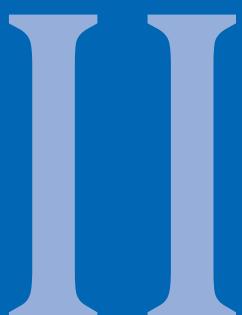


Section III

Neurotoxin Injection Techniques



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6

Neurotoxin Injection for Glabellar Frown Lines

Difficulty: •

Patient Satisfaction: •••

Risk: ••

Indications

Neurotoxins are commonly used to treat the vertical lines between the brows. This is the only area currently FDA-approved for all BoNTA neurotoxins (Botox, Dysport, Xeomin).

Anatomic Considerations

The vertical lines of the glabella are produced by contraction of the paired corrugator supercilii muscles, and the horizontal lines are caused by contraction of the centrally located procerus muscle. The corrugators originate on the supraorbital ridge of the frontal bone and insert on the skin above the middle third of the eyebrow. The procerus muscle originates on the nasal bone and inserts onto the skin of the glabella or mid-forehead.

Although this anatomy seems straightforward, there are subtle anatomic variations that can be visualized during facial animation. We have noted two distinct patterns of corrugator positioning: either straight along the brow, or more

vertically oriented in a V-shape. For this reason, the injector should not rely on only one technique in this area. The injector should “look through” the skin to imagine the location of the muscles and their contribution to the wrinkles produced during movement.

Injection Technique

Topical anesthesia may be used; however, this injection usually can be tolerated without anesthesia. Prior to injecting the patient, have the patient frown the brow. Attempt to look through the skin to determine the size, strength, and location of the procerus and corrugator muscles. Because the corrugator muscles insert laterally into the skin, the injector can visualize the dimpling of the skin to determine the lateral extent of the muscles.

Usual doses in this region are 20 to 30 BU (Botox units) or 50 to 80 DU (Dysport units), but injector experience with these treatments has shown that some patients can do well with as little as 10 units, and others (often men) may need substantially more.

Injections must be placed 1 cm above the superior orbital rim to reduce the risk of upper eyelid ptosis. Injections are placed in the muscle belly. Try not to

“bump” the periosteum, as this occasionally can be associated with post-injection headache.

Precautions

Injection in this area can result in an upper lid ptosis, which can be seen up to 2 weeks after injection and may last 2 to 4 weeks post-injection.

Post-Injection Instructions

There are no clinical data to suggest that giving patients post-treatment instructions decreases ptosis or improves results. However, some physicians ask their patients not to bend over, push on the injection sites, or lie down for 4 hours. They also recommend the patient not exercise that day and not actively move the injected muscles for 90 minutes.

Alternate Post-Injection Instructions

No exercise immediately after injection, as this may accentuate bruising.

Risks

Diffusion of product into the eyelid may affect the levator palpebrae superioris muscle and result in a transient ptosis.

Pearls of Injection

- Ask the patient to frown as you assess the size and shape of the muscle. Tailor the treatment to the anatomy. It is important to extend the injections far enough laterally to treat the entire extent of the corrugator muscles.
- Filler injections may be necessary for deep rhytids in this region.
- Consistent retreatment of the glabella may result in the patient “unlearning” to move the brow, and thus not only improve the rhytids but also extend the time required between injections.
- Placing the thumb along the orbital rim during injection may reduce the likelihood of diffusion toward the levator palpebrae superioris muscle.



Fig. 6.1 Clinical photographs of the differing anatomy of corrugator muscles. (a) More horizontal muscles. (b) More vertical V-like muscles. The injector should learn to “look through” the skin to determine the anatomy.

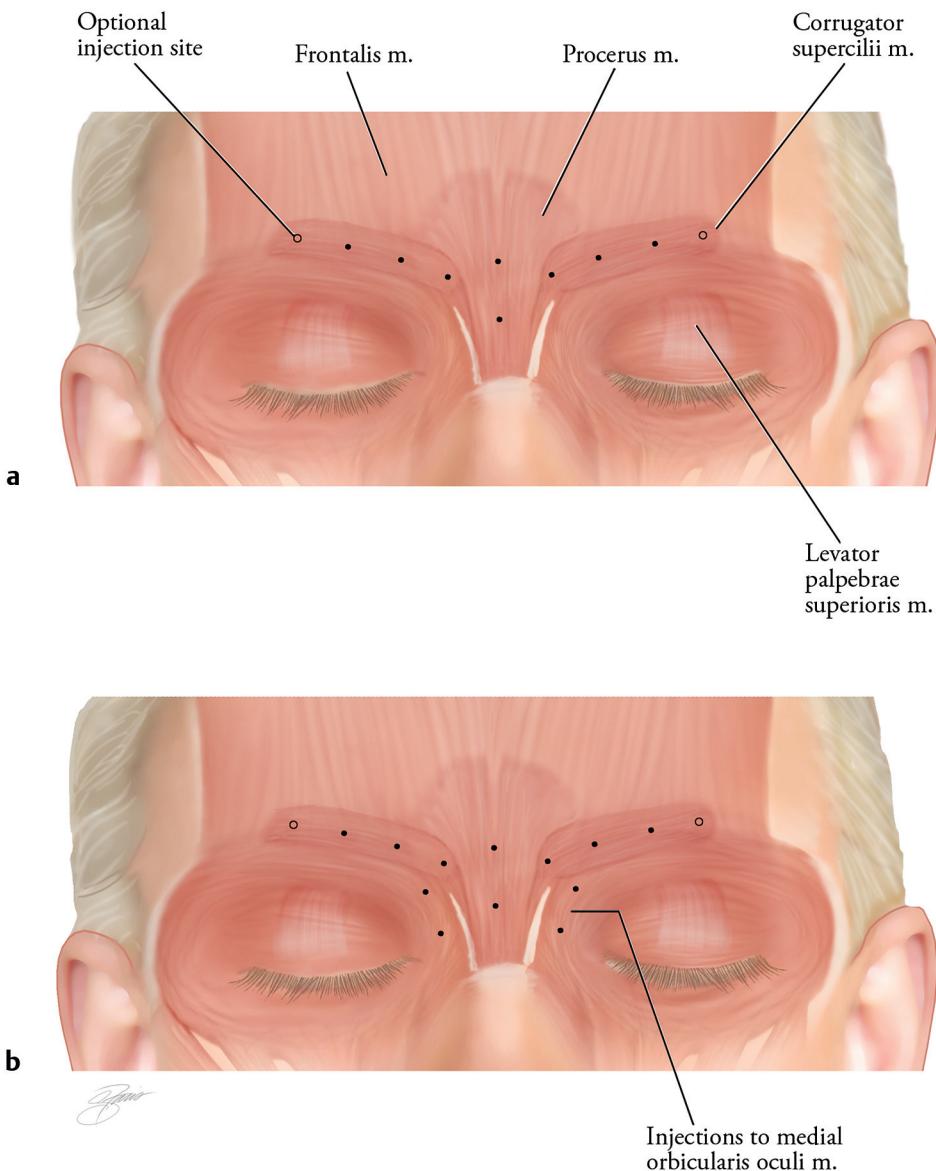


Fig. 6.2 (a,b) Suggested patterns of injection for more horizontal corrugator supercilii muscles. Depending on the length of the muscle, the injections may need to be placed farther out laterally. (Open circles denote optional injection sites.)

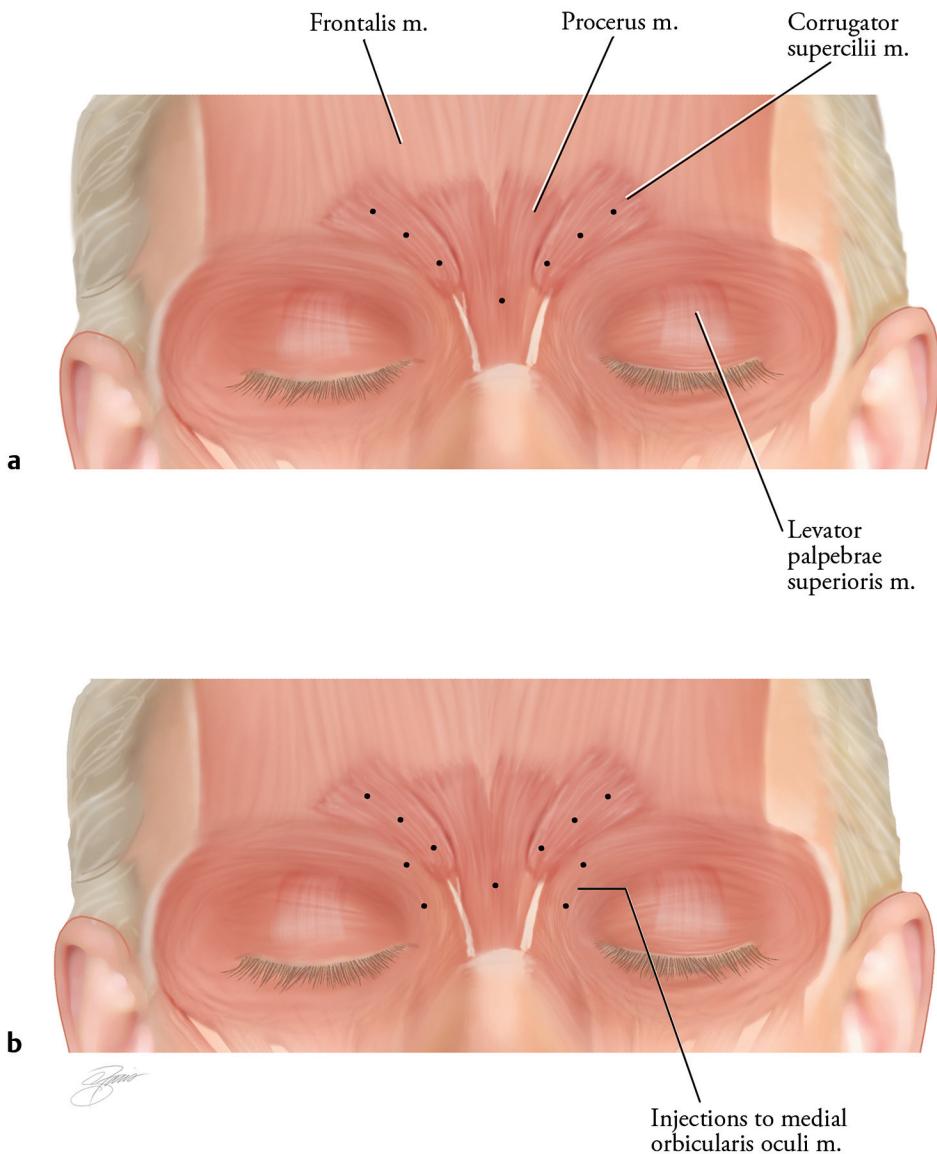


Fig. 6.3 (a,b) Suggested patterns of injection for the V-like corrugator supercilii muscles.

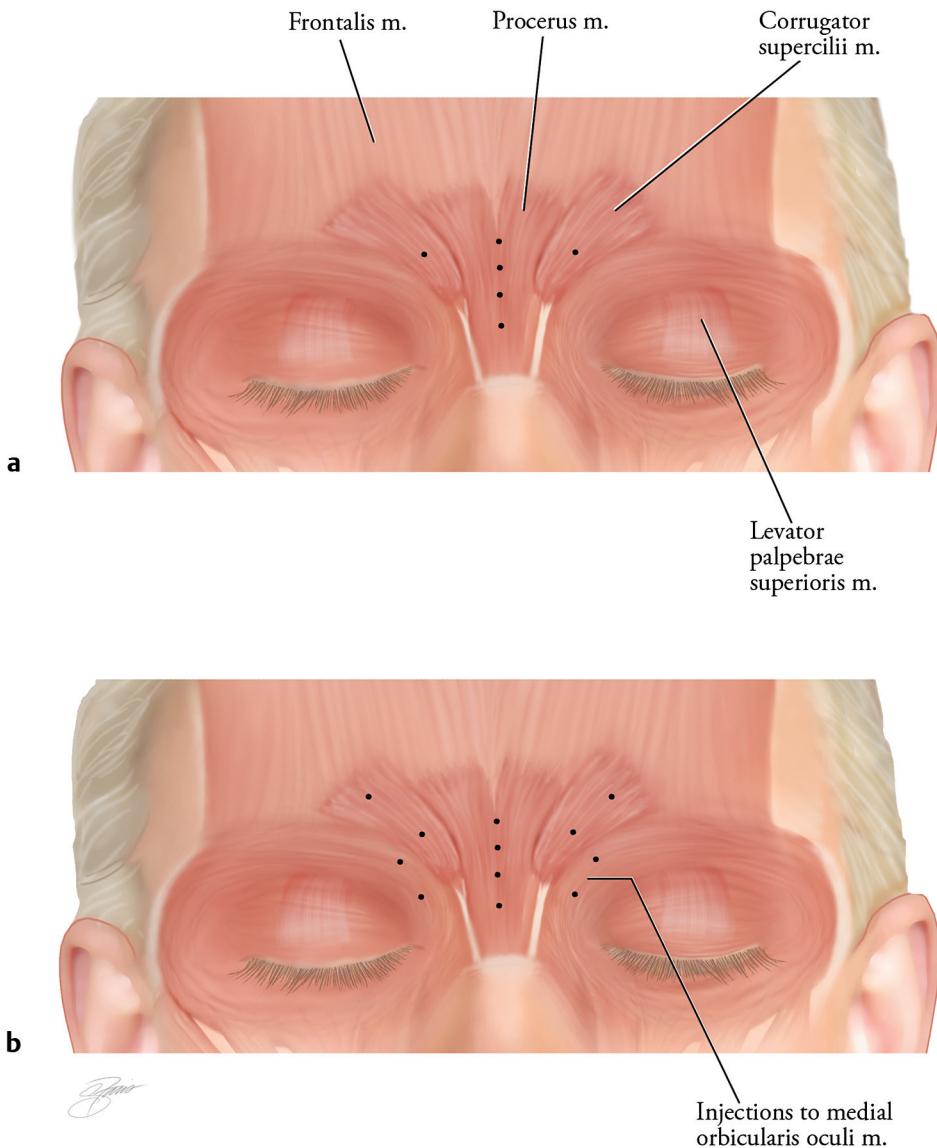


Fig. 6.4 (a,b) Suggested injection sites for predominantly horizontal glabellar rhytids with more contribution from the procerus muscle and less contribution from the corrugator supercilii muscles.

Additional Reading

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7

Neurotoxin Injection for Forehead Wrinkles

Difficulty: ●●

Patient Satisfaction: ●●●

Risk: ●●

Indications

Transverse wrinkles of the forehead.

Anatomic Considerations

Contraction of the paired frontalis muscles raises the eyebrows and upper eyelid skin, which produces transverse creases in the forehead. These muscles originate on the galea aponeurotica of the cranium and insert into the skin of the eyebrows. The frontalis muscles are often described as paired muscles that do not meet centrally. Clinically, however, the central position of the forehead is not devoid of wrinkles. Therefore, treatment of the forehead should include injections in the central aspect of the forehead.

The upper face must be assessed both in animation and at rest prior to injection. In women, the brow should lie at or just above the superior orbital rim. In men, it should lie at the bony rim.

Injection Technique

Have the patient raise and lower the brow and assess the extent of muscle movement. The frontalis muscles are located

superficially, so the injections should be placed in the superficial subcutaneous tissue. Treat the entire forehead from medial to lateral. As with all BoNTA injections, male patients may require a higher dose. The typical dose ranges from 10 to 20 BU or 30 to 60 DU.

Precautions

The forehead is often described as the most difficult area to inject well. Although treatment of the forehead seems intuitively simple, common errors include overtreatment or poor injection planning. The most important rule of injection is to assess the position of the brows at rest, prior to injection of neurotoxin. Two important conditions of this region must be predetermined: the presence of brow ptosis, and increased resting tone of the muscles, which can mask brow ptosis.

In some patients, horizontal forehead creases are the result of compensation for brow ptosis. These patients often request neurotoxins to improve their deep forehead rhytids. It is important to remember that the frontalis muscles are the only muscles that elevate the brows. If the brow is ptotic, then do not inject the frontalis muscles, as this will worsen the brow ptosis. If injection must be performed on a patient with brow ptosis, plan the injections high in the forehead

so that the patient retains some brow elevation movement, or consider under-treating this entire area.

In addition, the frontalis muscles can sometimes show a resting tonic contraction that must be relaxed to determine the resting position of the brow. This may even require the injector to “smooth out” the forehead manually to encourage relaxation of the muscles. Having these patients close their eyes can help relax the frontalis muscles. Once the frontalis muscles are at rest, assess the brow position to determine if the frontalis contraction was masking brow ptosis.

Poor technique in this area can produce an odd-shaped brow. Do not limit the injections to the central brow. Do not assume that the injections cannot extend laterally. If only the center of the brow is treated, the brow will drop medially and elevate laterally, which produces an odd-appearing slanted look, sometimes referred to as the “Mr. Spock,” or “Mephisto (devilish) sign.” A lateral browlift can be obtained by using this technique, but proceed with caution in this area to avoid an overly slanted medial brow.

Post-Injection Instructions

Instruct the patient not to exercise immediately after treatment. Bruising may decrease the effect of the BoNTA by preventing diffusion to the neuromuscular junction.

Risks

Ptosis of the upper eyelid and unmasking brow ptosis are the major risks of this procedure. Minor risks include inappropriate injection planning, which may result in unnatural-appearing brows or persistent rhytids.

Pearls of Injection

- More than with any other area, it is imperative to observe the patient contracting and relaxing the frontalis muscles while the injector plans the injection sites.
- If the rhytids extend up to the hairline, then ensure the injections extend to this area, or it will result in a smooth forehead with a ridge of wrinkles superiorly.
- Also be sure to assess the lateral brows: occasionally these rhytids are under-treated, and deep crescent-shaped creases will be seen just above the lateral brow.
- In patients who have a preexisting unilateral myogenic upper lid ptosis, a compensatory unilateral forehead resting contraction may be seen. If so, injection of the forehead may actually worsen the ptosis. Assess these areas carefully prior to injecting the patient.
- One dose of BONTA (20–25 BU or 50–70 DU) can occasionally be used to treat both the glabella and the forehead in selected patients.

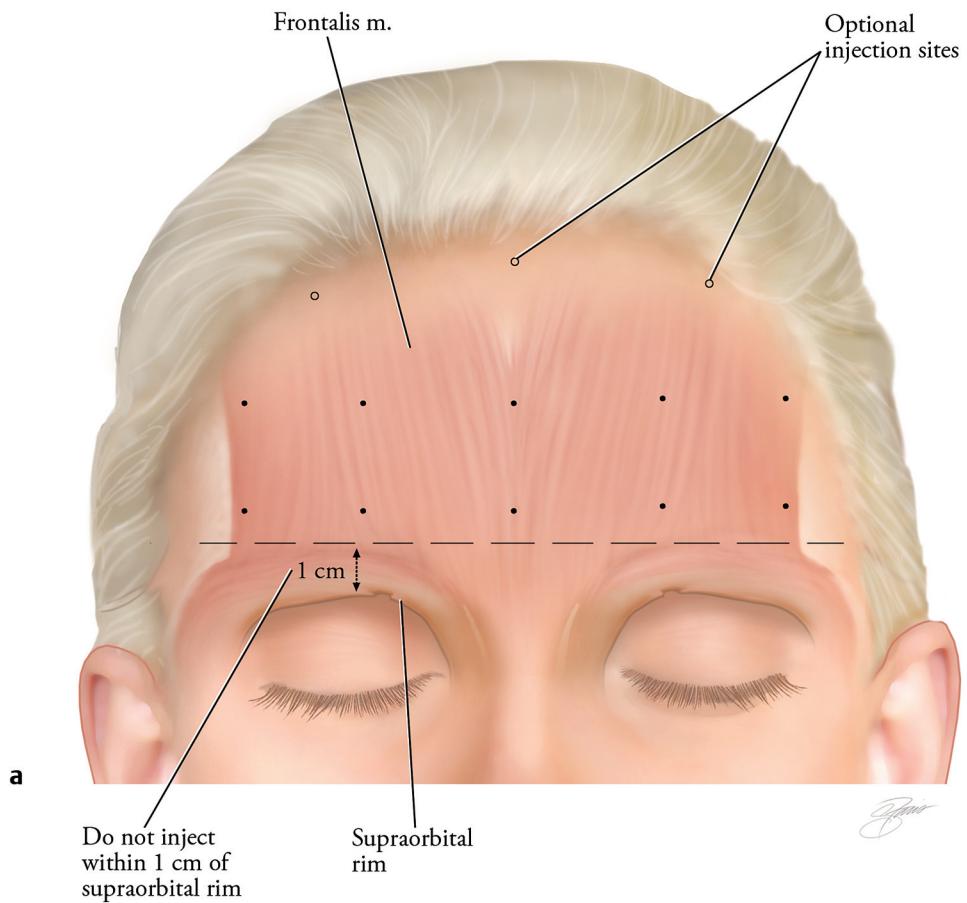


Fig. 7.1 (a,b) Frontalis muscle injection sites may extend up to the hairline in some individuals. Maintain a distance of 1 cm or more above the superior orbital rim. Alternate injection patterns are shown. Tailor the injection pattern to the shape and action of the muscle.

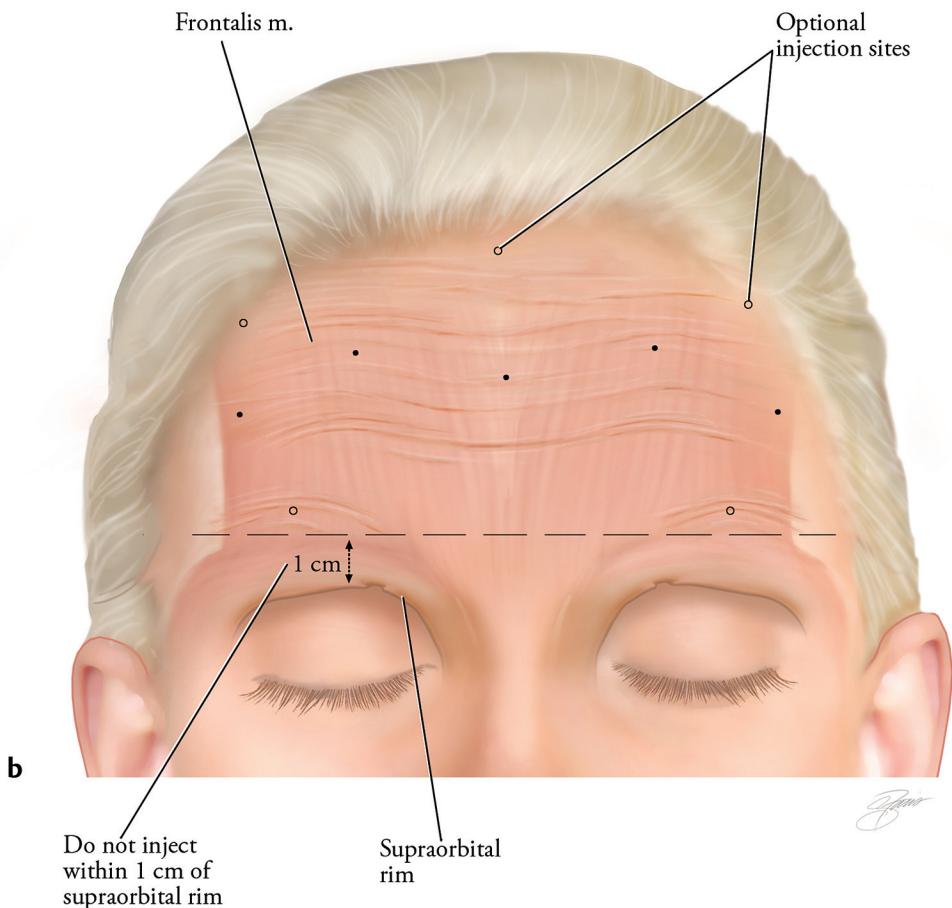


Fig. 7.1 (continued)



Fig. 7.2 "Mr. Spock" brow produced by central injection of the forehead.



Fig. 7.3 In some patients, care must be taken to treat the crescent-shaped rhytids superolateral to the brow.

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8

Neurotoxin Injection for Smile Lines and Crow's Feet

Difficulty: ●

Patient satisfaction: ●●

Risk: ●

Indications

Smile lines and crow's feet are two of the most commonly sought-after areas for treatment with BoNTA. To soften or eliminate wrinkles around the lateral and inferior orbit, injection of the orbicularis oculi muscles can prevent movement-related creasing of the overlying skin associated with expression and baseline muscle tension. Neurotoxin injection will not improve static wrinkles or deep creases due to photoaging.

Anatomic Considerations

The orbicularis oculi muscle surrounds the eye and is separated into three divisions: pretarsal, preseptal, and orbital. The orbital portion extends laterally and is intimately adherent to the overlying skin. Contraction of this muscle results in lines extending radially from the lateral canthus. As the overlying skin thins and ages, crow's feet become visible in the skin from repeated muscle contractions.

Injection Technique

Topical anesthesia may be used and ice may be applied, though neither is necessary in

most cases. Three to four injections of BoNTA are placed radially in the area of the crow's feet. A total of 8 to 20 BU or 20 to 60 DU may be placed in each side. Care should be taken to inject 1 cm lateral to the bony orbital rim, especially above the canthal angle, as upper lid lag can occur. It is helpful to place a finger of the noninjecting hand at the lateral orbital rim as a guide.

The muscle is superficial, so the needle does not need to be placed deep into the subcutaneous tissue. Because of the wide zone of effect for BoNTA, a superficial dermal injection will minimize bruising without compromising clinical results.

Precautions

The periocular area often has many superficial and deep venous structures that may or may not be visible through the surface of the skin. Trying to avoid them will keep the toxin from being washed away and also prevent bruising.

Post-Injection Instructions

This is a highly vascular area, so bruising is possible. If a vessel is injured, hold firm pressure for a minute or two to minimize bruising. Ice packs used after injection may also minimize bruising, if necessary.

Risks

Extending the injections too far inferiorly and too deep under the orbicularis can affect the zygomaticus major muscle and result in an upper lip droop or asymmetric smile. Patients should be made aware that injections cannot be extended too inferiorly in this area. Some patients will note an accentuation of

lines in this region once the lateral lines have been treated.

Pearls of Injection

- It is acceptable to have some movement with full expressive action of the muscle.
- Because of the wider zone of effect, some practitioners prefer BoNTA-ABO (Dysport) in this area.

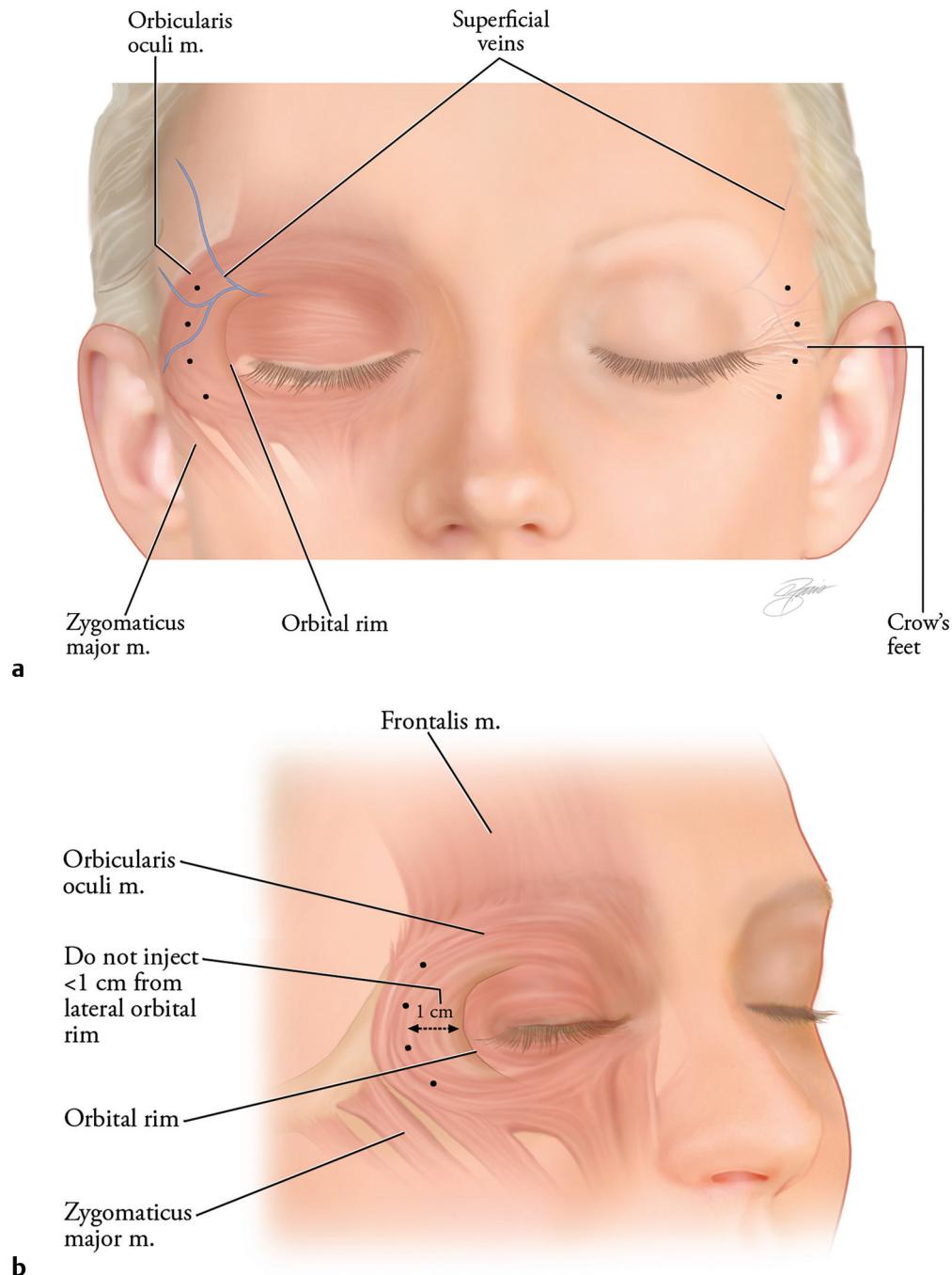


Fig. 8.1 (a,b) Injections to treat the crow's feet are traditionally placed subcutaneously into the orbicularis muscle in a radial fashion 1 cm outside the lateral orbital rim. Avoid injection into the superficial veins seen in that region.

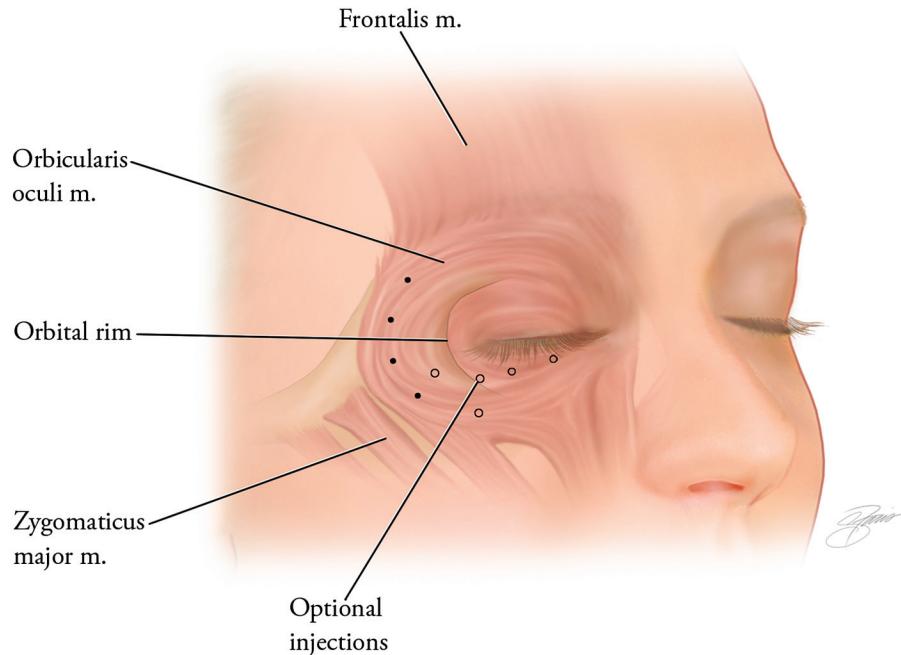


Fig. 8.2 For patients with wrinkles under the eyes, optional sites are shown, but care must be taken to avoid diffusion of BoNTA into the zygomaticus muscles.

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9

Neurotoxin Injection for Lateral Brow Lift

Difficulty: ●●

Patient Satisfaction: ●

Risk: ●

Indications

Hyperactivity of the lateral aspect of the orbicularis oculi muscle can result in ptosis of the lateral aspect of the brow. Vertically and obliquely oriented fibers of muscle, when activated or with baseline resting muscle tension, pull down on the position of the tail of the brow and oppose the lifting action of the frontalis muscle.

Anatomic Considerations

The orbicularis oculi muscle is a strong brow depressor. In most patients, the superolateral orbicularis oculi is positioned at or just inferior to the level of the lateral eyebrow hairs.

Injection Technique

The best effect occurs when the noninjecting hand is used to elevate the brow and injections are kept approximately 1 cm above the orbital rim. Topical anesthesia may be used but is not necessary in most cases.

BoNTA is injected into the muscle in two to three spots along the lateral brow, each with 2 to 3 BU for a total of 4 to 6 BU per side.

Precautions

Bruising is a risk in this area. The periocular area has many superficial venous structures that may or may not be visible through the surface of the skin. Bruising can be minimized by injecting into the superficial subcutaneous tissue.

Post-Injection Instructions

Hold firm pressure if bleeding occurs. Bruising is possible and more likely in this area than in many others.

Risks

There are few risks so long as the BoNTA does not affect the levator palpebrae superioris muscle.

Pearls of Injection

- Not all patients will be able to achieve significant brow elevation.
- Because brow elevation results from the upward pull of the brow by the frontalis muscle, simultaneous injection of the lateral aspect of the frontalis and the lateral orbicularis muscles will negate the upward lift of the brow in this region.

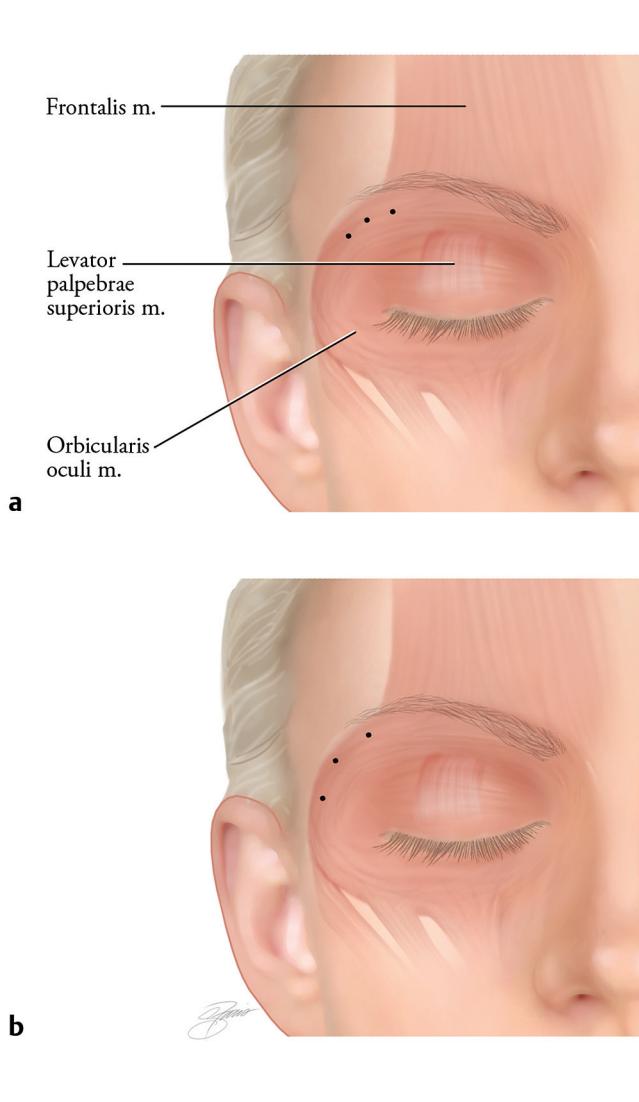


Fig. 9.1 (a,b) Suggested patterns of BoNTA injection of the lateral aspect of the orbicularis muscle can result in a lateral brow lift.

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10

Neurotoxin Injection for Chemical Brow Lift

Difficulty: ●●

Patient Satisfaction: ●

Risk: ●●

Indications

Volume loss in the forehead, combined with hyperactive corrugator, procerus, and orbicularis oculi muscles, is often responsible for brow ptosis. Vertically and obliquely oriented muscle fibers, when activated or with baseline resting muscle tension, pull down on the position of the brow relative to the upward pull of the frontalis muscle.

Anatomic Considerations

The corrugator, procerus, and lateral orbicularis oculi muscles are brow depressors. Inactivation of the depressor muscles permits the elevation of the brow by allowing the frontalis muscle to overcome their downward pull. Medial elevation is obtained by placing BoNTA in the corrugator and procerus muscles. Lateral brow lift is achieved by treating the lateral orbicularis oculi muscles. It is imperative to preserve muscle function in the forehead by not overly treating (relaxing) the frontalis muscle with BoNTA as the forehead will not be able to elevate the brow, and brow ptosis may occur.

Injection Technique

Topical anesthesia may be used; ice may be applied though neither is necessary in

most cases. Essentially, this lift is created by combining the techniques of treating the glabella and lateral brow (see also Chapter 6 and Chapter 9 of this book). A total of 20 to 30 BU or 60 to 90 DU may be necessary for this treatment.

Precautions

Place injections at least 1 cm away from the bony orbital rim to reduce the risk of spread to the levator palpebrae superioris muscle.

Post-Injection Instructions

Hold firm pressure for any bleeding. Bruising is possible and more likely in the temporal area than in many others. Patient instructions may include the following: avoid exercise for the day, and do not bend over, lie flat, or push on the injection sites for 4 hours. However, there are no clinical studies to show that these instructions actually improve the results or minimize ptosis.

Risks

There are few risks so long as the neurotoxin does not affect the levator palpebrae superioris muscle.

Pearls of Injection

- Not all patients obtain the same degree of brow elevation using this technique.

- Overtreatment of the frontalis muscle will negate any possible brow elevation achieved with these techniques.
- Patients with severe brow ptosis are less likely to obtain a significant lift from a neurotoxin.

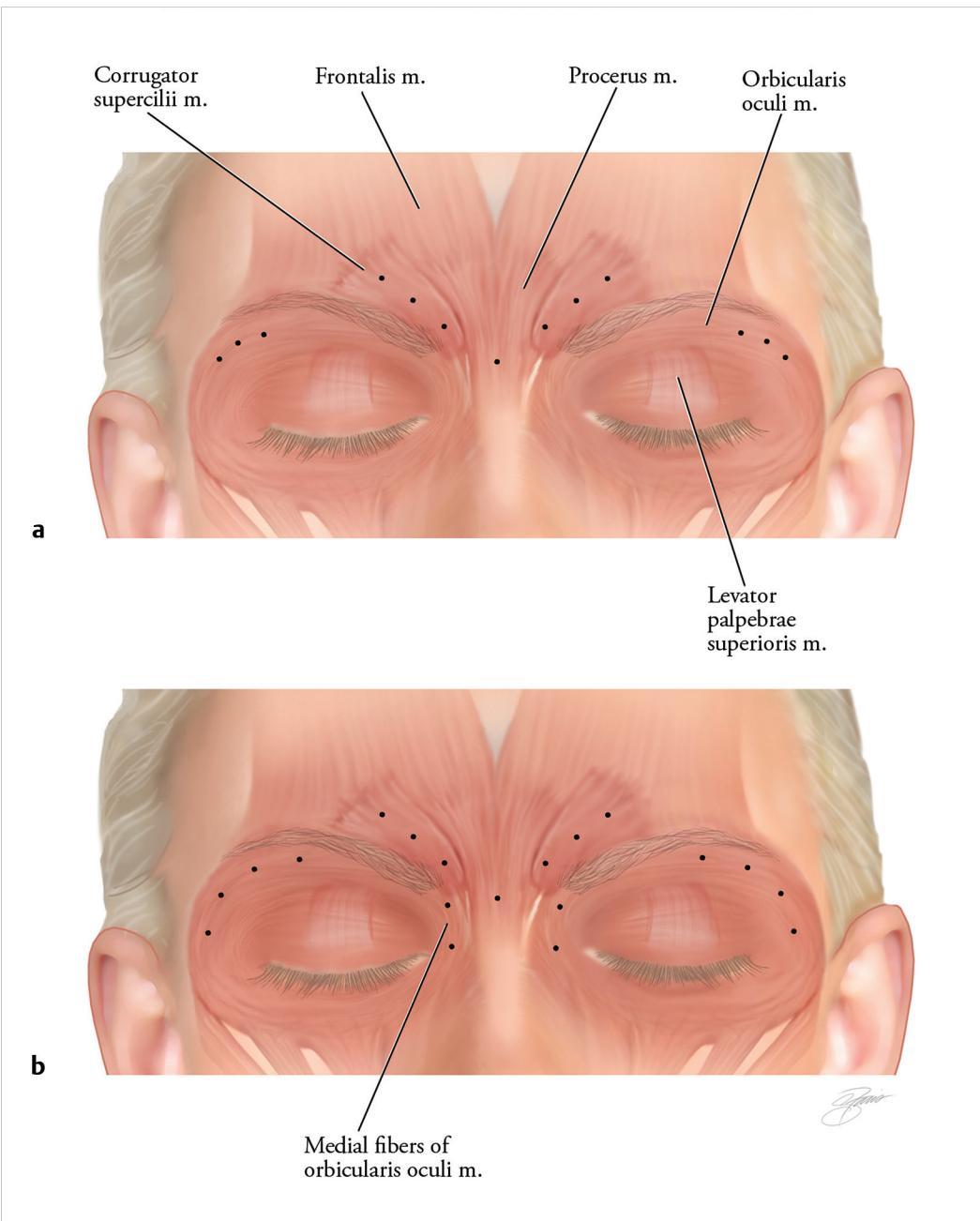


Fig. 10.1 (a,b) A chemical brow lift can be produced by treating the procerus and corrugator muscles centrally and the orbicularis oculi muscle laterally. The frontalis muscle must not be treated so that it can take over the upward pull of the brow. Alternative techniques are demonstrated.

Additional Reading

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11

Neurotoxin Injection for Lower Eyelid Roll

Difficulty: ••

Patient Satisfaction: ••

Risk: ••

Indications

Hypertrophy of the orbicularis oculi muscle can cause a fullness of the lower eyelid when smiling or squinting but is not noticeable at rest.

Anatomic Considerations

The orbicularis oculi muscle surrounds the eye and is divided into three parts: orbital, preseptal, and pretarsal. Hypertrophy of the pretarsal portion of the muscle can result in a fullness of the lower eyelid when the patient smiles.

Injection Technique

Botulinum toxin (1 to 2 BU) is injected at the midpupillary line approximately 3 mm below the lash line. A single injection is placed per eyelid. The injection is immediately subcutaneous.

Precautions

Injection of the pretarsal orbicularis muscle will result in a widening of the

palpebral aperture. Do not inject patients who have a preexisting lower lid laxity, excessive scleral show, or a history of dry eye.

Post-Injection Instructions

None.

Risks

Widening of the palpebral aperture may result in dry eyes. Inject with caution in patients with lax lower eyelids or with dry eye syndrome. Bruising may occur after injection.

Pearls of Injection

- Check the tone of the lower eyelid prior to injection (snap test). Accurate diagnosis is key in these patients, who complain of lower lid “bags.”
- Patients must be counseled on the differences between lower lid fat herniation and orbicularis muscle hypertrophy and treated appropriately.
- Because of the increased zone of effect for Dysport, Botox is preferred for these injections.

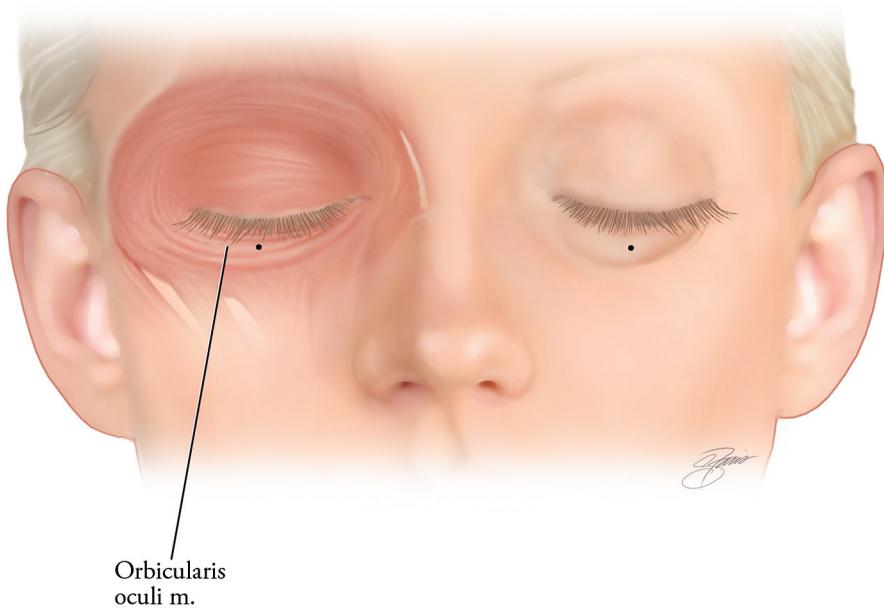


Fig. 11.1 BoNTA is injected at the midpupillary line into the superficial subcutaneous tissue to reduce the bulging of a hypertrophic orbicularis oculi muscle.

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12

Neurotoxin Injection for Bunny Lines

Difficulty: •

Patient Satisfaction: ••

Risk: ••

Indications

“Bunny lines” are wrinkles that radiate from the medial canthal region and run inferomedially on each side of the nose. Bunny lines are not found on every patient and are not universally disliked but can be unacceptable for some patients. Occasionally these rhytids can become stronger over time when all the other upper facial muscles have been treated with BoNTA and these are the only muscles left that the patient can move. They also contribute to deep horizontal glabellar rhytids. In those cases, BoNTA injections can be used to soften this region.

Anatomic Considerations

The superior portion of the nasalis muscle (pars transversa) originates over each incisor foramen and inserts into an aponeurosis on the nasal dorsum. At this aponeurosis, the fibers meet those of the opposite nasalis muscle and the midline procerus muscle. When contracted, these muscles create wrinkles or lines on the nose as well as pull the center of the forehead down and contribute to horizontal glabellar creases.

Injection Technique

Topical anesthesia may be used and ice may be applied, though neither is necessary in most cases. These patients are usually asked to wrinkle their nose up “like a bunny,” or “like they smell something bad.” This movement will indicate where the muscle is located and the strength of the nasalis fibers.

A single injection point can be placed into the muscle on each side using 2 to 3 BU. Assessing muscle location and activity during contraction is essential in determining the proper placement of BoNTA in this area. The muscle is not deep, so the injection need only be placed in the subdermal subcutaneous tissue.

Another technique is to insert the needle across the belly of the muscle and then inject retrograde. The injection occurs at or perpendicular to the direction of the actual bunny lines seen during muscle contraction. Alternately, for larger muscles and extensive lines, more injections can be placed, with care being taken not to extend too far laterally.

Precautions

The treatment in this area needs to be kept more medial to avoid relaxing the nearby levator labii superioris alaeque nasi muscle. Spread to that muscle could lead to lip ptosis or flattening of the nasolabial

fold. Injections also should be kept medial to avoid injection into the angular artery.

Post-Injection Instructions

Because this is a highly vascular and visible area, bruising is possible. Firm pressure should be applied after injection.

Risks

Undertreatment of one side will leave asymmetrical sniffing, which is usually not very noticeable and is easy to adjust with a small injection “boost.” Over-treatment is far more troublesome, as it can result in a flattening of the cheek,

nasolabial fold, or upper lip droop. It is advisable to begin with conservative dosing and to keep the area of injection at or near the level of the nasal bones and upper lateral cartilages of the nose.

Pearls of Injection

- Some patients may not understand why you are treating this area, not realizing that they move the area or that they gesture during smiling. You may need to demonstrate these creases to them in a mirror and explain that it is an important adjuvant in lifting the central glabella and softening the frown lines.

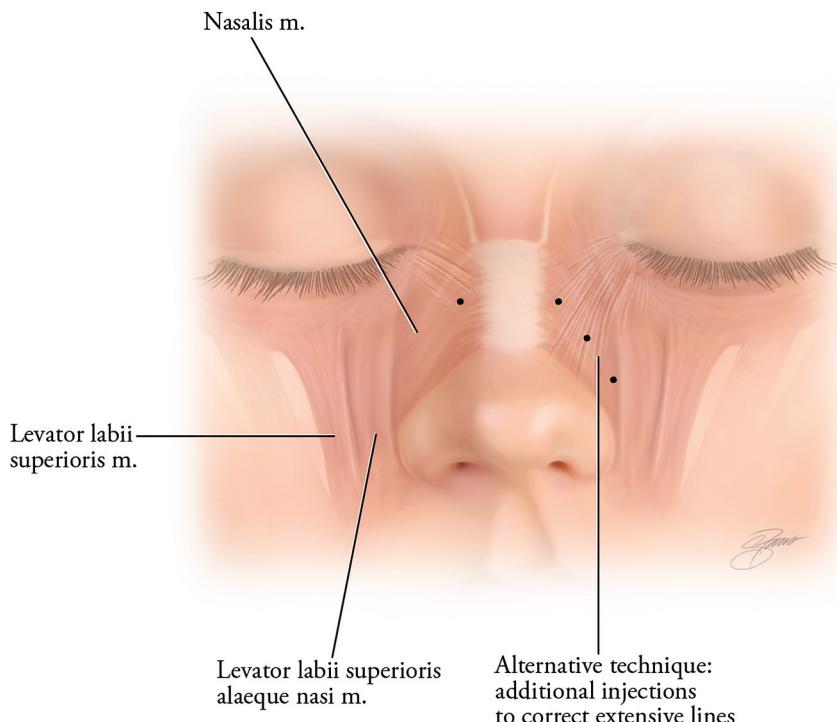


Fig. 12.1 A single injection is used for each muscle, or, for larger muscles, several injections may be placed, with care being taken to stay medial to the levator labii superioris alaeque nasi.

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- [1] Carruthers J, Carruthers A. Botulinum toxin (botox) chemodenervation for facial rejuvenation. *Facial Plast Surg Clin North Am.* 2001; 9(2):197–204, vii
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- [3] Erickson BP, Lee WW, Cohen J, Grunebaum LD. The role of neurotoxins in the periorbital and midfacial areas. *Facial Plast Surg Clin North Am.* 2015; 23(2):243–255

13

Neurotoxin Injection for Nasal Tip Lift

Difficulty: •

Patient Satisfaction: ••

Risk: ••

Indications

Neurotoxin can be injected into the base of the nasal columella to produce a subtle elevation of the nasal tip (increase in tip rotation). This is indicated in patients with a mild drooping of the nasal tip. It will not improve a severely ptotic nose with thick, sebaceous skin: consider surgical treatment for severely ptotic noses. This procedure is a mild “finesse” technique.

Anatomic Considerations

The depressor septi nasi muscle is an extension of the orbicularis oris muscle and inserts onto the medial crural foot-plates. It pulls the nasal tip down with smiling. Weakening of this muscle will result in elevation of the tip or widening of the nasolabial angle. The nasolabial angle should be approximately 90 degrees in men, and more obtuse in women.

Injection Technique

Topical anesthesia may be used; however, this single injection usually can be

tolerated without anesthesia. The depressor septi nasi muscle is located at the base of the columella and is the muscle targeted with the injection. Use approximately 2 BU or 5 to 9 DU.

Precautions

This injection will not improve a severely ptotic tip. Use with caution in women who already have an elevated tip. Use with caution in men, who generally do not want an over-rotated tip.

Post-Injection Instructions

None. Bruising is unlikely.

Risks

Overtreatment of this area may cause a drooping of the upper lip.

Pearls of Injection

- Proceed slowly; try half the suggested dose first.
- Make sure that the patient is aware that this is a subtle improvement.
- Do not overtreat.

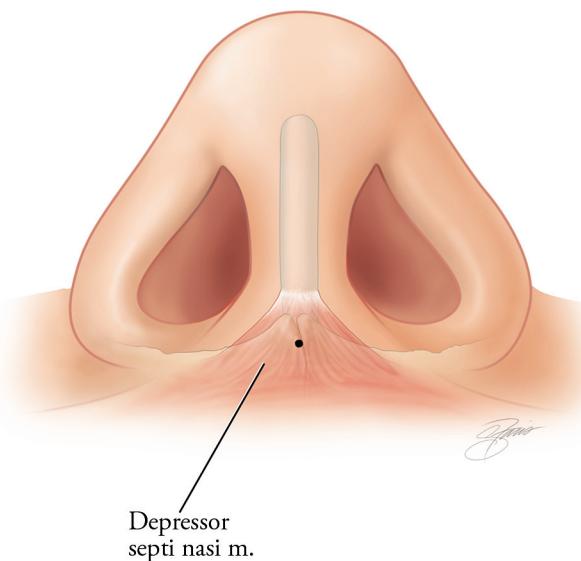


Fig. 13.1 A single injection at the base of the columella can produce a subtle nasal tip elevation.

Additional Reading

- [1] Carruthers J, Carruthers A. Aesthetic botulinum A toxin in the mid and lower face and neck. *Dermatol Surg*. 2003; 29 (5):468–476
- [2] Cigna E, Sorvillo V, Stefanizzi G, Fino P, Tarallo M. The use of botulinum toxin in the treatment of plunging nose: cosmetic results and a functional serendipity. *Clin Ter*. 2013; 164(2): e107–e113
- [3] Redaelli A. Medical rhinoplasty with hyaluronic acid and botulinum toxin A: a very simple and quite effective technique. *J Cosmet Dermatol*. 2008; 7(3):210–220

14

Neurotoxin Injection for Nasal Flare

Difficulty: ●●●

Patient Satisfaction: ●●

Risk: ●●

Indications

Some individuals inadvertently flare their nostrils while speaking.

Anatomic Considerations

The dilator nasalis muscle is the lower portion of the nasalis muscle and attaches to the alar cartilage. Contraction of the dilator nasalis muscle results in alar flaring. This muscle lies superficial to the lateral crura of the lower lateral cartilage.

Injection Technique

Topical anesthesia may be used; however, this single injection usually can be tolerated without anesthesia. One injection point is used per side. Approximately 5 BU or 15 DU are used per side. Inject into the immediate subdermal

tissue, with care being taken to avoid the alar cartilage.

Precautions

None.

Post-Injection Instructions

None. Bruising is unlikely.

Risks

None.

Pearls of Injection

- Proceed slowly; try half the suggested dose first.
- Make sure that the patient is aware that this is a subtle improvement.
- Do not overtreat.
- Results may last 3 to 4 months; however, frequent injections may not be necessary as the patient may “unlearn” to contract the muscle while speaking.

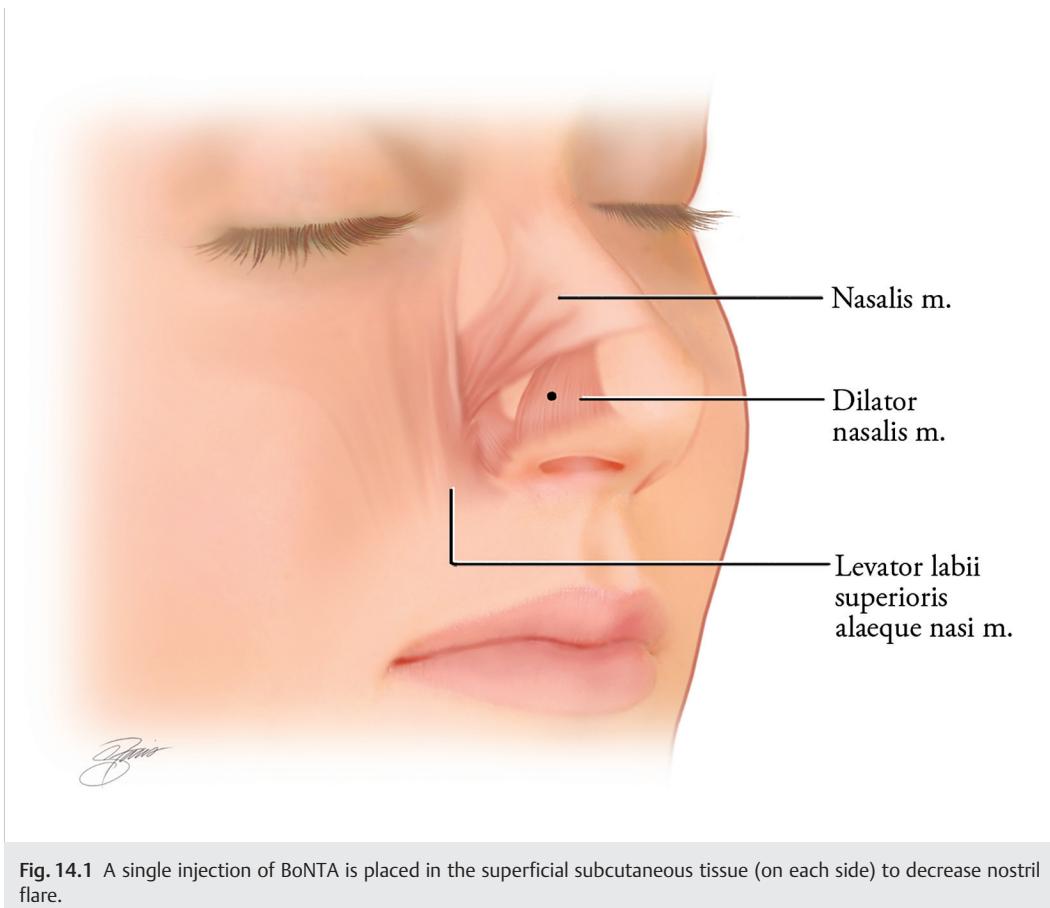


Fig. 14.1 A single injection of BoNTA is placed in the superficial subcutaneous tissue (on each side) to decrease nostril flare.

Additional Reading

- [1] Carruthers J, Carruthers A. Aesthetic botulinum A toxin in the mid and lower face and neck. *Dermatol Surg*. 2003; 29 (5):468–476
- [2] Gassia V, Raspaldo H, Niforos FR, Michaud T. Global 3-dimensional approach to natural rejuvenation: recommendations for perioral, nose, and ear rejuvenation. *J Cosmet Dermatol*. 2013; 12(2):123–136

15

Neurotoxin Injection for Elevating the Oral Commissures

Difficulty: ●●

Patient Satisfaction: ●●

Risk: ●●

Indications

Neurotoxin can be injected in the depressor anguli oris (DAO) muscles to elevate the oral commissures. This is indicated in patients with downturned corners of the mouth. Neurotoxin alone can be used in this area, but most often must be combined with filler injections to the oral commissure (see also Chapter 43).

Anatomic Considerations

The DAO muscle originates along the oblique line of the mandible and inserts into the modiolus. Contraction of the DAO muscle pulls down the corners of the mouth. Weakening this muscle will result in a compensatory upward pull of the zygomaticus muscles, which results in elevation of the oral commissures.

Injection Technique

A single injection per muscle is suggested and well tolerated. The DAO muscle should be palpated while having the patient actively frown. If the belly of the muscle cannot be palpated, a rough estimate of its location can be made by

going 1 cm lateral to the oral commissure and then 1 cm inferiorly. Inject approximately 2 to 5 BU or 6 to 15 DU deeply into each muscle.

Alternate Technique

To avoid other perioral muscles, injections may be placed into the inferior aspect of the muscle. A single injection is placed just above the mandibular border, diagonally and inferior to the oral commissure.

Precautions

This injection will not improve severely depressed oral commissures and will not elevate the marionette lines.

Post-Injection Instructions

None. Bruising is unlikely.

Risks

Overtreatment of this area is unlikely. It is more likely that only a mild improvement in the downturned oral commissure is seen, especially in patients with heavy surrounding skin. The major risk of injection in this area is incorrect placement of the BoNTA injection, which can affect the more medial lip depressor muscle (depressor labii inferioris) and thus affect the smile.

Pearls of Injection

- Neurotoxin alone may improve mild down-turning of the oral commissures. More resistant cases likely will require hyaluronic acid filler injection to the

oral commissure in addition to BoNTA injection of the DAO muscles.

- Be sure to inform the patient that only a subtle improvement is likely.

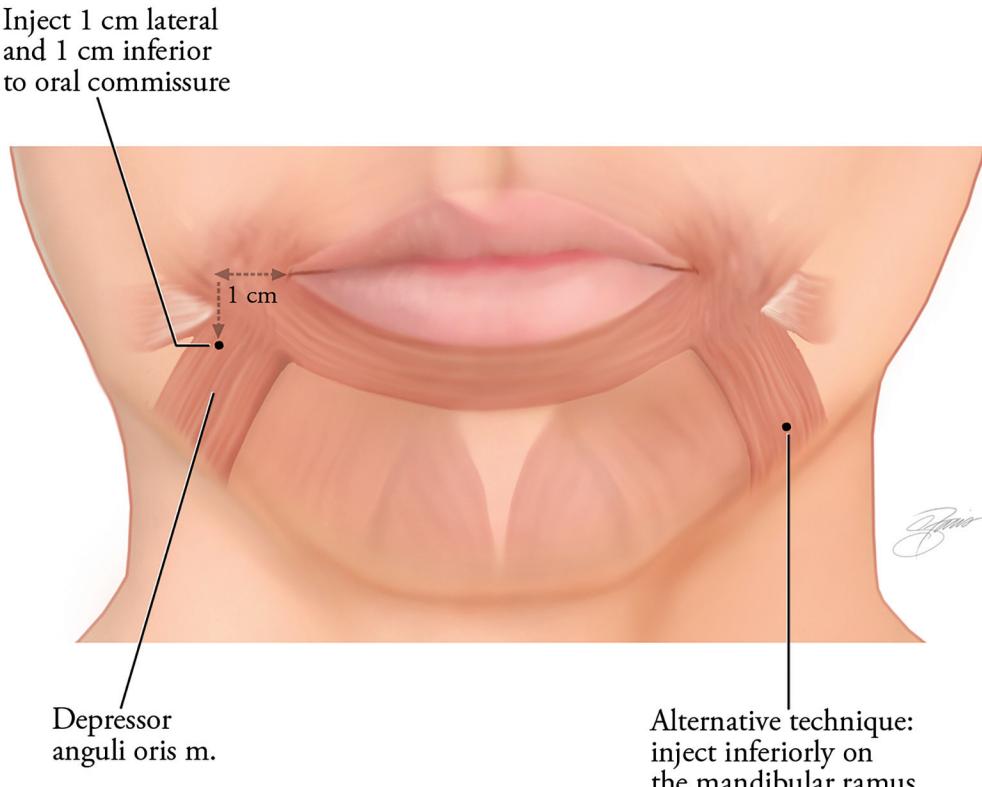


Fig. 15.1 (Left) BoNTA can be injected into the depressor anguli oris muscle, which can be palpated 1 cm lateral and inferior to the oral commissure. (Right) Alternate injection site of the depressor anguli oris muscle is 1 cm above the mandibular border, on a line positioned diagonally and inferior to the oral commissure.

Additional Reading

- [1] Carruthers J, Carruthers A. Aesthetic botulinum A toxin in the mid and lower face and neck. *Dermatol Surg*. 2003; 29 (5):468–476
- [2] Dayan SH, Maas CS. Botulinum toxins for facial wrinkles: beyond glabellar lines. *Facial Plast Surg Clin North Am*. 2007; 15(1):41–49, vi
- [3] Fabi SG, Massaki AN, Guiha I, Goldman MP. Randomized split-face study to assess the efficacy and safety of abobotulinumtoxinA versus onabotulinumtoxinA in the treatment of melolental folds (depressor anguli oris). *Dermatol Surg*. 2015; 41(11):1323–1325

16

Neurotoxin Injection for Lip Lift

Difficulty: ●●

Patient Satisfaction: ●●

Risk: ●●

Indications

A small improvement in the visible pink lip can be achieved by the use of BoNTA in some patients. This can be used to enhance the upper and/or lower lips.

Anatomic Considerations

The orbicularis oris muscle is the sphincter that surrounds the mouth. The pull of the muscle is toward the center; therefore, weakening this pull will allow the upper lip elevators and the lower lip depressors to increase their pull on the lips. This increased pull will result in more visible pink lip and a slight "lip lift."

Injection Technique

Botulinum toxin is injected at the base of the philtrum at the vermillion border. The corresponding location of the lower lip may also be injected. Approximately 1 to 2 BU is used for each injection. (Because of the increased zone of effect of Dysport, the authors prefer to use Botox in this area.)

Precautions

Injections around the mouth must be symmetric to avoid asymmetry of the mouth when smiling or puckering the lips. Avoid these injections in persons who play the flute, whistle, or do similar activities. Warn patients that they may initially experience difficulty drinking through straws.

Post-Injection Instructions

None.

Risks

Asymmetry can be reduced by ensuring that the injections are placed symmetrically.

Pearls of Injection

- This technique produces a very subtle augmentation in the lips, possibly a 1 to 2 mm increase in pink lip visibility.
- The relative size of the lip increases, but there is no increase in lip volume. The patient should not expect that this procedure will produce the same results as fillers; however, this procedure can be used in addition to fillers and is encouraged in patients who have very thin lips.



Fig. 16.1 BoNTA is injected at the base of the philtral columns on the upper lip and may also be injected in similar locations on the lower lip to cause a subtle increase in pink lip, or a pseudo-augmentation.

Additional Reading

- [1] Fagien S. Botox for the treatment of dynamic and hyperkinetic facial lines and furrows: adjunctive use in facial aesthetic surgery. *Plast Reconstr Surg.* 1999; 103(2):701-713
- [2] Semchyshyn N, Sengelmann RD. Botulinum toxin A treatment of perioral rhytides. *Dermatol Surg.* 2003; 29(5):490-495, discussion 495

17

Neurotoxin Injection for Smoker's Lines

Difficulty: ●●

Patient Satisfaction: ●●

Risk: ●●

Indications

Perioral wrinkles extend radially from the lips due to the repeated puckering motion from speaking or smoking. In women, lipstick may "bleed" into these lines. In non-smokers, these lines can be produced in patients who purse their lips while talking.

Anatomic Considerations

The orbicularis oris muscle is the sphincter that surrounds the mouth. Repeated contraction of this muscle may result in circumoral rhytids.

Injection Technique

BoNTA is injected at the vermillion border, usually 1 to 2 units per quadrant. Not more than four injections are performed on each lip, and not more than two per side. (Because of the increased zone of effect for Dysport, the authors prefer Botox in this area.) The wrinkles themselves do not necessarily need to be injected, as the mild paresis of the muscle will improve the entire region injected.

Precautions

Injections around the mouth must be symmetric, to avoid asymmetry of the

mouth when smiling or puckering the lips. Avoid these injections in persons who whistle, play the flute, or do similar activities. Warn patients that they may initially have difficulty drinking through straws.

Post-Injection Instructions

None.

Risks

Asymmetry can be reduced by ensuring that the injections are placed symmetrically.

Pearls of Injection

- This technique can be performed on one or both lips, but care must be taken not to inject near the oral commissure, and not to over-inject the lips, which potentially could cause oral incompetence.
- The concomitant use of fillers in this area can improve results.
- For those who charge by the unit, the benefit-risk ratio for this area is not favorable, and only tiny amounts are used, resulting in low reimbursement, yet the risk of asymmetry and/or overtreatment is high because of the small sensitive muscles being treated. The novice injector should beware.

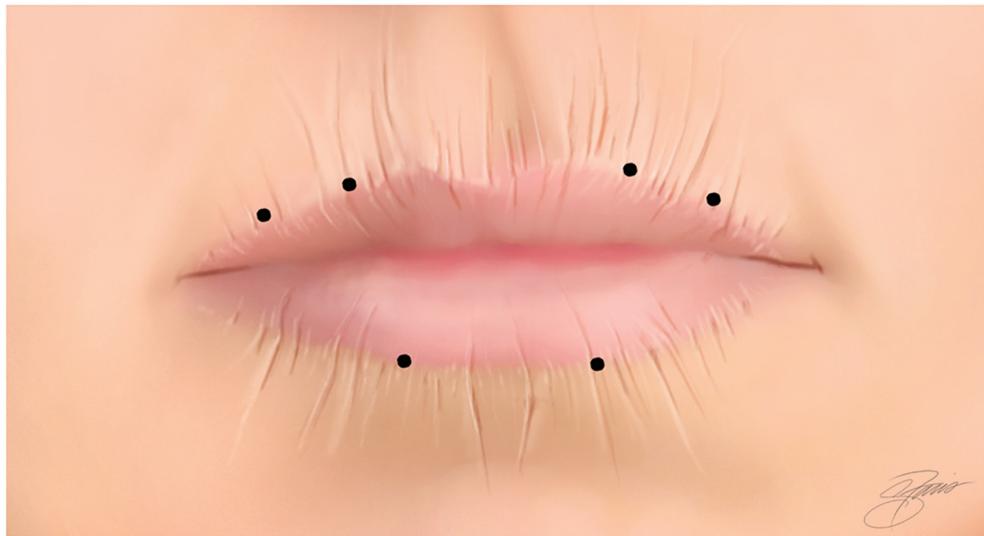


Fig. 17.1 To treat smoker's lines, either 2 or 4 injections should be placed symmetrically on the upper and/or lower lip. Do not attempt to inject every wrinkle.

Additional Reading

- [1] Carruthers J, Fagien S, Matarasso SL, Botox Consensus Group. Consensus recommendations on the use of botulinum toxin type A in facial aesthetics. *Plast Reconstr Surg.* 2004; 114(6 Suppl):1S–22S
- [2] Cohen JL, Dayan SH, Cox SE, Yalamanchili R, Tardie G. OnabotulinumtoxinA dose-ranging study for hyperdynamic perioral lines. *Dermatol Surg.* 2012; 38(9):1497–1505
- [3] Romagnoli M, Belmontesi M. Hyaluronic acid-based fillers: theory and practice. *Clin Dermatol.* 2008; 26(2):123–159

18

Neurotoxin Injection for Gummy Smile

Difficulty: ●●●

Patient Satisfaction: ●●

Risk: ●●

Indications

Some patients pull their upper lip up dramatically while smiling, which reveals a large part of the gingival tissue, often referred to as a “gummy smile.” Some patients also develop a strong horizontal crease just below the columella in the mid-lip area. Both of these problems are often helped with this treatment.

Anatomic Considerations

The upper lip is elevated during smile by the levator labii superioris alaeque nasi muscles. These muscles originate on the frontal process of the maxilla and insert on the skin of the lateral aspect of the nostril and upper lip. Unilateral contraction of this muscle results in an upper lip snarl, and this muscle has been referred to as the “Elvis” muscle.

Injection Technique

Topical anesthesia may be used, but this single injection (per side) usually can be tolerated without anesthesia.

The levator labii superioris alaeque nasi muscle travels just lateral to the nose; 1 to 2 BU is used in this area. Titrate to determine the necessary dosing for the patient.

Precautions

This injection will elongate the upper lip. Use with caution in older patients who may have long upper lips. Younger patients may benefit more from this procedure than do elderly patients.

Use with caution in patients who cannot tolerate a weakening of the upper lip (e.g., wind instrument musicians, actors).

Post-Injection Instructions

None. Bruising is unlikely.

Risks

Overtreatment of this area may cause severe drooping of the upper lip.

Pearls of Injection

- Proceed slowly; try half the suggested dose first.

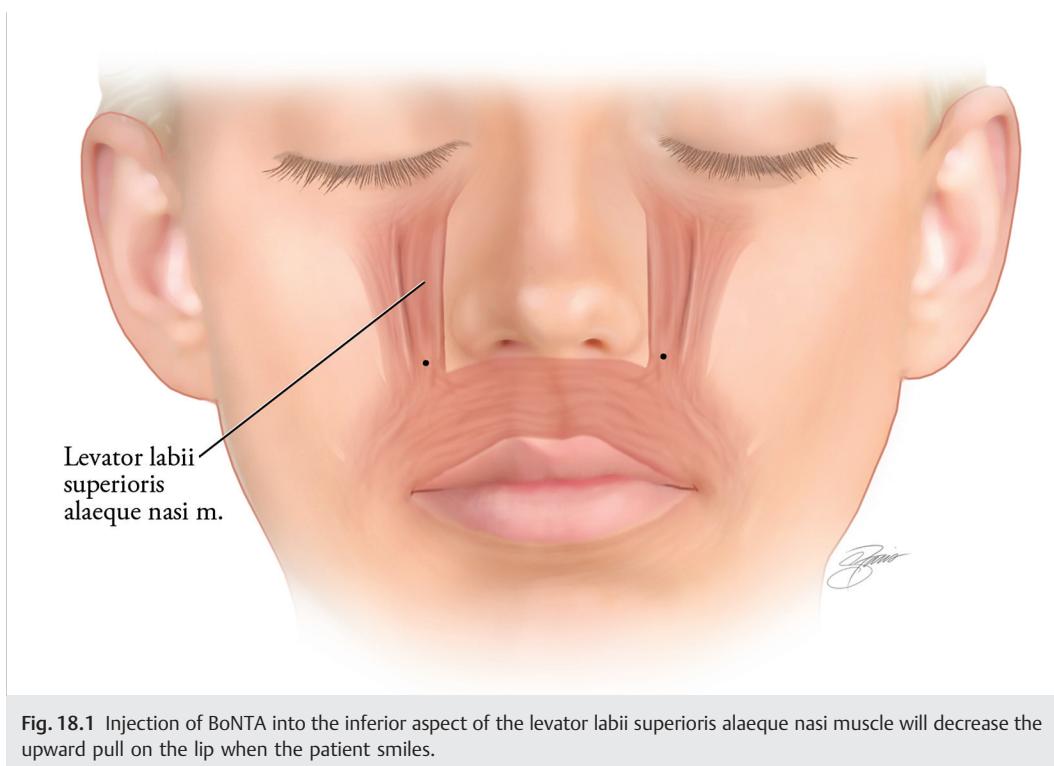


Fig. 18.1 Injection of BoNTA into the inferior aspect of the levator labii superioris alaeque nasi muscle will decrease the upward pull on the lip when the patient smiles.



Fig. 18.2 (a) Patient with gummy smile pre-injection. (b) Post-injection BoNTA with patient producing maximum smile excursion. Also note improvement in the horizontal crease below the columella.

Additional Reading

- [1] Polo M. Botulinum toxin type A (Botox) for the neuromuscular correction of excessive gingival display on smiling (gummy smile). *Am J Orthod Dentofacial Orthop.* 2008; 133(2):195–203
- [2] Stephan S, Wang TD. Botulinum toxin: clinical techniques, applications, and complications. *Facial Plast Surg.* 2011; 27(6):529–539

19

Neurotoxin Injection for Dimpled Chin

Difficulty: ●

Patient Satisfaction: ●●●

Risk: ●

Indications

Some patients inadvertently wrinkle their chins either at rest or while talking. Usually it is not noticed by the patient until it is pointed out by the clinician. Dimpled chins can also be seen after chin implants, or in patients with retrognathia. Atrophy of the subcutaneous fat and dermis overlying the muscles can contribute to a dimpling appearance. Because this dimpling somewhat resembles the skin of an orange, this deformity is called “peau d’orange” chin.

Anatomic Considerations

The paired mentalis muscles originate on the incisor fossa of the mandible and insert directly onto the dermis of the chin skin. Contraction of the mentalis muscles elevates the lower lip, producing a “pout.” Contraction also contributes to the mental crease.

Injection Technique

Botulinum toxin is injected deeply into each muscle in three or four injection

sites. A total of 3 to 10 BU or 9 to 30 DU is injected.

Precautions

Place injections low and medially in the chin, between the mental crease and the lower edge of the mandible.

Post-Injection Instructions

None.

Risks

- Injection above the mental crease can affect the orbicularis oris muscle and may result in lower lip droop, or even drooling.
- Under-treatment may result in abnormal contraction of the muscle, and an additional “boost” of BoNTA may be required to improve this deformity.

Pearls of Injection

- Inject symmetric amounts of neurotoxin into the muscle bodies.
- This is a relatively painless injection.
- Show patients how their muscle looks contracted, so that they may understand the rationale for this treatment.

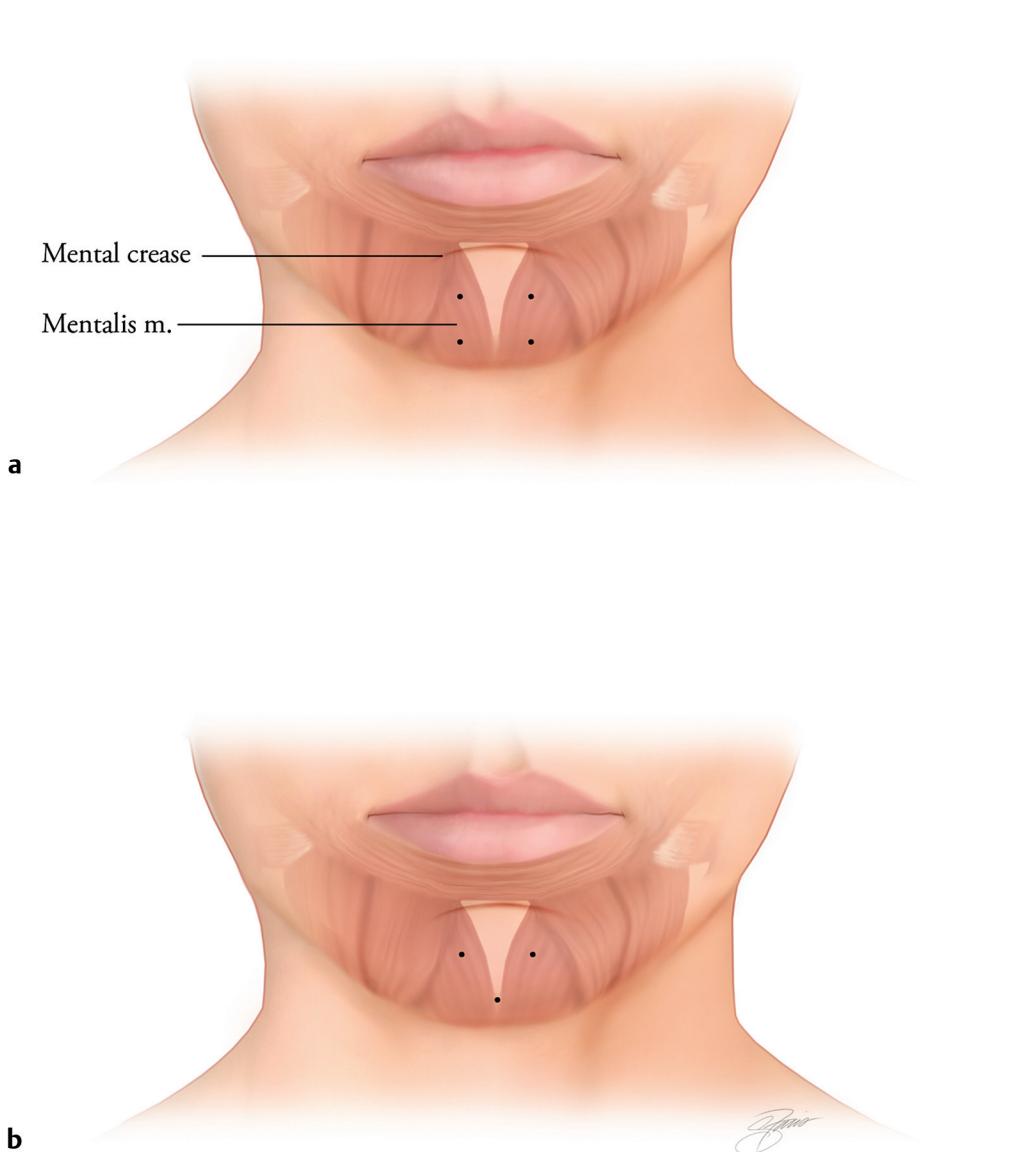


Fig. 19.1 (a,b) Suggested techniques for injection of BoNTA into the paired mentalis muscles to improve dimpled chin.

Additional Reading

- [1] Carruthers J, Carruthers A. Aesthetic botulinum A toxin in the mid and lower face and neck. *Dermatol Surg*. 2003; 29(5):468–476
- [2] Carruthers J, Fagien S, Matarasso SL, Botox Consensus Group. Consensus recommendations on the use of botulinum toxin type A in facial aesthetics. *Plast Reconstr Surg*. 2004; 114(6 Suppl):1S–22S
- [3] Wise JB, Greco T. Injectable treatments for the aging face. *Facial Plast Surg*. 2006; 22(2):140–146

20

Neurotoxin Injection for Platysmal Banding

Difficulty: ●●●

Patient Satisfaction: ●

Risk: ●

Indications

Platysmal bands are vertical bands in the neck that are seen at rest and are accentuated with neck tightening and forced jaw opening. This procedure may be used in younger patients who are not yet ready for surgery, or in older patients who do not desire surgery, and to treat recurrent bands in postoperative patients.

An additional indication is the patient who has been treated with submental fat therapies that have unmasked platysmal banding.

Anatomic Considerations

The platysma muscle is a thin, superficial muscle that originates on the clavicle and upper chest and inserts onto the superficial musculoponeurotic system (SMAS), the skin of the lower face, the facial muscles, and the mandible. Although in youth it is considered a continuous sheet, in the elderly this muscle may splay centrally and produce prominent vertical bands. Platysmal bands can be prominent in patients with thin necks, with thin skin, and without abundant overlying fat.

Injection Technique

Having the patient grimace to tighten the neck will often bring out the problem muscles and make the injection easier to perform. Ask the patient to sit upright and lean forward slightly, with the chin elevated just above the horizontal plane. With the platysma muscle in full contraction, the edge of the muscle band is grasped with two fingers while the muscle is injected. The needle is placed deeply into the muscle, between the fingers and perpendicular to the muscle fibers. Approximately 3 to 5 BU is injected into each injection site, for a total of 15 BU per band or 35 to 45 DU per band. A series of approximately three injections is placed down the length of the band approximately 1.5 to 2.0 cm apart. If lateral bands are prominent on full contraction, then these can be injected in the same fashion, though they may need fewer units. Begin injections at the cervicomental angle and work inferiorly, staying approximately 2.0 to 2.5 cm below the mandibular border so as not to affect the upper facial muscles of expression.

Precautions

Over-injection in this region may affect the muscles involved in swallowing. Bruising is not uncommon.

Post-Injection Instructions

Hold pressure to prevent bruising.

Risks

- Patients with a heavy neck may not be good candidates for this procedure, as the results of injection may not be impressive and may need the fat addressed first.
- Over-injection of BoNTA in this region can result in dysphagia or dysphonia.

Pearls of Injection

Although very effective for some patients, the results can be short-lived and can require large doses. This technique may need to be combined with submandibular gland injection for optimal neck contouring (see also Chapter 26). Appropriate surgical candidates should be given the option for lower face and neck lift surgery.

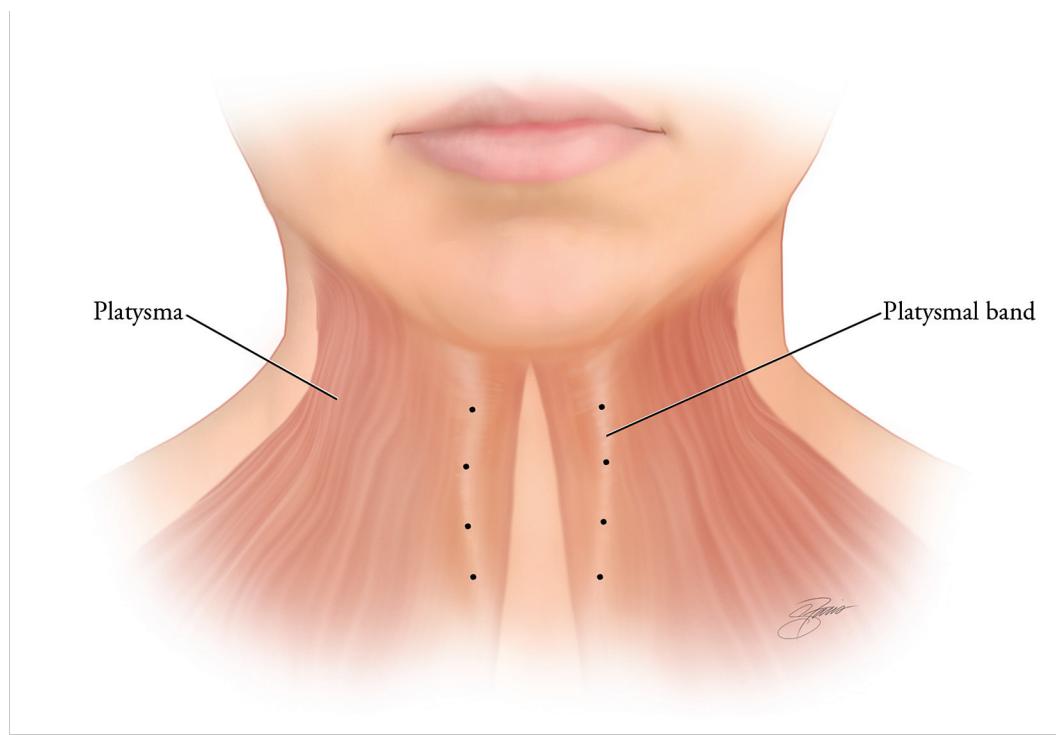


Fig. 20.1 A 1-inch (2.5-cm) or longer needle is usually required to place BoNTA well into the muscle of each platysmal band. Grasp the muscle during injection to ensure intramuscular injection.

Additional Reading

- [1] Carruthers J, Fagien S, Matarasso SL, Botox Consensus Group. Consensus recommendations on the use of botulinum toxin type A in facial aesthetics. *Plast Reconstr Surg.* 2004; 114(6 Suppl):S1-S22S
- [2] Matarasso A, Matarasso SL, Brandt FS, Bellman B. Botulinum A exotoxin for the management of platysma bands. *Plast Reconstr Surg.* 1999; 103(2):645-652, discussion 653-655
- [3] Prager W, Bee EK, Havermann I, Zschocke I. Incobotulinum-toxinA for the treatment of platysmal bands: a single-arm, prospective proof-of-concept clinical study. *Dermatol Surg.* 2015; 41 Suppl 1:S88-S92

21

Neurotoxin Injection for Necklace Lines

Difficulty: ●●

Patient Satisfaction: ●

Risk: ●

Indications

Horizontal lines of the neck are noted at rest and can deepen with aging.

Anatomic Considerations

These lines occur due to the dermal attachments of the superficial musculoponeurotic system (SMAS). They are seen in the neck from birth but can increase and deepen during the aging process. Treatment of these areas will soften the lines in this area but not completely remove them.

Injection Technique

This is an intradermal injection. One or 2 BU is injected at 1.0- to 1.5-cm intervals along the horizontal crease. There should be a wheal of product in the skin. Do not use more than 15 to 20 units per treatment session.

Precautions

Deep injection may affect the muscles involved in swallowing.

Post-Injection Instructions

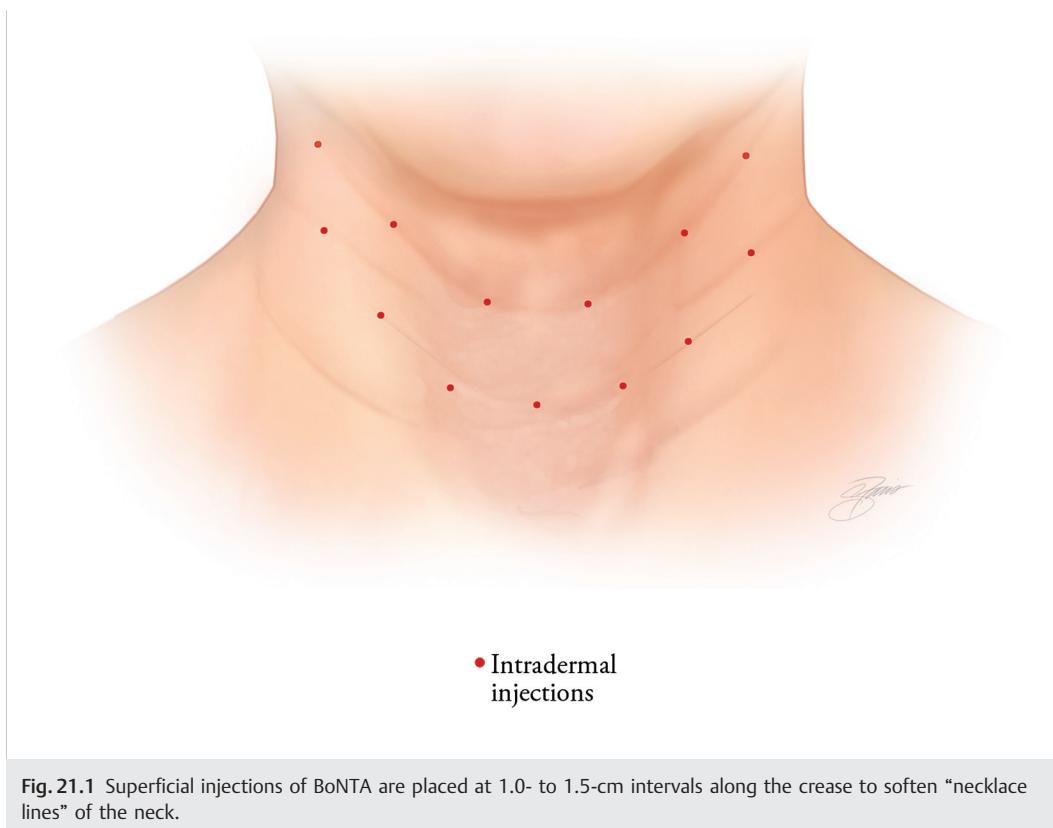
None. Bruising is unlikely.

Risks

Because the swallowing muscles are cholinergic, overtreatment of this area can result in a weak or diminished swallow.

Pearls of Injection

- Stay intradermal: do not inject deeply.
- Proceed slowly; try half the suggested dose first.
- Inform the patient that this is only a subtle improvement.
- Do not overtreat.
- Inform the patient of the risk of diminished swallowing.



● Intradermal injections

Fig. 21.1 Superficial injections of BoNTA are placed at 1.0- to 1.5-cm intervals along the crease to soften “necklace lines” of the neck.

Additional Reading

- [1] Carruthers J, Carruthers A. Aesthetic botulinum A toxin in the mid and lower face and neck. *Dermatol Surg*. 2003; 29 (5):468–476

22

Neurotoxin Injection for the Décolleté

Difficulty: ●●

Patient Satisfaction: ●

Risk: ●

Indications

Vertical wrinkles can emanate from the cleavage area superiorly, especially when the arms are crossed. These wrinkles can be mild in younger patients, yet become deep-set creases in older patients. Such wrinkles may be troublesome to women who like to wear blouses or dresses with low necklines.

Anatomic Considerations

The platysma muscle originates in the chest attaching to the fascia of the pectoralis major muscles generally at the level of the second intercostal space. In some patients, this origination can be lower and contributes to the presence of décolleté lines.

The skin of the chest is often quite photodamaged, and complete treatment of the décolleté may involve a combination of skin care and intense pulsed light (IPL) treatments.

Injection Technique

This is not a painful injection; either no anesthesia or topical anesthesia can be used. Neurotoxin is placed in a V-shaped pattern starting at the cleavage and extending upward toward the clavicle. The injection sites are separated by approximately

2 cm, and usually 10 to 12 injections are placed. Each injection should deposit approximately 3 to 5 BU or 7 to 10 DU for a total of approximately 30 to 50 BU or 70 to 100 DU. The injections are placed approximately 4 mm deep (which is half the length of the needle if using the BD syringe) and oriented perpendicular to the skin. If longer needles are used, then care must be taken not to go too deep. The needle can be oriented tangentially to deposit the BONT-A in the deep subcutaneous-muscle level.

Precautions

This is a very safe procedure, so long as lengthy needles are not inserted deeply into the chest. Often mild bruising results from this procedure.

Post-Injection Instructions

None.

Risks

Ideal patient selection is important for patient satisfaction. Some older patients have décolleté lines due to sleeping on their sides (sleep creases), and these will not improve with neurotoxin injection.

Pearls of Injection

- Patient selection is important for patient satisfaction.

- Results can sometimes be improved by also treating the platysmal bands of the neck (see also Chapter 20).
- Adjuvant treatment can be achieved with filler to the décolleté (see also Chapter 65).

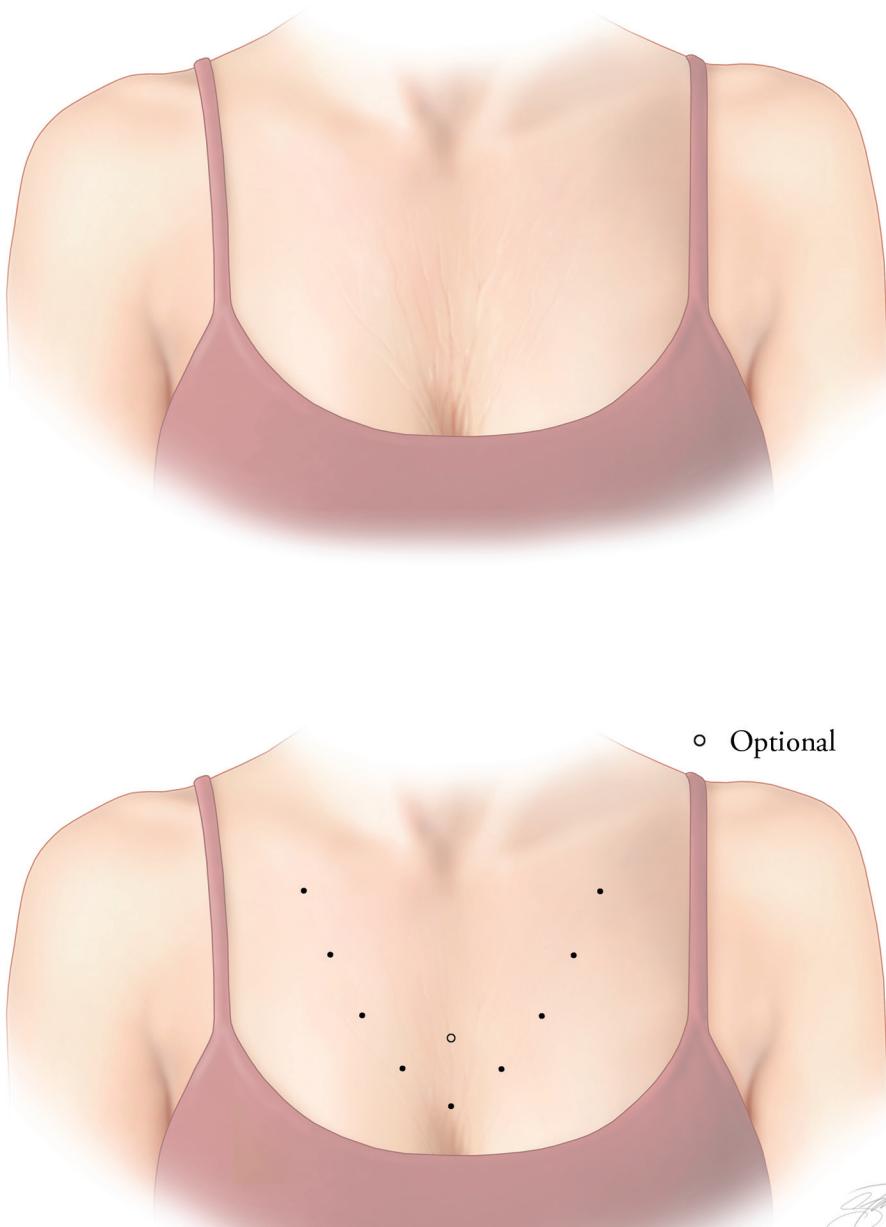


Fig. 22.1 Injection pattern to treat the décolleté with BoNT-A. Open circles denote optional injection sites.

Additional Reading

- [1] Ascher B, Talarico S, Cassuto D, et al. International consensus recommendations on the aesthetic usage of botulinum toxin type A (Speywood Unit)–Part II: Wrinkles on the middle and lower face, neck and chest. *J Eur Acad Dermatol Venereol.* 2010; 24(11):1285–1295
- [2] Becker-Wegerich PM, Rauch L, Ruzicka T. Botulinum toxin A: successful décolleté rejuvenation. *Dermatol Surg.* 2002; 28 (2):168–171

23

Neurotoxin Injection for Nefertiti Neck Lift

Difficulty: ●●●

Patient Satisfaction: ●

Risk: ●●

Indications

Queen Nefertiti of Ancient Egypt is referred to as one of the most beautiful women to have ever lived. Images of Nefertiti generally bring to mind a very graceful neck and a sculpted jawline, based on the famed 3,300-year-old bust found in Egypt in 1912 and now displayed in Berlin. In selected patients, the “Nefertiti neck lift” procedure uses BoNTA to increase the definition of the mandible.

Anatomic Considerations

The platysma muscle is a neck depressor. It originates at the clavicle and fascia of the upper chest and inserts onto the mandible and skin of the chin and cheek. Release of the downward pull of the platysma will allow the facial elevators to elevate the sagging skin over the lower face and more clearly define the mandibular border.

Injection Technique

Patient selection is extremely important when performing this procedure. Patients who desire a more defined mandibular contour should be assessed for the extent

of platysmal pull on their lower face. It is suggested that the patient be asked to contract the platysma muscles; if the mandibular border becomes less visible, then this patient is a good candidate for the procedure.

Injections of BoNTA are placed along the inferior aspect of the mandible and in the upper aspect of the strongest lateral platysmal band. Injections are deep into the muscle; approximately 14 to 20 BU (or 42 to 60 DU) is used per side in equal injections.

Precautions

Extending these injections too far medially can affect the depressor labii inferioris and cause a lip droop or asymmetric smile. Do not inject medial to a line drawn down from the lateral extent of the nasolabial fold to the mandible.

Post-Injection Instructions

None.

Risks

Over-injection of this area can result in dysphagia or an irregular smile. Excessive pull upward on the lower face can result in irregular bunching of the tissue over the mandible.

Pearls of Injection

- This technique is difficult to perform well and should be done only by experienced injectors.
- Careful patient selection and meticulous technique are imperative.

- Stay low and lateral on the mandible to avoid complications.
- Results may last up to 6 months.



Fig. 23.1 Photograph of the famed Queen Nefertiti bust, crafted circa 1345 BC in Egypt and unearthed in 1912. (Courtesy of Album/Art Resource, NY)

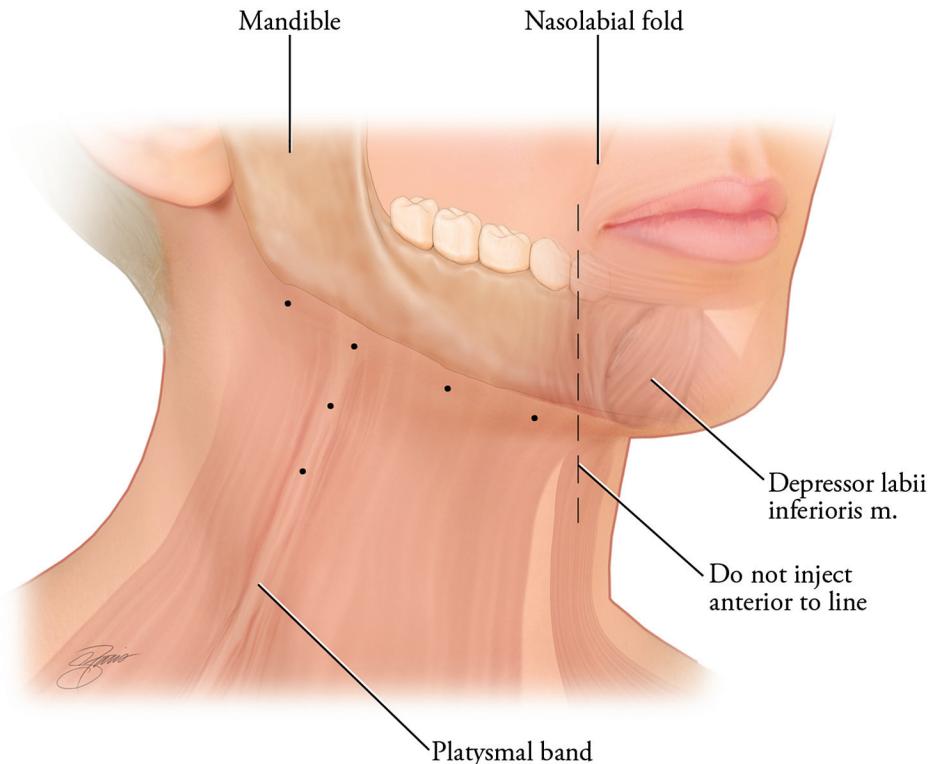


Fig. 23.2 Injections of BoNTA should be placed along the inferior aspect of the mandibular border and into the strongest platysmal band noted during contraction. Stay lateral to avoid weakening the depressor labii inferioris muscle.

Additional Reading

- [1] Levy PM. The 'Nefertiti lift': a new technique for specific re-contouring of the jawline. *J Cosmet Laser Ther.* 2007; 9 (4):249–252
- [2] Levy PM. Neurotoxins: current concepts in cosmetic use on the face and neck-jawline contouring/platysma bands/necklace lines. *Plast Reconstr Surg.* 2015; 136(5) Suppl:80S–83S

24

Neurotoxin Injection for Masseter Hypertrophy

Difficulty: ●●●

Patient Satisfaction: ●●

Risk: ●●

Indications

Square jaw lines and wide mandibular borders are often desirable masculine characteristics but can be unattractive for women and become exaggerated when anatomic hypertrophy exists. Bruxism (teeth grinding), anxiety, and clenching can lead to masseter muscle enlargement and accentuate the horizontal width of the mandibular border. Occasionally patients, especially of East Asian descent, express concern about hypertrophic masseter muscles and request improvement in this area.

Anatomic Considerations

The masseter muscle's origin is along the inferior aspect of the anterior zygomatic arch, and it inserts into the angle of the mandible along both the horizontal (body) and the vertical portions of the mandible (ramus).

Injection Technique

Two different techniques for injecting the muscle can be attempted: intraoral or transcutaneous. In the intraoral technique, the injector's thumb is placed inside the mouth along the buccal mucosa until the

angle of the mandible is palpated, and the patient is asked to bite down (but not on the injector's thumb!). The anterior edge of the masseter muscle is palpated between the thumb and fingers of the same hand resting outside on the cheek. A 1-inch (2.5-cm), 30-gauge needle is passed intraorally anterior to the mandibular ramus and into the muscle belly. This will be somewhat uncomfortable for the patient. BoNTA is injected in a retrograde fashion as the needle is withdrawn. Two to four passes are performed in several tangential intramuscular injections for a total of 20 BU (or 60 DU) to the muscle.

In the transcutaneous technique, it is useful to place one finger along the lower border of the mandible, one along the vertical border of the mandible, and one as a reference at the inner aspect of the mandibular angle, with the patient clenching as a way to mark out the perimeter of the muscle. With a half- or $\frac{3}{4}$ -inch (1.3 or 1.9 cm) needle or longer, injection can be performed inside that perimeter down to just above the bone, and depot injections of 4 to 5 units can be placed per area. An average of 20 units should be used depending on the mass of the muscle being treated.

Precautions

Care must be taken to keep the injections low and posterior, and centered in the

muscle itself. If placed too far anteriorly, the smile may be affected by diffusion into the zygomaticus major or risorius muscles.

Post-Injection Instructions

Holding pressure and gentle massage help to prevent bruising. It can take up to a month for atrophy of the muscle to occur.

Risks

Improper injection into surrounding muscles can result in swallowing and speech disorders. Over-injection of the masseter is unlikely to result in problems with bite or chewing because the temporalis muscle, one of the strongest primary muscles of mastication, is unaffected. Over-injection can lead to masseteric and

parotid atrophy, with excessive hollowing of the preauricular area. Undertreatment can be re-treated with more product and can be tested by asking the patient to clench while you palpate the masseter.

Pearls of Injection

- Reduction of muscle hypertrophy and mandibular width narrowing occur gradually and it may take 6 weeks to see the full effect.
- If not adequately improved, touch-up treatments may be required approximately 6 weeks after the initial treatment.
- Adjust injection amounts accordingly for patients with asymmetric muscle hypertrophy.
- Results can last 6 to 12 months.

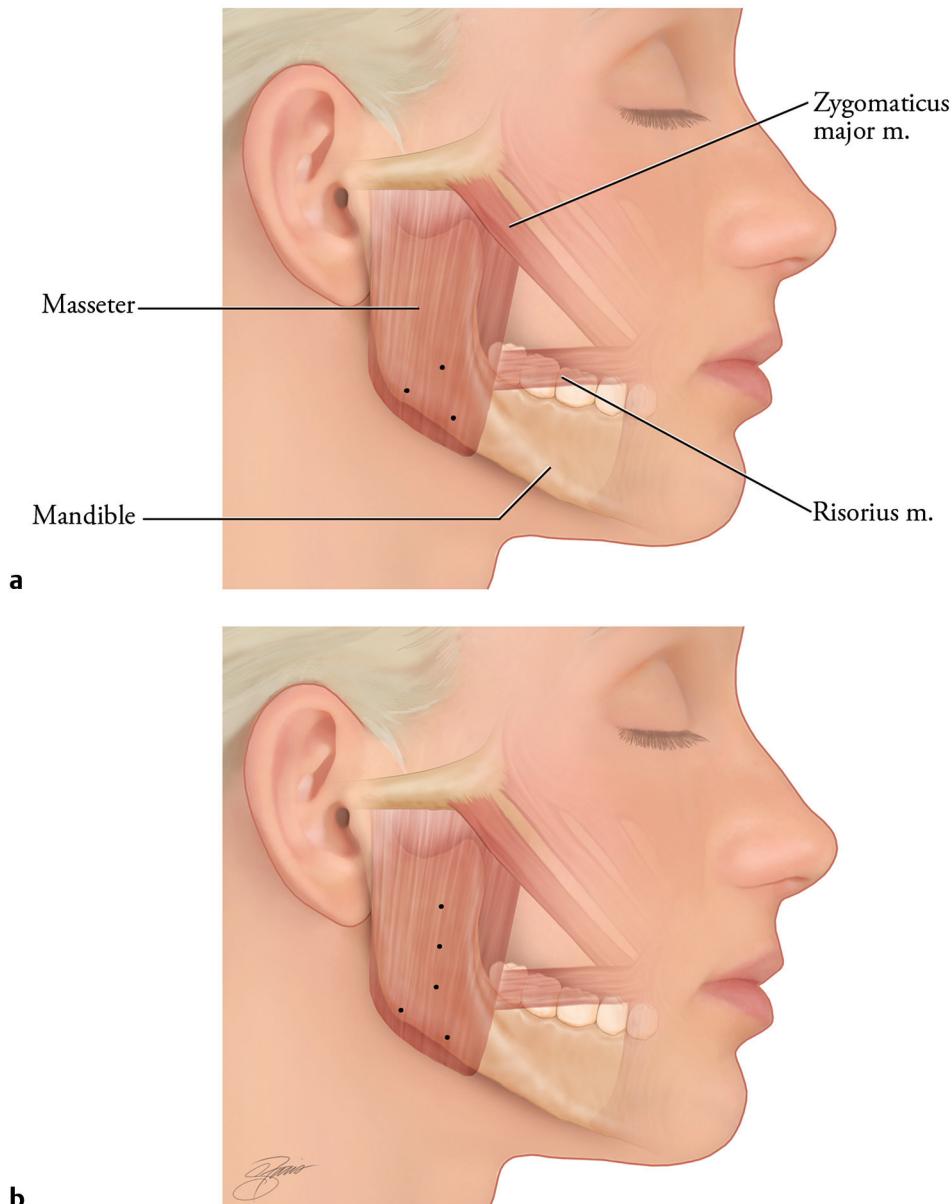


Fig. 24.1 (a,b) Possible injection patterns for transcutaneous BoNTA injection for the treatment of masseter hypertrophy.

Additional Reading

- [1] Choe SW, Cho WI, Lee CK, Seo SJ. Effects of botulinum toxin type A on contouring of the lower face. *Dermatol Surg*. 2005; 31(5):502–507, discussion 507–508
- [2] Wu WT. Botox facial slimming/facial sculpting: the role of botulinum toxin-A in the treatment of hypertrophic masseteric
- [3] Yu CC, Chen PK, Chen YR. Botulinum toxin a for lower facial contouring: a prospective study. *Aesthetic Plast Surg*. 2007; 31(5):445–451, discussion 452–453

muscle and parotid enlargement to narrow the lower facial width. *Facial Plast Surg Clin North Am*. 2010; 18(1):133–140

[3] Yu CC, Chen PK, Chen YR. Botulinum toxin a for lower facial contouring: a prospective study. *Aesthetic Plast Surg*. 2007; 31(5):445–451, discussion 452–453

25

Neurotoxin Injection for Parotid Gland Hypertrophy

Difficulty: ●●●●

Patient Satisfaction: ●●

Risk: ●●●

Indications

Hypertrophy of the parotid gland can be caused by many different factors. Ruling out neoplasms and other diseases should be undertaken before beginning treatment to shrink the gland with BoNTA. Benign glandular enlargement from aging and xerostomia conditions are sometimes appropriate indications for neurotoxin injection. HIV patients can develop lymphoepithelial enlargement of the parotid, and bulimic patients can also develop benign parotid enlargement.

Anatomic Considerations

The parotid gland rests anterior to the ear, beneath the superficial musculoaponeurotic system (SMAS) and platysma muscles, over the lateral mandible. The external carotid artery and posterior facial vein pass just posterior to the gland. The five branches of the facial nerve, which provides motor innervation to facial mimetic musculature, pass through the middle of the gland.

Injection Technique

A 30-gauge, 1-inch (2.5-cm) needle is inserted perpendicular to the gland, and 20

to 30 BU (or 60 to 90 DU) of BoNTA is injected as the needle is withdrawn via several passes through the parenchyma of the gland. It is definitely discernable that the needle has entered the firmer body of the gland after passing through the SMAS/platysma muscle. Patients will also be able to sense when the needle is in the gland as they will feel an electric or tingling sensation that is clearly different from what they felt before the needle passed into the gland. It is necessary to use a longer needle (1 inch/2.5 cm) to reach the gland.

Precautions

Injection above the gland and through the mandibular notch can lead to neurotoxin spread into the lateral pterygoids, which assist in jaw opening and contralateral jaw thrust.

Post-Injection Instructions

Holding pressure and gentle massage helps to prevent bruising. It can take up to a month for involution and shrinking of the gland to occur. Shrinkage of 20 to 30% can be seen, often lasting 6 months or longer. Repeat treatments can be expected. If cosmetic narrowing of the lower third of the face is desired, then injection of the masseter muscle should be undertaken at the same time (see also Chapter 24).

Risks

Improper injection into surrounding muscles can result in swallowing and speech disorders. Hematoma or major bruising could result from injury to one of the large vessels near the gland. Because BoNTA's action is at the neuromuscular junction, injection in this region does not risk facial paralysis.

Pearls of Injection

- Turning the patient's head slightly upward and away from the side of injection, and grasping either side of the gland with the thumb and first finger to stabilize it, will help ensure proper placement of the neurotoxin.

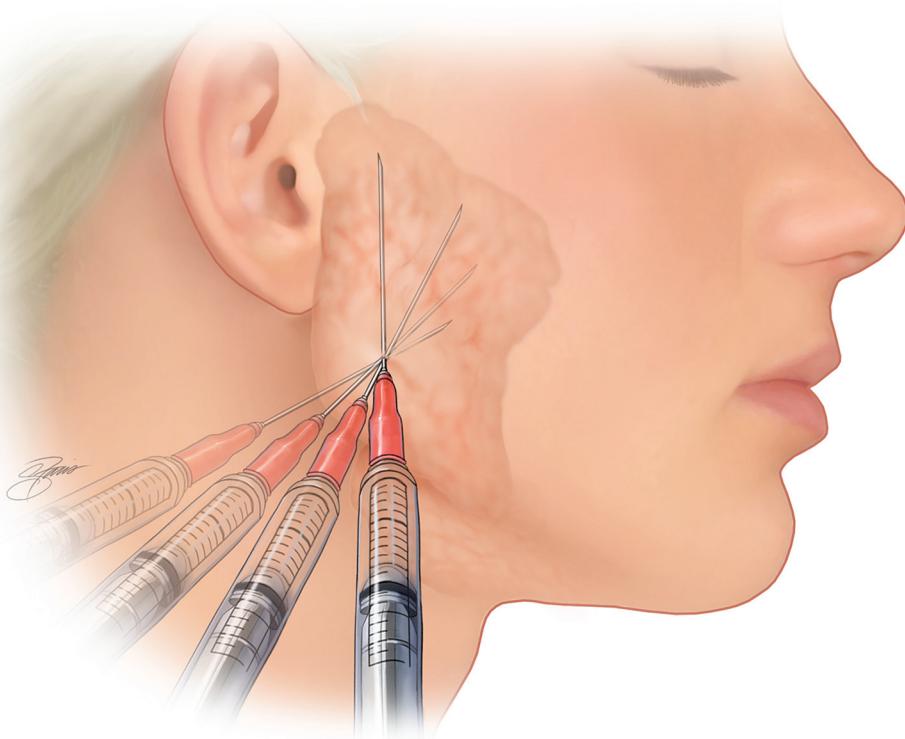


Fig. 25.1 BoNTA is injected into the body of the parotid gland by using a fanning technique to reduce gland hypertrophy.

Additional Reading

- [1] Bae GY, Yune YM, Seo K, Hwang SI. Botulinum toxin injection for salivary gland enlargement evaluated using computed tomographic volumetry. *Dermatol Surg*. 2013; 39(9):1404–1407
- [2] Wu WT. Botox facial slimming/facial sculpting: the role of botulinum toxin-A in the treatment of hypertrophic masseteric muscle and parotid enlargement to narrow the lower facial width. *Facial Plast Surg Clin North Am*. 2010; 18(1):133–140

26

Neurotoxin Injection for Submandibular Gland Hypertrophy

Difficulty: ●●●●

Patient Satisfaction: ●●

Risk: ●●●

Indications

Ptosis or hypertrophy of the submandibular glands can be seen with aging. Post-necklift/facelift and liposuction patients are often left with more elegant jaw lines; however, ptotic submandibular glands can be unmasked, which can produce an unsightly lump on an otherwise smooth neck. Benign hypertrophy of the submandibular glands can be treated with BoNTA.

Anatomic Considerations

The submandibular glands are located under the mandible, beneath the platysma muscle, 2 to 3 cm posterior from midline, on each side of the neck. The facial artery passes just posterior to the gland, the marginal mandibular branch of the facial nerve passes over the capsule of the gland, and the facial vein passes around the gland's posterior aspect. Deep to the gland are pharyngeal muscles and muscles of the floor of the mouth and base of the tongue.

Injection Technique

Botulinum toxin (12 to 15 BU, or 36 to 45 DU, per gland) is injected in a retrograde

fashion via several passes through the parenchyma of the gland. The injector should "feel" that the needle has entered the firmer body of the gland after passing through the platysma. Patients will be able to sense when the needle is in the gland as they will feel an electric or tingling sensation that is clearly different from what they felt before the needle passed into the gland. It is necessary to use a longer needle (1.0 to 1.5 inch/2.5 to 3.8 cm) to enter the gland.

Precautions

Injection into surrounding structures may result in significant side effects, including bleeding, hematoma, intravascular injection, swallowing dysfunction, and tongue movement disorders. Care must be taken to ensure that the BoNTA is injected into the body of the gland.

Post-Injection Instructions

Holding pressure over the injection site and gentle massage help to prevent bruising. It can take up to a month for involution and shrinking of the gland to occur. Shrinkage of 30 to 60% can be seen.

Risks

Improper injection into surrounding muscles can result in swallowing and speech disorders or even aspiration.

Hematoma or major bruising could result from injury to one of the facial vessels near the gland.

Pearls of Injection

- Proper placement of BoNTA can be ensured by turning the patient's head

slightly upward and away from the side of injection. The gland should be grasped and stabilized during injection.

- Reflux on the syringe prior to injection prevents intravascular injection.

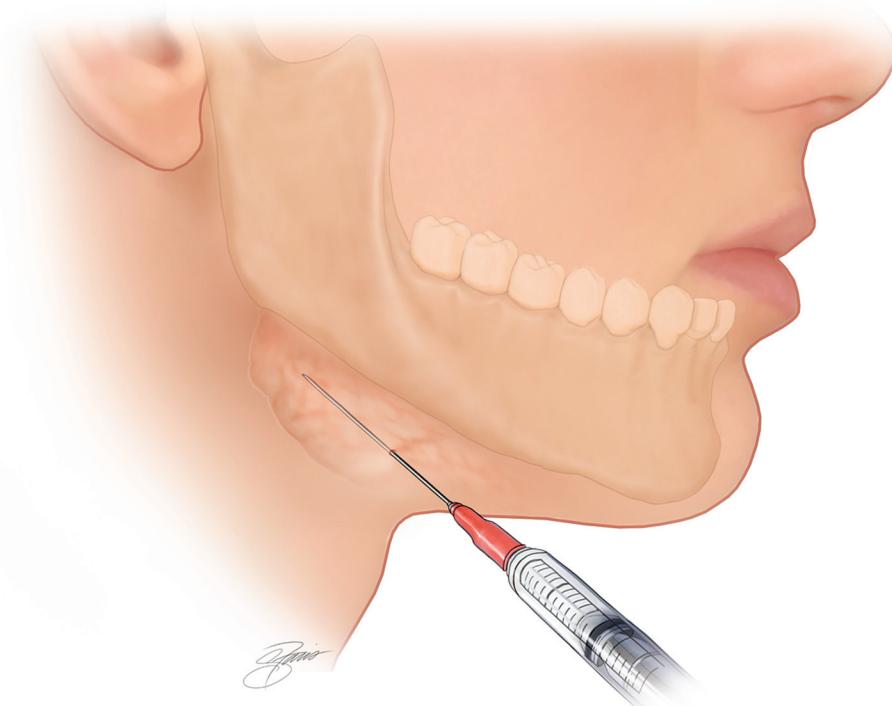


Fig. 26.1 A long needle is used for injecting BoNTA into the body of the submandibular gland to improve submandibular gland hypertrophy.

Additional Reading

- [1] Bae GY, Yune YM, Seo K, Hwang SI. Botulinum toxin injection for salivary gland enlargement evaluated using computed tomographic volumetry. Dermatol Surg. 2013; 39(9):1404-1407

27

Neurotoxin Injection for Gustatory Sweating (Frey Syndrome)

Difficulty: ●●●●

Patient Satisfaction: ●●

Risk: ●●

Indications

Gustatory sweating can be seen after superficial parotidectomy. These patients notice mild to profuse sweating of the cheek during meals.

Anatomic Considerations

Acetylcholine, the neurotransmitter blocked by botulinum toxin, is released when eating, and it stimulates secretion of saliva by the salivary glands. When the gland has been partially resected, such as in superficial parotidectomy, the acetylcholine is released and diffuses to the skin, where it stimulates the sweat glands. These patients notice sweating of the cheek skin overlying the parotid bed.

The starch-iodine test is useful when first treating these patients because the pattern of sweating may not be predictable. On subsequent treatments, once the injector has developed an idea of the affected sites, further treatments may be performed without repeating the starch-iodine test. It can also be utilized for touch-up treatments in order to identify areas that require re-treatment.

If the starch-iodine test can be performed prior to injection, then povidone

iodine (Betadine) is painted over the cheek on the side of the parotidectomy and is left for a few minutes to air dry. The Betadine application should extend over the mandible into the neck, onto the ear, and into the temporal hairline. Corn starch (available from a grocery store) is sprinkled lightly onto the cheek; a large makeup brush works well for this application. The patient may need to suck on a piece of sour candy to stimulate the salivary glands. The areas of sweating will cause the cornstarch to turn black, and a grid is drawn in the area of the sweating. The area is marked with a surgical marker, then the starch and iodine are cleaned prior to injection.

Injection Technique

This is a slightly uncomfortable procedure, and is generally well tolerated by pre-treating with topical anesthetics. Usually 30 to 50 BU or 100 to 150 DU may be necessary for this treatment. The product is injected into the dermis in small wheals separated by 1.0 to 1.5 cm. Each injection is 0.05 to 0.1 mL, or approximately 1 to 2 units per injection.

Precautions

Care must be taken to maintain the level of injection into the dermis.

Post-Injection Instructions

None.

Pearls of Injection

- Inject in a grid pattern and inject superficially.

- Wait at least 2 weeks for maximum response before considering a touch-up.
- Weakening of the facial mimetic muscles is unlikely and can be prevented by keeping injections lateral to the anterior border of the masseter muscle.

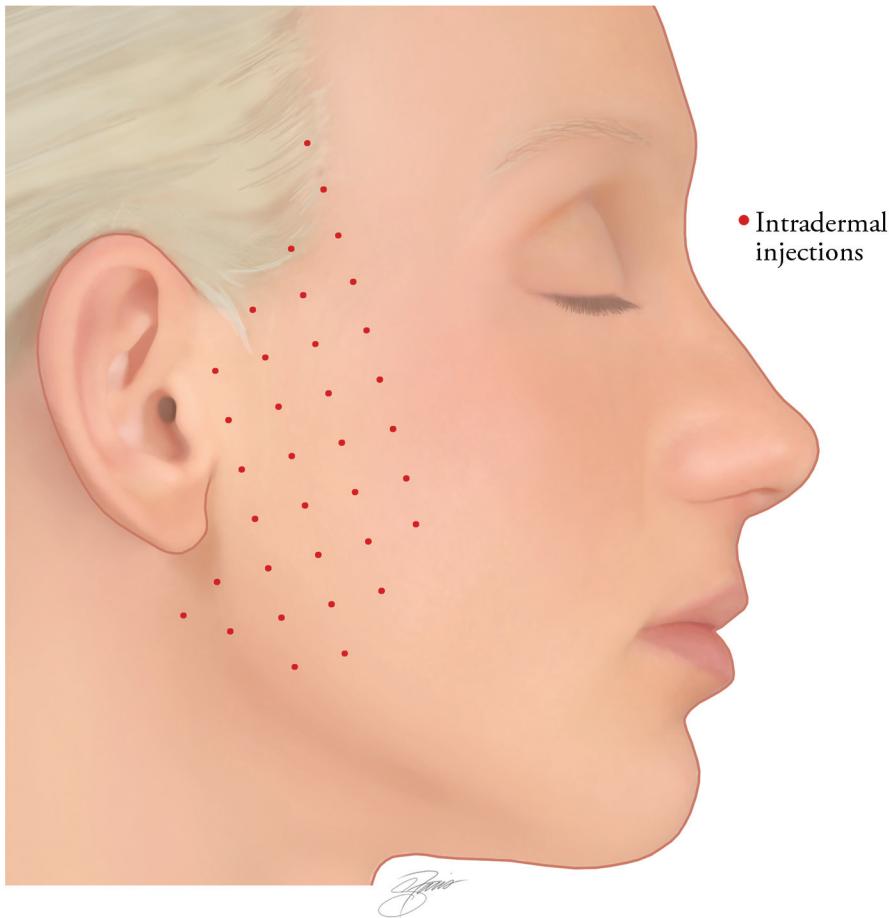


Fig. 27.1 A starch-iodine test is used to delineate the areas of gustatory sweating, and BoNTA is injected intradermally in a grid-like pattern at the sites of maximum sweating.

Additional Reading

- [1] Arad-Cohen A, Blitzer A. Botulinum toxin treatment for symptomatic Frey's syndrome. Otolaryngol Head Neck Surg. 2000; 122(2):237–240
- [2] Guntinas-Lichius O. Management of Frey's syndrome and hypersialorrhea with botulinum toxin. Facial Plast Surg Clin North Am. 2003; 11(4):503–513
- [3] Xie S, Wang K, Xu T, Guo XS, Shan XF, Cai ZG. Efficacy and safety of botulinum toxin type A for treatment of Frey's syndrome: evidence from 22 published articles. Cancer Med. 2015; 4(11):1639–1650

28

Neurotoxin Injection for Profusely Sweating Underarms

Difficulty: ●●

Patient Satisfaction: ●●●

Risk: ●

Indications

Profuse sweating of the armpits can be treated with BoNTA. Results of treatment are impressive and can last up to a year.

Anatomic Considerations

Neurotoxins act by preventing release of acetylcholine from nerve endings at the neuromuscular junction, the effect of which is to inhibit muscle contraction. Acetylcholine is also the neurotransmitter for the sweat glands. Injection of botulinum toxin into sweat glands will prevent sweating and is an excellent treatment for patients who complain of profuse underarm sweating. The starch-iodine test can be performed prior to injection. The axilla is painted with Betadine and is left for a few minutes to air dry. Corn starch (available from a grocery store) is sprinkled lightly onto the axilla; a large makeup brush works well for this application. The areas of sweating will cause the cornstarch to turn black. The treatment area is marked with a surgical marker, and the starch and iodine are cleaned prior to injection.

This is a messy procedure and often unnecessary because most sweating usually occurs in the hair-bearing skin of the axilla. Touch-up treatments are occasionally required several weeks later if not all areas were adequately treated. A starch-iodine test can be helpful in these cases.

Injection Technique

This is a relatively painless procedure, well tolerated without the use of topical anesthetics. Usually 100 BU or 300 DU is used for this treatment, divided evenly for each axilla. The product is injected into the dermis in small wheals separated by 1.0 to 1.5 cm. Each injection is 0.05 to 0.1 mL, or approximately 1 to 2 BU or 3 to 6 DU per injection.

Precautions

Care must be taken to maintain the level of injection into the dermis. Deep injection may weaken the muscles of the arm. Deep injection also will not adequately treat the sweat glands, which lie in the dermis.

Post-Injection Instructions

None.

Pearls of Injection

- Inject in a grid pattern, into the hair-bearing areas of the axilla.
- The injector may make use of the starch-iodine test for more accurate injections or for touch-up treatments.
- Wait at least 2 weeks for maximum response before considering a touch-up.

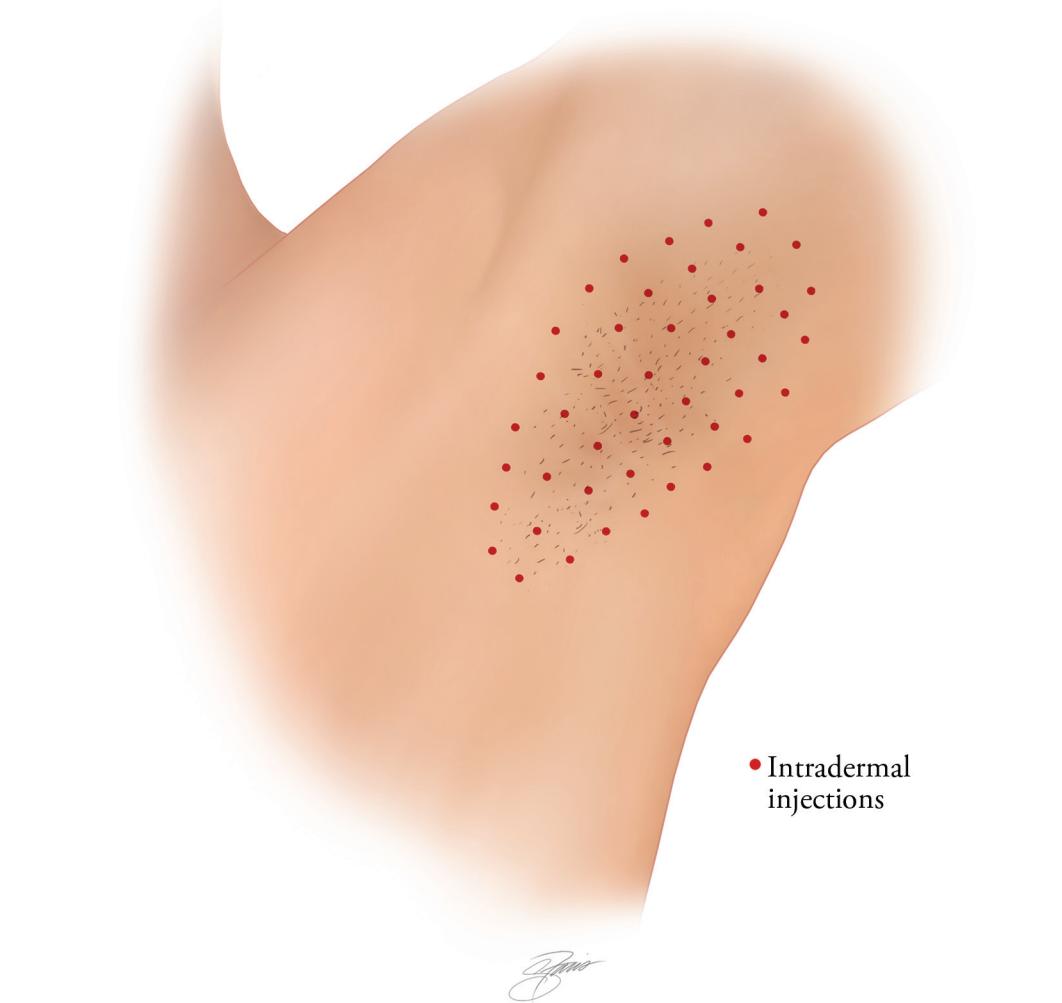


Fig. 28.1 Injection of BoNTA in the axilla is intradermal and placed in a grid-like pattern with injections separated by 1.0 to 1.5 cm. If a starch-iodine test is not performed, injections should be placed in the hair-bearing area.

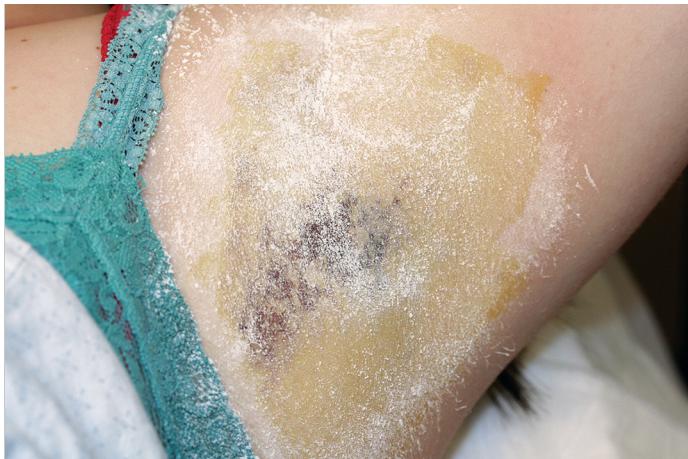


Fig. 28.2 Corn starch is lightly brushed on the area that has been painted with Betadine.



Fig. 28.3 The injection grid is placed in the areas of maximum sweating, denoted by the dark areas.

Additional Reading

- [1] Cohen JL, Solish N. Treatment of hyperhidrosis with botulinum toxin. *Facial Plast Surg Clin North Am.* 2003; 11(4):493–502
- [2] de Almeida AR, Montagner S. Botulinum toxin for axillary hyperhidrosis. *Dermatol Clin.* 2014; 32(4):495–504
- [3] Doft MA, Hardy KL, Ascherman JA. Treatment of hyperhidrosis with botulinum toxin. *Aesthet Surg J.* 2012; 32 (2):238–244
- [4] Naver H, Swartling C, Aquilonius S-M. Palmar and axillary hyperhidrosis treated with botulinum toxin: one-year clinical follow-up. *Eur J Neurol.* 2000; 7(1):55–62

29

Neurotoxin Injection for Profusely Sweating Scalp and Forehead

Difficulty: ●●

Patient Satisfaction: ●●●

Risk: ●

Indications

Profuse sweating of the forehead and scalp is a bothersome problem for some individuals, especially postmenopausal women.

Anatomic Considerations

Injection of neurotoxin into the sweat glands prevents their action and can reduce sweating. These injections must be placed intradermally for maximal effect. Patients can usually identify the region of their scalp and forehead that produces the troublesome sweating. Often these areas are based along the hairline and forehead. Although these injections are intradermal, patients receiving injections to the forehead may exhibit some spread to the frontalis muscle; therefore care must be taken in patients with ptotic brows.

Injection Technique

Use of a starch-iodine test for these patients is usually not performed because of the messiness involved if placed in the scalp and hair.

Injections are placed 1.0 to 1.5 cm apart into the dermis, along the hairline and

forehead, in the areas of maximal sweating as noted by the patient. Each injection is 0.05 to 0.1 mL, or approximately 1 to 2 BU or 3 to 6 DU. Depending on the area treated, approximately 50 to 100 BU or 150 to 300 DU may be required.

Similar injections can be placed in the back of the head and scalp along the hairline if sweating is noted in those areas.

Precautions

Care must be taken to maintain the level of injection into the dermis. Even if placed correctly, there may be some spread to the frontalis muscle. Likewise, deep injections will not adequately treat the sweat glands.

Post-Injection Instructions

None.

Pearls of Injection

- Have the patient outline the areas of excess sweating.
- Keep the injections intradermal.
- Use caution when treating the forehead in patients with ptotic brows; keep the injections in these patients closer to the hairline.
- Wait at least 2 weeks for maximal response before considering touch-up injections.

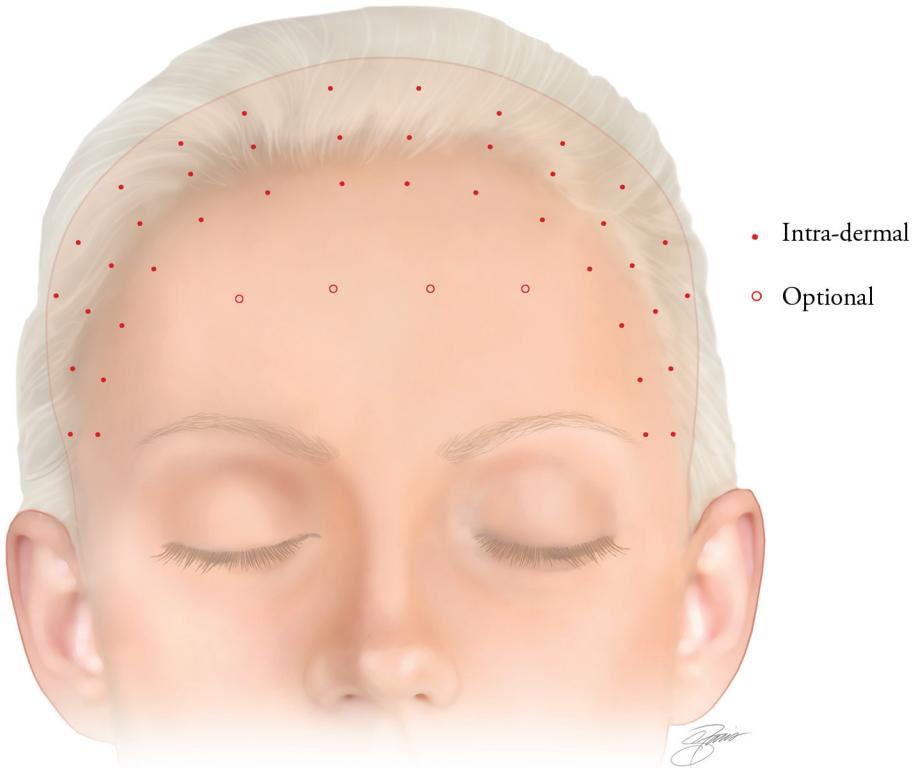


Fig. 29.1 Intradermal injections are placed along the hairline and into the scalp. Injections can also be placed into the forehead. Patient history is the key in determining location of the injection sites.

Additional Reading

- [1] Karlqvist M, Rosell K, Rystedt A, Hymnelius K, Swartling C. Botulinum toxin B in the treatment of craniofacial hyperhidrosis. *J Eur Acad Dermatol Venereol*. 2014; 28(10):1313–1317

30

Neurotoxin Injection for Profusely Sweating Hands

Difficulty: ●●●

Patient Satisfaction: ●●

Risk: ●●

Indications

Profuse sweating of the hands may be treated by BoNTA injections.

Anatomic Considerations

Neurotoxins act by preventing release of acetylcholine from nerve endings at the neuromuscular junction, the effect of which is to inhibit muscle contraction. Acetylcholine is also the neurotransmitter for the sweat glands. Injection of botulinum toxin into sweat glands will prevent sweating and is an excellent treatment for patients who complain of profuse sweating of the hands.

Injection Technique

This is a painful procedure, and sedation or general anesthesia is usually required. Because of the thick skin of the hands, topical anesthetics may not be well absorbed by callused hands. Numbing the hands in ice baths, using a regional block, or even sedation may be necessary.

Usually 100 BU (or 300 DU) is used for this treatment, divided evenly for each hand. The product is injected into the dermis in small wheals separated by 1.0 to 1.5 cm. Each injection is 0.05 to 0.1 mL, or approximately 1 to 2 BU or 3 to 6 DU per injection. Because of the thickness of the skin, a 30- or 26-gauge needle may be necessary.

Precautions

Care must be taken to maintain the level of injection into the dermis. Deep injection may weaken the hand muscles.

Post-Injection Instructions

None.

Pearls of Injection

- Needles dull quickly when used on hands and feet, so multiple needles may be needed.
- Be careful to inject superficially.
- Patients are likely to experience some weakness of the hand muscles during maximal grip, which can last for several weeks post-injection.
- Results can last an average of 6 months.

Additional Reading



Fig. 30.1 BoNTA is injected in a grid-like pattern on the palmar surface of the hand to reduce profuse sweating.

- [1] Cohen JL, Solish N. Treatment of hyperhidrosis with botulinum toxin. *Facial Plast Surg Clin North Am.* 2003; 11(4):493–502
- [2] Doft MA, Hardy KL, Ascherman JA. Treatment of hyperhidrosis with botulinum toxin. *Aesthet Surg J.* 2012; 32(2):238–244
- [3] Weinberg T, Solish N, Murray C. Botulinum neurotoxin treatment of palmar and plantar hyperhidrosis. *Dermatol Clin.* 2014; 32(4):505–515
- [4] Yamashita N, Shimizu H, Kawada M, et al. Local injection of botulinum toxin A for palmar hyperhidrosis: usefulness and efficacy in relation to severity. *J Dermatol.* 2008; 35(6):325–329

31

Neurotoxin Injection for Profusely Sweating Feet

Difficulty: ●●●

Patient Satisfaction: ●●

Risk: ●●

Indications

Profuse sweating of the feet.

Anatomic Considerations

Neurotoxins act by preventing release of acetylcholine from nerve endings at the neuromuscular junction, the effect of which is to inhibit muscle contraction. Acetylcholine is also the neurotransmitter for the sweat glands. Injection of botulinum toxin into sweat glands will prevent sweating and is an excellent treatment for patients who complain of profuse sweating of the feet.

Injection Technique

This is a painful procedure, and sedation or general anesthesia is usually required. Because of the increased thickness of the skin, topical anesthetics may not be well absorbed by callused feet. Using a regional block (posterior tibial and sural nerve

block) or even sedation anesthesia may be necessary.

Usually 100 BU or 300 DU is injected for this treatment, divided evenly for each foot (occasionally more is necessary for larger feet). The product is injected into the dermis in small wheals separated by 1.0 to 1.5 cm. Each injection is 0.05 to 0.1 mL, or approximately 1 to 2 BU or 3 to 6 DU per injection. Because of the thickness of the skin, a 30- or 26-gauge needle may be necessary.

Precautions

Care must be taken to maintain the level of injection into the dermis. Deep injection may weaken the muscles of the foot.

Post-Injection Instructions

None.

Pearls of Injection

- Needles dull quickly on the hands and feet, so multiple needles may be needed.
- Be careful to inject superficially.
- Results of treatment can last up to a year.

Additional Reading

- [1] Cohen JL, Solish N. Treatment of hyperhidrosis with botulinum toxin. *Facial Plast Surg Clin North Am.* 2003; 11(4):493–502
- [2] Doft MA, Hardy KL, Ascherman JA. Treatment of hyperhidrosis with botulinum toxin. *Aesthet Surg J.* 2012; 32(2):238–244
- [3] Weinberg T, Solish N, Murray C. Botulinum neurotoxin treatment of palmar and plantar hyperhidrosis. *Dermatol Clin.* 2014; 32(4):505–515

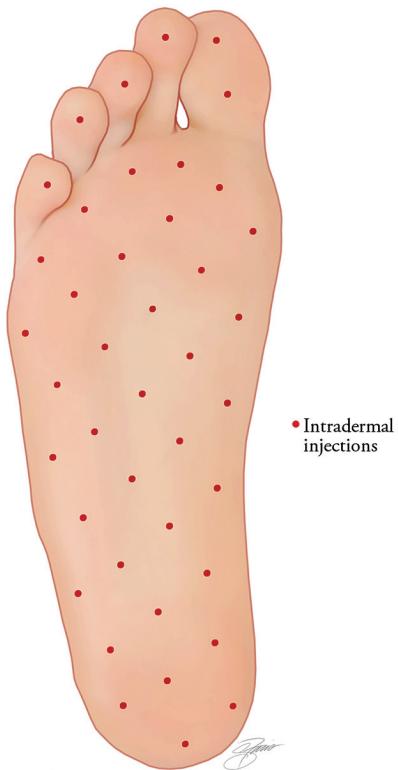


Fig. 31.1 BoNTA is injected in a grid-like pattern on the soles of the feet to reduce profuse sweating.

32

Neurotoxin Injection for Chronic Migraines

Difficulty: ●●●

Patient Satisfaction: ●

Risk: ●●

Indications

Symptoms of classic migraines may include auras, photophobia, unilateral foci, nausea, and pounding headaches. BoNTA has been used successfully in some patients to reduce the frequency or severity of their headaches. Similarly, BoNTA may be used to treat patients with recurrent tension headaches in the frontal and occipital regions. Botox is the only BoNTA currently FDA approved to treat chronic migraines.

Anatomic Considerations

Individual patients may be able to determine “trigger points” for their headaches. If feasible, try to inject directly into the site of the trigger area. Most often, the glabella, forehead, and lateral brow as well as the temporalis muscle and upper portion of the trapezius muscle as it enters the occiput are the most common areas in which injection can relieve classic or common migraines and tension headaches.

Injection Technique

Topical anesthesia may be used, and ice may be applied, though neither is necessary in most cases. Injection techniques as described herein for the treatment of the glabella, forehead, and lateral brow-lift are used for migraine headache as well. In addition, BoNTA injections of the temporalis muscle may be performed on the offending side.

For the posterior type headaches, trigger points are identified by digital pressure to the back of the neck near the origin of the trapezius muscle. A 1-inch (2.5-cm) needle is then directed into the muscle through the skin, deep toward the bone, and BoNTA is injected into the muscle. Typically 5 to 10 BU (or 15 to 30 DU) is injected into this trigger area and massaged into the muscle after injection.

Precautions

None, outside of normal injection precautions. Be sure that the patient's headaches are confirmed to be migraines.

Post-Injection Instructions

None.

Risks

None; minimal to no bruising.

Pearls of Injection

- Some patients experience immediate relief, although there is a 25% initial placebo effect in most patients.
- Botox has been FDA-approved for the treatment of chronic migraine pain and

has been shown to reduce the number of painful days in a percentage of migraine sufferers.

- In those patients for whom this treatment is effective, results can last 3 to 6 months and can be profound. In others, there can be no noticeable results at all.

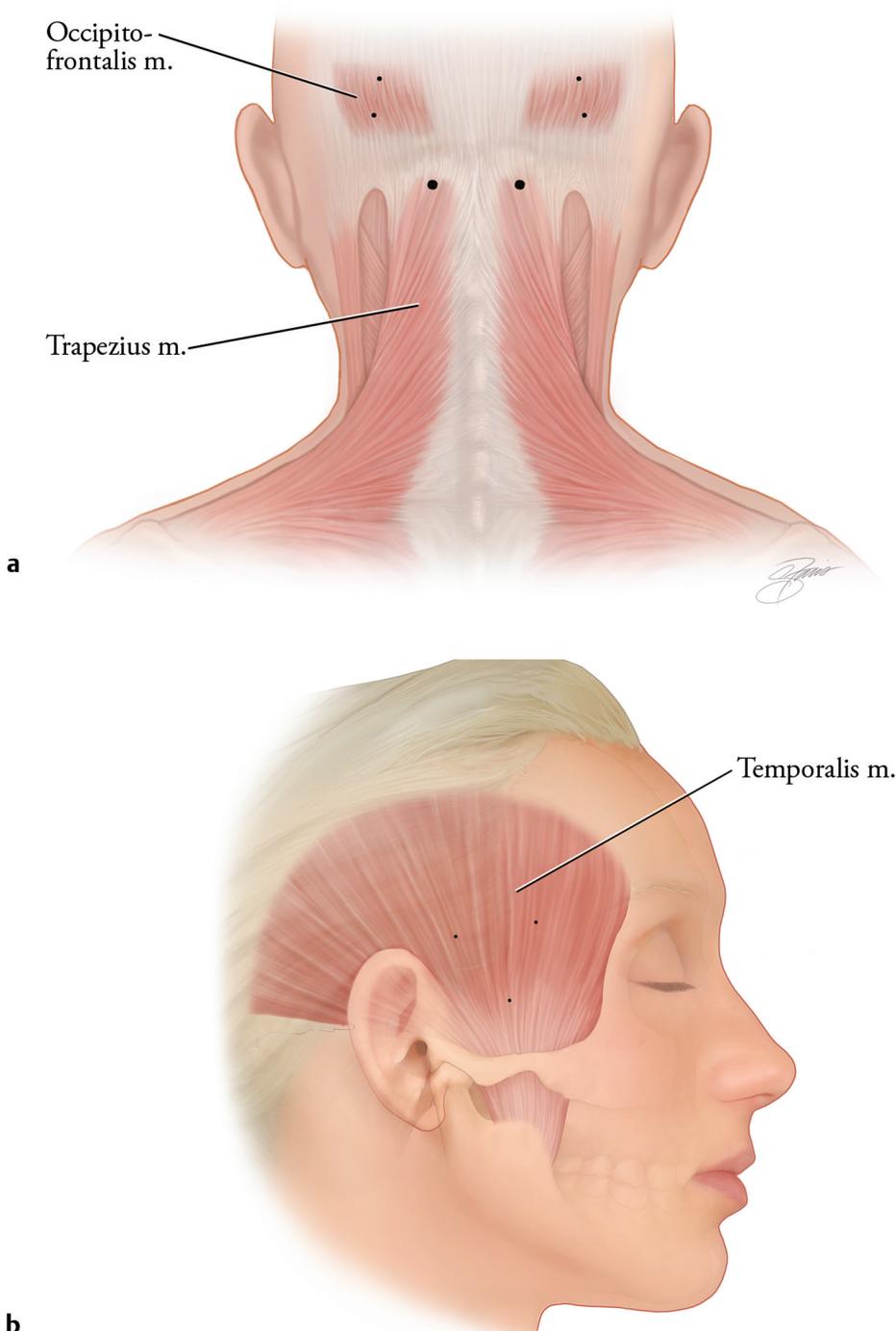


Fig. 32.1 (a,b) Trigger points identified by the patient are injected with BoNTA. These may include the trapezius, occipitofrontalis, and temporalis muscles.

Additional Reading

- [1] Binder WJ, Blitzer A. Treatment of migraine headache with botulinum toxin type A. *Facial Plast Surg Clin North Am.* 2003; 11(4):465–475
- [2] Blumenfeld A, Evans RW. OnabotulinumtoxinA for chronic migraine. *Headache.* 2012; 52(1):142–148
- [3] Escher CM, Paracka L, Dressler D, Kollewe K. Botulinum toxin in the management of chronic migraine: clinical evidence and experience. *Ther Adv Neurol Disorder.* 2017; 10(2):127–135
- [4] Mathew NT, Frishberg BM, Gawel M, Dimitrova R, Gibson J, Turkel C, BOTOX CDH Study Group. Botulinum toxin type A (BOTOX) for the prophylactic treatment of chronic daily headache: a randomized, double-blind, placebo-controlled trial. *Headache.* 2005; 45(4):293–307

33

Management of Neurotoxin Injection Complications

Introduction

The key to managing complications of neurotoxins is their prevention. Accurate assessment and planning of injection sites will minimize the chances of unsatisfactory results. Because of the duration of clinical effect of only approximately 12 weeks, most side effects are self-limiting and mild.

Headache

Although BoNTA can be used to treat migraine, some patients complain of headache following injection. Some practitioners feel this is due to “bumping” the periosteum with the needle before injection. These headaches usually do not require treatment.

Asymmetries

Occasionally BoNTA results are not symmetric, usually due to poor injection planning. These asymmetries may be remedied with a small “touch-up” injection into the mobile muscle.

Brow Ptosis

Usually brow ptosis occurs from over-treatment of the forehead in an already ptotic brow. The key to managing this is prevention, but a way to counter brow ptosis is to treat the infrabrow area (as described in Chapter 9 and Chapter 10) to

overcome the downward pull on the brow by the orbicularis muscle.

Eyelid Ptosis

Due to the diffusion of BoNTA into the levator palpebrae superioris muscle, this complication is usually self-limited and may last 2 to 3 weeks. Make sure the correct diagnosis is made: evaluate the patient to assess if the complication is brow ptosis or lid ptosis.

Treatment of Eyelid Ptosis

Often supportive measures are all that is necessary. Stimulation of Müller’s muscle with an α -adrenergic agonist can be used in patients who are uncomfortable with the appearance of the ptosis. These medications include the following:

- *Naphcon A* (naphazoline and pheniramine): a nonprescription over-the-counter allergy ophthalmic drop used for allergic ocular symptoms (Alcon Inc., Fort Worth, Texas)
- *Iopidine 0.5%* (apraclonidine): a prescription drop used to treat glaucoma (Alcon Inc.)

Dosing of these drops is titrated by effect; usually 1 to 2 drops can be used 2 to 3 times a day. Side effects or overuse of the drops may result in blurred vision, dry eye, tearing, and lid edema.



Fig. 33.1 Right upper lid ptosis developed 1 week after BoNTA injection to the glabella.

Additional Reading

- [1] Dayan SH. Complications from toxins and fillers in the dermatology clinic: recognition, prevention, and treatment. *Facial Plast Surg Clin North Am*. 2013; 21(4):663–673
- [2] Sundaram H, Signorini M, Liew S, et al. Global Aesthetics Consensus Group. Global aesthetics consensus: botulinum toxin type A—evidence-based review, emerging concepts, and consensus recommendations for aesthetic use, including updates on complications. *Plast Reconstr Surg*. 2016; 137(3):518e–529e

