Long-term Enhancement of Botulinum Toxin Injections by Upper-Eyelid Surgery in 14 Patients With Facial Dyskinesias

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Objectives: To determine the effects of upper-eyelid surgery (limited myectomy, blepharoplasty, and levator aponeurotic advancement) on patients who demonstrated a suboptimal response or residual heaviness of the upper eyelids after botulinum toxin eyelid injections for facial dyskinesia.

Design: Retrospective study.

Subjects: Charts of 358 patients with a diagnosis of benign essential blepharospasm, Meige syndrome (with eyelid involvement), and hemifacial spasm were reviewed.

Methods: Data were retrospectively analyzed and included subjective and objective responses about botulinum toxin injections (number and duration of effect of injections before and after eyelid surgery).

Results: Of 358 patients with facial dyskinesias, 14 (3.91%) underwent upper-eyelid limited myectomy with or without upper-lid blepharoplasty (n=5), upper-lid blepharoplasty alone (n=6), or levator advancement with or without blepharoplasty (n=3). Mean subjective improvement was 68.75% after limited myectomy combined with blepharoplasty and 58.33% after levator and/or blepharoplasty surgery. Average duration of effect of injections increased from 122.1 days in the patients prior to undergoing eyelid surgery to 210.5 days after surgery.

Conclusions: Upper-eyelid surgery, including limited myectomy, enhanced the effect of the botulinum toxin in this small group of patients. Patients with a suboptimal response to injections in terms of moderate to marked dermatochalasis with subjective heaviness of the eyelids, upper-eyelid blepharoplasty, and/or limited myectomy should be considered.


Botulinum toxin injections are the treatment of choice for essential blepharospasm, Meige syndrome (eyelid, facial, and laryngeal-cervical dystonia), and hemifacial spasm.1-21 Patients who fail to respond adequately to botulinum toxin injections may opt for systemic pharmacological or surgical treatment.1,4 Surgical alternatives include “full” myectomy or eyelid protractor excision (extirpation of the palpebral and orbital orbicularis muscle and procerus and corrugator supracilii muscles combined with browplasty), limited myectomy (orbicularis muscle extirpation without brow surgery), or selective seventh-nerve ablation.20 Full myectomy and seventh-nerve ablation may obviate the need for repeat botulinum toxin injections, while limited myectomy tends to enhance the effects of botulinum toxin injections, but repeat injections are necessary.1,3 Selective seventh-nerve ablation often results in recurrence along with the need for additional eyelid and facial surgery.2 Full myectomy may result in a cosmetic eyelid deformity.1

The effects of upper-eyelid surgery, including limited myectomy, blepharoplasty, and levator aponeurotic blepharoptosis repair, on botulinum toxin treatment for facial dyskinesias have not been studied with long-term follow-up.

During the past 14 years, 239 patients with blepharospasm and Meige syndrome and 119 patients with hemifacial spasm were evaluated and/or treated with botulinum toxin. A retrospective study of a subset of patients undergoing upper-eyelid surgery was performed on patients who received botulinum toxin injections and who demonstrated suboptimal response. Long-term follow-up data were obtained.

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MATERIALS AND METHODS

PATIENTS

Charts of all patients with a diagnosis of benign essential blepharospasm, Meige syndrome, and hemifacial spasm were reviewed from the Oculoplastics Clinic of the Department of Ophthalmology of the University of Medicine and Dentistry, New Jersey Medical School, Newark, and from a private practice clinic (J.A.M.) from October 1983 through August 1997.

The following data were obtained from patient records: (1) duration of eyelid spasms prior to eyelid surgery; (2) types of eyelid surgery; (3) overall subjective improvement; and (4) number, dosage, and duration of effect of botulinum toxin injections prior to and after eyelid surgery. Only those patients who had surgery and were followed up by the primary surgeon (J.A.M.) were included in the study.

Patients who experienced pain on botulinum toxin injections before or after eyelid surgery were offered ice compresses and/or topical skin anesthesia with a mixture of local anesthetic cream (2.5% lidocaine and 2.5% prilocaine) prior to injection.

Patients who did not respond to botulinum toxin injections and who opted for full myectomy were excluded from the study. Patients introduced into the study prior to the advent of limited myectomy underwent repair of blepharospasm due to aponeurotic dehiscences and upper-eyelid blepharoplasty for excessive dermatochalasis, creating heaviness of the eyelid tissues.

After surgery, all patients were asked (1) to estimate the percentage of improvement in eyelid spasms, (2) whether they experienced enhanced eyelid symmetry and cosmesis, and (3) whether they would opt for surgery again. The surgeon made an independent assessment of the cosmetic result.

SURGICAL TECHNIQUE
(BLEPHAROPLASTY WITH LIMITED MYECTOMY OR LEVATOR ADVANCEMENT)

Patients were prepared and draped with their entire face exposed. Approximately 3 mL of 0.5% bupivacaine and 2% lidocaine with epinephrine was locally infiltrated into the upper eyelids, with oxygen delivered through the mouth by the anesthesiologist, who administered monitored sedation. In patients undergoing levator advancement only, epinephrine was not used in the anesthetic injection mixture to avoid stimulation of the Müller muscle. Eyelid-crease incisions were marked with a marking pen to create symmetry. An appropriate amount of excess skin was marked above the lid crease in patients undergoing concomitant blepharoplasty. If excess skin was noted in the lateral canthal area, the incision was extended beyond the canthus. The incision through skin and muscle was made with a No. 15 blade, Ellman needle (Ellman International Inc, Hewlett, NY) with radiofrequency on the cutting and coagulation mode, or carbon dioxide laser set on the continuous mode (Figure 1 through Figure 4).

The previously marked skin orbicularis oculi muscle flap was excised with a handheld cautery, electrocautery Colorado needle (Colorado Biomedical, Evergreen), Bovie needle tip, Ellman needle, or carbon dioxide laser. Pre-tarsal skin-muscle flap was dissected from the inferior wound to expose the anterior tarsal surface to within 1 to 2 mm of the eyelid margin. Care was taken not to damage the hair follicles at the eyelid margin.

After hemostasis was achieved with cautery, gentle digital pressure on the globe prolapsed the underlying preaponeurotic fat in the nasal quadrant of the upper lid. A 3-mm horizontal incision was made through the orbital septum, where the preaponeurotic fat pad was identified 6 to 8 mm above the upper tarsal border. Care was taken not to injure the underlying fused orbital septum and levator aponeurosis.

A cotton-tip applicator was introduced into the space occupied by preaponeurotic fat between the orbital septum anteriorly and the levator aponeurosis posteriorly across the entire eyelid. With the cotton-tip applicator in place, a monopolar cautery device (handheld battery-powered cautery or Bovie needle tip) was used to incise the orbital septum across the horizontal width of the upper eyelid.

Superior to the fused levator aponeurosis and orbital septum, the underlying levator was bluntly dissected from the overlying orbital septum and preaponeurotic fat pad. The preaponeurotic fat, along with any retro-orbicularis oculi fat, was debulked and excised with a unipolar cautery or vaporized with a bipolar cautery. A 2- to 3-mm horizontal band of preseptal orbicularis muscle (adherent to fused orbital septum and levator aponeurosis just above the superior tarsal border) was excised (Figures 1-3). This excision facilitated surgical advancement of the levator aponeurosis. The pretarsal orbicularis muscle was bluntly dissected from the overlying skin across the entire eyelid over the tarsal plate. Care was taken not to buttonhole the skin. In patients undergoing levator advancement, the levator aponeurosis was identified, advanced, and secured to the upper one third of the anterior tarsal surface with 3-0 silk double-armed sutures. The horizontal mattress sutures were placed at the medial, middle, and lateral aspects of the upper tarsus. The arms of each suture were then brought through the edge of the levator. The eyelid position and contour were adjusted with the patient sitting up. In patients in whom levator advancement was not performed, the levator aponeurosis was plicated in its original position with the 6-0 silk sutures.

The preseptal portion of the palpebral orbicularis oculi muscle and the orbital portion of the orbicularis muscle were dissected superiorly from any residual attachment to the orbital septum and superior orbital rim. These muscles were dissected from overlying skin superiorly to the eyebrow and excised with sharp dissection (Figure 3). The skin wound was closed with interrupted 6-0 silk sutures or 6-0 polypropylene sutures. In each case, the lid crease was defined by the number of deep bites taken through the underlying levator aponeurosis at the time of skin closure.

All patients were discharged from the outpatient surgery unit on the day of surgery. Ice compresses were applied to the eyelid tissues every hour for 15 minutes for 48 hours immediately after surgery and then 4 times a day for a total of 4 days. Topical antibiotic drops were instilled into each eye 4 times a day along with antibiotic ointment into each eye at bedtime for a minimum of 2 weeks after surgery. No systemic antibiotics were prescribed.

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RESULTS

Patient age at the time of surgery ranged from 53 to 77 years (mean age, 65.2 years) (Table 1). Thirteen patients had bilateral eyelid facial dyskinesia without significant lower facial involvement and 1 patient (patient 14) had hemifacial spasm (Table 1 and Table 2). Mean subjective improvement was 66.75% (n = 5) in the limited myectomy group compared with 58.33% (n = 9) in the other 9 patients who underwent blepharoplasty only (n = 5) and/or levator advancement (n = 4). The single patient with hemifacial spasm received 2 injections after surgery. He had difficulty quantifying the percentage of improvement, but improvement was noted at the time the study was concluded.

There were no significant surgical complications in any of the 14 patients. Improved cosmesis and upper-eyelid symmetry were noted by all patients and the surgeon. All patients stated that the surgery improved their condition and cosmesis and all would have repeat surgery (Figure 4 and Figure 5). One patient with severe dry eye experienced recurrent erosion that was treated successfully with topical lubricants and did not recur after subsequent injections. The mean dose of botulinum toxin was 37.1 U prior to surgery and 33.9 U after surgery. The mean number of injections was 6.1 prior to surgery and 8.7 after surgery. The mean follow-up period

Figure 1. Excision of pretarsal orbicularis muscle after dissection of skin orbicularis muscle flap from underlying tarsus.

Figure 2. Excision of strip of preseptal orbicularis muscle adherent to fused orbital septum and levator aponeurosis, which allows exposures and facilitates reinsertion of the levator aponeurosis.

Figure 3. After all the orbital septum adhesions are lysed and the preaponeurotic fat pad is dissected from the overlying orbital portion of the orbicularis muscle, the preseptal portion of the pretarsal orbicularis muscle and the orbital portion of the orbicularis muscle are dissected in 1 band from overlying skin up to the eyebrow tissues.

Figure 4. A 66-year-old Vietnamese woman (patient 12) with bilateral blepharospasm and increased heaviness of eyelids before (A) and after (B and C) limited myectomy and upper-eyelid blepharoplasty.
was 30.5 months for all patients after surgery. The average duration of effect of botulinum toxin was 122.1 days prior to surgery and 210.5 days after surgery for the 13 patients with sufficient data to analyze. Data regarding the average duration of effect from a patient who died of a myocardial infarction approximately 6 months after surgery were not included. The 13 other patients continued to receive botulinum toxin injections at the time this study was concluded.

All patients experienced a subjective increase in pain with botulinum toxin eyelid injections that resulted from scar tissue induced by upper-eyelid surgery. A resistance to injection, particularly in the pretarsal orbicularis muscle, was noted after all types of upper-lid surgery, particularly limited myectomy. The resultant discomfort on injection was significantly improved by the use of ice compresses prior to injection and/or topical skin anesthesia with local anesthetic cream (a mixture of 2.5% lidocaine and 2.5% prilocaine).

**COMMENT**

The present study of 14 patients suggests that virtually any type of eyelid surgery (limited myectomy, upper-eyelid blepharoplasty, and levator aponeurotic advancement) improves the subjective and, probably, the objective effects of botulinum toxin eyelid injections. While long-term data support this contention, the limited number of patients makes statistical analysis impossible.

All patients stated that the improvement after surgery was beyond that afforded by botulinum toxin injections alone. All stated that they would have repeat eyelid surgery. In addition, while cosmesis was not the goal of surgery, enhanced cosmesis and eyelid symmetry were noted by all patients.

Objective data show that the average duration of effect of injections increased from 122.1 days prior to sur-

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**Table 1. Response of Patients With Facial Dyskinesia to Botulinum Toxin and Eyelid Surgery**

<table>
<thead>
<tr>
<th>Patient No./ Age, y/Sex</th>
<th>Duration of BEB Prior to Surgery, y</th>
<th>Type of Surgery</th>
<th>Overall Subjective Improvement per Injection, %</th>
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<td>4 Upper eyelids</td>
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<td>8/77/M 77/M 10 Levator advancement</td>
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<td>11 Upper eyelids</td>
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*BEB indicates benign essential blepharospasm. Ellipses indicate data not applicable.

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**Table 2. Number of Botulinum Toxin Injections and Duration of Response of Patients With Facial Dyskinesia Undergoing Eyelid Surgery**

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Injections, No. Before Surgery</th>
<th>After Surgery</th>
<th>Dosage of Botulinum Toxin, U Before Surgery</th>
<th>After Surgery</th>
<th>Average Duration of Response to Toxin, d Before Surgery</th>
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<td>2</td>
<td>17.5</td>
<td>17.5</td>
<td>124.6</td>
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*Ellipses indicate data not applicable.
†Patient received only 1 injection and then opted for surgery.
‡Patient died approximately 6 months after surgery.
surgery to 210.5 days after surgery. Eyelid surgery may decrease the mean dose of botulinum toxin (37.1 U prior to surgery vs 33.9 U after surgery) necessary after surgery. All patients required continued botulinum toxin treatment.

The ameliorating effects of eyelid surgery are probably because of overall improved eyelid function, resulting from correction of the underlying eyelid defect. Due to the small number of patients in each surgical group, it cannot be determined whether one form of eyelid surgery was more effective than another.

Nonetheless, this study suggests that patients who have (1) suboptimal response to injections in terms or duration of effect and degree of improvement or (2) moderate to marked dermatochalasis with subjective heaviness of the eyelids may be candidates for upper-eyelid blepharoplasty and/or limited myectomy.1-4 These data along with other studies1-4 prove that any eyelid surgery improves the quality of life of patients with facial dyskinesias.

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REFERENCES