

Local neural block at the wrist for treatment of palmar hyperhidrosis with botulinum toxin: Technical improvements

Anna Campanati, MD,^a G. Lagalla, MD,^b L. Penna, MD,^a R. Gesuita, PhD,^c and A. Offidani, MD^a
Ancona, Italy

Background: Wrist blockage of median and ulnar nerves before treatment of palmar hyperhidrosis with botulinum toxin (BTX-A) reduces discomfort and improves accuracy of BTX-A injections, but can be associated with mechanical/chemical injury.

Objectives: We sought to compare locoregional anesthesia of median and ulnar nerves using conventional 25-G × 0.50 × 13 mm gauge needle with short 30-G × 0.40 × 6 mm gauge needle.

Methods: In all, 37 patients with idiopathic, recalcitrant palmar hyperhidrosis were treated with BTX-A after median and ulnar nerve blockage. In 18 patients, a conventional needle was used to achieve nerve blockage and in 19 the short needle was used. The 2 groups of patients were compared for analgesic effects and lag phase.

Results: No differences were found between groups for lag phase ($P = .26$) and discomfort of subsequent BTX-A treatment ($P = 1.0$).

Conclusion: The use of a short-gauge needle to block median and ulnar nerves is a suitable method to anesthetize the palm before treatment with BTX-A. (J Am Acad Dermatol 2004;51:345-8.)

Botulinum toxin (BTX-A) has radically changed the treatment of patients who are hyperhidrotic, but pain during injections represents one of the most important limiting factors in its application for the treatment of palmar hyperhidrosis.¹⁻⁸ The series of injections through the densely innervated skin of the palms is often rated as very painful, even if topical anesthetic cream, ethyl chloride liquid spray, cold packs, or a combination of these are applied.^{1-3,6,8,9} For this reason the use of locoregional anesthesia of the median and ulnar nerves before the treatment is often used.^{1,6-8,10-12} However, blockage of the ulnar and median nerves at the wrist can be associated with a risk of mechan-

ical and chemical neural damage^{13,14} as a result of the deep injections of anesthetic. However, if direct injection into the nerve can be avoided then this risk would be greatly reduced.⁷

If the topographic anatomy of the wrist is considered from the deepest area to the surface, the median nerve is covered by deep fascia, tendon of the palmaris longus, ligamentum carpi transversum, subcutaneous connective tissue, and cutis; and the ulnar nerve is covered by tendon of the flexor ulnaris carpi, ligamentum carpi transversum, subcutaneous tissue, and cutis. The conventional needle used to deliver the BTX-A is the 25-G × 0.50 × 13 mm gauge needle, and obviously the longer the needle used, the deeper into these tissues it will penetrate. The aim of this study was to evaluate the effectiveness of locoregional anesthesia obtained using a shorter needle (30-G × 0.40 × 6 mm gauge), to determine whether the anesthetic effects were similar. If so, then the shorter needle could be used, thus minimizing the risk of neural damage through the injection technique.

MATERIALS AND METHODS

A total of 37 patients (27 women and 10 men) with idiopathic palmar hyperhidrosis resistant to any prior

From the Departments of Dermatology^a; Neurology^b; and Epidemiology, Biostatistics, and Medical Information Technology,^c University of Ancona.

Funding sources: None.

Conflicts of interest: None identified.

Accepted for publication September 2, 2003.

Reprint requests: Anna Campanati, MD, Clinica Dermatologica, Largo Cappelli 1, Ancona, 60123, Italy. E-mail: campana@freefast.it.

0190-9622/\$30.00

© 2004 by the American Academy of Dermatology, Inc.

doi:10.1016/j.jaad.2003.09.006

Table I. Demographic details of patients included in the study and results of analysis of lag phase and pain levels

Variables	Short needle (n = 19)	Conventional needle (n = 18)	P value
Age (y) (median 25th-75th percentile)	25 (23-35)	28.5 (21-35)	.73*
Male sex (%)	5 (26.3)	5 (27.8)	1.00†
Lag phase (min) (median 25th-75th percentile)	30 (30-35)	30 (25-35)	.26*
Pain level 1 (%)	6 (31.6)	5 (27.8)	1.00†

*Wilcoxon rank sum test.

†Fisher's exact test.

topical treatment were included in the study and treated with BTX-A injections. Ethics committee approval was obtained and all patients provided informed consent. Patients were excluded from the study if they were pregnant or nursing women, if they had secondary hyperhidrosis or neuromuscular changes, or if they were using systemic medications that could interfere with neuromuscular activity.

In all patients the hyperhidrotic area was evaluated by the Minor iodine starch test and then subdivided into squares of 1.5×1.5 cm (2.25 cm²). A total of 100 mouse units (MU) of lyophilized BTX-A (BOTOX, Allergan, Irvine, Calif) was diluted in 5 mL of sterile 0.9% saline solution. A total of 0.10 mL (2 MU) was injected intracutaneously into each 2.25 -cm² area using a single injection with a 30-G \times 0.30 \times 4 mm gauge needle.

The locoregional block of both median and ulnar nerves was performed in all patients who underwent BTX-A treatment. The patients were randomized into 2 groups. Group 1 consisted of 18 patients who received locoregional block of median and ulnar nerves using the conventional technique (3 mL of lignocaine 2% diluted in 3 mL of saline sterile solution injected at the wrist using a 25-G \times 0.50 \times 13 mm gauge needle).^{7,8} The second group of 19 patients underwent locoregional anesthesia using the same dosage of lignocaine at the same injection sites but using a 30-G \times 0.40 \times 6 mm—gauge needle. In both groups the patients were asked to bend the wrist, and put the thumb and the 2 last fingers together to accentuate the palmaris longus and flexor carpi radialis tendons. The needle was then inserted perpendicularly to the skin between the palmaris longus tendon and the flexor carpi radialis tendon at the proximal flexion crease of the wrist. Blockage of this nerve made the radial side of the palmar surface of the hand insensitive. To block ulnar nerve the patient was asked to actively bend the wrist to make

the flexor carpi ulnaris tendon more prominent and the needle was then inserted perpendicularly to the skin between the tendon and the ulnar styloid process (to avoid the risk of intraradial artery injection). This block anesthetizes the cubital portion of the palm of the hand, the little finger, and the median half of the fifth finger.^{7,8}

To compare the effects of local anesthesia using these 2 different methods we assessed both the lag phase between the anesthetic injection and the appearance of the analgesic effect, and the patient's impression of the discomfort induced by the BTX-A injections. Subjective evaluation of the pain caused by the BTX-A injections was obtained using a self-administered questionnaire that used a scale of 3 to 0 for each question relating to the degree of discomfort, where 3 = "very much" and 0 = "not at all." The results were then summed, thus providing a global value ranging from 0 to 3, with the higher the score, the greater the discomfort induced by the treatment. The questionnaire was administered to the patients by a clinician external to the study.

Wilcoxon rank sum test was used to compare age and lag phase between groups. Sex and levels of pain were compared using the Fisher's exact test. A level of 5% was used to assess statistical significance. Software (SAS Version 8.2, SAS Inc, Cary, NC) was used to perform all analyses.

RESULTS

The 2 groups were similar both for age and sex distribution ($P = .73$ and $P = 1.00$, respectively). In the analysis of the lag phase between the time of injection of the anesthetic and the onset of effect, no differences were found between the 2 needle types (median lag time of 30 in both groups, $P = .26$). Patients felt pain at low levels in both groups with the subsequent BTX-A injections, although the proportions experiencing pain was similar using the 2 types of needles ($P = 1.00$) (Table I).

DISCUSSION

BTX-A injection is a new, safe, and effective therapeutic option for the treatment of palmar hyperhidrosis.^{1-11,13-15} However, one of the main disadvantages of this treatment is the degree of pain experienced during injections, which is related to the abundance of free nerve endings located in the papillary dermis of the palms.^{3,5,9} A subcutaneous injection of BTX-A would be more comfortable^{2,9}; however, intracutaneous administration is the most appropriate procedure for palmar hyperhidrosis to deliver the toxin as close to the sweat glands as possible and to reduce the risk of causing muscular weakness and weakening of the grip.^{3,4,9,10}

Neural blockage provides sufficient analgesia to make an accurate injection of BTX-A in the papillary dermis of the palms, reducing the diffusion to the underlying muscles and avoiding the risk of injecting the toxin into the capillary networks of the fingertips.⁹ Moreover, neural blockage and the subsequent analgesic effect allows optimization of the BTX-A treatment by increasing the number of injection points possible and, thus, allowing a reduction of the dose injected at each point, as suggested by several authors.^{2,5,10,11,15} For these reasons most clinicians routinely use ulnar and median nerve blockage for the treatment of palmar hyperhidrosis with BTX-A.^{1,4,6-11} However, the median disease-free interval after treatment with BTX-A for palmar hyperhidrosis is 6 to 8 months¹ (with doses ranging from 120-220 MU), so treatment has to be repeated sometimes 2 or 3 times a year to maintain good clinical effects. Therefore, some authors prefer to use different methods to reduce pain during the treatment, such as topical anesthetic cream, cold packs, ethyl chloride cooling spray liquid, or a combination of these^{2,3,13} because repetition of nerve blockage can increase the risk of neural injury caused by mechanical or chemical damage.¹³

No cases of median and ulnar nerve damages caused by the wrist block before a BTX-A treatment have been reported; however, the occurrence of these iatrogenic lesions seems to be the same as those generally reported for median and ulnar wrist block.

The risk of transient or permanent nerve damage after the block at the wrist seems to be lower than reported after brachial plexus block, which is estimated to vary from 2.1% to 9%.¹⁶ However, Kim et al¹⁷ reported that in 49 patients who underwent operation for median nerve lesions at wrist level, 9% had iatrogenic injury as a result of a direct needlestick trauma, noxious reaction to the substances injected, or vascular complications from local compressive injury.

All these data state that median and ulnar nerve damage risk does exist during the wrist block.

Unfortunately, cold packs, topical anesthetic cream, and ethyl chloride cooling spray liquid, however, do not provide sufficient analgesia to make BTX-A injections significantly less painful^{1-3,8,13} and patients do not find them satisfactory. Thus, there is a need to find an appropriate method of anesthesia for repeated treatment sessions in palmar hyperhidrosis.^{5,13,14} Owing to the anatomic structure of the wrist, the use of a shorter 30-G \times 0.40 \times 6 mm gauge needle to administer the anesthetic in proximity of the median and ulnar nerve reduces the potential risk of injecting directly into the nerves and

the associated risk of mechanical and chemical neural damage.

The discomfort of BTX-A injections perceived by patients after receiving locoregional anesthesia using the short needle were mainly "null" or "little" and was comparable with that experienced by patients who underwent nerve blockage using the conventional needle size. Moreover, no increase in time to anesthetic effect was observed using the short needle, because the lag phase between the injection of the anesthetic and the appearance of analgesic effect was similar the conventional anesthetic procedure.

CONCLUSION

Further studies on a larger number of patients should be performed, but the results of this preliminary study show that the use of a short needle to obtain local blockage of the median and ulnar nerves is potentially the preferential technique. This is because it permits the controlled release of anesthetic at a safer distance from the nerves compared with the conventional technique and it achieves a good level of analgesia without any increase in the overall time to carry out the whole BTX-A procedure.

We thank Drs Anne Hodgkins and Debbie Jordan for writing and editing assistance.

REFERENCES

1. Naumann M, Bergman I, Hofman U, Hamm H, Reiners K. Botulinum toxin for focal hyperhidrosis: technical considerations and improvements in application. *Br J Dermatol* 1998; 139:1123-4.
2. Schneider P, Binder M, Auff E, Kittler H, Berger T, Wolff K. Double-blind trial of botulinum toxin A for the treatment of focal hyperhidrosis of the palms. *Br J Dermatol* 1997;136: 548-52.
3. Solomon BA, Hayman R. Botulinum toxin type A therapy for palmar and digital hyperhidrosis. *J Am Acad Dermatol* 2000; 42:1026-9.
4. Heckmann M, Schaller M, Plevig G, Ceballos-Naumann A. Optimizing botulinum toxin therapy for hyperhidrosis. *Br J Dermatol* 1998;138:544-64.
5. Odderson IR. Hyperhidrosis treated by botulinum A exotoxin. *Dermatol Surg* 1998;24:1237-41.
6. Naumann M. Evidence-based medicine botulinum toxin in focal hyperhidrosis. *J Neurol* 2001;248(Suppl):131-3.
7. Fujita M, Mann T, Mann O, Berg D. Surgical pearls: use of nerve blocks for botulinum toxin treatment of palmar-plantar hyperhidrosis. *J Am Acad Dermatol* 2001;45:587-9.
8. Trindade de Almeida ART, Kadunc BV, Martins de Oliveira EM. Improving botulinum toxin therapy for palmar hyperhidrosis: wrist block and technical considerations. *Dermatol Surg* 2001; 27:34-6.
9. Shelley WB, Talanin NY, Shelley ED. Botulinum toxin therapy for palmar hyperhidrosis. *J Am Acad Dermatol* 1998;38:227-9.
10. Naver H, Swartling C, Aquilonius SM. Palmar and axillary hyperhidrosis treated with botulinum toxin one-year clinical follow-up. *Eur J Neurol* 2000;7:55-62.
11. Naver H, Aquilonius SM. The treatment of focal hyperhidrosis with botulinum toxin. *Eur J Neurol* 1997;4(Suppl):S75-9.

12. Hernot S, Samii K. [Different types of nerve injuries in loco-regional anesthesia.] *Ann Fr Anesth Reanim* 1997;16:274-81.
13. Schnider P, Moraru E, Kittler H, Binder M, Kranz G, Voller B, et al. Treatment of focal hyperhidrosis with botulinum toxin type A: long-term follow-up in 61 patients. *Br J Dermatol* 2001;145:289-93.
14. Klein AW, Glogau RG. Botulinum toxin beyond cosmesis. *Arch Dermatol* 2000;136:487-90.
15. Goldmann A. Treatment of axillary and palmar hyperhidrosis with botulinum toxin. *Aesthetic Plast Surg* 2000;24:280-2.
16. Delaunay L, Chelly JE. Blocks at the wrist provide effective anesthesia for carpal tunnel disease. *Can J Anesth* 2001;48:656-60.
17. Kim DH, Kam AC, Chandika P, Tiel RL, Kline DG. Surgical management and outcomes in patients with median nerve lesions. *J Neurosurg* 2001;95:584-94.

CORRECTION

Goldsmith LA, Bologna JL, Callen JP, Chen SC, Feldman SR, Lim HW, Lucky AW, Reed BR, Siegfried EC, Thiboutot DM, Wheeland RG. American Academy of Dermatology Consensus Conference on the Safe and Optimal Use of Isotretinoin: Summary and recommendations. *J Am Acad Dermatol* 2004;51:900-6 (June)

An incorrect isotretinoin dosage was given for beginning treatment: On page 901, left-hand column, second paragraph under the heading "Conference Proceedings": the sentence beginning "When prescribing isotretinoin..." should read: "When prescribing isotretinoin, he [Lookingbill] advises starting isotretinoin at 0.5 mg/kg/day for the first four weeks of treatment to avoid flares before increasing to the full dosage of 1.0 mg/kg."