Section I

Introduction to Injectables

I

1
The Consultation

Initial Evaluation

A combination of factors can lead a patient to visit a provider for injectable treatment or evaluation. Often, it is a result of the patient looking or feeling tired or being told that they give that impression to others. Sometimes it is the drive for a youthful appearance or simply for a different look (whether that is fewer wrinkles, fuller lips, or higher cheekbones). The motivation for change may be preparation for an event that is fast approaching, like a wedding or reunion, or a longer-term goal, such as maintaining a competitive edge in the job market. All of these factors must be determined in the first discussions prior to developing the plan. The time frame for treatment and recovery, longevity of results, and patient expectations must be part of the planning.

Anatomic Considerations

The injector must have a thorough and comprehensive understanding of facial bone structure, muscle location and function, skin structure and thickness, as well as the location of nerve and vascular supplies to the face and neck. Greater familiarity will lead to increased comfort, sophistication, and talent with both diagnosing and treating the changes seen in facial aging. Most aging changes are a result of facial fat loss and redistribution away from key areas of the face, which leads to sagging, undesirable folds, and skeletonization. Loss of fat in the forehead and temples leads to drooping brows and hollowing of the temples. Loss of fat in the cheeks and around the eyes causes dark circles under the eyes and drooping of the malar skin, creating deeper nasolabial folds as well as hollowing, melolabial folding, and jowling. Buccal fat loss contributes to a gaunt look in the lower cheek and can create the effect of a "pouch" lateral to the mouth. Intrinsic changes of the skin due to solar exposure and collagen and elastin loss can accentuate these changes. Recognizing, understanding, and explaining to patients the global effects of these anatomic changes will greatly facilitate the consultation.

Consultation Techniques

A mirror placed on a desk in front of the patient (or a handheld mirror) is used so that the patient's facial features can be analyzed, both at rest and in animation. It is important to ask patients about what bothers them the most when they look into the mirror. Sometimes the practitioner's trained eye targets an area that turns out not to bother the patient at all. Patients are happiest when we listen to and address *their* concerns first. After we discuss how we can (or cannot) improve what bothers them, we can help them develop a plan for total facial rejuvenation, if they so desire.

Pointing out facial asymmetries or irregularities should be done as part of the preinjection teaching. Patients may not see their asymmetries preinjection but will note them postinjection. Photographic documentation is essential to document the preinjection appearance. Three-dimensional photography is another helpful tool that can be used as an objective means to demonstrate areas of concavity and asymmetry, as well as skin changes.

Once the need for treatment is established, a summary of the tools available, including neurotoxins for relaxing, fillers for volume restoration, skin boosting, and line filling, is discussed. Patients may have heard of the different brand names but are often ignorant of where they are placed, how they work, and how long the results will last. One should develop clear, concise talking points on the products used, which include safety and recovery profiles. Next, the injector should recommend the quantity of product necessary for a complete correction and a conservative estimate as to when they would need to be retreated. This should also be provided in written estimate form to avoid any

later confusion. An example would be 50 units of Botox to treat the glabella, forehead, and crow's feet, and four to six syringes of hyaluronic acid filler to treat the under eyes, upper cheekbones, melolabial folds, lip lines, and jawline. The patient should understand that the injections can be done either all at once or in stages, as the patient's budget allows. The potential risks, including the risk of bruising after treatment, should also be discussed. This would complete the consultation and leave the patient well educated and not feeling like they were pressured.

Some patients will want to be injected at their initial consultation, and others will just want to develop a plan by gaining information and having their questions answered. The initial consultation can be overwhelming for a patient new to injectables. It is important to proceed slowly at first. If a patient is not a candidate for neurotoxins or fillers, be honest about it.

Precautions

The injector must listen to patients and take cues from their body language about how comfortable they are with the concept of injectables and how willing they are to proceed. Some patients are very timid and self-conscious about discussing aesthetic issues. In those cases, it is best not to overwhelm them with too many things that they did not initially seek advice about lest they be scared away. Other patients may be open to a clinician's advice as to what is available and will want to learn all that is possible. Listen carefully to patients and address their primary aesthetic concerns first.

Body dysmorphic disorder (BDD) is a syndrome that all injectors should understand. Know that BDD patients often desire our expertise: these patients have abnormal body perceptions, and small abnormalities are magnified in their minds. It is difficult, if not impossible, to please such patients, so proceed with caution. In practice, it is more likely to regret injecting someone than to regret not injecting them!

Additional Reading

[1] Coleman SR, Grover R. The anatomy of the aging face: volume loss and changes in 3-dimensional topography. Aesthet Surg J. 2006; 26 1S:S4–S9

[2] Crerand CE, Menard W, Phillips KA. Surgical and minimally invasive cosmetic procedures among persons with body dysmorphic disorder. Ann Plast Surg. 2010; 65(1):11–16

[3] Fabi S, Alexiades M, Chatrath V, et al. Facial aesthetic priorities and concerns: a physician and patient perception global survey. Aesthet Surg J. 2022; 42(4):NP218–NP229

[4] Kapoor KM, Saputra DI, Porter CE, et al. Treating aging changes of facial anatomical layers with hyaluronic acid fillers. Clin Cosmet Investig Dermatol. 2021; 14:1105–1118

[5] Matarasso A, Nikfarjam J, Abramowitz L. Incorporating minimally invasive procedures into an aesthetic surgery practice. Clin Plast Surg. 2016; 43(3):449–457

2
Injectable Safety Considerations

The Physicians Aesthetic Coalition for Injectable Safety

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 Aesthetic Coalition (PAC) was created to provide information on qualified injectors, materials approved by the U.S. Food and Drug Administration (FDA), and injectable training that can be obtained by qualified professionals. We direct patients and injectors to the PAC website (http://www.physiciansaestheticcoalition.org) for appropriate information about the safe use of injectable materials.

The PAC is represented by over 5,000 board-certified members of the American Society for Aesthetic Plastic Surgery (ASAPS), the American Society for Dermatologic Surgery (ASDS), the American Academy of Facial Plastic and Reconstructive Surgery (AAFPRS), and the American Society of Ophthalmic Plastic and Reconstructive Surgery (ASOPRS). We encourage professionals to utilize the PAC website 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.

Counterfeit and Non–FDA-Approved Products

Neurotoxins and filler materials are now readily available for purchase online by anyone. This has led to a host of safety concerns. Counterfeit products are dangerous and may not be sterile or contain the correct type and amount of product. In May 2024, the FDA issued a consumer warning about counterfeit "Botox," which was causing botulism-like symptoms in patients. In addition, many non–FDA-approved filler products have been available to purchase online for very low prices. This has led to some patients even attempting to inject themselves. Obviously, without the knowledge of facial anatomy, injection of filler products can have devastating complications.

The authors caution readers to take the injection of these products seriously. Appropriate training in facial anatomy is imperative, and we encourage injectors to participate in hands-on training. We also caution injectors to avoid the use of non–FDA-approved injectable products. These precautions are paramount in ensuring the safety of our patients.

Additional Reading

[1] Food and Drug Administration. Counterfeit Version of Botox Found in Multiple States. Accessed December 16, 2024 at: https://www.fda.gov/drugs/drug-safety-and-availability/counterfeit-version-botox-found-multiple-states

[2] Wang JV, Hattier G, Rohrer T, Zachary CB, Saedi N. Experiences with counterfeit aesthetic medical devices and injectables: a national survey. Dermatol Surg. 2020; 46(10):1323–1326

Section II

Introduction to Neurotoxins

II

3
Neurotoxins Overview

Action

Peripheral neuromuscular blocking agents.

Mechanism of Action

Botulinum toxins irreversibly bind to the presynaptic terminal of the neuromuscular junction and prevent the release of acetylcholine (ACh), thereby preventing muscle contraction. ACh is also the transmitter that stimulates sweat glands, and blocking ACh transmission in the skin can decrease sweating.

Botulinum Toxin A (BoNTA) Formulations

A comparison of the Food and Drug Administration (FDA) approved botulinum toxin A formulations is shown in ▶ Table 3.1.

Table 3.1 Comparison of FDA-approved botulinum toxin A formulations

Neurotoxin	Year of FDA approval	Chemical name	Trade names	Composition	Manufacturer and location	Dosing ratio compared to Botox
Botox	2002	OnabotulinumtoxinA	Botox, Botox Cosmetic, Vistabel, Vistabex	900 kDa	Allergan (AbbVie), Irvine, CA	1:1
Dysport	2009	AbobotulinumtoxinA	Dysport, Reloxin, Azzalure	500–900 kDa	Ipsen, Brisbane, CA (Galderma)	2.5–3.0:1
Xeomin	2011	IncobotulinumtoxinA	Xeomin, Bocouture	150 kDa, no complexing proteins	Merz Pharmaceuticals, Frankfurt, Germany	1:1
Daxxify	2022	DaxibotulinumtoxinA	Daxxify	150 kDa	Revance Therapeutics, Nashville, TN	2:1
Jeuveau	2019	PrabotulinumtoxinA	Jeuveau, Nabota	900 kDa	Evolus, Newport Beach, CA	1:1
Letybo	2025	LetibotulinumtoxinA	Letybo, Botulax	900 kDa	Hugel Pharma, Seoul, South Korea	1:1
RelabotulinumtoxinA	(pending)	RelabotulinumtoxinA	Relfydess, Alluzience	900 kDa	Ipsen, Brisbane, CA (Galderma)	2.5:1

Abbreviation: FDA, Food and Drug Administration.

Botox: OnabotulinumtoxinA (BoNTA-ONA)

- 100 BU (Botox units) per vial (also contains 0.5 mg human serum albumin and 0.9 mg sodium chloride).
- Vacuum dried.
- Store in the refrigerator (2–8 °C) or freezer (–5 to –20 °C) until reconstituted; refrigerate after reconstitution.

Dysport: AbobotulinumtoxinA (BoNTA-ABO)

- 300 DU (Dysport units) per vial (also contains 0.125 mg human serum albumin and 2.5 mg lactose).
- Lyophilized.
- Store in the refrigerator and refrigerate after reconstitution.

Daxxify: DaxibotulinumtoxinA (BoNTA-Daxi)

- 100 U per vial.
- Contains L-histidine, L-histidine-HCl monohydrate, *polysorbate 20*, *RTP004 peptide*, and trehalose dihydrate. Daxxify uses a novel peptide as a stabilizer instead of human serum albumin.
- Lyophilized.
- Store at room temperature or refrigerate; refrigerate after reconstitution.

Jeuveau: PrabotulinumtoxinA (BoNTA-PRA)

- 100-U vial (also contains 0.5 mg of human serum albumin and 0.9 mg of sodium chloride).
- Vacuum dried.
- Store in the refrigerator before and after reconstitution.

Letybo: LetibotulinumtoxinA (BoNTA-Lety)

- 100-U vial (also contains 0.5 mg human serum albumin and 0.9 mg sodium chloride).
- Lyophilized.
- Store in the refrigerator and refrigerate after reconstitution.

Relfydess: RelabotulinumtoxinA (BoNTA-Rel)

- 150-U vial (also contains sodium chloride, sodium phosphate, potassium chloride, L-tryptophan, polysorbate, and water for injection).
- Liquid—ready to use.
- Store in the refrigerator.

Xeomin: IncobotulinumtoxinA (BoNTA-INC)

- 100 XU (Xeomin units) per vial (also contains 1.0 mg human serum albumin and 4.7 mg sucrose).
- Lyophilized.
- Store at room temperature; refrigerate after reconstitution.

Neuronox

- Not U.S. FDA approved in the United States.
- Approved in 2004 by the South Korean Ministry of Food and Drug Safety (MFDS), manufactured by Medytox Inc. (Seoul, Korea).
- 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 the refrigerator or freezer until reconstituted; refrigerate after reconstitution.

LanbotulinumtoxinA (LAN)

- Not FDA approved in the United States.
- Used in China, Asia, and Latin America (trade names: Hengli, Lantox, Prosigne, Lanzox, Redux, Liftox, HBTX-A, and CBTX-A).
- Lyophilized.
- Contains 5 mg bovine serum albumin, 25 mg dextran, and 25 mg sucrose per 100 U.
- Conversion ratio to Botox unknown.
- Store in the freezer; refrigerate after reconstitution.

Botulinum Toxin B (BoNTB) Formulation

Myobloc: BoNTB (RimabotulinumtoxinB)

- Solstice Neurosciences Inc., Malvern, PA.
- Trade names: Myobloc and NeuroBloc.

- Minimal cosmetic use due to painful injection and limited duration.
- FDA approved only for cervical dystonia and sialorrhea in adults.

Botulinum Toxin E (BoNTE) Formulation

TrenibotE: BoNTE (TrenibotulinumtoxinE)

- Pending FDA approval.
- AbbVie (Irvine, CA).
- Rapid onset (as early as 8 hours).
- Short duration (2–3 weeks).

Additional Reading

[1] Curry A, Rosenfeld J, Levin MK. Unmasking botulinum toxin myths. Dermatology Times. 2024; 45(9):22–25
[2] Flynn TC. Advances in the use of botulinum neurotoxins in facial esthetics. J Cosmet Dermatol. 2012; 11(1):42–50
[3] Hong SO. Cosmetic treatment using botulinum toxin in the oral and maxillofacial area: a narrative review of esthetic techniques. Toxins (Basel). 2023; 15(2):82
[4] Nettar K, Maas C. Neuromodulators: available agents, physiology, and anatomy. Facial Plast Surg. 2011; 27(6):517–522
[5] Walker TJ, Dayan SH. Comparison and overview of currently available neurotoxins. J Clin Aesthet Dermatol. 2014; 7(2):31–39

4
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 (containing benzyl alcohol) results in much less patient discomfort.

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

- 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 similarly to Botox, above.

Jeuveau—100 JU (Jeuveau units) may be reconstituted as above.

Daxxify—100 DaU (Daxxify units) may be reconstituted as above; usually, 1 mL is used.

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

- 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

[1] Bass Kaplan J. The dilution confusion: easy dosing for botulinum toxins. Plast Surg Nurs. 2016; 36(1):24–27

[2] 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). Paper presented at: European Masters in Aesthetic and Anti-aging Medicine; September 30–October 1, 2011; Paris

[3] Philipp-Dormston WG, Joseph JH, Carruthers JDA, et al. Why dosing matters: a closer look at the dose-response relationship with OnabotulinumtoxinA. J Cosmet Dermatol. 2025; 24(4):e70170

5
Instrumentation for Neurotoxin Injections

After reconstitution, botulinum toxin A (BoNTA) can be injected using a 1-mL syringe with a 30-gauge needle. The product can be withdrawn from the vial using 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 the product through the needle hub (▶ Fig. 5.1). Alternatively, nondrip 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 (▶ Fig. 5.2).

When using these nondrip insulin syringes, the needle is preattached. The BoNTA must be

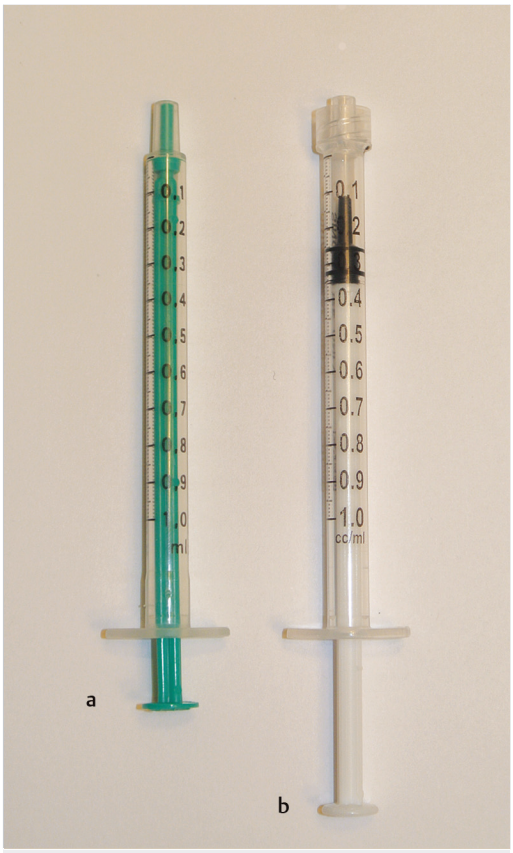

Fig. 5.1 A "No Waste" syringe pushes the plunger into the needle hub: **(a)** Acuderm and **(b)** exelint.

Fig. 5.2 **(a)** Dripless 0.3 mL and **(b)** 0.5 mL BD insulin syringes may be used for BoNTA injections. These syringes have a preattached 31-gauge needle.

reconstituted, and the vial stopper must be removed. Neurotoxin is drawn up into each syringe, and the syringes are 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 recapping of the needle (prior to patient use) to prevent damage or blunting of the fine needle tip.