Blepharospasm, a focal dystonia characterized by involuntary orbicularis oculi muscle spasms, may vary in severity from a slightly bothersome condition to a disabling disorder that renders patients functionally blind. Botulinum toxin (BTX) injection, the gold-standard treatment, has a beneficial effect in 95% of patients. Oral medication is of limited efficacy. For individuals that do not respond, eyelid myectomy or upper-lid orbicularis muscle strip with subsequent eyebrow suspension are possible therapeutic options, although not always with acceptable results. Herein, we present the first case report of globus pallidus interna (GPi)-DBS surgery for isolated blepharospasm.

Case Report

A 63-year-old man with a 1-year history of involuntary contractions of right periorbital muscles, spreading subsequently to both eyes, was presented for the first time to our movement disorder clinic in September 2009. His past medical history was unremarkable, with no family history of dystonia and no exposure to antidopaminergic drugs. His neurological examination was normal with the exception of a blepharospasm of mild severity. Pharmacological treatment was started (clonazepam till 1.5 mg/day) as well as BTXA injection in orbicularis and tarsalis (Botox, 100 U; Dysport, 360 U) and subsequently BTXB (Neurobloc, 7,000 U) with a moderate effect. With time, there was a progressive worsening of blepharospasm. Electromyography (levator palpebrae superiors, orbicularis oculi) showed dystonic discharges of orbicularis, consistent with a blepharospasm diagnosis. Brain MRI was normal. During a 4-year period, he received repeated BTX injections and was submitted to two oculoplastic surgeries (myectomy and frontal suspension). Nonetheless, his condition was aggravated and rendered him functionally blind with a Jankovic rating scale of 4 (severity and frequency) bilaterally (see Video 1, Segment A). In October 2013, he was considered refractory to medical therapy and bilateral GPi-DBS was performed. As described previously, stereo- tactic surgery was undertaken under general anesthesia with a Leksell G frame (Elekta Instruments AB, Stockholm, Sweden). Images of stereotactic CT scan and previous MRI were fused. Target coordinates were chosen by direct visualization in MRI. Standard burr holes and dura mater incisions were made, and central, anterior, and lateral recording electrodes were introduced. Intraoperative microrecording was used to define the neurophysiological borders of GPi. Macrostimulation was performed to find the threshold for internal capsular response. The lateral trajectory was the most favorable bilaterally. Definitive electrodes (model 3389; Medtronic, Inc., Fridley, MN) and an Activa RC IPG (Medtronic) were implanted. An implantable pulse generator was programmed on the first postoperative day (left: GPi 8 - 3V / 60μs / 130Hz; right: GPi 0 - 3V / 60μs / 130Hz) and blepharospasm improved gradually over the subsequent weeks achieving a Jankovic rating scale of 1 (severity) and 2 (frequency) on the left eye and of 1 (severity and frequency) on the right eye (see Video 1, Segment B). However, a progressive loss of benefit for the left eye was noted at the seventh month postsurgery. Fusion of postoperative stereotactic CT to preoperative MRI using FrameLink and OPTIVISE (Medtronic) demonstrated a correct positioning of the left electrode within the posteroventral lateral GPi, whereas the right electrode took a more lateral trajectory ending within the GPe (Fig. 1). Based on image fusion, we selected the two contacts of the right electrode in closest proximity to the GPi and tried an interleaving stimulation protocol (right: GPi 0 - 3.5V / 60μs / 125Hz; 1 - 4V / 90μs / 125Hz; left: GPi 8 - 5.5V / 90μs / 125Hz). After changing the stimulation parameters, the patient's condition improved, achieving a Jankovic rating scale of 1 (severity) and 2 (frequency) on the left eye and of 1 (severity and frequency) on the right eye (see Video 1, Segment C). Further stimulation parameters were optimized in the third month, resulting in a Jankovic rating scale of 1 (severity) and 1 (frequency) on both eyes. Electrical stimulation was maintained at this level for 13 months. Due to a reduction in MTX dose, we attempted to wean the patient off DBS. When DBS was turned off, blepharospasm worsened sharply within 2 years, resulting in a Jankovic rating scale of 4 (severity) and 3 (frequency) bilaterally. MTX dose was increased back to the previous level, but severe side effects required a further dose reduction. Only recently, after a successful 6-month interruption of DBS, have we been able to reduce the MTX dose back to its previous level, with a consequent reduction in blepharospasm severity. It appears that in each of these partial responders, DBS therapy resulted in a significant improvement followed by a relapse when therapy was discontinued.

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and frequency) on the right eye. The progressive reduction of symptoms granted him total independence for activities of daily living. Hence, up to the time of writing (21 months after surgery), it was not necessary to proceed to electrode reposition given that the same score on the Jankovic scale was maintained.

There is a growing interest in using DBS on patients with craniocervical dystonia (Meige syndrome) who became refractory to other forms of therapy.6–11 In 2003, Capelle6 reported on the first case of pallidal DBS for isolated Meige syndrome with marked improvement of oromandibular dystonia and blepharospasm (2 years after surgery Burke-Fahn-Marsden Dystonia Rating Scale [BFMDRS] score improved by 92% for eyes). Reese7 demonstrated sustained benefit (BFMDRS subscore for eyes was improved by 47%) of pallidal neurostimulation in 12 patients with this condition for up to 6 years. In the case series of Ghang,8 (11 patients), Ostrem9 (6 patients), Sako10 (5 patients), and Limota11 (6 patients), positive results were also achieved in patients with Meige syndrome treated with DBS; blepharospasm improved in all them (improvement of 63% in BFMDRS subscores for the eyes at 12 months, 72% in BFMDRS total movement score at 6 months, 84% in BFMDRS total movement score at 49±3.7 months, and 61.8±30.9% in BFMDRS total movement score at 12 months, respectively).

BTX is still the main treatment option for blepharospasm. When it fails, there are not many options. Given the experience of blepharospasm improving with bilateral GPi-DBS in patients with Meige syndrome, DBS surgery can be an acceptably effective therapy for patients with isolated blepharospasm, like it was in our case. The risk of procedure should be weighed cautiously against the potential benefit.

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References

Supporting Information
A video accompanying this article is available in the supporting information here.

Video 1. Video captured and broadcasted with the patient’s written consent, illustrating the most relevant clinical aspects. Segment A: preoperative video showing a bilateral blepharospasm with Jankovic rating scale of 4 (severity and frequency) on both eyes, rendering the patient functionally blind. Segment B: postoperative video showing much improved bilateral blepharospasm with a Jankovic rating scale of 1 (severity) and 2 (frequency) on the left eye and of 1 (severity and frequency) on the right eye.
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