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Botulinum toxin treatment in patients with hemifacial spasm

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Abstract Hemifacial spasm is nearly always a unilateral disease of the facial musculature and is characterized by involuntary tonic or clonic cramps that considerably reduce the affected patient's quality of life. In the past, a number of different conservative and operative therapeutic procedures have been applied for the treatment of hemifacial spasm. In many cases these attempts failed to control the disease permanently or resulted in unwanted, sometimes strong, side effects. We report our own experiences with botulinum therapy in 29 patients with hemifacial spasm (78 therapeutic sessions). In our patients the mean duration of an effect after treatment with botulinum toxin was 18.2 weeks. Side effects were rare. Our results since 1990 at the University of Göttingen demonstrate that subcutaneous application of toxin from *Clostridium botulinum* to involved facial muscles represents a reliable method for successful treatment of hemifacial spasm.

Key words Hemifacial spasm · Botulinum toxin
Clostridium botulinum

Introduction

The clinical findings in hemifacial spasm are characterized by involuntary tonic or clonic spasms of all muscles of one side of the face receiving their innervation from the facial nerve. Spasms usually start periorbitally [4] and may spread caudally in the further course of the disease. This can take any period of time, ranging from hours to years. In a small number of cases, the disease is bilateral. The mean age of patients is about 45 years [7], with women suffering more often than men. Occurrence is very rare in childhood.

Different pathogenic approaches have been taken to elucidate the etiology of hemifacial spasm, although its

interpretation as a psychogenic disease [7] has been abandoned. Among those clinicians looking for an organic cause of hemifacial spasm, most authors agree today on an intracranial irritation of the facial nerve caused by a pulsating vascular loop [13].

The therapeutic concepts suggested for hemifacial spasm are manifold. They range from medical treatment with such drugs as carbamazepine [1], alcohol blocks or targeted surgical transections of the facial nerve [9] to myectomies of the periorbital muscles [14]. Jannetta et al. [13] have proposed a therapy based on the relief of intracranial nerve irritation by a vascular loop (mostly the anterior inferior and posterior cerebellar arteries). They then performed surgical decompression of the facial nerve, placing an interposition graft between the vascular loop and facial nerve. This operation has a low recurrence rate, which according to several authors ranges from 3% to 25% [10, 18]. Its disadvantage lies in the potential side effects of the surgery involved with persistent impairment of hearing and facial nerve paralysis predominating.

A completely different therapeutic approach was first reported in 1981 by Scott [22]. As a purely symptomatic therapy, a targeted, selective weakening of the muscles affected by the hemifacial spasm was performed by subcutaneous injections of botulinum toxin (BT). The main advantage of this technique was its easy performance. Complications, if occurring at all, were only temporary. Its disadvantage was that the effect of BT was not permanent, necessitating repetition of therapy after varying time intervals. Since 1990, patients with hemifacial spasm have been treated at the University ENT Hospital in Göttingen by subcutaneous injections of BT.

Patients and methods

From September 1990 until February 1993, 29 patients suffering from hemifacial spasm were treated by injections of botulinum toxin type A (Botox, Allergan, USA) at the University ENT Hospital, Göttingen. Their ages ranged from 34 to 81 years, with a median of 61.5 years and a mean of 59.5 years. Nineteen patients were women, and 10 were men.

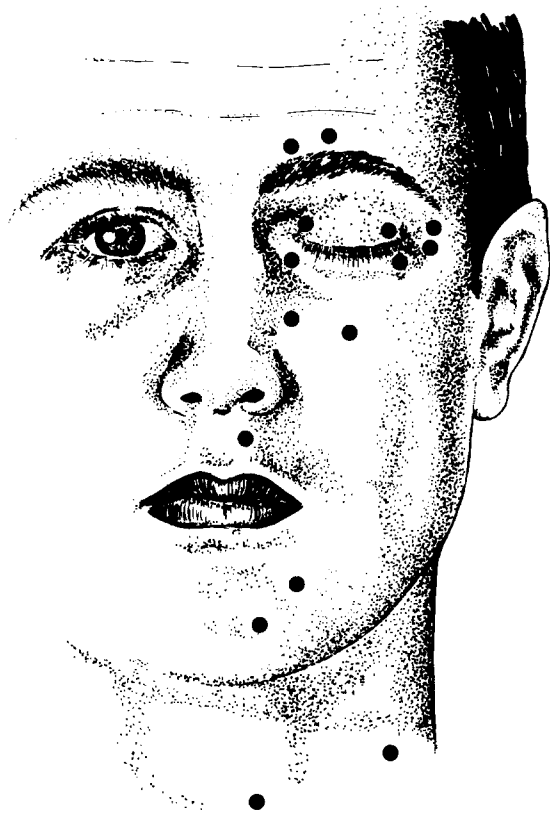


Fig. 1 Injection points chosen for therapy of hemifacial spasm

A total of 78 therapeutic sessions were performed with all patients. Individual patients received Botox doses between 5 and 40.5 units (mean=22.25 units) by injection into the region of the affected facial muscles. The number of injection points varied from a minimum of 2 to a maximum of 17 sites (mean, 10.6 injection points).

Figure 1 is a schematic illustration of the positions of the individual injection points. The doses applied at these sites varied between 1.25 and 5 units of BT. Solutions used for injection were prepared by dissolving 100 units of lyophilized Botox in 4 ml of 0.9% saline (final concentration, 2.5 units/0.1 ml solution).

In order to evaluate therapeutic success, all patients were asked before and after the first therapeutic session to rate the degree of their impairment according to a quantitative, subjectively graded scale. This scale distinguishes between four different grades of hemifacial spasm, beginning with a stage of rare contractions up to a stage of nearly continuous spasms [6, 21]. Following BT treatment, patients were hospitalized for 2 days for observation. The patients themselves determined the interval between the first and second injections, depending on the severity of the symptoms.

Results

Hemifacial spasm occurred on the left side of the face in 13 cases (45%), and on the right side in 16 cases (55%). The time lags between initial disease symptoms and first toxin application, as revealed by history, varied from 1 to 33 years for all 29 patients. Altogether 35 previous therapeutic attempts by various techniques had been attempted before patients presented for further treatment. Among the prior approaches used, drug therapies (33%) and acupuncture (29%) were the most frequent.

Table 1 Factors triggering contractions in hemifacial spasm

Light	6 patients
Stress	11 patients
Cold	1 patient
Innervation	8 patients
Reading	2 patients
Exposure to wind	1 patient

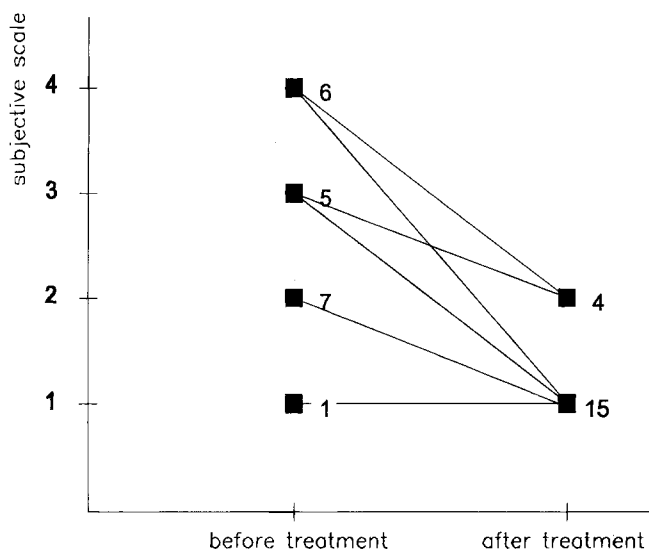


Fig. 2 Subjective assessment of hemifacial spasm by 19 patients before and after first botulinum toxin injections (1 = rare contractions, 2 = more frequent contractions, 3 = contractions several times per hour, impairing, 4 = nearly continuous contractions causing marked impairment)

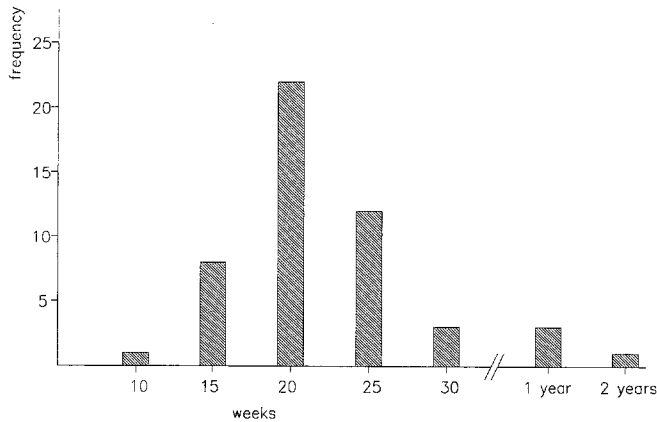
After careful history, trigger factors causing contractions of the facial muscles were determined in 14 patients (Table 1). The most common factor was a stress reaction (78.6% of cases).

Nineteen of the 29 patients (65.5%) subjectively rated their spasm-induced facial impairments before and after the first BT injection (Fig. 2). Administration of the toxin resulted in a self-assessed alleviation of symptoms in 18 cases (94.7%). Only one patient did not feel any difference in his spastic attacks before and after treatment. In this case, however, symptoms were rather slight prior to onset of therapy and consisted mainly of rare contractions which could not be further influenced by treatment with toxin. The frequency of contractions was reduced to significantly fewer spasms in 14 patients (73.7%).

Table 2 presents the results of BT treatment. The onset of the effect produced occurred on average 4.7 days after treatment. The average time during which the BT effect was at its optimum was 12.6 weeks. A further, although weaker, effect extending beyond this optimum period was reported by patients to last for an additional 5.6 weeks. On average the total effective time following BT application was 18.2 weeks. Additionally, 9 of the patients showed a reduction of spasms in mimetic muscles in regions where no injections were given.

Table 2 Course of action following injection of botulinum toxin

	Onset of effect (days)	Duration of optimum effect (weeks)	Duration of weaker effect (weeks)
Max.	14	28	16
Min.	1	2.5	1
Mean	4.7	12.6	5.6
SD	3	4.9	3.7

**Fig. 3** Time intervals between botulinum toxin injections**Table 3** Side effects after injection of botulinum toxin

Hematoma	2%
Tearing	12%
Ectropium	0%
Diplopia	0%
Ptosis	2%
"Burning eyes"	10%
Initial, incomplete lid closure	20%
Foreign body sensation	4%
Light sensitivity	2%
Weakness of the mouth angle	4%
None	64%

Intervals between injections, as determined by the patients, ranged from 10 weeks to 2 years, with a mean of 22.5 weeks (Fig. 3). Side effects after BT applications were observed in 46% of cases (Table 3). The most common side effect was incomplete lid closure immediately after the injection, but this effect lasted for only a maximum of 6 weeks. If necessary, this could be compensated for without problems by local measures. Local discomfort (as tearing or "burning eyes") was reported, but in no case did more serious complications of the eyes or facial muscles develop.

Discussion

Subjectively, 95% of our patients experienced relief of spastic symptoms following the first BT injections. In particular, patients suffering from nearly continuous con-

tractions of the facial muscles prior to treatment reported sometimes dramatic reductions in the number and severity of disabling attacks, or were even symptom-free. These observations confirm the findings in a number of other reports [2, 3, 6, 19, 21, 23]. The time of onset for the therapeutic effect after toxin application occurred at a mean of 4.7 days and was nearly identical to that reported by Elston [8].

In addition to a reliable response to BT the length of its spasmolytic effect has had great influence on the clinical picture of hemifacial spasm. The mean optimum effective period of BT action was 12.6 weeks in our present investigation, and is within the time range found in previous studies [19, 20, 23]. In this connection, however, it must be kept in mind that the studies published so far on BT therapy for hemifacial spasm show variations with regard to the patients treated, the injection technique used and standard injection doses [23]. This creates problems for direct comparison of treatment results.

The side effects observed during BT therapy of hemifacial spasm can be divided into three groups [17]: (1) side effects arising from injections either too deep or too close to neighboring structures; (2) aggravation of pre-treatment symptoms affecting the eyelid; (3) initial over-correction leading to post-treatment paralysis of the orbicularis oris muscle.

The side-effects listed in Table 3 correspond to those reported thus far in the literature [16], but more serious disorders such as ectropium or diplopia images were absent.

That there were reductions of spasm in muscles of the face where no injections were given is in concert with the results of other authors [19]. We can only speculate that the trigeminal nerve might be involved in such mechanisms.

We believe that treatment of hemifacial spasm with local injections of BT is an effective therapy for this disease. In contrast to the various drug therapies reported, the responses of our patients are in keeping with toxin applications. This observation agrees with the results of Jankovic and Orman [11], who were able to document the efficacy of BT type A in a double-blind study. The rate of success of toxin treatment also compares favorably to that achieved after surgical decompression of the facial nerve [12, 13]. In addition to personal ratings by affected patients, the course of the disease can also be documented by electromyographic investigations [5, 15]. After introducing BT injections into the clinical treatment of hemifacial spasm, there now exist two effective therapeutic approaches: surgical decompression as a causal treatment and toxin injection as a symptomatic therapy.

Surgical decompression of the facial nerve is a "causal" treatment of hemifacial spasm. After successful operation, further therapy of the disease is usually not necessary. For its successful and safe performance, however, this kind of surgery requires very advanced neurosurgical knowledge and skill, and the complexity of the operation may involve a high incidence of side effects.

In contrast, only slight and always transient side effects were found following local application of BT. The com-

plication rate in our present study was lower than after intracranial decompression [10, 18]. BT application for hemifacial spasm is relatively easy to perform and can be done on an outpatient basis, making this approach even more advantageous. One is therefore able to offer a therapy that is at the same time not too expensive and is relatively stress-free. However, as opposed to surgical decompression, the patient must be informed of the necessity for repeated injections over time. Precise information, given individually to each patient by the attending physician, is the main factor for selecting proper therapy.

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