Author's reply to the comment on: "The effect of intradermal botulinum toxin on androgenetic alopecia and its possible mechanism"

To the Editor: We read the reply of Carloni et al[1] to "The effect of intradermal botulinum toxin on androgenetic alopecia and its possible mechanism" and are grateful for their interest and the comments on our research.

Carloni et al[2] recently published a systematic review about the use of botulinum toxin in alopecia and the main mechanism of action related to the relaxation of scalp muscle. Authors of previous reports[3-5] speculated that their positive results might be attributed to increased blood flow and oxygen concentration caused by reduced muscle pressure on the perforating vasculature as they injected botulinum toxin into the scalp muscle, including the frontalis, temporalis, periauricular, and occipitalis muscles.

Unlike them,[3-5] we tried to focus on the direct effect of botulinum toxin on the hair follicles, provided that botulinum toxin could inhibit the secretion of transforming growth factor-β1 from the dermal papilla cells, which we confirmed in the in vitro study. Therefore, we made intradermal injections of botulinum toxin, which is expected to block the secretion of transforming growth factor-β1 from the hair bulb, and the injected areas were limited to the alopecic areas approximately 70 to 100 cm^2.

We mentioned the possible diffusion of intramuscularly injected botulinum toxin to the subcutaneous layer to emphasize the location of the hair bulb, including dermal papilla, which exists in the dermal-subcutaneous junction or upper subcutaneous layer. Our study did not put a focus on the neuromodulator effect of botulinum toxin on alopecia because we assumed that the diffusion of toxin to the subcutaneous layer would affect the hair bulb, which was the main target of botulinum toxin in our study.

Although we used a small dose of botulinum toxin per each treatment session, the cumulative dose was 180 U for 6 months. It was as high as Freund et al,[3] but the dosage per unit area might be higher in our study because we only injected toxin within the alopecic area.

This study has limitations in its small sample size and the nature of a pilot study without a control group. Confirmation of the effect of botulinum toxin on the androgenetic alopecia is required through a large-scale randomized controlled study.

Now a phase IIb clinical trial is ongoing under the approval of Korean Food and Drug Administration, and we are investigating further mechanisms regarding the effect of botulinum toxin on alopecia. At the end of the trial, we hope to have more data about botulinum toxin and androgenetic alopecia.

Byung Cheol Park, MD, PhD, and Uri Shon, MD

From the Department of Dermatology, College of Medicine, Dankook University, Cheonan-si, South Korea.

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Correspondence to: Byung Cheol Park, MD, PhD, Department of Dermatology, College of Medicine, Dankook University, Manghyangro 201, Dongnam-gu, Cheonan-si 300-715, South Korea

E-mail: 4exodus@hanmail.net

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