the eyebrow to the level of a horizontal line from the outer canthus.
2. Moisture of the eye was measured with a Schirmertest, a tear break up time (BUT).
3. A snap test was done.
4. Any degree of ectropion or puffiness of the lower lid was recorded.
5. Visual acuity and intra ocular pressure were recorded.
6. Marginal reflex distance 1 (MRD1) to assess occurrence of post injection ptosis.
7. Marginal reflex distance 2 (MRD2) to assess occurrence of post injection lower lid drooping.

8. Inter palpebral distance measurement.

History of any eye surgeries and medications were reported.

Patients with proved dry eye during examination were excluded.

Schirmer test was performed by measuring the amount of wetting of a special filter paper which is 5mm wide and 35mm long, the test performed with prior installation of a topical anesthetic. Wetting of less than 5-6mm of the strip after 5 minutes is considered abnormal.

Tear break-up time(BUT) is defined as the interval between a complete blink and the development of the first randomly distributed dry spot on the cornea. Fluorescein was instilled into the lower fornix ,the patient was asked to blink several times and then stop .the tear film was examined with a broad beam and cobalt blue filter. After an interval of time,black spots or lines appear indicating the formation of dry areas. A BUT of less than 10 seconds is considered abnormal.

The marginal reflex distance-1 (MRD-1) is the distance between the center of the pupillary light reflex and the upper eyelid margin with the eye in primary gaze. A measurement of greater

than 3.5 mm,resting slightly below the limbus,is considered normal.

The marginal reflex distance-2 (MRD-2) is the distance between the center of the pupillary light reflex and the lower eyelid margin with the eye in primary gaze.Almost 5mm with the lid resting on the lower limbus .

Inter palpebral distance of 9mm is considered normal.

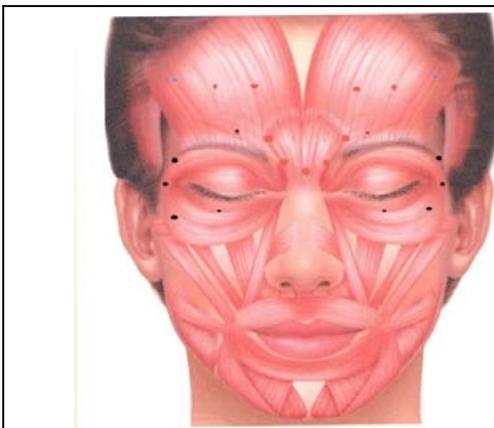
Lateral brow height was measured using a caliper with millimeter grading. The distance is measured from lateral canthus to the lowest row of eyebrow hairs while the patient eyes focused on a fixed point in space.

The snap test measures the snap of the lid back toward the eye immediately after it's distraction , which should not be more than 7mm away from the globe.

Botulinium toxin type A used on all patients was reconstituted in 2 .5ml of saline to achieve a final concentration of 4 units /0.1ml(table 3) .

Amounts used in all patients were also recorded. The points of injection were marked and recorded.

Botox injections were performed with small 1 ml insulin syringes with 30 gauge needles.



Botox injection sites:

Glabella lines:4-5 units per injection site.(5 sites)2 other sites in the lateral corrugator could be injected with 1-2 U.

Forehead lines:2-4 sites on each side of the mid line according to the width of the forehead , with a total dose of 10-20 units distributed on the injection sites.

1 unit could be injected in the lateral side of the frontalis to avoid excessive elevation.

Crows feet:3-4 units per site(2-3 sites)

Infraorbital wrinkles:1-2 unites intradermally in the mid pupillary line.

Nine patients had previous lower lid belepharoplasty.16 patients had previous upper eyelid belpharoplasty

Table (1): Showing different dilutions options for Botox:

Diluent added (0.9% normal saline)	Resultant dose (Number of units per 0.1ml)
1.0ml	10.0units
2.0ml	5.0 units
2.5ml	4.0 units
4.0ml	1.25units

Statistical methods

Data were coded and entered using the statistical package SPSS version 15. Data were summarized using mean and standard Deviation for quantitative values, number and percent for qualitative values. Comparisons between the

different readings of the studied groups was done using repeated measurement ANOVA (analysis of variants and paired simple T-test .P-value ≤ 0.05 were considered as statistically significant.

RESULTS

Picture number 1 a,1b showing pre and post Botox crow feet improvement



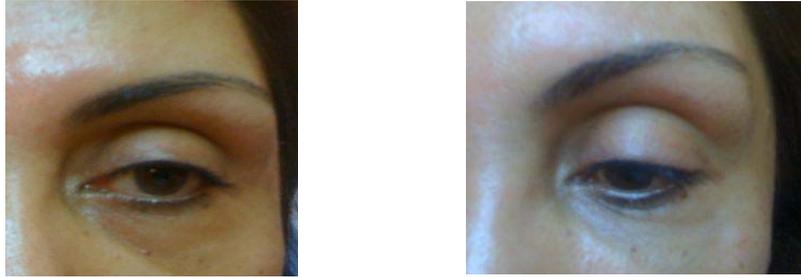
Picture number 2 a, 2b showing pre and post Botox eye brow elevation



Picture number 3a, 3b showing pre and post Botox eye brow elevation



Picture number 4a,4b showing pre and post Botox eye brow elevation

**Table (2):** Showing the pre and post injection findings of the tests.

	Pre injection	Wk1	Wk 3	p-value
BUT	11.5±1.1	10.9±0.8	12.0±0.8	>0.05 ^a
Schirmer test	7.0±1.4	7.5±1.4	7.1±1.3	>0.05 ^a
MRD1	4.5±0.5	4.6±0.4	4.6±0.5	>0.05 ^a
MRD2	5.0±0.5	4.8±0.4	4.9±0.4	>0.05 ^a

p>0.05 by repeated measurement ANOVA

The table discusses the mean and standard deviation of the results of the for tests before and after injection

None of the 150 patients showed eyelid ptosis (0%), 15 patients showed brow ptosis, 30 patients showed minor bruising and one showed major bruising (table 3).

Table (3): Showing the adverse effects of periorbital Botox on the eye monitored in the study:

Adverse Effects	Mean incidence %
Eye lid ptosis	0 %
Pain	36.6%
Bruising	28%
Dropping in the lower lid	1.3%
Eye brow ptosis	6%
Lower lid puffiness	4%

Table (4): Showing mean brow height of the eyebrows before and after Botox treatment in 150 patients:

	Pre injection	3 weeks after injection	Mean difference	P-value
Right side average height(mm)	18.7±0.2	21.2±0.3	2.4±0.4	<0.001
Left side average height(mm)	18.6±0.3	21.1±0.3	2.5±0.4	<0.001

P<0.001 (results with a two paired sample *T* test)

There was no significant change seen in the amount of tears or in the dryness of the eye from time of injection and 3 weeks following the injection.

There was no significant change in the width of the palpebral fissure from the time of injection to 3 weeks after injection.

There was a significant improvement in the height of the tail of the eyebrow after injection.

DISCUSSION

The frontalis muscle fibers and the orbicularis muscle fibers are attached to the skin, they give a drape effect on the skin when the muscle contracts giving rise to the aesthetically non-pleasant facial lines that the patients seek to abolish. Totally abolishing the forehead lines in patients with many forehead lines could cause the drape to loosen and the brows to ptose down.

Injecting the mid forehead could cause medial brow ptosis especially in patients with pseudo belptharochalasis. This could also be a cause of the manafisto look or the devils look when we miss injecting small amounts of units outside the midpupillary region of the forehead. Also Completely relaxing the crowfeet wrinkles could cause weakening of the malar area and enhancement of the tear trough area. Giving high doses of Botox in the lower eye lid wrinkles could cause swelling of the lower lid especially noticed in patients who had under gone previous lower lid belptharoplasty. There is excessive debate on whether or not to perform Botox in patients who will soon perform surgery on the face and lids as it could fool the surgeon on how to assess the amount of skin to remove and what to leave behind.⁽²⁾

The degree of eye brow ptosis following Botox injection in the transverse muscles of the forehead varies according to the amount of wrinkles in the fore head, (6% in our study) the dose of Botox injection in each site and whether the lateral part frontalis muscle was injected or not and whether the brow depressors were injected or not. The occurrence of brow ptosis varies from 1% -5%.⁽³⁾

In our study we prefer to treat the forehead in patients with excessive wrinkles on two stages, first stage avoiding the mid forehead and giving a very small dose to the lateral frontalis. Treating the brow depressors (*Corrugator supercilii, depressor supercilii. Procerus and the upper lateral part of the orbicularis oculi*). The second touchup session would be after a week to correct any remaining wrinkles left untreated and correcting any brow asymmetry.

When the fibers of the corrugators in our patients were seen causing strong pull up to the mid pupillary line, 2-5 units of Botox could be given 1cm above the supra orbital notch.

The dose varied from 4-6 units in females to 6-10 units in the males for the correction of lateral brow ptosis.

A sea -saw effect is the usual outcome of injecting the medial fibers of the frontalis in the forehead and not injecting in the lateral frontalis fibers making them stronger in the pull on the lateral brow and giving a high brow elevation and a devil's look.

In our patients a full smile show the laughter lines on the lateral sides of the eye and the bunny lines on the sides of the nose. Injection of 2-4 injection sites 1-1.5 mm outside the orbital rim starting just below the eye brow and stopping

just above the zygoma was done to perceive softer lines, help open the eyes and elevate the tail of the eyebrow.

The average amount of injection used was 12-16 units per site and a touch up of the average of 5-6 units was needed to reach the desired effect.

Patients with static wrinkles and excessive wrinkles and those with belptharochalasis of the lower lids were treated with caution and less doses to avoid excessive loosening of the drape effect of the orbicularis muscle on the skin.

All the patients that showed the almond shaped swelling over the malar area were above 55 years with excessive wrinkles on the lateral side of the face. The swelling improved in all the cases by the third week .

In our study elevation of the level of the eyebrow was on the average about 2.4mm by the injection of 8-10 units from just above the level of the outer canthus to the eyebrow. Klien⁽²⁾ suggested that Botox could potentially raise the brow by 1-2 mm.

Injection of 2 unites of Botox in the infraorbital area in the area that produces maximum puckering during smiling improves the lines around the eye ,widens the palpebral fissure, but caution should be taken with patients showing delay in the snap test; The injection should be above the bony ridge and to avoid injection in this area in patients with previous lower lid surgery. The lower injection point should not lie below the level of the zygomatic rim ,as the diffusion of the botox may effect the smile of the patient by paralyzing the zygomaticus major muscle.

Bruising is due to injury of one of the superficial vessels on the lateral orbital skin , avoiding these by injection between them under good light and compressing for a while after removal of the needle helps in avoiding the bruises. Major bruises were seen with old patients with history of easy bruising.

28% of our patients had bruises, which was almost near to the results reported from a double -blind controlled study examining the treatment of patients with crow's feet using Botox, which reported bruising in 11%-25%. We believe that our adverse effects should be slightly less if concentrating on the crow feet only, since we collected our data from our patients who had almost all areas treated (forehead, glabella, crowfeet, infraorbital areas and bunny lines).⁽⁴⁾

The almond shaped jelly like swelling that appears over the zygomatic area is probably due

to increased dose of the lateral lowest most injection and the lateral infra orbital injection.

Appearance of the almond jelly like structure over the zomatic arch enhances the tear trough deformity in some patients and if persists, can be treated by injection of fillers in the tear trough area.

16% of the patients only received local anaesthesia prior to their injection.

Some patients are given Emla cream 5% to be applied one hour before treatment to relief some pain, but we believe that it should be avoided, as applying the cream relaxes some wrinkles and alters the physicians decision for the proper dosing for different areas.

There were no cases of eyelid ptosis in our study with a zero %. Ptosis was avoided by injecting at least 1 cm above the orbital rim, not over diluting (prepared in 2.5cc saline) which prevents injection of large amount and putting the patient in the upright position for 3 hours. Carruthers et al⁽⁵⁾ in a multi center study reported ptosis in 5.4% of their 265 patients. We don't advise the patients to move the muscles excessively like some authors recommend as we think that it might be the cause of ptosis reported, as we suggest that it could be due to Botox being injected behind the frontalis and excessive contraction of the muscle causes it to migrate downwards.

There was no significant difference in our study in the amount of tears and the degree of dryness of the eyes before and after injection of the Botulinum toxin.

Botulinum toxin was suggested for dry eye therapy because of the reduction of lacrimal drainage after treatment. Paralysis of the orbicularis oculi muscle acts on the canaliculi and induces a decreased pump function during blinking. Therefore Botulinum toxin injection significantly lowered the blink output 3 weeks after treatment⁽⁶⁾.

Winter et al⁽⁷⁾ suggested that because of the direct pharmacological effect of Botox on the lacrimal gland, a decreased Schirmer test could be seen, denoting that it not only affects the neuromuscular junctions but also autonomic cholinergic transmission during the systemic manifestation of botulism. Clinical presentation includes mydriases, accommodation paresis, reduced salivary secretion and reduced lacrimation.

None of the patients suffered any intraocular pressure problems, Corridan et al⁽⁸⁾ reported a very rare case of acute angle closure glaucoma

after injection of high doses of Botox in the periorbital area.

Conclusion:

We conclude that Botox injection in the periorbital area improves the aesthetic look of the eye and helps to elevate the level of the eye brow in patients with brow ptosis.

Injection of the lower half of the orbicularis oculi should be done with caution to avoid enhancing belfarochalasis of the lower lids 1-2 units are some times needed to be injected in the forehead region outside the plane of the mid pupil to prevent the devils look.

When belfarochalasis is obvious in the upper lids, we should try to concentrate on the medial and lateral brow depressors and avoid the transverse forehead injections.

REFERENCES

1. **Dutton JJ and Fowler AM:** Botulinum toxin in ophthalmology. Survey of ophthalmology .vol 52;1 .pp 13-31 ,2007.
2. **Klein AW:** Complications and adverse reactions with the use of botulinum toxin. seminars in cutaneous medicine and surgery, vol 20, no 2 (june)pp 109-120,2001.
3. **Redaelli A:** How to avoid brow ptosis after forehead treatment with botulinum toxin .J Cosmet Laser Ther 5:220-222,2001.
4. **Hexsel D, Mazzuco R, Zechmeister M, et al:** Complications and adverse effects: diagnosis and treatment, in hexelD, trinidad de almeida A (eds): Cosmetic use of botulinum toxin. porte alegre, Brazil, AGE Editoria 2002, pp233-239.
5. **Carruthers JA, Lowe NJ, Menter MA, et al:** A multicenter , double-blind, randomized , placebo-controlled study of the efficacy and safety of botulinum toxin type A in the treatment of glabellar lines. J Am Acad Dermatol 46:840-849,2002.
6. **Sahlin S, Chen E.** Evaluation of the lacrimal drainage function by the drop test. Am J ophthalmol 122:701-8.1996
7. **Winter JH, Bergloff J, Floegel I, Hallerschober EM and ShchmutO:** Botulinum toxin A treatment in Patients suffering from Blepharospasm and dry eye; BR.T. ophthalmol 87:54-56,2003.
8. **Corridan P, Nightingale S, Mashoudi N, Williams AC.** Acute angle -closure glaucoma following botulinum toxin for belfarospasm .Br J ophthalmol ;74, pp309-10 1990.

