

# Botulinum toxin treatment for a compensatory hyperhidrosis subsequent to an upper thoracic sympathectomy

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**BACKGROUND:** Compensatory hyperhidrosis is the commonest complication of sympathectomy, but there's no known effective treatment.

**METHODS:** Botulinum toxin type A (a total dose of 300 MU, 1.0 MU/cm<sup>2</sup>) was used successfully to treat a 68-year-old male with a 5-year history of compensatory hyperhidrosis of the anterior chest following thoracic

sympathectomy for palmar hyperhidrosis.

**RESULTS:** The hyperhidrosis resolved for 8 months without systemic side effects.

**CONCLUSION:** Intracutaneous injection of botulinum toxin is a fast, safe, effective and well-accepted approach for treatment of compensatory hyperhidrosis. (*J Dermatol Treat* (2002) 13: 91–93)

Received 4th September 2001  
Revised 24th October 2001  
Accepted 6th November 2001

**Keywords:** Botulinum toxin — Compensatory hyperhidrosis

## Introduction

Excessive sweating beyond requirement for thermoregulation, although lacking a precise definition and of unknown aetiology, affects approximately 0.6% to 1% of the population.<sup>1</sup> It can disrupt professional and social life and may lead to emotional problems. Treatment is difficult, and conservative therapies, using commercial topical applications that contain aluminium chloride or aluminium chlorohydroxide, iontophoresis, or systemic anticholinergics are often imperfect and temporary in their effects. Endoscopic, transthoracic sympathectomy for palmar and axillary hyperhidrosis has been a standard therapy in recent years. However, the complications resulting from this approach, such as Horner's syndrome, brachial plexus injuries, pneumothorax and compensatory hyperhidrosis, are sometimes severe and disabling.<sup>2</sup> The most common complication is a compensatory hyperhidrosis in other areas of the body, notably the back, abdomen, chest, face, thighs, and buttocks.<sup>3</sup>

The incidence of compensatory hyperhidrosis after

sympathectomy also varies with temperature, humidity and activity; this has ranged from 44% to 91% of patients, depending on the study cited.<sup>4–6</sup> Such a high prevalence post-sympathectomy leads some surgeons to the conclusion that compensatory hyperhidrosis is not a complication but is a natural neurological sequel after such an intervention. The pathophysiological mechanisms underlying compensatory hyperhidrosis are incompletely understood.<sup>3</sup> Furthermore, it is irreversible and there is no known effective treatment.

We describe our successful experience using botulinum toxin therapy in a patient with compensatory hyperhidrosis.

## Case history

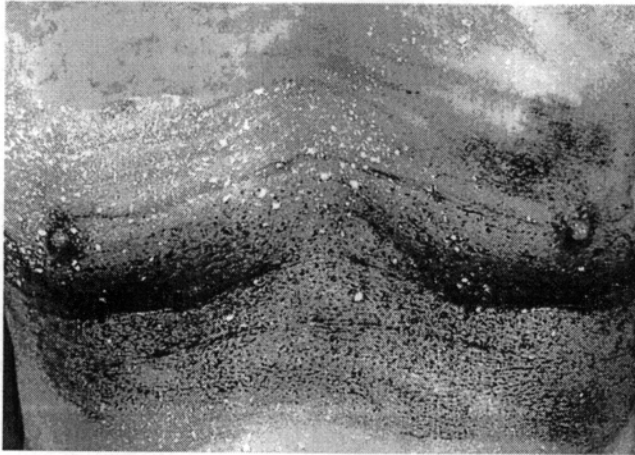
A 68-year-old male presented with a 5-year history of excessive bilateral sweating of the anterior chest wall subsequent to an upper thoracic sympathectomy for palmar hyperhidrosis. None of the conservative therapies such as 20% aluminium chloride hexahydrate (DriClor<sup>®</sup>, Stiefel Laboratories, Sligo, Ireland), systemic anticholinergics, or iontophoresis provided adequate relief of the hyperhidrosis. Therefore, we decided to use intracutaneous injections of botulinum toxin.

The hyperhidrotic area, as indicated by Minor's starch-

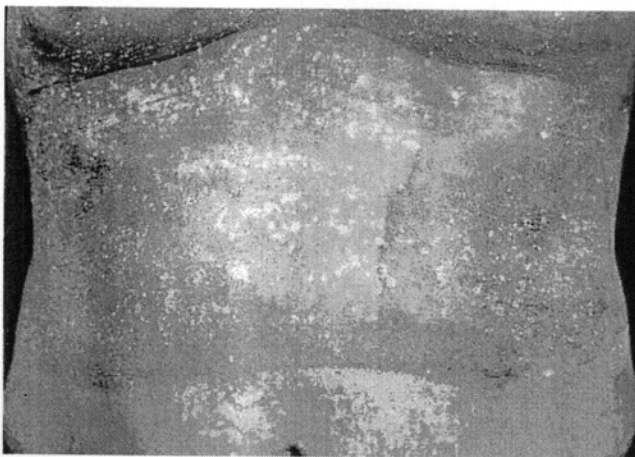
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iodine test (Figure 1), was subdivided into squares of 1 × 1 cm each with a marking pen. To reduce pain, EMLA® (Astra Pharmaceuticals, LP, Wayne, USA) was used. After sterilizing the skin, one mouse unit (MU) of botulinum toxin type A (Botox®, Allergan, Irvine, USA; 100 MU per vial with a diluent of 10 ml of 0.9% sterile, preservative-free, normal saline added for a final dose per 0.1 ml of 1.0 MU) was injected intracutaneously into each marked square of the skin with a 30-G needle. A total of 300 separate sites were injected with a maximum total dose of 300 MU.

After 1 week, the patient indicated a resolution of the sweating (Figure 2), and no systemic side effects were experienced. This anhidrotic effect persisted for the subsequent 8 months and required no booster injections in that time.



**Figure 1**  
Compensatory sweating visualized by Minor's starch-iodine test before treatment with botulinum toxin.



**Figure 2**  
Hyperhidrosis is completely abolished 1 week after botulinum toxin injection.

Using a visual analogue scale, the therapeutic effects were also evaluated by the patient. The patient was 90% satisfied with the results after 1 week, 80% after 1 month, and 50% after 8 months.

## Discussion

Botulinum toxin, a product of *Clostridium botulinum*, is a neurotoxin that acts by blocking the release of the neurotransmitter acetylcholine at the motor endplates of the neuromuscular junction and cholinergic autonomic nerve terminals. Seven distinct antigenic botulinum toxins (BTX-A, B, C, D, E, F and G) that are produced by different strains of *C. botulinum* have been described. The human nervous system is susceptible to five toxin serotypes (A, B, E, F and G) and unaffected by two (C and D).<sup>7</sup>

Botulinum toxin therapy has been used recently as a successful treatment in a variety of conditions, including blepharospasm, strabismus, focal dystonias, spasmodic dysphonia, achalasia, Frey's syndrome, palmar or axillary hyperhidrosis and facial wrinkles.<sup>8</sup>

The mechanism of the therapeutic effect of botulinum toxin on hyperhidrosis is not clear, but it is believed to block the release of acetylcholine from presynaptic cholinergic nerve fibres that innervate sweat glands. Cell death does not result from the binding of the toxin or its effects, and neurons will regenerate synapses by sprouting new terminal buds or endplates. Consequently, the effects of botulinum toxin are temporary.<sup>9</sup> We observed the beneficial effects of the injections were gradually reduced, but remained for 8 months.

Determining the level of the dose in cases of localized hyperhidrosis is still rather arbitrary and is based on the experience of the physician. Bjerkhoel and Trobbe<sup>10</sup> reported that the injection of 1.2 MU/cm<sup>2</sup> at 2-cm intervals resulted in an insufficient effect. Therefore, many clinicians prefer to inject 2 MU/cm<sup>2</sup> at 2-cm intervals in the case of hyperhidrosis. In another study where botulinum toxin was used for the treatment of compensatory hyperhidrosis after sympathectomy, an injection aliquot of 20 MU Dysport® (Speywood Pharmaceuticals, England),<sup>11</sup> which corresponded to 5 MU Botox®,<sup>12</sup> was chosen. We prefer to inject 1 MU/cm<sup>2</sup> at 1-cm intervals to distribute the toxin more evenly and found this method effective.

With regard to injection depth, we injected intracutaneously similarly to most previous authors because the sweat glands are located between the corium and the subcutaneous layer; a deeper injection might result in a higher rate of diffusion of the toxin to underlying cholinergic neuromuscular junctions.

In conclusion, we found that intracutaneous injection of botulinum toxin is a fast, safe, effective and well-accepted approach for treatment of compensatory hyperhidrosis. Additional studies are required to establish the long-term benefits of this treatment.

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