

# Tips and Tricks for Facial Toxin Injections with Illustrated Anatomy

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**Learning Objectives:** After studying this article, the participant should be able to: 1. Recognize facial muscle contraction direction and muscle morphology based on skin surface movements and facial rhytides. 2. Classify different muscle contraction patterns and target respectively with the recommended dosage and injection technique. 3. Apply the presented injection techniques to the patients' individual anatomy with greater precision and without affecting adjacent muscles or causing other adverse events.

**Summary:** Facial muscular anatomy has recently gained increased attention, with new investigative methodologies and new injection techniques arising on the market. These recent advancements have increased our understanding about the functional anatomy of facial muscles and have changed the way health care professionals see and understand their interplay during various facial expressions and in determining facial shape. This new anatomical understanding of facial muscles and their interaction has resulted in superior neuromodulator treatment outcomes with fewer side effects and with increased precision. The latter is of greatest importance, as all facial muscles act as a unit and connect with each other. It is therefore paramount to target during neuromodulator treatments only the muscle responsible for the aesthetic effect desired and not other adjacent muscles, which can have different or even antagonistic effects. Conventional anatomy was previously limited to two-dimensional explanations of muscle locations without incorporating their detailed action or their three-dimensional location of extent. The "new" anatomy incorporates those novel concepts and, once understood, will help health care providers to understand better and to "read" the underlying muscular anatomy based on the wrinkle status and based on the change in skin surface landmarks based on the actions of the underlying musculature. The following article summarizes tips and tricks, pearls and pitfalls, and dos and don'ts during facial neuromodulator injections along with a guide toward adverse event management and patient outcome assessment with special focus on the underlying anatomy. (*Plast. Reconstr. Surg.* 149: 303e, 2022.)

**A**dministration of neuromodulators (independent of the brand used) continues to increase in popularity. According to the

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annually released plastic surgery statistics report by the American Society of Plastic Surgeons, 7,697,798 botulinum toxin type A injection procedures were performed in 2019, which represents an increase by 4 percent to 2018 and an increase by 878 percent when compared to 2000.<sup>1</sup> This increase in popularity is also attributable to the

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widespread availability of the procedure, the high effectivity and satisfaction of these procedures, the minimal downtime, the reduced costs when compared to invasive surgical procedures, and the reversibility of effects after 3 to 6 months. This trend is also favored by the increasing number of neuromodulators that have been approved by the U.S. Food Drug and Food Administration, which is expected to increase more within the next years.<sup>2</sup>

Despite the slight differences that exist between the U.S. Food Drug and Food Administration–approved products in terms of their potency, diffusion radius (“field of effect”), and presence/absence of additional proteins in their formulation, the mechanism by which they act is the basically the same: the neurotoxin inhibits the fusion of vesicles at the neuromuscular plate and thus the release of the neurotransmitter (acetylcholine) into the synaptic cleft.<sup>3</sup> The absence of this chemical signal transmission results in a dose-dependent paralytic effect of the receiving muscle that is observed clinically as muscle relaxation.<sup>4</sup> The effect of the muscle relaxation will depend on the administered dosage but also on the regenerative sprouting capacity of the terminal axon.<sup>5</sup>

Temporary relaxation of facial muscles results in the reduction of dynamic and static facial lines depending on the anatomical area targeted. It is important, however, to understand the relationship between organ of target (i.e., muscle) and organ of desired effect (i.e., skin surface). This relationship is influenced by the thickness of the subdermal fat layer, by the presence/absence of dermal muscle insertion, and by the firmness of connective tissue fibers that connect facial muscles to the overlying skin.<sup>6,7</sup> This relationship varies between anatomical regions and should be described in brief.

## FASCIAL ARRANGEMENT OF THE FACE

### Direct Attachment of Facial Muscles

The strongest connection between facial muscles and the overlying skin can be found at the hairy eyebrow and in the perioral region. Here, the underlying muscles connect directly to the dermal underside and effect acute and direct movements of the overlying skin.<sup>8,9</sup> The facial muscles of both regions are arranged in muscle complexes that act together as a unit. This can be observed by the precise and distinct facial expressions of the eyebrow and of the perioral region. The physiologic explanation for this fascial arrangement is that these facial regions are

majorly involved in interpersonal communication and therefore a precise movement of the overlying skin is needed.<sup>10</sup>

### Indirect Attachment of Facial Muscles

The second strongest attachment between facial muscles and the overlying skin can be found in the forehead. Here, the frontalis muscle is located within a fascial envelope that is termed suprafrontalis and subfrontalis fascia.<sup>11</sup> The suprafrontalis fascia was previously described<sup>12</sup> and recently confirmed in histologic studies<sup>13</sup> and functions as a force-transmitting unit between the contracting muscles and the overlying skin of the forehead. The suprafrontalis fascia acts in close interaction with the subdermal fatty layer of the forehead,<sup>11</sup> and it is plausible that the increase in fatty layer thickness results in a reduced muscle contraction visibility on the overlying skin. The same arrangement can be found in the lateral periorbital region, in the upper and lower eyelids, and in the tear trough; however, in the majority of patients, the layer of fat in the periorbital region is substantially reduced or even absent.<sup>14,15</sup>

### Loose Attachment of Facial Muscles

In most areas of the face, there is a loose attachment between muscles of facial expression and the overlying skin. This loose attachment is the result of the interplay between the three-dimensional fascial network termed superficial musculoaponeurotic system (SMAS),<sup>16</sup> the superficial (i.e., subdermal) facial fat compartments,<sup>17</sup> and the dermal underside. The SMAS is against current understanding not a single fascial layer but rather a compound of elastic fibers, fat lobules, and strong connective tissue fibers that transmit the movement of facial muscles toward the overlying skin.<sup>18</sup> An increase in fatty layer thickness or a reduction of elastin and collagen content with aging results in a reduction of force transmission that is observed clinically as age-related hypometric facial expression.

### Injection Biomechanics

Understanding facial anatomy is not sufficient to achieve aesthetically pleasing outcomes. There should be an understanding of product distribution following the injection procedure. Soluble neuromodulators have a similar behavior in the human tissue to water which indicates a three-dimensional product distribution within the area injected comparable to a round sphere. The shape of this sphere, however, is influenced by the

volume injected, the speed of the injection, the depth of the injection, the anatomical layers penetrated by the needle, and the direction and orientation of the needle and bevel. Administering the product subdermally or intradermally will result in a limited local product distribution that will primarily affect the underlying structures (deeper), whereas injections in contact with the bone will mostly affect the directly overlying (more superficial) structures. Administering the product within the facial soft tissues will passively diffuse the product in all three dimensions equally, if no fascial or structural boundary is present. It is, however, of importance to understand that each injection process creates an injection canal by the advancing needle. This injection canal represents an area of lesser resistance, which allows for the potential for retrograde fluid flow.<sup>19</sup> This retrograde fluid flow allows for product migration and for product passage through fascial layers, which is of clinical relevance when treating the forehead.<sup>20</sup>

### Patient Assessment

Differences in aesthetic outcomes are majorly influenced by the individual muscle anatomy of the patient, by the injection technique, and by the preparation of the product but to a significantly lesser extent by the product itself, as the size of the core neurotoxin is the same across formulations, as is its mechanism of action. The way the product is injected (how?), the targeted three-dimensional anatomical area (where?), and the size of the dose (how much?) are the major determining factors of an optimal aesthetic outcome.

### Anatomical Assessment

The underlying anatomy can be best evaluated by asking the patient to perform various facial expressions at maximum contraction force possible in an upright seated position. This will reveal the contraction pattern of the muscle and the muscle fiber orientation.<sup>10,21,22</sup> Observing the presence of static facial lines or the formation of dynamic facial lines will also provide guidance for the most optimal injection points.<sup>23</sup>

### Injection Technique

Understanding the underlying anatomy first will guide the injection technique used toward safer and more precise results with less collateral damage (i.e., affect on muscles that are not the target of the injection). The selection of the product is of secondary importance once anatomy and injection technique are aligned and the dose is standardized (e.g., knowing the origin of a muscle

will allow for deep injections with product administration in contact with the bone). Hereby, the product will distribute superficially into the muscle belly which results in a fast onset, less collateral damage, and best product use. The amount of neuromodulator injected should be tailored to the patient's needs, with male patients needing in general more toxin than female patients, and those with stronger muscle contraction patterns needing more than those with less prominent facial lines.

## Key Facial Regions for Neuromodulator Treatments

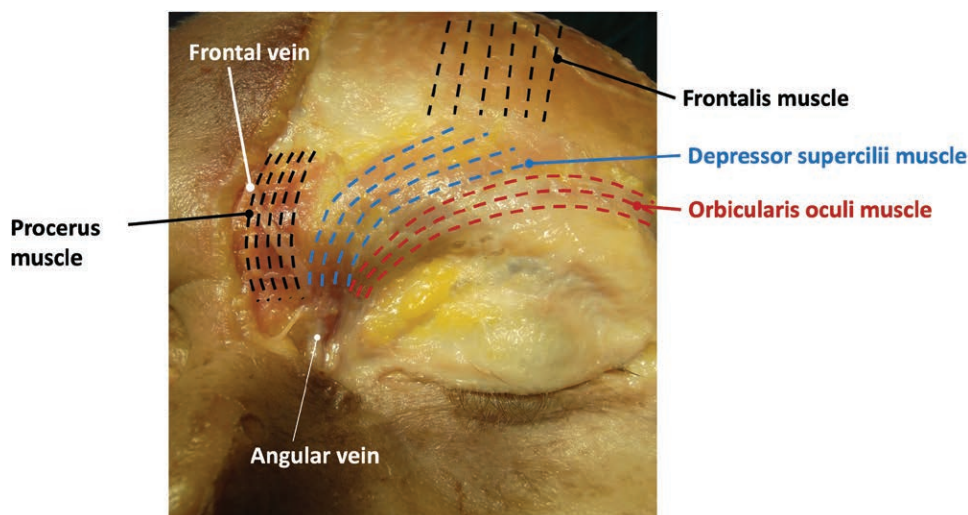
### Horizontal Forehead Lines

**Anatomy:** Horizontal forehead lines are the result of muscle contraction of the frontalis muscle. The lines can have a straight or a wavy appearance with a plethora of nuances in between. The lines indicate the direction of the frontalis muscle fiber orientation,<sup>10,21,22</sup> with wavy lines indicating a more lateral frontalis muscle location. The length of the lines indicates how lateral the injection should be administered, with some cases reaching lateral to the temporal crest and into the frontal or temporal hairlines. The skin movement of the forehead is bidirectional, with the lower forehead skin moving cranially (i.e., eyebrow elevation segment of frontalis muscle) and the upper forehead skin moving caudally (i.e., hairline depressor segment of frontalis muscle). These movements converge at a horizontal line at an approximate length of 60 percent of the total forehead length; this line is termed the line of convergence, or C-line.<sup>10</sup>

**Aesthetic Outcome and Adverse Events:** Treatment of the frontalis muscle should aim for a smooth and rhytide-free forehead. However, as the frontalis muscle is the only eyebrow elevator, injections into this muscle more often will influence eyebrow position (Fig. 1). Affecting the lower forehead and injecting below the line of convergence (<60 percent total forehead length) will increase the risk for eyebrow ptosis. Injecting above the line of convergence on the contrary will increase the total forehead length.

**Injection Technique and Dosage:** At or above the line of convergence, product should be administered in contact with the bone into the supraperiosteal plane to increase efficacy (when compared to intradermal injections). Below the line of convergence (i.e., lower forehead), the product should be administered subdermally.<sup>10</sup> The pattern of application should be lateralized if wavy lines are present and should be extended even past the temporal crest if the length of the horizontal forehead lines are present that lateral.





**Fig. 1.** Photograph showing an anatomical dissection of a head after removal of the skin and subcutaneous fat. Note the intersection between the muscles of the periorbital region (orbicularis oculi muscle, procerus muscle, and corrugator supercillii muscle) and the muscle of the forehead (frontalis muscle).

In the upper forehead, between 2 to 5 IU should be selected per injection point, whereas in the lower forehead, 0.5 to 2 IU per injection point should be favored. Injection points should be distributed symmetrically and in a zigzag pattern, with two rows in the upper forehead and one row in the lower forehead. [See [Video 1 \(online\)](#), which displays the injection procedure, showing the injection technique of the forehead.]

**Safety:** The major adverse event of this treatment is eyebrow ptosis, which can be avoided if the eyebrow elevation segment is not treated. Another unpleasant outcome is lateral eyebrow hyperelevation (i.e., Mephisto appearance), which can be avoided if a lateralization of the injection points is achieved.

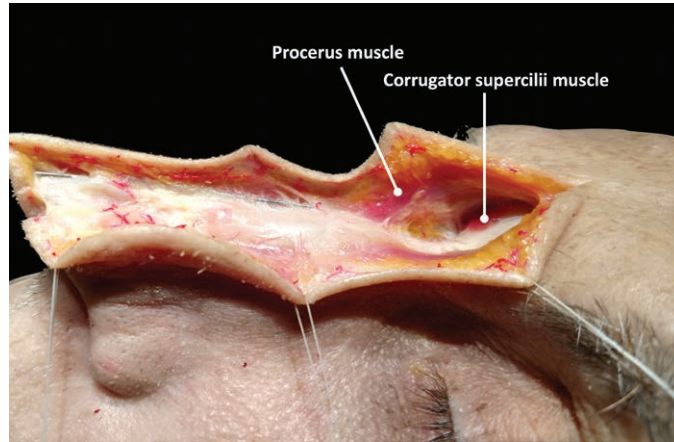
**Tips and Tricks:** In some patients, a “rescue” injection point should be planned to avoid lateral eyebrow hyperelevation. This injection point administers between 1 and 3 IU, 1 to 2 cm above the maximal elevation point of the lateral eyebrow. Patients with a receding hairline require product administration into the posterior scalp with 1 to 2 IU per injection point. Patients with eyelid ptosis (caused by levator aponeurosis weakness) should be assessed carefully, as in these cases, the frontalis muscle is also responsible for compensatory upper eyelid elevation.

### Vertical and Horizontal Glabellar Lines

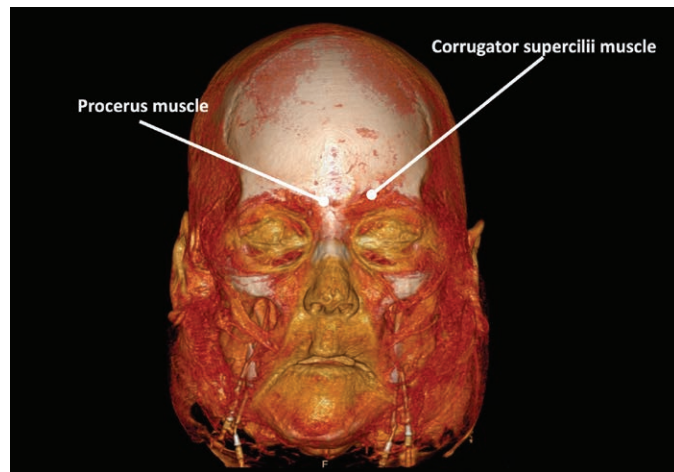
**Anatomy:** Vertical glabellar lines are the results of contraction of the corrugator supercillii muscle, the orbicularis oculi muscle, and the lateral

parts of the procerus muscle (Figs. 2 through 4). Horizontal glabellar lines are the result of contraction of the procerus muscle. The orbicularis oculi muscle is a strictly subdermal muscle with bony contact only at the orbital rim and should therefore be best targeted by subdermal product application. In contrast, the procerus and corrugator supercillii muscles have a very defined bony origin that can be precisely targeted without influencing the muscle function of the other periorbital muscles. The bony origin of the procerus muscle is located at the nasal bone, and the bony origin of the corrugator supercillii muscle is located deep to the most medial portion of the hairy eyebrow. All muscles fuse with the skin at the level of the hairy eyebrow.

**Aesthetic Outcome and Adverse Events:** Targeting the glabellar muscles results in a smooth appearance of the glabella but can also influence substantially eyebrow position at rest and during various facial expressions. High precision should be mandatory for glabellar injections, as the three-dimensional relationship with the other muscles of the orbicularis oculi complex is very intimate. Understanding the underlying anatomy and targeting periorbital locations where only a single muscle is present reduces collateral damage. The most feared adverse event is upper eyelid ptosis, which is the result of product application and/or migration to the intraorbitally located levator palpebrae superioris muscle. This can be avoided by not injecting deep but exclusively superficially in the supraorbital region.



**Fig. 2.** Photograph showing an anatomical dissection. Note the bony origin of the procerus muscle and the corrugator supercilii muscle.

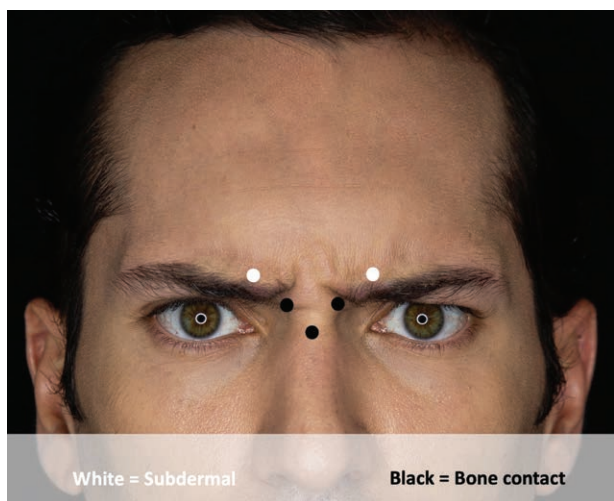


**Fig. 3.** Three-dimensional reconstruction of a cephalic computed tomographic scan. The muscle belly of the procerus muscle and the corrugator supercilii muscle can be identified.

**Injection Technique and Dosage:** A newly accepted technique for treating the glabella is the three-point injection technique, which targets exclusively the bony origin of the procerus and of the corrugator supercilii muscles, with injection applying the product in contact with the bone. Some patients require up to 10 IU for each of the three injection points for an optimal aesthetic outcome. In cases where a muscular contraction is visible at the upper margin of the hairy eyebrow, subdermal injection of up to 1 to 5 IU in the medial third of the eyebrow should also be performed. The classic five-point injection technique is also frequently used but attention needs to be placed on understanding the relationship between the muscles and the orbital rim. [See [Video 2 \(online\)](#), which displays the injection procedure, showing the injection technique of the glabella.]

**Safety:** Reducing collateral damage is the key for most effective glabellar treatments. Injecting in contact with the bone medially and subdermally in the supraorbital region should account for most anatomical variations and avoid product diffusion to the levator palpebrae superioris muscle. In the event that upper eyelid ptosis occurs, apraclonidine as a local topical has been shown to have beneficial effects on the outcome.<sup>24</sup>

**Tips and Tricks:** With the previously performed five-point or seven-point injection techniques, the glabellar injection point (i.e., median injection point) was frequently placed too superiorly and therefore affected the eyebrow elevation segment of the medial frontalis muscle. The resulting adverse event was medial eyebrow ptosis, which was frequently accompanied by lateral eyebrow hyper-elevation. Additional injection points were



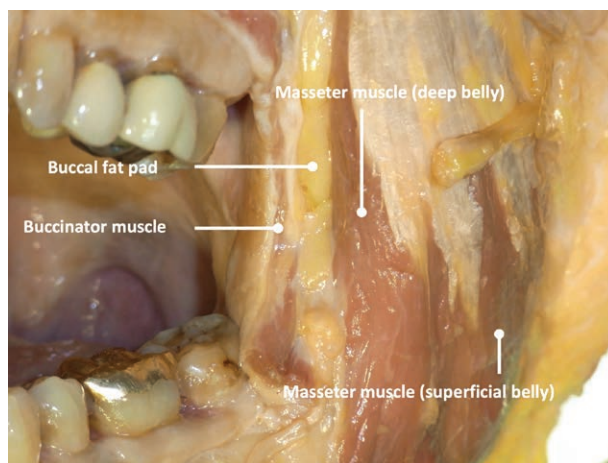
**Fig. 4.** Photograph of a male patient depicting the injection points for vertical glabellar lines. The three points in the center target exclusively the bony origin of the procerus and of the corrugator supercilii muscles by injecting the product in contact with the bone (*black dots*). The bilateral superficial lateral injection points target the horizontal portion of the orbicularis oculi muscle (*white dots*).

necessary to treat the lateral eyebrow that affected overall the position of the eyebrow at rest and during frontal contraction. These adverse events can be summarized as “collateral damage” and can be avoided by precise product administration.

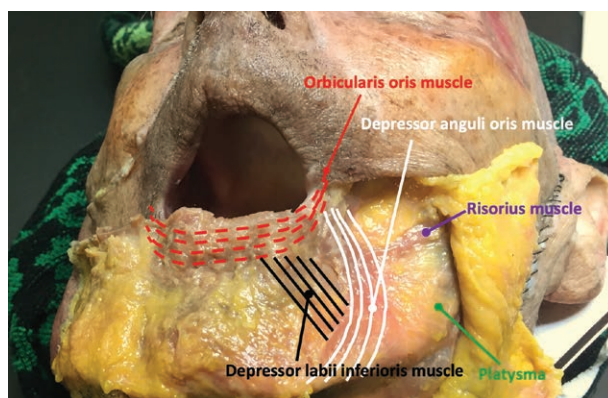
### Masseter Muscle Hypertrophy and Facial Slimming

**Anatomy:** The masseter muscle is one of the four muscles of mastication and contributes predominantly to the shape of the face. This is of greater importance in the Asian patient community because of their round facial shape but also in the Caucasian patient population affected by bruxism.<sup>25,26</sup> The masseter muscle can be easily palpated while asking the patient to clench their teeth and their boundaries determined manually. However, the masseter muscle is composed of two separate muscle bellies that are separated by a strong intramuscular tendon (Figs. 5 and 6).<sup>27,28</sup> This tendon can inhibit retrograde product distribution or limit the depth of product distribution following injections. The muscle covers the angle of the mandible and has an anterosuperior fiber orientation.

**Adverse Outcome and Adverse Events:** The desired aesthetic outcome should be masseter muscle volume and strength reduction. This will result in facial slimming because of the volume loss and a more feminine facial appearance. Reducing the muscle’s strength will diminish the discomfort in patients with bruxism, including headaches,



**Fig. 5.** Photograph showing a cadaveric dissection of the superficial and deep bellies of the masseter muscle, overlying the buccal fat pad and the buccinator muscle.



**Fig. 6.** Photograph showing a cadaveric dissection of the lower face after removal of the skin and subcutaneous fat depicting the close arrangement of the perioral musculature (depressor labii inferioris, depressor anguli oris, orbicularis oris, platysma, and risorius muscles).

fracture of restorations or teeth, hypersensitive or painful teeth, and loss of periodontal support.<sup>29</sup>

Treating the masseter muscle with neuromodulators can result in an asymmetric smile or even in the inability to smile because of the affect on the risorius muscle. This small muscle of facial expression has its origin in close proximity to the masseter muscle and is also influenced in its function by the horizontal part of the platysma muscle. Both muscle platysma and risorius can be affected if the needle is not long enough and the product can migrate retrograde out of the masseter muscle and into more superficial layers where both muscles are located. Masseter bulging following neuromodulator treatments is the result of insufficient product administration into the deep part of the masseter muscle, with resulting hypertrophy of

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the superficial belly of the muscle. Furthermore, understanding the possible overlapping relationship of the risorius with the anterior masseter is paramount in performing the technique safely.

**Injection Technique and Dosage:** A recent study has shown that there is no statistically significant difference between the administration of 40 IU of neuromodulator by means of a single-injection technique compared to a multi-injection technique, indicating that the technique by which the product is applied is of reduced relevance for the outcome.<sup>30</sup> This inherently makes sense, as the peak of muscle thickness lies in the region where the two heads overlap maximally. Of greater importance is the use of a 30-gauge needle that is at least 1 inch in length; shorter needles might not penetrate the intramuscular tendon and therefore not target the deep belly of the masseter muscle, which could result in masseter bulging. The aim of all injection procedures should be as follows: conducted in bone contact in the lower 25 percent of the total extent of the muscle. [See **Video 3 (online)**, which displays the injection procedure, showing the five-point injection technique of the masseter. See **Video 4 (online)**, which displays the injection procedure, showing the one-point injection technique of the masseter.]

**Tips and Tricks:** Before performing the treatment, the horizontal intermolar axis should be assessed and adjusted if one side is higher compared to the other; the higher side should receive more neuromodulator product. During follow-up visits, the status of the teeth should be closely

monitored and adjusted if needed. It is of additional importance to note that treating the masseter muscle with neuromodulators will result in a compensatory volume increase of the temporalis muscle.<sup>31</sup> This will reduce temporal hollowing and can also be used to reshape the facial appearance. The amount of neuromodulator administered should be tailored to the muscle volume, sex, and ethnicity of the patient, which have been suggested to range between 8 and 10 IU per injection point in the Asian population, if the three-point injection technique is performed.<sup>32</sup>

### Chin

**Anatomy:** The shape of the chin is majorly determined by the mentalis muscle and varies in appearance between sexes (**Fig. 7**). Whereas women have a more pointed and elongated chin, men have a more squared and robust appearance. The mentalis muscle originates from the bone inferior to the labiomental sulcus and inserts with its muscle fibers into the dermis while traveling inferiorly. Contraction of the muscle can elevate the chin, evert the lower lip (pouting), and cause surface irregularities and dimpling in the area between the laterally located depressor labii inferioris muscle; this is also termed “chinullite.”

**Aesthetic Outcome and Adverse Events:** Despite being majorly neglected, the treatment of the chin with neuromodulators can influence the facial shape by changing from square- to heart-shaped and can feminize the overall facial



**Fig. 7.** (Left) Photograph showing a cadaveric dissection of the lower face that depicts the bony origin of the mentalis muscle that inserts superficially into the subcutaneous fat and dermis. (Right) Three-dimensional surface image showing the dimpling of the chin on contraction of the mentalis muscle and its dermal muscle fiber insertion.

appearance. Elongating the chin can also influence the position of the lower lip and can smooth the labiomandibular sulcus. In addition, using neuromodulators can ameliorate skin surface dimpling on muscular contraction and can support soft-tissue filler injection for masculinizing procedures by weakening the tension of the muscle.

Imprecise product administration can result in the affection of the laterally and deep located depressor labii inferioris muscle. Depending on the desired outcome, the injection technique should respect this anatomical location to avoid asymmetric lip movement and oral commissure closure.

**Injection Technique and Dosage:** To elongate the chin, to smooth the labiomental sulcus, and to weaken the activity of the mentalis muscle, one midline injection of 3 to 7 IU in contact with the bone should be administered. This can be split into two injections in the presence of a wider chin. To treat surface irregularities and to smoothen skin dimpling on muscle contraction, multiple strictly subdermal injections of 1 to 3 IU should be administered; the total dose of 3 to 6 IU should not be exceeded. It is important to stay mostly in the center to avoid product diffusion laterally to the depressor labii inferioris muscle. On patients with longer chins, one should be prepared to add a further injection point inferiorly, as the lower part of the mentalis muscle will still contract and create an undesired aesthetic result. [See [Video 5 \(online\)](#), which displays the injection procedure, showing the injection technique of the deep chin. See [Video 6 \(online\)](#), which displays the injection procedure, showing the injection technique of the superficial chin.]

**Tips and Tricks:** Patient communication is important, as changes in the movement and in the contraction pattern of the chin and of the lower lip will occur. Close monitoring is advised to monitor affection of the depressor labii inferioris muscle; if the muscle is affected by the treatment, the contralateral muscle should be targeted to obtain a symmetric lower lip position.

### Jawline Contouring

**Anatomy:** The contour of the jawline is of great importance to increase facial attractiveness and ameliorate the signs of facial aging in both sexes. The contour of the jawline, when targeted with neuromodulators, depends on the position and on the resting tone of the platysma muscle. The platysma muscle is a large, thin, and superficially located muscle that connects to the superior portion of the depressor labii inferioris and to the modiolus, and extends past the mandibular angle. This large muscle is continuous with the midfacial

SMAS and with the orbicularis oculi muscle and has strong connections to the zygomaticus major muscle (by means of the SMAS). It is of importance to understand that the platysma is the major facial depressor muscle and that antagonizing its inferior pull can elevate the total lateral face and can also increase the midfacial volume.

**Aesthetic Outcome and Adverse Events:** Targeting the platysma muscle will reduce its muscular tension and align to the contours of the underlying mandible and masseter muscle (Figs. 8 and 9). This will increase the difference in lateral projection between the mandible (superiorly) and the neck (inferiorly). Reducing the inferior pull of the platysma as a lateral face depressor will increase the cranial pull of the lateral face elevators, which will result in reduction of the jowls. The latter is formed by the gliding of the platysma caudally, posterior to the mandibular ligament. Prior publications have discussed this<sup>33</sup> but have introduced the concept without an elaborate explanation of the relevant anatomy necessary to optimize patient selection and technique. Injecting deep, medial to the labiomandibular sulcus, can result in targeting the depressor labii inferioris, which can cause lower lip asymmetries.

**Injection Technique and Dosage:** Using a 30-gauge insulin syringe with subdermal injection depth, four equidistant points, each with 2 to 4 IU per point, should be injected with a total of 8 to 16 IU. The injection points are located higher than the original description of the Nefertiti lift<sup>33</sup> and should be located 1 cm cranial to the mandibular line. The most medial injection point is located 1 cm inferior to the oral commissure. [See [Video 7 \(online\)](#), which displays the injection procedure, showing the injection techniques of the jawline and platysmal bands.]

**Tips and Tricks:** If the labiomandibular sulcus is of strong appearance, a greater dosage should be selected for the most medial injection point, as here the depressor anguli oris muscle is also affected. Patients with platysmal bands should be treated for the muscular banding in the same session, as this will also influence the aesthetic outcome.

### Follow-Up

The regular onset of effect should be expected to be as early as 3 days and should have its full appearance at 10 to 14 days following the treatment. It is recommended to ask the patient to monitor the muscular contractions for symmetry and intensity. If asymmetric outcomes start to appear, an additional visit should be planned and the neuromodulator dose should be adjusted and potentially increased on the contralateral side.





**Fig. 8.** Three-dimensional surface image showing a patient before (*left*) and after (*right*) injection with neurotoxins into the platysma. Targeting the platysma muscle reduced its muscular tension and aligns the platysma to the contours of the underlying mandible and masseter muscle, increasing jawline contouring and midfacial volume. Note the reduction in lower facial volume especially posterior to the Marionette lines.

Outcome documentation should be performed with two-dimensional or three-dimensional imaging both at rest and during muscular contraction.

It is of crucial importance to document eyebrow position and eyebrow movement during follow-up visits (e.g., lateral eyebrow hyperlevation can be



**Fig. 9.** Three-dimensional surface image with markerless tracking depicting the movement of the glabella region and forehead before injection of the glabella and 14 days after injection of the glabella region following the three-point injection technique (*black dots* of Fig. 4). Note how the frontalis muscle activity, depicted by the surface vectors, remains intact after precise injection of the procerus and corrugator supercilii fibers, whereas the movement in the glabella region is reduced and almost absent.

best detected on frontalis muscle contraction). If patients perceive their frontalis muscle treatment as too intense and report difficulties during upper eyelid movement, radiofrequency can be applied in the periorbital area to reduce the effects of the neuromodulators.

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### PATIENT CONSENT

*Patients provided written consent for the use of their images.*

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