Cosmetic Injection Techniques
A Text and Video Guide to Neurotoxins and Fillers
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I dedicate this book to David and Alexandra, for their love and support; to my Mom, my greatest fan; and in memory of my father, my angel.
– TCK

I dedicate this book to my wife, Alice, and my children, Victoria and Max. You all mean the world to me. Love, Victor.
– VGL
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Drs. Theda C. Kontis and Victor G. Lacombe, two highly respected facial plastic surgeons, share their combined experiences in this practical handbook on *Cosmetic Injection Techniques*. If “Seeing Is Believing,” the authors have done a superb job in making the facial tissue “transparent” for everyone interested in this increasingly important subject area. Universal appreciation of the predictable effectiveness and safety of cosmetic injections has opened up the possibilities of other medical treatments to the benefit and health of millions.

Cosmetic surgeons have the privilege of using transcutaneous treatments to restore patients’ faces to their natural best. Drs Kontis and Lacombe written a text to assist with this process. The anatomy drawings are precise, clearly labeled, and well correlated with the clinical issues under discussion. Details of injection technique are carefully explained and demonstrated. But none of this efferent response is possible without a secure afferent knowledge of anatomy—both classical and as found with the subject themselves.

This book is a labor of love written by authors who represent variations in techniques from the East and West coasts of the United States. I recommend it to all readers who choose to review their treatment plans from start to finish and who value learning from experts who teach with passion as well as knowledge.

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Preface

I hear and I forget.
I see and I remember.
I do and I understand.

Confucius
Chinese philosopher (551 BC–479 BC)

The number of nonsurgical facial enhancements has skyrocketed in the past 10 years. As a consequence of patient demand, many physicians, nurses, and physician assistants have begun to treat such patients. This book is a guide and quick reference for the many professionals and paraprofessionals who have become facial injectors. It is not, however, a training manual for the naive injector. We highly discourage the novice injector from using this book as a primer on injections. In our opinion, nothing can replace training that is offered by courses and by one-on-one preceptorships.

This book was designed to augment the knowledge of a beginner injector and to train the experienced injector in how to perform “finesse” injections. The face can be shaped and minor irregularities and asymmetries improved by performing the techniques we describe. In addition, we hope to help the injector “look through” the skin to the underlying anatomy. This will help to identify both the targets of injection and the important structures to avoid.

The authors are aware that there is certainly more than one way to treat a certain anatomic region. It was our aim, by having authors from two very different locales (East Coast and West Coast), and different practices, that the “best” injection technique would be described by comparing our techniques of injection. In cases where our techniques markedly differed, alternate techniques are presented.

The products described in the book are all U.S. Food and Drug Administration (FDA)-approved fillers and neurotoxins; however, most of the techniques described are considered “off-label” uses of the products. The doses of products described serve as a general guide for injection. Although the utmost care was taken in ensuring the accuracy of the dosing listed, we urge the injector to use his or her best judgment or experience in the unlikely event that a misprint suggests an inappropriate dose. The comments we make about specific products are often our opinion derived from clinical observation. Others may have
different observations clinically, and we respect these variations in clinical practices and results.

We realize that this book will be utilized by injectors with different skill levels. In an attempt to promote safe utilization of these products, we have devised a rating scale for each technique. Each injection technique is evaluated in terms of difficulty for the trainer, risks involved in performing the injection, and patient satisfaction with the results. Appendix A lists the chapters by degree of difficulty, as a cross-reference for injectors who would like to safely advance to more challenging injection techniques. The rating system is as follows:

Degree of difficulty for the injector:
- Easy
- Intermediate
- Advanced
- Expert injectors only should attempt these injections

Patient satisfaction with procedure:
- Variable results; results may be subtle
- Good results; patients usually pleased
- High patient satisfaction; predictable results

Risks of complications:
- Low
- Medium
- High

The products described in this book include Botox, Dysport, Xeomin, Restylane, Perlane, Juvederm Ultra and Ultra Plus, Belotero, Radiesse, Sculptra, and Artefill. These products are the most commonly used fillers and neurotoxins at the time this manual was written. New products are being developed and may be available at the time of publication. However, because we have no experience with these new products, they will not be described in this edition. The experienced injectors, however, will be able to extrapolate the techniques and dosing strategies described in this book to newer products, if they desire.

Disclosure

T.C.K. is a speaker/trainer for Allergan, Medicis, and Valeant. V.G.L. is a speaker/trainer for Allergan, Medicis, and Valeant, and serves as a principal investigator for Juvederm Voluma.

Disclaimer

The material presented is a compilation of the clinical experiences of the authors. Off-label uses of FDA approved products are described. A qualified health care professional should be consulted before using any therapeutic procedure discussed. Readers should verify all information and data before treating patients or employing any therapies described in this publication.
The authors would like to thank the people at Thieme Publishers for believing that a well-illustrated manual for facial injectables was needed in the medical literature. Specifically, we appreciate the editorial assistance of Timothy Hiscock and J. Owen Zurhellen at Thieme. This quality of this book was enhanced by the fabulous artwork of our medical illustrator, Sarah E. Faris. Her attention to detail and her artistic skill have made this volume one that is not only thorough, but easy to read and understand. We would also like to thank Kristi Fritz for scheduling patients for injection technique demonstrations and for acting as videographer for such sessions. Finally, and most importantly, we thank our patients who have graciously agreed to have their procedures filmed so that medical professionals can learn safe injection techniques.
SECTION I

Introduction to Neurotoxins
Neurotoxins Overview

■ Action
Peripheral neuromuscular blocking agents.

■ Mechanism of Action
Botulinum toxins irreversibly bind to the presynaptic terminal of the neuromuscular junction and prevent release of acetylcholine, thereby preventing muscle contraction.

■ Botulinum Toxin A (BoNTA) Formulations

Botox: OnabotulinumtoxinA (BoNTA-ONA)
• 100 BU (Botox units) per vial (also contains 0.5 mg human serum albumin, 0.9 mg sodium chloride)

Dysport: AbobotulinumtoxinA (BoNTA-ABO)
• 300 DU (Dysport units) per vial (also contains 0.125 mg human serum albumin, 2.5 mg lactose)
• Lyophilized
• Store in freezer until reconstituted; refrigerate after reconstitution

Xeomin: IncobotulinumtoxinA (BoNTA-INC)
• 100 XU (Xeomin units) per vial (also contains 1.0 mg human albumin, 4.7 mg sucrose)
• Lyophilized
• Stored at room temperature; refrigerate after reconstitution
Neuronox

- Approved in 2004 by South Korean Food and Drug Administration (FDA), manufactured by Medy-Tox Inc. (Seoul, Korea)
- Not U.S. FDA-approved in the United States
- 50, 100, and 200 U vials available (100 U contains 0.5 mg human serum albumin and 0.9 mg sodium chloride)
- Lyophilized
- Conversion ratio appears to be 1:1 with Botox
- Store in freezer until reconstituted; refrigerate after reconstitution

Purtox

- Pending FDA approval
- Similar to Xeomin without complexing proteins

BTXA

- Not FDA-approved in the United States
- The only botulinum toxin A registered with the Chinese government
- Lyophilized
- Contains 5 mg bovine serum albumin, 25 mg dextran, 25 mg sucrose per 100 units
- Conversion ratio to Botox unknown
- Store in freezer, refrigerate after reconstituted

Botulinum Toxin B (BoNTB) Formulation

Myobloc: BoNTB (rimabotulinumtoxinB)

- Solstice Neurosciences Inc., Malvern, PA
- Minimal use cosmetically due to painful injection and limited duration
- FDA-approved only for cervical dystonia
Table 1.1  Comparison of Botulinum Toxin A Formulations

<table>
<thead>
<tr>
<th>Product</th>
<th>Year of FDA Approval</th>
<th>Generic Name</th>
<th>Composition</th>
<th>Manufacturer</th>
<th>Similar Product Trade Names</th>
<th>Dosing Ratio Compared with Botox</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botox</td>
<td>2002</td>
<td>OnabotulinumtoxinA</td>
<td>900 kd</td>
<td>Allergan, Inc., Irvine, CA</td>
<td>Botox cosmetic, Vistabel, Vistabex</td>
<td>NA</td>
</tr>
<tr>
<td>Dysport</td>
<td>2009</td>
<td>AbobotulinumtoxinA</td>
<td>500–900 kd</td>
<td>Medicis Aesthetics, Inc., Scottsdale, AZ</td>
<td>Reloxin, Azzalure</td>
<td>2.5–3:1</td>
</tr>
<tr>
<td>Xeomin</td>
<td>2011</td>
<td>IncobotulinumtoxinA</td>
<td>150 kd No complexing proteins</td>
<td>Merz Aesthetics, Inc., Franksville, WI</td>
<td>Xeomeen, Bocouture</td>
<td>1–1.5:1</td>
</tr>
<tr>
<td>Neuronox</td>
<td>N/A</td>
<td>N/A</td>
<td>900 kd</td>
<td>Medy-Tox Inc., Seoul, Korea</td>
<td>Meditoxin, Cunox, Siax, and Botulift</td>
<td>1:1</td>
</tr>
<tr>
<td>Purtox</td>
<td>Pending</td>
<td>N/A</td>
<td>150 kd No complexing proteins</td>
<td>Mentor Corp., Santa Barbara, CA</td>
<td></td>
<td>1–1.5:1</td>
</tr>
<tr>
<td>BTXA</td>
<td>N/A</td>
<td>N/A</td>
<td>900 kd</td>
<td>Lanzhou Biologics, Lanzhou, China</td>
<td>Prosigne</td>
<td>?</td>
</tr>
</tbody>
</table>

Abbreviation: N/A, not applicable.

■ Additional Reading

Neurotoxin Preparation

Package inserts for the neurotransmitters state that they should be reconstituted with nonpreserved saline (0.9% sodium chloride). However, clinical practice has determined that using preserved saline results in much less patient discomfort.

Botox, Botox Cosmetic—100 BU (Botox units) may be reconstituted with:

- 1 mL preserved saline, which produces a solution of 10 BU per 0.1 mL
- 2 mL preserved saline, which produces a solution of 5 BU per 0.1 mL
- 2.5 mL preserved saline, which produces a solution of 4 BU per 0.1 mL
- 4 mL preserved saline, which produces a solution of 2.5 BU per 0.1 mL

Xeomin—100 XU (Xeomin units) may be reconstituted and used similar to Botox, above.

Dysport—300 DU (Dysport units) may be reconstituted with:

- 2.5 mL preserved saline, which produces a solution of 12 DU per 0.1 mL
- 1.5 mL preserved saline, which produces a solution of 20 DU per 0.1 mL
- 1.0 mL preserved saline, which produces a solution of 30 DU per 0.1 mL

General conversion ratios:

- 1 BU = 1.0 to 1.5 XU
- 1 BU = 2.5 to 3.0 DU

Additional Reading

Moers-Carpi M, Tan K, Fulford-Smith A. A multicentre, randomized, double-blind study to evaluate the efficacy of OnabotulinumtoxinA (20 units) in the treatment of glabellar lines when compared to IncobotulinumtoxinA (30 units). European Masters in Aesthetic and Anti-aging Medicine, September 30–October 1, 2011, Paris
After reconstitution, botulinum toxin A (BoNTA) can be injected using a 1-mL syringe with a 30-gauge needle. Product can be withdrawn from the vial with a 20-gauge needle, and a 30-gauge or smaller needle can then be used for injection. A “No Waste” syringe with or without a Luer lock (Acuderm Inc., Fort Lauderdale, FL, or Exelint International, Los Angeles, CA) is also available that pushes the last drop of product through the needle hub. Alternatively, non-drip insulin syringes (BD Ultra-Fine Needle, Becton Dickinson, Franklin Lakes, NJ) may be used. These syringes are available in 0.3 and 0.5 mL and have an attached 31-gauge, 8-mm needle.

When using these non-drip insulin syringes, the needle is pre-attached. The BoNTA must be reconstituted and the vial stopper removed. Neurotoxin is drawn up into each syringe and the syringes labeled with the product name, lot number, and expiration date. The syringes are stored in the refrigerator. Because the needles are so fine and fragile, care must be taken not to hit the vial with the needle tip while aspirating the product. In addition, the utmost care is required during re-capping of the needle (prior to patient use) to prevent damage or blunting of the fine needle tip.
Fig. 3.1  Dripless 0.5 mL (left) and 0.3 mL (right) BD insulin syringes may be used for BoNTA injections. These syringes have a pre-attached 31-gauge needle.

Fig. 3.2  “No Waste” syringe pushes plunger into needle hub. (Left) Acuderm, (right) Exelint.
The increased popularity of injectable procedures has been accompanied by an unfortunate increase in the performance of these procedures by unqualified personnel. It is the authors’ concern that the use of this book by untrained individuals could produce disastrous results. The Physicians Coalition for Injectable Safety (PCIS) was created to provide the public with information on qualified injectors, Food and Drug Administration (FDA)-approved materials, and information on injectable training that can be obtained by qualified professionals. We direct patients and injectors to the PCIS Web site, http://www.injectablesafety.org, for appropriate information about the safe use of injectable materials.

The PCIS is represented by over 5,000 board-certified members of the American Society for Aesthetic Plastic Surgery (ASAPS), the American Society of Plastic Surgeons (ASPS), the American Society for Dermatologic Surgery (ASDS), the American Academy of Facial Plastic and Reconstructive Surgery (AAFPRS), the American Society of Ophthalmic Plastic and Reconstructive Surgery (ASOPRS), the International Society of Aesthetic Plastic Surgery (ISAPS), the International Federation of Facial Plastic Surgery Societies (IFFPSS), and the Canadian Society for Aesthetic Plastic Surgery. We encourage professionals to utilize the PCIS Web site for up-to-date information about injectables and injectable safety, laws and ethical guidelines pertaining to the purchase of injectables, research and statistics, and courses available for training in the use of injectables.
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.

**Indications**

Neurotoxins are commonly used to treat the vertical lines between the brows. This is the only area currently Food and Drug Administration (FDA) approved for treatment with botulinum toxin A (BoNTA).

**Anatomic Considerations**

The vertical lines of the glabella are produced by contraction of the paired corrugator superciliii 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.
CHAPTER 5  ■ Neurotoxin Injection for Glabellar Frown Lines

■ 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.

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 is 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 to actively move the injected muscles for 90 minutes.

Alternate Post-Injection Instructions

No exercise immediately after injection, as it 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. 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. 5.1a, b  Clinical photographs of the differing anatomy of corrugators 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. 5.2a, b  Suggested patterns of injection for more horizontal corrugator supercili 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. 5.3a, b  Suggested patterns of injection for the V-like corrugator supercilii muscles.
**Fig. 5.4a, 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**


Neurotoxin Injection for Forehead Wrinkles

Indications

Transverse wrinkles of the forehead.

Anatomic Considerations

Contraction of the paired frontalis muscles raises the eyebrows and upper eyelids, 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. However, clinically, 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, 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 undertreating 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 the patient close his/her 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 contract-
ing and relaxing the frontalis muscles while the injector plans the injection sites. If the rhytids extend up to the hairline, make sure 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 undertreated, and deep crescent-shaped creases will be seen just above the lateral brow. A unilateral forehead resting contraction may be compensation for upper eyelid 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. 6.1a, 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. 6.1a, b (Continued)
Fig. 6.2  “Mr. Spock” brow produced by central injection of the forehead.

Fig. 6.3  In some patients, care must be taken to treat the crescent-shaped rhytids superolateral to the brow.

Neurotoxin Injection for Smile Lines and Crow’s Feet

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.

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.

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.

■ 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.

■ 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.

■ 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.
Fig. 7.1a, 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.
CHAPTER 7  ■ Neurotoxin Injection for Smile Lines and Crow’s Feet  


Additional Reading


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Fig. 7.2  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.
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 non-injecting hand is used to elevate the brow and injections are kept approximately 1 cm above the orbital rim. Topical anesthesia may be used and ice may be applied, though neither is 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.

**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.

**Precautions**

Bruising is a risk in this area. The periorbicular 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.

**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.

**Post-Injection Instructions**

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

**Risks**

There are few risks as long as the BoNTA does not affect the levator palpebrae superioris muscle.
Fig. 8.1a, b  Suggested patterns of BoNTA injection of the lateral aspect of the orbicularis muscle can result in a lateral brow lift.

Additional Reading


Neurotoxin Injection for Chemical Brow Lift

Difficult: ●●
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 corrugators, 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 Chapters 5 and 8). A total of 20 to
30 BU or 60 to 90 DU may be necessary for this treatment. Alternatively, patients are instructed not to exercise immediately post-injection.

**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.

**Risks**

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

**Post-Injection Instructions**

Hold firm pressure. 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, do not bend over, lie flat, or push on the injection sites for 4 hours. It also may be advisable to have the patients move their brows for 90 minutes after injection to potentiate uptake of the BoNTA. However, there are no clinical studies to show that these instructions improve the results or minimize ptosis.

**Pearls of Injection**

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


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 or excessive scleral show.

Post-Injection Instructions

None.
CHAPTER 10  ■  Neurotoxin Injection for Lower Eyelid Roll

muscle hypertrophy and treated appropriately. Because of the increased zone of effect for Dysport, Botox is preferred for these injections.

■ Additional Reading


■ 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. 10.1  BoNTA is injected at the midpupillary line into the superficial subcutaneous tissue to reduce the bulging of a hypertrophic orbicularis oculi muscle.
Neurotoxin Injection for Bunny Lines

■ 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 contribute to deep horizontal glabellar rhytids. In those cases, BoNTA injections can be used to soften this region.

■ Injection Technique

Topical anesthesia may be used and ice may be applied, though neither is necessary in most cases. The patient is usually asked to wrinkle his/her nose up “like a bunny.” This will indicate where the muscle is located and the strength of the nasalis fibers. A single injection of 2 to 3 BU is placed per side. The muscle is not deep, so the injection need only be placed in the subdermal subcutaneous tissue.

Difficult: ●
Patient Satisfaction: ●●
Risk: ●
A single injection point can be placed into the muscle on each side. Assessing muscle location and activity during contraction is essential in determining the proper placement of BoNTA in this area. 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.

**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.

**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 vein.

**Pearls of Injection**

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

**Post-Injection Instructions**

Because this is a highly vascular and visible area, bruising is possible. Firm pressure should be applied after injection.
Fig. 11.1  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.

Neurotoxin Injection for Nasal Tip Lift

- **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.

- **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.

- **Anatomic Considerations**

  The depressor septi nasi muscle is an extension of the orbicularis muscle and inserts onto the medical 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.

- **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.

**Additional Reading**


Neurotoxin Injection for Nasal Flare

- **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.
Fig. 13.1  A single injection of BoNTA is placed in the superficial subcutaneous tissue (on each side) to decrease nostril flare.

### 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.

### Additional Reading

**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 Chapter 38).

**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 as-
pect 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 is that BoNTA will affect the wrong peri-oral muscles and affect the smile or expression.

- **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. 14.1  (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


Neurotoxin Injection for Lip Lift

Difficult: ●●
Patient Satisfaction: ●
Risk: ●●

**Indications**

A small improvement in the visible pink lip can be achieved by the use of BoNTA. 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 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 vermilion 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
Fig. 15.1  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.

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 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.

■ Additional Reading


Neurotoxin Injection for Smoker’s Lines

■ 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 nonsmokers, 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 done 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 entire 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 play the flute, whistle, or do similar activities. Warn patients that they may
Neurotoxin Injection Techniques

SECTION II

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.

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. 16.1 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


Neurotoxin Injection for Gummy Smile

Difficult: ⬤⬤⬤
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.”

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; however, 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 for 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.

![Diagram of facial muscles](image)

**Fig. 17.1** 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.
SECTION II  ■ Neurotoxin Injection Techniques

Fig. 17.2a, b  (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


Neurotoxin Injection for Dimpled Chin

**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 subcutane-ous fat and dermis overlying the muscles can contribute to a dimpled 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 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 9–30 DU is injected.

**Precautions**

Place injections low 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.

**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 understand the rationale for this treatment.
Fig. 18.1  Suggested techniques for injection of BoNTA into the paired mentalis muscles to improve dimpled chin.

■ Additional Reading


Neurotoxin Injection for Platysmal Banding

■ 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.

■ Precautions

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

■ Anatomic Considerations

The platysma muscle is a thin superficial muscle that originates on the clavicle and upper chest and inserts onto the superficial musculoaponeurotic system (SMAS), the skin of the lower face, 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, 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 20 to 40 DU per band. A series of approximately three injections is placed down the length of the band approximately 1.5 to 2 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.

Post-Injection Instructions

Hold pressure to prevent bruising.

Risks

Patients with heavy necks may not be good candidates for this procedure, as the results of injection may not be impressive. 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 Chapter 24). Appropriate surgical candidates should be given the option for lower face and neck lift surgery.
Fig. 19.1  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


Neurotoxin Injection for Necklace Lines

■ 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 musculo-aponeurotic 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.
CHAPTER 20  ■ Neurotoxin Injection for Necklace Lines  

**Inform the patient that this is only a subtle improvement.**
**Do not overtreat.**
**Inform the patient of the risk of diminished swallowing.**

**Additional Reading**


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**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.

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**Fig. 20.1** Superficial injections of BoNTA are placed at 1.0- to 1.5-cm intervals along the crease to soften “necklace lines” of the neck.
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.

Indications

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

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, the patient is a good candidate for this procedure.

Injections of BoNTA are placed along the inferior aspect of the mandible and in the upper aspect of the strongest lateral platysma 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 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 performed only by experienced injectors. Patient selection and meticulous technique is imperative. Stay low and lateral on the mandible to avoid complications. Results may last up to six months.
Fig. 21.1  Photograph of the famed Queen Nefertiti bust, crafted ca. 1345 BC in Egypt and unearthed in 1912. (Courtesy of Album/Art Resource, NY)
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

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).

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 Asian patients note hypertrophic masseter muscles and may request improvement in this area.

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 buccal mucosa until the angle of the mandible is palpated and the patient is asked to bite down (but not on the injector’s finger!). 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 ¾-inch (1.27–1.9 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.

### Post-Injection Instructions

Holding pressure and gentle massage helps 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. Undertreatment can be retreated 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 occurs 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. Results can last 6 to 12 months.
SECTION II  ■ Neurotoxin Injection Techniques

Neurotoxin Injection Techniques


Additional Reading


**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.

**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.

**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.
**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 discernible 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.

**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 Chapter 22).

**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.

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

**Additional Reading**

Neurotoxin Injection for Submandibular Gland Hypertrophy

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.

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.

Injection Technique
Botulinum toxin (12 to 15 BU, or 36 to 45 DU, per gland) is injected in a retro-
grade 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.

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. 24.1 A long needle is used to inject BoNTA into the body of the submandibular gland to improve submandibular gland hypertrophy.
Neurotoxin Injection for Gustatory Sweating (Frey Syndrome)

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.

The starch-iodine test can be performed prior to injection. 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 food shop) is sprinkled lightly onto the cheek; a large makeup brush works well for this application. The patient may need to suck on a 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 starch-iodine testing can also be utilized for touch-up treatments, and to identify untreated areas that require re-treatment.

■ Injection Technique

This is a slightly uncomfortable procedure, and 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 cc, 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 not injecting anterior to the anterior border of the masseter muscle.

■ Additional Reading


![Fig. 25.1 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.](image)
Neurotoxin Injection for Profusely Sweating Underarms

■ 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 food shop) 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. 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 cc, 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. 26.1** 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. 26.2  Corn starch is lightly brushed on the area that has been painted with Betadine.

Fig. 26.3  The injection grid is placed in the areas of maximum sweating, denoted by the dark areas.
**Additional Reading**


Neurotoxin Injection for Profusely Sweating Hands

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 some type of anesthesia is 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 cc, 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.
CHAPTER 27  ■  Neurotoxin Injection for Profusely Sweating Hands

■ 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


■ 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.

Fig. 27.1  BoNTA is injected in a grid-like pattern on the palmar surface of the hand to reduce profuse sweating.
Neurotoxin Injection for Profusely Sweating Feet

Indications
Profuse sweating of the feet. Results of treatment 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 sweating of the feet.

Injection Technique
This is a painful procedure and some type of anesthesia is 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 cc, or approximately 1 to 2 BU or 3 to 6 DU per injection. Be-
cause 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.

### Additional Reading


Neurotoxin Injection for Migraines

■ 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.

■ 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 into 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 pres-
Neurotoxin Injection for Migraines

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 Food and Drug Administration (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.

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

Post-Injection Instructions
None.

Sure 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 15–30 DU) is injected into this trigger area and massaged into the muscle after injection.
Fig. 29.1a, b  Trigger points identified by the patient are injected with BoNTA. These may include the trapezius, occipitofrontalis, and temporalis muscles.
■ Additional Reading


Management of Neurotoxin Injection Complications

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.

- **Brow Ptosis**
  Usually this occurs from overtreatment of the forehead in an already ptotic brow. The key to treating this is prevention.

- **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.

- **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.

- **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.

- **Treatment of Eyelid Ptosis**
  Often supportive measures are all that is necessary. Stimulation of Müller’s mus-
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 may include blurred vision, dry eye, tearing, and lid edema.

Fig. 30.1 Right upper lid ptosis developed 1 week after BoNTA injection to the glabella.

Naphcon A (naphazoline and pheniramine): a nonprescription over-the-counter allergy ophthalmic drop used for allergic ocular symptoms (Alcon Inc., Fort Worth, TX).

cicle with an α-adrenergic agonist can be done in patients who are uncomfortable with the appearance of the ptosis. These medications include the following:

• Iopidine 0.5% (apraclonidine): a prescription drop used to treat glaucoma (Alcon Inc.).
SECTION III

Introduction to Fillers
The use of injectable fillers has become one of the most requested minimally invasive treatment options to re-volumize the aging face. Bovine collagen use was limited both by its short duration of effect and its potential for allergic reaction. In 2003, the introduction of hyaluronic acid (HA) as a facial filling agent revolutionized the world of fillers. Currently the U.S. Food and Drug Administration (FDA) has approved various types of HAs, biostimulatory products like calcium hydroxylapatite and poly-L-lactic acid, as well as polymethylmethacrylate, a permanent filler. Although these fillers are FDA approved only for certain indications, their “off-label” use has become the mainstay for facial rejuvenation in the United States.

### Hyaluronic Acid

#### Composition

Hyaluronic acid is a polysaccharide normally found in the connective tissues of the body. Original HA products were made from animals (e.g., rooster combs); however, newer products are synthetic.

#### Injection

Some of these products are premixed with lidocaine. Injection is performed using 27- or 30-gauge needles. Cannulas may be used, but usually needles are preferred for accurate placement of this product. Topical anesthetics or regional blocks may be required.
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Uses

This class of fillers is used to improve mild to moderate folds and wrinkles. These fillers may be used anywhere on the face, including the lips, nose, and around the mouth.

Precautions

These products should be placed in the deep dermis, superficial subcutaneous tissue, or pre-periosteal planes. When injected too superficially, the product can be seen through the skin and has a blue appearance. This is due to the particles scattering blue light, referred to in physics as the Tyndall effect. Because of more uniform particle size, Belotero may be placed more superficially and is less likely to produce a Tyndall effect. When injecting HAs, care must be taken not to cause vascular injury by occlusion or compression.

Calcium Hydroxylapatite

Composition

Calcium hydroxylapatite (CaHA) is a biostimulatory filler of CaHA spheres suspended in an aqueous gel.

Injection

The FDA has approved mixing this product with 2% lidocaine (0.2 cc) prior to injection. Injection is performed using a 27-gauge needle. Cannulas can also be used to inject this product, and may decrease the chances of vascular injury. Topical anesthetics or regional blocks may be required.

Uses

This thicker paste is used to improve moderate to severe folds and wrinkles. It should not be used around the eyes or in the lips.

Precautions

This product should be placed in the subdermal or preperiosteal plane. When injecting this product, care must be taken not to cause vascular injury by occlusion or compression. This product is radiopaque and can be seen on X-rays and computed tomography (CT) scans.

Polymethylmethacrylate

Composition

Polymethylmethacrylate (PMMA) is a permanent filler composed of PMMA microspheres (20%) suspended in a bovine collagen gel.

Properties

This thick gel must be kept refrigerated. Allow the syringe to come to room temperature prior to injection. A 26-gauge needle or cannula may be used for injection. Topical anesthetics or regional blocks may be required.
Uses
Due to the permanence of this product, it should be injected only for improvement of the nasolabial folds, cheeks/midface, and marionette lines. Fill to 80% correction at the first injection and place 20% more at second treatment approximately 4 to 6 weeks later. Do not overcorrect with this product (see also Chapter 35).

Precautions
A skin test is required 1 month prior to injection of this product to rule out allergy to bovine collagen. This product is a permanent filler and should not be used around the eyes and lips. Injection should be placed in the subdermal or pre-periosteal plane. When injecting this product, care must be taken not to cause vascular injury by occlusion or compression.

Poly-L Lactic Acid

Composition
Poly-L lactic acid (PLLA) is a biostimulatory filler composed of lyophilized crystals of PLLA resuspended in water.

Injection
Poly-L lactic acid must be resuspended with water prior to use. We recommend using 5 to 8 cc preserved water. At the time of injection, 1 to 2 cc of lidocaine (1 or 2%) is added to the vial. Avoid shaking this product in the vial because foam in the bottle increases needle clogging. Multiple treatments are needed at 4- to 8-week intervals until sufficient collagen has been produced. The patient may require three to five treatment sessions for adequate correction. A maintenance “boost” of one to two vials will be required every 1 to 3 years. Injection may be performed with 25- or 26-gauge needles or cannulas. Topical anesthetics or regional blocks may be required.

Uses
This product is used to restore volume to faces that have developed lipoatrophy from aging or HIV medications. It also can be used to improve deep folds and lines (see also Chapter 57).

Precautions
A skin test is required 1 month prior to injection of this product to rule out allergy to bovine collagen. This product is a permanent filler and should not be used around the eyes and lips. Injection should be placed in the subdermal or pre-periosteal plane. When injecting this product, care must be taken not to cause vascular injury by occlusion or compression.
Table 31.1  Facial Fillers Currently FDA Approved in the United States

<table>
<thead>
<tr>
<th>Year FDA Approved</th>
<th>Product Name</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>Zyderm® 1</td>
<td>Bovine collagen</td>
</tr>
<tr>
<td>1983</td>
<td>Zyderm® 2</td>
<td>Bovine collagen</td>
</tr>
<tr>
<td>1985</td>
<td>Zyplast®</td>
<td>Bovine collagen</td>
</tr>
<tr>
<td>2003</td>
<td>CosmoDerm® 1</td>
<td>Human collagen</td>
</tr>
<tr>
<td></td>
<td>CosmoPlast®</td>
<td>Human collagen</td>
</tr>
<tr>
<td></td>
<td>Restylane®</td>
<td>Hyaluronic acid (HA)</td>
</tr>
<tr>
<td>2003</td>
<td>Hylaform®</td>
<td>HA</td>
</tr>
<tr>
<td></td>
<td>Hylaform® Plus</td>
<td>HA</td>
</tr>
<tr>
<td></td>
<td>Captique™</td>
<td>HA</td>
</tr>
<tr>
<td></td>
<td>Sculptra® (HIV)</td>
<td>Poly-L lactic acid (PLLA)</td>
</tr>
<tr>
<td>2005</td>
<td>CosmoDerm® 2</td>
<td>Human collagen</td>
</tr>
<tr>
<td>2006</td>
<td>Juvéderm® Ultra/Ultra Plus</td>
<td>HA</td>
</tr>
<tr>
<td></td>
<td>Artefill®</td>
<td>Polymethyl methacrylate (PMMA)</td>
</tr>
<tr>
<td></td>
<td>Radiesse®</td>
<td>Calcium hydroxylapatite (CaHA)</td>
</tr>
<tr>
<td>2007</td>
<td>Perlane®</td>
<td>HA</td>
</tr>
<tr>
<td></td>
<td>Elevess™</td>
<td>HA</td>
</tr>
<tr>
<td>2008</td>
<td>Prevelle® Silk</td>
<td>HA + lidocaine</td>
</tr>
<tr>
<td></td>
<td>Evolence®</td>
<td>Porcine collagen</td>
</tr>
<tr>
<td>2009</td>
<td>Hydrelle™ (formerly Elevess™)</td>
<td>HA</td>
</tr>
<tr>
<td></td>
<td>Sculptra® Aesthetic</td>
<td>PLLA</td>
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<tr>
<td>2010</td>
<td>Juvéderm® XC products</td>
<td>HA + lidocaine</td>
</tr>
<tr>
<td></td>
<td>Restylane®-L</td>
<td>HA + lidocaine</td>
</tr>
<tr>
<td></td>
<td>Perlane®-L</td>
<td>HA + lidocaine</td>
</tr>
<tr>
<td>2011</td>
<td>Belotero</td>
<td>HA</td>
</tr>
</tbody>
</table>
Anesthesia Techniques

■ Indications

Needle injections to the face are painful, even more so in certain facial areas. The injector can shake the lip, use numbing cream, or tap the cheek to “fool the brain,” but patients will tell you and everyone else that these injections hurt! Although some injectables now have lidocaine pre-added into the product or can have lidocaine mixed into the product at the time of injection, it is the needle that hurts. In addition, the lidocaine does not take effect for several minutes after injection. In sensitive areas like the lip or when broad areas are being treated, most patients will require some form of anesthesia. Options include topical anesthesia, ice, or regional blocks.

Even some of the most stoic patients who dislike the feeling of regional blocks have eventually succumbed to the numbing block because, when done correctly, it is much more comfortable during the injection process. By using these blocks, not only is the patient more comfortable but the injector is more at liberty to inject where necessary to provide a better overall outcome. The key to well-executed anesthesia is knowledge of the anatomy, practice, and having a routine.

■ Anatomic Considerations

An intimate knowledge of the anatomy of the trigeminal nerve (fifth cranial nerve) is essential because its branches (V1, V2, and V3) provide cutaneous sensory innervation to the face. The injector should also understand how and why anesthetics work to relieve pain. The most commonly used blocks are the infraorbital and mental blocks, though mini-mucosal blocks have been described and can be useful adjuncts for treating areas around the mouth.
Topical Anesthetics

Topical numbing creams are available to lessen the feeling of the needle insertion. These can be obtained as pre-compounded products such as EMLA (eutectic mixture of local anesthetics) or Ela-Max (AstraZeneca, London, England). EMLA contains 2.5% lidocaine and 2.5% prilocaine. It is obtained only by prescription and must be applied for 1 hour with or without occlusion. Occlusion with plastic wrap can be used to increase absorption, if desired. Ela-Max (4% or 5% lidocaine) (AstraZeneca) is available without a prescription, has a 30-minute onset of analgesia and can be used with or without occlusion. In addition, a cream can be compounded by the physician’s specifications, and may include benzocaine (20%), lidocaine (6%), and tetracaine (4%) (BLT; Bayview Pharmacy, Baltimore, MD). BLT has a quicker onset of action of approximately 20 minutes.

Injection Technique

Regional or “dental” blocks can be performed for the midface (V2), lower face (V3), or both. The injection technique should be directed at the base of the nerve as it exits the bone, which will provide the most effective and broadest area of anesthesia. This technique also permits the least use of lidocaine (with or without epinephrine) and the least distortion of surrounding soft tissues. As such, to adequately reach the desired target areas it is often necessary to use at least a 1-inch (2.5-cm) or longer needle. If a finger is placed over the infraorbital foramen, then the needle can be directed percutaneously toward the foramen and approximately 0.5 cc of local injection placed on the periosteum near the nerve, but not in the opening. Similarly, if the mental foramen can be palpated in its position near the first molar, then the needle can be angled to land near its location on the face of the mandible. A second injection is done with the needle in the submucosal plane along the gingival-buccal sulcus. This is performed in a retrograde fashion, as the needle that has been passed from the first premolar posteriorly to the back molar is withdrawn.

Mini-blocks are a series of 0.1-cc aliquots of local anesthesia injected just submucosally in the sulcus approximately 1 cm apart to anesthetize the lips and nasolabial folds. These blocks tend to be more variable in effect and more short acting in duration. One major benefit is that they are very useful in getting the center of the upper lip numb when the regional blocks fail in this area.

Alternate Technique

Dental block may be performed intra-oraly only via a buccal sulcus injections into the canine fossa and inferiorly at the mental foramen. The areas not anesthetized by these blocks are treated with topical anesthetics, which may be placed at the philtrum and lateral oral commissures.
■ Precautions

Especially with the use of epinephrine, the patient may experience some mild tachycardia and some rarer cases of lightheadedness and occasional fainting. In those patients who are particularly sensitive, a note should be placed in the chart noting epinephrine sensitivity. Alternately, 1 or 2% plain lidocaine can be utilized; however, the anesthesia result may not be as dense or as long acting.

■ Post-Injection Instructions

The duration of effect of the injection typically is 1.5 to 2 hours.

■ Risks

Minimal to none unless bupivacaine is used. (Intravascular bupivacaine injections have been known to cause irreversible cardiac arrhythmias.) Lidocaine can be toxic, and overdose may be fatal. Patients should be observed when topical applications are used on large areas of the body.

■ Pearls of Injection

Caffeine intake, lack of sleep, hormonal variations, and stress can all make a painful experience more so. Shaking the lip when the needle enters the mucosa or actually pulling the mucosa onto the tip of the needle can minimize the discomfort of the initial numbing injection. Use of topical intraoral lidocaine can also make the entrance of the needle easier in the most sensitive patients. In areas where a regional or local block is not possible, distraction using the gate theory of pain can help to decrease discomfort. Use of tapping or vibration at the site or an adjacent site can flood and then downregulate the perception of painful stimuli felt by the central nervous system.

■ Additional Resources

Dentists can provide valuable assistance when learning to perform regional blocks. Ask a dentist to show you how to provide regional anesthesia or “dental blocks.”
**Fig. 32.1** Maxillary (V2) and mandibular (V3) divisions of the trigeminal nerve supply sensation to the middle and lower face.

### Additional Reading


Filler Injection Methods

- **Linear Threading**
  Product is injected in a line or “thread” as the needle is moving.

- **Depot**
  Small aliquots of product deposited in the desired plane.

- **Serial Puncture**
  Also called a “string of pearls” injection. Multiple closely spaced depot injections are placed in a linear fashion along a wrinkle or fold.

- **Fanning**
  From a single entry point, the needle is fanned in multiple directions, and product is placed by retrograde injection. In this technique, it is important to stop...
The needle is then directed to each side of the central tract, and product is placed in small quantities, like the branches of a fern. This technique is useful when treating fine lines with filler.

### Cannulas

The choice of needles or cannulas for injection of fillers is based on the personal preference of the injector. Cannula use lessens the chances of intravascular injury and may diminish bruising; however, the trade-off is precise control of the product. We have found that cannulas may be used for large-volume injections of product placed pre-periosteally or subcutaneously, but we prefer needles for fine, controlled injections placed more superficially.

### Cross-Hatching

Multiple linear threads placed in an X-shaped fashion.

### Grid

Linear threads intersecting at right angles.

### Ferning

The needle is fully inserted and injection is performed in a retrograde fashion.
Fig. 33.1 Injection techniques.
SECTION IV

Filler Injection Techniques
The nasolabial fold (NLF), the groove from the corner of the nose to the outer corner of the mouth, is perhaps one of the most maligned, studied, poked, filled, and worried-about features in facial cosmetic surgery. It is present in youth, deepens with the aging process, and is not well addressed by facelift surgery. It is the site of most “on-label” filler product applications, it is easiest to study as it has a built-in control (the opposite side), and there are good grading scales that have long been agreed upon to describe various severities of the notorious fold. In the quest to eradicate this bane of the aging face, it important to consider that not all faces should be completely “nasolabial fold-free,” and in fact complete flattening or overfilling of the fold produces quite an unnatural appearance. Some NLFs are etched creases in the skin, whereas others are deep structural folds transitioning from the lip to full “apple” cheeks.

■ Anatomic Considerations

Volumetric loss of the malar mound and descent of the cheek can contribute to folding over of the skin lateral to the fold. Thinning of the upper lip and perioral complex can lead to sinking of the medial portion of the fold. Injection deep into the area near the corner of the nasal ala can be perilously close to the angular artery, a branch of the facial artery.
**Injection Technique**

Placement of product in this region may be performed by using the cross-hatching, fanning, linear threading, or serial puncture techniques. The product generally is placed at varying depths, deeper for folds and more superficial for wrinkles. The area injected should be massaged into place after injection to minimize lumpiness.

**Technique**

The injection technique should be mostly perpendicular to and medial to the fold, just barely crossing or coming to the edge of the fold so as not to augment lateral to the fold. It is best to imagine a tall, thin, triangular deficit in front of the fold that needs to be filled with fanning or threading injections rather than large boluses or a fat sausage roll placed parallel to and under the fold.

**Alternate Technique**

Injection can begin as described above with filler placed in a deeper plane, perpendicular to the fold, to act as scaffolding. A second layer is placed more superficially parallel to and slightly medial to the fold. A fanning technique can be performed at the nasal-alar junction, with care being taken not to inject the angular artery.

**Precautions**

Injecting deeply onto bone at the corner of the nasal ala, near the pyriform aperture, can provide nice elevation of a deep fold. However, extreme caution must be used with proper placement and either aspiration or perhaps the use of a blunt cannula to avoid intravascular injection. Superficial injections especially parallel to the fold will increase the risk of the Tyndall effect.

**Post-Injection Instructions**

Ice and pressure are helpful to prevent bruising in this region. The product will swell some with hyaluronic acid (HA) and feel firmer to palpation the first week, and then blend in more naturally. This is also true of CaHA injections which become firm, then soften over time.

**Risks**

Minimal risks besides bruising and Tyndall effect from too superficial injection into the dermis.

**Pearls of Injection**

Overcorrection of the nasolabial fold can look unnatural and should not be overly flattened.
Many products have been approved for use in this region including hyaluronic acid (HA), calcium hydroxylapatite (CaHA), and polymethylmethacrylate (PMMA). All are injected similarly, with care being taken to place CaHA and PMMA deep in the superficial subcutaneous layers and avoid more superficial injection. PMMA is a permanent filler, and patients are generally “under-filled” initially, with re-injection six weeks later.

Fig. 34.1a, b Possible techniques to treat the nasolabial fold are shown. The injector may choose to perform a combination of these techniques to achieve maximum correction of the fold. (a) Filler may be placed along the depth of the fold as well as horizontally to act as a scaffold for the filler. Fanning technique can be performed at the nasal-alar crease. (b) Some patients will require the placement of more filler medial to the fold as shown.
**Additional Reading**


Narins RS, Dayan SH, Brandt FS, Baldwin EK. Persistence and improvement of nasolabial fold correction with nonanimal-stabilized hyaluronic acid 100,000 gel particles/mL filler on two retreatment schedules: results up to 18 months on two retreatment schedules. Dermatol Surg 2008;34(Suppl 1):S2–S8, discussion S8 [PubMed](https://pubmed.ncbi.nlm.nih.gov/18346575/)
**Filler Injection with Polymethylmethacrylate (Artefill)**

**Indications**

Polymethylmethacrylate (PMMA) is used as a permanent filler for improving the nasolabial folds. This filler is most often used in patients who have used absorbable fillers and desire a more permanent correction. This is also a filler to consider for men, who often do not want to undergo multiple treatments.

**Anatomic Considerations**

Because of its permanence, we prefer to use this product only in the nasolabial folds, cheeks, and marionette lines. It is contraindicated for use in the lips.

**Precautions**

The PMMA microspheres are suspended in a bovine collagen matrix. A skin test is required prior to injection to determine if the patient has an allergy to bovine collagen.

**Injection Technique**

Injection should be placed in the subdermal plane. The product is stored in the refrigerator and must be allowed to come to room temperature prior to injection. Retrograde tunneling, cross-hatching, or depot injection techniques are appropriate.
CHAPTER 35  ■  Filler Injection with Polymethylmethacrylate (Artefill)  109

■ Post-Injection Instructions

Ice as needed.

■ Risks

Do not overcorrect with this product. Fill to 80% correction with the first treatment and give 20% more at the second treatment, usually 4 to 6 weeks later. Nodules may form if the product is injected into the lips or around the eyes. Because of the large particle size, care must be taken to avoid intravascular injection and possible vessel occlusion.

■ Pearls of Injection

Polymethylmethacrylate should be used with caution in patients who are filler naive. It may be preferable to inject patients first with a reversible or semi-permanent filler. The bovine collagen matrix absorbs in 4 weeks, so a second treatment should be performed at that time. Patients should be informed that their results will actually improve over time as the body forms collagen around the PMMA particles; their 5-year results may look better than their 1-year results.

Fig. 35.1a, b  (a) Polymethylmethacrylate (PMMA) is placed in the subcutaneous tissue to augment the nasolabial fold. Injections can be placed along the fold as shown, or these techniques can be combined as needed to optimize results. (continued on next page)
Fig. 35.1a, b (Continued)  (b) The marionette lines can be treated similarly with either technique shown or a combination of these techniques.

Additional Reading


Filler Injection for Marionette Lines

**Indications**

The groove that descends vertically from the corner of the mouth toward the mandible is known as the marionette line, drool line, or melolabial groove. These folds are prominent contributors to signs of facial aging due to volume loss in the prejowl region, and may create a sad, tired, and more aged facial countenance.

**Anatomic Considerations**

The action of the depressor anguli oris (DAO) muscle underlies the melolabial groove and acts to deepen the groove. Volumetric loss of the prejowl and chin soft tissues can also lead to deepening this region.

**Injection Technique**

The injection technique should be perpendicular to and medial to the fold so as not to augment lateral to the fold. It can be helpful to pinch or squeeze the fold with the thumb and first finger on either side of the line down onto the chin to accentuate the line and demonstrate its extent. This technique will also demonstrate the accessory lines that are generally parallel to the marionette lines, and other weakened areas of skin and volume loss in the vicinity. Once those are determined, the appropriate treatment can begin. Fill should occur in the areas of concavity, avoiding thicker areas of convexity.
**Precautions**

Undercorrection of this area will lead to unsatisfactory results, and patients will feel “that didn’t make much of a difference.” It can often take 1 cc of product in each marionette line to correct the entire area and blend in on the chin and all the way down toward the mandible, not even including the prejowl or along the mandibular border, to achieve a proper correction.

**Post-Injection Instructions**

Ice and pressure is helpful to prevent bruising. The product will swell some with an HA and feel firmer to palpation the first week and then blend in more naturally. Massage of the area after injection will help reduce lumpiness.

**Risks**

Minimal risks besides bruising and Tyn dall effect from overly superficial injection into the dermis.

**Pearls of Injection**

Overcorrection of this area is unlikely, unless there are no lines to begin with before injection. Bruising is quite common. As this area blends in with the oral commissure, techniques to augment the oral commissure will assist in improving the appearance of this fold (see Chapter 38).

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*Fig. 36.1* A combination of techniques may be necessary to improve this region, including injection into the fold, horizontal filling across the fold, and fanning at the oral commissure. Combine techniques as needed to obtain the desired clinical result.
**Additional Reading**


**Filler Injection for Lip Augmentation**

**Indications**

One of the most requested filler treatments is that of lip rejuvenation or augmentation. Unfortunately, poor technique in performing this injection has resulted in patients being fearful of unnatural and overdone results.

**Anatomic Considerations**

It is important when filling the lips to decide what area needs to be augmented: the volume of the lip, the outline, or both. The lips can be accentuated and shaped by filling the vermillion border. There is a potential space that, if entered accurately, will allow the product to track along the lip margin.

Volume can be placed in the body (pink) of the lips for augmentation or rejuvenation, or to improve symmetry.

Often overlooked are the philtral columns, which flatten with aging. A small amount of filler to accentuate the philtrum will give more definition to cupid’s bow and slightly evert the upper lip.

**Injection Technique**

Filler injections into the lips can be quite painful. A dental block or topical anesthetic may be placed prior to injection. Some injectors believe that no anesthetic is necessary when using fillers with added lidocaine. A skillful injector will inject slowly and enter the skin in areas previously injected that have become anesthetized. These injections are gen-
generally placed in the superficial subcutaneous plane. Massage after injection helps to evenly distribute the product.

Injection of the vermillion proceeds from lateral to medial. Palpation is important to feel how far along the vermillion the filler has traveled and to detect untreated or skipped areas. Injection may be performed in an anterograde fashion as the filler can track along a plane along the vermillion. Alternatively filler may be placed in a retrograde fashion.

The body of the lips can be improved by filling in the zones that require augmentation. Do not think of the lip as one long unit but rather as smaller subunits, and fill appropriately. Overdone lips are usually the result of overfilling the lip without paying attention to aesthetic units. Do not fill the lips like “filling a sausage.”

The philtral columns can be redefined using a small amount of filler. Pinch the philtrum after injection to further define the ridges.

**Precautions**

As a general rule, do not inject more than 3 cc into the lips at one time. Avoid over-injection of the upper lip, especially in patients with very small lips. Rather than over-filling small lips, consider the adjunctive use of BoNTA to evert and lift the lips (see Chapter 15).

**Post-Injection Instructions**

Ice as needed. Bruising and edema are likely. Advise patients that the edema will subside in a few days.

**Risks**

Injections into the lips can stimulate recurrence of herpes simplex viral eruptions. Any patient receiving lip injections who has a history of fever blisters should be placed on a short course of antiviral medication.

**Pearls of Injection**

Consider treating the oral commissures when treating the lips (see Chapter 14). Take photographs prior to performing the dental block, as the block itself will likely produce some asymmetries. Once the injection is completed, persistent asymmetries may be evident. Wait until the effects of the local anesthetic have worn off before assessing the final results. Because of its hydrophilic properties and syrup-like consistency, Juvéderm may be preferable for use in the lips.
Fig. 37.1a–f  (a) The philtral columns can be augmented linearly along the fold. (b) Alternatively, the philtral columns can be augmented with small horizontal retrograde injections injected medial to lateral. (c) Definition of the lips is accomplished by augmenting the vermillion border, injection either retrograde or anterograde, from lateral to medial. (d) Small amounts of filler may need to be placed outside the vermillion after augmentation to decrease shadowing. (e) Lip fullness is achieved by directed injection into the body of the lips, artistically filling in deficient areas. (f) A combination of these techniques may be necessary to achieve the desired results.
Additional Reading


not until later in life, when skin, soft tissue, and volumetric loss in the lower face and chin develop, that the oral commissure angle drops and may become turned downward or negative in its vector. When this occurs, the overall effect is one of a sad, tired, or stern facial countenance.

■ Indications

The corner of the mouth, known as the oral commissure, turns downward with age, and often there is a genetic predisposition to this downward turn. Filling the oral commissure can significantly alter the sad or angry appearance; it can “turn the frown upside down.”

■ Anatomic Considerations

In childhood, the corner of the mouth turns up in a slight smile. In the teens to early twenties, the commissure becomes level to neutral in position. It is

■ Injection Technique

The most frequently used products in this area are the hyaluronic acids (HAs). The injection technique involves placing an X-like injection at the oral commissure. A depot of product inferiorly also can help turn the commissure upward. Occasionally an injection of filler can be placed perpendicular to the commissure. A slight immediate overcorrection, which takes a down-turned lip and makes it into a slightly up-curved lip at the corner, is necessary to achieve a
good result when the swelling subsides. Also, because this is such a highly mobile area, it is necessary to use an adequate amount of product in the space or the effect will be relatively short lived.

## Precautions

It is important to advise patients that they will experience an overcorrection at first, and that they should not be alarmed by a slight “joker-like” smile at first. This will resolve once the swelling subsides.

### Post-Injection Instructions

Ice and pressure are helpful to prevent bruising. Bruising and a sense of firmness or hardness in the corner are not uncommon.

### Risks

Minimal risks occur besides bruising and the Tyndall effect from overly superficial injection into the dermis.

### Pearls of Injection

The action of the depressor anguli oris (DAO) muscle pulls the corners down. In cases where fillers result in inadequate upturning of the commissures, consider also treating the DAO with BoNTA (see Chapter 14).

### Additional Reading


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Fig. 38.1a, b  (a) The oral commissure can be elevated by injecting in an X-shaped fashion as shown. An optional vertical injection can also be placed. A depot of filler will also act to support the commissure. (b) Alternate fanning technique may be used alone or in combination with other procedures described.
**Filler Injection for Vertical Lip Lines**

**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 nonsmokers, 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**

Because of the risk of visible product ridges under the skin, this is a difficult area to correct with fillers. Only low-concentration hyaluronic acid (HA) fillers and small volumes of product should be used in this area. The initial injection is placed along the vermillion border. Subsequent injections are placed in the skin of the lips; a combination of linear threading and cross-hatching techniques can be used. Injection in the lips is painful. Patients may require topical anesthesia or a dental block.

**Precautions**

Consider antiviral medication when injecting patients with a history of fever blisters (herpes simplex).
• Post-Injection Instructions

Ice as needed.

Fig. 39.1a, b  (a) The vermillion is treated first, injecting from lateral to medial in an anterograde or retrograde fashion. (b) After the vermillion is outlined, the lip lines are treated in a vertical or a cross-hatch fashion and massaged after injection to minimize lumpiness. A combination of these techniques may be required to optimize clinical results.

• Risks

Patients should be counseled that fillers and neurotoxins cannot fully eradicate lip lines. Risks include asymmetry, incomplete correction, and bruising.

• Pearls of Injection

Do not over-inject this area. Massage after injection to minimize lumpiness. The concomitant use of neurotoxins in this area can improve results (see also Chapter 16).

Perioral lines can be quite resistant to many forms of treatment. Consider laser resurfacing, chemical peel, dermabrasion, or other adjunctive measures to treat stubborn lines.

• Additional Reading

**Indications**

Neurotoxins are commonly used to treat the vertical lines between the brows. Fillers can be used in conjunction with fillers, or as a primary mode if patients are afraid of BoNTA injections. The horizontal lines on the nasal dorsum can be similarly treated.

**Anatomic Considerations**

The vertical lines of the glabella are produced by contraction of the paired corrugator supercili muscles, and the horizontal lines are caused by contraction of the centrally located procerus muscle.

Branches of the supraorbital and supratrochlear vessels are located in the glabella. The supratrochlear artery is a distal branch of the ophthalmic artery.

**Precautions**

Injection of fillers in this region should be considered with some trepidation. Warnings in the past about collagen injections suggested that arterial embolization and possible skin necrosis could occur with injection in the glabella. Additionally, particles can travel retrograde in the supratrochlear vessels and embolize the ophthalmic artery. Because of the high risk in this area and the potential for lumpiness, hyaluronic acids (HAs) are the product of choice in this region.
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. Filler is placed deep and parallel to the wrinkle with a 30-gauge needle. Filler is placed into the superficial to mid-dermis and massaged to prevent lumpiness.

Post-Injection Instructions

Ice as needed.

Risks

When treating the vertical lines of the glabella, reflux on the syringe prior to injecting to minimize the risk of arterial injury, and do not inject deeply in this area. Do not overfill in this area to minimize lumpiness and the risk of vascular compression. However, injection of the horizontal lines over the nasal bridge is much safer and can be injected into the subdermal plane. Massage is also necessary to prevent lumpiness.

Pearls of Injection

Patients who have persistent glabellar lines after BoNTA treatment may benefit from injection of fillers into the residual creases. Patients find that the combination of fillers and neurotoxins in this region produces a longer lasting result.
**Additional Reading**


Patients with ptotic brows may not be candidates for BoNTA because the ptosis can be accentuated (and constantly raising a ptotic brow is likely the reason they have rhytids in the first place!). In certain cases, the injector may elect to augment deep transverse folds of the forehead with filler.

**Indications**

Transverse wrinkles of the forehead in patients who have had insufficient response from BoNTA injections, or who are not candidates for BoNTA injection of the forehead.

**Anatomic Considerations**

Transverse wrinkles of the brow generally respond to neurotoxin injection; however, even with BoNTA, some rhytids may not fully improve. Also, some patients are opposed to BoNTA injections.

Patients with ptotic brows may not be candidates for BoNTA because the ptosis can be accentuated (and constantly raising a ptotic brow is likely the reason they have rhytids in the first place!). In certain cases, the injector may elect to augment deep transverse folds of the forehead with filler.

**Injection Technique**

Multiple injections are required in this area, so topical anesthetic is recommended. Small depot injections are placed along the line of the wrinkle in the immediate subdermal plane. The filler is marched along the fold along its entire length. After several injections, the product should be massaged to evenly distribute the filler into the wrinkle. Hold firm pressure over areas that bleed.
Precautions

Care must be taken to smooth the product well and to place very small amounts directly into the fold to elevate the crease. Inject only the amount of product necessary to improve the wrinkle, or an elevated ridge of product will be seen horizontally across the forehead.

Pearls of Injection

Use a small needle (30 or 32 gauge) and inject only enough filler to elevate the wrinkle. Do not over-inject! Because of the chance of lumpiness, we prefer hyaluronic acids in this area. Combining fillers with BoNTA can also improve results.

Post-Injection Instructions

None. Ice may be used for bruising.

Risks

Although this is an easy technique, vascular interruption of the subdermal vessels can occasionally occur. If blanching of a wide area is seen during injection, usually massage and warm compresses will restore the circulation to the region.

Fig. 41.1  Filler is placed like a string of pearls along the forehead crease. The serial puncture (depot) technique is used and the product is smoothed by gentle massage of the treated areas.
## Additional Reading


**Indications**

The semicircular depression under the eyes may be filled with hyaluronic acid (HA) fillers to lessen the shadowing in this area. Fillers may be used to delay blepharoplasty surgery in patients with mild fat herniation.

**Anatomic Considerations**

Classically the tear trough referred to the most medial segment of the under-eye crease; however, with aging the infraorbital rim becomes more skeletonized and filler may be placed at the top of the rim along its entirety.

**Injection Technique**

This is not a painful area to inject, but it is quite unsettling for many patients. Options for anesthesia include topical anesthetic cream, or an infraorbital nerve block using a small amount of lidocaine.

This is one of the most difficult areas to inject well. Ideally a 1-inch (2.5-cm), 30-gauge needle should be used to allow the point of entry to occur below the thin skin of the lower eyelid. This will greatly reduce the amount of bruising, as most of the blood vessels are in the orbicularis muscle. The needle is then passed upward at an angle until it comes to rest at the top of the orbital rim, where the finger of the opposite hand is positioned so as to direct the needle, confirm the location, and protect the contents of the orbit. Injection should not proceed until the tip of the needle has been place against the bone and its
precise location has been verified. Inject very slowly and deeply onto the bone. It is very important that the product be precisely placed at the highest point along the upper edge of the maxilla at the top of the infraorbital rim. If out of hesitation or fear the injection is placed lower, one runs the risk of creating a deeper trough by augmenting the cheek while neglecting the deep valley. Massage the product as it is injected in small 0.1- to 0.2-cc depot boluses to fill in the depressed areas. The patient should be placed in a sitting position. Have the patient vary the eye position, as this may accentuate bulges and depressions and aid in evaluating for symmetry.

■ Precautions

Inject deeply onto the orbital rim periosteum. Superficial injections will increase bruising and increase the risk of the Tyndall effect.

■ Post-Injection Instructions

Ice is necessary. Bruising is possible but less common when injected as described above. If injected through the thin skin or superficially, then bruising will be very common. Lumpiness and unevenness of the lower lid should not be seen if the injection has been done properly, unless a hematoma occurs. If it persists for more than 2 weeks, have the patient place a warm compress over the lid for 20 minutes while applying firm pressure. This can help flatten lumps and improve minor irregularities.

■ Risks

Although there are no serious risks to injecting the tear trough, the greatest risk of injection is an unsatisfactory result. Particularly with the HAs, the Tyndall effect can be seen even if the HA is deposited deeply. The HA can occasionally increase fluid retention in the entire periocular area in certain patients and lead to prolonged swelling in the malar area or a delayed bluish color in the medial orbicularis muscle. If this occurs, hyaluronidase injections into the subcutaneous tissue can often disperse the swelling and discoloration.

■ Pearls of Injection

It is not uncommon for patients to become vasovagal with cosmetic injections, but this is particularly seen with tear trough injections. Patients are often quite anxious about being injected in this area. They also complain of an unsettling feeling when the lower lid becomes numb. At the completion of the procedure, ensure that the patient does not feel lightheaded upon standing.

Hyaluronic acids are the products of choice in this area. The uniform particle size of Belotero allows for more superficial injections and less chance of the Tyndall effect.
Fig. 42.1a, b  (a) The intraorbital region of the midface. (b) Filler is placed along the infraorbital rim periosteum to improve inferior orbital hollowing. If necessary, filler can be placed subcutaneously, but this technique runs the risk of the Tyndall effect with some products.

■ Additional Reading

Filler Injection for Sunken Upper Eyelids

- **Indications**

The hollow or sunken upper eyelid can be unattractive and an aging sign on the face. Genetics, aging, illness, and overly aggressive surgical fat resection can all contribute to a skeletonized, bony appearance of the medial third to half of the superior orbital rim as it blends into the nasal bridge. Restoring the look of lost soft tissue fullness in this area can greatly improve the youthful aesthetic of a hollow orbit.

- **Anatomic Considerations**

The upper lid skin is usually quite thin in most individuals; there are sensory nerves of the supraorbital and supratrochlear nerve branches, as well as vascular bundles to avoid during the injection of this area. This is an area that requires advanced knowledge and experience; it should be approached only by the confident injector who is experienced and comfortable with the pertinent anatomy and the management of all aspects of complicated filler patient care.

- **Injection Technique**

We prefer hyaluronic acid (HA) for these injections. The best injection plane is
directly onto the periosteum on the lower to inferior aspect of the superior orbital rim. Whether performed as a series of depot pearl-like injections massaged together or with a long retrograde injection, the goal is to coat the bone with a uniform layer of product so as to cushion and fill the space between the bone and the skin/muscle complex. The area is most safely approached from a lateral to medial direction, keeping the injections lateral to the medial aspect of the brow. The safest technique is to use a 30- to 32-gauge, 1-inch (2.5-cm) needle; place the tip of the needle firmly on the bone and perform retrograde injections. Careful observation will reveal where extra sculpting is necessary to augment the deepest concavities of the upper eyelid complex and improve the upper lid contour.

**Precautions**

Injecting higher along the face of the frontal bone away from the free edge of the orbit will create two potential problems. The first would be a risk of injury to or injection into one of the neurovascular bundles as it exits the bone or orbit. The second possible problem would be the potential for creating the appearance of frontal bossing if filler is placed along the bone rather than in the orbital hollow.

**Post-Injection Instructions**

Immediate pressure and then ice is helpful to minimize bruises. The eyelid will swell and may need to be iced for several days.

**Risks**

Risks for swelling and bruising are real, but the catastrophic intravascular, periorbital accidents that could arise are enough to deter most novice and even experienced injectors from trying this new area of volumetric correction.

**Pearls of Injection**

Keep the injection volume low at first. Inject from the lateral toward the medial upper eyelid, staying low and keeping the needle moving while introducing product. Many times there is not a true foramen for the supraorbital nerve, so it can be expected to exit from the orbit and course superiorly over the bony rim. Consider dilution of the HA with Xylocaine.

**Additional Reading**

**Filler Injection for Lateral Brow Lift**

- **Indications**

  The brow becomes ptotic or droopy because of volume loss between the skin and the bone, with hollowing of the temple and skeletonization of the lateral orbital rim. As a result, the position of the brow hairs can be much lower than desired, and the overall position of the brow can cause a sad or even stern appearance. Fillers can be used, when placed properly, to restore fullness, volume, and actual lift to a flat or bony brow.

- **Anatomic Considerations**

  The skin is usually thin in individuals who are candidates for lateral browlift with volumetric filling, and there may be a great deal of superficial vascularity. Typically there is a single perforating sentinel vein just superolateral to the orbital rim that is perpendicular to the surface of the skin, whereas all the other vessels spread out parallel with the surface and can be avoided with deep injection.

- **Injection Technique**

  The best injection plane is deep to the orbicularis and the aponeurotic fascia and galea, but just above the peristomeum. It is often easiest if this plane is first en-
CHAPTER 44 — Filler Injection for Lateral Brow Lift

Alternate Technique

Filler is layered on the periosteum and also in the subdermal tissue until adequate elevation of the brow is achieved. Massage into place after injection, and confirm bilateral brow symmetry.

Precautions

Do not over-inject this area. Be careful to maintain symmetry.

Post-Injection Instructions

Immediate pressure and then ice is helpful to minimize bruises. The brow will swell and may need to be blended out laterally to the temple or the lateral orbit to achieve a natural look.

Risks

Minimal risks occur besides bruising using the superficial technique as long as the injections are smooth and even.

Pearls of Injection

Keep the injection at the tail of the brow at or under the level of the brow hairs initially to make the best use of the product and get the most lift. Also, keeping the volume at or below the level of the brow will keep the brow lifting rather than potentially making the brow appear heavier. Hyaluronic acid or calcium hydroxylapatite may be used in this region. Consider treatment of the lateral orbicularis muscle with BoNTA (see also Chapter 9).
Fig. 44.1 Filler is placed along the periosteum of the lateral orbital rim to produce a lateral browlift.

■ Additional Reading

ally, the hairline posteriorly, and the zygomatic arch inferiorly. Several large veins and arteries run superficially in this region. The tempora-lis muscle fills the temporal fossa. Injections are placed through the muscle, down to the periosteum of the temporal fossa.

**Injection Technique**

**Hyaluronic Acid**

The superior and medial aspects of the temporal area provide the most benefit aesthetically, and should be filled first. Injection of hyaluronic acid (HA) requires use of a 1-inch (2.5-cm) needle to inject deep onto the periosteum in the upper half of the fossa and then deep onto or below the temporalis fascia more inferiorly. Depot injections must be used in this region to minimize contour irregularities. Placing the product deep
and then massaging it into place will ensure uniform volumization of the temporal fossa. It would not be unusual to use 1 cc of product in each temple in moderately to severely sunken temples.

**Calcium Hydroxylapatite**

Calcium hydroxylapatite (CaHA) may be injected into the temporal fossa and gives a more firm feel to the temples. The injection technique is similar to that used for HAs.

**Poly-L Lactic Acid**

The depot technique similarly is used, laying product onto the periosteum. A 25-gauge needle of at least 1 to 1.5 inches (2.5 to 3.8 cm) in length is preferable to ensure deep placement. To evenly spread the product, massage is performed by the injector just after placement and by the patient for 5 days posttreatment (for 5 minutes, five times a day). With a 6- to 8-cc dilution of poly-L lactic acid (PLLA), 1 to 2 cc of product is administered to each temporal fossa, depending on the amount of atrophy. Two or three treatment sessions may be required. An interval of 4 to 8 weeks between injections is recommended, and increased improvement continues for 3 to 6 months after the final injection.

**Precautions**

There are many surface vessels in the temple, and care should be taken to perform depot injections between or below them. If a vessel is traumatized, firm pressure for several minutes will minimize bruising.

**Post-Injection Instructions**

Massage is helpful for the HA patients, and mandatory for the PLLA patients. Cold compresses can help prevent both soreness of the temporalis muscle and discomfort while chewing.

**Risks**

Bruising is possible; apply firm pressure should a vessel be violated. Filling too close to the surface can result in an uneven or lumpy appearance. Trismus may be noted in some patients for 1 to 2 days posttreatment and will resolve without treatment.

**Pearls of Injection**

The end point of treatment usually occurs when the area is still slightly concave to flat but not overcorrected to bordering on convex. Proper depth of placement is the key to smooth results.

It is hard to overfill this area. It is valuable to look at both sides of the patient to compare after completing the first side. It helps to show the patient the difference in the two sides, as it is often dramatic. This will give the patient an idea of the treatment end point as well.

Because of the high vascularity in this region, it is often helpful to perform a
reflux maneuver on the syringe before injecting the product to prevent intra-vascular injection.

Some patients will notice an elevation of the lateral brow with improvement of the temporal hollowing.

**Additional Reading**


Anatomic Considerations

Knowledge of the ideal proportions of an attractive nose will be necessary as well as knowledge of the basic anatomy of the bony, cartilaginous, and soft tissue structures involved. It is also important from a safety standpoint to be aware of the key vascular channels to avoid intravascular injections.

Injection Technique

When injecting a hollow or void in the nose, it is best to start deep on the bone or cartilage and perform a retrograde injection with a threading movement so as to avoid a direct depot injection that could possibly flow into a blood vessel.

Indications

Because the nose occupies the center of the face, mild asymmetries can be quite striking. Rhinoplasty surgery is not always a perfect procedure, and postsurgical defects can be difficult to correct. As a result, the use of fillers in small quantities to treat specific nasal deformities has become a way to fine-tune postsurgical noses. In addition, in some patients who refuse surgery or who are not surgical candidates, a nonsurgical approach to their nasal concerns may be possible by the use of filling agents.
**Dorsal Hump**

To straighten a dorsal hump, inject both above and below it as needed to straighten the dorsal profile. This technique can also be used on a wide nose to give the illusion of a higher and narrower nasal profile. Better define the tip, and can also increase the tip projection and increase tip rotation. The thickness of the skin and the amount of scar tissue in the area will determine whether and to what extent this technique will be successful.

**Saddle Nose Deformity**

In these cases, there is little to no supporting cartilage at the base of the concavity; therefore, it is necessary to inject into the immediate dermal/subdermal plane to thicken the skin layer to allow improved bridging from the bony dorsum to the cartilaginous tip. Secondary injection to the deeper plane below will help to further support and elevate the concave area and augment the bridge contour.

**Twisted/Crooked Nose**

When dealing with the twisted nose, it is possible to imagine a single line that passes through the midline. Usually there are portions of the twisted nose that will wind in a C or S shape onto either side of the midline. By filling the concavities the nose will appear straighter.

**Drooping Tip**

When there is little tip definition and a droopy tip, a new, more rotated and defined tip can be “created” by placing filler depot injections into appropriate anatomic locations. The injections can mimic a tip graft that will augment and better define the tip, and can also increase the tip projection and increase tip rotation. The thickness of the skin and the amount of scar tissue in the area will determine whether and to what extent this technique will be successful.

**Risks**

Nasal injections must be placed in an avascular plane, either preperiosteal or pre-perichondral. Care should be taken not to inject into the dermis to avoid the dermal vascular plexus.

**Precautions**

Often if there are large pores in the area being injected, the needle may need to be passed at a deeper or different angle if product begins to extrude through one of the dilated pore tracts. Over-injection of a given area can lead to blanching or even intravascular occlusion. Restylane is the preferred hyaluronic acid (HA) for the nose, because the hydrophilic nature of Juvederm accentuates edema in this region. Calcium hydroxylapatite (CaHA) may be used; however, because of its permanence, the injector should proceed with extreme caution.

**Post-Injection Instructions**

Ice and pressure are helpful to prevent bruising. The product will swell some with an HA and feel firmer to palpation the first week and then blend in more
Fig. 46.1a–d  (a) Dorsal hump. Filler can be placed above and below a dorsal hump to straighten the dorsal profile. (b) Saddle nose. The concavity of the dorsum seen in the saddle nose deformity can be improved nonsurgically by using filler.
Fig. 46.1 (Continued)  (c) Crooked nose. Filler is placed along the periosteum or perichondrium in the concave aspect of the nasal sidewall to give the illusion of a straight dorsum. Pre- (left upper and lower panels) and post- (right upper and lower panels) injections along the right nasal sidewall improve a mildly crooked nose in a patient with a persistent deformity after closed reduction of a nasal fracture. (continued on next page)
**Fig. 46.1** (Continued)  (d) Droopy tip. Filler can be used as a “tip graft” to define and elevate a ptotic tip.

**Fig. 46.2a, b**  (a) Mild right lateral nasal sidewall depression post rhinoplasty. (observe the light reflexes)  (b) Improvement of right sidewall depression by placing filler in the defect.
naturally. The patient should expect that the areas injected will look raised and welted at first. Swelling should improve within about 2 to 4 days.

- **Risks**

The most significant risks involve injection into a vessel that could lead to vascular necrosis. Retrograde injections and avoiding high pressure on, or blanching of, the skin during treatments can help prevent this devastating complication. Because of the high risk of vascular compromise in these areas, consider using only HAs in this region.

- **Pearls of Injection**

Undercorrection is recommended in this region. Also, keep the needle in motion so as not to inject into a vessel and create an occlusion or embolic situation. Proceed with caution in post-rhinoplasty patients because prior surgery may compromise the blood supply to the nasal skin, which may increase the chance of skin necrosis.

- **Additional Reading**


Filler Injection for Nasal Valve Stenting

**Indications**

Collapse of the internal and external nasal valves is generally treated surgically. In patients who have not had adequate improvement after surgery, or those who refuse surgery, filler can be used to stent the valve and prevent collapse with inspiration.

**Anatomic Considerations**

The internal nasal valve is the acute angle formed by the junction of the septum and the lateral crus of the lower lateral cartilage. The external nasal valve refers to the area created by the ala, columella, and nasal floor.

**Injection Technique**

Topical anesthetics or intranasal 4% Xylocaine is adequate anesthesia for this procedure. Avoid using injected local anesthesia as it will change the shape of the valve and negate the filler effect.

**Internal Nasal Valve**

Very small amounts of filler are deposited intranasally in the area of the lateral crus or scroll region until the patient notices improvement in the airway. Before injection, ask the patient to rate the nasal patency on a scale of 1 to 10.
Inject a small amount of filler and ask the patient to rate the airway patency again. Inject until the nasal patency is acceptable.

**External Nasal Valve**

Very small amounts of filler are placed along the alar rim until there is improvement of collapse during deep inspiration.

**Precautions**

Lumpiness may be seen externally if over-injected.

**Post-Injection Instructions**

None. Bruising is unlikely.

**Risks**

Over-injection can weigh down the ala and worsen collapse.

**Pearls of Injection**

Optimal results are obtained with thicker fillers like calcium hydroxyapatite or more concentrated hyaluronic acid fillers.

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### Fig. 47.1a, b

(a) Filler is injected intranasally at the scroll region to stiffen the internal nasal valve. (b) Filler can be used to strengthen a collapsed ala and improve the external nasal valve.
**Additional Reading**


**Indications**

Facial aging is a complex combination of volume loss and tissue ptosis. However, midface hollowing can be seen with facial aging or occasionally in younger individuals who present with an anatomically flattened midface.

**Anatomic Considerations**

The medial midface is the triangular zone below the infraorbital rim, lateral to the nasal sidewall and medial to the infraorbital foramen adjacent to the submalar region.

**Injection Technique**

Hyaluronic acid (HA) or calcium hydroxylapatite (CaHA) may be injected into this area for facial volume restoration. Injection may be placed deeply onto the periosteum or more superficially in the superficial subcutaneous tissue. A fanning technique can ensure even placement of the product. Massage after placement helps to evenly distribute product and allows the injector to palpate any areas that were not fully injected.

**Precautions**

Bruising is common in this area. The angular artery runs lateral to the nose, and care must be taken not to injure this vessel, either by compression or embolization. Avoid injecting into the infraorbital nerve foramen.
Ask the patient to refrain from applying heavy pressure on the injected cheeks (either from ice after treatment or pressure from sleeping) to prevent flattening the revolumized areas.

**Post-Injection Instructions**

Ice and pressure are helpful to prevent bruising. The product will swell some with HA or CaHA and feel firmer to pal-

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**Fig. 48.1a, b**  
(a) Anteromedial subdivision of the midface lies medial to the infraorbital nerve, lateral to the angular artery and inferior to the infraorbital rim. (b) Filler may be placed along the periosteum and massaged into place to improve a flattened midface.
CHAPTER 48 ▪ Filler Injection for Medial Midface Hollowing

superficial plane may require the use of needles.

Risks

There are minimal risks of injection in this area. The most difficult aspect of injection here is ensuring symmetry.

Pearls of Injection

To reduce the risk of vascular injury, consider the use of cannulas in this region when performing deep injections. Fine-tuning of the injection in a more superficial plane may require the use of needles.

Additional Reading

Filler Injection for Cheekbone Augmentation

**Indications**

Fillers may be used to augment the cheekbones, or lateral malar prominence. (Alternatively, permanent malar implants may be inserted surgically or fat augmentation can be performed.)

**Anatomic Considerations**

The malar bone and overlying soft tissue from the lateral malar prominence. High cheekbones contribute to a youthful arc seen in three-quarter view. Some patients with aging of the midface display a fat pad of the lateral malar prominence, referred to as the “malar mound.” This triangular prominence results from the orbital retaining and zygomatico-cutaneous ligaments.

**Injection Technique**

Topical anesthesia may be used for this procedure. Fillers with lidocaine may be placed deeply at first injection to anesthetize the infraorbital nerve. Dental blocks are discouraged and may actually distort the anatomy. To volumize the lateral malar prominence, fillers may be placed through the intraoral or percutaneous route. Intraoral injection does not predispose the patient to infection. Filler can be placed deep in the subcutaneous tissue and pre-periosteal planes.
To camouflage the malar mound, hyaluronic acid (HA) fillers can be placed more superficially (deep dermal or subcutaneous) over the retaining ligaments.

■ Precautions

This is a very safe injection location; HA or calcium hydroxylapatite (CaHA) may be used.

■ Post-Injection Instructions

Ice may be used as needed, but instruct the patient not to press firmly on the injected site or sleep on that side for a few days to minimize flattening of the product.

■ Risks

Bruising is possible. The greatest challenge with performing this procedure is ensuring symmetry.

■ Pearls of Injection

Lateral malar augmentation may be performed through a single entry point on each cheek. Cannulas may be used for the deep injections.
Fig. 49.1a, b  (a) The zygomaticomalar subdivision of the midface lies inferior to the infraorbital rim and lateral to the infraorbital nerve. (b) The prominence of the cheekbones is improved by augmenting the zygomaticomalar region. Injection may include deep injection along the infraorbital rim and zygomatic arch as well as a more superficial injection to camouflage the malar mound.
Additional Reading

filling these regions may be performed as an adjunct to rejuvenation surgery.

**Anatomic Considerations**

The area under the zygomatic arch and lateral to the nasolabial fold and modiolus comprises the submalar and buccal regions of the midface.

**Injection Technique**

Topical anesthesia is usually sufficient for these injections. The injection technique should be a grid or fanning pattern, spreading the product in a medial to lateral fashion. The plane of injection
is usually at the dermal–subcutaneous junction. Gentle massage after injection helps to smooth irregularities.

■ Precautions

Injecting too superficially in this region can result in ridges or striping of material. Placing the product in deeper planes will necessitate using more material. Lumpiness in this region is common after injection, and the injector should massage the area after injection to ensure even placement of product. Placement of product too deeply will project some of the volume into the oral cavity because the buccal area is not supported by bone.

■ Post-Injection Instructions

Ice and pressure are helpful to prevent bruising. The product will swell some and will feel firmer to palpation the first week, and then blend in more naturally, A gentle post-injection kneading massage can be helpful.

■ Risks

This is a low-risk procedure; however, if very large volumes of product are necessary, the excess filler can “weigh down” the cheek. In these excessively hollow patients, consider using poly-L-lactic acid (PLLA) or fat augmentation.

■ Pearls of Injection

Inject at different levels and massage to evenly disperse product. Large volumes of product are necessary to properly correct these areas. To best treat a patient on a modest budget, begin the injection medially and near the inferior aspect of the zygomatic arch. The goal is to ease the transition from the high to low regions and creates a less sharp step-off transition.
Fig. 50.1a, b  (a) The submalar and buccal regions of the midface lie inferior to the zygomatico-malar region and lateral to the infraorbital nerve. (b) Filler is placed at different depths in a crossed fanning technique to elevate the submalar and buccal hollows.
■ Additional Reading


Filler Injection for Chin Augmentation

Indications

The weak chin is usually best addressed with a permanent surgical solution such as an alloplastic implant. However, augmentation with a filler can be a good alternative in the following situations: the patient needs only small amounts of augmentation; the patient is elderly or a poor surgical candidate; the patient is already scheduled to undergo lower facial volume restoration; the patient is looking for immediate results without surgical downtime or great expense; the patient is considering a chin implant but is hesitant about receiving a permanent implant; the patient has a cleft chin and wants a smooth contour across the center of the chin.

Anatomic Considerations

The bone structure of the mandible can be too “squared,” “pointed,” or “weak,” and filler can be used creatively to shape or augment the chin. During injection, be cognizant of the location of the mental nerves and adjacent vessels exiting the mental foramen.

Injection Technique

There are two basic techniques that are useful for filling the chin: deep depot injections onto the periosteum to truly mimic a surgical implant; and fanning, threading-type injections in the subdermal plane that spread over a broad area. The more superficial injection tech-
niques should be at the dermal subcutaneous junction so as to add volume as well as to firm the overlying skin, which is often less firm than it once was. With the threading technique, a longer 1- to 1.5-inch (2.5- to 3.8-cm) needle and a 27- to 30-gauge work best. The depot is easily placed along the border of the mandible as long as the mental foramen is avoided.

**Precautions**

Determine where the mental foramen and nerve are located, and stay away from that region when injecting. If a chin implant is already in place, use careful sterile technique and avoid directly injecting into or onto the implant to avoid seeding the implant with bacteria.

**Post-Injection Instructions**

Immediate pressure and then ice are helpful to minimize bruises. The chin initially will appear swollen and more rounded than it will appear once the edema subsides.

**Risks**

Minimal risks occur, besides bruising, with the superficial technique if the injections are smooth and even. When injecting deeply onto the bone, there are more inherent risks for damage to the mental nerve and possible intravascular injection if a depot injection is used.

**Pearls of Injection**

Evaluate the chin from all angles to ensure that it looks proportionate and balanced all over, as symmetry will be important as well as challenging when trying to fill a whole midline structure. Massage of the area will aid in smoothing any injection irregularities.
Fig. 51.1a, b  (a) Filler is placed on the periosteum and/or in the subcutaneous tissue to increase prominence of the chin. (b) Filler may be placed subcutaneously to camouflage a chin cleft.
**Additional Reading**


Filler Injection for the Mental Crease

**Indications**

The mental crease (or chin crease) is the horizontal crease between the lower lip and chin, and it can be quite deep in some individuals.

**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 and contributes the mental crease.

**Injection Technique**

This is a painful area to inject; a topical or dental block may be utilized. Filler is injected at multiple levels in the dermis and subdermal subcutaneous tissue to elevate the crease. A combination of linear threading both parallel and perpendicular to the crease can be used. Deeper creases can be treated with depot techniques.

**Precautions**

Superficial injection of some hyaluronic acids (HAs) will result in bluish blebs of
In conjunction with BoNTA injection to the mentalis, the duration of any filler in this area is significantly improved. Neurotoxin may be injected into the mentalis muscles as in treatment of the peau d’orange chin (see Chapter 18), which may also help to flatten the mental crease.

**Post-Injection Instructions**

Ice as needed; bruising is possible.

**Risks**

This is a very safe area to inject. Deep creases may require a large amount of filler.

**Pearls of Injection**

Filler used alone in this area tends to last for very short periods of time. However, in conjunction with BoNTA injection to the mentalis, the duration of any filler in this area is significantly improved. Neurotoxin may be injected into the mentalis muscles as in treatment of the peau d’orange chin (see Chapter 18), which may also help to flatten the mental crease.

**Additional Reading**


Filled Injection for Jawline Rejuvenation

Indications

Prejowl sulcus fat loss and descent of the midface can accentuate the formation of the jowls. By filling the concave area just anterior to the jowl, a straighter, more youthful jawline can be achieved. However, the formation of jowls is multifactorial, and often a facelift is the only treatment that can adequately lift or remove the jowl.

Anatomic Considerations

Aging changes of the jawline are a result of draping of excess skin, sagging of buccal fat, loss of prejowl fullness, and changes in the submental platysmal angle. Filling the prejowl area, both in the area of the marionette lines as well as in the area at and below the mandible, creates a much more pleasing anterior mandibular contour. Augmentation of the prejowl sulcus occasionally must be addressed when surgical options are planned, either by the use of filling agents or by the use of prejowl surgical implants.

Injection Technique

Hyaluronic acids (HAs) are commonly used in this area. They may be injected at the dermal subcutaneous junction so as to add volume as well as to firm the overlying skin, which is often less firm than it once was. A threading technique with 1- or 1.5-inch (2.5- to 3.8-cm) needles and a 27- or 30-gauge needle works best. The injection needs to bridge all the way from the high point of the jowl.
and blend forward to the firm level portion of the chin.

**Alternate Technique**

Subdermal injections may be combined with depot injections along the mandible. For these deep injections, HA, calcium hydroxylapatite (CaHA), or polymethylmethacrylate (PMMA) can be used safely, and these deep injections can mimic a true prejowl implant. This technique requires more product volume than do the more superficial injections to achieve a similar effect.

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**Precautions**

Bruising is very common with the subdermal injection. Care needs to be taken to avoid the mental foramen, as paresthesias could occur with a direct injection into the foramen.

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**Post-Injection Instructions**

Immediate pressure and then ice are helpful to minimize bruising.

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**Risks**

Minimal risks occur, besides bruising, with the superficial technique if the injections are smooth and even.

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**Pearls of Injection**

Massage the product to shape it and recreate the mandibular jawline. Include injection along the inferior aspect of the mandible to fill in the entire prejowl concavity. Consider using a cannula for injection into this region, as precision of filler placement is not required in this location.

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**Additional Reading**


**Injection Technique**

Hyaluronic acid (HA) should be placed in the subcutaneous tissue in a U-shape until adequate filling of the earlobe is seen. Alternately, poly-L lactic acid (PLLA) may be used in a similar fashion, but the results will take longer to achieve.

**Precautions**

None.

**Post-Injection Instructions**

Ice as needed.

**Risks**

None; this is a very safe procedure to perform, yielding high patient satisfaction.
Pearls of Injection

This is a nice technique to offer patients, especially when looking for an appropriate place for the last little bit of product remaining in the syringe after treatment of other facial areas.

Additional Reading


Fig. 54.1  Hyaluronic acid may be placed in the earlobe both to support a hanging pierced earring and to restore volume to the deflated aging lobe.
Filler Injection for Acne Scars

■ Indications

Severe cystic acne can lead to large depressed facial scars. These scars can include depressions in the dermis as well as the subdermal fat. The shadowing of these depressed scars can accentuate their deep appearance, and elevation with fillers will minimize the shadowing and improve the overall skin contour. Although some flattened scars and concavities can be improved with fillers, enlarged pores and ice-pick scars will not improve with such injections.

■ Anatomic Considerations

Prior to injection of the scar, the injector may perform a “stretch” test to determine if the scar will improve with filler injection. If the scar flattens out with skin stretching, the scar will likely elevate and improve with filler. If it does not elevate, it may require release of the dermal attachments by subcision, or it may require direct excision. Most injections will be placed intradermally or in the immediate subdermal plane. To prevent lumpiness in areas with thin skin such as the temple and the lower eyelid, very small amounts of filler should be injected.

■ Injection Technique

Any filler may be used for these injections; however, we commonly use hyal-
uronic acids (HAs). The injection technique should start with a 30-gauge needle so as to layer and cross-hatch the intended area with multiple passes from different angles. Part of the correction requires subcision within the dermis and subdermis to break up fibrosis and scar tissue. The action of the needle moving back and forth across the scar will disrupt the fibrous attachments deep to the scar and permit its elevation with filler. A significant amount of force is necessary to introduce the product into the scar area. If no resistance is met, then the needle is probably too deep. It is best to introduce the needle 4 to 5 mm away from the edge of the scar area so that the product does not escape out of the puncture site when the needle is withdrawn or when the next pass is made from a different angle.

Precautions

If there are large pores in the area being injected, the needle may need to be passed at a deeper or different angle if product begins to extrude through one of the dilated pore tracts. Over-injection of a given area can lead to blanching or even intravascular occlusion.

Post-Injection Instructions

Ice and pressure are helpful to prevent bruising and lumpiness. The product will swell some with an HA and feel firmer to palpation the first week and then blend in more naturally. The patient should expect that the areas injected will look raised initially.

Risks

Minimal risks besides bruising and Tynndall effect from overly superficial injection into the dermis.

Pearls of Injection

The force of the injection and the presence of the product in the expanded space of the scar can actually stimulate neocollagenesis. Unless adequate release of scar tissue is performed at the center of a depressed scar, filling the area can create a mound that will accentuate the shadowing at the base of the scar.

Consider layering fillers, placing calcium hydroxylapatite (CaHA) deeply in the subcutaneous tissues and HA more superficially in the deep to superficial dermis. Restylane has more lifting qualities than does Juvéderm and is preferred for acne scars. Collagen is also an excellent scar elevator. Polymethylmethacrylate (PMMA) may be used as well, usually several days after subcision has been performed.
Fig. 55.1 Some acne scars may be elevated by placing filler deep to the scars. Scars that do not elevate with filler alone may require subcision to release dermal attachments prior to injection.

**Additional Reading**


extensor tendons. For deeper injections, the injector must be aware of the location of the interosseous muscles and the five metacarpal bones of the hand.

**Injection Technique**

Hyaluronic acid (HA) or calcium hydroxylapatite (CaHA) can be used to augment this region. These fillers provide instant gratification and a soft, even fill in the space between the skin and the interosseous muscles. The injections should be performed as if there are separate compartments between each metacarpal. It is best to avoid injecting directly over the tendons and bones, as it is more likely to lead to surface irregularities. As the area being injected is a long narrow compartment with many large veins throughout, it is best to use a long needle (either 1- or 1.5-inch/2.5- to 3.8-cm, 25- to 27-gauge) to inject.
product deep to veins and the skin into the deep subcutaneous layers or right above the muscle if necessary. All injections should be performed as retrograde threading or fanning to avoid vessel injection. Poly-L-lactic acid (PLLA) is also another excellent choice in this area and it should be diluted to approximately 10 cc per vial prior to injection. This high dilution and injecting deeply prevents the occurrence of nodule formation.

■ Precautions

With so many large and torturous vessels in this area, hitting one or even a couple is often inevitable. Ice ahead of time and quick firm pressure on the site of injection as soon as the needle is withdrawn can minimize hematomas or very large bruises from forming.

■ Post-Injection Instructions

Ice and firm pressure are helpful to prevent bruising. The product will swell some with an HA and feel firmer to palpation the first week and then blend in more naturally. The patient should expect that the areas injected will look raised and welted at first. Swelling should settle down within about 2 to 4 days. Vigorous massaging is necessary with the PLLA injections for the next 5 to 10 days.

■ Risks

The most significant risks involve injection irregularity and the product not feeling and looking smooth. It is important to massage uneven areas soon after injection so as to avoid a longer term problem, though an even injection technique is always more effective than any amount of massage.

■ Pearls of Injection

Undercorrection is usually safest, as well as injecting with the needle in motion so as not to inject into a vessel and create an occlusion or embolic situation.
Fig. 56.1  Filler is placed subcutaneously and massaged into place to improve the hollows of the aging hand.

Additional Reading

Anatomic Considerations

Prior to injecting this product, it is essential to have a thorough understanding of the facial aging process to accurately restore volume to a more youthful shape. PLLA is not intended to be injected into the muscle. Therefore, the injections should be directed either into the more superficial subcutaneous planes in the lower face or near the periosteum below the muscles of the upper face.

Injection Technique

Currently injectors are required to be trained by an injector trainer prior to use or purchase of this product in the United States. Re-suspension of product is performed preferably 48 hours prior to injection, but may be reconstituted

Indications

The aging face undergoes lipoatrophy and essentially “deflates” prior to succumbing to the effects of gravity. Fat augmentation of the face is gaining in popularity; however, poly-L lactic acid (PLLA) may provide similar results without the need for a surgical intervention. In addition, many thin faces are part of a body that is also depleted of fat, so with no adequate donor site for fat augmentation, PLLA may be a viable alternative. PLLA is a biostimulatory filler, and multiple treatments are necessary.
anywhere from 20 minutes to 3 days prior to the procedure using preserved water. Preserved water is preferred because it allows a longer shelf life after rehydration. (If saline is inadvertently used for re-suspension, the product should not be used.) The volume of water used should be 5 cc or more per vial. Xylocaine (1 or 2%) should be added to each vial (1 to 3 cc) just prior to performing the injections to increase patient comfort. Some injectors advocate using lidocaine with epinephrine 1:100,000 to theoretically minimize bruising. The authors do not use this mixture and have not found that its benefits have outweighed its complications.

Targeted on-label areas for injection include the temples, nasolabial folds, cheeks, pre- and post-jowl regions, and melolabial folds. Advanced areas that lead to good results in experienced hands include the brows, tear troughs, mid-face, lateral orbital rim, and backs of the hands. Injection is placed in the superficial subcutaneous or pre-periosteal planes, not intradermally or in the lips or lip lines. Typically a patient will receive a single vial for the upper half of the face and a single vial for the lower half of the face at each treatment session. A pan-facial volumization often requires the use of at least six vials over three sessions. In severe cases, much more can be used.

Injection techniques include linear threading in a grid pattern, which is an on-label use, along the cheeks and the whole lower face, or fanning, which is not an on-label use. Depot onto the periosteum is used for volumization of the upper half of the face in all areas above the inferior border of the orbicularis oculi muscle. Due to the suspension particle size of the PLLA product, it is necessary to use at least a 26-gauge needle and preferably a 25-gauge needle to inject. With both the depot and the fanning and threading techniques, the use of a 1.0- to 1.5-inch (2.5- to 3.8-cm) needle makes for many fewer puncture sites and more efficient placement of the product.

### Post-Injection Instructions

The patients are instructed to perform a deep tissue massage of the injected areas for 5 minutes, five times a day, for the next 5 days. Bruising can be quite significant, and patients should be warned that they may need to be camouflaged for upward of a week or more because of the volume of injection and the size of the needles.

### Precautions

Nodule formation is the great fear for those injecting this product and is due in most cases to faulty technique. Overly concentrating the particles in one area and not placing the injection at the right plane are the most common reasons for clumping of the product and subsequent collagen overgrowth or granulomatous
reaction. The occurrence of nodules and injection sequelae has diminished greatly due to the higher dilutions used and the injection training requirement by the manufacturing company.

Do not inject this product in the circular muscles of the face—the orbicularis oculi and oris—as there is increased incidence of nodules in these areas.

■ Risks

Intravascular injection is possible, especially along the nasal–alar junction. Perform a reflux maneuver on the syringe prior to injections in this area. One consolation, despite the blanching or hematoma, is that the product is almost entirely watery and that any embolic event will be self-limiting compared with a solid injectable substance.

■ Pearls of Injection

Do not attempt this injection without the proper training. Make sure patients understand that it will take several treatments at 4- to 6-week intervals to see results. It is almost impossible to over-inject a patient with PLLA.

To prevent the syringes or needles from plugging, it is advisable to keep the product warm at or above room temperature when ready to inject. Also, after adding the water reconstitute, allow the product to sit for 48 hours without agitating. When you are ready to add the lidocaine, gently vibrate, stir, or agitate for 5 to 10 minutes to fully suspend the particles. Try to avoid shaking the vial and causing the production of foam, as this tends to increase clogging of the needle.
Fig. 57.1 Multiple techniques may be used to inject PLLA. The depot technique is generally used to augment the temples. A grid technique may be used for the cheeks and pre- and post-jowl regions. The injection also may be placed along the nasolabial fold. Alternatively, a fanning technique can be used. A combination of these techniques is also acceptable.

Additional Reading

correctly and artistically, the techniques discussed in this book can be used alone or in combination to improve a patient’s appearance and “set the clock of aging back” 5 to 10 years.

■ What Is a Liquid Facelift?

A combination of fillers and neurotoxins can be used to rejuvenate the face. This technique can be offered to patients who are not willing to undergo surgical treatments. This technique can contour the face and rejuvenate wrinkles and folds. The results are temporary and repeated treatments are usually necessary, but overall, the patients note a fresher, more youthful appearance.

“Liquid facelift” is somewhat of a misnomer, as it is not truly a facelift. Used

■ What a Liquid Facelift Is Not

The liquid facelift is not a replacement for traditional facelift surgery. No amount of fillers and toxins can reposition the superficial musculoaponeurotic system (SMAS), improve the jowls, and remove fat and excess skin from the neck. It is important to accurately counsel patients about what fillers and neurotoxins can and cannot do for them. Be sure that patients have the correct expectations prior to treatment.
toxins (see Chapter 7) and augmenting the lips with fillers (see Chapter 37) can be nice adjuvants to facial rejuvenation surgeries.

Fig. 58.1a, b Three-dimensional volume assessment of a patient before and after treatment with 10 cc Restylane and 50 units of Botox.

Complementary Procedures

Fillers and neurotoxins can be used as an adjunct to facial surgical procedures. Treatment of the crow’s feet with neurotoxins (see Chapter 7) and augmenting the lips with fillers (see Chapter 37) can be nice adjuvants to facial rejuvenation surgeries.
Management of Filler Injection Complications

Fortunately, the most common complications from filler injections are minor and temporary, and may include swelling, bruising, and lumpiness. Rarely, more serious complications can occur, even in the best trained hands. By having thorough knowledge of facial anatomy and understanding the filler properties, most serious complications can be avoided.

■ Tyndall Effect

Some hyaluronic acids (HAs) will refract blue light if placed too superficially or if they migrate superficially.

Treatment

A 20-gauge needle is used to puncture the pool of product, and the product is expressed through this tract. This is the preferred treatment for product in the lower face. Treatment of the lower lids with the puncture technique is difficult and can cause excessive bruising while trying to manipulate the product. In this region, 20 to 50 units of hyaluronidase (Vitrase, ISTA Pharmaceuticals, Irvine, CA) can be used. Vitrase is sheep-derived (Ovine) hyaluronidase supplied in 200 U/1 cc vials (20 units/0.1 mL).

■ Herpetic Outbreak

When injections are placed in the lips, patients who have experienced prior herpetic outbreaks may have a flare-up of symptoms. Valtrex (500 mg) is typically started 3 days before injection and continued for 1 week afterward. More aggressive therapy with higher dosing and acyclovir creams is prescribed if herpetic eruptions occur despite prophylaxis.
**Nodules/Lumpiness**

Clumps of product may occur after injections.

**Treatment**

Massaging the product at the time of injection can lessen the occurrence of these lumps and bumps. Warm compresses and massage often help improve these lumps over time. Hyaluronidase can be used if HA lumps are unacceptable to the patient.

**Granulomas**

Granulomas are reactions to product that can be seen several months after injection.

**Treatment**

Granulomas may be treated with Kenalog injections, oral methylprednisolone, and oral antibiotics. Some advocate using 5-fluorouracil (5-FU) for treatment. Excision is also an option.

**Delayed Hypersensitivity**

Erythema of the skin surrounding the injected product can be seen weeks to months after injection. It is theorized that biofilms play a role in this condition.

**Treatment**

Oral fluoroquinolones (ciprofloxacin, levofloxacin) or macrolides (clarithromycin or azithromycin) may be used for up to 6 weeks. Steroids and nonsteroidal anti-inflammatory drugs (NSAIDs) may encourage the formation of biofilms and should be avoided in these conditions.

**Vascular Compromise**

Can be due to intravascular injection, vasospasm, or external compression. Immediate blanching of the skin is seen during injection.

**Treatment**

- Stop injection immediately.
- Massage the area.
- Apply warm compresses.
- Consider use of hyaluronidase (even if a calcium hydroxylapatite [CaHA] was used).
- Apply topical nitropaste.
- Prescribe aspirin PO.
- Follow the patient frequently; photodocument the injury and its progress.
- Consider consulting colleagues for assistance/advice.
Fig. 59.1a–f  (a) Blanching seen acutely at the time of vascular occlusion. (b) Purpura noted after facial artery occlusion.
(c) Vascular injury from nonsurgical rhinoplasty in a postoperative patient. (d) Delayed hypersensitivity seen 6 months after HA injection. (continued on next page)
Fig. 59.1a–f (Continued) (e) Herpetic outbreak after filler injections to nasolabial folds. (f) Tyndall effect seen on the lower eyelids.

### Additional Reading

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Neurotoxin/Filler Injection Techniques Arranged by Order of Difficulty and Level of Experience Required
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<td>PMMA</td>
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Sample Informed Consent Form for Neurotoxin Injections

I authorize Dr. ___________ to perform injection of Botox/Dysport/Xeomin on me.

Indications for procedure: Facial wrinkles

Risks of procedure: Bleeding, bruising, pain, infections, asymmetry, not fully improved wrinkles, temporary drooping of the eyelid, need for additional treatment, may also need filler for improved correction. In addition, there have been reports of distant spread of botulinum toxin that has resulted in secondary problematic weakness. These observations have been reported only in children being treated for spasticity and have never been reported with the cosmetic use of these products.

Alternative treatments: No treatment, filler injection, chemical peels, laser resurfacing, etc.

Photographs: I give my consent for photographs to be taken before and after the procedure for documentation.

I will allow these photographs to be shown to other patients. My name and other personal information will not be disclosed. YES NO

I will allow these photographs to be placed on the Internet. My name and other personal information will not be disclosed. YES NO

I understand that the results of these injections are not immediate and it may take 7 to 10 days for the full effect of the injection to be seen.

I am aware that the practice of medicine and surgery is not an exact science, and I acknowledge that no guarantees have been given to me concerning the results of this procedure.

Patient ________________________________ Date __________________

Physician _________________________________________________________

Witness ___________________________________________________________
Sample Informed Consent Form for Filler Injections

I authorize Dr. _____________ to perform injection of _________________________ on me.

**Indications for procedure**: Facial wrinkles, facial aging

**Risks of procedure**: Bleeding, bruising, pain, infection or inflammation, asymmetry, not fully improved wrinkles, lumps, nodules, vascular injury or occlusion, scarring, need for additional treatments, delayed hypersensitivity, allergic reaction. *(Additional risk for PMMA: This is a permanent product and cannot be removed.)*

**Alternative treatments**: No treatment, use of a different filler product

**Photographs**: I give my consent for photographs to be taken before and after the procedure for documentation.

I will allow these photographs to be shown to other patients. My name and other personal information will not be disclosed. **YES**  **NO**

I will allow these photographs to be placed on the Internet. My name and other personal information will not be disclosed. **YES**  **NO**

**Anesthesia**: I consent to the administration of anesthetics considered necessary or advisable. I understand that all forms of anesthesia involve risk and the possibility of complications, injury, and allergic reaction.

I am aware that the practice of medicine and surgery is not an exact science, and I acknowledge that no guarantees have been given to me concerning the results of this procedure.

Patient __________________________________________  Date ___________________
Physician ______________________________________________________________
Witness _______________________________________________________________
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