

Complications of botulinum toxin A use in facial rejuvenation

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The effacement of hyperkinetic facial lines with botulinum toxin A injections (Botox, Botox Cosmetic, Allergan, Irvine, California) has become an established part of modern facial rejuvenation. An ever-increasing number of patients are receiving Botox treatments spurred on by word of mouth, the dissemination of information about Botox in the media, and by its excellent safety record. The Federal Food and Drug Administration's (FDA) approval of Botox for cosmetic indications and Allergan's remarketing of it as Botox Cosmetic, promises to increase the number of patients who elect to receive Botox injections. With increased demand, greater public acceptance, and larger numbers of physicians offering Botox injections, it may be timely to review the spectrum of possible complications with esthetic Botox applications.

Botulinum toxin type A is one of seven botulinum toxin antigenic (A,B,C1,D,E,F, and G) subtypes. It is produced by *Clostridium botulinum* bacterial fermentation. Several botulinum toxin subtypes are under investigation for clinical use, but only botulinum toxin type A (Botox Cosmetic) is currently approved for cosmetic use. In Europe, botulinum toxin A is marketed under the trademark, Dysport (Ipsen Pharmaceuticals, Dublin, Ireland). The per unit potency of Botox is three to five times that of Dysport [1–4].

Despite clinical evidence of similar safety profiles, Botox may have a higher efficacy to safety ratio in animal studies [5]. Each vial of Botox contains 100 units of Botox, 0.9 mg of sodium chloride, and 0.5 mg of human albumin [6].

Safety profile

The excellent safety profile of Botox is illustrated by the paucity of irreversible medical complications that have been documented over the last 20 years (see references [2,7–10]). The reversible, short-term, and localized effects of Botox are reflected in the observed complications, which also tend to be localized and reversible. No reports of life-threatening allergic or urticarial reactions have been reported with facial Botox applications [4]. Nevertheless, animal or human studies on long-term immunogenic, carcinogenic, and other potential deleterious side effects of Botox have not been performed [11,12].

Accurate dosing of Botox is important for documentation and standardization of injection schedules. The pharmacologically-defined Standard Unit of Botox is based on the lethal dose (LD 50) of botulinum type A toxin in 50% of test mice [6,13]. Clinically, the Standard Unit serves as an important unit of measurement and reference. In cases of classic food-borne botulism, flaccid paralysis of motor and autonomic nerves begin with the cranial nerves (including symptoms of dysphagia, dysarthria, dysphonia, blurry vision) and descend to include the rest of the body. Further progression to more severe botulism states may lead to flaccid respiratory failure and death. The classic presentation of systemic botulism

This article was originally published in *Facial Plastic Surgery Clinics of North America* 11:4, November 2003.

The authors have no financial conflict of interests to declare regarding products described in this article.

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includes a flaccid descending paralysis, clear sensorium, and no fever [14]. The estimated lethal dose for a 70-kg human is estimated to be around 2800 units. Not surprisingly, there have been no reports of deaths from esthetic Botox injections (see references [2,4,7,9]). In case of accidental poisoning or overdosing, an antitoxin is available and should be administered within 24 hours [12,15].

Drug interactions

The quantities of Botox used in esthetic cases are usually small enough that clinically significant drug-drug interactions have not been reported (see references [5,6,12]). Nevertheless, drugs that interfere with neuromuscular transmission could potentially interact with Botox. Drugs that may alter the effects of Botox include: aminoglycosides (gentamycin), cyclosporine, D-penicillamine, muscle relaxants (curare-type nondepolarizing blockers, succinylcholine), aminoquinolones, quinidine, magnesium sulfate, and lincosamide (see references [2,11,12,17]). Many of these drugs have intrinsic inhibitory effects on neuromuscular transmission, and thus may potentiate the effects of Botox. Large doses of aminoglycosides (such as gentamycin) can prevent the release of acetylcholine into the neuromuscular junction (NMJ) and induce a botulism-like clinical state [17]. Cyclosporine can induce muscle weakness secondary to neuromuscular blockade, and, in one case report, led to respiratory failure [18]. D-penicillamine induced antiacetylcholine antibodies in a small percentage of patients who had rheumatoid arthritis who received this drug. These patients can develop muscle weakness similar to patients who have myasthenia gravis [19,20]. In contrast, aminoquinolones, such as chloroquine and hydroxychloroquine, can inhibit Botox activity by interfering with botulinum toxin interaction within the cell [21].

Systemic side effects

Botox is most effective at the site of injection. Despite this, minute quantities of Botox may spread to nearby structures or enter the circulatory system and elicit a loco-regional or systemic reaction. These regional or “remote effects” are most pronounced in patients who receive repetitive high doses of Botox, but have been observed in patients who received lower doses of Botox for blepharospasm [2,22]. Systemic Botox exposure is evidenced by antibody development against various components of botulinum toxin complex. Studies have confirmed the development of neutralizing antibodies and primed

T lymphocytes to epitopes on the heavy chain of botulinum toxin protein [23,24]. Some reports indicated that antibotulinum toxin A antibodies can occur in 5% to 10% of patients who receive repeated long-term, high-dose Botox treatments [25,26].

In the treatment of cervical dystonia, Greene and colleagues [27] noted that 4.3% of their 559 study patients developed secondary nonresponsiveness to Botox. These Botox-resistant patients required shorter intervals between injections and higher doses per treatment sessions.

The factors that contribute to antibody formation include longer duration of treatment, shorter time interval between injections, larger overall doses, and decreased purity of Botox preparation (see references [22,27–29]). Current batches of Botox (manufactured after 1997) have a lower albumin concentration and higher toxin specific activity, which may contribute to reduced clinical antigenicity (see references [2,6,30]). Clinically significant Botox resistance is less common in patients who receive the lower doses of Botox that are typically administered in cosmetic treatments.

Decreased Botox efficacy is the main negative clinical consequence of Botox-induced antibodies. The possibility of long-term, Botox-induced, immune-mediated disorders or other idiosyncratic autoimmune reactions are unknown at this time, but were not found in our review of the literature.

Should antibodies to Botox develop, they usually occur within the first several years of therapy. If immunoresistance to Botox is not noted within the first 4 years, then it is unlikely to develop [31]. Those who develop immunoresistance can be treated with breakthrough doses of Botox, or by nontype A botulinum toxin, such as botulinum toxin B (Myobloc, Elan Pharmaceuticals, South San Francisco, California) [32,33].

Contraindications

Botox is contraindicated in individuals who have known hypersensitivity or allergy to botulinum toxin A or human albumin. Additionally, Botox is not recommended in those with neuromuscular disorders, such as myasthenia gravis, multiple sclerosis, and Eaton Lambert syndrome. In any state where neuromuscular transmission is compromised, Botox injections may potentially worsen symptoms of the existing disease state [34].

Botox treatments are not administered during pregnancy and while nursing. The localized nature of Botox injections tends to suggest its safe use during pregnancy. Also, there are no reports of

teratogenic effects in humans from in utero botulinum toxin exposure. Moreover, there are accounts of women who while unaware of being pregnant, received Botox injection without experiencing pregnancy-related problems [35]. Nevertheless, the FDA classifies Botox as a category C drug, indicating that its safety profile during pregnancy has not been adequately evaluated. Studies with mice and rodents during periods of organogenesis demonstrated reduction of fetal body weights and delayed ossification with higher botulinum toxin doses. [12] Botulinum toxin studies in pregnant rabbits revealed much more severe maternal and fetal consequences, including death [12]. Until additional evidence supporting the safe use of Botox during pregnancy and nursing is presented, pregnant women and nursing mothers should not be treated [36].

Esthetic Botox application in patients older than 75 years of age has not been adequately studied. In general, those older than 75 are initially treated more conservatively. This is done as a cautionary move to offset the greater frequency of undiagnosed neurologic and medical disorders, higher likelihood of other drug therapy interactions, and higher susceptibility of older patients to functional problems [12].

Adverse side effects

Following a complete history and a physical examination, possible risks and complication are shared with the patient and written informed consents are obtained. Revealing common injection site-related sequelae helps to eliminate surprises, decrease subjective anxiety, and may reduce the potential for early disappointment with Botox injections.

Injection site pain, edema, and ecchymosis occur with varying frequencies in a large minority of patients; although their occurrence is, in part, technique-dependent, they should not be considered complications. Headaches, dry mouth sensation, and flu-like mild malaise can also occur after Botox injections [3,37]. Forewarning the patient will go a long way toward allaying patient concerns.

Mild bruising was reported in 11% to 25% of patients who received Botox injections [38,39]. In a large study by Matarasso and colleagues [39] that involved 1500 patients who received Botox for platysmal bands, a 20% percent bruising rate was noted.

Patients who are on aspirin; anticoagulant medications (such as warfarin); nonsteroidal anti-inflammatory drugs; vitamin E; herbal remedies, like ginseng, ginkgo, and high doses of garlic; may experience higher rates of bruising (see references [2,10,

12,34,40]). Injection site bruising can be reduced by using fresh 30-gauge needles (changing the needle after every three to four injections), icing the injection site before injection, and injecting intradermally. For those who are on prescriptive blood thinner the temporary cessation of their use (if medically advisable) may be helpful [40]. If a vessel is punctured, immediate digital pressure on the injection site will prevent or minimize subsequent bruising to a pinpoint lesion.

Injection site pain can be reduced by topical anesthetics (Ela-Max, Ferndale Laboratories Inc., Ferndale, Michigan; EMLA cream, AstraZeneca Pharmaceuticals LP, Wilmington, Delaware; and Topicalaine, ESBA Laboratories, Mountain View, California). A simple, safe, and cost-effective method of providing temporary local anesthesia involves icing the treatment site immediately before injection. We have also found, as have others, that reconstituting Botox with bacteriostatic benzyl-alcohol-preserved saline, instead of preservative-free saline, can contribute to reduced injection site pain [41]. The reduction of injection pain may be the result of the higher pH of the preservative-enhanced saline solution.

Reports of injection site temporary hypesthesia are poorly documented in most studies, but do exist and may be due to localized edema and trauma. Concerns regarding possible nerve damage from accidental Botox injection directly into nerves were allayed by studies performed by Lu and colleagues [16]. In their study, direct intraneural injection of botulinum toxin in rats caused no permanent nerve damage. Hypesthesia may also be related to the localized antinociceptive properties of Botox, which has been suggested by preliminary in vivo and in vitro data [42].

Cutaneous infections are a potential complication whenever the skin barrier is violated; however, with proper injection site skin cleansing and site selection (avoiding injections adjacent to acne) the risk for skin infection with Botox injections is low. A case report of psoriasiform eruption was described temporally related to Botox injections, which resolved spontaneously within 5 months following a treatment [43].

Another localized skin reaction, namely dry skin and subsequent flakiness, can occur in some patients. In a prospective study by Bulstrode and Grobelaar [44], in 52 patients who received Botox for upper face rejuvenation, 3.8% (2 out of 52) of the patients experienced localized skin dryness and flakiness. Both patients were men; their symptoms resolved after the application of skin moisturizers. It has been hypothesized that localized skin dryness may

be due to decreased sweat gland activity. This localized side-effect may be underreported because of the observations that more women than men received Botox injections; women are more likely to use skin moisturizers on a regular basis which masks any skin dryness.

Despite being a treatment modality for many types of headaches, a minority of patients who receive Botox injection may complain of transient headaches [45]. In a large, randomized study comparing the efficacy of Botox with placebo in treating glabellar frown lines, headaches were noticed in 15.3% of patients who received Botox and 15.0% of patients who received placebo. Of the patients who received Botox injections, 53.7% reported experiencing headaches within the first 2 days postinjection. The headaches were mild (93%) and of brief (71%) duration, lasting only for a few hours [9]. The lack of statistical difference between the two groups may suggest that the headaches were related more to the injections and not the Botox. Although the cause of the headaches is difficult to ascertain, it had been hypothesized that they may result from the needle hitting the periosteum or from deep muscle hematomas [46]. Another explanation for mild headaches was toxin-related muscle spasms immediately postinjection, followed by subsequent toxin-mediated relaxation of affected muscles and resolution of the headache [47]. Alternatively, the stress of the injections themselves may be an important factor in patients who experience transient headaches.

Occasionally, a small subset of patients who receive Botox injections report postinjection headaches that are severe and life-altering in nature. These headaches are different than the transient headaches described earlier and may be underreported in the literature. Although it is difficult to calculate the incidence of these rare headaches, some investigators report that up to 1% of patients who receive Botox injections may experience severe, debilitating headaches. These severe headaches can persist at a high intensity for 2 to 4 weeks before gradually subsiding. No clear explanation for the occurrence of these severe headaches has been proposed. Patients should be informed that Botox injections might infrequently be associated with the development of idiosyncratic severe headaches [48].

Botox-related complications present with localized functional or esthetic deficits. Complications are minimized by good injection technique, accurate understanding of underlying facial anatomy, and appropriate site-specific dosing of Botox. When complications do occur, they are almost always reversible and short-lived. Timely patient education,

emotional support, and medical intervention can help minimize the impact of any complications on the patient.

Complications

Periorbital complications

Botox injections can cause unintended side effects either from improper placement of injections or from localized diffusion of injected Botox into functionally-important muscle fibers. Nearby spread of Botox is influenced by the diffusion of unbound toxin through the extracellular matrix, the concentration gradient in this space, the physical and anatomic boundaries in the injected area, the volume injected, and the mechanics of injection. Localized diffusion has been demonstrated to occur as far as 3 cm from the injection site [49]. Local diffusion of Botox can assume the most clinical significance in periorbital injections where functional and esthetic problems can occur. Additionally in periorbital treatments, any hints at preinjection eyelid compromise must be noted including upper lid ptosis, lower lid ectropion or entropion, weak lower lid snap test, or a history of dry eyes.

Although periorbital injections can be safely used in most patients, in cases where safety needs to be optimized, placing periorbital injection outside a recommended “orbital zone” can help minimize complications (Fig. 1). For the treatment of superior periorbital rhytids, it is recommended that injections



Fig. 1. An outline of the safe “orbital zone” is illustrated. In some patients where safety concerns need to be optimized, reducing treatment doses and placing periorbital injections outside a recommended “orbital zone” can help to substantially minimize periorbital complications.

over five units be placed 1 cm above the supraorbital rim [7]. Inferiorly and laterally, keeping all injections outside the boundary defined by the infraorbital rim and a point 1 cm lateral to the lateral canthus can significantly reduce periorbital complications [8,50]. We found that intradermal injections are helpful in decreasing Botox spread, inadvertent intravascular delivery, and injection of deeper muscles and structures. No decrease in Botox efficacy was noticed in our experience with intradermal injections.

Lid ptosis

Botox-induced lid ptosis can manifest within 48 hours or as late as a week after injections, and can last for weeks (Fig. 2) [8]. It usually resolves within 2 to 6 weeks, with the cosmetic benefits of Botox outlasting the negative eyelid effects. Sub-clinical eyelid ptosis may not be initially recognized and may only become noticeable with fatigue or at the end of the day. It was hypothesized that in some cases, previous lid ptosis may become “unmasked” after the frontalis muscles are paralyzed and the patient can no longer compensate for the ptotic lid with habitual brow elevation [51].

In a study that compared Botox with placebo injections for treating forehead rhytids, Carruthers et al [9] noted blepharoptosis in 5.4% of patients who were injected with Botox and 0% patients who were injected with placebo [9]. Blepharoptosis rates with forehead injections can range from 2 to 20% [52–54]. Carruthers et al [9] calculated an averaged blepharoptosis rate of 6.5% based on the pooled data from five previously published studies.

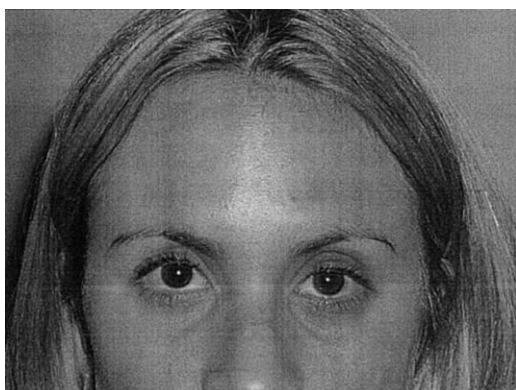


Fig. 2. Eyelid ptosis can occur from the effects of extravasated botulinum toxin-mediated compromise of levator palpebrae superioris muscle function.

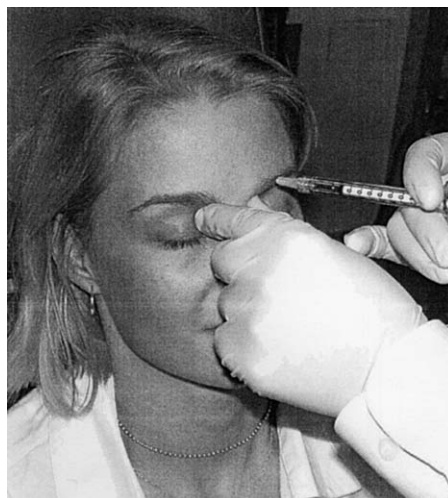


Fig. 3. Direct digital pressure placed in adjacent areas during injection can minimize localized diffusion to functionally sensitive neighboring areas.

Injections of the orbicularis oculii, corrugator supercilii, and procerus muscles have the highest likelihood of producing lid ptosis. This is especially true in patients who have pre-existing lid ptosis or levator function weakness and in the elderly. In the older patient, a combination of loose skin and attenuated orbital septum can further facilitate the dissection of injected Botox. Ptosis of the upper eyelid occurs from effects of diffused Botox on the levator palpebrae superioris muscle. The levator palpebrae muscle is particularly susceptible to low doses of Botox given its comparatively limited number of motor endplates [55].

To minimize Botox spread, several easy-to-perform maneuvers can be used. Direct digital pressure can be used to “isolate” the injection site from the eye (Fig. 3). In addition, when injecting the glabellar area, the corrugator muscle can be grasped between two fingers to decrease regional extravasation [56]. A useful guideline for reducing blepharoptosis is to place corrugator injections at least 1 cm above the level of the supraorbital ridge [9]. Smaller injection volumes can logically reduce solution spread. Some investigators recommend that patients do not assume a supine or dependent position for 3 to 4 hours after periorbital injections, although other investigators do not find this precaution necessary [57].

Besides being of temporary nature, lid ptosis responds well to several alpha-adrenergic agonist ophthalmic eye drops. Apraclonidine 0.5% (Iopidine, Alcon Labs, Fort Worth, Texas), Naphazoline (Naph-

con, Alcon Labs) and phenylephrine 2.5% (Myfrin 2.5%, Alcon Labs) stimulate muellers muscles and help elevate the ptotic eyelid. In cases of mild ptosis, ophthalmic drops can be titrated to achieve normal (preinjection) eyelid position. The typical dosage is begun at two drops, twice a day (three times a day at most) until the ptosis is resolved [9]. With severe cases of ptosis, the typical 2 mm of lid elevation that is achieved with eye drops may not be enough to restore lid position back to normal.

Ectropion

Lower lid tone and function varies between patients. Botox treatments that are placed around the lower eyelid can compromise orbicularis oculii function. This is especially true in older patients, patients who have had lower eyelid surgery, and anyone with pre-existing lower lid laxity or ectropion. The “snap test” or “lower lid extraction test” are useful tools in assessing lower lid tone in any patient who receives periorbital injections. Periorbital injections that may be well-tolerated in a younger patient may result in ectropion in the older patient. Keeping all injections outside the boundary defined by the infraorbital rim and a point 1cm lateral to the lateral canthus can significantly reduce this and other periorbital complications [9,50]. The development of postinjection ectropion requires prompt attention to prevent exposure keratitis and corneal damage. Topical lubricating drops, lid taping, and ocular moisture chambers may be helpful in the immediate period. An ophthalmologic consultation may be indicated.

Strabismus

Transient strabismus has been observed in lateral (crow’s feet) periorbital injections [50]. Diplopia that results from crow’s feet area injection is secondary to Botox diffusion leading to lateral rectus weakness. Diplopia can also be experienced after nasalis muscle injections (for “bunny scrunch” lines) if the injections are misplaced. Overly lateral injection, along with larger injection doses and the lack of finger isolation maneuvers may lead to medial rectus muscle palsy. The onset of diplopia can be distressing to the patient and physician alike. Prompt consultation with an ophthalmologist can help in accurate diagnosis and a temporary strabismus treatment plan. Eye patching or the application of Fresnel membrane prism to eyeglasses can allay the diplopia until recovery [57]. The risk of diplopia from Botox injections is increased whenever the “orbital zone” is violated and migration of injected Botox results in ocular muscle weakness [50].

Pseudoherniation of infraorbital fat pads

Prominence of pseudoherniating infraorbital fat pads can occur following Botox treatments of the inferior eyelid in patients who have existing fat herniation. Injections in the inferior orbital, inferolateral canthal, and high malar regions can lead to compromise in orbicularis oculi muscle tone. The orbicularis oculi muscle, along with the orbital septum, provides the requisite sling-like support that reduces the appearance of orbital fat pseudoherniation. Compromise of orbicularis oculi tone in the patient who has lax septal support can result in the temporary herniation of infraorbital fat [58]. Infraorbital injections are best avoided in patients who are at risk for this complication.

Other eye complications

Lagophthalmos is a possible complication of periorbital Botox injections. It was observed in patients who receive Botox injection for blepharospasm. In esthetic cases, the injections of larger quantities of Botox into the lateral canthal area (crow’s feet) may compromise orbicularis functions to the point of weakening eye closure and causing secondary dry eyes. Lagophthalmos is rarely seen following esthetic Botox treatments.

Perioral complications

Perioral complication can result from several sources. Upper lip weakness has been associated with the treatment of the melolabial folds. The unacceptably high frequency of upper lip ptosis combined with the inability to smile, has led most practitioner to address deep melolabial folds with treatment modalities other than Botox [10].

Perioral complications can also arise from chin, oral commissure, and perioral injections. Correction of chin dimpling or *peau d’orange* skin can be achieved by medial mentalis muscle injections. Overly lateral placement of injections can paralyze the depressor labii muscles which results in a lower lip droop and weakness.

Injections that are aimed at achieving subtle elevation of the oral commissure can be accomplished by injecting the depressor anguli oris muscle located laterally over the mandible. It is best palpated while the patient is clenching their teeth. A lower lip dysfunction can occur if the injections are carried too medially into the depressor labii muscles.

Lip weakness can also occur from perioral injections that are aimed at softening of radial perioral lines. These lines become most apparent with pursing of the lips and can lead to unattractive lipstick

“bleeding.” To avoid lip dysfunction, total perioral injection doses are kept to a minimum. Injections are placed 5 mm apart; the upper lip is treated with six units and the lower lip with four units. In some cases, subclinical lip weakness may become apparent with increased need for lip strength, such as when whistling or using a straw. The necessity for complete oral competence may make Botox lip treatments contraindicated in scuba divers, wind instrument players, and professional vocalists.

Periorbital injections have been reported as a rare cause for upper lip ptosis in several cases, presumably from Botox diffusion into, and weakening of, the zygomaticus major muscle (see references [38,45, 47]). In one report, this rare complication occurred in 3 patients out of more than 1000 patients (or 2000 face sides) who were treated with periorbital Botox treatments [59]. In all three cases, 15 units (7.5 units per side) of Botox were used to treat lateral periorbital (crow’s feet) rhytids. Of significance, two of the patients received Botox injections immediately after having undergone four-quadrant blepharoplasties, whereas the third patient had a history of having undergone four-quadrant blepharoplasty. The investigators concluded that altered anatomic boundaries and planes might have placed these patients at a higher risk. In all cases, a complete resolution of symptoms occurred within 6 weeks.

Cervical complications

Cervical Botox injections can help to reduce fine cervical lines and vertical platysmal banding [48]. Given the large span of platysmal muscle fibers, greater doses of Botox are usually needed than in other areas of the face. Larger doses (50 units and higher) of Botox placed into the neck increases the risk for temporary dysphagia, and, even rarely, hoarseness [8]. Older patients are at particular risk because they present with more cervical lines and have a higher likelihood of having an attenuated platysmal layer. This combination increases the possibility of direct Botox injections or localized diffusion into the deeper cervical structures, such as the sternocleidomastoid (SCM) and strap muscles, which results in subjective neck weakness and dysphagia (see references [8,37,60]).

For comparison, in the treatment of cervical dystonias where larger doses of Botox (100 or more units) are injected directly into the SCM muscle, new onset dysphagia was observed in 33% of the patients [61]. Other adverse reactions that were observed in patients who had cervical dystonia include hoarseness, dry mouth, and flu-like syndromes [3,37].

In a study by Matarasso and colleagues [39], 1500 patients who had platysmal bands were treated with Botox injections; 10% of the patients reported a mild and transient cervical discomfort that occurred 2 to 5 days postinjection. Neck weakness upon head elevation was noted by 1% of patients. Only one patient (0.067%) experienced clinically significant dysphagia that resolved spontaneously within 2 weeks. In a similar, but smaller, study where lower doses of Botox were administered, Kane [62] did not report any cases of dysphagia in treating platysmal banding with Botox in 26 patients.

Clinically significant dysphagia is unlikely in patients who are treated with less than 50 units of Botox, as is typically used for esthetic Botox application in the neck. In most cases, the dysphagia is mild and transient. If severe dysphagia is noted, a temporary change to a soft diet or pureed foods may be instituted and emotional support provided until full recovery occurs.

Brow malposition

Fine, horizontal forehead rhytids respond well to Botox injections (see references [1,2,9,10]). The paralysis of the frontalis muscles reduces horizontal forehead lines that result from animation and long-term brow elevation. Pretreatment evaluation and discussion with the patient includes pointing out existing brow position and asymmetry. By some estimates, 80% of middle-aged women have asymmetric brow position [63]. In some cases, brow asymmetry can become exaggerated by, or is directly attributable to, Botox injections. Fortunately, this is often an easy problem to amend with additional “fine tuning” injections after a 2-week observation period.

Typically, to achieve a maximum reduction in forehead rhytids, brow position will be lowered to some extent in most patients [44]. This may become problematic in the patient who has an existing lower brow position. The seemingly contradictory goals of rhytid effacement and avoidance of noticeable brow ptosis can be achieved by conservative treatment of the medial forehead and by not treating (or under-treating) the lateral forehead. This technique can become problematic in a subset of patients who have lateral frontalis muscle hyperactivity. In such cases, the differential elevation of lateral brow in comparison with the paralyzed medial brow can result in a “sinister” or “joker face” type of brow arching (Fig. 4). Patients who are at risk for this outcome are identified on the pretreatment examination as they animate and maximally elevate their brows. In cases with excessive or asymmetric brow ptosis, care-



Fig. 4. Excessive lateral brow elevation may occur if Botox treatment areas are limited to the glabella and middle one third of the forehead, leading to a “joker face” type of brow arching.

ful weakening of brow depressors (ie, corrugator supercilii or procerus muscles) and can produce subtle brow elevation [64,65].

Lack of facial animation

Overtreating patients may induce an expressionless, mask-like face. The goal of rhytid effacement must be balanced with the patient’s expectant need for facial expression [8]. Decreased brow elevation and the inability to squint or frown may be undesirable in some cases. For individuals who have a greater need for facial animation (eg, those who must communicate with children, actors, broadcasters), such an outcome may have negative professional consequences. Accordingly, such patients should be undertreated and the physician’s strategy for a balanced Botox treatment shared with the patient.

The dissatisfied patient

Although not a true complication, in a busy Botox practice the dissatisfied patient is bound to occur. Detailed pretreatment counseling can significantly increase patient satisfaction. It is essential to understand the patient’s desires and expectations. Each patient’s unique anatomy will affect the treatment option chosen. The patients need to be made aware, that for a multitude of reasons, their result may not be the same as their friend’s who received Botox. They also need to understand that deep glabellar or periorbital creases are not going to be completely effaced with one, or perhaps even multiple, Botox treatments. In patients who have low set brows, intended wrinkle reduction may place them at risk for excess brow ptosis and a cosmetically unappealing result. These

patients are more likely to be happier with an elevated brow position along with some residual forehead creases, than a flat forehead with a crowded eyelid appearance. Conversely, the patient who has eyelid ptosis that is masked by a dependant brow may not appreciate the ptosis “unmasking” that could result from brow elevation. There are many reasons why an initial treatment session may not meet with full patient satisfaction. Fortunately with Botox, the unhappy patient is a rarity; when it does occur, it can usually be ameliorated by a second visit. Some physicians routinely see patients who take Botox treatments 2 weeks after their initial treatment which allows them to evaluate their outcomes, provide additional treatments if necessary, or to give reassurances. One drawback with routinely performing “touch-ups” is the potential for patient interpretation that the initial treatment was less than complete or somehow failed. Regardless of patient management style, it is in the patient and physician’s best interest to have clearly defined esthetic goals, which are discussed in detail before treatment. An educated and well-informed patient who has realistic expectations is more likely to become a satisfied patient.

Summary

The esthetic application of botulinum toxin type A is a safe treatment modality; nevertheless, complications can occur as a result of patient- and physician-related factors. Fortunately, adverse effects and undesirable sequelae after Botox injections are temporary. Complications may be more serious in patients who have more severe rhytids (which require more Botox), have undergone previous facial plastic surgery (altered anatomy), and those who have pre-existing neuromuscular disease. The physician can reduce complications by using proper injection techniques, appropriate regional Botox dosing, and by being conservative in the overall approach to Botox-mediated facial rejuvenation.

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