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Cosmetic Use of Botulinum Toxin for Upper Face

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ABSTRACT

Botulinum toxin is an injectable neuromodulator derived from neurotoxins produced by the bacterium Clostridium botulinum, which causes botulism. The human face is made up of a complex network of muscles that work together to create facial expressions and perform essential functions. Clinicians who understand facial anatomy and the functional relationships between muscles in the face and neck can use botulinum toxin safely to selectively weaken specific muscles, resulting in favorable cosmetic results.

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INTRODUCTION

Botulinum toxin is an injectable neuromodulator derived from neurotoxins produced by the bacterium Clostridium botulinum, which causes botulism. Botulinum toxin is an effective treatment for aesthetic and medical concerns that are exacerbated by muscle contraction due to the toxin's ability to inhibit neurotransmission between peripheral nerves and muscle tissue.[1]

The human face is made up of a complex network of muscles that work together to create facial expressions and perform essential functions. [2]

Patients who have particular aesthetic issues that can be relieved by local muscle weakening and do not have contraindications to therapy are appropriate candidates for botulinum toxin injection. Patients between the ages of 30 and 50 frequently benefit the most from therapy; a higher incidence of rhytides in older patients may be attributed to loss of skin elasticity, which botulinum toxin alone does not improve.[3]

Once a patient is judged to be a suitable candidate for botulinum toxin therapy, it is critical to ensure that the anatomic placement of injections is right and that the dosages utilized are appropriate depending on the treatment location and patient-specific factors (eg, anatomic variation, patient sex, and preferences regarding the magnitude of effect).[4]

Conservative treatment is preferred; incorrect injection placement or an overdose of botulinum toxin can result in cosmetic or functional defects that last for months.[4]

Botulinum toxin has seven serotypes, two of which are clinically useful (botulinum toxin type A and botulinum toxin type B). Botulinum toxin type A has received the greatest attention for aesthetic applications and is the serotype that will be discussed here.[5]

UPPER FACE

The frontalis is a large quadrilateral muscle that raises the brows and skin over the root of the nose and draws the scalp forward, and the glabellar complex is a group of brow-associated muscles (corrugator supercilii, procerus, depressor supercilii, and orbicularis oculi) used primarily for expression, particularly anger, displeasure, or concern.[6]

Over time, hyperactivity or repetitive activation of these muscles causes the creation of skin wrinkles, which are worsened during muscular contraction (dynamic rhytides). Botulinum toxin can smooth vertical glabellar rhytides (associated with glabellar complex muscle contraction), horizontal forehead rhytides (caused by frontalis muscle contraction), and periorbital lateral canthal rhytides (associated with contraction of the lateral orbicularis oculi muscle). [7]

The first report of botulinum toxin usage for aesthetic purposes was for the treatment of glabellar rhytides. Contraction of the corrugator supercilii and orbicularis oculi muscles, which move the brow medially, and the procerus and depressor supercilii muscles, which draw the brow inferiorly, causes glabellar lines. During therapy, the corrugator supercilii and procerus muscles are commonly addressed. In most individuals, the beneficial benefits of injection extend at least three months. [8]

Although anatomical differences among patients influence the precise placement and number of injections, five injection sites are commonly used to weaken the brow depressors in the treatment of glabellar rhytides. [9] To reduce the risk of

upper eyelid ptosis, all injections should be placed above the supraorbital rim. [10]

The normal dosages of onabotulinumtoxinA (Botox Cosmetic), incobotulinumtoxinA (Xeomin), prabotulinumtoxinA (Jeuveau), and abobotulinumtoxinA (Dysport) suggested by the makers are 20 units, 20 units, 20 units, and 50 units, respectively. However, the dosages needed to produce the intended benefits fluctuate amongst people due to variances in muscle mass or activity. Males often have more muscle mass in the brow than girls, therefore bigger dosages are required to get excellent effects. [11]

Frontalis muscle contraction eventually results in the formation of horizontal creases in the forehead, which are exacerbated by brow elevation. Botulinum toxin injections can reduce the visibility of these lines during muscle contraction as well as at rest.[12]

The objective of therapy is to weaken the frontalis muscle but not entirely paralyze it. Patients that respond well have lower forehead rhytides and can still raise their brows, albeit to a lesser extent. The frontalis muscle should always be treated in combination with the brow depressors when treating horizontal rhytides. Weakening the frontalis muscle without inhibiting the brow depressors might result in unopposed depressor activation and a depressed, angry-looking brow. Patient-specific variables, as as the glabellar region, impact botulinum toxin delivery.[13]

To avoid unfavorable cosmetic outcomes, injections into the frontalis muscle must be placed precisely. Excessive dosing or injection placement too close to the brow can result in facial expression inhibition and brow ptosis.[14]

The orbicularis oculi muscle complex is essential for eyelid closure. Contraction of the orbicularis oculi muscle's lateral fibers results in lines (also known as crow's feet) that radiate from the lateral canthus and are accentuated when smiling. Injections of botulinum toxin into this area can reduce the appearance of these rhytides. Because the orbicularis oculi muscle is diffusely innervated, multiple injections are needed to effectively weaken the muscle. [15]

Brow ptosis, a common aging feature, can cause facial features at rest to mimic angry or scowling expressions. Botulinum toxin can be used to treat brow ptosis because the shape and height of the brow are controlled by the opposing action of the frontalis muscle, which elevates the brow, and the muscles that depress the brow.[16]

The nonsurgical brow lift with botulinum toxin was found by chance while treating glabellar frown lines, when it became clear that treated individuals had central and medial brow elevation. The inactivation of the medial depressor muscles was once assumed to be the cause of brow elevation. However, botulinum toxin-induced weakness of the lower medial frontalis muscle may be responsible for improved resting tone in the rest of the frontalis musculature and subsequent brow elevation. [17]

When the glabellar area is treated without concurrent injection of the frontalis muscle for horizontal forehead lines, brow elevation is typically seen. Furthermore, lateral brow elevation has been reported following injections of the superolateral orbicularis oculi muscle.[18]

Botulinum toxin can be used to widen the ocular aperture by weakening the orbicularis oculi muscle complex, resulting in a wider, rounder eye when smiling or at rest.[19]

More than 4 units of botulinum toxin in the lower eyelid is not suggested owing to an increased risk of side effects. Patients who respond poorly to a preinjection snap test (lower eyelid does not return quickly to the globe after abrupt release from manual downward retraction), patients who are prone to lower lid puffiness, patients who have had ablative laser resurfacing of the lower eyelid, or patients who have had lower lid blepharoplasty without concomitant canthopexy to support the normal eyelid position are poor candidates for this procedure. [19]

CONCLUSION

Clinicians who understand facial anatomy and the functional links between muscles in the face and neck can safely utilize botulinum toxin to weaken particular muscles, resulting in good aesthetic effects.

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