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Views and Practice

Considerations in the aesthetic use of botulinum toxins

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Introduction

Botulinum neurotoxin (BoNT) treatments are currently one of the most popular cosmetic procedures performed worldwide, first coming into clinical use more than four decades ago as a non-surgical treatment for strabismus.[1] Its therapeutic indications have since expanded to include a variety of medical indications such as hyperfunctional muscle disorders, functional indications of headache and excessive sweating, and cosmetic indications including hyperdynamic facial rhytides and masseter hypertrophy. A list of common indications of BoNT-A injections in aesthetic dermatology is shown in Table 1.

Basic pharmacology

Botulinum neurotoxins are biological products that are derived from bacteria, which are purified, processed and stabilised in a complex manufacturing process. Botulinum neurotoxin inhibits the release of acetylcholine at the neuromuscular junction to cause a flaccid paralysis of target muscles. Within a few hours, there is a near-complete loss of motor end-plate potentials, but the clinical effect may not become evident for up to one week after administration.[2] Full onset of action usually occurs approximately 10 to 14 days post-treatment.[3] Although there is irreversible neuromuscular blockade, axonal sprouting and the formation of new neuromuscular junctions result in dissipation of its clinical effects over time.[4] The typical duration of BoNT-A effects is 3-4 months, but varies according to the dose administered, injection technique and individual patient factors.

To date, there are seven known serotypes of BoNT (A-G) of which botulinum toxin type A (BoNT-A) produces the strongest neuromuscular blockade and is the most widely used in clinical practice. There are currently three BoNT-A products used for aesthetic indications: onabotulinumtoxinA, abobotulinumtoxinA and incobotulinumtoxinA. Each of these agents have a unique biological activity and manufacturing process, so although they have similar clinical effects and safety profiles, they differ in the units of dosing, onset of action, degree of diffusion, dilution and storage methods, and duration of effects.[5] Moreover, since there is not yet a clear dose equivalency between different preparations of BoNT-A,[6] any conversion ratios must be interpreted with caution when switching between formulations.

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Considerations for the aesthetic use of botulinum neurotoxins

Facial expression is an important form of non-verbal communication between humans and is controlled by a complex set of superficial facial mimetic muscles that insert directly onto the undersurface of the skin. The repetitive contraction of these muscles over time, coupled with ageing skin results in characteristic furrows (rhytides) that form perpendicular to the direction of contraction. With careful patient selection and proper technique, BoNT-A injections into specific groups of facial muscles can effectively reduce the appearance of unwanted hyperdynamic facial lines in the ageing face, and are associated with high patient satisfaction.

A thorough evaluation of the patient is paramount in achieving good clinical outcomes and patient satisfaction. This begins with a careful medical history, paying attention to the patient's cosmetic concerns, past medical history and prior cosmetic treatments, medications, allergies and propensity to bleeding.

The physician should evaluate the face at rest for an overall assessment of the degree of photoageing, pigmentary changes, volumetric loss and visible (static) wrinkles; and then in motion by asking the patient to perform facial expressions that demonstrate the undesirable lines, such as frowning, grimacing, smiling, squinting, and raising the eyebrows. For facial rhytides, it is important to distinguish dynamic wrinkles that are amenable to BoNT-A injections from deeper static furrows that may require a combination of BoNT-A and dermal filler injections for optimal cosmetic outcomes.

After the initial evaluation, an individualised treatment plan should be formulated to address the patient's short- and long-term aesthetic goals, whether it involves BoNT-A injections and/or other aesthetic procedures such as laser treatment and dermal fillers.

Once a patient is considered likely to benefit from BoNT-A injections, considerable time should be used to discuss the indications of BoNT-A in the patient, the anticipated outcome and realistic expectations, duration of effects, and potential side effects and complications. Feedback from the patient is also important to understand his or her needs and perspectives on relaxing certain facial muscle groups so that the dosing of BoNT-A can be customised.

Table 1. Common indications of BoNT-A in aesthetic dermatology

Region	Indication	Target musculature
Upper face	Glabella frown lines	Glabella complex: procerus, corrugator, depressor supercilii, medial orbicularis oculi, frontalis
	Forehead lines	Frontalis
Mid face	"Crow's feet"	Lateral orbicularis oculi
	Lateral eyebrow lift	Lateral orbicularis oculi
	Nasal scrunch or "bunny lines"	Transverse portion of the nasalis
Lower face	Perioral lip lines	Orbicularis oris
	Lip corner "Marionette" lines	Depressor anguli oris
	Chin lines and "popply chin"	Mentalis
	Masseter hypertrophy	Masseter
Jawline	Anterior platysmal bands	Platysma
Others	Axillary hyperhidrosis	–
	Palmar hyperhidrosis	

Instead of using a "one-dose-fits-all" approach, the goal of BoNT-A injections is to achieve a balance between diminishing unwanted rhytides while retaining a natural appearance in the patient. Taking the example of BoNT-A injections into the glabella complex to reduce glabella frown lines, although most patients are happy to aim for a complete paralysis of the muscles of the glabella complex to smooth out the frown lines, there are some who prefer to retain a degree of activity in the glabella complex so they can frown when they want to. For these patients, the strategy would be to aim for partial relaxation of the muscles of the glabella complex by using lower doses of BoNT-A. However, patients must be made aware that lower doses will result in a shorter duration of clinical effect and thus more frequent injections may be required. In most situations, especially in patients undergoing BoNT-A treatments for the first time, it is actually better to start with lower doses of BoNT-A to aim for as natural an effect as possible, and then review their response in two weeks when the full onset of action has taken place to decide whether higher doses are needed.

Prior to administering BoNT-A injections for the agreed indications, patient information sheets and informed consent documents should be reviewed and signed. Patient photographs should also be taken before any first-time procedure for each patient and thereafter as appropriate, including the face in both resting position and during expression to reveal the dynamic lines that are to be treated. Follow-up evaluation should be planned, usually two weeks after treatment and thereafter when the effects of the neurotoxin have begun to wear off and repeat treatment is likely to be appropriate.

A detailed discussion of the BoNT-A dosing and injection strategies is beyond the scope of this article. Consensus guidelines have been published on the use of onabotulinumtoxinA, abobotulinumtoxinA and incobotulinumtoxinA.[7-9] Readers are urged to review the wealth of information and clinical recommendations developed by the panels of experts for a more comprehensive review on aesthetic evaluation, facial anatomical considerations, BoNT-A dosing and strategies for the injection of BoNT-A products in improving facial aesthetics.

Conclusion

BoNT-A injections for aesthetic improvement can be very satisfying for the patient as well as the physician. Apart from solid knowledge of BoNT-A products, their effects, facial anatomy and aesthetics, the physician should also select patients carefully, educate them about the benefits, potential side effects and limitations of BoNT-A, and customise the strategy and dosing of BoNT-A to suit each individual patient in order to achieve good patient satisfaction and outcomes.

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