Review Article

Upper- and mid-face anti-aging treatment and prevention using onabotulinumtoxin A: the 2010 multidisciplinary French consensus – part 1

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Summary

Background Onabotulinumtoxin A (onabotulinum) has been used for 7 years in the treatment of the aging face. A survey was conducted to identify current practices in France.

Objective To develop consensual practice recommendations for treating the aging upper- and mid-face with onabotulinum.

Methods and Materials Fifty-seven participants reviewed practices and techniques for each identified upper- and mid-face treatment indication. From data gathered during six regional conferences and from a questionnaire, consensual recommendations were developed.

Results General considerations, key treatment rules, injection specifics (dose, site, and techniques), associated procedures/treatments, and follow-up were defined for each indication, i.e., glabellar, horizontal forehead, crow's feet and bunny lines, lower eyelid rhytides, and eyebrow repositioning and reshaping. For the consensus participants, current onabotulinum use is a global, both preventive and corrective treatment. In France, judicious lowest effective dose, treatment of multiple sites and adjunctive treatment modalities, such as fillers and peels, lead to satisfactory results for clinicians and patients with a youthful, harmonious, animated and natural looking face.

Conclusions Years of experience using onabotulinum result in sophisticated treatment approaches, more specific targeted injections, and a better understanding of facial aging, leading to satisfying therapeutic results for both patients and clinicians.

Keywords: botulinum toxin type A, cosmetic techniques, face, onabotulinumtoxin A, rejuvenation

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Introduction

Botox® (onabotulinumtoxin A) was the first formulation of botulinum toxin available worldwide. This agent, first approved for cosmetic indications in the US in 2002, and marketed by Allergan as Botox Cosmetic® in Northern America and Vistabel®/Vistabex® in Europe, 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 ≤65 years of age.[1] Hereafter in this publication, the abbreviation ''onabotulinum'' refers to onabotulinumtoxin A.

The different available botulinum toxin formulations have distinct molecular, biochemical, physiological, and diffusion characteristics, underlying differences in their efficacy and safety profile and prohibiting any dose conversion. Onabotulinum consistently results in minimal migration from injection site,[2] promoting more precise localization of clinical effects,[3] and resulting in a predictable patient outcome,[4] thereby helping to optimize the risk/benefit ratio. When treating the face, where many adjacent muscles interplay in facial expressions and vital functions such as eye and eyesight control, it is particularly important to minimize toxin diffusion and potential related adverse effects.[4] Benefiting from over 20 years of clinical use in many indications, with 6–7 years in the esthetic indications, onabotulinum demonstrates an excellent safety profile.[5]

With the benefit of enhanced clinical experience, practitioners have progressively extended the field of application beyond the approved indication. In current clinical practice, onabotulinum is widely used for the treatment of many other face and neck areas affected by lines and rhytides caused by hyperdynamic facial muscles.

Today, most publications in the literature summarize the Northern American experience. The clinical approach in esthetic medicine in Europe, and particularly in France, may present some specificities. For this reason, it was decided to assess the clinical use of onabotulinum in France through a multidisciplinary survey on esthetic treatment and prevention of the aging face. The consensus derived from these consultations is reported in this publication for the upper- and mid-face, as a documentation of practice in France and as a basis for continuing medical education. Results for the lower face will be submitted elsewhere.

Methods

The survey took place in June and July 2009 and consisted of six practice surveys organized in different geographic regions in France and two consensus summary conferences. A total of 57 practitioners, with broad practice in facial rejuvenation and over 7 years' experience with onabotulinum injections, participated in the consensus: 29 dermatology specialists, 23 plastic and esthetic surgery specialists, three face and neck surgery specialists, and one ophthalmologist. Each survey followed a quite open agenda with a review of the practices and techniques for each individual onabotulinum treatment indication. Each debate was coordinated by a different moderator. The discussions were recorded and minutes were written, based on the audiotape recordings. A 15-item questionnaire was completed by the survey participants and analyzed.

During the summary conferences, minutes of the six surveys, answers to the questionnaire, and literature information on the use of onabotulinum in esthetic medicine were presented and discussed. Consensual recommendations on the use of onabotulinum in general and by individual treatment localizations were developed. For each indication, consensus data covered general considerations, key treatment rules, injection sites, dose selection criteria and techniques, associated procedures and treatments, and procedure follow-up. Unanimously accepted consensual recommendations were validated by the participants.

Results

Answers to the consensus questionnaire

A total of 49 participants completed the questionnaire, while the remaining eight failed to send back their answers before deadline. All clinicians had an extensive clinical experience with onabotulinum (Allergan) in many esthetic indications but only 18.4% and 6.1% had used abobotulinumtoxin A (Galderma/Ipsen) or incobotulinumtoxin A (Merz), respectively. This explains why the recommendations provided in this publication are based on the consensus participants' experience with onabotulinum. The percentages of clinicians injecting the orbicularis oculi muscle were as follows: 82.2% for the external canthus, 66.7% for the inferior tarsus, 57.8% for the superior tarsus, and 40% for the internal canthus; 80.4% of them had experience injecting the depressor supercilii muscle (elevation of the internal brow).

Overall, most clinicians used a volume of 1–1.25 mL of 0.9% saline solution (50-unit vial), with a median of 1 mL, to dilute onabotulinum. Over 75% of responders used doses of 40–50 U inclusive and only 3 of 39 clinicians used more than 50 U. It was mentioned that

the rather low maximum doses used with onabotulinum were of clinical interest, when compared with higher doses used with other toxin formulations. Most clinicians were adjusting doses according to sex and degree of facial hyperkinetic activity.

Over half the clinicians used a 10-mm distance between injection points (median of 10 mm and range of 1–30 mm).

The great majority of clinicians (>95%) adopted a time interval of 4–6 months between injections.

General consensus recommendations in the treatment of the upper face

During patient examination, clinicians must ascertain that the patient does not present any contraindications to treatment with onabotulinum. A thorough clinical examination must be performed prior to treatment. Patient should be made aware of any pre-existing facial asymmetry. It is mandatory that photographs of the face be taken at rest and in contraction, prior to the first injection and preferably at each injection session.

In-depth questioning of the patients must be conducted to clarify patient's treatment goals. Prior to treatment, the procedure, its potential complications, and the large variability of the effects among patients must be explained to the patient. Furthermore, written informed consent must be obtained from the patient, as well as a signed quotation (a legal requirement in France).

For the injection, 32-gauge needles are now preferred to the 30-gauge needles initially advised, because they are less painful. In addition, as documented in the answers to the regional consensus questionnaire and as confirmed during the summary meeting, most clinicians use 1–1.25 mL of saline for the dilution of onabotulinum (50-unit vial) in the preparation of the solution for injection.

The only consensual advice in case of pain is the use of ice packs. Topical anesthetic cream is not routinely used any more.

Need for repeat treatment is more frequent for crow's feet and forehead lines than for the glabella. In nearly all patients, treatment is long term, if not to say indefinite.

Patients must be informed to avoid, on the day of the injection, any excessive pressure on the injected zone (such as wearing a helmet or swimming or diving goggles), any massage or rubbing of the injected zone, skin treatment or lymphatic drainage, and any vibrations (power-plate, whirlpool, hydrotherapy, etc.), and to abstain from any violent sport practice for 1–7 days. On the other hand, further precautions, that were advised in the past, such as avoiding bending the head or repetitively contracting facial muscles for several hours following the injection, are not justified anymore in the opinion of the consensus members. Indeed, these recommendations are not based on any documented physiological observations or data.

Consensus recommendations in each upper-face treatment indications

The consensus recommendations by specific indication are reported together with a summary of the corresponding information gathered in the literature. All doses listed in the consensus recommendations are those for onabotulinum.

Glabellar lines treatment

The treatment of glabellar frown lines is the only formally approved indication for onabotulinum. Formerly considered as an independent indication, the treatment of the glabella is now viewed as an integral part of harmonization of the brow shape and eyebrow position. Target muscles for treatment[6–8] are the corrugators and procerus. Concomitant injection in the medial portion of the depressor supercilii, a divergent part of the orbicularis muscle, is sometimes required.

Key considerations in the clinical management of patients are as follows: (i) clinical examination of the involved muscles at rest and during voluntary contraction; (ii) evaluation of the causality relation between the muscular activity and the rhytides; (iii) identification of the external cutaneous insertion of the corrugator muscle; and (iv) investigation into the involvement of the procerus muscle whose treatment is not always needed; this muscle is injected only if horizontal lines are present during the lowering of the glabella.

Consensus recommendations on the treatment of glabellar lines are provided in Table 1.

Although the prescribing information[1] recommends injecting onabotulinum at least 10 mm above the orbital ridge to avoid eyelid ptosis, based on their years of experience with onabotulinum and on its favorable low diffusion profile, the distance was reduced by most clinicians to a minimum of 5 mm. An example of treatment of glabellar lines is provided in Figure 2. (All anatomic drawings: courtesy Dr L. Belhaouari.[9])

Horizontal forehead lines treatment

The horizontal forehead lines are caused by the activity of the frontalis muscle. This muscle is formed by the anterior part of the occipitofrontal muscle and covers the frontal bone and the glabella. Frontalis fibers are intertwined with the corrugator, procerus and orbicularis oculi muscles overlying the brow area. The upper

Table 1 Consensus on the treatment of glabellar lines

Indication		Summary of data in the literature references 7, 8, 10–16	Consensus results
Glabellar lines	Injection site(s)	Variable number of sites: 1–10 Injection(s) of the corrugator and procerus, sometimes in the orbicularis oculi at the level of the mid-pupillary line	In the muscular mass and at 5 mm minimum above the orbital ridge 2–5 injection sites (Fig. 1)
	Injection doses	Total doses of 5–30 U in female patients and 5–40 U in male patients Doses up to 50 U[16] Males with a larger muscular mass require higher doses and more sites	4–5 U/site Maximum total dose can be higher than 25 U in hyperkinetic cases
	Injection technique	Superficial injections on the medial line of the procerus and under the brow Deeper injections near the periosteum in the corrugator Avoid sliding off the nasal ridge and injecting toward the medial canthus or the orbicularis oculi and levator labii superioris alaeque nasi muscles with a risk of levator ptosis.[12]	Direction is perpendicular to the forehead or at an angle alongside the body of the corrugator Deep injection at the internal bone insertion More superficial hypodermic injection at the external cutaneous insertion It is important to inject upward (not downward to the orbit)
	Associated treatments		In case of residual deep dermis fractures associated treatment with low reticulation hyaluronic acid Concomitant treatment of depressor supercilii muscle
	Follow-up	Additional injections at 2–3 weeks Efficacy lasts 3–6 months	At 2 weeks and 5–6 months after treatment

facial muscle balance involves the frontalis muscle (the only eyebrow elevator) and the depressor muscles (procerus, corrugator, and orbicularis oculi).[6–8]

In the hands of the French clinicians, the onabotulinum treatment of the forehead is becoming more subtle and balanced. Compared with former goals and techniques, treatment is more conservative and aims at preserving some frontalis muscle mobility and a harmonious balance between elevator and depressor muscles. Furthermore, current treatment has evolved from being strictly limited to forehead rhytides effacement to a more global approach combining the management of the rhytides and of the brows' shape. This is consistent with recommendations in the literature.[7,8,10,11] Clinicians have identified improvements in bright skin shine and silky skin texture as additional benefits with onabotulinum treatment.

Key considerations in the clinical management of patients are as follows: (i) always ask the patient what his/her wishes are prior to deciding on the treatment protocol; (ii) examine the eyelids and eyebrows prior to the injection; (iii) inform patients with low brows, excess cutaneous fat, or ptotic eyelids of the frequent increased risk in eyelid heaviness and of difficulty to spontaneously raise the brows following toxin treatment; explain the benefits of ptosis surgical treatment before treatment with onabotulinum, in these cases; and (iv) onabotulinum doses vary with the patient sex and with the tonicity of the frontalis muscle.

Consensus recommendations on the treatment of horizontal forehead lines are provided in Table 2.

The protocol varies depending upon the desired outcome. For patients desiring an elevated arch-shaped external eyebrow, the temporal zone is not injected but treatment is combined with lateral orbicularis oculi muscle injections. This modality maintains the elevator function of the untreated frontalis muscle and results in a subtle and pleasant facial look. On the other hand, when a flatter eyebrow is desired, for example in men, careful injection of the external part may be considered.

Additionally, in this anatomic region, onabotulinum may be used to repair traumatic or neurologic facial asymmetry as illustrated in Figure 4.

Crow's feet lines treatment

The radial lines at the crow's feet are mainly caused by the orbital portion of the orbicularis oculi muscle, but zygomatic muscles may also have some indirect contribution to the inferior lines.

Based on clinical knowledge acquired through many years of experience,[7,8,10–16] injections are now performed at sites closer to the orbital ridge and with higher doses. Larger doses are injected at sites where muscle contractions are the strongest. An example of treatment of crow's feet lines is provided in Figure 5.

Key considerations in the clinical management of patients are as follows: (i) thorough clinical assessment of the orbicular and zygomatic muscles at rest and in dynamic contraction alone and together; and (ii) targeting of the injections based on clinical findings on the contribution of each muscle group.

Consensus recommendations on the treatment of crow's feet wrinkles are provided in Table 3.

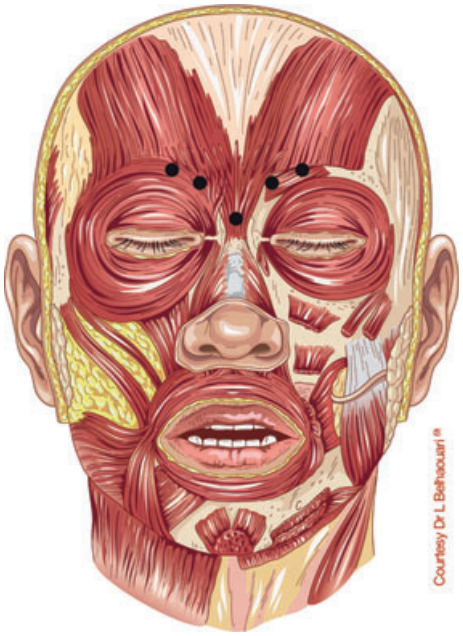

Figure 1 Injection sites for the treatment of glabellar lines.

Bunny lines treatment

Bunny lines are horizontal wrinkles that form across the bridge of the nose. Muscles involved in the development of bunny lines are the transverse portion of the paramedian nasalis muscle (nasalis rhytides) and occasionally the levator labii superioris alaeque nasi muscle (nasoalar rhytides). The transverse portion of the nasalis muscle constricts the nostril and the ala, while the levator labii superioris alaeque nasi muscle contributes to the elevation movement of the upper lip and nasal ala.[7,8,17]

Treatment of bunny lines is rarely requested by patients in France, because they are not perceived as an aging sign, or even as a negative symptom. Nonetheless, treatment of this specific site is now more frequently carried out as part of a global treatment. Consensus recommendations on the treatment of bunny lines are provided in Table 4.

Lower eyelid rhytides

The primary function of the orbicularis muscle palpebral portion is the involuntary closing of the eye.[6] Lower eyelid rhytides are attributed to this muscle part. Patients may present with a prominent ridge of the pretarsal orbicularis muscle that causes bunching of the skin.[10] Furthermore, a newer indication has emerged:[14] widening the palpebral aperture in patients with hypertrophic orbicularis, in whom the act of smiling contracts the pretarsal portion of the orbicularis muscle and leads to a decrease in palpebral aperture size.[18] Infraorbital creases (orbicularis oculi), upper and lower lid reshaping (targeted orbicularis oculi muscle), and lower eyelid asymmetries (preseptal orbicularis oculi)

Figure 2 Glabellar lines. Fifty-six-year-old female patient frowning: Glabella 20 U of onabotulinum.

Table 2 Consensus on the treatment of horizontal forehead lines

Indication		Summary of data in the literature references 7, 8, 10–16	Consensus results
Horizontal forehead frown lines	Injection site(s)	2–8 sites Avoid the lower and lateral part of the forehead More or fewer sites are required, based on anatomic and esthetic evaluations	Mean of 3–5 sites or more adjusted to the patient's morphology (Fig. 3) Injections are away from the lower 1/3 of the frontalis muscle Injections are positioned in zigzag along alternate lines The external third of the forehead is not always injected
	Injection doses	6–20 U [up to 50 U 15] 6–20 U in females; up to 30 U[16] 6–30 U in males 1.25–2.5 U/injection	10–20 U and up 30 U in males 1–2 U/site
	Injection technique	For most authors, to avoid upper eyelid ptosis: deep injections, 1-cm apart, at least 2 cm above the eyebrow and inside the segment delimited by the mid-pupillary vertical lines When the brow tends to sag, lower dosage injections should be placed 2–3 cm above the brow (3–4 cm above the orbital ridge[12])	Hypodermic injections Avoid bone contact
	Associated treatments		Filler treatment with hyaluronic acid of residual rhytides (external portion of the brows, persistent or newly discernible vertical or oblique lines)
	Follow-up	When needed, after 10 days, additional treatment with 5–7 U at unresponsive site 10 Treatment of complications: brow ptosis by injections of onabotulinum in the glabella and brow depressors; excessive brow elevation because of hyperactive frontalis (quizzical look) by injection of 1–2 U onabotulinum in the external frontalis[11]	At 2 weeks and 5–6 months after treatment

are among other suggested advanced indications around the eyes.[7]

As stated by consensus participants, clinicians are becoming more and more selective regarding the treatment of lower eyelid rhytides. This is now a rare indication, predominantly conducted in younger patients. Caution must be exercised in patients wearing contact lenses. Treatment may induce unwanted effects such as disturbances to normal eye blinking and motionless or frozen eyesight.

Key considerations in the clinical management of patients are as follows: (i) injection is to be performed only in case of a tonic lower eyelid; (ii) clinicians must exercise caution or consider a contraindication to treatment in the presence of eyelid drooping or fat bulging or malar sagging, particularly in case of eyelid laxity with poor snap test results; and (iii) injections must not be placed under the tarsus, even for the lower palpebral rhytides.

Consensus recommendations on the treatment of lower eyelid rhytides are provided in Table 5.

Treatment of the position and shape of the eyebrows

The brow is a dynamic anatomic structure. Its position is affected by a continuous interaction between elevator (only one, i.e., the frontalis) and depressor muscles.[7,10] There are three distinct anatomic parts:[6]

- the internal section (head of the eyebrow) with a balance between the frontalis muscle (elevator) and the procerus, corrugator, and depressor supercilii and the internal part of orbicularis (depressors);
- the medial section (mid-brow) with a balance between the frontalis muscle (elevator) and the orbicularis oculi (depressor); and

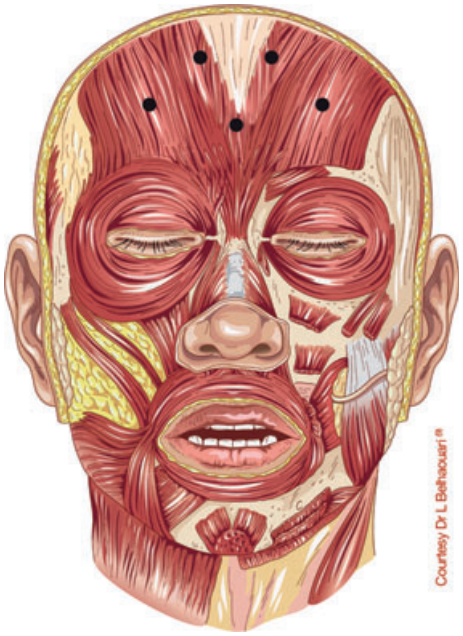

Figure 3 Injection sites for the treatment of horizontal forehead lines.

- the external section (brow tail) affected only by the depressor action of the orbicularis oculi lateral part with no elevator antagonism, since the frontalis muscle extends only up to the brow external third.

As identified by the French Consensus participants, the treatment of eyebrows is comprised of two individualized indications: the treatment of the outer part (tail) and the treatment of the internal part (head). It is possible to treat the entire eyebrow. Both indications participate in the global treatment of the upper third of the face in the search of a harmonious muscle balance. Clinicians now frequently propose to patients to modify the appearance of their brows (instead of forehead wrinkles treatment). Most patients wish to have eyebrows (often the eyebrow's tail) that are positioned slightly higher, more arched, and more symmetrical.

Treatment of the external eyebrows

This treatment is almost always included in the global management of the upper face. One key consideration in the clinical management of patients has been identified by the consensus participants: the clinician must take into consideration the different esthetic specificities of the brows in women and in men. Consensus recommendations on the treatment of external eyebrows are provided in Table 6.

An example of treatment of the eyebrow arch is provided in Figure 10.

Treatment of the internal eyebrows

This involves the injection of onabotulinum in the depressor supercilii muscle at the internal part of

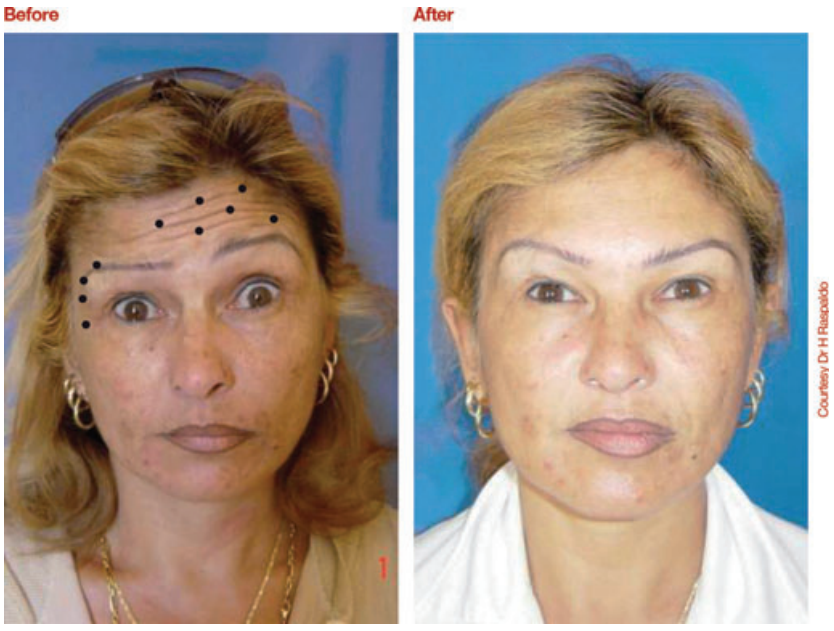

Figure 4 Facial asymmetry. Fifty-year-old female patient with facial asymmetry due to section of the right frontalis muscle: Right orbicularis 8 U onabotulinum. Frontalis muscle (medial and left part) of 12 U of onabotulinum.

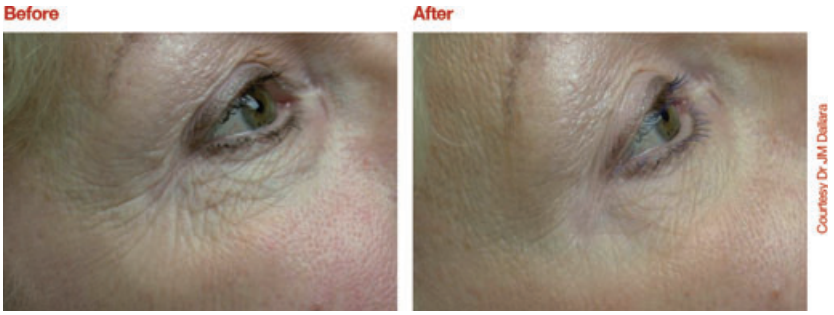

Figure 5 Crow's feet at rest. Sixty-year-old female patient. Orbicularis (external part) 9 U/side of onabotulinum and orbicularis (tarsal rim) 1 U/side of onabotulinum.

Table 3 Consensus on the treatment of crow's feet

Indication		Summary of data in the literature references 7, 8, 10–16	Consensus results
Crow's feet	Injection site(s)	2–5 sites per side Higher number of sites in selected patients Injections at 1.5 cm lateral to the lateral canthus and above the level of the inferior margin of the zygomatic arch	Injection at the site of strongest contraction of the orbicularis muscle 3–4 injection sites (Fig. 6) At 4–5 mm minimum of the orbital ridge
	Injection doses	Total doses of 8–30 U similar in females and males 8–30 U in females 12–30 U in males	2–4 U/site
	Injection technique	Snap test to evaluate palpebral laxity signing a propensity to palpebral ectropion Very rarely medial movement from the lateral canthus can result in diplopia and strabismus[12]	Very superficial hypodermic injections Carefully observe the distribution of the many small superficial vessels in the area and avoid pricking them
	Associated treatments		In case of residual lines after treatment with onabotulinum: injection of nonreticulated hyaluronic acid at low concentration In case of deep lines or of marked dermic fractures, during the same treatment session: dermal filler injection followed by onabotulinum injection (after massage of the HA)
	Follow-up		Follow-up at 2 weeks postinjection: mandatory for the first treatment session but optional for the following sessions Additional injection at 5–6 months

orbicularis muscle, elevating the internal part of the eyebrows.

Key considerations in the clinical management of patients are as follows: (i) injection technique must be very careful (very superficial) and precise as this is a dangerous area with risks of diffusion of the toxin potentially inducing diplopia and ptosis of the upper eyelid; and (ii) in this difficult zone, the French

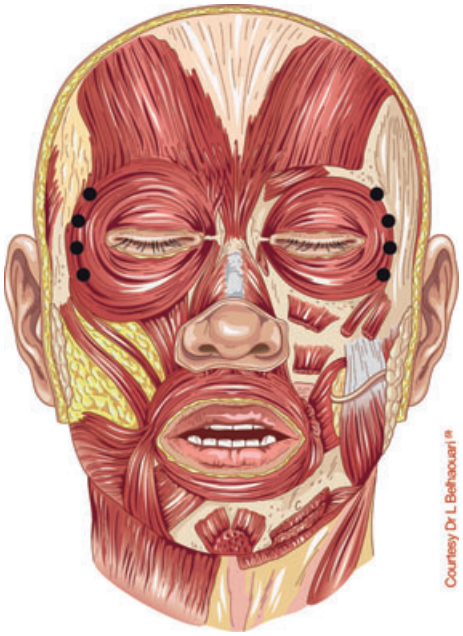

Figure 6 Injection sites for the treatment of crow's feet.

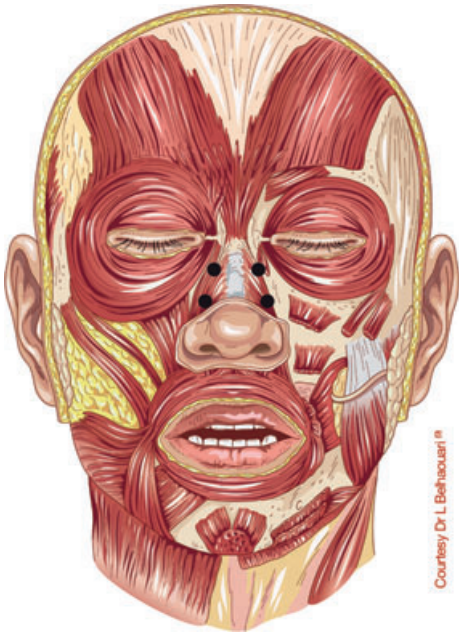

Figure 7 Injection sites for the treatment of bunny lines.

consensus participants are more confident with onabotulinum, than with any other toxins, because of the precision and predictability of results.

Consensus recommendations on the treatment of external eyebrows are provided in Table 7.

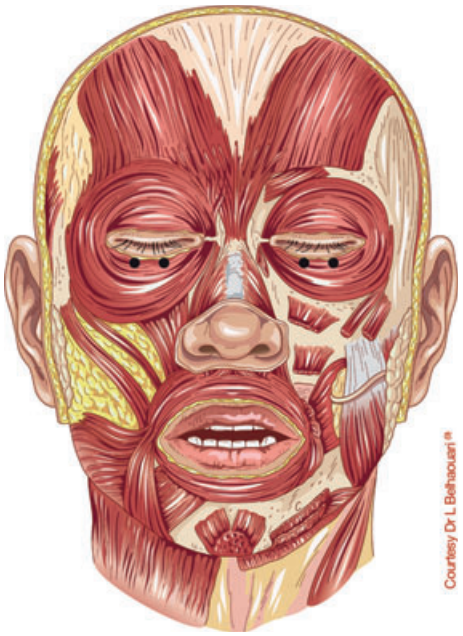

Figure 8 Injection sites for the treatment of lower eyelid.

Discussion

As outlined in the literature, the learning brought by years of experience with onabotulinum and by the more recent introduction of soft tissue fillers, such as hyaluronic acid, has profoundly affected medical practice in the treatment of the aging face. Treatment indications have moved from the restricted treatment of the glabellar wrinkles to enlarged, more global,[7,14–16,19] refined and sophisticated indications, aiming at a fresh, smoother, youthful, more relaxed, harmonious, and natural looking face that retains some muscle animation.[7,14,16] The global approach entails a multidimensional step-by-step treatment of multiple sites,[7] a multimodal approach[7,14] and taking into consideration the effects of treatment of one area on the overall muscle balance.[7,14,16,20]

The efficacy and safety of the simultaneous treatment of several sites have been documented in clinical studies for the forehead area (glabella, crow's feet, and forehead lines)[20] and the periorbital rejuvenation (brows, crow's feet ± corrugator muscles, and forehead).[19]

In agreement with newer upper-face treatment approaches, the clinicians participating in the consensus regard the current use of onabotulinum in the management of the aging face as a global treatment, with both preventive and corrective aims.

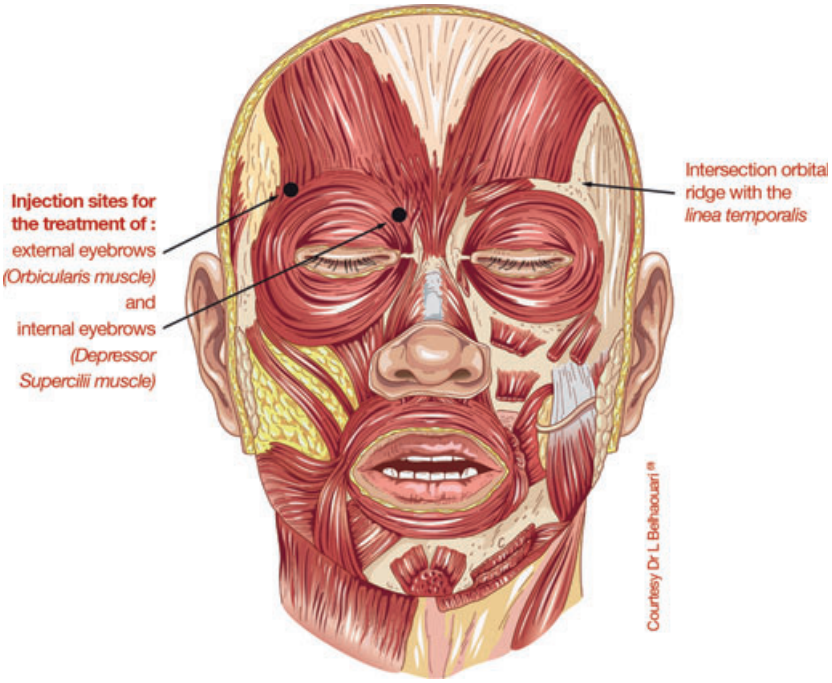

Figure 9 Injection sites for the treatment of external and internal eyebrows.

Table 4 Consensus on the treatment of bunny lines

Indication		Summary of data in the literature references 7, 10, 16–18	Consensus results
Bunny lines	Injection site(s)	2–3 sites (1 in each nasalis and optionally one medial in the procerus)	1 injection site on each side (Fig. 7) 5 mm of the medial line Inject in the projection area of the nasal bone
	Injection doses	2–6 U	2–4 U/side
	Injection technique	Superficial injections Keep injections in the lateral aspect of the nasal wall to avoid diffusion into surrounding muscles causing upper lip asymmetry	Hypodermic injections at an oblique angle towards the medial line or perpendicular to the nasal vault
	Associated treatments		Optional treatment of the levator labii superioris alaeque nasi muscle and levator labii superioris when these muscles are involved (1–2 U)
	Follow-up	In patients with residual rhytides at 30 days, additional injections at specifically selected sites (nasoalar, naso-orbicular or nasociliary rhytides)[17]	At 2 weeks and 5–6 months after treatment

Global treatment

With extended experience in the use of onabotulinum for facial rejuvenation, practitioners have learnt a new way to look at and to analyze the face, in particular the eyes and palpebral aperture.[21] The newer global corrective treatment approaches, targeted to the periorbital area, the reshaping and repositioning of the eyebrows, and the frontal area (glabella, frontalis, and crow's feet), combine the simultaneous management of several anatomic

Table 5 Consensus on the treatment of lower lid rhytides

Indication		Summary of data in the literature references 7, 10, 12, 16, 18	Consensus results
Lower lid	Injection site(s)	2 injection sites 3 mm below the ciliary margin in the lower pretarsal orbicularis[18] or 1 cm of lid edge[16] Exact injection site depends on the specific desired outcome[7]	1–2 injection sites (Fig. 8) On the tarsal rim of the orbicularis muscle at 2 mm from the ciliary edge
	Injection doses	Low doses of 0.5–2 U/side, no differences in doses between sexes Doses higher than 2 U are not recommended anymore in this area because they can lead to symptomatic dry eye and ectropion	1–2 U/eyelid
	Injection technique	Subcutaneously or intradermal blebs Tissue in this area is very fragile and should be handled very gently Superficial vessels should be identified and avoided	Injection is easier when patient is looking upwards Needle positioned horizontally, injection parallel to the eyelid border (not perpendicularly and of course never vertically) Intradermal injections forming a papule, horizontally and parallel to the eyelid border
	Associated treatments	Treatment rarely isolated but part of the treatment of the lateral periorbital area including crow's feet	1 U injected 3 mm under the lacrimal duct to smooth out the puckery skin at the internal angle of the lower lid, close to the inner canthus
	Follow-up	Reserved to experienced injectors because of the high risk of complications including ectropion	At 2 weeks and 5–6 months after treatment

sites in a coordinated and predefined treatment plan, using toxin and fillers but also different other modalities. In this approach, the evaluation of overall facial muscle balance is of utmost importance.

Preventive treatment

Regular repeat onabotulinum injections produce stable and durable clinical results and offer a preventive effect to further aging damages, stopping the development of new rhytides and lines but also hindering the modifications of the structures surrounding the cutaneous plan. For example, the permanent lifelong contraction of the orbicularis muscle – a muscle with cutaneous but also internal bone insertions – draws the eyelid toward the medial line. This is most likely one of the contributing factors to the rounding of the ocular slit and loss of palpebral elasticity and eyelid laxity. Repeat onabotulinum injections in the orbicularis oculi muscle for 15–20 years may help maintain a more tonic palpebral slit shape.[21] During the consensus, clinicians also agreed that for the corrugator muscle, frequency of repeat injections can possibly be lower.

Corrective treatment

Onabotulinum is an efficient treatment in the correction of naturally occurring or treatment-induced anatomic abnormalities (dermatochalasis, eyebrow asymmetry and unilateral spontaneous Mephisto look, upper lid ptosis, lower lid and fold asymmetries).

Other discussion points covered during the consensus included the following:

- The unique and specific pharmacological properties of the onabotulinum product and its perfect adaptation to esthetic medicine needs were outlined. Importantly, the predictability and precision of onabotulinum diffusion, controlling the diameter of effects and limiting unwanted adverse events, as well as the easiness of utilization, allow treating previously avoided areas and doing so with a feeling of great security. This is especially true for the

Table 6 Consensus on the treatment of external eyebrows

Indication		Summary of data in the literature references 10, 15, 16	Consensus results
External eyebrows	Injection site(s)	Injection in the depressor muscle under the brow tail	Main injection site: at 4–5 mm of the orbital ridge at the intersection with the linea temporalis (Fig. 9) Accessory (but frequent) injection site: 1 cm more medial and at 4–5 mm of the orbital rim (Fig. 9)
	Injection doses	2–8 U	2–4 U/side
	Injection technique	Subcutaneous Inject slowly away from the eyelid	Subcutaneous injections at an angle of 10° and directed upward and tangentially to the skin
	Associated treatments	Concomitant injection of the crow's feet increase the brow elevation effect Concomitant injection of the medial fibers of the frontalis muscle with 12 U resulting in the lowering of the medial brow and in the compensatory activity of lateral frontalis fibers. This leads to arching the brow[10]	Fine-tune associated frontalis muscle injections based on external eyebrow treatment and on the desired look and on crow's feet treatment (same as orbicularis oculi muscle)
	Follow-up	Treatment of complications with small 4- to 5-U doses	In case of an excessive upward lift of the external eyebrow (Mephisto look), corrective treatment is implemented by injecting the lateral part of the frontalis muscle 2 weeks after the first injection (with 1 or 2 U/side), at 2 cm vertically from the orbital rim where the maximum contraction of the frontalis muscle is located laterally

Figure 10 Eyebrows arch. Thirty-five-year-old female patient: Glabella 20 U of onabotulinum. Depressor supercilii 1 U/side of onabotulinum. Orbicularis 10 U/side of onabotulinum.

periorbital area, for which there is no risk of inducing diplopia. To the contrary, reservations were expressed on the use in this area of other botulinum toxins with wider diffusion zones.

- While it was merely conceivable in 2003 to inject patients younger than 30 years, today young patients want to enhance their eye aperture shape or adjust facial asymmetries; some of them even seek the benefit of a preventive treatment.
- There are no more age upper limits for performing esthetic medicine procedures. Undeniably, facial dynamics and muscular balance are still active,

Table 7 Consensus on the treatment of internal eyebrows

Indication		Summary of data in the literature references 10, 15, 16	Consensus results
Internal eyebrows	Injection site(s)	Inject in the inferior part of the medial brow or underneath This results in an elevation of the internal brow by the unopposed frontalis muscle and in a compensatory effect on the lateral fibers of the frontalis muscle, both leading to brow arching	Draw a rectangular triangle from the orbital ridge and from the nasal bone Inject on the bisecting line and at 2–3 mm of the rectangular angle apex (Fig. 9)
	Injection doses	10–20 U	1–2 U/side
	Injection technique	Avoid the adjacent fibers of the frontalis muscle	Intradermic injections Upward injections
	Associated treatments		To raise the medial portion of the eyebrow : 1-U injection in the orbicularis muscle at 4–5 mm from the orbital ridge on a vertical line drawn from the pupil (Fig. 9) This procedure may induce ptosis of the upper eyelid
	Follow-up		Systematically see for an office visit or call the patient 2 weeks after treatment

even after 65 years of age. Injections must be subtle and adapted to age, anatomy, functional morphology, and patient's physiopathology.
- Patients are more demanding and use words such as, ''well-being, natural look, quality of life.''

Overall, the distinctive elements of the recommendations of the French consensus are the following:
- The extreme ''surgical'' precision of the anatomic topography definition of the sites to inject and the skillful control of the safety margins between injection sites: a clear consequence of years of clinical practice, this expert mode has expanded the limits of use, optimized onabotulinum efficacy results, and ensured prevention of local unwanted effects, leading to a sophisticated finesse in patient management.
- A trend toward the use of lower doses (total doses and doses at each injection sites) and individualized dose adjustments regulated by the specific patient presentation (taking into consideration anatomic variants, asymmetries, patient unique functional and animation anatomy, but also patient's expectations of treatment), the number of sites planned for a specific treatment area and the global treatment plan involving several upper-face areas.
- A thorough patient selection, a careful patient clinical assessment, and a careful analysis of patient's treatment expectations.

Ultimately, the clinical expertise and years of experience in France have enabled the development of an impeccable injection technique based on the knowledge of anatomy, morphology, and functions of the face and neck, and on the in-depth knowledge of the onabotulinum toxin characteristics (pharmacological effects, diffusion, and unwanted effects) and of its co-administration with other treatment modalities. This approach, characterized by expertise and finesse of execution, has enabled elegant treatment results with a fresh, smoother, youthful, more relaxed, harmonious, and natural looking face that retains sufficient muscle animation.

Conclusions

Onabotulinumtoxin A has a favorable safety profile with rare and reversible local complications. Impeccable precise treatment technique (injection site selection, number of injection points, doses and volumes of injection, recommendations to patients) is based on complete comprehensive knowledge of the anatomy and physiology of the facial muscles and surrounding structures.

As documented in the French consensus, global treatment aims at a youthful, harmonious, and natural looking face retaining sufficient animation to express emotions. Years of clinical experience using onabotulinum have led to larger and newer treatment indications and enabled a sophisticated approach to treatment, more specific and targeted injection techniques, and a better understanding of the facial muscular balance. Achievement of these goals rests on the finesse, precision, and predictability of effects of

onabotulinum and its specific properties, which allows a lower diffusion and consequently higher safety and efficacy (precisely right into the targeted muscle thanks to its precise halo of action).

Last but not least, a better understanding of the facial aging process leads to more satisfying therapeutic results for both patients and clinicians.

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Appendix

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