Consensus Recommendations on the Use of Botulinum Toxin Type A in Facial Aesthetics

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The use of botulinum toxin type A for facial enhancement is the most common cosmetic procedure currently undertaken in the United States. Overall clinical and study experience with botulinum toxin type A treatment for facial enhancement has confirmed that it is effective and safe in both the short and long term. Nevertheless, consistent guidelines representing the consensus of experts for aesthetic treatments of areas other than glabellar lines have not been published. Therefore, a panel of experts on the aesthetic uses of Botox Cosmetic (botulinum toxin type A; Allergan, Inc., Irvine, Calif.) was convened to develop consensus guidelines. This publication comprises the recommendations of this panel and provides guidelines on general issues, such as the importance of the aesthetic evaluation and individualization of treatment, reconstitution and handling of the botulinum toxin type A, procedural considerations, dosing and injection-site variables, and patient selection and counseling. In addition, specific considerations and recommendations are provided by treatment area, including glabellar lines, horizontal forehead lines, “crow’s feet,” “bunny lines” (downward radiating lines on the sides of nose), the perioral area, the dimpled chin, and platysmal bands. The review of each area encompasses the relevant anatomy, specifics on injection locations and techniques, starting doses (total and per injection point), the influence of other variables, such as gender, and assessment and retreatment issues. Factors unique to each area are presented, and the discussion of each treatment area concludes with a review of key elements that can increase the likelihood of a successful outcome. Summary tables are provided throughout. (Plast. Reconstr. Surg. 114 [Suppl.]: 1S, 2004.)

OVERVIEW AND GENERAL PRINCIPLES

The aesthetic use of botulinum toxin type A is governed by general principles as well as specific considerations for each treatment area. This supplement will review the general principles of botulinum toxin type A use in aesthetics and then provide specific guidelines for each potential treatment area. These sections will include information on the target muscles, the injection sites, total starting doses by gender and amount per injection site, response assessment, and potential retreatment intervals. Techniques and guidance to minimize side effects and maximize efficacy will be provided. Finally, special considerations for each area will be addressed.

Reconstitution and Handling

Clostridium botulinum toxin type A (Botox; Allergan, Inc., Irvine, Calif.) is supplied in a vial containing 100 U of vacuum-dried neurotoxin complex. According to the prescribing information, powder in each vial should be reconstituted with 2.5 ml of 0.9% nonpreserved saline to a final concentration of 4.0 U/0.1 ml. A literature review noted that most clinicians use a dilution of 2.5 to 3.0 ml per vial. The members of the consensus panel agreed that a range of dilutions and injection

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The members of the Botox Consensus Group are listed in the Appendix at the end of this article.

Off-Label Statement: It should be noted that the results reported in this article refer to the Allergan formulation of botulinum toxin type A (Botox, Botox Cosmetic, Vistabel) and cannot be generalized to other formulations or serotypes of botulinum toxin. Botulinum toxin type A is indicated for the temporary improvement in the appearance of moderate to severe glabellar lines associated with corrugator and/or procerus muscle activity in adult patients less than or equal to 65 years of age. All other uses are considered off-label. The full prescribing information should be viewed prior to using any products discussed here.

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volumes is acceptable and depends primarily on the number of units to be injected and the preference of the practitioner. Currently, no data from well-controlled studies support the idea that volume of injection contributes significantly to diffusion. In a dose-dilution study in which a total dose of 30 U was reconstituted in 1, 3, 5, or 10 ml, no between-group differences in efficacy or safety were observed in treating glabellar rhytids.5 The effects of dilution at higher volumes and in other regions remain to be investigated systematically. Anecdotal and published reports suggest that volume may influence duration of effect: the greater the volume, the shorter the duration of effect.4 In general, physicians should choose a dilution that minimizes the likelihood of diffusion to neighboring muscle groups.

The full prescribing information also states that botulinum toxin type A should be used within 4 hours of reconstitution.1 Clinical experience and recently published data, however, suggest that potency can be maintained for up to 6 weeks with proper storage. For example, the results of a multicenter, double-blind study demonstrated that reconstitution with nonpreserved saline up to 6 weeks before use did not diminish efficacy in the treatment of glabellar frown lines.5 Reconstituted vials were stored at 4°C. It has also been reported that botulinum toxin type A reconstituted 30 days before use did not decrease in efficacy.6 Other studies and reports have also noted retention of potency over varying durations, as reviewed by Hexsel et al.5 A survey of the consensus panel members revealed that 73 percent store botulinum toxin type A for more than 4 hours. The other members do so occasionally.

The consensus panel members agreed that preserved saline can be used to dilute botulinum toxin type A. The results of a bilateral, comparative, prospective study showed that 100 percent of patients (n = 15) reported less pain with preserved isotonic saline than with nonpreserved isotonic saline (p < 0.001).7 In an additional analysis, patients who received botulinum toxin type A in preserved saline were asked to compare the pain relative to previous injections with nonpreserved saline. Of 20 patients, 90 percent reported less pain with the preserved saline preparation. Once reconstituted, botulinum toxin type A should be clear, colorless, and free of particulate matter, regardless of the diluent.1

Concerns about loss of botulinum toxin type A potency at the air/solution interface have led to recommendations to avoid agitation and foam during reconstitution.1,8,9 To examine this issue, Trindade de Almeida and colleagues8 reconstituted two vials of botulinum toxin type A simultaneously, vigorously agitating only one vial until bubbles appeared. Six female patients received injections in the glabellar and periocular areas bilaterally. The right side was treated with the gently reconstituted botulinum toxin type A and the left side was treated with the agitated solution. Blinded observers compared pretreatment and posttreatment photographs. No differences in muscle relaxation between the two treatment sides were detected (p = 0.0013). Effects were maintained through 16 weeks on both treatment sides (p = 0.0025). This report supports the clinical experience of the consensus panel members that suggests the fragility of botulinum toxin type A is not as problematic as previously reported. The results, however, need to be confirmed in larger studies and in mouse lethality assays.

Recommendations for reconstitution and handling are summarized in Table I.1 Please also refer to the approved package insert before using Botox Cosmetic.

**Procedural Considerations: Type of Syringe and Pain Management**

Prescribing information for botulinum toxin type A (Botox)1 suggests a tuberculin syringe, which was preferred by 44 percent of consensus panel members. Insulin syringes were used

**TABLE I**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diluent</td>
<td>● Preserved 0.9 percent saline (preferred)</td>
</tr>
<tr>
<td></td>
<td>● Nonpreserved 0.9 percent saline*</td>
</tr>
<tr>
<td>Concentration</td>
<td>● 4 U/0.1 ml* or any convenient concentration to deliver required units per injection site</td>
</tr>
<tr>
<td>Storage</td>
<td>Before reconstitution ● 2°C to 8°C for up to 24 months*</td>
</tr>
<tr>
<td></td>
<td>After reconstitution ● 4 hours at 2°C to 8°C</td>
</tr>
<tr>
<td></td>
<td>● Up to 6 weeks at 4°C</td>
</tr>
<tr>
<td>Handling</td>
<td>● Special precautions not required</td>
</tr>
</tbody>
</table>

* Please refer to the approved package insert before using Botox Cosmetic.

**References**

by 32 percent of consensus panel members, and another 12 percent reported using both types of syringes. Plastic, single-use syringes are recommended; the insulin syringe, with no potential space at the hub, may waste less solution. A 30-gauge needle is standard, but several panel members have reported on their experiences of reduced pain with the use of a 32-gauge needle. The choice of syringe depends primarily on practitioner preference.

Topical anesthesia can be beneficial in helping to reduce any discomfort associated with the injections. Botulinum toxin type A prescribing information does not provide recommendations on the use of topical anesthesia, but the use of such agents may provide a more comfortable, positive experience for some patients. A total of 65 percent of the consensus panel members agreed that the use of a topical anesthetic, including ice, could be beneficial for some patients.

**Dosing and Injection-Site Considerations**

For any facial area treated with botulinum toxin type A, a number of variables, including specific aesthetic goals, influence the starting and total doses, as well as the placement and number of injections (Table II). Here again, the distinction between wrinkle effacement and facial shaping is critical. Patient evaluation within the framework of facial enhancement will lead to a treatment plan that incorporates the creation of harmony and balance rather than wrinkle removal in isolation.

Understanding the variables that contribute to the patient’s appearance will aid in the development of an individualized treatment plan designed to achieve the patient’s and physician’s agreed-upon aesthetic goals. Foremost, a thorough understanding of the underlying facial musculature and the physiologic interactions of the muscles is critical to success. The number of units to be injected depends on the specific region and the characteristics of the involved muscles, including their masses. In turn, muscle mass is influenced by gender and individual variation. Generally, the muscles of men are greater in mass and require higher doses of botulinum toxin type A. The required dose and the sites to be injected are also based on an assessment of how the muscles behave in repose, in normal animation, and during maximal contraction. Skin thickness and texture may also contribute to dosing decisions. Although injections are generally intramuscular, the thickness of the dermis may influence the injection technique. For example, the skin of Asians tends to be thicker and have more collagen fiber than the skin of Caucasians. In general, thicker skin requires a higher dose of botulinum toxin type A than thinner skin does for an equivalent outcome. The amount will depend on muscle bulk. With the exception of the periocular and perioral areas (in which injections should be superficial), intramuscular injections should be made perpendicular to the skin and directed to the belly of the muscle. Where skin is thin, injections should be made superficially in the subcutaneous plane.

**Aesthetic Considerations**

Aesthetic planning involves understanding and assessing the patient’s desires and preferences in the context of an overall treatment plan. The evolving emphasis on facial shaping and enhancement argues against treating any one area in isolation, without regard to its effect on other areas. Correspondingly, the muscles of facial expression do not act in isolation but have complex anatomic and physiologic interactions. For example, treatment of glabellar lines, “crow’s feet,” or forehead lines can alter eyebrow shape and position, which are considered central to aesthetic evaluations of the upper face. Therefore, potential effects on eyebrow shape and position should be considered in advance of any and all treatments in the upper face. Gender differences are important for eyebrow shape: typically, women have a more arched eyebrow, which is considered to be aesthetically pleasing; the male brow is flatter. Just as the eyebrows are central to the appearance of the upper face, the lips are fundamental to the appearance of the mid- and

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**TABLE II**

Variables Influencing Treatment Plan

<table>
<thead>
<tr>
<th>Variable</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetic goals</td>
<td>Development of overall treatment plan</td>
</tr>
<tr>
<td>Region(s) to be injected</td>
<td>Dose, injection sites, retreatment interval</td>
</tr>
<tr>
<td>Gender</td>
<td>Usually higher doses for men; aesthetic goals</td>
</tr>
<tr>
<td>Muscle mass</td>
<td>Higher doses for larger muscles</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Aesthetic ideals, skin thickness, functional anatomy</td>
</tr>
<tr>
<td>Skin thickness</td>
<td>Higher doses may be needed for thicker skin</td>
</tr>
<tr>
<td>Anatomic variation</td>
<td>Injection sites and dosing</td>
</tr>
<tr>
<td>Animation</td>
<td>Illustrates functional anatomy; injection sites</td>
</tr>
</tbody>
</table>
lower face. Thus, treatment of the perioral area or dimpled chin needs to consider the shape and position of the mouth and the type of smile.

Patient Selection, Education, and Counseling

The quality of the botulinum toxin type A treatment experience depends to a certain extent on proper patient selection and education. Patients who present with severe, deep wrinkles may have unrealistic expectations as to the outcome of botulinum toxin type A treatment. Clinicians can help avert dissatisfaction by setting overall aesthetic goals with patients, developing an overall treatment plan, and establishing realistic expectations for the outcome. Photographing the patient before treatment and at follow-up is also useful in documenting the effect and in planning any touch-ups or retreatments.

An accurate medical history can uncover potential problem areas and functional effects. The physical examination presents an opportunity to watch the patient in a dynamic setting and to observe how the potential areas of treatment behave as well as to reveal any contraindications to treatment.

Although adverse events with botulinum toxin type A treatment are rare,1,12 a few preprocedural and postprocedural instructions and precautions, as well as technical nuances, can increase the probability of a successful outcome. For example, the potential for bruising can be reduced by advising patients to avoid medications that inhibit clotting, such as vitamin E, aspirin, aspirin-containing products, and nonsteroidal anti-inflammatory drugs, for a period of 10 to 14 days before treatment. Even though specific posttreatment instructions differ by treatment area, several universal recommendations were made by consensus panel members (Table III). In addition, the use of loupe magnification by the injector makes it easier to detect areas in which vein and venous plexi are evident through the thin periorbital skin, thereby avoiding bleeding and bruising to this region.

Patients need to receive information about potential adverse effects of botulinum toxin type A, but they should be made aware of the long history of safe use, the low probability of any of these effects occurring, and the fact that most adverse effects are mild and transient.1,12 The results of a recent retrospective study confirmed the long-term safety of botulinum toxin type A in all facial areas.13 Fifty subjects received a total of 853 injection sessions. Ten adverse events occurred in total, but only five events were considered to be definitely or probably related to the use of botulinum toxin type A. These events were bilateral eyebrow ptosis (n = 2), right brow ptosis (n = 1), right eyelid ptosis (n = 1), and dysphagia (n = 1). Other adverse events, pain at injection site, and bruising were associated with the injection technique but not with the toxin itself. The likelihood of ptosis can be minimized by careful selection of injection sites in the eye area.

In double-blind, controlled clinical trials for the use of botulinum toxin type A in the treatment of glabellar lines, the overall rate of adverse events was similar in placebo-treated (41.5 percent) and botulinum toxin type A–treated patients (43.7 percent). Headache occurred in 17.7 percent of placebo-treated patients and in 13.3 percent of botulinum toxin type A–treated patients, suggesting that this adverse event may be caused by the injection and technique rather than the toxin.14

<table>
<thead>
<tr>
<th>TABLE III General Posttreatment Instructions for Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruction</td>
</tr>
<tr>
<td>1. Massage treatment area?</td>
</tr>
<tr>
<td>a. Yes</td>
</tr>
<tr>
<td>b. No</td>
</tr>
<tr>
<td>2. Contract treated muscles?</td>
</tr>
<tr>
<td>a. Yes</td>
</tr>
<tr>
<td>b. No</td>
</tr>
<tr>
<td>3. Limit activity?</td>
</tr>
<tr>
<td>a. Yes</td>
</tr>
<tr>
<td>b. No</td>
</tr>
<tr>
<td>4. Avoid bending?</td>
</tr>
<tr>
<td>a. Yes</td>
</tr>
<tr>
<td>b. No</td>
</tr>
<tr>
<td>5. Avoid exposure to heat for 2 hours after treatment?</td>
</tr>
<tr>
<td>a. Yes</td>
</tr>
<tr>
<td>b. No</td>
</tr>
<tr>
<td>6. Avoid flying for 2 hours?</td>
</tr>
<tr>
<td>a. Yes</td>
</tr>
<tr>
<td>b. No</td>
</tr>
</tbody>
</table>
Botulinum toxin type A is contraindicated in the presence of infection at the proposed injection site(s) and in individuals with known hypersensitivity to any ingredient in the formulation, including albumin. Caution in the use of botulinum toxin type A is recommended in several circumstances, including but not limited to the following:

- Treatment of patients with peripheral motor neuropathic diseases or neuromuscular functional disorders; for example, patients with myasthenia gravis or Eaton-Lambert syndrome may be at increased risk of clinically significant systemic side effects.
- Coadministration with aminoglycoside antibiotics or other agents that interfere with neuromuscular transmission, which may potentiate the effect of botulinum toxin type A.
- Treatment of patients with inflammatory skin conditions at the injection site.
- Pregnancy (pregnancy category C), although inadvertent use has not resulted in any reported teratogenicity or pregnancy problems.
- Lactation, because it is not known whether the toxin is excreted in human milk or has any effect on the infant’s nervous system.

Physicians must consider the suitability of botulinum toxin type A treatment for each patient based on the complete evaluation. The patient’s comfort level with the procedure and expectations are important variables.

### THE GLABELLAR COMPLEX AND VERTICAL FROWN LINES

The musculature of the glabellar complex, responsible for vertical frown lines, is the most common site for botulinum toxin type A injection, and published experience is extensive.11,15–36

#### Anatomy

The primary muscles of the glabellar complex are the corrugator supercillii, the pro-

#### TABLE IV

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Location</th>
<th>Origin/Insertion/Orientation</th>
<th>Primary Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrugator</td>
<td>Bilateral, deep to frontalis muscle; superficial to periosteum, directly on frontal bone of the upper medial orbits</td>
<td>Frontal bone medial to eyebrows; inserts into underside of galea, just above medial head of eyebrow; runs approximately 30 degrees above horizontal</td>
<td>Brow adductors (depressors); moves the eyebrow downward and medial</td>
</tr>
<tr>
<td>Procerus</td>
<td>Vertical midline; flat muscle on bridge of nose</td>
<td>Lower part of nasal bone and upper lateral nasal cartilage; insets on skin overlying nasal root; interdigitates with frontalis, corrugators, and orbicularis oculi; vertically oriented</td>
<td>Brow depressor; depresses medial head of the eyebrows; results in transverse lines on nasal dorsum</td>
</tr>
<tr>
<td>Orbicularis oculi (medial); sometimes considered to be separate and called the depressor supercilii</td>
<td>Bilateral, thin muscle, lying superficial to the corrugators</td>
<td>Superior upper dorsum; inserts on underside of galea, near the medial aspect of the corrugator; vertically oriented</td>
<td>Brow depressors</td>
</tr>
</tbody>
</table>

cerus, and the depressor supercili (Fig. 1). In addition, the medial fibers of the orbicularis oculi and the frontalis can contribute, as fibers from these muscles may interdigitate with those of the corrugator. The main functions of these muscles are summarized in Table IV. The treatment plan needs to take into account the interdigitation of muscle fibers and the degree to which their activities are in opposition to anticipate the effect of botulinum toxin type A injection. For example, treatment of the depressor supercili fibers will allow a slight elevation of the medial brow because the majority of frontalis activity will be unopposed.

Injection Technique

Prescribing information for botulinum toxin type A recommends five injection sites. When indicated by muscular anatomy, however, two additional bilateral points above the superior orbital rim may be injected. Members of the consensus panel noted that the exact number of injection points depends on individual patient variables, as discussed. Gender is particularly important, as men have larger muscle masses on average. The shape of the male brow tends to the horizontal, whereas the female brow is characterized by a gentle arch. Most members of the consensus panel recommended the injection of five to seven points, with men undergoing a greater number of injections than women (Table V). In individual cases, as few as three sites or as many as 10 to 12 sites may be treated. Asian skin, for example, may require more conservative treatment, and three starting points may be sufficient. Typical injection sites for “average” men and women are depicted in Figure 2.

Total Starting Doses

The recommended total treatment dose according to the Botox Cosmetic prescribing information is 20 U. A review of the literature revealed that total starting doses ranged from 10 to 80 U, with a median total dose of approximately 20 U. Gender. The majority of studies have been conducted in women, who require a lower starting dose than men. A recent dose-ranging study in female subjects confirmed that 10 U was less effective than 20 U, 30 U, or 40 U injected in seven points in the glabellar complex. Among members of the consensus panel, 96 percent began treating women with either 20 or 30 U of botulinum toxin type A, evenly divided between the two doses.

In men, a dose-ranging study evaluated total doses of 20, 40, 60, or 80 U administered in the glabellar complex. As expected, on the basis of clinical experience and gender differences in anatomy, the 20-U dose was significantly less effective than the other doses. Many consensus panel members begin treatment with 30 U (50 percent) in women and 40 U (38 percent) in men. Thirty percent of the panel members

<table>
<thead>
<tr>
<th>Target Muscles</th>
<th>Usual No. of Injection Points (range)</th>
<th>Total Starting Dose* (usual range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrugator, procerus,</td>
<td>5 to 7; men may require more sites</td>
<td>Women: 20 to 30 U</td>
</tr>
<tr>
<td>depressor supercili,</td>
<td></td>
<td>Men: 30 to 40 U</td>
</tr>
<tr>
<td>orbicularis oculi, frontalis</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Higher starting doses may be used depending on individual patient variables.
frequently started with higher doses in men (45 to 120 U).

Other variables. In treating Asian women, a more conservative approach may be warranted because of their epicanthal folds and the effects on their ability to apply makeup. In these circumstances, consensus panel members recommended starting with a 10-U total dose and reevaluating in 2 weeks. Thicker, sebaceous skin otherwise generally requires somewhat higher doses of botulinum toxin type A.

Units per injection point. The total dose is divided among the total number of injection points, but not necessarily equally. For example, when injecting seven sites, Carruthers and panel members used the following distribution: procerus, 20 percent; each corrugator, 15 percent; and the orbicularis oculi, 50 percent, with 15 percent at each of two sites above the medial canthus and 10 percent at each of two sites above the midpupillary line. Final dosing and distribution depend on individual assessment of muscle function and aesthetic goals. Members of the consensus panel injected a range of aliquots from 1 U to 10 U.

Assessment and Retreatment

In assessing response to a starting treatment, consensus panel members recommended seeing patients at 14 days after treatment, but only if there is a problem or if response is inadequate. At that time, adjustments in dosing or touch-ups can be made based on patient presentation. When an interim assessment is not deemed necessary, the typical interval for retreatment is 3 to 4 months. The duration of effect may depend on the total unit dose administered, which is supported by some published data for both men and women.\textsuperscript{21,23} Retreatment, in some cases, may not take place before 5 to 6 months have elapsed.

Special Considerations for Treating the Glabellar Complex

Botulinum toxin type A is being used with increasing frequency in combination with other procedures and materials, such as resurfacing and surgery, and in conjunction with fillers. Some experts believe that botulinum toxin type A treatment 1 to 2 weeks before laser resurfacing and other procedures can provide better overall outcomes. At times, however, this may be impractical because of the need for frequent visits. Moreover, some physicians believe the duration of results may be reduced.

Botulinum toxin type A treatment can take place either before or after a face lift, but at least 2 to 4 weeks should intervene after facial surgery. Botulinum toxin type A treatment and fillers should be considered complementary tools in achieving overall aesthetic goals. It is important to understand that botulinum toxin type A treatment may have an effect on facial features other than those treated directly (i.e., eyebrow position). Such effects need to be considered in advance of treatment, to achieve an optimal and satisfactory result (Table V).

Key Elements

1. Assess facial expression at rest and during animation.
2. Evaluate the range of motion of involved muscles.
3. Palpate muscles during repose and contraction.
4. Assess brow position. In women, be sure to consider whether the brows have been plucked or tattooed.
5. Evaluate any asymmetries and assess potential effects of botulinum toxin type A injection.
6. Avoid injecting too low over the orbit; in general, to be ultimately safe, injections should be directed “outside” the orbital rim.
7. Use caution with lateral brow injections; stay well above the superior orbital rim.
8. It is not necessary to insert the needle to periosteum and “back off” to administer effective treatment to the central brow depressors; however, the desired effect on brow position will dictate the plane of injection.
9. Exercise caution in patients who have undergone surgery that can alter the underlying anatomy.
10. Recognize the variables that affect required dosage in individuals.
11. Begin with the recommended starting doses and add more units or additional sites if necessary at a 2-week evaluation.
12. Do not completely paralyze the muscles.
13. Consider patient expectations as well as cultural viewpoints in planning the overall effect.
14. Assess the need for treatment with other modalities, such as soft-tissue augmentation or surgical intervention.

**Horizontal Forehead Lines**

The frontalis muscle of the forehead elevates the brow and is associated with the develop-
ment of horizontal forehead rhytids. The goal in treating the forehead is to maintain some movement of the frontalis muscle and avoid complete paralysis. Although the effects of botulinum toxin type A for treating horizontal rhytids are less well studied than those for frown lines, the results consistently indicate that botulinum toxin type A is safe and effective for this use.11,18,27,31,34–36,40–45 Many members of the consensus panel noted, however, that the frontalis muscle presents significant challenges for the more inexperienced user for several reasons41: (1) interindividual variability in frontalis structural anatomy; (2) interindividual variability in frontalis functional (habit/expression) anatomy; (3) difficulty in treating in isolation because of the potential for eyebrow ptosis on the one hand and failure to efface lines on the other; and (4) the potential for overtreating and producing an inanimate appearance.

**Anatomy**

The frontalis, a large, vertically oriented muscle, is illustrated in Figure 337 and discussed in Table VI.38,39 Members of the consensus panel noted that clinical experience suggests considerable interindividual variation in the structural features of the frontalis. Although usually depicted as two somewhat fan-shaped bands, the midline fibers overlap substantially in some individuals.39 In addition, the medial fibers of the frontalis may be more fibrous than the lateral fibers.38 Forehead shape also differs between individuals in both vertical and horizontal directions. In addition, some individuals have numerous fine forehead lines, whereas others have a single deep horizontal furrow. Moreover, individuals will also demonstrate a spectrum of variations in habitual facial expression, causing furrows and influencing eyebrow shape. The totality of these anatomic features and their variations play an important role in determining the treatment plan for horizontal forehead rhytids.

**Injection Technique**

The number of injection points varies based on the aesthetic goals and the individual patient characteristics. Figure 4 illustrates the potential injection points based on possible presentations of horizontal forehead lines and anatomic variation in forehead shape and eyebrow position.

Among members of the consensus panel, the number of injection points ranged from two to 12. The most frequent number of injection points cited by the panel members was a range of four to six (Table VII). Regardless of the number of injection sites, it is important that all injections remain 1 to 2 cm above the orbital rim to reduce the potential for brow ptosis in selected individ-

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**TABLE VI**

The Frontalis Muscle*

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Location</th>
<th>Origin/Insertion/Orientation</th>
<th>Primary Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontalis, but muscle interacts with procerus, corrugators, and orbicularis oculi</td>
<td>Forehead, superior to eyebrows and inferior to scalp</td>
<td>Galea aponeurotica, variably near the coronal suture/inserts on the supraciliary ridge of the frontal bone; also inserts onto fibers of the procerus, corrugator, and orbicularis oculi muscles; vertically oriented</td>
<td>Brow elevation</td>
</tr>
</tbody>
</table>

uals who wish to maintain or elevate brow position. The upper two thirds of the forehead was also suggested as a landmark. Again, for women, care should be taken to assess the natural position of the eyebrows and whether they are plucked or tattooed. Panel members suggested that injections should avoid the first horizontal line above the brows. In addition, a filler may be needed to soften the inferior lines, where botulinum toxin type A injections should be avoided.

Some of the consensus panel members suggested that forehead lines not be treated until 2 weeks after treatment of vertical frown lines, to achieve aesthetic harmony in the upper face. However, a careful dynamic aesthetic and functional evaluation of the

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**TABLE VII**

Recommendations for Treating Horizontal Forehead Lines

<table>
<thead>
<tr>
<th>Target Muscles</th>
<th>Usual No. of Injection Points (range)</th>
<th>Total Starting Dose (usual range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontalis, but consider interactions with procerus, corrugators, and orbicularis oculi in overall facial shape</td>
<td>4 to 8; more or fewer may be required based on anatomic and aesthetic evaluations</td>
<td>Women: 15 U; 10 to 20 U</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Men: 20 to 30 U</td>
</tr>
</tbody>
</table>

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Fig. 4. Possible injection sites for horizontal forehead rhytids in men (above) and women (below). (Left) Brows raised before injection; (right) brows in attempt to raise after injection. Note that male patients who desire complete eradication of forehead rhytids will accept the inevitable induction of significant brow ptosis (that may be unacceptable for most female patients) in exchange for maximum reduction of rhytids. A reduced induction of brow ptosis may be achieved with coincident injection to the corrugators as shown. Photographs of male patient reprinted from Fagien, S. Botulinum toxin type A for facial aesthetic enhancement: Role in facial shaping. *Plast. Reconstr. Surg.* 112 (Suppl.): 6S, 2003; photographs of female patient courtesy of Rod Rohrich, M.D.
forehead, in most cases, would allow for simultaneous treatment.

**Total Starting Doses**

For women, 94 percent of consensus panel members recommended a total starting dose of 10 to 20 U, with 61 percent recommending the lower dose. For men, 32 percent of the panel recommended starting with 20 U, and 46 percent recommended starting with 30 U. The calculated typical starting dose was 15 U for women and 20 U for men. Gender differences in muscle mass allow a higher starting dose in men. Also, men accept and prefer a flatter, less arched brow. Some of the members of the consensus panel recommended 1- to 3-U aliquots into the lateral orbicularis (depressor muscle), particularly in women, to allow eyebrow elevation. This application also tends to neutralize the potential brow depression that can occur when individuals receive frontalis injections that extend inferiorly toward the eyebrow proper or laterally toward the line of temporal fusion. The total dose for eyebrow elevation rarely exceeds 30 U, especially in women, although a somewhat higher dose may be necessary in patients with a very high brow.

**Units per injection point.** The total dose is divided by the number of planned injection points, starting with a low dose. Typically, each point is injected with 1- to 5-U aliquots, with higher doses used in men. As with other areas, the dosing depends on the pretreatment aesthetic analysis.

**Assessment and Retreatment**

Because the starting dose is low and balance of the upper face depends on eyebrow position, reassessment in 2 weeks for additional treatments or subtle corrections is highly recommended. At that time, eyebrow position can be reassessed and adjusted with small amounts of properly placed botulinum toxin type A. Before and after photographs can be very helpful.

Retreatment intervals for horizontal forehead lines range from 3 to 6 months. Usually, retreatment is needed less often for this area than for the glabellar complex. Some panel members have also suggested that a slightly reduced dose to the frontalis can be advantageous when the glabella and lateral canthus are also being treated. This may allow retreatment of all the periorbital regions to be more “in sync” with regard to harmonious dissipation of effects. Approximately 80 percent of the panel members observed benefits to last for 4 to 6 months.

**Special Considerations for Treating Horizontal Forehead Rhytids**

Older patients may use the frontalis to increase their visual field. Therefore, caution is needed in these circumstances. Men may be more willing to tolerate forehead lines than women, and they are not always good candidates for this procedure. When they do desire treatment, they may need higher doses than women do, but overtreatment should be avoided in all cases. If laser treatment is planned, botulinum toxin type A treatments can be undertaken 1 to 2 weeks before resurfacing. Botulinum toxin type A injection can also be combined with fillers, and many of the panel members apply these treatments simultaneously.

**Key Elements**

1. Less experienced injectors of botulinum toxin type A should stay at least 2 cm above the brow.
2. Assess for asymmetries in brow position. As few as two injections high up in the forehead can help bring the eyebrows into symmetry.
3. Ensure that injection sites are lateral enough to avoid a quizzical eyebrow appearance, but avoid the lower lateral forehead. A high lateral injection can modulate a severe lateral brow elevation.
4. A small amount of botulinum toxin type A administered in the procerus can help prevent brow ptosis.
5. A midline injection should be considered because many patients have frontalis fibers in that area, even though some schematic drawings fail to depict them.
6. Some consensus panel members recommend that the frontalis and brow depressors should be treated at the same time for a harmonious result. Others recommend injecting these areas separately to decrease the amount of botulinum toxin type A used. Diffusion and overlap can result in immobilization. If treatments are undertaken separately, treat the depressors first, followed 2 weeks later by the frontalis treatment. The selected approach should be undertaken in the context of the pretreatment aesthetic evaluation.
7. Start with a low dose in the frontalis and avoid using a dose of botulinum toxin type A
that will cause forehead immobilization. This may also facilitate a more uniform dissipation of effects to the upper face and accentuate facial harmony throughout the treatment period.

8. Distribute the injection points according to the observed animation and muscle function of the individual patient.

9. If injections are too centralized, a “quizzical” eyebrow shape can result.

10. Centrally focused injections can allow lateral brows to elevate.

**CROW’S FEET**

Lateral orbital wrinkles, commonly termed crow’s feet, result from muscle activity in combination with photoaging. The goal is to ameliorate or soften wrinkles and to provide a relaxed look, not to cause immobility. In the published literature, botulinum toxin type A has been used in relatively low doses to achieve these goals safely and effectively. Patient counseling is particularly important in making patients aware of the inadvisability of attempts to eliminate crow’s feet because of the important functions of the orbicularis oculi—voluntary and involuntary closing of the eyelids. Treatment of this area should be avoided in patients with laxity of the canthal tendon and/or with lower lid retraction as well as in individuals who recruit their zygomaticus major muscle to animate their crow’s feet.

**Anatomy**

The orbicularis oculi is a sphincter-like muscle encircling the eyes (Fig. 5). The muscle is generally broad and thin. It is usually categorized into two or three regions, which are summarized in Table VIII. Botulinum toxin type A treatment for crow’s feet is generally directed to the lateral orbital portions of the muscle.

**Injection Technique**

Despite the commonality of the underlying anatomy, crow’s feet lines occur in several distinct patterns and may require different treatment strategies. The usual number of injection points is two to five per side (Table IX). Occasionally more sites are injected, which is influenced by other

### Table VIII

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Location</th>
<th>Origin/Insertion</th>
<th>Primary Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palpebral portion</td>
<td>Covers eyelid</td>
<td>Palpebral ligament/palpebral raphe</td>
<td>Involuntary action to close eye; works with other portions</td>
</tr>
<tr>
<td>Orbital portion</td>
<td>Surrounds the orbit, from bottom of forehead to front of cheek</td>
<td>Frontal process of maxilla/inserts near its own origin; upper fibers blend with occipitofrontalis and corrugator supercilii</td>
<td>Moves eyebrow medially; lateral portion of this muscle depresses lateral brow⁶⁶; may also serve as an accessory upper cheek elevator</td>
</tr>
<tr>
<td>Lacrimal portion</td>
<td>Smallest and innermost portion, at the medial side of the orbit</td>
<td>Lacrimal crest inside of bridge of nose; passes across the lacrimal sac/inserts with the palpebral portion</td>
<td>Interacts with other portions to close the eye</td>
</tr>
</tbody>
</table>

desired effects at the lateral canthus.\textsuperscript{10} The injection sites should be kept well lateral, approximately 1 to 1.5 cm from the orbital rim in the vertically oriented portions of the lateral orbicularis fibers. The precise injection points will depend on the pretreatment analysis, including the activity of the muscle and the observed line patterns (Figs. 6 and 7).\textsuperscript{56}

**Total Starting Doses**

As with horizontal forehead lines, lower doses are preferable. The selected dose depends on the severity and location of the lines and the number of injection sites per side. Members of the consensus panel typically started treating crow’s feet with 8 to 16 U per side in women (96 percent) and 12 to 16 U per side in men (89 percent), but lower starting doses may be advisable for less experienced clinicians.

*Units per injection point.* The total dose is divided by the number of planned injection points, starting with a low dose. Consensus panel members typically injected approximately 3 to 4 U per injection site. In some circumstances, but not all, men will receive a 1- to 2-U higher dose than women. Generally men will tolerate more smile-associated wrinkles than women and also may desire less brow elevation.

![FIG. 6. Typical injection pattern; all others can be modified from this pattern. The figure shows a typical patient who might receive injections at four sites in the lateral canthus region. These sites will also change (slightly) depending on the patient presentation and the desired effect. Courtesy of Steven Fagien, M.D.](image)

![FIG. 7. Treatment of crow’s feet. (Above) Hypertrophy of the lateral fibers of the orbicularis oculi muscle, resulting in horizontal crow’s feet (white dots indicate injection points). (Below, below) Eradication of rhytids after three intramuscular injections of 2.5 U of Botox spaced approximately 1.0 cm from each other. Reprinted from Matarasso, S. L., and Matarasso, A. Treatment guidelines for botulinum toxin type A for the periocular region and a report on partial upper lip ptosis following injections to the lateral canthal rhytids. Plast. Reconstr. Surg. 108: 208, 2001.](image)

**Assessment and Retreatment**

Patients can be reassessed in 2 weeks if reassessment is deemed necessary. Duration of effect is usually less than that observed in other areas of the upper face, at typically 3 months. In some patients, the effect may last 4 months. In one published study, benefits of treatment were maintained for 12 weeks after the first botulinum toxin type A treatment for crow’s feet and was sustained in 65 percent of patients at 16 weeks after a second injection.\textsuperscript{50} Less frequently, the treatment effect may endure for up to (and rarely beyond) 6 months. Anecdotal evidence suggests that as in all other areas, duration is dose-dependent, with the higher (saturation) dosages yielding the longest-lasting effects.
Special Considerations for Treating Crow’s Feet

It is very important to inject superficially in this area using intradermal subdermal blebs to avoid or minimize bruising. The needle should be oriented away from the orbit. Applying pressure and/or ice after the injection can also minimize bruising.

In this region, botulinum toxin type A injections are useful in combination with fillers and resurfacing techniques. Botulinum toxin type A can be used 2 weeks before laser resurfacing or chemical peels to enhance collagen remodeling. Denervation treatment may prolong the results of the resurfacing procedures. Botulinum toxin type A treatment should be approached with greater caution in patients who have undergone recent blepharoplasty or vision/refractive procedures such as laser-assisted in situ keratomileusis (LASIK) procedures.

Key Elements

1. Ask the patient to animate to enable assessment of the line patterns and dynamic eyebrow and cheek positions.
2. Treat crow’s feet around the lower third of the canthal area with caution.
3. Evaluate lid laxity with a snap test. Laxity indicates the potential for developing an ectropion, and lower injections may be avoided.
4. Exercise caution in patients who have undergone surgery.
5. Avoid, in most patients, the area below the zygomatic arch and the zygomaticus major muscle. Injection into this area has the potential to cause lip and cheek ptosis.
6. Start with low doses to avoid overtreatment and potential lid ptosis; Asian patients who wish to have a wider eye look may be treated with doses up to 50 percent higher than those used for other patients.
7. Asking patients to animate during injection can be helpful, especially in individuals with significant rhytids.
8. Avoid veins, when possible, in the lateral canthus; they may be revealed under appropriate lighting and magnification.
9. Proceed with caution when treating patients who have a history of dry eyes.
10. Keep injections superficial; use intradermal or subdermal blebs with the needle oriented away from the orbit.
11. Use ice to help avoid ecchymoses.

“BUNNY LINES”

Bunny lines appear on the sides of the nose and radiate downward from the sides, as shown in Figure 8. They should be differentiated from transverse lines resulting from procerus activity. Bunny lines occur from regular wrinkling of the nose and should be evaluated in the preoperative analysis. A literature review revealed only one published article that addressed the treatment of bunny lines. The members of the consensus panel, however, noted that they typically treat bunny lines, if they are present, in conjunction with the glabellar complex.

Anatomy

Bunny lines result from contracting the transverse portion of the nasalis. This portion arises from the maxilla and runs diagonally across the bridge of the nose. It expands into a thin aponeurosis and is continuous with that of the muscle of the opposite side and with the aponeurosis of the procerus.54,55

Injection Technique

A low-dose midline injection is often sufficient to soften bunny lines. If necessary, one low-dose injection on each side may be administered as well, for a total of one to three injection points (Fig. 7). The injections should be relatively superficial.

TABLE X

Recommendations for Treating Bunny Lines

<table>
<thead>
<tr>
<th>Target Muscle</th>
<th>Usual No. of Injection Points</th>
<th>Total Starting Dose (usual range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasalis</td>
<td>1 per side</td>
<td>2 to 5 U, divided evenly</td>
</tr>
<tr>
<td>Procerus (for transverse nasal)</td>
<td>1 in midline</td>
<td>1 U, if needed</td>
</tr>
</tbody>
</table>

FIG. 8. Nasalis muscle injection sites for bunny lines (downward radiating lines on the sides of the nose). Courtesy of Steven Fagien, M.D.
**Total Starting Doses and Units per Injection Point**

The usual total starting dose for the members of the consensus panel was 2 to 5 U (Table X). As little as 1 U per site may be adequate. Men do not receive treatment for bunny lines as often as women do, so gender differences are not an important variable. When treated, men may receive a dose that is slightly higher by 1 U.

**Assessment and Retreatment**

Assessment will be part of the overall evaluation, as bunny lines are not typically treated in isolation. The usual retreatment interval is 3 months.

**Special Considerations for Treating Bunny Lines**

Few special considerations apply other than those discussed for the glabellar complex. Treatments may be less effective in patients who have had rhinoplasty.

**Summary for Treating Bunny Lines**

Use low doses on the upper part of the nasalis. A total of two injections—one on each side—should suffice. A midline procerus injection will address transverse nasal lines.

**Key Elements**

1. Ensure that injections avoid the levator labii alaeque nasi and the levator labii superioris to prevent drooping of the upper lip.
2. Do not massage vigorously or in a downward direction, which could also result in lip ptosis.
3. Consider including an injection of 1 to 2 U per side of the upper nasalis when treating the glabellar area, to prevent recruitment.
4. Keep injections superficial in this vascularized area to avoid bruising.

**Perioral Treatment**

As the eyebrows are central to the aesthetic appearance of the upper face, the lips are central to the lower face. Aging, smoking, and expression result in substantial changes in the appearance of the lips, including vertical perioral rhytids. The normal actions of the orbicularis oris accentuate these lines, which are a common source of patient dissatisfaction with appearance. Fine wrinkles of the upper lip are often treated with fillers or resurfacing, but botulinum toxin type A can help improve the appearance of the wrinkles in this area. In addition, careful treatment in the perioral area may produce the appearance of fuller lips, because weakening of the muscle results in slight eversion of the upper lip. Because of the complex functions of this region and the interplay of muscles, treatment of the perioral area deserves careful attention and should be practiced by experienced injectors.

**TABLE XI**

<table>
<thead>
<tr>
<th>Location</th>
<th>Origin/Insertion</th>
<th>Primary Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surrounds the orifice of the</td>
<td>Buccinator/form deeper strata of orbicularis oris;</td>
<td>Direct closure of the lips; applies lips to alveolar arch; brings lips together</td>
</tr>
<tr>
<td>mouth</td>
<td>caninus/upper lip; depressor anguli oris (trianguli)/lower lip; quadratus labii</td>
<td>and protrudes them forward; the depressor anguli oris depresses the angle of the</td>
</tr>
<tr>
<td></td>
<td>superioris; zygomaticus, quadratus labii inferioris; orbicularis oris is also</td>
<td>mouth (to express sadness)</td>
</tr>
<tr>
<td></td>
<td>connected to the maxillae and septum of the nose and mandible</td>
<td></td>
</tr>
</tbody>
</table>

Anatomy

The perioral area encompasses several muscles, including the orbicularis oris, the depressor anguli oris, and the mentalis. The depressor anguli oris derive from the lower jaw and insert into the angle of the mouth. They depress the angle of the mouth and pull it backward. The mentalis raises the skin over the chin. The focus of this section is on the orbicularis oris, which is the sphincter muscle of the mouth (Fig. 9). Fibers derive partially from other muscles inserted into the lips and from muscles associated with the lips (Table XI).54,55

Injection Technique

Among members of the consensus panel, treatment of the perioral area with botulinum toxin type A was highly individualized with regard to number of injection points. The average number of injection points was five to six, but ranged from one per side to a total of 11 (for example, including four in each lip, one in each depressor anguli oris, and one in the mentalis). Several members of the panel injected the upper lip only, whereas others injected both the upper and lower lips. In general, injections should be kept superficial and symmetrical. The use of ice for topical anesthetic effect is beneficial for enhanced patient comfort.

Potential injection sites are depicted in Figure 10 and include both the upper and lower lips. A reasonably conservative approach is to begin with one site per quarter lip and reassess in 2 weeks. Regardless of facial asymmetries, consensus panel members recommended strongly that injections be placed symmetrically. Some experts suggested placing the sites just above the vermillion border, while others recommended a distance of 5 mm above the border. Injections that are too cephalad can cause the upper lip to invert, evert, or become ptotic temporarily. The midline (or Cupid’s bow) should be avoided. In general, the injection sites need to be adjusted to the patterns of the lines and preference of lip shape.

Total Starting Doses and Units per Injection Point

The average total starting dose for the perioral area was approximately 5 to 6 U (Table XII). Most panel members recommended 1 to 2 U per injection point. As little as 0.5 to 0.75 U can be used conservatively. If the depressor anguli oris muscles are treated, low doses should be used (e.g., 2 to 5 U).4

Assessment and Retreatment

It is a good practice to reassess the treatment 2 weeks after injection, at which time slight corrections can be attempted. The duration of effect may be less than that of other areas because of the low doses, sometimes only 2 to 3 months. Patient outcomes can be enhanced when botulinum toxin type A treatment is used in combination with fillers and/or resurfacing. Panel members frequently undertake these procedures in the same session.

Special Considerations for Treating the Perioral Area

The treatment of the perioral area is best managed by using botulinum toxin type A in conjunction with laser resurfacing and fillers. When fillers and botulinum toxin type A are used at the same appointment, most physicians inject the filler first. In principle, this is to prevent the possibility of the filler causing the spread of the botulinum toxin type A along the lip line, with the added advantage of the anesthetic effect of the filler allowing for a painless injection.

Overtreatment of the perioral area can result in significant dysfunction, including difficulty in pursing the lips; speech impairments, such as the inability to pronounce “b” and “p”; difficulty eating, brushing teeth, and using a straw for drinking; and diminished proprioception. Treatment of the depressor anguli oris that is

<table>
<thead>
<tr>
<th>Target Muscle</th>
<th>Usual No. of Injection Points*</th>
<th>Total Starting Dose (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orbicularis oris</td>
<td>2 to 6; to start: 4 sites, 1 site/lip quadrant</td>
<td>4 to 10 U, evenly divided among the sites</td>
</tr>
</tbody>
</table>

* All injections in this area should be symmetrical.
too close to the mouth can result in inadvertent injection of other muscles and produce oral incompetence, drooling, and an asymmetrical smile.

Key Elements

1. Patient selection and counseling are critical. Those who rely on their lips in their professions (e.g., some musicians, singers, and public speakers) are not good candidates for botulinum toxin type A treatment. Patients may also have unrealistic expectations about the benefits of treatment and should be counseled or not treated.

2. Treat conservatively with low doses at a minimum number of injection sites (one to two sites per side of the upper lip); always inject symmetrically.

3. Avoid treating the corners of the lips, which could result in drooping and drooling.

4. Avoid the midline of the upper lip to avoid flattening the lip.

5. Avoid treating too distantly from the lip margin, that is, not usually more than 5 mm above the vermilion border.


7. Injections in the lower lip area are more likely to affect function; treat conservatively, if at all.

8. Consider using botulinum toxin type A in conjunction with resurfacing procedures and fillers.

9. Use ice liberally to anesthetize the area, as injections in the perioral area can be painful.

Dimpled Chin (Peau d’Orange)

The dimpled appearance of the chin can be reduced with conservative botulinum toxin type A treatment. The dimpled appearance is the result of the actions of the mentalis muscle coupled with loss of collagen and subcutaneous fat in the chin.

Anatomy

The mentalis muscle is shown in Figure 11.37. The mentalis originates from the mandible, covers the chin, and inserts into the skin below the lower lip.54,55 The mentalis raises the chin, which can cause wrinkles and dimpling, and protrudes the lower lip, which expresses sadness, anger, disdain, or doubt (Fig. 12).

Injection Technique

Only one injection with botulinum toxin type A is generally necessary to weaken the muscle, although some experts inject two sites (Table XIII). The injection should be low or just below the tip or prominence of the chin (Fig. 13). If one injection point is used, it should be in the midline mass of the muscle. The injection should be angled upward. The muscle should be massaged in a lateral direction. It is preferable to start with a more conservative approach of one injection and reassess.

Total Starting Doses and Units per Injection Point

The typical total starting dose among panel members was 5 to 6 U, with some experienced...
users going up to 12 U. In general, 5 to 10 U should be adequate. Men are treated significantly less frequently than women. Their chins may be less likely to develop dimpling, and it presents less of an aesthetic problem to them. Dosing is similar in women and men; occasionally men who are treated may require a dose 2 to 3 U greater than that used for women. The total dose is divided evenly among sites if more than one injection point is used.

Assessment and Retreatment

If desired, patients can be seen at 2 weeks. The usual retreatment interval is 3 to 4 months, but it can be as long as 6 months in some patients.

Special Considerations for Treating Dimpled Chin

This is an area that responds well to combination treatment with botulinum toxin type A and fillers. Treatment of this area is also useful in patients undergoing chin implants and anticipating laser resurfacing. It should be noted, however, that the dimpled chin is not as responsive to laser resurfacing as other areas of the face.

Key Elements

1. Some patients are unaware of their dimpled chin, which appears on animation. It can be demonstrated with a mirror.
2. Avoid injecting too high, which can affect the orbicularis oris and cause lower lip incompetence and possibly drooling.
3. Care must be taken to avoid the depressor labii, which can cause the lower lip to depress.
4. Be aware that some individuals who present with a dimpled chin may have hypertrophic mentalis muscles, which may be a sign of a predisposition to oral incompetence. Do not treat with botulinum toxin type A if this is suspected.

PLATYSMAL BANDS

The platysmal bands of the neck may become very prominent in some individuals with aging or after surgical rhytidectomy. Botulinum toxin type A treatments may be a useful adjunct in carefully selected patients who have retained skin elasticity and have a minimal descent of submental fat.

Anatomy

The platysma, a broad, thin sheet of muscle, originates in the pectoral and deltoid muscles (Fig. 14). It extends upward over the clavicle and inward along each side of the neck and under the skin near the mandible. Anterior fibers may interdigitate with the fibers of the opposite side. The platysma depresses the lower jaw and pulls the lower lips and corners of the mouth sideways and down, partially opening the mouth. Banding occurs with aging and changes in the submental space.

Injection Technique

Among the members of the consensus panel, 80 percent treated three to five sites per band with botulinum toxin type A (Table XIV). Another 20 percent treated more sites. Usually injections are given at 1-cm intervals (Fig. 15).

Total Starting Doses and Units per Injection Point

In the published literature, a considerable range of botulinum toxin type A doses has
been reported for the treatment of platysmal bands.18,45,57–61 Among consensus panel members, doses per injection point were also quite variable, resulting in total doses per band of 6 to 40 U, depending on the number of injection sites and doses used. Usually two bands are treated in a session.

Assessment and Retreatment

As with other areas, follow-up assessments can take place 2 weeks after treatment if needed. Retreatment intervals are typically 3 to 4 months.

Special Considerations for Treating Platysmal Bands

Treatment of platysmal bands can be combined with treatment of the depressor anguli oris and the use of fillers to restore volume in the lower third of the face. Botulinum toxin type A can also be used to treat the platysmal bands 2 weeks before liposuction of the neck or before resurfacing.

The majority of clinicians recommended grasping the band with the nondominant hand and injecting directly into the belly of the muscle. A few practitioners injected superficially into the skin and allowed for diffusion to carry botulinum toxin type A into the platysma. Although some clinicians continue to use electromyographic guidance to allow for the most accurate placement of the toxin with the smallest dose, the consensus panel members generally do not utilize this technique.62

Key Elements

1. Select patients with care, as patient selection is critical. This procedure works best on younger
patients with good skin elasticity or postoperatively for residual bands.

2. Note that botulinum toxin type A injection in this area can also diminish horizontal (“necklace”) lines on the neck in selected patients.

3. Counsel patients about the variability of results in the neck area so that they will have realistic expectations; platysmal band injection does not substitute for surgical procedures, and it will not correct skin laxity or fat deposits.

4. Use caution to avoid dysphagia, dysphonia, and neck weakness. The strap muscles should be avoided. Grasping of the bands and direct injection and/or the use of electromyographic guidance should ensure a more accurate injection.

5. Inject multiple sites per band for the most satisfactory results.

**SUMMARY**

The cosmetic use of botulinum toxin type A has continued to expand since its approval by the U.S. Food and Drug Administration for improving the appearance of moderate to severe glabellar lines associated with activity of the corrugator and procerus muscles. As the most prevalent cosmetic procedure undertaken in the United States, botulinum toxin type A injections are now used to enhance facial appearance in a number of areas, alone or in combination with other aesthetic techniques. The consensus panel, convened on April 3 and 4, 2004, met to develop guidelines to aid the practitioner in using botulinum toxin type A in a wide range of aesthetic applications and to help ensure a satisfactory outcome that reflects an aesthetic ideal of harmony and balance.

The guidelines and recommendations presented in this article include general principles as well as information on specific use. Perhaps one of the most important perspectives is that individualized aesthetic planning is the key to success. This depends on a thorough understanding of the underlying anatomy and physiology of the individual muscles and their interactions, as well as on individual patient characteristics, including goals and expectations. Engaging the prospective or continuing patient in the development and refinement of the aesthetic treatment plan is critical.

On the basis of their extensive experience, consensus panel members provided injection and dosing guidelines for using botulinum toxin type A in the upper, mid-, and lower face, as summarized in Table XV.

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| TABLE XV  |

<table>
<thead>
<tr>
<th>Region and Target Muscle</th>
<th>Usual No. of Injection Points (range)</th>
<th>Total Starting Dose (usual range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glabellar complex</td>
<td>5 to 7; men may require more sites</td>
<td>Women: 20 to 30 U</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Men: 30 to 40 U</td>
</tr>
<tr>
<td>Horizontal forehead rhytids</td>
<td>4 to 8; more or fewer may be required based on anatomic and aesthetic evaluations</td>
<td>Women: 15 U; 10 to 20 U</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Men: 20 to 30 U</td>
</tr>
<tr>
<td>Crow’s feet</td>
<td>2 to 5 (higher in selected patients)</td>
<td>12 to 30 U</td>
</tr>
<tr>
<td>Bunny lines</td>
<td>1 per side</td>
<td>2 to 4 U divided evenly</td>
</tr>
<tr>
<td></td>
<td>1 in midline</td>
<td>1 U, if needed</td>
</tr>
<tr>
<td>Perioral</td>
<td>2 to 6; to start: 4 sites, 1 site/lip quadrant</td>
<td>4 to 10 U evenly divided among the sites</td>
</tr>
<tr>
<td>Dimpled chin (peau d’orange)</td>
<td>1 to 2 (start with one midline or 2 symmetrical, lateral injections)</td>
<td>Women: 2 to 6 U</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Men: 2 to 8 U</td>
</tr>
<tr>
<td>Neck, platysmal bands</td>
<td>Women: 2 to 12/band</td>
<td>Women: 10 to 30 U</td>
</tr>
<tr>
<td></td>
<td>Men: 3 to 12/band</td>
<td>Men: 10 to 40 U</td>
</tr>
</tbody>
</table>
APPENDIX

Botox Consensus Group


REFERENCES


