

ABOUT THE AUTHOR

Malika Ladha, MD, FRCPC

Dr. Malika Ladha is a board-certified dermatologist in Toronto. She completed Canada's only official clinical fellowship in Laser Surgery and Aesthetic Dermatology at the University of Toronto. She practices medical and cosmetic dermatology and has an interest in skin of colour. She has been actively involved in various medical organizations, including the Canadian Dermatology Association, Women's Dermatologic Society, and the American Society for Laser Medicine and Surgery.



USE OF NEUROMODULATORS AS AESTHETIC TREATMENT IN THE LOWER FACE

Introduction

Neuromodulator treatment is one of the most common non-invasive aesthetic treatments in dermatology. Botulinum toxin A has been established as a safe and effective treatment for the upper face. It is increasingly used beyond the forehead, glabella and peri-ocular region. The purpose of lower face neuromodulator use is to soften dynamic rhytids, improve facial expression at rest and with animation, and provide facial contouring. There is significant interplay between the muscles of the lower face for expression and function; therefore, careful administration of botulinum toxin A is necessary to avoid adverse effects. This article reviews off-label botulinum toxin A treatments to the peri-oral region, chin and masseter. For the purposes of the article, all dosing provided is for onabotulinum toxin A.

Peri-oral Region

The peri-oral region is a facial cosmetic unit, extending from the base of the nose to the labiomental crease. Muscles in this area include: levator labii superioris alaeque nasalis (LLSAN); orbicularis oris; depressor anugli oris (DAO); depressor labii inferioris (DLI); risorius; zygomaticus major; and zygomaticus minor.

LLSAN – “Gummy Smile”

The LLSAN enables flaring of the nostril and elevation of the upper lip. A hyperactive LLSAN can lead to excessive gingival show when smiling, colloquially known as a “gummy smile” (**Table 1**). This is clinically defined as maxillary gingiva exposure > 2 mm above the dental line during a smile.^{1,2}

Treatment to the LLSAN with botulinum toxin A reduces muscle activity, thereby decreasing gingival show with smiling. Various treatment protocols exist, with dose ranging from 2–5 units per side.³ The injection point is located 3 to 5 mm lateral each nostril (**Figure 1**).¹ Dosing should be adjusted to account for any asymmetries in gingival show; the side with greater upward pull will require a higher dose of botulinum toxin A.

Orbicularis Oris – “Smoker’s Lines and Lip Flip”

The orbicularis oris is a circular muscle surrounding the opening of the mouth. It is responsible for closing and projecting the lip outwards. This muscle plays a role in mastication, expression, phonation, whistling, and kissing. The formation of radial peri-oral rhytids, often referred to as “smoker’s lines,” can partially be due to repeated contraction of the orbicularis oris. Relaxation of this muscle can lead to reduced dynamic peri-oral rhytids. It can also lead to a slight

Colloquial name/phrase	Target muscle	Verbal cues for examination	Pertinent examination findings
"Gummy smile"	LLSAN	Smile	>2 mm maxillary gingival show with smiling
"Smoker's lines"	Orbicular oris	Make a kiss and hold it	Dynamic perioral rhytids
"Lip flip"		Smile	Inversion of upper lip with smiling
"Saggy mouth corners"	DAO	Stick out your bottom teeth	Downward turned oral commissures at rest
"Chin cellulite"	Mentalis	Roll your bottom lip out	Deep labiomental crease and pebbled appearance at the chin
"Jaw pain," "teeth grinding"	Masseter	Bite down without opening your mouth	Square facial shape at rest; bulge with clenching

Table 1. Lower face muscles commonly treated with botulinum toxin A; courtesy of Malika Ladha, MD. LLSAN = levator labii superioris alaeque nasalis; DAO = depressor anugli oris.

increase in upper lip eversion; this technique is known on social media as a "lip flip" (Table 1).

A maximum total dose of 6 to 10 units is recommended. Six injection points are recommended: four to the upper lip and two to the lower lip. The lateral injection points should be medial to the oral commissures to avoid diffusion to the levator anguli oris.⁴ The upper medial injection points should not be directly over the philtral columns, to prevent flattening of Cupid's bow. Injections should be superficial and on the vermilion border. To ensure safety and preservation of muscle function, a lower dose should be used. The dose can then be gradually titrated upward until the desired effect is achieved.

Possible side effects include: decreased ability to drink out of a straw, decreased ability to whistle, and difficulty enunciating the letters F, M, O and P. Treatment of the orbicular oris with botulinum toxin A should not be performed on individuals whose professions and/or hobbies require full function of the mouth, such as saxophone players.

DAO – "Downward Mouth Corners"

The DAO is a triangle-shaped muscle that originates at the inferior border of the mandible and inserts at the angle of the mouth, fusing with the orbicularis oris and risorius. With aging, a melomental fold, or Marionette line, can emerge from the oral commissure to the jawline. The etiology is multifactorial: loss of collagen; mandible and maxillary bone resorption; and, hyperactive DAO muscles. The combination of these factors creates a sad expression

at rest. It can be elicited on examination by asking patients to "stick out their bottom teeth" (Table 1, Figure 2).

A dose of 2 to 5 units per side can be used. The injection site has been variably reported.⁵ The author's preferred location is near the jawline, at least 1 cm away from the corners of the mouth. A pearl is to direct the needle laterally to avoid diffusion into the DLI. The DLI is responsible for depressing and everting the lower lip. If inadvertently injected with botulinum toxin A, the affected DLI will not equally depress the lower lip, resulting in an asymmetric smile.⁵

Chin – "Peau d'orange"

The mentalis is the major muscle of the chin. Contraction of the mentalis raises the chin and contributes to the labiomental fold. With maturity, overactivity of the mentalis, in combination with loss of fat and collagen, leads to a cobblestone – or "peau d'orange" – appearance of the skin. This is colloquially known as "chin cellulite." This can be further accentuated on examination by asking patients to "roll their bottom lip out" (Table 1, Figure 3).

A total dose of 4 to 10 units of botulinum toxin A can be used. The single injection technique involves one injection at the midline point 0.5 to 1.0 cm above the most inferior aspect of the chin.⁵ Another technique is two lateral injections parallel to the midline. The injections should be directed medially to avoid displacement of the neurotoxin to the DLI muscle, as above.



- LLSAN
- ▲ Orbicularis oris
- DAO
- ▮ Mentalis

Figure 1. Injection points for various lower face muscles; courtesy of Malika Ladha, MD.



Figure 2. Examining the depressor anguli oris by asking patients to “stick out their bottom teeth.”; courtesy of Malika Ladha, MD.



Figure 3. Examining the mentalis by asking patients to “roll their bottom lip out.”; courtesy of Malika Ladha, MD.

Masseter

The masseter is an important mastication muscle; its primary role is to elevate the mandible with chewing. The surface anatomy of the masseter muscle includes the zygomatic arch and the inferior border of the mandible. The anterior and posterior borders can be observed and palpated by asking patients to clench their teeth. This muscle consists of three layers; the maximum bulk is at the overlapping point of these layers.⁶

Masseter hypertrophy can be genetic or related to jaw clenching or bruxism. The former is more common in East Asian patients.⁷ The latter may be associated with pain, headaches and damage to teeth. Masseter hypertrophy also leads to squaring of the facial shape. Treatment of masseter hypertrophy with botulinum toxin A will therefore provide relief of symptoms, as well as facial contouring.

Careful patient selection is required. A masculine appearance is associated with sharp angles. Treating hypertrophic masseters with botulinum toxin A will decrease the size of the muscle and will soften well-defined jawline contours. Therefore, patients who prefer to maintain a square jawline are not ideal candidates for this treatment. In addition, decreasing the masseter muscle mass can make jowls appear larger by contrast. While this treatment may provide relief of symptoms, patients with prominent jowls and pre-jowl sulci may not achieve ideal aesthetic facial contouring results.

Three deep injections in a triangular pattern can be delivered to each masseter. A range of 4 to 10 units can be injected at each site.⁵ Dosing will be dependent on the size of the masseters; gender (males require a higher dose than females due to their larger muscle bulk); amount of desired facial tapering; and the presence of jowls and lower face sagging.⁸ A lower initial dose should be used, and then gradually titrated upward until the desired effect is achieved. Unlike botulinum toxin A injections for rhytids, full effect on the masseters requires four to six weeks post-treatment; duration of the effect is up to six months.

It is recommended that clinicians counsel patients on the following possible treatment side effects: difficulty chewing foods that require powerful biting or grinding, such as steak; increased appearance of jowl and lower facial sagging; intramuscular or subcutaneous hematoma; and paradoxical masseter bulging.

Correspondence

Dr. Malika Ladha

Email: drmalikaladha@gmail.com

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