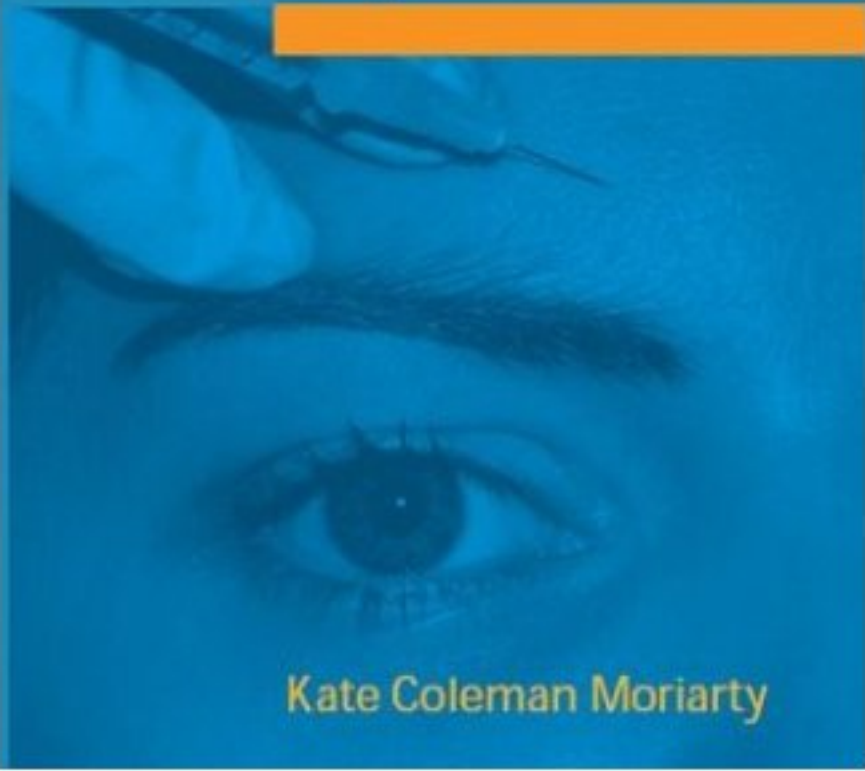
Botulinum Toxin in Facial Rejuvenation



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For
Paul, Fleur and Timothy Moriarty

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Note
Medical knowledge is constantly changing. Standard safety precautions must be followed, but as new research and clinical experience broaden our knowledge, changes in treatment and drug therapy may become necessary or appropriate. Readers are advised to check the most current product information provided by the manufacturer of each drug to be administered to verify the recommended dose, the method and duration of administration, and contraindications. It is the responsibility of the practitioner, relying on experience and knowledge of the patient, to determine dosages and the best treatment for each individual patient. Neither the Publisher nor the author assumes any liability for any injury and/or damage to persons or property arising from this publication.

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Foreword

It is indeed a great pleasure for us to have the opportunity to write the foreword to this important handbook. Kate Coleman Moriarty has chronicled and catalogued her extensive observations following the treatment of her patients with botulinum toxin. These are displayed in an orderly fashion, allowing physicians to readily apply these pearls to the treatment of their patients.

We have used botulinum toxin injections to treat blepharospasm patients for more than 20 years. Now, just as botulinum toxin revolutionized the treatment of benign essential blepharospasm, it is launching non-invasive-techniques for facial rejuvenation into another era. Every physician and surgeon seriously pursuing rejuvenation of the facial structures must include chemodenervation as a cornerstone of their therapeutic menu. The effects of ablative and non-ablative laser therapies are enhanced with botulinum toxin Type A pretreatment. Combination therapy of botulinum toxin and filling agents yields prolonged effacement of glabellar furrows. The artful application of botulinum toxin not only reduces facial rhytidosis but repositions eyebrows, flattens pretarsal muscle folds and diminishes platysmal bands. Understanding the facial musculature allows the aesthetic physician to manipulate the balance of counteracting muscles and rejuvenate the face. This is the dawn of a new age of facial rejuvenation.

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2003

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I would like to thank PAJ Moriarty for many things in my life, but of most relevance now is my gratitude for introducing me to botulinum toxin in the blepharospasm clinic of the Eye and Ear Hospital Dublin in 1988. A review of the patients in this clinic was the subject of my presentation to the Royal Academy of Ophthalmology in March 1988, the start of a deep curiosity in botulinum toxin. I would also like to thank the late Leo Koornneef and my friends JRO Collin, D MacNeill and Steve Bosniak for setting high standards, if only to aspire to their elevated heights of surgical and aesthetic perfection. Thank you Marian Cantisano-Zilkha for showing how the eye zone should be considered, surgery, make up, peels and all.

Thanks too to Chris Zachary and Roy Grekin for being so inspirational, the best teachers and simply the best at cosmetic dermatology. Thank you Rita Rakis for all the tricks!

A very special thanks is reserved for Maria Micheau. This book would not have been written without her inspiration, management, organization and motivation.

Thank you to the highly skilled Airmid McSeain and Andrea McAlister for being so much fun to work with and so supportive and dedicated.

Kate Coleman Moriarty

1 Historical background

The *Clostridium* family of bacteria, common to most environments, produces spores that on germination release some of the deadliest toxins known to mankind. *Clostridium welchii* contaminates wounds and caused the infamous gas gangrene of World War 1: *Clostridium botulinum* produces botulinum toxin – a powerful neurotoxin.

Clostridium botulinum was first identified in 1897, in Belgium, by Professor Emile van Ermengem who was investigating fatal cases of food poisoning following the consumption of macerated ham. It was named after the disease it causes, botulism, a lethal form of food poisoning originally associated with sausage meat (botulus is Latin for sausage). In the same year, an antiserum for botulism was made.

There are seven known serotypes of botulinum toxin (A, B, C, D, E, F, and G). Serotypes A, B and E cause the classic food-borne disease with a flaccid paralysis of motor and autonomic nerves. Type B was first discovered in 1910, and the isolation of Type A began in the 1920s. During the Second World War research continued into this potent neurotoxin as a possible agent ('agent X') for biological warfare. Most of this work was carried out at the chemical warfare laboratories of Fort Detrick, Maryland, and Porton Down in the UK. Porton Chemicals was bought by Ipsen pharmaceuticals in 1989 and is the source of Dysport®, one of the commercially available forms of botulinum toxin.

Dr Alan Scott, an ophthalmologist from the Smith-Kettlewell Eye Research Foundation, became interested in substances that caused transient muscular paralysis. He acquired botulinum toxin Type A from Fort Detrick, and

performed the first clinical tests on humans in 1978. His results in the treatment of strabismus (an abnormal contraction of the extra-ocular eye muscles) were published in 1980 and led to the extensive use of botulinum toxin Type A by ophthalmologists in the treatment of blepharospasm (an abnormal involuntary twitching and contraction of the facial muscles around the eye), hemifacial spasm and cervical dystonia (abnormal spasm of cervical musculature) (see Chapter 10).

The astute observation by Dr Jean Carruthers, an oculoplastic surgeon in Toronto, of the incidental rejuvenating effects of botulinum toxin on patients with facial dystonia, was shared with her husband, Dr Alastair Carruthers, a dermatologist. At the same time, similar observations were being published by Professor Nick Lowe and others.

Thereafter the story is well known. With good medical training and the correct selection of patients, botulinum toxin can be given easily, safely, and repeatedly.

2 Botulinum toxin: mode of action and serotypes

A working knowledge of the pharmacology of botulinum toxin is essential to understand the contraindications and complications of treatment with it. For an excellent analysis of its pharmacology, the reader is referred to Huang, Foster and Rogachefsky (2000, see Bibliography).

Botulinum neurotoxins are polypeptides. Botulinum toxin comprises a protein molecule (150kd) which can be cleaved into a heavy (H)(100kd) and a light (L)(50kd) chain (Fig. 2.1). These chains are normally held together by a disulphide bond, which is heat labile. Disruption of this bond inactivates the neurotoxin. This explains why botulinum toxin must be stored at the correct temperature and reconstituted carefully, preserving the integrity of the two-chained molecule (see below).

Botulinum toxin induces paralysis by blocking the release of acetylcholine at the skeletal neuromuscular junction, thereby inhibiting the transmission of nerve impulses across the synaptic junction to the motor end plate. There are seven serotypes of botulinum toxin, five of which are effective at the human neuromuscular junction (BTX A, B, E, F and G). The different serotypes act by cleaving different proteins at the presynaptic vesicle.

Three types of botulinum toxin are currently available commercially: Botox® and Dysport® (both botulinum toxin Type A); and NeuroBloc® (botulinum toxin Type B).

Allergan in Westport, Ireland produces Botox®. Dysport® is produced by Ipsen Pharmaceuticals, UK, and NeuroBloc® is produced by Elan, Ireland. Product specifications are given below. NeuroBloc® is licensed for use in cervical dystonia under the name of Myobloc® in USA.

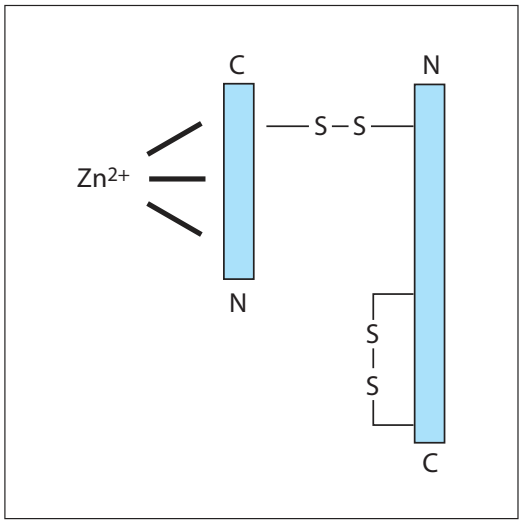


Fig 2.1 Diagram of botulinum toxin molecule showing heavy and light chains. After Aoki , R. The development of botox – its history and pharmacology. Pain Digest 1998; 8:337–341 by permission of Springer–Verlag.

MUSCULAR CONTRACTION: NORMAL CHOLINERGIC TRANSMISSION (SEE FIG. 2.2)

Voluntary muscle contraction is a response to stimulation by action potentials passing along a nerve to the muscle. Once these action potentials reach a synapse at the neuromuscular junction, they stimulate an influx of calcium into the cytoplasm of the nerve ending. This increase in calcium concentration allows acetylcholine to fuse with the membrane, using a protein complex, before crossing the synapse and fusing with nicotinic receptors on the muscle fiber. The protein complex consists of three types of protein: VAMP (synaptobrevin), SNAP-25 (synaptosomal associated protein), and syntaxin.

THE MODE OF ACTION OF BOTULINUM TOXIN (SEE FIG. 2.3)

Acetylcholine depends on a protein complex for its release from the nerve ending into the synapse. Botulinum toxin, using a specific enzyme in the light (L) chain, interacts with one component of the protein complex of the nerve terminal, thereby inhibiting the discharge of the acetylcholine. The protein attacked is specific to the different serotypes of botulinum toxin. BTX-A blocks SNAP-25, while BTX-B blocks VAMP. This explains why the development of antibodies to BTX-A (Botox® or Dysport®) does not preclude a good clinical result from BTX-B (NeuroBloc®).

Both the heavy (H) and light (L) chains of the botulinum toxin molecule are needed to block the release of acetylcholine. The H-chain attaches the botulinum toxin to the nerve membrane, allowing the L-chain to be transported to its site of action – the protein complex. The L-chain enzyme then cleaves the protein specific to the particular neurotoxin. Neuromuscular transmission ceases and the target muscle atrophies reversibly.

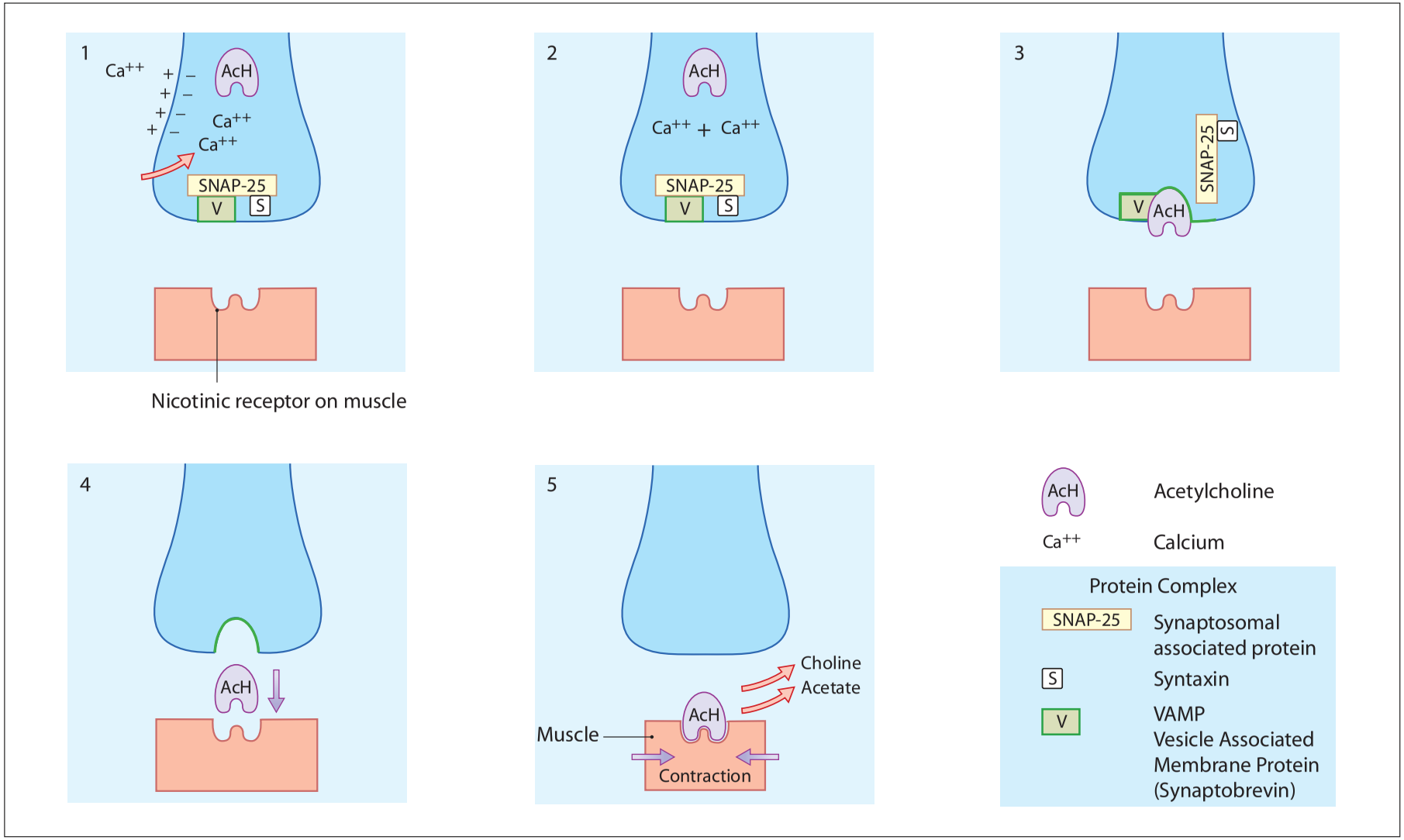


Fig 2.2 Normal cholinergic transmission. 1, A signal passes down the cholinergic nerve, causing calcium to pass through the depolarising presynaptic membrane; 2, The calcium then triggers the binding of the acetylcholine molecule to a protein membrane complex; 3, The protein membrane complex allows the acetylcholine to pass into the synaptic cleft; 4, The acetylcholine travels across the synapse to a nicotinic receptor on the muscle, where it stimulates contraction before disintegrating into acetate and choline.

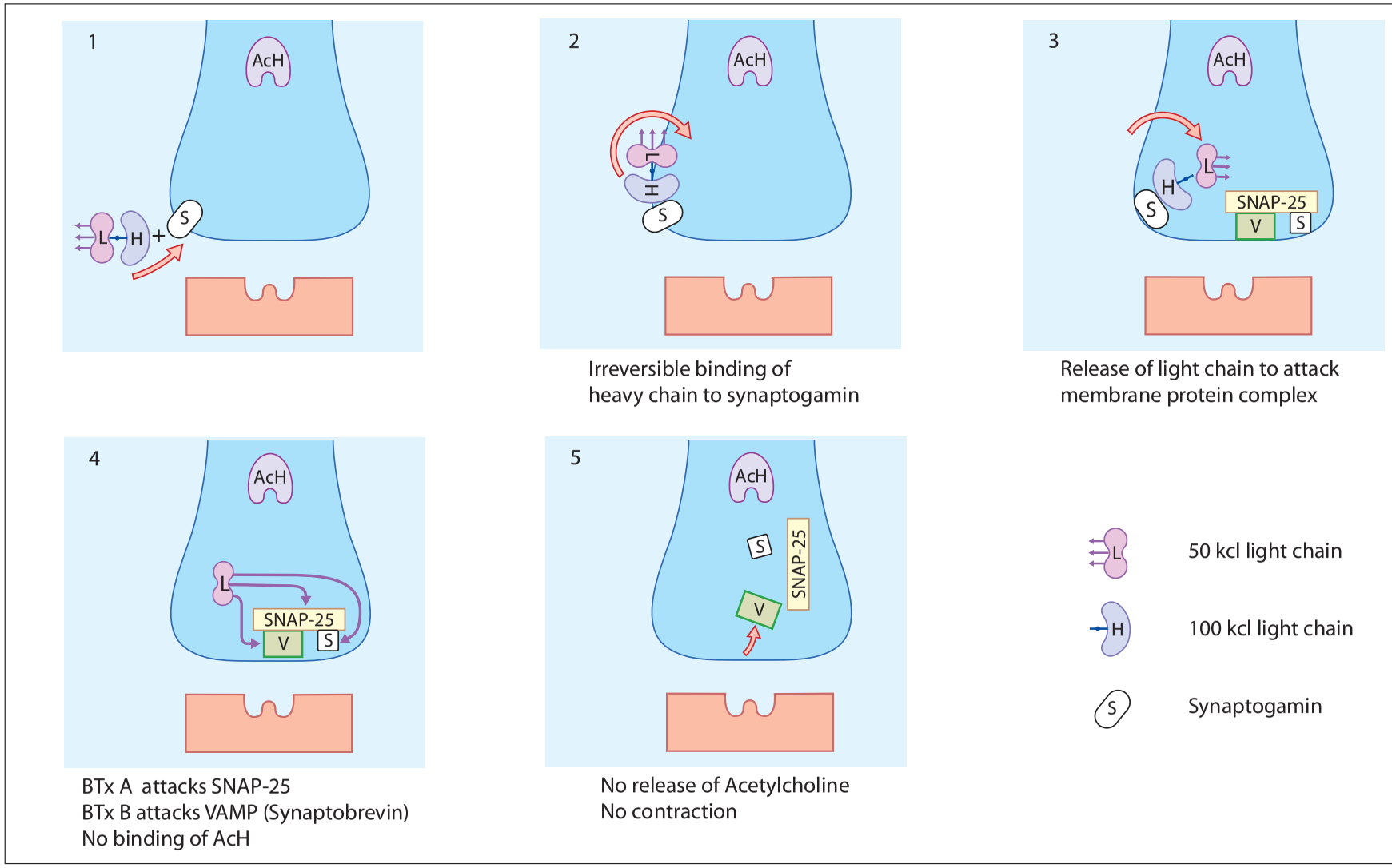


Fig 2.3 Action of botulinum toxin at the neuromuscular junction. 1, The heavy chain of the BTX binds to synaptogamin on the presynaptic membrane; 2, The heavy chain/synaptogamin complex enables the BTX light chain to enter the cell; 3, The light chain attacks the membrane complex and disables it so that *no acetylcholine binds*; 4, BTX-A attacks the snap-25 protein of the membrane protein complex while BTX-B attacks VAMP (synaptobrevin); 5, There is no release of acetylcholine.

If botulinum toxin is not handled correctly before injection, the fragile bond which holds the L and H chains together may split, preventing the H-chain from being able to guide the L-chain to the correct protein inside the terminal, and rendering the molecule ineffective.

USER TIP

Botulinum toxin acts only on the neuromuscular cholinergic receptors unless given in very high doses, when autonomic effects may be possible.

USER TIP

Botulinum toxin acts by blocking the release of acetylcholine from the pre-synaptic terminal of the neuromuscular junction.

MUSCLE RECOVERY

The precise way in which muscles recover after an injection of botulinum toxin is still unknown. Cleavage of the protein complex is irreversible, but the changes following botulinum toxin use include a proliferation of axonal nerve buds to the target muscle and the regeneration of muscle end plates.

Muscle function takes between 24 hours and five days to cease; in contrast, recovery takes from six weeks with NeuroBloc®, and an average of 14 weeks with Botox® and Dysport®. Some muscles, the frontalis in particular, remain paralyzed in some patients for as long as five months after only one treatment. Prolonged paralysis results in muscle atrophy which has been shown to last years in the forehead musculature.

The orbicularis oculi muscle requires three to six months to recover its function but, even then, the muscle returns to only 70-80% of its original bulk. This explains the fact that a single treatment can help the 'crow's feet' of patients who are reluctant to engage in a series of treatments.

THE DEVELOPMENT OF ANTIBODIES TO BOTULINUM TOXIN

The development of antibodies to one serotype does not preclude an effective response to another one. Research suggests that the development of these antibodies is related both to the frequency of administration of BTX and to its concentration. Ideally, therefore, good therapy should be spaced at a minimum of 12-week intervals, and should use the lowest concentration effective for that duration of action.

USER TIP

Avoid the development of antibodies by using the lowest dose recommended for the site, with a minimum treatment interval of 12 weeks.

BOTULINUM TOXIN SEROTYPES

Botulinum Toxin Type A (BTX-A) (Botox®, Dysport®)

BTX-A cleaves SNAP-25 at the neuromuscular junction, preventing the release of acetylcholine. It is the most widely available botulinum toxin and has been used by the author since 1988. All treatments in this book refer to BTX-A with the exception of a report below on BTX-B.

Two forms of BTX-A are currently available: Botox® is produced by Allergan Inc.; and Dysport® by Ipsen Pharmaceuticals. The author has used Dysport® since 1988 and Botox® since 1990. At the time of publication, Dysport® is widely used in Europe and South America, while Botox® is available in the USA as well as in Europe. Allergan was awarded FDA approval for the cosmetic treatment of glabellar lines in May 2002, and, as Botox® Cosmetic, BTX-A is sold in the USA for this purpose.

Botulinum Toxin Type B (BTX-B) (NeuroBloc®)

BTX-B acts on a different cytoplasmic protein complex. The secretion of acetylcholine is disrupted when the light chain of the BTX-B molecule cleaves a protein called synaptobrevin, also known as vesicle associated membrane protein (VAMP). Clinical trials have shown BTX-B to be effective for the treatment of patients with cervical dystonia, including those resistant to BTX-A. BTX-B is produced by Elan, Ireland, and is called NeuroBloc®.

In a recent trial of NeuroBloc® for rhytids, 30 patients were treated at a dose recommended by Elan as the equivalent of doses usually used for Dysport® and Botox® (to be discussed in detail in Chapters 4, 7, 8 and 9). It was found that, unlike BTX-A, muscle inaction begins within 24 hours – the average for BTX-A being three to five days. Diffusion of toxin from the injection site was similar to that of Dysport®. Patients noted that BTX-B stung more than BTX-A but were pleased by the speed of its effect and by the outcome.

The greatest difference in clinical effect was its duration of action. The effect of BTX-B, at doses expected to be similar, lasted for only 6 weeks (unpublished results, Author) and this is in keeping with other reports. Both toxin serotypes 'wear off' within a few days: i.e. once muscle function has started to return, it recovers completely over a short period. The second phase of the trial is now underway, examining the cosmetic effects of BTX-B at the concentrations used for cervical dystonia.

3 Clinical indications and usage

THE INDICATIONS FOR USING BOTULINUM TOXIN

The cosmetic indications for botulinum toxin are listed in Table 3.1. Non-cosmetic indications for botulinum toxin include the following: strabismus, hemifacial spasm and blepharospasm, spasmodic torticollis, focal dystonias such as writer's cramp, post facial nerve palsy synkinesis, migraine, hyperhidrosis, bruxism and esophageal achalasia. (For further discussion of non-cosmetic indications, see Chapter 10).

How to choose between Botox®, Dysport® and NeuroBloc® for rejuvenation

The choice between BTX-A (Botox® and Dysport®) and BTX-B (NeuroBloc®) will be based on the duration of action required, unless the patient already has antibodies to BTX-A.

Table 3.1. The cosmetic indications for botulinum toxin

Crows feet (periocular rhytids)	Pebbly chin
Vertical (glabellar) frown	Nasolabial folds
Horizontal (frontalis) frown	Jaw line (platysma
Wrinkles on nose	Venus rings (horizontal neck rhytids)
Upper lip rhytids	Turkey neck (vertical platysma bands)
Vermilion border	Décolleté
Angle of mouth	Scar management

Fig 3.1 Bottle of NeuroBloc®

NeuroBloc® (at a concentration of 200 units per 0.1ml) is the toxin of choice for shorter periods of action (Fig. 3.1). Some patients (and practitioners) are nervous of the outcome of their first treatment and may be happy to have an effect lasting six rather than 12–14 weeks. Others need to use their facial muscles professionally and are happy to induce muscle atrophy for a limited period e.g. while 'resting' between film productions. This encourages their wrinkles to flatten, while retaining the ability to retrieve full facial expression when desired. It is also possible that even shorter actions will be available with further modifications of the dose. It is worth noting that inadequate storage of Botox® or Dysport® (e.g. at an incorrect temperature), or excessive dilution, also shortens the duration of their effect.

USER TIP

NeuroBloc®, at a concentration of 200 units per 0.1ml, is the first choice for a duration of action of six weeks. Botox® and Dysport® both last for 12–14 weeks.

Botox® or Dysport®?

Botox® Cosmetic (Fig. 3.2) is the only botulinum toxin Type A currently licensed for cosmetic use in the USA for the treatment of the vertical glabellar

Fig 3.2 Botox® Cosmetic

frown. The rights to Dysport® in the USA have been acquired by INAMED Corporation (Zyplast, Zyderm) and licensing is expected in the near future. Both are widely used in Europe. Dysport® is licensed for cosmetic use in Brazil and Mexico.

In Europe, the choice lies between Botox® and Dysport®. Research shows both to be equally effective in comparable doses for cervical dystonia and facial rejuvenation. The author's experience with both types of BTX-A for rejuvenation and blepharospasm indicates that Dysport® (Fig. 3.3) may be more effective in patients with blepharospasm who have had an incomplete result with Botox®. Both Dysport® and Botox® have similar durations of action, their effects wearing off after 12 to 14 weeks. Dysport® tends to diffuse to more muscle fibers per site of injection than Botox®.

These qualities are useful for the beginner who may find it easier to start with Botox® around the eyes and Dysport® to the frontalis. An experienced practitioner with a busy BTX-A practice may choose between the two on economic grounds only – both are currently available at the same price in Ireland.

From a practical point of view, an inexperienced practitioner, with few patients and an irregular demand for BTX-A, may initially prefer the storage qualities of Dysport® (see Chapter 4) though the larger vial of Botox® makes preparation and dilution easier.

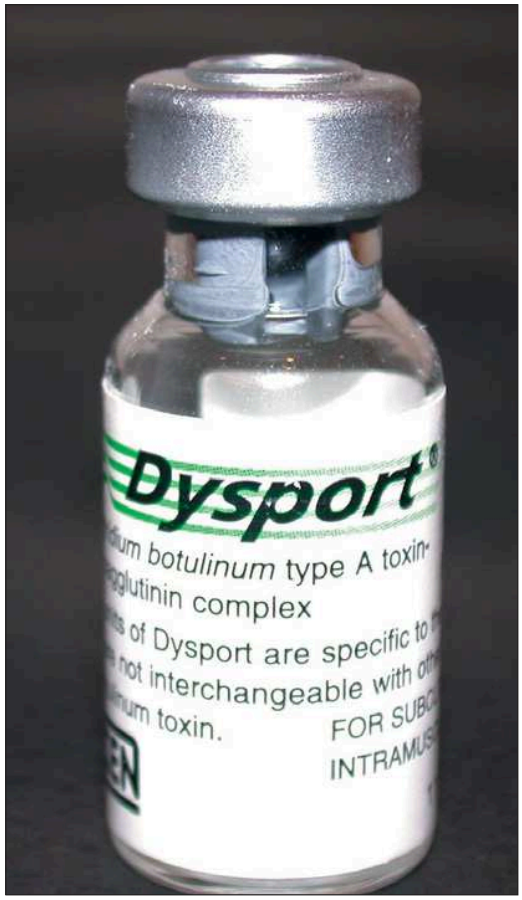


Fig 3.3 Bottle of Dysport®

CONCENTRATIONS

Botulinum toxin is the most potent toxin known to mankind. It functions at very low concentrations and so can be assessed accurately only in terms of lethal dose unit per Swiss-Webster mouse. One mouse unit (mu) is the median intraperitoneal dose required to kill 50% of a batch of 18 to 20g female Swiss–Webster mice (LD50) over three to four days.

The types of mice used by Allergan, Ipsen and Elan differ and so the units discussed are NOT interchangeable. One vial of Botox® contains 100 mu, while one vial of Dysport® contains 500 mu: one vial of NeuroBloc® contains 10,000 mu. This variability of assay, coupled with the absence of a definitive human assay, means that the doses used have to be based on clinical experience. Clinical efficacy is directly related to the degree of dilution of the toxin, the muscle targeted and the volume injected.

The potency of one vial of Botox® is not the same as that of one vial of Dysport®. Several studies suggest that 3–5 units of Dysport® equate with one unit of Botox®. NeuroBloc® is said to measure up against Botox® at the ratio of 1 unit of Botox® equaling 50 units of NeuroBloc®.

The concentration of Botox® has changed since it was introduced to Europe in 1989. The original batch of 150 g of pure crystallized toxin was prepared by Dr Schantz in 1979. Botox® is a vacuum-dried form of purified BTX-A, produced by cultures of the Hall strain of *Clostridium botulinus*. It is isolated as a crystalline protein complex from the culture solution by a series of acid preparations, and then redissolved in a solution containing saline and albumin. It is then filtered using a sterile technique before vacuum drying. This author's experience with Botox® from 1989 to 1997 was with the original Schantz preparation. In 1997, a new batch was prepared by Allergan with different labeling. This batch, in current use, contains 20% less protein than the original one and so is less likely to stimulate an albumin-related allergic response. However, the author noticed an immediate reduction in the duration of effect of the 'new' Botox® and concluded it to be weaker than the original batch. Several observant patients in the author's clinic, who had been treated every 14 weeks for two years, complained in the same month of a reduced effect though they were unaware of the change in batch. The author's practice changed, from using a regular dilution of the Botox® vial with 3.5 ml (as previously published) to a dilution with 2.5 ml, in order to reproduce the same results. Subsequent reports from the USA have suggested the new batch was associated with an increase in side effects (e.g. ptosis) and so was assumed to be stronger. These reports, in fact, support the belief that the new batch is more dilute, because it is well documented now that greater dilutions diffuse more widely and are more likely to produce side effects.

The author continues to dilute Botox® with 2–3 ml for routine rhytid management (depending on the site) and has detected no further changes in concentration.

- **Botox is produced by a precipitation technique and freeze-dried to a powder.**
- **Dysport is produced by column-based purification and freeze-dried to a powder.**
- **Neurobloc is a high molecular weight BTX-B that is not lyophilized but a buffered intact protein complex in liquid form, at a pH of 5.5.**

DOSAGES

Bolinum toxin Type A

This book gives doses in milliliters of reconstituted solution as opposed to 'units' of BTX-A. One ml syringes are recommended (Fig. 3.4, see also Chapter 4) allowing doses of 0.025 ml to be given safely. Always keep an eye on the hub of the syringe and the volume used while injecting. The doses

Fig 3.4 One-ml syringe

recommended relate to the experience of the author, with thousands of patients undergoing repeated cosmetic treatments over six years (and over 14 years for blepharospasm patients). The concentration used per injection site will be described in detail in Chapters 4, 7, 8 and 9.

Botox® and Dysport® are both reconstituted to give an equal effect per ml. In this book, 0.1 ml BTX-A refers both to Botox® (reconstituted with 2.5 ml) and Dysport® (reconstituted with 3 ml). The difference in concentration is because a vial of Dysport® is stronger than a vial of Botox® (although the price per vial is equal), and so requires greater dilution for effect. Allergan (Botox®) and Ipsen (Dysport®) have developed different individual 'mouse units' of concentration. These are not interchangeable and refer to different quantities.

A vial of Botox® contains 100 (Allergan) units, whereas a vial of Dysport® contains 500 (Ipsen) units. Measurement of dose per site in units could therefore be hazardous in countries where both products are available. Measurement in volume allows the practitioner to get a 'feeling' for the different doses per site. The practitioner can observe a treatment in volume as opposed to having to convert volume to units during treatment e.g. 0.1 ml to a site can be observed, rather than thinking 'this is 4 units Botox®' or '16.6 units Dysport®'. With practice, the concentration can be adjusted to modify the effect of treatment further.

USER TIP

Think in vol/ml solution and not units/BTX-A when injecting a patient. This allows good control and safety as one eye should always watch the volume gauge.

USER TIP

2.5 ml to Botox® correlates with 3 ml to Dysport®, giving equal doses per 0.1 ml injected.

0.1 ml Botox® (4 Botox® units) = 0.1 ml Dysport® (16.6 Dysport® units)

Botulinum toxin Type B (NeuroBloc®)

NeuroBloc® was launched in Europe in March 2001 for the treatment of cervical dystonia. It is presented in a ready-to-use solution and can be stored for 2 years if refrigerated. It is available in three vial volumes (containing 2,500, 5,000 and 10,000 units) and each vial contains a slight overfill. Although it is effective for 12–16 weeks in the treatment of cervical dystonia, at concentrations equal to that of Botox® (i.e. one unit Botox® = 50 units NeuroBloc®), its duration of action for cosmetic use in the author's clinic was six weeks. Current trials with this new product are examining the effect of increasing concentration on duration of action.

- **Botox® units are not equivalent to Dysport® units: Allergan (Botox®) and Ipsen (Dysport®) have developed different individual 'mouse units' of concentration which are not interchangeable.**
- **Botox® and Dysport® vials contain different quantities in units and are the same price per vial.One Botox® unit is 3-5 times stronger than one Dysport® unit. One Botox® vial has 100 units but one Dyport vial has 500 units.**
- **Low concentrations diffuse further than high concentrations.**
- **High concentrations last 12 weeks, low concentrations often wear off sooner.**
- **In this handbook, Botox® and Dysport® are both reconstituted to give an equal effect per ml.**
- **Dose should be measured in volume, rather than units, in order to avoid confusion. This also allows an eye to be kept on the syringe gauge while injecting a precise volume.**

The preparation of the toxin and of the patient are discussed in Chapter 4.

4 Preparation, storage and injection technique

USER TIP

NEVER handle botulinum toxin without surgical gloves.

PRESENTATION

Botox®

Botox® is delivered in an insulated container. It is presented as 100 units of freeze dried powder in a glass vial. The vials frequently look empty to the inexperienced eye, as the powder tends to rest in their bottom angle (Fig. 4.1).

There are strict guidelines for storage of botulinum toxin in order to prevent denaturation and maintain maximum efficacy. Botox® should be stored, before reconstitution, either frozen at minus five degrees (-5°) centigrade or in a refrigerator at 2–8° centigrade until reconstituted. Once reconstituted, Botox® must be stored at 2–8° centigrade (refrigeration temperature). Inexperienced practitioners can use a thermos flask or a vaccination transporter (Fig. 4.2) to maintain the solution at 2–8° if a refrigerator is not available in the clinic. This is effective but the temperature may vary and, if ice is used, may even be too cold. There is minimal evidence that freezing reconstituted Botox® solution preserves its efficacy and Allergan do not recommend this. Freezing may in fact accelerate denaturation of the product, greatly reducing its duration of efficacy after injection. In the author's experience, Botox® that has been partially denatured by being stored at the wrong temperature (e.g. leaving the bottle

Fig 4.1 Powder at the bottom of a Botox® vial.

Fig 4.2 Insulated container.

on a table instead of in the refrigerator) will still achieve some effect but of a reduced duration.

Dysport®

Dysport® comes in a plastic hinged box containing two glass vials (Fig. 4.3). Like Botox®, it is a freeze-dried powder that clumps at the bottom of the vial. Dysport® does not have to be stored in a deep freeze but, once reconstituted, it must be kept at 2–8° centigrade. Ipsen recommend using it within eight hours of reconstitution. Reconstituted Dysport® should not be frozen.

NeuroBloc® (Myobloc in the USA)

NeuroBloc® is a liquid and comes in vials of three different sizes: 2,500 units (0.5 ml), 5,000 units (1.0 ml) and 10,000 units (2.0 ml) (see Fig. 3.1). It can be

Fig 4.3 Plastic box of Dysport® with 2 vials.

stored in unopened vials, in a refrigerator at 2–8°, for up to 18 months, and at room temperature for 8 hours. If diluted with saline, it should not be stored for longer than 8 hours. NeuroBloc® should not be frozen.

RECONSTITUTION

The rubber seal on the vial should be wiped with an alcohol swab before using a 5 ml syringe to inject the desired volume of normal preservative-free saline. A green 25-gauge needle is inserted carefully through the center of the bung. Especial care must be taken with Botox® bungs which freeze solid as the needle can easily enter at an angle, releasing pieces of rubber into the solution.

USER TIP

Never agitate botulinum toxin solution when reconstituting it.

The product is vacuum-sealed. Air can be injected into the vial to avoid too rapid a reconstitution, and a thumb can be placed under the plunger of the syringe to control the rate of release of saline onto the powder (Fig. 4.4). The saline must not gush in and agitate the solution mechanically. Rotating the vial during injection also assists a gentle reconstitution.

TRANSPORT

Both Dysport® and Botox® can be transported after reconstitution if the solution is not agitated. The author used to work in an outlying clinic and used a cold packed vaccine insulation box for transport. Ideally Dysport® and Botox® should be reconstituted after the journey. Agitation denatures the toxin and greatly reduces its duration of action

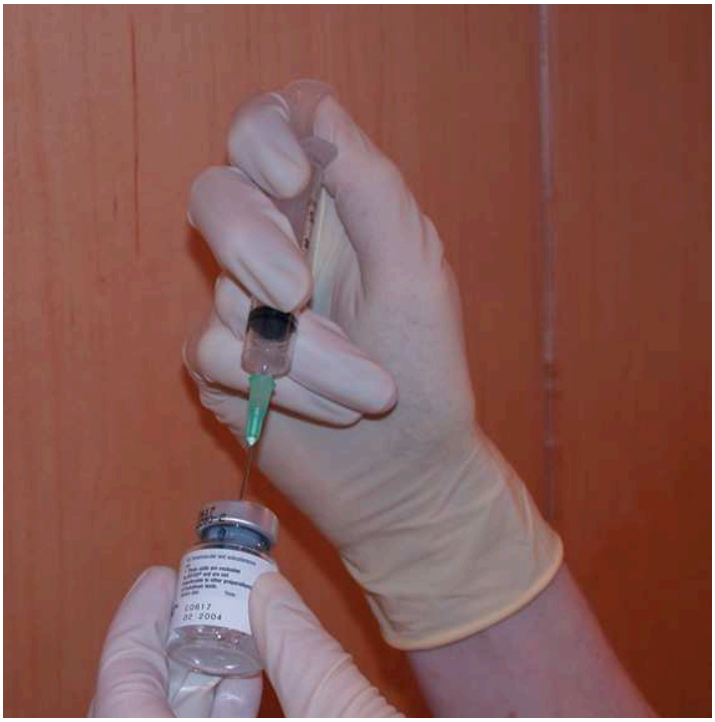


Fig 4.4 Controlled reconstitution.

INJECTION TECHNIQUE

Almost all of the injections mentioned in this book, unless specifically stated otherwise, are intramuscular and not subcutaneous.

The author's experience is based on the initial management of patients with facial dystonia. Such patients suffer from involuntary and irregular contraction of one or several groups of facial muscles, often involving the orbicularis oculi and orbicularis oris. The impulse, once sparked, is thought to travel from muscle fiber to muscle fiber by the sequential depolarization of adjacent fibers (ephaptic transmission). BTX-A injections are placed in such a way that they achieve the maximum blockage of impulse transmission with the minimum of side effects, by giving BTX-A to muscles along the line of transmission.

The placement of BTX-A around dangerous areas, such as the corner of the mouth where inadvertent diffusion to the levators of the labii superioris will cause drooling, requires careful analysis of the degree of diffusion of the injection by dose and by depth of injection. Intramuscular placement is essential for maximum effect and control, but subcutaneous treatment can be used gently in these areas.

USER TIP

All injections of BTX-A referred to here are intramuscular unless otherwise stated.

INJECTION

We recommend using one ml tuberculin or insulin syringes. These are essential for the dose to be gauged accurately during injection. The doses recommended in this book are given in units of volume. The finest mark on a one ml syringe is 0.01: we often recommend using 0.025 ml (more later).

USER TIP

Always watch the gauge of the syringe while injecting.

DOSAGE

The vial can be diluted with preservative-free normal saline to achieve the desired concentration. The doses recommended for cosmetic use have been established independently by several workers over the last six years and, while now based on experience, were initially derived from the doses used for blepharospasm (Chapter 10).

Jean and Alastair Carruthers made their original observations about the ability of Botox® to smooth rhytids while treating a patient with blepharospasm induced by facial palsy. Blepharospasm due to orbicularis oculi spasm is treated with injections into the muscle above and below the eye. The information leaflet provided with each vial of Botox® or Dysport® gives the optimal dose recommended to relax each part of the orbicularis muscle. For blepharospasm, Allergan recommend a dilution of 2.5 ml to give 4 units per 0.1 ml. Dysport® recommend a dilution of 2.5 ml to give 20 units per 0.1 ml.

USER TIP

Botox® Cosmetic has been licensed for the management of the glabellar frown (see Chapter 8). Specific directions for dosage are provided.

A review of the literature provides information on the dosage preferences of a variety of practitioners. The author has validated the doses suggested in this book over the course of more than 10,000 treatments given since the cosmetic use of Botox® was suggested in the early nineties. With experience, the reader should get a feeling for the required dose in each patient – as part of the 'art of botulinum' – and may well modify these doses accordingly. The following guidelines based on the author's experience may be useful:

- **Aim to use the smallest volume of the lowest concentration necessary to provide paralysis of the target muscle for at least 12 weeks.**

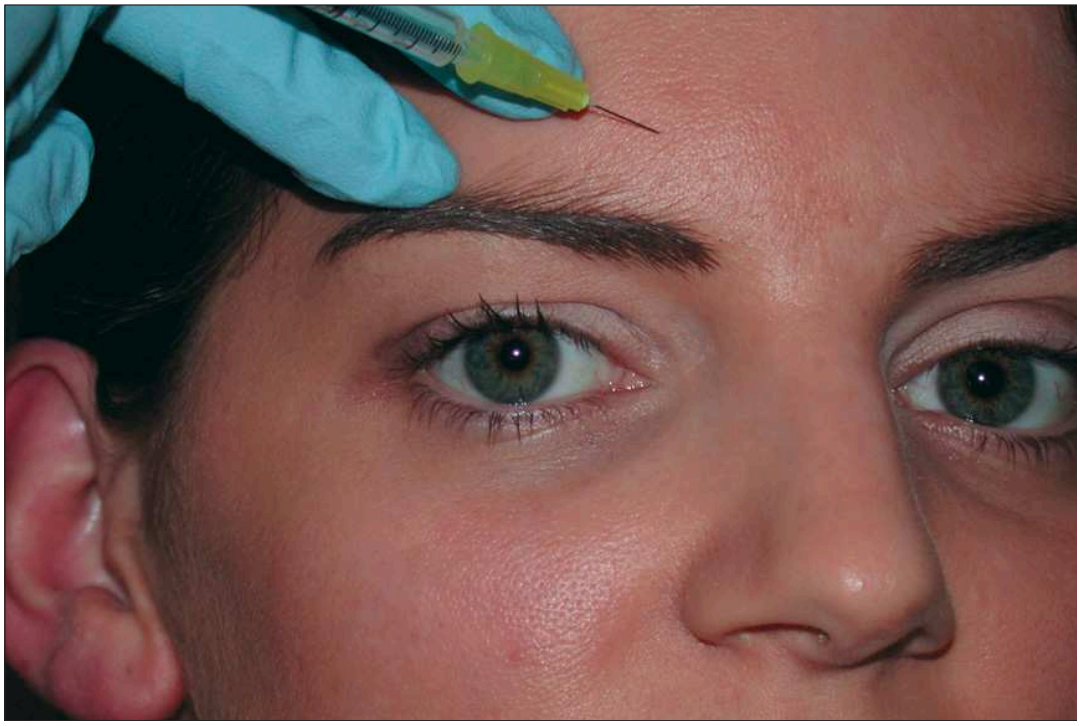


Fig 4.5 Injecting at 1cm over superior orbital rim.

- **Decide in advance how far you want the injection to diffuse.**
- **Remember that, on average, 4 units in 0.1 ml of Botox® will diffuse 1 cm; 20 units of Dysport® in 0.1 ml will diffuse 1.5 cm; 20 units of Dysport® in 0.05 ml will diffuse less far; as will 2 units of Botox® in 0.05 ml.**
- **Select the injection site so that treatment will not extend beyond the desired diffusion zone e.g. 0.1ml Botox® injected one centimeter above the superior orbital rim (not brow) to treat the glabellar muscle. This avoids diffusion towards the levator muscle (Fig. 4.5). Likewise, inject Dysport® 0.05 ml one centimeter from the lateral canthus (outer corner of the eyelid) to avoid diffusion medially. This is dealt with in detail in later chapters.**
- **Base your choice of dosage on the recommendations given in Chapters 7, 8 and 9. Most receive the same dose for the same rhytids; but one aim of this book is to teach how to treat the unpredictable minority too.**

USER TIP

Concentration of botulinum toxin:
Too weak = short duration of action
Too strong = risk of increased side effects

Increased Diffusion

GOOD FOR:

- **Treatment of frontalis**
- **Extended treatment of crow's feet (inferolaterally over zygomatic arch)**

Reduced Diffusion

GOOD FOR:

- **Lateral canthus**
- **Pre tarsal orbicularis**
- **Close to superior orbital rim**

USER TIP

Increased volume dilution per unit botulinum toxin means increased diffusion.

ASPIRATION

Always use gloves for self protection. The solution should be aspirated freshly for each patient, although some doctors recommend pre-aspiration of botulinum in several one ml syringes, and then storing them in the refrigerator. Manufacturers recommend a single vial per patient which must be used within four hours of reconstitution.

Botulinum toxin is potent and very expensive, so each drop must be used to its maximum effect. Even 0.0125ml is effective in certain sites.

Take care to remove the 25-gauge needle from the bottle after aspiration, particularly with Dysport® where the combination of a small vial and a viscous solution encourage seepages from the needle.

Once aspiration is complete, attach a 30-gauge needle to the hub of the syringe. Take care that the batches of needles and syringes fit well together, and beware attachments so loose that the toxin dribbles from the hub during injection. This is wasteful, and may be hazardous if the leaked fluid contacts the patient's face (ingestion of botulinum toxin droplets have been suspected of causing mild gastroenteritis). Clear the air bubble from the syringe using minimal agitation. This requires more care with Dysport® because of its greater viscosity.

USER TIP

Wipe away any spilled botulinum toxin with a hypochlorite solution

INJECTION TECHNIQUE

First, study the face and the muscles of the area to be injected (see Chapters 7 and 8). An inexperienced worker should mark the injection sites with a washable skin marker, having first wiped the sites with an alcohol swab. It is important to sterilize the skin at the injection site, as many patients wear a make-up foundation. Local granulomas or erythematous nodules can develop at injection sites (Fig. 4.6), but the author has never seen areas of infection or cellulitis related to an injection. Some practitioners suggest that alcohol denatures the toxin. If this were so, then every injection site swabbed with alcohol during a treatment session should have a similar effect on the toxin at the time of injection. The author, however, has seen no difference in the effect of BTX when given simultaneously to sites which have been swabbed (forehead) and have not (eye zone in patients who find the alcohol too irritating and are simply swabbed with saline).

Botulinum toxin can be injected intramuscularly or subcutaneously. Most doses in this book, however, are based on intramuscular injections, and have been derived from experience with blepharospasm. Subcutaneous injections are also effective but need more injection sites to allow for maximum absorption. Pre-tarsal orbicularis injections are usually given intramuscularly

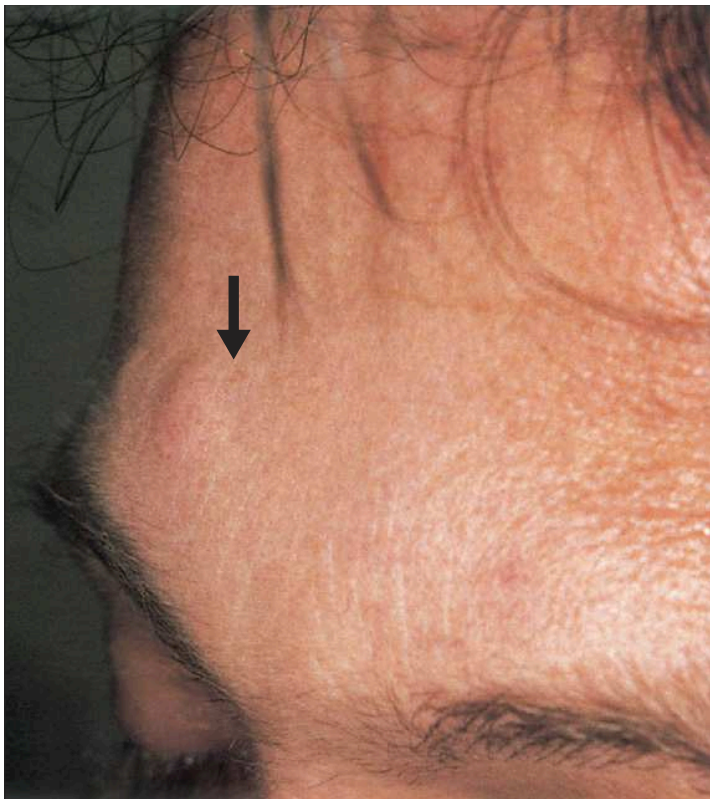


Fig 4.6 Granuloma on forehead at site of Botox® injection (arrow).

as the skin here is only 0.5 mm thick. Intramuscular placement stings less, and produces less local erythema. However it carries a slight risk of causing intramuscular bruising.

USER TIP

Avoid the supraorbital nerve, vein and artery complex when injecting the glabellar area. Study the anatomy and, if in doubt, feel for the supraorbital notch (not always present) under the medial aspect of the brow .

Start with the frontalis zone. Ask the patients to frown while assessing the bulk of muscle contraction, then relax the patient and inject at the point noted. Gently tip the periosteum with the needle, withdraw slightly, and inject while watching the syringe gradations. With experience, one soon becomes familiar with the muscle bulk, and the periosteum is rarely touched. Take care to point the needle away from danger and in particular avoid pointing it towards the orbital septum when injecting the lateral canthus.

It is sometimes useful to hold the muscle site between two fingers, especially in the glabellar area (Fig. 4.7).

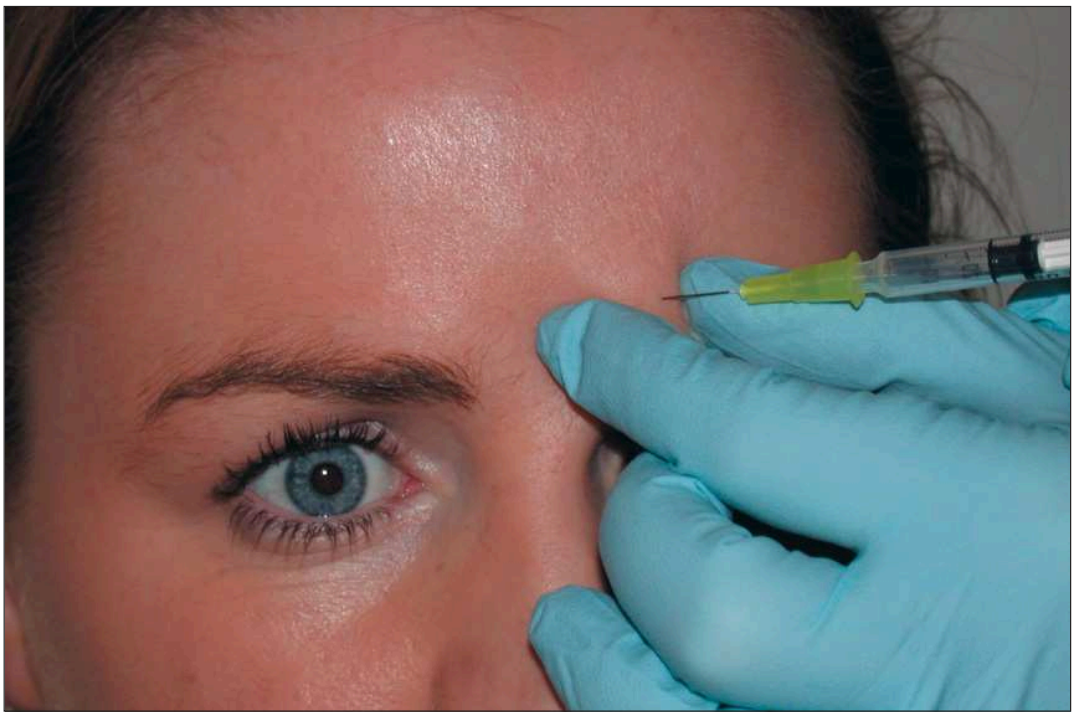


Fig 4.7 Holding the muscle between two fingers when injecting the glabella.

USER TIP

Spread the lateral orbital skin between two fingers to observe the orbital veins clearly and take care to inject around these.

USER TIP

Steady the injecting hand by resting the little finger on the face while spreading the skin with the other hand. Resting the little finger of the injecting hand against the face, or the other hand on the face, also helps to avoid sudden movement by the patient towards the needle (Fig. 4.8). Look carefully for and avoid superficial veins.

PAIN

Botox® stings more than Dysport®, and NeuroBloc® more than Botox®. Topical anesthesia makes no difference to the pain of intramuscular injections, although it should be used for other injections – see Chapter 11. Slow insertion of the needle can greatly reduce the perception of pain, possibly by minimizing the mechanical stimulation of cutaneous pain receptors.

In the author's clinic experimental reconstitution using saline preserved with 0.9% benzyl alcohol (Wigmore pharmacy) has been found to stop the stinging. There have also been reports of reconstitution with lidocaine (lignocaine) to minimize pain but the efficacy of this has not been tested by the author.

Fig 4.8 Steady the injecting hand, and avoid sudden movement by the patient towards the needle.

POST-INJECTION

The patient should be asked to press on the site with a tissue immediately after the injection – even while other sites are being treated. This minimizes bruising. Any bruising that occurs should be treated immediately with an ice pack from the freezer. Camouflage cream or make-up is then applied before the patient goes home.

Some experts believe that flying or lying down after treatment causes untoward diffusion and hence side effects such as ptosis. However, the author has had no cases of ptosis in over 10,000 treatments, and has seen no evidence to confirm this theory.

DURATION OF APPOINTMENT

An average botulinum appointment lasts a maximum of 10 minutes. This excludes the first counseling visit (often 90 minutes) but includes reading and signing the consent form, the injections and settling the account. A nurse practitioner may prepare the patient, thus reducing the time spent with the practitioner.

Table 4.1. A comparison of the different commercially available botulinum toxins

	Botox®	Dysport®	NeuroBloc®
Presentation	Single 100 unit vial (frozen)	Two 500 unit vials (refrigerated)	0.5 ml, 1.0 ml or 2.0 ml vials (refrigerated)
Form	Freeze dried powder	Freeze dried powder	Liquid protein complex
Reconstitution	0.9% preservative free saline	0.9% preservative-free saline	May be further diluted with 0.9% preservative-free saline
Recommended storage before reconstitution	One year frozen at = ≤5° or one year refrigerated at 2–8°	One year refrigerated at 2–8°	18 months under refrigeration at 2–8° or 8 hours at room temperature If diluted, no more than 8 hours at either room temperature or under refrigeration
Recommended storage after reconstitution	Four hours at 2–8° Should not be frozen	Eight hours at 2–8° Should not be frozen	

5 Patient selection

Some patients have a clear idea of their requirements and a good aesthetic sense. Others trust their doctors to advise them on 'what looks good'. They may come for treatment only because they were told to do so by their friends or their parents. If so they may resent a treatment to which they are not fully committed.

The golden rule here is that if patients are not going to derive any *perceivable* pleasure from botulinum toxin, then their expenditure will not be properly rewarded. Their trust in their physician will be reduced, almost as if they had been 'sold' a dress in a shop that they did not really want – such shops are rarely revisited. It is important not to be influenced by such patients' demands. If a decision is made by the physician to refuse treatment, then at least no harm is done. The botulinum treatment cannot be 'undone' one week later if the patient is unhappy with the outcome (even though the physician had already described the implications of treatment clearly). Above all, remember that no one *needs* botulinum toxin.

HOW TO IDENTIFY SUITABLE PATIENTS

- **Listen to their presenting complaint and then, while still looking at the patient, decide quickly whether it can be treated with botulinum toxin or not.**
- **Continue the consultation while carefully assessing the patient's psychological suitability (more below).**

- **If, on first impression, the patient seems suitable, spend time providing verbal and written information about the treatment (this can be done by a trained nurse).**
- **Always examine patients closely – as described in the following chapters – and discuss the likely outcome of botulinum toxin injections with them.**
- **Be sure that your patients understand what has been said fully before they sign the consent form.**

Physical assessment is an art, which becomes intuitive with experience. A variety of different complaints are dealt with in detail in this book with all their caveats. Time must be taken over the initial examination and in order to be certain that the patient will be happy after treatment.

SELECTION PROCESS

All new patients must be assessed physically and mentally. Written information about botulinum toxin should be provided at the time of consultation and patients should have time to digest this before an opportunity is provided to ask the physician any relevant questions. Practice nurses (Chapter 12) should be able to identify most patients suitable for botulinum toxin, and so do not have to spend time counseling those the practitioner is likely to decide not to treat. The alternative is to assess patients first and then send those selected for treatment to the aesthetic nurse for photography and counseling. When the patients return to the practitioner, it will be possible to double-check that the risks and likely outcomes are fully understood before the consent form is signed.

THE INITIAL PHYSICAL ASSESSMENT

With experience, it is possible to decide at a glance whether or not botulinum toxin will help a patient. A 29-year-old non-smoker, for example, with crow's feet that only wrinkle when she is smiling, will do very well. Botulinum toxin will rid her of wrinkles completely. On the other hand, her twin, who smokes and uses a sun bed for a permanent tan, may have wrinkles at rest with an early reduction in lower lid skin tone. Time must be spent explaining to her that she may possibly be disappointed with botulinum toxin – the injections might help to stop the clock and avoid new rhytids, but without alternative treatments (including sun protection, laser resurfacing, stopping smoking) she will continue to have her wrinkles.

The decision must be made, prior to treatment, as to whether botulinum toxin can eliminate rhytids, reduce them and prevent further rhytids, or whether another type of treatment is necessary. Consider whether patients are

likely to look unusual after treatment e.g. with peaked brows or tired appearance with heavy brows. Would they be better to avoid treatment altogether, to have gradual treatment over a few weeks, or to have a different treatment?

The initial assessment must be followed by a physical examination but obvious contraindications should be detectable at this stage. Some signs immediately indicate or contraindicate treatment; for example, it is best to decline treatment where a patient has no specific complaints but decides that 'the doctor knows best', and presents for botulinum toxin with the vague aim of 'looking better'.

The patient should have given an accurate age and history of smoking (though some do not!) and a full medical history should reveal no obvious contraindications such as myasthenia gravis, pregnancy etc. (see Chapter 6).

At this stage, the physician should:

- **Observe the face, neck and hands of the patient while the patient is animated (talking).**
- **Look for the signs summarized in Table 5.1**
- **How old does the patient look? Is this older or younger than expected?**
- **Is the skin on the face sun-damaged?**
- **Consider the patient's profession. Many actors will not benefit from paucity of facial expression.**
- **How does the skin behave with facial expressions?**
- **In particular, observe static wrinkles around the eyes and on the forehead, whether these change with the facial expression and, importantly, whether**

Table 5.1. Signs to be observed quickly before a full consultation takes place

Consider the following:	Look for:
General skin condition	Sun damaged, pigment spots, poor tone.
Age	Cardiovascular status, skin perfusion, overall tone and skeletal structure.
Brow position	Examine lash/brow distance. How does it change with expression? Are the forehead wrinkles the result of 'holding' brows?
Crow's feet	At rest or in motion? Do they extend down towards the perioral lines when smiling?
Hooding	Is there a fold of skin at the corner of the eye that disappears when the patient lifts the brow?

patients tend to hold their brows in continuous suspension by wrinkling their forehead, thereby hiding any underlying dermatochalasis (excess skin folds on upper eyelids).

- **Are crow's feet present only when the patient smiles?**
- **Are wrinkles present at rest?**
- **Do the wrinkles continue over the zygomatic arches?**
- **Is there 'hooding' of the skin above the corners of the brows?**

INDICATIONS FOR TREATMENT

Wrinkles on the face

It is good if the wrinkles are dynamic i.e. only appear with frowning and smiling. Treat these.

If the patient has wrinkles at rest and is sun damaged or simply elderly, care must be taken to emphasize that botulinum toxin will reduce lines around the eyes and forehead but will not eliminate them.

Glabellar rhytid (vertical frown)

Consider the following points:

- **If the frown is dynamic i.e. visible only in motion, the result of treatment may well be a good one.**
- **If the furrow is present at rest: warn the patient that it may not be completely eliminated.**
- **If the patient has heavy brows (seen especially in men), treatment of the frown may increase the sagging medially.**
- **Examine the brow–lash distance? (Fig. 5.1). If low, regardless of age and skin tone, treatment may cause descension of the medial brow over the orbital rim, causing an unusual 'tired' appearance.**
- **Are the patient's brows asymmetrical in motion? If so, the results of treatment will be asymmetrical too unless this is taken into account.**
- **Does the patient have an active frontalis? If so, treatment of the vertical furrow alone may cause the lateral brow to elevate, creating an unattractive peaking of the brows. Such patients should have a different treatment or their full forehead zone treated.**

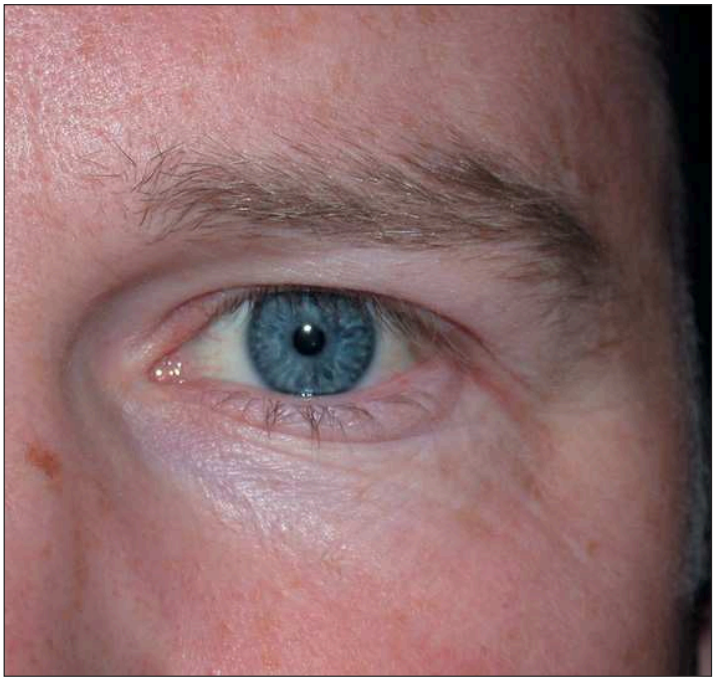


Fig 5.1 Patient with low lash–brow distance.

Horizontal rhytids (frontalis)

Consider the following points:

- **Eyebrow position: Patients with a good lash/brow distance at rest, will do well with treatment.**
- **High eyebrows: relaxing the horizontal rhytids will prevent the high resting tone of the brows, particularly in patients over 50 or those with sun damaged skin.**
- **Active brows with changes in facial expression: if such motility is culturally influenced, as, for example, in France, the patients may be unhappy with the loss of facial expression.**

Crow's feet

- **Wrinkles in motion only – such rhytids are ideal for treatment.**
- **Wrinkles at rest – aim to discuss modification and prevention in detail with the patient.**
- **Wrinkles extending over zygomatic arch, increasing with smiling, and usually seen in older patients: extra care must be taken. Botulinum toxin treatment alone can create an incongruous appearance: no crow's feet when smiling, but wrinkles extending from the cheekbone to the perioral smile lines. This can even**

Fig 5.2 Patient with hooding of lateral brows.

create a 'Mickey Mouse' appearance – a flat area around the eyes surrounded by extended perioral smile lines.

- **Hooding of lateral brows (Fig. 5.2): this is usually due to loss of tone and descension of the lateral brow and temporal forehead. The 'wrinkle' under the hood will remain after treatment. It is important to explain to the patient that other treatment (e.g. endoscopic brow lift, carbon dioxide laser resurfacing) is indicated and that botulinum toxin will not remove the particular rhytid.**

Psychological assessment

The physician must develop a keen instinct when assessing patients for cosmetic botulinum toxin, in particular, the patient's psychological suitability and comprehension.

Aesthetic treatments, unlike medical ones, are not essential and can be refused at any stage. The initial consultation should identify patients who are poorly equipped psychologically to deal with changes in their appearance.

Every patient is entitled to follow up consultations once they have received a treatment, regardless of the medical necessity of the visit. If a patient becomes distressed by the new shape of their eyebrows, it is important to be available to counsel and reassure them until the effect of the botulinum toxin has worn off. This may even entail daily appointments for the first week, followed by weekly appointments for reassurance until the toxin has worn off.

Guidelines applicable to all cosmetic medical and surgical treatments

An astute, experienced, telephonist will screen out many unsuitable patients. The next point of contact in a cosmetic practice may be the practice manager, who books appointments and deals with patients' accounts. They too are trained to detect patients who may have unrealistic expectations, or show poor

comprehension. Patients frequently see an aesthetic nurse before their medical consultation. An experienced practice nurse can cancel a treatment plan for an unsuitable patient. The patients who eventually see the physician are usually ideal for treatment, but some are still deemed unsuitable at the time of consultation because of unachievable expectations or more frequently, lack of psychological reserves to deal with a risk at that particular moment in time. Such patients may have their first treatment postponed and be given an appointment for review. A typical reason for postponement would be a recent bereavement.

There are obvious reasons for refusing certain patients even though they are physically suitable for botulinum toxin, but more subtle ones should also be considered.

The decision not to treat is always based on the possibility that the patient will not be happy with what the treatment will do – even if they think they will!

- **Ask yourself, before every new treatment, will this make this patient happy?**
- **If not, why not?**

Some reasons for poor patient satisfaction despite a good result

Low intelligence

Patients who cannot understand risks or side effects despite repeated explanations often reveal themselves only after the first treatment, by telephoning the next day to say that it 'hasn't worked', or 14 weeks later to complain that the 'wrinkles have returned' despite advice about the time of onset and duration.

Unreasonable expectations

Patients with unreasonable expectations often argue with the physician. For example, if shown how the brows might peak if their glabella alone is treated, they might disagree and continue to request the glabella treatment on its own. Do not treat these patients!

Some cosmetic surgery patients are highly manipulative. There may be a pattern of missing or changing appointments, insisting that they have canceled when they had not, and misquoting the secretary about the instructions given. Such patients are often extremely nice to the physician but create havoc with the nurse and manager. Once such a pattern of behavior has emerged it is wise to try to stop further treatments or fail to make appointments available.

Some manipulative patients like to 'test' their doctors. Patients who are deceitful about their medical history (e.g. concealing previous cosmetic surgery despite obvious scars) may conceal other facts. There are numerous anecdotes about patients attending hospital under a pseudonym for cosmetic procedures. In one case, the patient suffered a myocardial infarction at the time of the procedure, having denied a previous history of the heart disease in case the cosmetic surgery was refused, attending under a pseudonym.

Care must be taken to document in detail all consultations, with written information, photography and a good signed consent form. Certain patients may deny ever being given information and have been known to misrepresent medical advice, slandering the physician. Such patients typically slander other colleagues to the physician e.g. 'I went to Dr X but it didn't work'. Most colleagues are proficient, and it may be prudent to be alert to the motives of patients who complain about them. The easiest solution is NOT to treat difficult patients in the first place.

The close friends of patients or their siblings can also have unreasonable expectations. One sibling, with a family resemblance, may marvel at the other's result, and expect the same cosmetic result. It can be hard to point out that their sibling is a natural beauty with symmetrical features and good skin tone, whereas they, although rather alike, have lower heavier brows with asymmetrical frontalis action and sun damaged skin!

Some patients are referred by other patients, expecting the same result as their friend. Care must be taken to explain the expected differences in results, while never referring to their friend or acknowledging that their friend really is a patient.

Depression

Depression is greatly underdiagnosed. Both reactive and endogenous types are relative contraindications to treatment. A depressed patient may speak slowly, and seem 'flat' during the consultation. They may have suffered a recent bereavement, separation or divorce. Those who experience such life crises often review themselves. They notice their appearance, decide that they have 'let themselves go' and fix up a botulinum toxin appointment. Some become tearful during the consultation.

There are two good reasons for not treating depressed patients. The first is the risk associated with every procedure. An unusual complication could deepen their depression. The other is that many patients, even mildly depressed ones, have poor powers of concentration, so they find it hard to assimilate medical advice.

The subject of their depression may be gently broached. Cosmetic treatment options can be discussed but accompanied with a suggestion to postpone the treatment until they are better. Psychological and medical counseling may be recommended, perhaps with a referral to their G.P. for a psychiatric referral. Time is well spent discussing the way the body behaves with depression, and the forms of treatment available. These patients usually return when they are better and are often suitable then for cosmetic procedures.

It is true that some depressed patients do cheer up when botulinum toxin eliminates their frown, but care should be taken about the timing of such treatments.

Dysmorphophobia

This disorder is rare but seen at every cosmetic clinic. It has various degrees of severity and patients require a psychiatric referral – if they will agree to one. Avoid treating such patients without a report from their psychiatrist.

An example of a dysmorphophobic patient is one who came for the management of a 'wrinkle'. There simply was no wrinkle where they pointed. In another, the normal lower lid Morgagnian crease (between the pretarsal and tarsal orbicularis) was the offending wrinkle.

Such patients often refuse to look in the mirror during the consultation, and almost always become distressed if attempts are made to photograph them. It is useful to remember that even though the defect identified by the patient is not apparent to an objective viewer, the patient may continue to view it as a problem whether it is treated or not. Some patients will have received numerous cosmetic treatments elsewhere at enormous expense. The ethics of this are debatable.

USER TIP

Avoid joint consultations i.e. seeing two friends at the same time. Welcome a 'second ear' if necessary and let a friend sit in, but it is difficult to assess a patient's mental suitability for a procedure when speaking to two people at once.

6 Contraindications and complications

The selection of patients for treatment with botulinum toxin is described in detail in Chapter 5. Some well-established contraindications must always be kept in mind.

ABSOLUTE CONTRAINDICATIONS

Anything that interferes with the predicted response to botulinum toxin, which inhibits the release of acetylcholine at the neuromuscular synapse (Fig. 6.1).

Drugs and disorders which also reduce acetylcholine at the motor end plate, amplifying the action of BTX.

- **Eaton Lambert antibodies. Note a history of cancer, metastases and general lack of wellbeing which may suggest a diagnosis of Eaton Lambert syndrome (see Neuromuscular disorders).**
- **Aminoglycosides (gentamycin, streptomycin, kanamycin) act on the presynaptic neurone.**

Drugs and disorders which alter the response of the motor end plate, amplifying the action of BTX

- **Myasthenia gravis alters and reduces the acetylcholine receptors on the motor end-plate (see Neuromuscular disorders).**

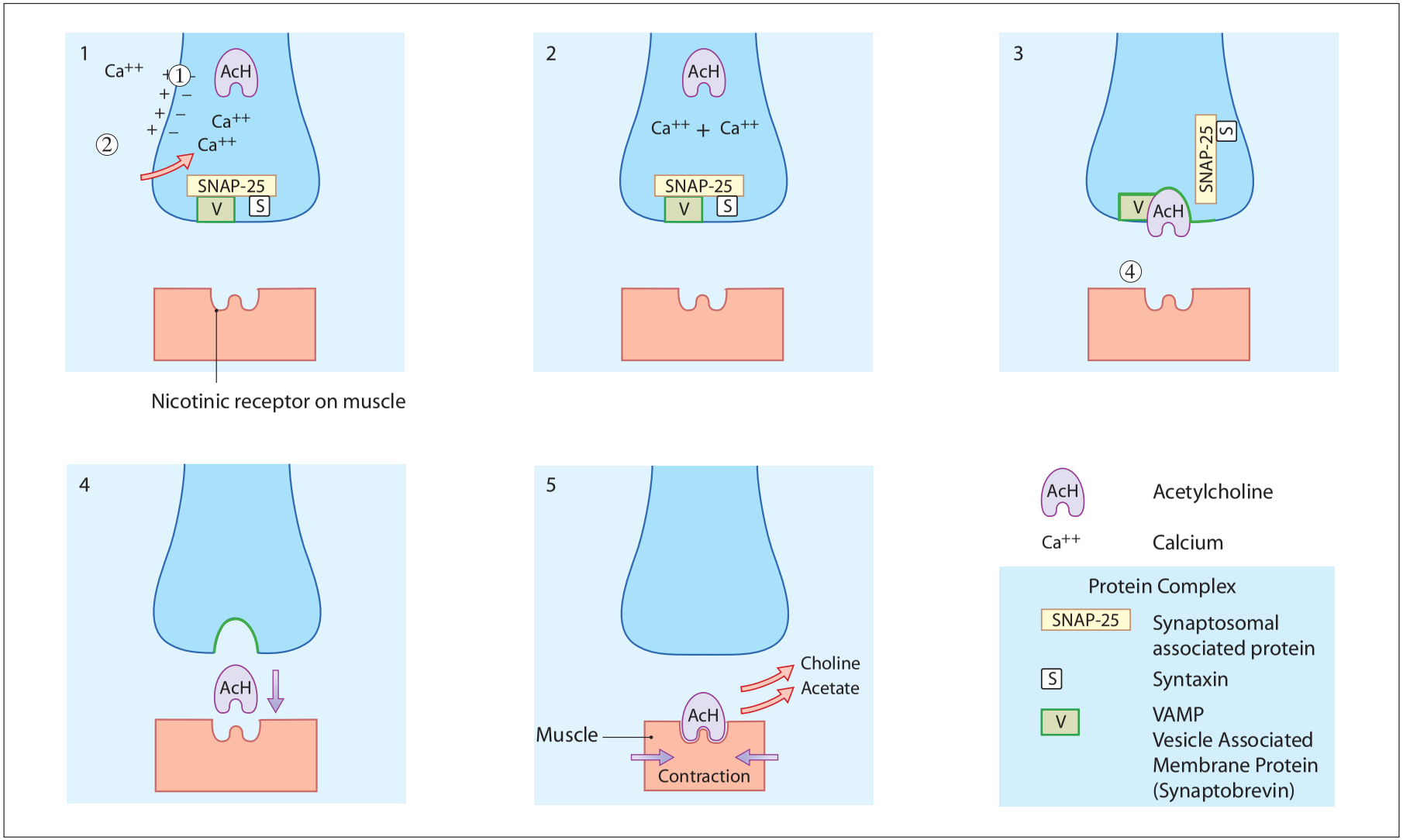


Fig 6.1 Normal cholinergic transmission and action of botulinum toxin at the neuromuscular junction: effects of drug and disease interactions (circled numbers). ① Calcium channel blockers: aminoglycosides, ciclosporin; ② Tumour antigen antibodies block calcium channels (Lambert Eaton syndrome); ③ Block binding of BTX heavy chain to synaptogamin: chloroquine and hydroxychloroquine; ④ Block nicotine receptors: antibodies, e.g. myasthenia gravis, D-penicillamine; 5, Post synaptic acetylcholine antagonist: tubocurarine, gallamine, pancuronium. Agonist blocker: succinylcholine.

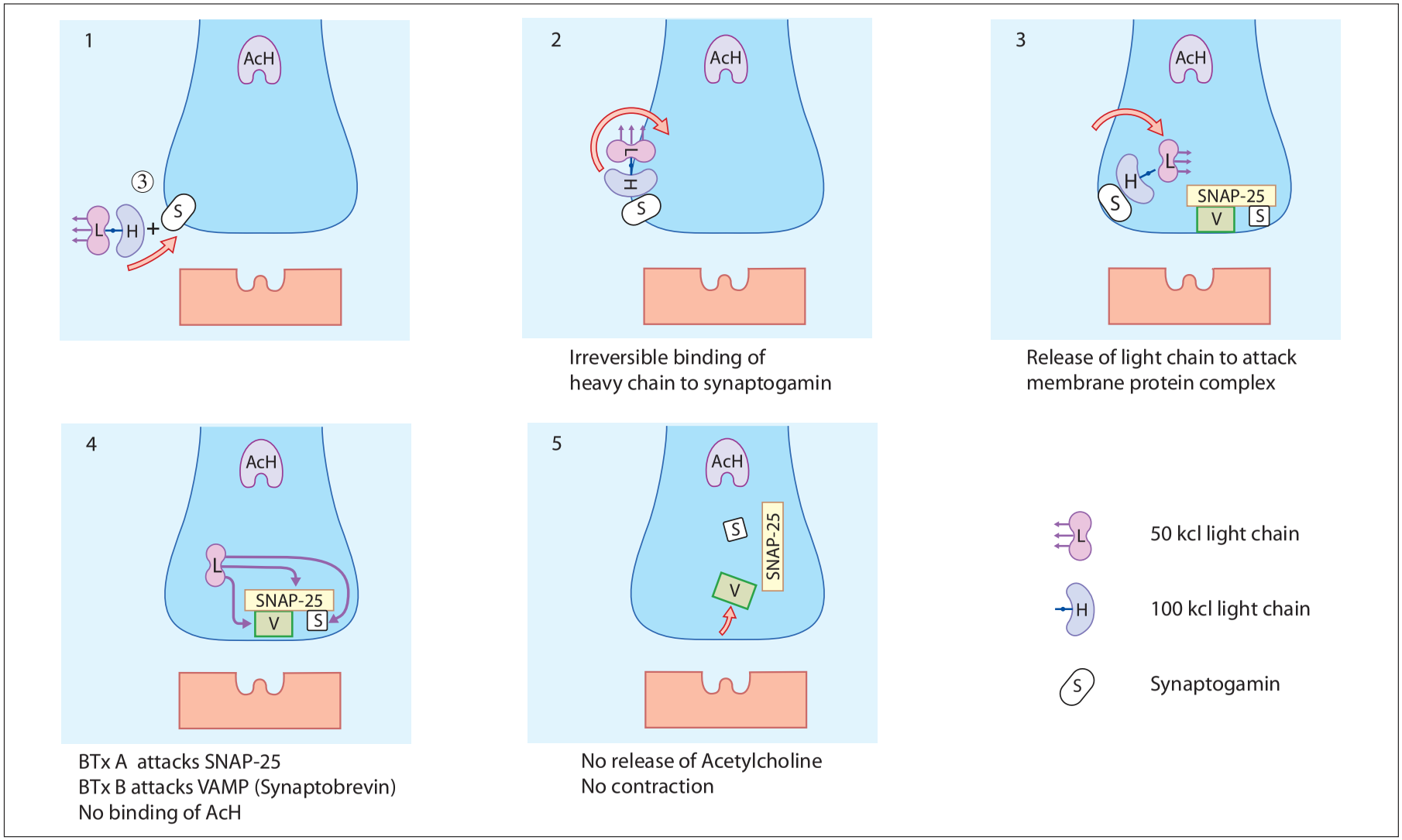

1
AcH
3
L
H
+
S
2
AcH
L
H
S
Irreversible binding of
heavy chain to synaptogamin
3
AcH
L
H
S
SNAP-25
V
S
Release of light chain to attack
membrane protein complex
4
AcH
L
SNAP-25
V
S
BTx A attacks SNAP-25
BTx B attacks VAMP (Synaptobrevin)
No binding of AcH
5
AcH
S
SNAP-25
V
No release of Acetylcholine
No contraction
L
50 kcl light chain
H
100 kcl light chain
S
Synaptogamin

Fig 6.1 *Cont'd.*

- **Medication with succinylcholine (an agonist blocker) produces a prolonged depolarization with reduced contraction.**
- **Tubocurarine, pancuronium and gallamine are antagonist blockers that compete with acetylcholine for end-plate receptor sites.**
- **D-penicillamine can produce myasthenia gravis-type antibodies.**

Drugs which reduce the action of botulinum toxin

The antimalarials chloroquine and hydroxychloroquine, and the immunosuppressant ciclosporin can reduce the action of botulinum toxin.

Neuromuscular disorders

It is of paramount importance to avoid botulinum toxin in patients with neuromuscular disorders. Many such disorders are inherited and so a thorough family history must be taken with this point in mind.

General and local anesthesia

Administering botulinum toxin at the time of general or local anesthesia gives less predictable results. Avoid injecting botulinum toxin to the eye zone in patients who have had local anesthesia for blepharoplasty.

Also avoid giving botulinum toxin in the post-operative phase where there is local oedema, in order to reduce the risk of distal diffusion and, for example, perioral palsy.

Pregnancy and breast feeding

The teratogenicity of botulinum toxin has not yet been established and so it is contraindicated in pregnancy and during breast-feeding.

Allergy

A history of allergy to any ingredient in the formulation, including albumin.

Infection at the proposed injection site

Contraindications:

- **Eaton Lambert syndrome**
- **Myasthenia gravis**
- **Neuromuscular disorders (check family history)**
- **Aminoglycosides, e.g. streptomycin, gentamycin, kanamycin**
- **Certain drugs used during anesthesia, e.g. succinylcholine, tubocurare**

Contraindications (*continued*):

- **D-Penicillamine – used in rheumatoid arthritis**
- **Chloroquine, hydroxychloroquine (antimalarials)**
- **Ciclosporin (immunosuppressant)**
- **Pregnancy**
- **Infection**

USER TIP

Search the patient's history for any hint of muscle or nerve weakness that they may not be aware of. Enquire about episodes of intermittent drooping of the eyelid.

USER TIP

Take care to document that the patient has denied any contraindications.

RELATIVE CONTRAINDICATIONS

Many patients who come for botulinum toxin treatment for rhytids are self-referred. Their motivation is based either on a drive for self-improvement or a desire to 'have what their friend has had', i.e. a wrinkle-free forehead. Reserve judgment on their suitability for treatment until a careful assessment has been carried out. This is dealt with in detail in Chapter 5, and most of the side effects discussed in the present chapter can be avoided by rigorous patient selection. In addition, patients must be provided with detailed written information about the poisonous nature of the botulinum toxin as well as about the other risks associated with treatment.

If fully informed, most patients have reasonable expectations. Once in possession of all the facts, they are in a position to decide what risks to take and when. They may be happy to risk walking down the aisle with a camouflaged bruise, or may prefer to postpone this risk until after their 'big day', and opt to keep their frown instead. If their treatment will be unpredictable (e.g. the treatment of a deep frown in a patient with moderate lash/brow distance and a moderate transient risk of immobile brows) then let them know about this. They can always change the date of their appointment to avoid it clashing with a big occasion.

USER TIP

Avoid treating patients who cannot fully understand the risks being discussed.

Table 6.1. Patients' complaints after injections of botulinum toxin (BTX) for their rhytids.

Complaint	Most likely cause
It didn't work!	BTX denatured.
It didn't last!	BTX too dilute or too old.
I'm still frowning!	Patients don't understand what you have told them about their low brows and the treatment of frown! (see Chapter 8)
Patient looks tired	BTX to forehead causes brow ptosis.
My eyes are swollen!	Due to protrusion of upper and lower lid orbital fat and skin from weight of flaccid brows and flaccid lower septum.
Peaked eyebrows	BTX over 75% of medial brow only.
Hollow socket	BTX to inferolateral canthus in certain patients.
Epiphora	BTX over lacrimal pump.
Severe bruising	BTX over branch of maxillary vein.
Unnaturally wide lateral palpebral aperture	BTX to pretarsal orbicularis muscle.

Table 6.1 lists the most frequent complaints encountered in the author's practice during more than 10,000 treatments with botulinum toxin for rhytids. During this time the incidence of complaints has dropped dramatically, probably as a result of more rigorous patient selection and counseling.

PATIENT COMPLAINTS

Complaint: 'It didn't work'

Dysport® and NeuroBloc® usually start to work within 24 hours, but it is advisable to warn patients that results are not immediate, and that they may notice nothing for up to five days.

It is possible to get a bad batch of toxin, albeit very rarely. Both Allergan and Dysport® will replace a faulty vial immediately, free of charge. Take care not to agitate the solution and to follow storage guidelines carefully (see Chapter 4). The most likely cause for a failure of the toxin to work is inappropriate handling of it.

See the patient as soon as possible. Confirm that treatment has not worked. It is wise to examine your files for other patients who received treatment from the same batch. Offer to re-treat at no extra cost and re-examine within two weeks. If there is still no effect, the patients may be resistant to the toxin and will have to pay for any further treatment using an alternative toxin.

USER TIP

Advise patients to re-attend with their complaint – but not earlier than one week, and not later than three weeks.

Complaint: 'It didn't last'

Examine the patient if possible, but this complaint is usually made at a follow-up visit. Check the batch used and the other patients treated with it. The patient is usually right. The most likely cause will be excessive dilution of the botulinum toxin or denaturation by agitation or the wrong room temperature.

Reassure the patient. Resist any temptation to re-inject within 12 weeks in order to avoid the risk of stimulating antibody formation (see below). Use a different strength, or more sites, next time.

Complaint: 'I'm still frowning'

Examine patients within three weeks but not before 10 days. This allows the toxin to take effect. Give more botulinum toxin if stray residual active fibers are genuinely visible. Spend more time on counseling if the result is what you have aimed for i.e. some residual brow movement and lift in a moderate- to low-browed patient.

Do not give more toxin to the lateral frontalis against your better judgment. A tired-looking patient will be far less happy than a partially frowning one.

Complaint: the patient looks tired

This is due to an unexpected lack of brow movement in a moderately low-browed person. It can also occur when botulinum toxin diffuses too far medially. The tonic orbicularis under the eyelid is loosened, allowing the infra-orbital fat pad to protrude.

Spend time reassuring patients that the maximum effect is transient, and that the extra muscles involved have received only the 'edge' of the treatment as the toxin diffused. This means that they will recover much sooner that the central muscles, and that a tired look rarely lasts for more than four weeks. Increase brow movement with scalp aponeurosis exercises.

Complaint: 'My eyes are swollen'

A sudden onset of swelling and puffiness around the eyes, if pathological, is almost always due to allergy (associated with itch, hayfever etc.) or infection (associated with erythema, pain, temperature). In the author's experience a local allergic reaction to botulinum toxin is uncommon although it can occur in those who react to albumin. Care must be taken with patients in the 60+ age group. Such patients have greatly reduced skin elasticity and tone. This results in sagging of the forehead skin (causing brows to drop) and sagging of the periocular skin (causing upper and lower lid bags). Many patients use their frontalis muscle to suspend the sagging brows and upper lids. They hold their forehead muscle in a permanent frown, causing high arching brows and nice deep upper lids. Treatment of such a frown with BTX will automatically relax the frontalis, throwing their brows down and their lid skin onto their lashes.

These patients may complain of droopy lids and 'swelling' over their eyes due to BTX, when in fact it is simply the skin sagging because the brow position has been lowered. Try to demonstrate this possibility to the patient by manually pressing their brows down. Avoid BTX unless blepharoplasty and/or brow lift has been performed.

Swollen eyes after Botox® mean that the natural orbital fat and skin folds have protruded. Demonstrate this to the patient by asking them to look in a mirror with their head tilted upwards, a position that allows the fat to sink back into the sockets. Also lift the brows up actively with your hands while they watch the effect in the mirror. Reassure as above.

Complaint: peaked eyebrows

This is dealt with in Chapter 8. Incomplete paralysis of the frontalis muscle is often chosen to achieve a natural effect. The aim is to retain some forehead movement while freezing the frown. The problem is that residual active frontalis fibers may sometimes, unpredictably, distort the shape of the brows. A symmetrical treatment may result in asymmetric brow peaking (Fig 6.2). Some patients have naturally asymmetrical eyebrows: others experience contra-lateral overaction of untreated frontalis fibers as the opposite side fails to respond to stimulation. This is common in squint patients whose eye muscles work as part of a yoke mechanism. Contraction of the medial rectus on one side is associated with contraction of the contra-lateral lateral rectus. Under-activity of one muscle e.g. the lateral rectus due to abducens palsy, will result in over-activity of the opposite medial rectus (Herring's law).

Fig 6.2 Unnatural brow peaking following botulinum toxin to glabella in a patient with overactive lateral frontalis fibers.

Examine your patients carefully before starting treatment. Try to predict asymmetry. It is best to give an initial symmetrical treatment with a view to 'balancing' the effect within two weeks of the first treatment. Very little botulinum toxin is needed to achieve the correct effect e.g. 0.025ml (see dose box) subcutaneously. Avoid using too much as this can cause brow ptosis.

Complaint: a droopy eyelid

Ptosis is the term used for a droopy eyelid. The distance from the lower lid margin to the upper lid margin (the palpebral aperture) varies. Some patients have visible sclera below and above their limbus (edge of the cornea). This may occur in myopic patients with naturally large eyes; in patients with thyroid eye disease; or in those with unusually shallow orbits.

The eyelid is elevated by the levator palpebrae superioris muscle (normal range is 17mm from looking down to looking up) and Müller's muscle – a supra-tarsal collection of involuntary smooth muscle fibers. The voluntary levator muscle elevates the lid, while Müller's muscle is responsible for fine tuning lid height and 'setting' it. Müller's muscle is only responsible for 2 mm of lid height and paralysis, e.g. in Horner's syndrome, therefore causes only 2 mm of ptosis.

The upper eyelid margin of most patients rests 2 mm below the limbus and is symmetrical. Unilateral ptosis will often result in a raised eyelid on the other side and, likewise, the illusion of ptosis can be created by unilateral lid retraction causing lowering of the opposite lid (Herring's law).

USER TIP

Always look for lid symmetry before giving botulinum toxin.

Congenital ptosis is relatively common, and age-related ptosis even more so. The latter is due to involutional weakening of the levator muscle attachments. It can be subtle at first i.e. less than 1 mm, and is usually associated with elevation of the lid crease as the skin-muscle attachment separates from the original crease. Ptosis is often worse in the evening and, in age-related ptosis, the eyelid will be lower than the normal lid on looking down. It is important to note that patients with levator aponeurosis disinsertion (age-related ptosis) usually raise their eyebrows to 'hold' the lid height. This can be a subtle change and failure to detect it prior to botulinum toxin treatment will result in the unmasking of a pre-existing ptosis.

There have been several reports of ptosis due to botulinum toxin, but some of these refer to brow ptosis, not to true ptosis. Brow ptosis will occur in any patient with an overactive frontalis muscle and involutional descent of the

brows. It is not due to botulinum toxin to eyelid muscles although brow ptosis can lead to an eyelid being pressed to a lower height by the simple effect of the weight of the brow on it. This can be identified by replacing the brows manually and observing the return of normal lid height.

True ptosis following botulinum toxin is due to inadvertent treatment of the levator palpebrae superioris muscle. Reported incidents occur if toxin diffuses through the orbital septum and usually last less than two weeks. The incidence is low and the author has not seen a case in 14 years of experience with botulinum toxin, perhaps as a result of avoiding the levator muscle and never injecting medial to the lateral orbital rim. Unless experienced, practitioners should also avoid injecting the corrugator muscle from the inferior aspect of the brow, particularly in patients with a low lash/brow distance.

Treatment of botulinum-induced ptosis is reassurance, reminding the patient that it will recover as the BTX wears off. Recovery is reported to occur between 2 weeks and 3 months. Some recommend using apraclonidine 5% (Iopidine®) eye drops to stimulate Müller's muscle. This will result in a temporary elevation, but only of 2 mm. Apraclonidine is an alpha-adrenergic stimulator used to reduce intra-ocular pressure and has several ocular side effects: its use in the treatment of transient ptosis occuring as a result of cosmetic application of botulinum is therefore questionable. The risks posed to the eye by use of apraclonidine must be balanced against the fact that the ptosis will undoubtedly recover when the botulinum wears off.

Complaint: a watery eye

Epiphora means a 'watery eye'. It is an unusual complaint but can either be due to paralysis of the lachrymal pump or to paralysis of the lower lid orbicularis.

Paralysis of the medial pre-tarsal orbicularis prevents the suction of tears into the lacrimal sac that normally occurs with blinking. It is often seen with Bell's palsy. It can be avoided by not injecting botulinum toxin medial to the mid-pupil line.

Another cause of epiphora is excessive laxity of the inferior pre-tarsal orbicularis. The resting tone of the muscle is reduced and so the height of the lower lid drops. The increased palpebral aperture may undermine the normal tear film. The tear film break-up time may increase and the ocular area exposed to the atmosphere may be too great for the volume of tears produced. This results in inadequate lubrication of the eye (a dry eye) BUT manifests itself as epiphora. When the eye is dry, the blink reflex causes the lid to pass over a dry surface, creating 'microscratches' on the cornea. This stimulates trigeminal nerve fibers and results in tears, and a watery eye. Unfortunately this reflex flow of tears is often not enough to cure the

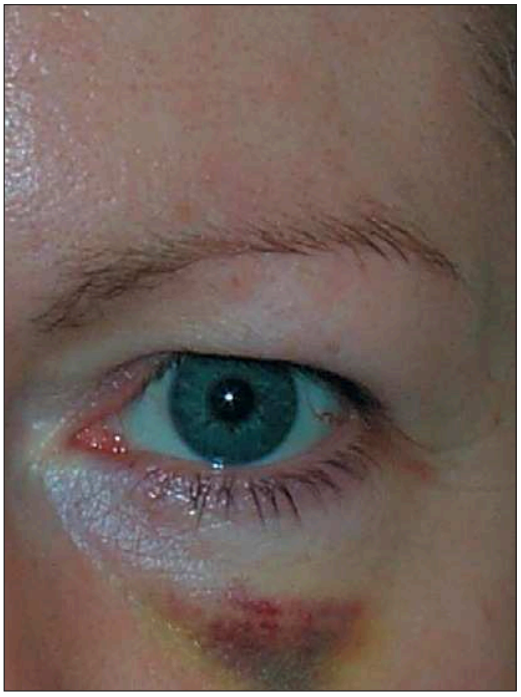


Fig 6.3 Bruising following botulinum toxin injection to lateral canthus for crow's feet.

dry eye and may be accompanied by a gritty sensation. Remember that a reduction in the tear film, and mildly dry eyes, are common in menopausal women.

The treatment of epiphora due to pump inaction is to wait until the botulinum toxin wears off. The treatment of a dry eye is lubrication. Recommend over-the-counter preparations such as Tears Naturale®, Artelac® or Liquefilm Tears®. More viscous agents, such as Vidisic® gel or gel tears, help if the patient is outdoors and at night. Lacri-Lube® (petrolatum eye ointment) may be recommended in severe cases for use at night. If these measures fail, consider referral to an ophthalmologist for other types of management such as temporary lachrymal plugs.

Other complaints in Table 6.1

These are dealt with in Chapters 7 and 8. Experience in the art of botulinum toxin usage will help to avoid them. However, bruising due to damage to intramuscular arterioles is completely unavoidable. Figure 6.3 shows a recent patient who had botulinum toxin prior to lower lid blepharoplasty. Recommend a suitable camouflage cream.

SIDE EFFECTS

The side effects of botulinum toxin are usually minimal: one of the deadliest poisons known to mankind is also one of the safest when used correctly.

Resistance

Most reported side effects follow the injection of toxin at high doses for the treatment of cervical dystonia and other large muscle disorders. Antibody production has not been reported in patients receiving less than 50 units Botox®. In one study, the production of immunoglobulin G autoantibodies occurred in 4.3% of patients receiving botulinum toxin for torticollis. Those who have developed antibodies to Type A should still respond to other serotypes. It is noteworthy that no resistance has been reported in patients receiving botulinum toxin for aesthetic reasons, but as patients receive higher doses to include neck rhytids, the risk of resistance must be kept in mind. Current advice is to avoid repeating injections within three months and to avoid booster injections.

USER TIP

Lessen the risk of developing resistance by avoiding booster injections and treatments less than three months apart. Use the smallest dose necessary.

General

Patients have complained of generalized side effects, such as an influenza-like illness and headache. Certain rare side effects, such as generalized muscular weakness, are believed to be due to the dissemination of botulinum toxin via the blood stream. Botulinum toxin does not cross the blood /brain barrier.

Dysphagia can occur after the injection of botulinum toxin for cervical dystonia, and is due to local diffusion from the injection site. The use of low volume doses at high concentrations will limit this. Dysphagia has been reported following cosmetic use in the neck: neck weakness has also been reported. These symptoms usually subside after two to three weeks.

Bruising is an inevitable side effect of any intramuscular injection. Cutaneous vessels can be seen and avoided, but patients must accept the risk of ecchymoses from hidden vessels. Bruising in the lower lid can track down to the neck. Compress the injection site immediately after treatment and apply ice. Avoid injecting patients taking aspirin, non-steroidal anti-inflammatory preparations or *Ginko biloba* – a homeopathic inhibitor of platelet function – in order to reduce the risk.

7 The management of crow's feet

'Crow's feet' are the wrinkles that form with age at the outer corners of the eyes. They are due to contraction of the orbicularis oculi muscles (Fig. 7.1). Their treatment with botulinum toxin is usually straightforward but certain aspects must be considered carefully first.

The functions of the orbicularis oculi muscle are to close the eye, to drain the tear film, and to create facial expressions. Contraction of this muscle can also drag on the lateral third of the eyebrow, contributing to drooping of the brow with age. In addition, the resting tension of the orbicularis oculi muscle can increase with age and character.

Many patients keep tension at the lateral canthal angle constant, and so have pleasant 'smiling eyes'. This tension can be important to the appearance of the patient: it results in rhytids, but also supports an ageing midface in some patients. It can also prevent the protrusion of age-related lower lid 'bags' (orbital fat) by supporting the orbital septum.

Injections of botulinum toxin will smooth out the rhytids and make the skin look younger, but patients may begin to look 'thin' around their eyes as they lose muscle bulk after repeated injections. They may also look 'drawn' or tired as their mid-face falls over the zygomatic arch. Such changes usually do not become apparent until several treatments have been undertaken. The loss of tension can reverse with time as the orbicularis muscle rarely atrophies permanently; this has been shown by the results of long-term botulinum toxin treatment of orbital blepharospasm.

This chapter covers the assessment and treatment of crow's feet. It is important, however, to re-examine patients before every treatment and to

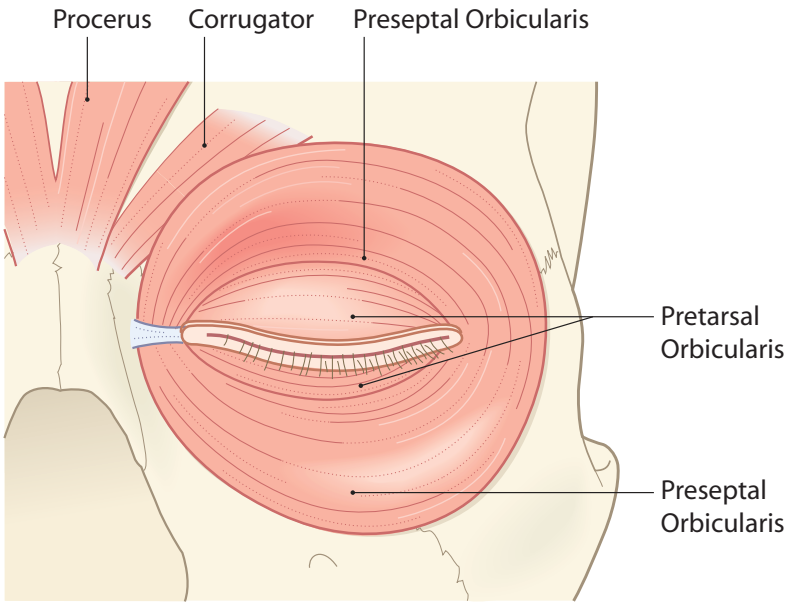


Fig 7.1 Anatomy of orbicularis oculi muscle. After Zide BM and Jelks GW (1985) Surgical Anatomy of the Orbit. Raven Press Books, Ltd. New York. With permission of Barry M Zide.

make sure that they will still look well because of it. Make certain that the botulinum toxin can do for the patient what the patient expects.

USER TIP

Botulinum toxin will paralyse the orbicularis muscle, making it flaccid and even atrophic. This will stop wrinkles, but the loss of muscle tone will not suit everyone.

PATIENT EXAMINATION

- **Examine patients both from the front and the side.**
- **Examine them at rest and when smiling.**
- **Try to imagine what relaxation of their orbicularis muscle will do to their appearance.**

WHAT TO LOOK FOR WHEN EXAMINING A PATIENT

- **Examine the tone of the orbicularis oculi muscle and the position of rhytids.** Are the wrinkles deep? Spread the skin gently between your fingers. Are they still

very obvious? If they are, tell patients that they might not notice much effect from the treatment. Advise them about laser resurfacing and skin management (Chapter 11). If the wrinkles are mild, advise patients that they might get a permanent effect with time and good skin care. (Fig. 7.2ab)

- **Examine the facial skin and muscle tone** by asking patients to smile while pressing lightly on the zygomatic arch with two fingers. This stops the orbicularis muscle from contracting and so simulates the paralysis of botulinum toxin.
- **Patients with severe sun damage or poor skin tone** (often older patients) will observe that, on smiling, the cheek and orbicularis oculi muscles elevate the

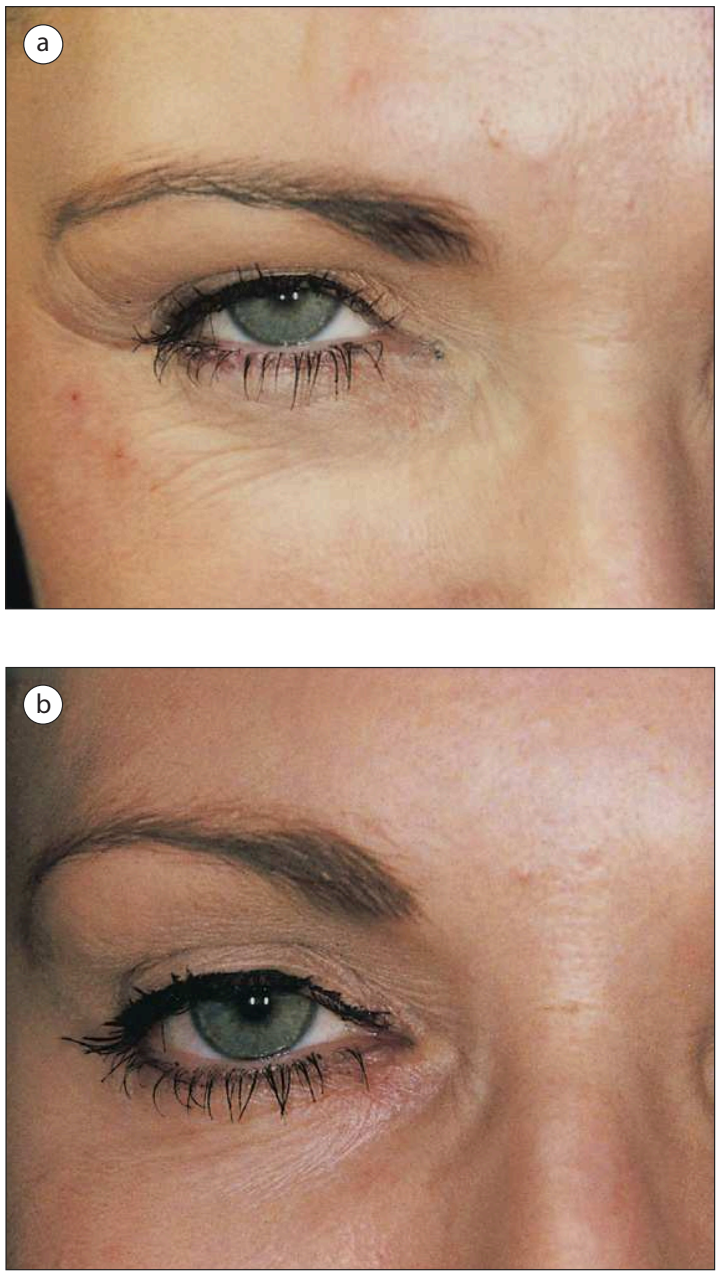


Fig 7.2 Before (a) and one year after (b) Botox® to crows feet and forehead.

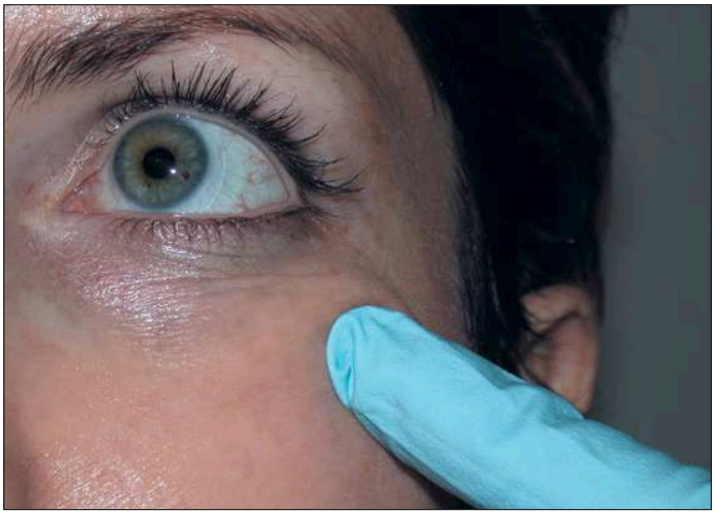


Fig 7.3 Patient with poor skin tone and wrinkles at rest. Ask patient not to smile. Push skin up over zygomatic arch. Demonstrate to patient the wrinkles that occur at the crow's feet due to deterioration of skin tone. These will also occur when the patient smiles and their smile 'pushes' the cheek up, even when BTX has paralysed the lateral orbicularis oculis.

facial skin and send it into folds around the lateral orbit. Show patients that this will also happen after botulinum toxin treatment to the crow's feet (Fig. 7.3), otherwise they will think that the injections have not worked. It is often wisest not to treat such patients unless they have had surgical or laser correction of skin tone (Chapter 11).

- **The Mickey Mouse sign:** occasionally patients (especially men over 50 with good skin tone) notice that smiling causes their wrinkles to 'bunch up' at the level of the zygoma after treatment of their crow's feet. This can create a curved wrinkle running from the lower orbital rim, out along the inferior border of the orbicularis oculi, over the zygomatic arch, to the top of the orbicularis oris (the Mickey Mouse smile). The periocular fibers have atrophied as planned, but the resting skin tone prevents elevation of the periocular skin and muscle on smiling. The excessive tone of the orbicularis oris, however, associated with thinning of lateral orbicularis oculi fibers, makes the smile appear much wider than the upper face. Take care with such patients.

- **Examine the contour of the socket.** Is it shallow, allowing anterior displacement of orbital fat and bags? Does the inferior orbital rim protrude? Is it recessed behind the level of the anterior surface of the cornea? This may also be assessed by the 'pencil test'. Ask the patient to hold a pencil vertically against the anterior cheekbone. If this passes in front of the cornea (Fig. 7.4a), then the patient has good lower lid skeletal support. If the pencil only reaches the lash margin (Fig. 7.4b), then the patient is at risk of developing sagging of the lower lid and widening of the palpebral aperture if botulinum toxin is injected for pretarsal orbicularis wrinkles.

- **Examine the distance between the lash margin and the lower orbital rim, which increases with age.** A short distance means that the patient may have botulinum

Fig 7.4a Example of bone structure where a pencil will pass from the maxilla in front of the cornea.

Fig 7.4b Some patients have a maxilla which recedes from the inferior orbital rim. A pencil will pass from the maxilla through the eye. This means that infero-orbital contents (muscle and fat) are prone to bulging in front of the orbital rim, creating 'bags'.

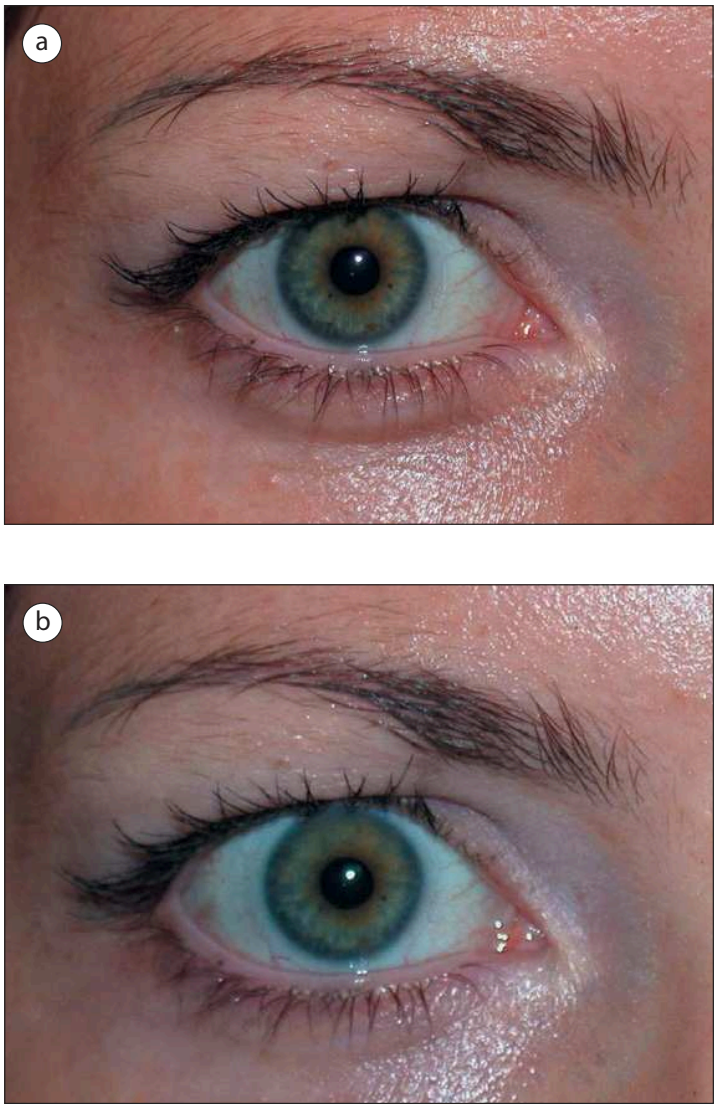


Fig 7.5 Short orbital rim–lash distance allows safe botulinum toxin to the preseptal orbicularis if hypertrophied. (a) is before Botox® and (b) is after Botox®.

toxin successfully to pretarsal wrinkles without protrusion of orbital fat or folds of skin (Fig. 7.5ab).

- **Examine the height and width of the zygomatic arch.** Does the orbicularis muscle sag between the cheekbone and the eye? Will this area develop a hollow appearance if the muscle becomes thinner? Such a hollowing can be unattractive if accentuated (Fig. 7.6). Discuss this and inject more laterally to avoid diffusion to the 'hollow'.
- **Take especial care over patients with large eyes and wide high cheekbones** (e.g. fashion models – Fig. 7.7). They are also, because of their large eyes, at high risk of sagging of the lower lid. The lower lid normally elevates with smiling as the palpebral aperture narrows and the orbicularis oculi contracts. Botulinum toxin will allow a more wide-eyed smile. This is often attractive, but never when

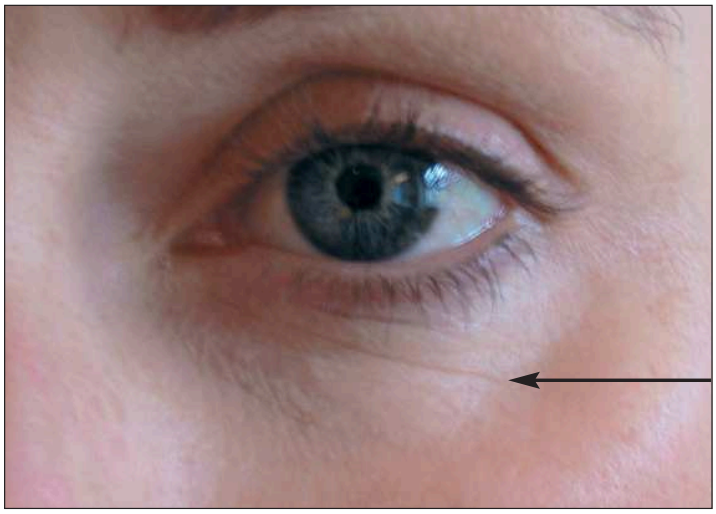


Fig 7.6 Hollowing after botulinum toxin (BTX) treatment. Avoid giving BTX on, or medial to, the infraorbital zygoma in a patient with high broad cheekbones. This would cause atrophy of overlying orbicularis and subsequent hollowing. Note hollowing (arrow).

Fig 7.7 Large eyes, wide high cheekbone: botulinum toxin close to the lower lid will weaken elevation of the lower lid and may increase the lateral palpebral fissure, creating a flat lateral lid instead of being angled above the height of the medial canthus.

the lateral corner of the lid falls below the medial, creating a pseudo lateral canthus inversus.

- **Look for a weak orbital septum or protruding orbital fat pads.** Ask patients to put their chin *down* and then to look up into the mirror – this will accentuate lower orbital fat pads. If fat protrudes, *do not* treat the skin under the eyelid as the subsequent loss of tone will cause temporary deterioration of the bags. These patients should have lower lid blepharoplasty and understand that only the wrinkles at the sides of their eyes will benefit from botulinum toxin.

Table 7.2. Side effects of botulinum toxin injections into the orbicularis oculi for crow's feet

Problem	Cause	Management
Thinning of muscle over zygoma	Injection in a patient with high, broad cheek bones	Inject more inferolaterally, below the zygomatic arch
Failure of lower lid to ascend with smile	Diffusion of BTX to pre tarsal orbicularis	If looks well, repeat! If not, inject more laterally next time
Watery eye (epiphora)	Diffusion of BTX towards lacrimal pump preventing tear drainage	Avoid pre-tarsal orbicularis medial to mid-pupillary line
Hooding	Wrinkle due to sagging skin and not orbicularis contraction	Counsel patient carefully. Recommend brow lift surgery or cheat with hyaluronic acid
Large fold of wrinkles below zygoma (Mickey Mouse sign)	Patient has good result but poor skin tone, causing wrinkling of lower face only with smile	Discuss carefully. Patient may benefit from full face resurfacing or face-lift. BTX may be contraindicated otherwise.

Side effects of botulinum toxin treatment for crow's feet

These may occur if the injections are placed in the wrong part of the muscle, given at the wrong dose, or given with unrealistic expectations. They are listed in Table 7.2.

Tear film

Botulinum toxin to the eye zone can affect the tear film in two ways: the need for tear film may increase, and the drainage of tears may be reduced.

Increased need for tear film

Weakening of the pretarsal orbicularis widens the palpebral aperture (as discussed above). This may aggravate an already compromised tear film by increasing the area requiring lubrication and by reducing the rate of reflex blinking. Such patients may complain of a dry gritty feeling or, more likely, of watery eyes. This is because drying of the eye causes the eyelid to scrape over the cornea and sclera, creating micro-epithelial defects and a sensation of grittiness. The resulting corneal stimulation provokes involuntary epiphora and a watery eye.

These patients should increase their artificial lubricants or lubricate occasionally with a gel substitute until the botulinum toxin wears off. Many lubricants are available without prescription and the trick is to use them frequently initially, then to wean them off according to symptoms.

Reduction of drainage of tears

Botulinum toxin can be injected into the pretarsal orbicularis to reduce a hypertrophic orbicularis muscle and early 'bagging' (Fig. 7.8). However it should never be injected close enough to diffuse towards the lower lid punctum. This would paralyze the lacrimal pump, causing a watery eye – unless, luckily, the patient was already suffering from a dry eye.

The lacrimal pump (Fig. 7.9) comprises fibers from the orbicularis that insert onto the vertical portion of the canaliculus and the lacrimal sac. Blinking contracts these fibers and dilates the canaliculus and sac. This creates a negative pressure drawing the tears along the lower lid margin into the lacrimal sac. Paralysis of the lacrimal pump occurs naturally in patients with facial nerve palsy. Treatment, if indicated, is by means of a glass tube (Lester Jones tube) inserted from the medial canthus to the nasal cavity.

Temporary paralysis of the lacrimal pump by botulinum toxin can be avoided by staying lateral to the mid-pupillary line, and by using low doses of high concentrations. This treatment is not recommended for the novice practitioner.

Lower lid bags (dermatochalasis and/or orbital fat)

Avoid injecting botulinum toxin medial to the outer orbital rim in patients with excessive lower lid skin and fat (Fig. 7.10) as this will cause sagging of the orbicularis muscle with protrusion of the inferior orbital fat. Remember, too, that botulinum toxin will diffuse to different degrees in different patients.

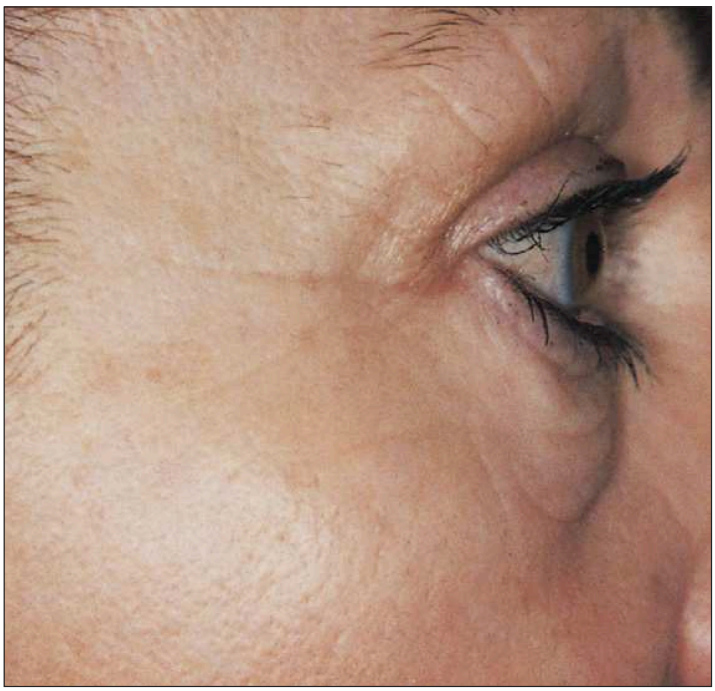


Fig 7.8 Hypertrophic orbicularis muscle.

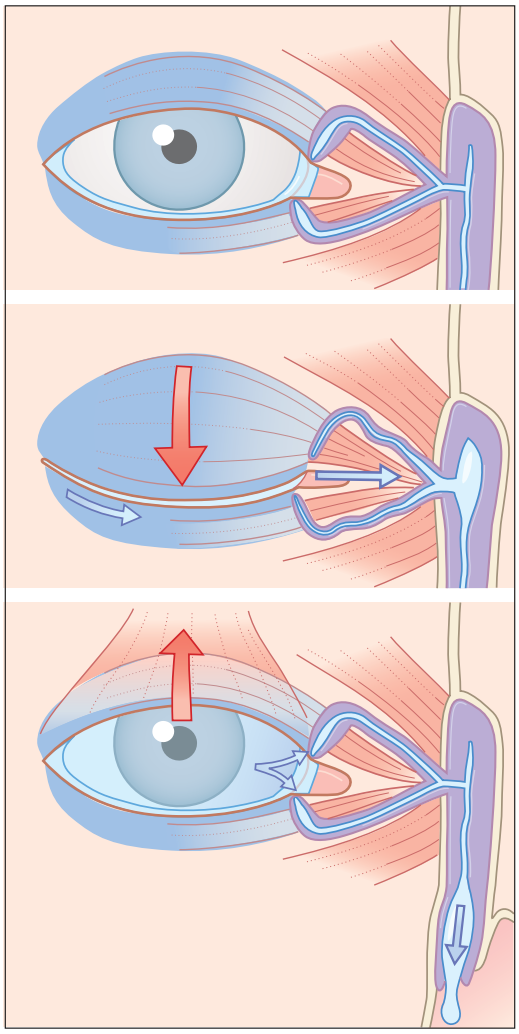


Fig 7.9 The lacrimal pump. Contraction of orbicularis fibers with blinking dilates the vertical portion of the canaliculus, creating a negative pressure which 'sucks' the tears into the lacrimal sac. After Zide BM and Jelks GW (1985) Surgical Anatomy of the Orbit. Raven Press Books, Ltd. New York. With permission of Barry Zide.

I have injected thousands of patients but was recently surprised to discover this side effect in a female smoker in her mid-forties with marked solar elastosis. I injected botulinum toxin as usual, including one centimeter inferolateral to her orbital rim. She developed temporary heavy bags under both eyes as the toxin diffused towards the pretarsal orbicularis bilaterally. Fortunately, she only received the 'tail end' of the diffused toxin here and the effect wore off after a few weeks, long before the rhytids returned. It is very unusual for that level of diffusion to occur and her poor skin quality was a contributory factor, but be warned! The same patient unfortunately refused to allow publication of her photographs.

Discuss blepharoplasty with such patients and demonstrate what they can expect from botulinum toxin alone.

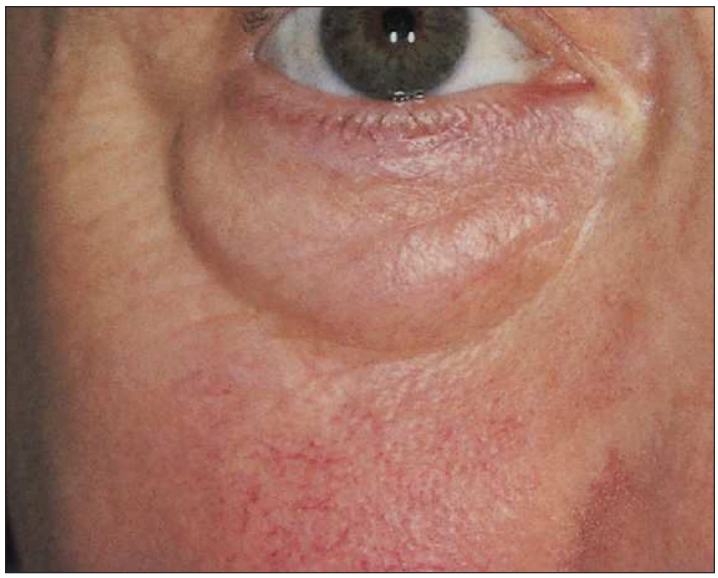


Fig 7.10 Lower lid 'bags'.

Hooding

Some crow's feet will persist despite botulinum toxin. These include the skin folds at the outer corners of the lids due either to brow ptosis or to sagging of the temporal frontalis muscle or both (Fig. 7.11). Discuss this with the patient and suggest correct treatment of these wrinkles. Mention that 'cheating' with hyaluronic acid will also be effective (Chapter 11).

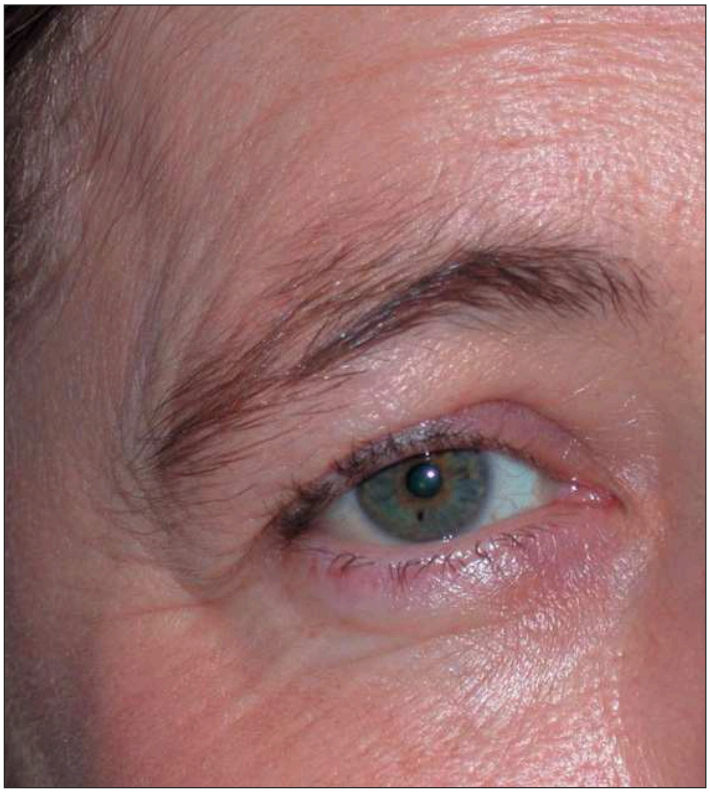


Fig 7.11 Eyebrow ptosis.

Table 7.1. Categories of crow's feet and their treatment

Type of crow's feet	Management
Wrinkles in motion	Botulinum toxin
Fine lines at rest	Botulinum toxin, collagen stimulation
Deep wrinkles at rest	Botulinum toxin, laser resurfacing, coblation
Deep wrinkles at rest with hooding	Botulinum toxin, laser resurfacing, hyaluronic acid, brow repositioning.

Method of treatment

Crow's feet may be categorized and treated accordingly, as shown in Table 7.1.

DOSE BOX

Botox®: 2.5 ml dil to 100 units vial = 4 units in 0.1 ml
Dysport®: 3 ml dil to 500 units vial = 16.6 units in 0.1 ml

Once the patient has been prepared, informed, examined, photographed and has consented, the recommended doses are as follows (drawn on photographs):

- **wrinkles in motion (Fig. 7.12): 0.05 ml x 2 each side.**
- **wrinkles in motion with lateral depression of brow (Fig. 7.13): as above with 0.025 ml lateral to point of contraction.**

Fig 7.12 Injection sites and dose for a young patient with wrinkles in motion.

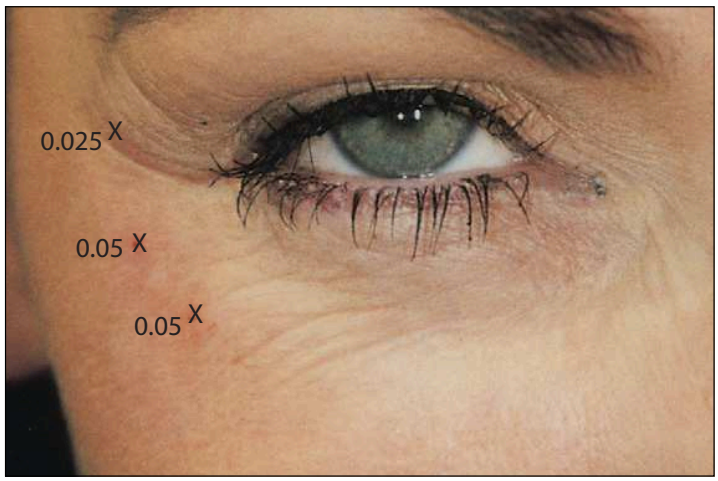


Fig 7.13 Injection sites for wrinkles in motion and at rest with wrinkles below lateral brow.

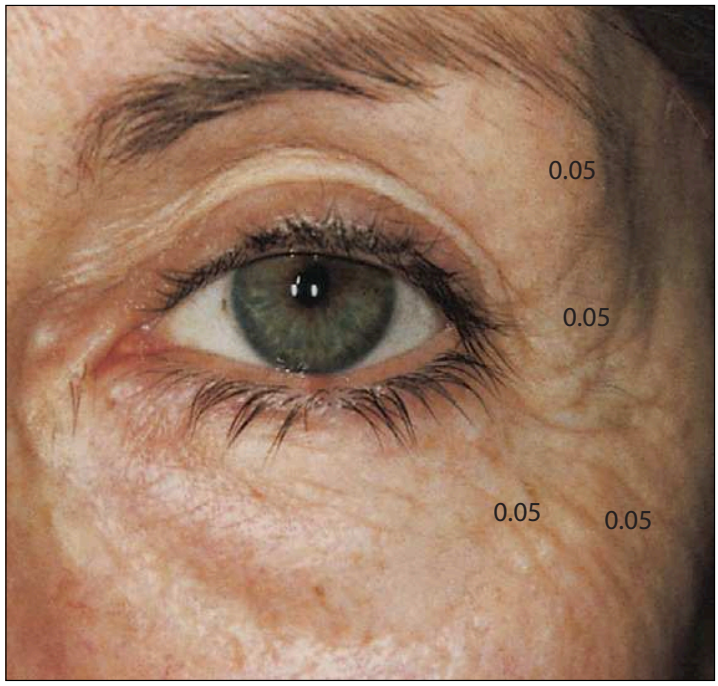


Fig 7.14 Deep wrinkles at rest extending over zygomatic arch. X, 0.05 ml.

- **wrinkles at rest extending over the zygomatic arch (Fig. 7.14): as above with 0.05 ml one cm inferolateral to lateral canthus.**
- **wrinkles at rest with orbicularis hypertrophy and no contraindication (see above) (Fig. 7.15): 0.0125 ml above and below pretarsal crease, lateral to the mid papillary line.**
- **high wide cheekbone (Fig. 7.16): 0.05 ml at outer canthus and 0.05 ml 0.5 cm below zygomatic arch.**

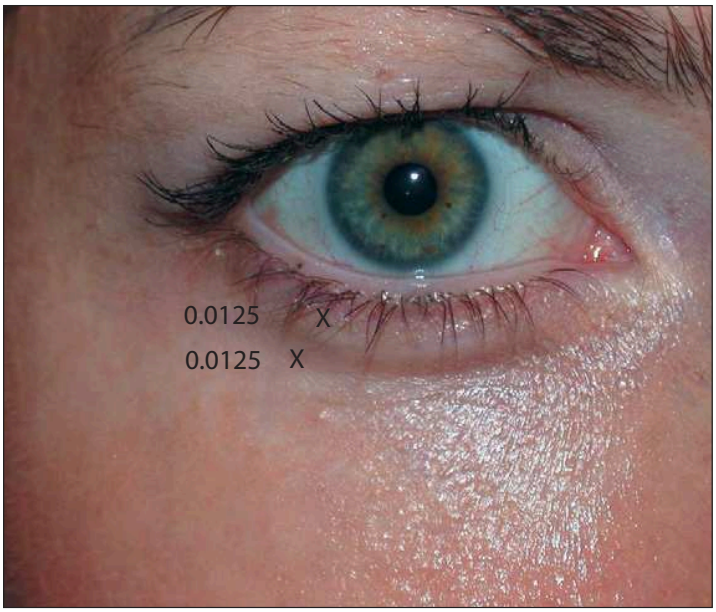


Fig 7.15 Treatment of crows feet with orbicularis hypertrophy.

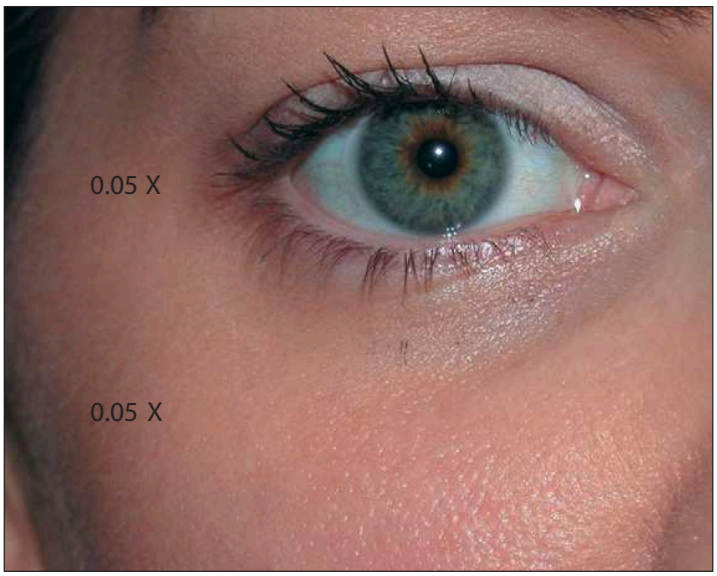


Fig 7.16 Treatment of high wide cheekbones.

8 Management of forehead wrinkles

Botulinum toxin is widely known to be an excellent treatment for smoothing out both vertical and horizontal forehead lines. Patients often ask for it to be used to treat their vertical (glabellar) frown, their horizontal lines, or put in a general request for improvement. It is important to find out at an early stage whether they are looking for total immobility of the forehead (this is often not possible – as explained below) or simply for a natural-looking effect with some residual forehead expression and greatly reduced wrinkles.

Forehead wrinkles are due to a combination of genetic and environmental factors, especially damage from light ultraviolet light. The contributions of both must be analyzed when patients attend for treatment. Make sure too that they do not expect the ablation of furrows as this requires CO_2 laser resurfacing for maximum effect.

Botulinum toxin to the mid-forehead can lead to permanent atrophy of the muscle fibers, with an excellent long-lasting result. This usually occurs after five or six treatments at 14-week intervals. The glabellar muscles always seem to recover after treatment but can, with time, diminish in size and function. Most patients continue to return for glabellar and crow's feet treatment, with an annual 'top up' to the mid-frontalis.

Treatment of the frontalis will inevitably affect the shape of the brow. This must be assessed carefully and discussed with the patient. The treatment of horizontal lines alone may avoid changes to the brow, but once the glabella has been treated, the frontalis must be balanced with the treatment.

Remember that the shape of the brow is subject to fashion. The author prefers the current trend for a female brow to have a slight arch at the junction

of the medial two thirds to the lateral third. More modern trends include a horizontal brow that elevates laterally. It is essential to avoid a 'Dr Spock' effect with a peak to the brow, usually achieved by the unopposed action of the frontalis on the mid-brow, and most likely to occur when the glabellar muscles are treated independently (see fig 6.2).

Tell your patients what to expect from botulinum toxin at this stage, and discuss how their foreheads might alter with age. Let them know that, although an injection might provide a nice temporary brow lift, in the long run this might have to be maintained by surgery.

Select patients as described in Chapter 5, and take great care to avoid treating the forehead of a patient with the rare neuromuscular disorder known as chronic progressive external ophthalmoplegia (CPEO). Remember that such patients may not yet have been diagnosed. Examine the eyes and eyelids of every new patient for signs of abnormal muscle function. If in doubt, refer to an ophthalmologist for examination before any treatment is attempted.

- **Chronic Progressive External Ophthalmoplegia (CPEO) is a rare neuromuscular disorder that causes progressive immobility of all the external ocular muscles and of the levator muscles of the eyelids. Patients eventually need an operation to attach their frontalis muscles to their eyelids (by a subcutaneous sling) so that they can open their eyes and see. The initial presentation is often a symmetrical ptosis with brow elevation.**

ANATOMY OF FROWN MUSCLES

An intimate knowledge of the anatomy of the forehead is essential for successful treatment. There will always be a few patients with variations on the normal anatomy, but the typical muscle attachments are shown in Figure 8.1. In particular note the following:

- **The frontalis muscle originates from the galea aponeurosis (near the hair line) and stretches to an insertion into the skin and the orbicularis oculi at the level of the eyebrows.**
- **The frontalis does not cross the midline and is separated by a central muscle-free zone at the base of the nose (Fig. 8.2). Movements of the galea aponeurosis unaccompanied by movement of the frontalis will cause wrinkling of the forehead skin, especially in patients who can voluntarily 'wiggle their ears' or 'move their scalp'.**
- **The bone at the base of the nose is covered by the procerus muscle (skin attachments only), blending into the corrugator muscle at the level of the**

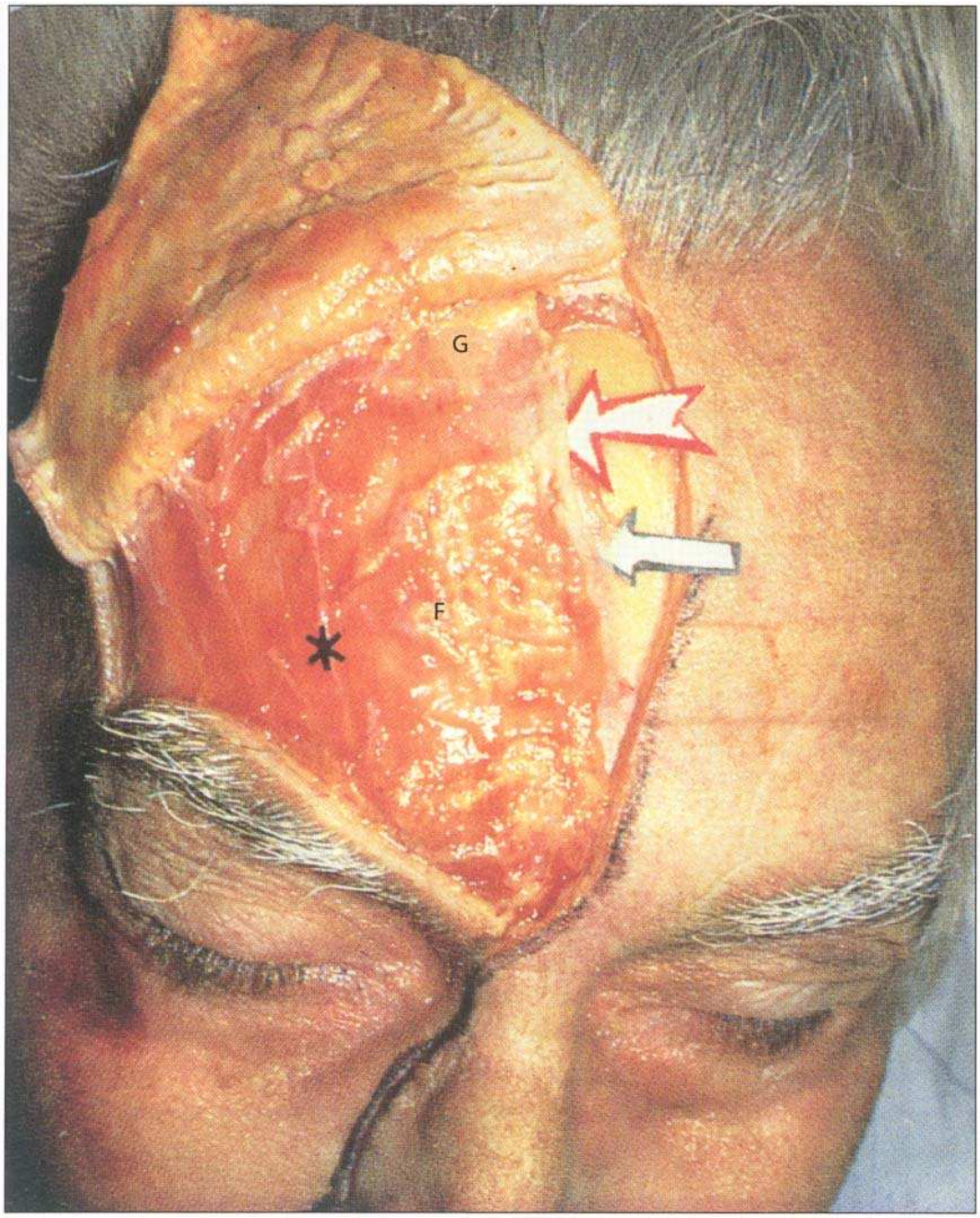


Fig 8.1 Anatomy of the forehead. The vertical fibers of the frontalis muscle (F) insert into the skin and orbicularis oculi at the level of the eyebrow. The frontalis muscle, innervated by a branch of the seventh cranial nerve, originates from the galeal aponeurosis (G). The red arrow tip is inserted below the galea. The black arrow tip lies beneath the periosteum of the frontal bone. Note the sensory nerve (*), a branch of the supraorbital nerve coursing over the muscle. The frontalis muscle usually does not cross the midline. From Zide BM and Jelks GW (1985) Surgical Anatomy of the Orbit. Raven Press Books, Ltd. New York. With permission of Barry Zide.

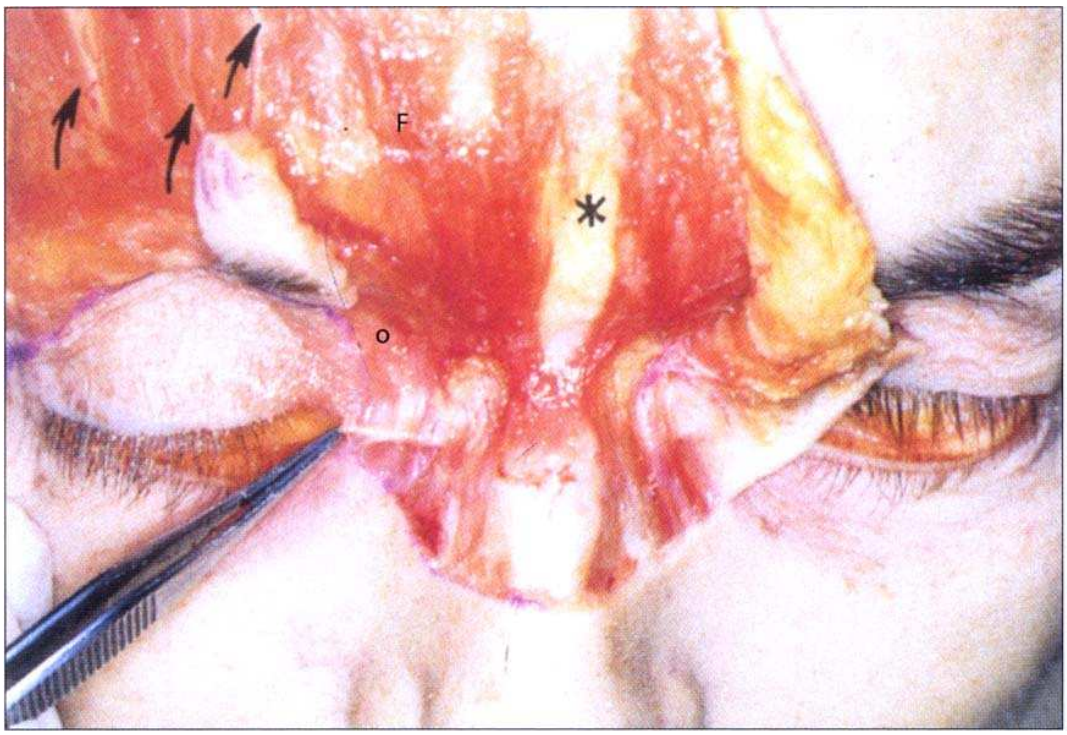


Fig 8.2 Note that the frontalis fibers do not cross the midline. Note the paired frontalis muscles (F) with their central muscle-free zone (*). The supraorbital nerves are noted coursing upward (small arrows). The forceps grasp the anterior portion of the medial canthal tendon. Note the orbicularis oculi fibers (o), some of which originate from this tendon. From Zide BM and Jelks BW (1985) Surgical Anatomy of the Orbit. Raven Press Books, Ltd. With permission of Barry Zide.

eyebrows, and the medial fibers of the orbicularis oculi below the medial part of the brow (Fig. 8.3).

- **The corrugator muscle arises from the nasal process of the frontal bone. It is responsible for drawing the eyebrows together, creating the vertical glabellar rhytid. The corrugator lies deep to the frontalis, the procerus, and the supraorbital nerves and arteries. It attaches to the skin above the medial aspect of the eyebrow.**
- **The vertical fibers of the orbicularis oculi, which run superomedial to the medial canthal tendon, attach to the medial brow and are known as the depressor supercilii. The angular veins are embedded in this muscle.**

EXAMINATION OF BROW/FOREHEAD RHYTIDS

- **General appraisal**
- **Specific glabella (vertical frown) examination**
- **Specific forehead (horizontal frown) examination**

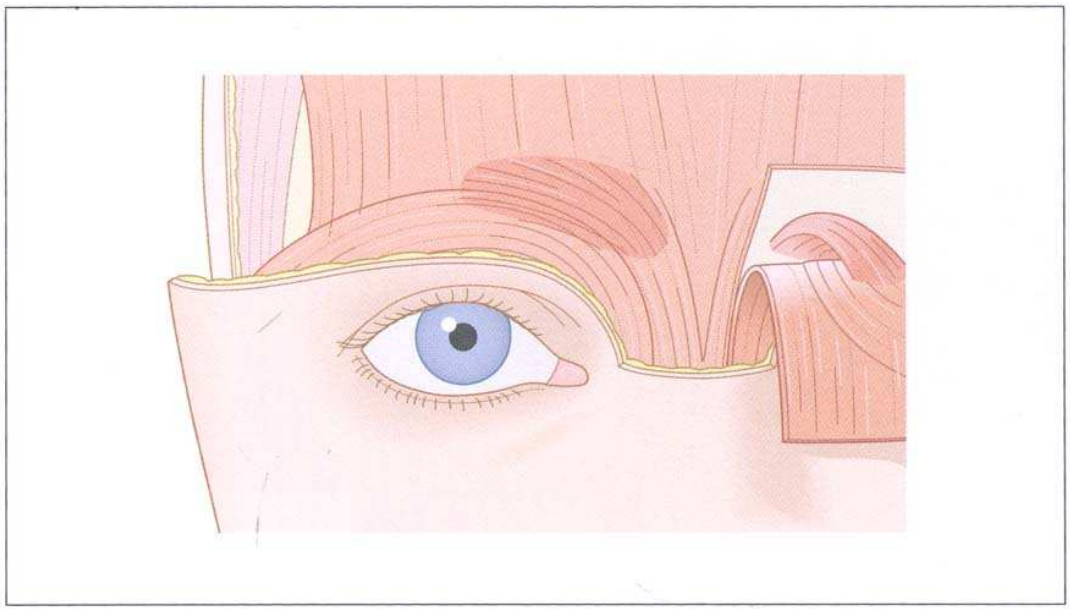


Fig 8.3 The glabella complex. After Zide BM and Jelks GW (1985) Surgical Anatomy of the Orbit. Raven Press Books, Ltd. New York. With permission of Barry M. Zide.

General appraisal

- **Eyebrows**
- **Hairstyle**
- **Ptosis**
- **Dermatochalasis**

First examine your patient carefully and decide what botulinum toxin can do for his or her particular type of lines. Decide at this stage whether or not botulinum toxin treatment will eliminate the wrinkles. Will laser resurfacing be needed? Will the vertical lines also require a filler? (Chapter 11)

Eyebrows

Examine the eyebrows. Are they heavy or groomed? Some brows look as if they have descended because of their excessive growth of hair. Simple contouring of the brow with tweezers can give the illusion of a lift and instantly take years off the eyes (Fig. 8.4ab). A visit to a reputable beautician may be recommended in order to acquire a professional shape, which the patient can easily maintain thereafter.

Hairstyle

Discuss this with the patient. If a fringe (bangs) is being worn, will the effects of botulinum toxin be noticeable? Is the patient happy to have botulinum toxin to

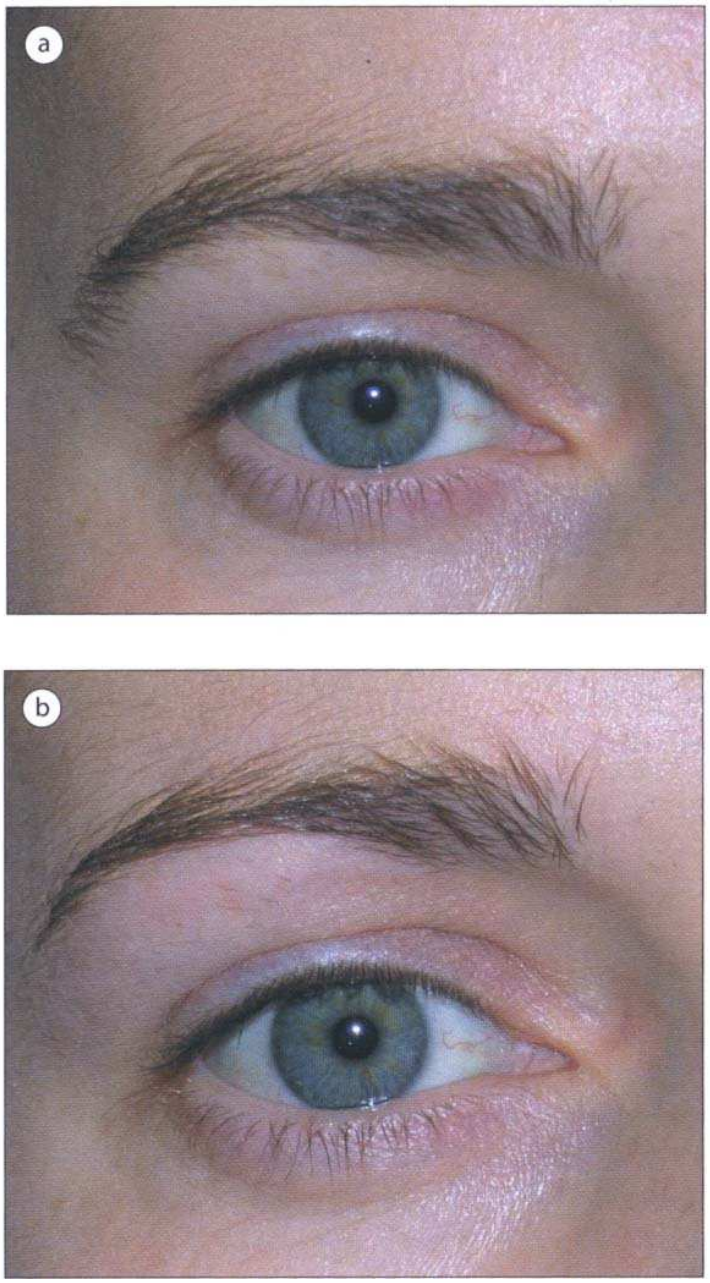


Fig 8.4 (a) before and (b) after eyebrow contouring.

prevent further ageing of the forehead, regardless of whether or not it can be seen?

Ptosis

Always examine the patient for signs of ptosis (a droopy eyelid). This is common in patients over 60 years old, and is usually unilateral or asymmetrical. The levator aponeurosis, which opens the eyelid, and which is also responsible for the 'lid crease' by its superficial insertion into the orbicularis muscle and skin, slips up under the orbital rim (and eyebrow) with age or trauma. This causes a slight drooping of the eyelid that worsens on

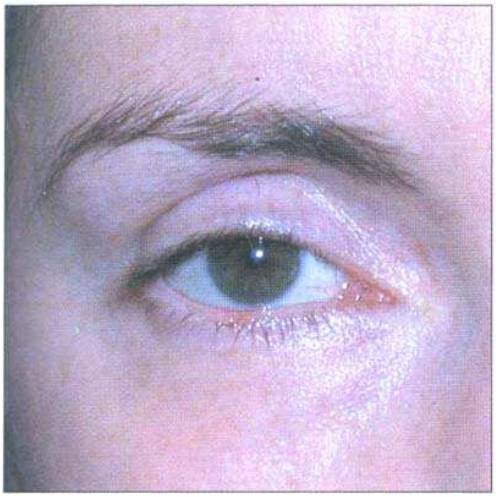


Fig 8.5 Levator aponeurosis disinsertion. Note high lid crease and ptosis.

looking down and when the patient is tired (Fig. 8.5). Patients then compensate by tensing the frontalis muscle, developing high arched eyebrows, deep frontalis furrows, and deep upper lids, which droop sleepily. The lid crease is often noticeably higher on the affected side (normal 7–10 mm, symmetrical).

In these patients, botulinum toxin to the frontalis muscle will remove the frown but also drop their eyebrow. This may result in an immediately obvious ptosis (even though it was already present). Patients will also complain of swollen upper lids as their brow descends. The ptosis is often asymmetrical, sometimes unilateral and sometimes occurs in young people following trauma. It will be hard to convince these patients that the botulinum toxin did not cause the initial ptosis. Examine carefully before treating!

BASIC PTOSIS EXAMINATION

1. **Observe the patient in the primary position (looking straight ahead).**
2. **Measure the palpebral aperture – the distance from the lower lash margin to the upper lash margin at the midpoint of the pupil.**
3. **Place a finger over the patient's brow to stop it from moving.**
4. **Ask the patient to look down. Place the zero point on a fine ruler over the upper lid lashes before immediately asking the patient to look up. Now measure the point on the ruler where the lash margin is.**
5. **The result is the levator muscle function (normal is 15–18 mm).**

Dermatochalasis (eyelid bags)

The term dermatochalasis refers to age-related wrinkling and sagging of the skin over the eyelids. Examine carefully for brow elevation with overaction of

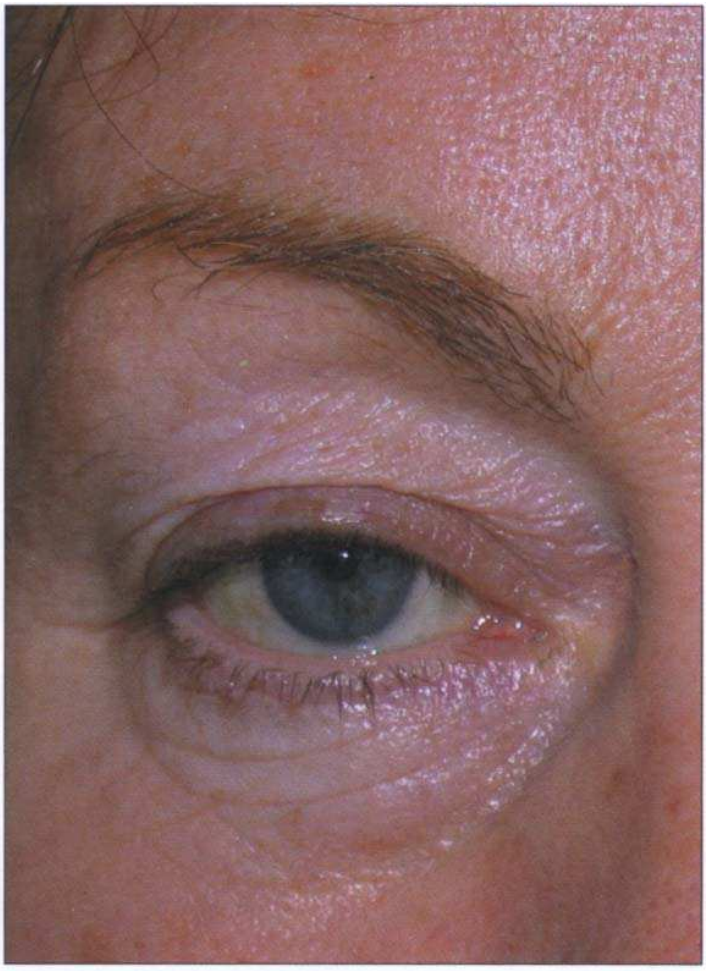


Fig 8.6 High raised eyebrows with forehead wrinkles and upper eyelid bags, and weight-induced ptosis.

the frontalis compensating for the 'heavy skin' and subconsciously lifting it off the lids (Fig. 8.6). Botulinum treatment to the frontalis may unmask the dermatochalasis and give the illusion of 'swelling' of the upper lid skin.

Examination of the glabellar frown

The glabella is the area between the eyebrows. A deep rhytid, the glabellar crease, may occur in isolation (Fig. 8.7); with a parallel but usually shorter rhytid (Fig. 8.8); or with curved rhytids under the medial brows (Fig. 8.9). A vertical glabellar crease is usually associated with hypertrophy of the medial corrugator fibers.

Horizontal glabellar rhytids ('Bunny lines') are due both to dynamic and static factors. The dynamic cause is contraction of the procerus muscle (there is no frontalis here). The static cause is sagging of the forehead skin and muscle with age, overhanging the base of the nose (Fig. 8.10).

The medial fibers of the frontalis elevate the brow but overlie the brow depressor and the corrugator. Treatment of the corrugator should avoid the brow elevator fibers.

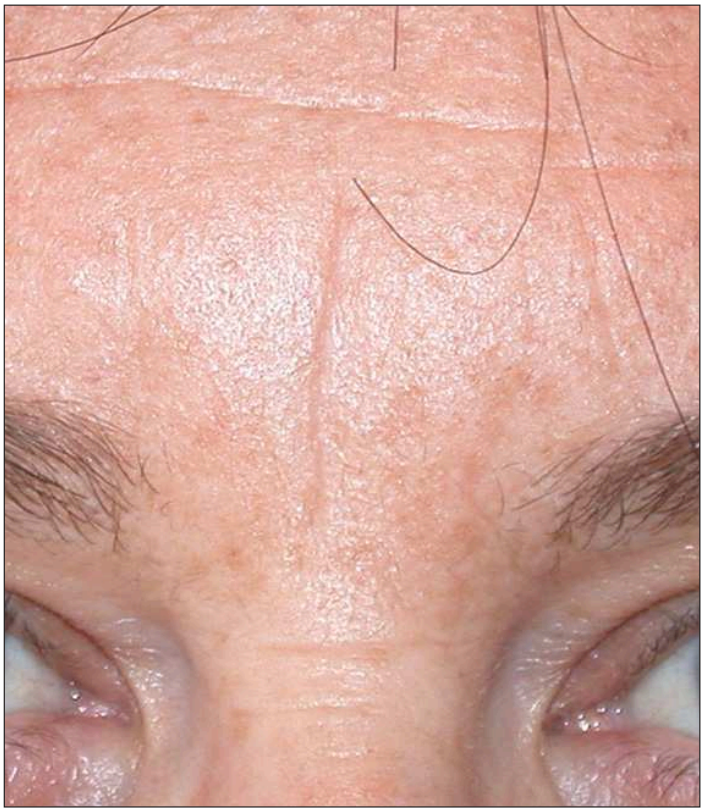


Fig 8.7 Single vertical frown line in a 40-year-old woman.

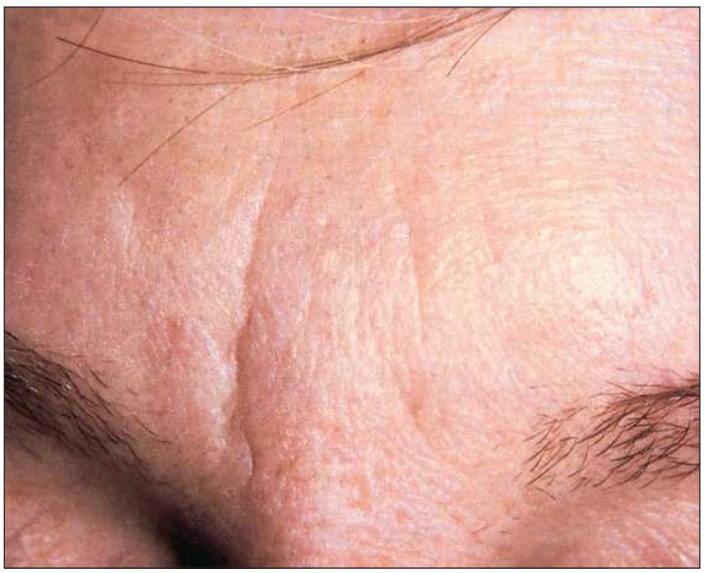


Fig 8.8 Parallel vertical frown lines.

Examination of the horizontal frown

Examine the brows carefully. First, demonstrate the effect that botulinum toxin to the forehead would have if brow tone were to be weakened. To do this, ask the patient to close both eyes and then to open them very slowly while looking in the mirror. This may require repeated attempts, but show the result to the patient in the mirror (Fig. 8.11)

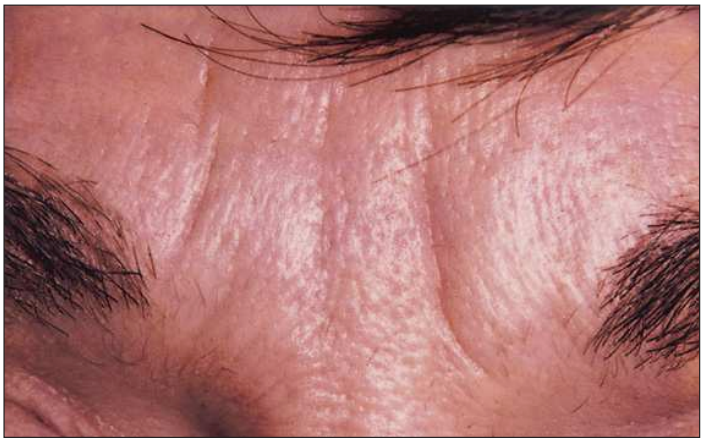


Fig 8.9 Curved vertical frown lines

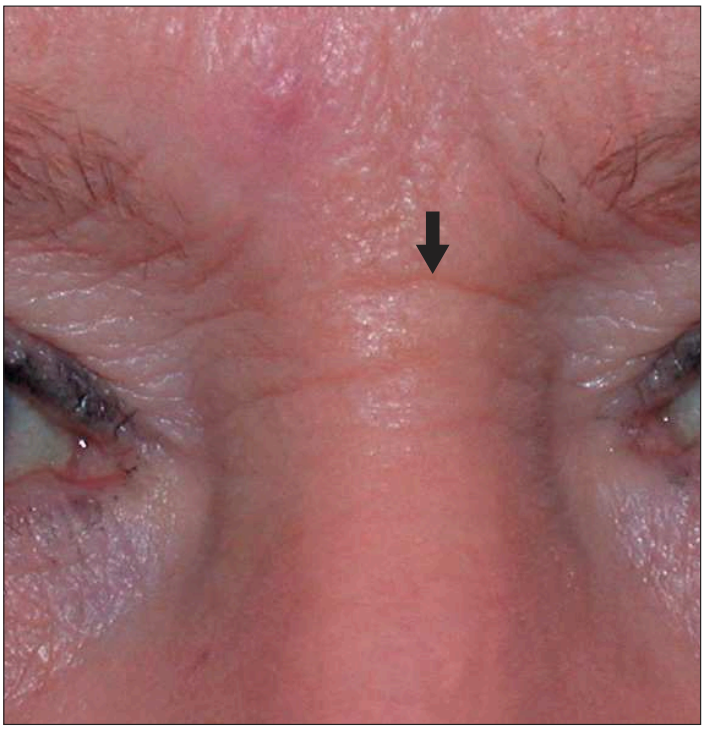


Fig 8.10 Bunny line.

Examine the upper lid crease once this has been achieved. If the lid crease is unaltered by their resting brow, then the patient is suitable for full botulinum toxin treatment. If the lid crease has become full due to dermatochalasis or mild brow ptosis, recommend a limited botulinum toxin treatment to the upper forehead and advise the patient that some movement of the forehead will remain.

BROW EXAMINATION

- **Observe where the horizontal and vertical forehead rhytids lie. Are they due to excessive brow elevation? Is the patient holding an excess of upper lid skin off**

Fig 8.11 Ask patient to close both eyes (allowing eyebrows to drop) then to open eyes slowly while looking in a mirror. This demonstrates the probable resting position of the brows after botulinum toxin A to the frontalis muscle.

their lids? Explain to the patient that botulinum toxin may make them look too 'tired' or 'heavy lidded'. They will be open to a partial effect or surgical alternatives.

- **Tug on the skin below the brow to check for laxity. Does the brow droop at the sides? Tell patients that they might get a temporary elevation of the lateral brows after treatment (Fig. 8.12) but that this is not always repeatable as some frontalis fibers eventually atrophy.**
- **Ask patients to elevate their brows. Are they symmetrical? (Most are not). Point out any asymmetry.**
- **When the brows are elevated, do they 'peak' at any point? Some patients have naturally pointed brows which, if unmasked with botulinum toxin, look unattractive (Fig. 8.13ab). The currently fashionable arch lies at the junction of the medial two thirds and the outer third of the eyebrow – but fashions change.**
- **Ask the patient to frown (Fig. 8.14ab). Which fibers contract? Some patients actually elevate their medial brow by contracting the corrugator, raising the brow superomedially. Others tend to drag the brow down.**
- **Decide whether or not the patient would benefit from an endoscopic brow lift or blepharoplasties (Fig. 8.15ab). Discuss this with them and refer if necessary. Explain the improvements possible from botulinum toxin without surgery (use your hands to stabilize the medial brow, for example, while the patient raises the brow).**

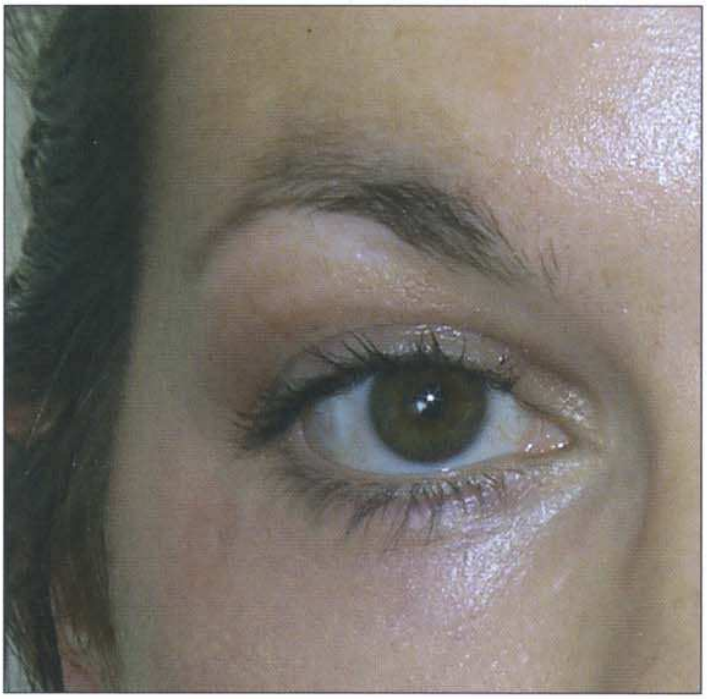
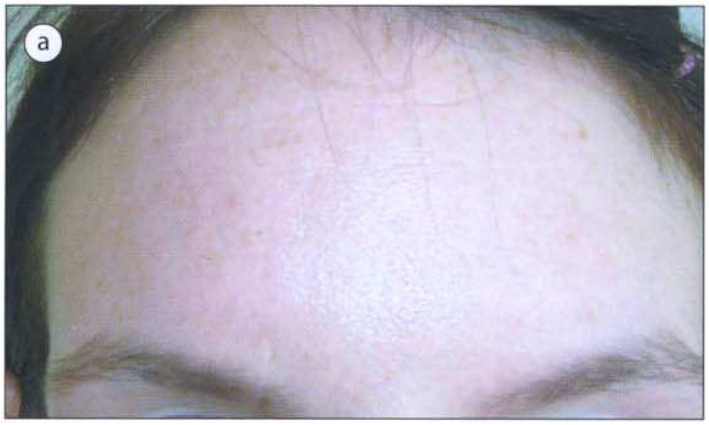


Fig 8.12 Temporary elevation of lateral brow, creating a pleasing arch after Botox® to the glabella. Note post–laser resurfacing erythema (10 days post–laser).



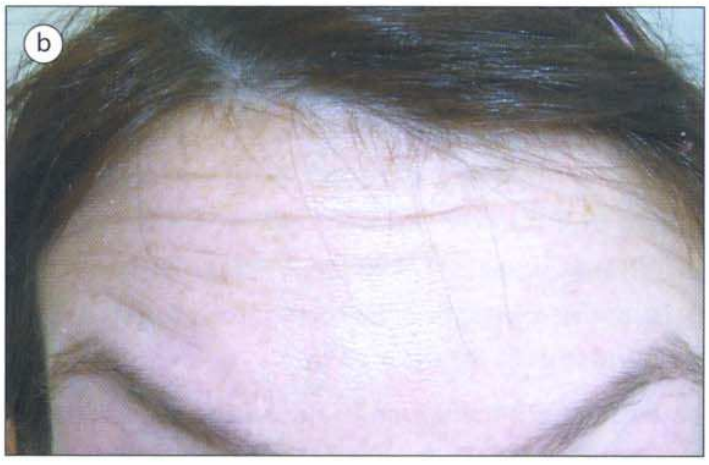
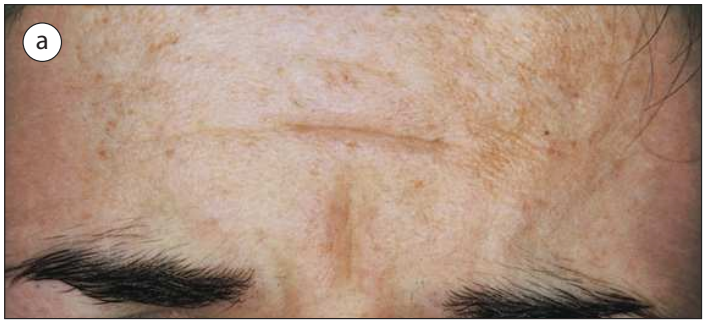


Fig 8.13 A patient with natural peaking of her eyebrows (a) at rest and (b) when asked to elevate brow during pre-treatment consultation.



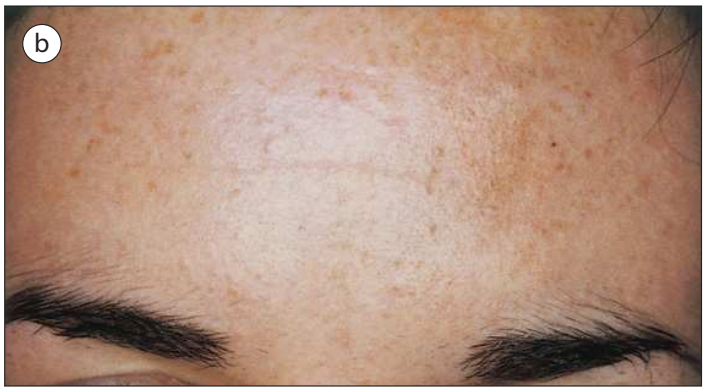


Fig 8.14 (a) before and (b) after Botox® for frowning. Patient is trying to frown in photo 8.14b.

On the follow-up visit, before the next treatment, ask patients to place their fingers over their brow muscles and feel the contraction as they frown. They will often notice that the lateral fibers of the frontalis have strengthened, squeezing the corrugator toward the glabellar area. Some patients may tolerate botulinum

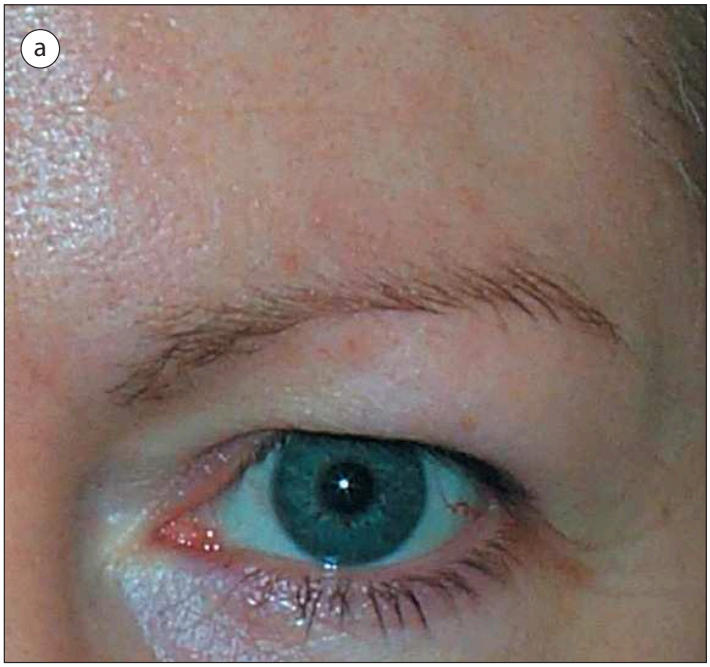


Fig 8.15 (a) before and (b) after upper blepharoplasty and internal brow fixation.

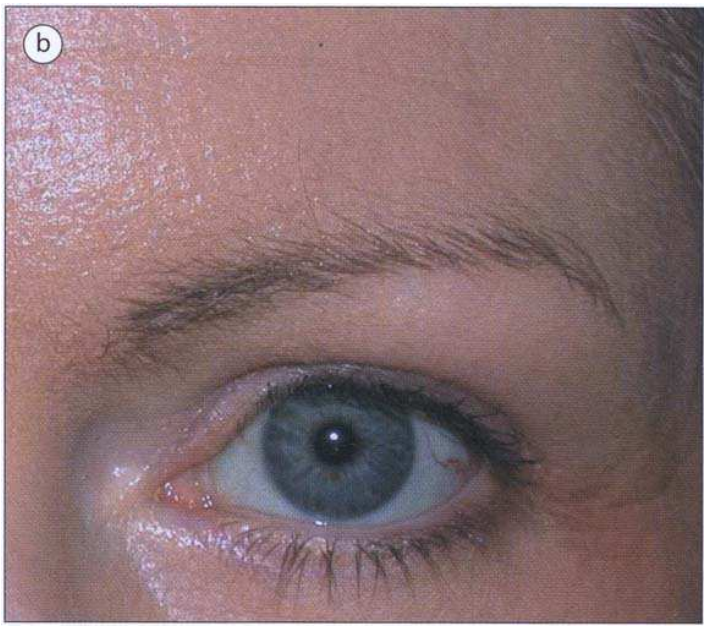


Fig 8.15 *cont'd.*

toxin to this lateral area, but most will look tired, with total inaction of their frontalis if treated.

PRINCIPLES OF FOREHEAD RHYTID TREATMENT

- **The mid-frontalis may eventually atrophy, requiring less treatment.**
- **The glabellar complex rarely atrophies.**
- **Treatment changes with time as the muscle response alters.**
- **Untreated muscle can hypertrophy with time e.g. the lateral frontalis.**
- **Treatment depends on brow position and the presence or absence of blepharochalasis.**
- **Avoid ptosis by not injecting beneath the superior orbital rim.**

  Allow for one centimeter of diffusion of toxin when injecting (more with Dysport®).
- **Avoid peaked brows by treating the frontalis two centimeters above the possible peak.**
- **Avoid intramuscular injections close to or in the brow.**
- **Discuss brow movement at length with the patient.**

RECOMMENDED TREATMENT OF FOREHEAD WRINKLES

DOSE BOX

Botox®: 2.5 ml dil to 100 units vial = 4 units in 0.1 ml
Dysport®: 3 ml dil to 500 units vial = 16.6 units in 0.1 ml

Treat the forehead as a single zone to achieve a balanced effect. Consider the optimal glabellar treatment and then treat the frontalis accordingly.

BASIC GLABELLAR TREATMENT (FIG. 8.16)

- **Treatment of a glabellar rhytid:**
- **The essence of treatment is to paralyze the contraction of the corrugator muscle while allowing acceptable brow movement WITHOUT descent of the medial brow or ascent of the lateral brow!**

Inject 0.1 ml botulinum toxin one centimeter above medial brow (line of medial canthus). ALWAYS aspirate first to avoid the supraorbital complex. Inject 0.05 ml at base of nose below brow level (to diffuse to procerus and brow depressors). Inject 0.05 ml one centimeter above base of corrugator muscle (ask patient to frown and palpate each time before injection).

ADVANCED GLABELLAR TREATMENT

With experience it is possible to increase the concentration of the botulinum toxin while reducing the volume. Injections can then be placed below the brow, up towards the corrugator muscle and above the trochlear tendon towards the medial brow depressor fibers. Great caution must be taken not to enter a blood vessel in the very vascular area of the superomedial orbit. Inaccurate dosage

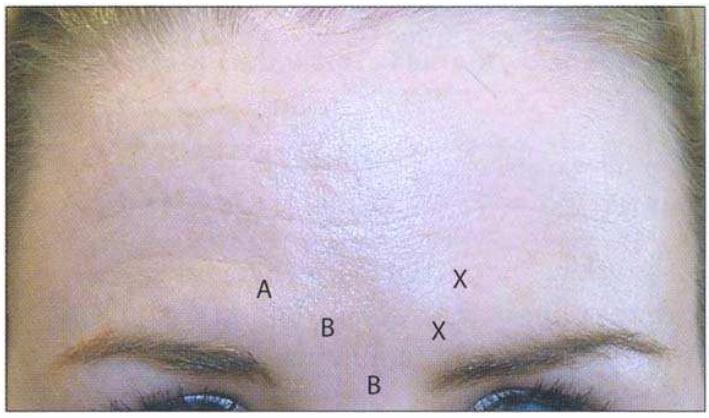


Fig 8.16 Suggestion for glabellar treatment in inexperienced hands. A, 0.1 ml; B, 0.05 ml.

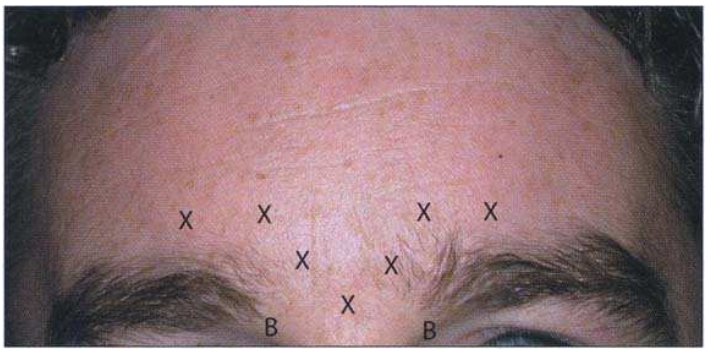


Fig 8.17 Suggested injection sites for optimal glabellar treatment in experienced hands. Site B is at high concentration and low volume. Do not try unless comfortable with diffusion distance as ptosis will be likely.

may cause toxin to diffuse towards the levator muscle, causing ptosis, and toward the superior oblique muscle, causing diplopia. Outstanding results may be achieved in this fashion, with subtle elevation of the brows and smoothing of all furrows. However this technique should be undertaken only by those completely familiar with anatomical variations in this area who are experienced enough to assess the degree of diffusion of the different concentrations accurately. (Fig. 8.17)

IMPORTANT CONSIDERATIONS FOR GLABELLAR TREATMENT

Injecting botulinum toxin below the orbital rim greatly increases the risks of true ptosis (a droopy eyelid) due to diffusion of toxin towards the levator muscle of the lid.

The corrugator may be approached from below the medial brow by an expert, thereby avoiding the elevating frontalis fibers. Lower doses at higher concentrations are recommended – but only in experienced hands. (Fig. 8.18)

The supraorbital artery, vein and nerve lie on the corrugator muscle and must be avoided. Palpate the supraorbital notch (not always present), in the bone at the medial brow. This is the line of the supraorbital complex (2.7 cm from midline).

The angular vein traverses the area below the medial brow, the site of the depressor supercilii.

BASIC FRONTALIS TREATMENT

I examine the frontalis region by asking the patient to frown repeatedly, allowing me to identify the strong points of the frontalis. I inject the bulk of the muscle adjacent to the rhytid. I inject 0.01ml intramuscularly in the central zone as shown (Fig. 8.19) and then inject 0.05ml to the other areas to give

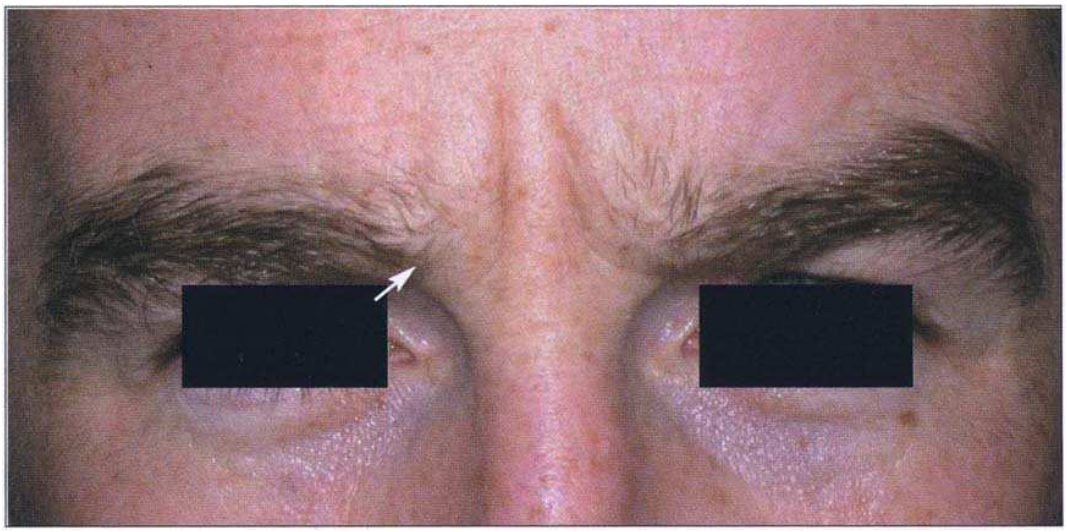


Fig 8.18 Extra treatment to corrugator – only for experienced practitioners. Deep approach to currugator muscle.

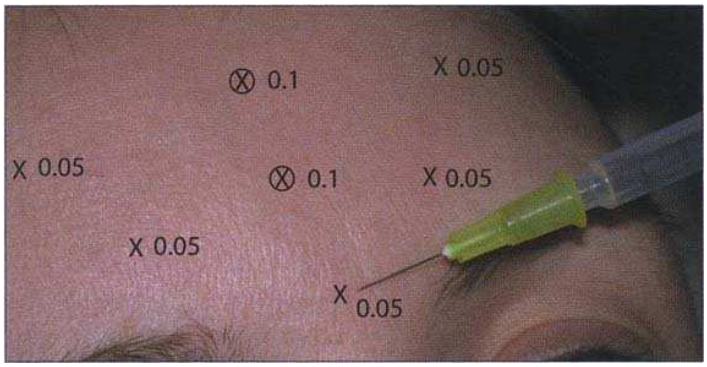


Fig 8.19 Basic frontalis treatment. (X), 0.1 ml, X, 0.05 ml.

symmetry. I sometimes give 0.025ml subcutaneously above the lateral brow to soften rhytids whilst retaining frontalis action. On follow up visits, I frequently inject 0.1ml into the scalp aponeurosis to discourage hypertrophy and an overaction of aponeurotic fibers which would result in excessive scalp movement relative to the atrophic frontalis muscle (Fig. 8.20).

USER TIP

Tell the patient that the treatment sites will be different each time because the muscles will recover differently.

TREATMENT OF RHYTIDS

Different types of rhytids may be treated as follows:

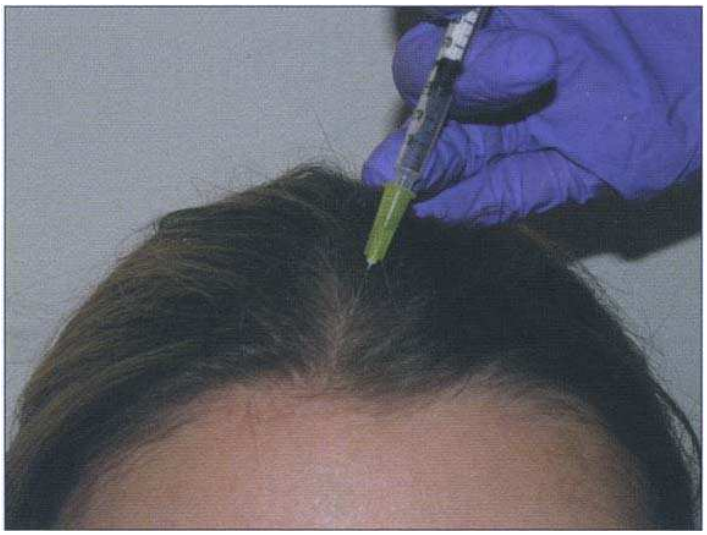


Fig 8.20 Injection of scalp aponeurosis.

Simple forehead lines in motion, none at rest (20 – 30 years) (Fig. 8.21)

If the brows are firm, then treat the complete frontalis. Expect a semi-permanent effect within 2 years as the frontalis muscle atrophies.

Young patients with firm brow attachments are easy. Inject the glabellar area as shown in Figure 8.16, along the line of the corrugator. Treat the frontalis as shown to prevent peaking of the brows. Injection sites are chosen to allow for diffusion of the toxin within one centimeter of the site. This allows treatment of the procerus medially, sometimes incorporating some overlying frontalis fibers

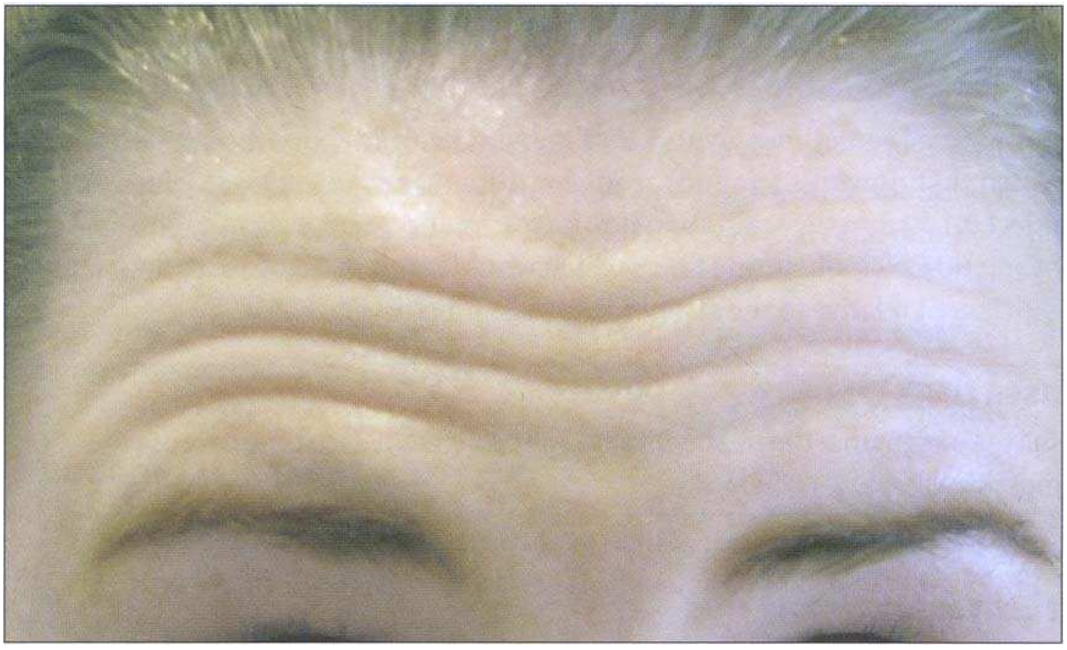


Fig 8.21 Simple forehead lines in motion, none at rest (20–30 years).

with diffusion towards the brow depressor, counteracting brow depression medially at the most nasal aspect of the brow.

Simple forehead lines in motion, none at rest (20-30 years) (Fig. 8.22)
Short brow lash distance with slightly mobile brows. Avoid lateral frontalis and treat superolateral frontalis instead. Treat medial brow depressors.

Forehead lines at rest and in motion (Fig. 8.23)
Treat as above but classify rhytids. If severe, advise about CO_2 resurfacing.

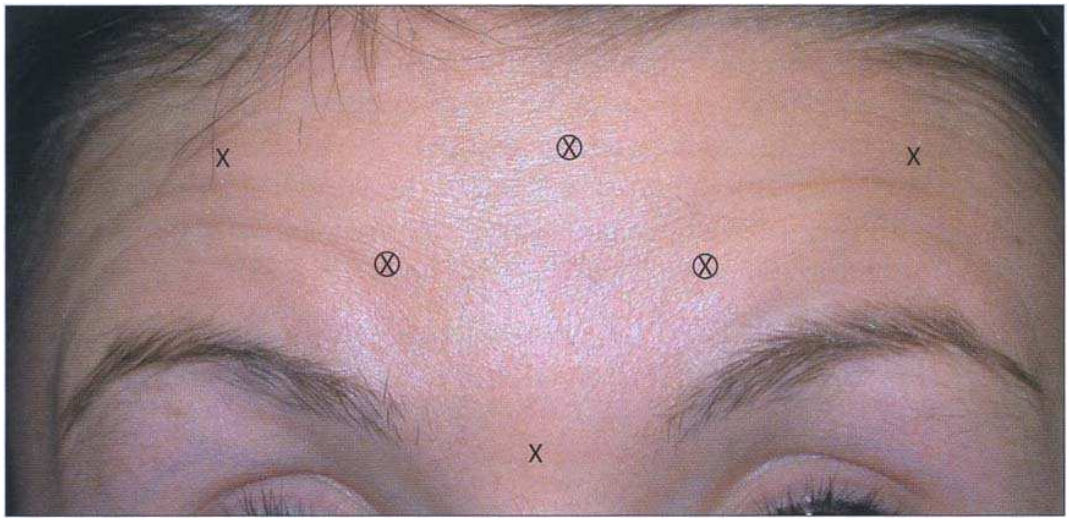


Fig 8.22 Wrinkles in motion in a 20 year old woman with short lash–brow distance and mobile brows.

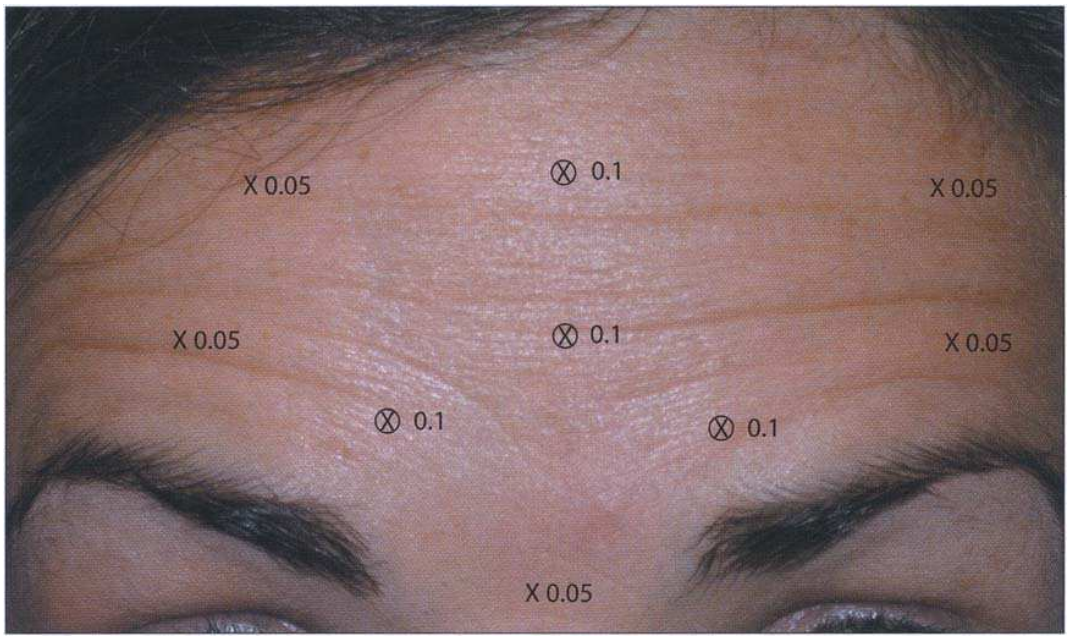


Fig 8.23 Patient over 40 with high arched brows and wrinkled forehead. X, 0.05 ml, (x), 0.1 ml.

High arched brows with furrowed horizontal lines in patient over 35 (Fig. 8.24)
Take great care. This patient is typical of those who can become extremely distressed if they lose the deep appearance of their upper eyelids as the frontalis becomes paralysed with botulinum toxin. The heavy brow can sometimes weigh upon the upper lid simulating ptosis; but when the brow is gently lifted by the examiner's finger, the lid will return to its normal position.

Discuss surgical correction at length (Chapter 11). Consider botulinum toxin treatment to the upper rhytids, retaining the elevating action of the lower frontalis fibres. Offer filler to the glabellar crease and the fine lines over the lateral brow.

The male forehead (Fig. 8.25)
The male brow tends to be horizontal with a short lash brow distance. The muscles may be bulkier than those of the female forehead and sometimes need greater doses. Treatment of the glabellar area alone can lead to a feminising arch and must be avoided unless requested. The male forehead is also prone to a receding hairline. Such patients may require extensive volumes of botulinum toxin to treat the occipital portion of the frontalis, otherwise they will return with frontal furrows.

Fig 8.24 Patient over 35 with high arched brows and wrinkled forehead. Retain brow height by avoiding BTX to brow area (i.e. lower half of forehead).

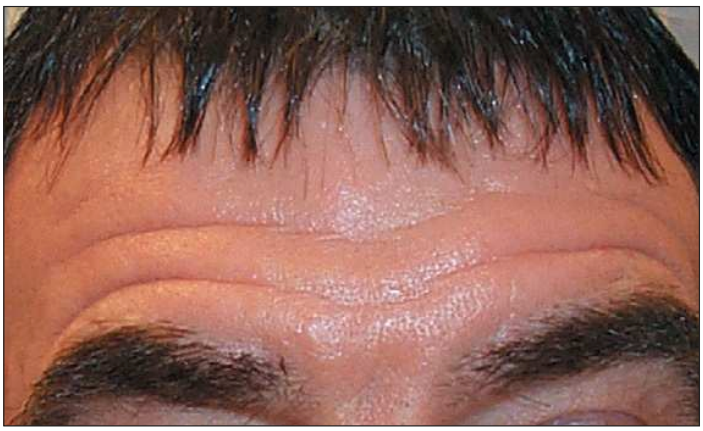


Fig 8.25 Typical heavy male forehead.

9 Treatment of the perioral region, the neck and scars

DOSE BOX

Botox®: 2.5 ml dil to 100 units vial = 4 units in 0.1 ml
Dysport®: 3 ml dil to 500 units vial = 16.6 units in 0.1 ml

A good knowledge of the anatomy of the perioral region is essential before undertaking botulinum toxin treatment. The orbicularis oris responds well to botulinum toxin but great care must be taken to limit diffusion into the surrounding muscles (Fig. 9.1). This can be achieved by using a higher concentration of the toxin, at a smaller dose. Treatment of the wrong muscle fibers can lead to dribbling, difficulty in drinking water, slurred speech and asymmetrical smiling.

Patients with facial hemispasm frequently require botulinum toxin to a focus of spasm over the elevator of the lip. This leads to a depression of the corner of the mouth and drooling of saliva (Fig. 9.2) but patients would usually rather have an embarrassing dribble than an uncomfortable spasm and twitching of the side of their face. However this complication MUST be avoided in a cosmetic practice.

AGEING OF THE PERIORAL REGION AND NECK

Ablating wrinkles does not always make a patient look younger. When considering rejuvenation of this area, examine the overall tone of the musculocutaneous complex. Also examine the skeletal support, the dentition and the shape of the nose.

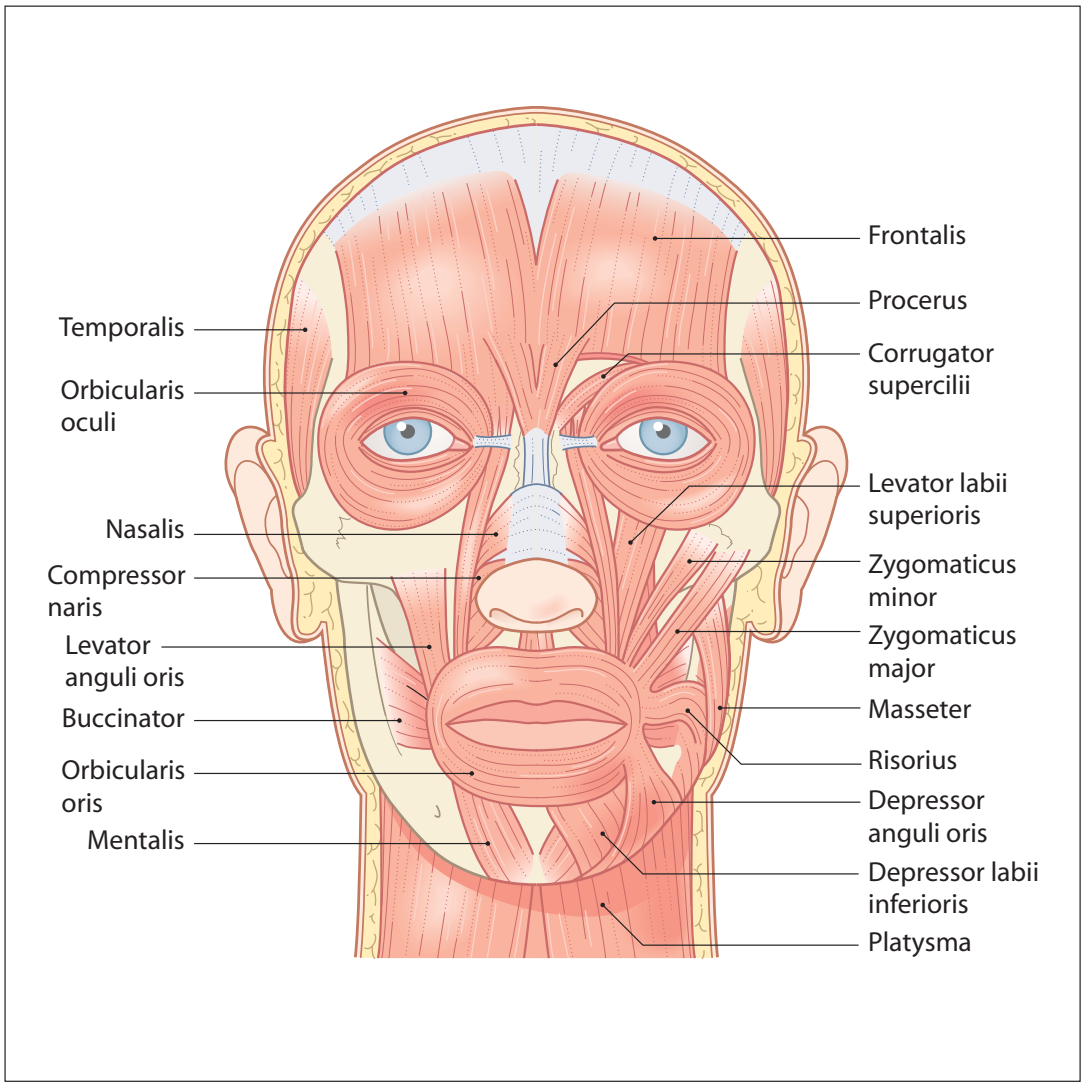


Fig 9.1 Anatomy of perioral area. After Zide BM and Jelks GW (1985) Surgical Anatomy of the Orbit. Raven Press Books, Ltd. New York. With permission of Barry M Zide.

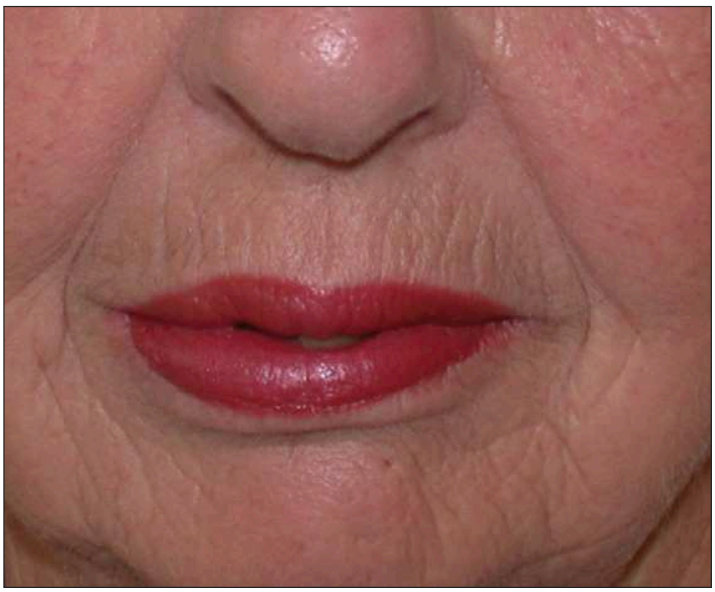


Fig 9.2 Mouth droop following botulinum toxin for severe blepharospasm.

Research has confirmed that ageing causes an antero-postero recession of the facial bones, which contributes to sagging. The distance from the nose to the vermilion border increases with time. The vermilion border itself shrinks, the lips lose volume, and tend to turn downwards instead of up and out.

The lip depressors and elevators induce wrinkles at the corners of the mouth and 'marionette lines'. The mentalis muscle encourages the tip of the chin to turn upwards, creating the mental fold and sometimes a 'pointed' chin. Recession of the jaw will accentuate the wrinkles, from the corner of the mouth to the chin.

The platysma muscle will eventually draw the sides of the mouth towards the jaw, and this, along with facial sagging, creates jowls. Increased resting tone of the platysma creates vertical bands (turkey neck) along the line of action, and 'venus rings' i.e. horizontal banding, perpendicular to the line of action.

The tip of the nose becomes pulled down with time (pointed nose) and the descent of the mid-face, coupled with recession of the facial bones, deepens the nasolabial folds.

TREATMENT

Botulinum toxin causes a flaccid paralysis of muscles that have been injected, and so induces a mild elongation as the muscle spindles stop contracting. This is particularly obvious in the vertical muscles of the face e.g. in the upper lip. Examine the patient carefully and consider the likely effect of elongating a perioral muscle before injecting it. If the patient already has a long nasal–vermilion distance, for example (Fig. 9.3), then treating upper lip wrinkles with further relaxation of the muscle will not produce a good

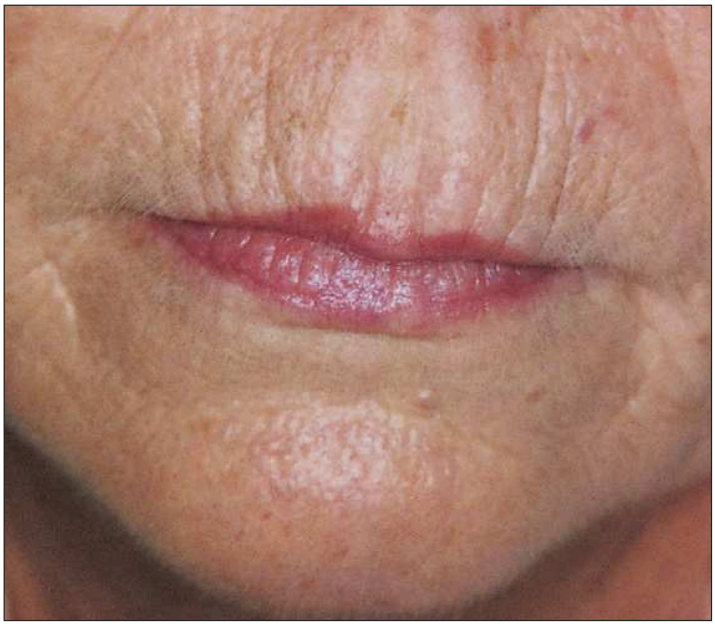


Fig 9.3 Long upper lip with wrinkles.

appearance. Treatment of the nasolabial fold will also lengthen the upper lip. These patients can be offered alternative treatments such as surgery, CO_2 resurfacing and fillers (Chapter 11).

PERIORAL INDICATIONS

- **Upper lip rhytids**
- **Lower lip rhytids**
- **Pebbly chin**
- **Elevation of lip corner**
- **Reduction of nasolabial folds**

Upper and lower lip rhytids

Moderate rhytids, particularly in non-smokers, can be discouraged with a small volume of botulinum toxin injected away from the vermilion border (Fig. 9.4). Limiting the contraction of the orbicularis oris will always curtail its true function as a sphincter around the mouth for articulation and eating. Patients often notice a weakening of their ability to 'pout' and, even though they seldom actually slur their speech, they sometimes experience the sensation of slurring.

More profound side effects occasionally occur and patients must be warned about these. Milder sensations of poor articulation often wear off over the first few weeks. It is often easiest to counteract the risks by using a milder phased treatment augmented with resurfacing or fillers.

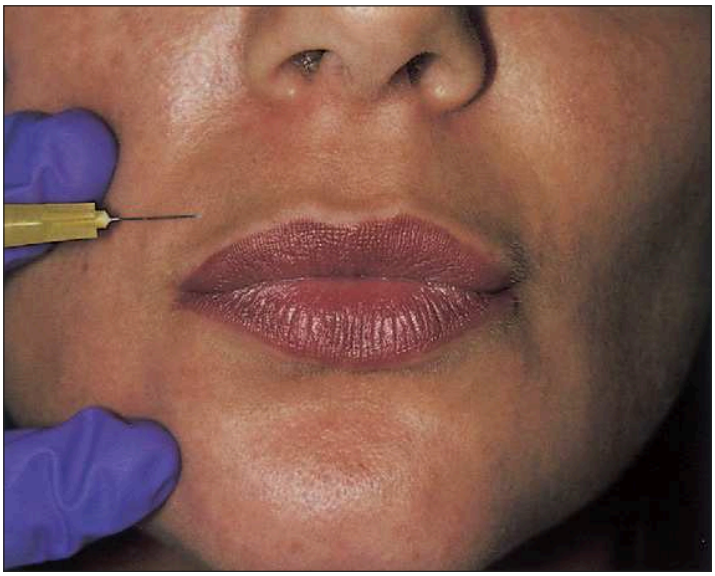


Fig 9.4 Botulinum toxin to the upper lip.

Whenever possible, encourage CO_2 resurfacing of the rhytids for at least a 50% long term improvement (Chapter 11), or, if an instant remedy is desired, inject hyaluronic acid into the valley of the rhytid. Some patients benefit from both; but never at the same time in the lip or nasolabial fold area.

If necessary, no more than 0.0125 ml of botulinum toxin per site (at the above dilutions) is recommended. Using a lower volume at a higher concentration is also valuable, but difficult to manipulate at first, and is perhaps best tried by an experienced operator.

USER TIP

Avoid injecting fillers and botulinum toxin into the perioral area at the same time. Botulinum toxin can elongate and flatten the lip, requiring a different level of filler. The filler may also appear as nodules if given to an area which subsequently flattens with botulinum toxin.

USER TIP

It is sometimes safer to treat deep upper lip rhytids with laser resurfacing and/or injections of hyaluronic acid than with botulinum toxin, because of the twin risks of weakening the lip sphincter and elongating the lip (Chapter 11).

Vermilion border

Fine 'bleeder' lines at the vermilion border can be injected with 0.0125 ml of botulinum toxin (Fig. 9.5). I avoid injecting rhytids farther away from the vermilion border at the same time. This minimizes the laxity of the lip and the risk of side effects. I tend to inject intramuscularly, although other experts have had excellent results with subcutaneous injections in the 'danger zones'.

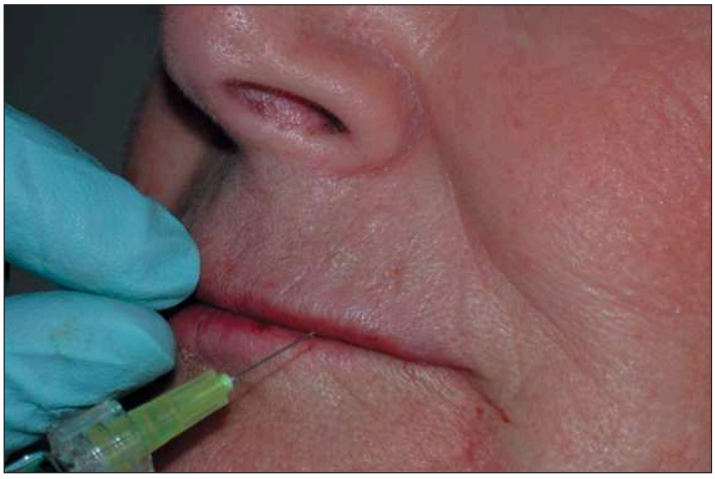


Fig 9.5 Treating 'bleeder lines'.

Corner of mouth (Fig 9.6)

Botulinum toxin to the depressor of the angle of the mouth can achieve a sought-after upturn of the outer corners, which can be nicely augmented with hyaluronic acid. I have achieved good results with 0.05 ml. The depressor anguli oris is intimately associated with the underlying platysma and the adjacent depressor labii inferioris. Unwanted diffusion to the depressor labii inferioris will result in an inability to purse the lower lip, asymmetry when smiling, and even dribbling when drinking. Some experts recommend avoiding these side effects by injecting subcutaneously and not within one centimeter of the angle.

USER TIP

For peri-oral treatment, if in doubt, start with a low dose and low dilution of botulinum toxin, given subcutaneously. Review the patient within 2 weeks and give more if necessary.

Nasolabial folds

Injections of botulinum toxin have been used to treat deep nasolabial folds and nostril flares. I tend to treat the folds with Perlane® (Chapter 11). I have seen photographs of the impressive results obtained by Dr Le Louarn of Paris, who recommends a low volume of highly concentrated Dysport® (personal communication). Ipsen Pharmaceuticals will publish these results shortly.

Pebbly chin and mental crease

Botulinum toxin is excellent for smoothing the mentalis muscle, the main muscle responsible for wrinkling of the chin (Fig. 9.7). It is important to warn patients that the result may be asymmetrical at first, as the toxin may diffuse

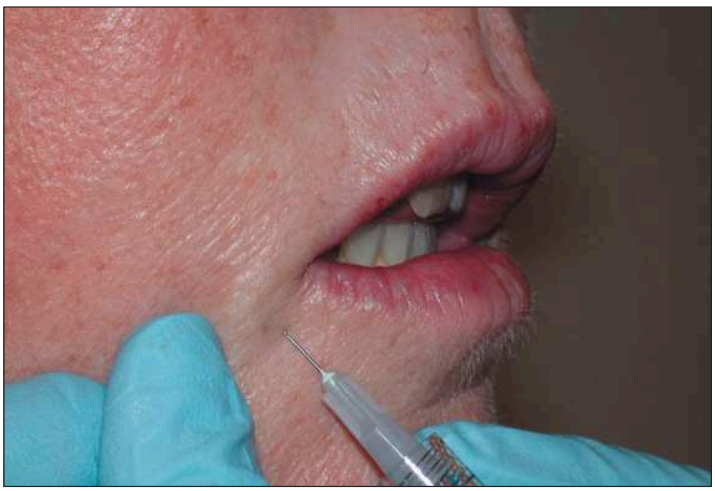


Fig 9.6 Treating the corners of the mouth.

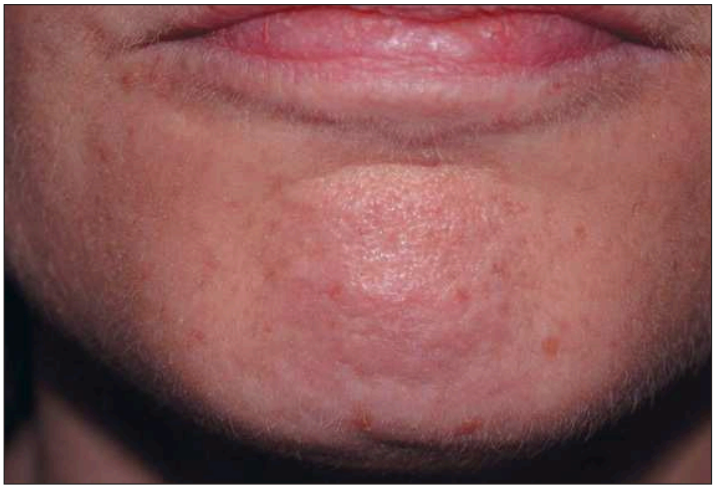


Fig 9.7 'Pebbly' chin.

irregularly towards one head of the muscle. I recommend starting with a low dose (0.025 ml) and increasing this until the desired effect is achieved. Insert the needle directly in the center of the tip of the chin, withdraw slightly having reached the periosteum, and inject 0.025 ml initially. Consider subsequent subcutaneous injections of 0.0125 ml to the overlying depressor anguli oris.

The mental crease deepens with age as the tip of the chin elevates (a 'Wicked Witch' chin). Subcutaneous injections of 0.0125 ml along the crease help to shorten it (Fig 9.8). Hyaluronic acid (especially Perlane) will fill it instantly.

BOTULINUM TOXIN TO THE NECK

Botulinum toxin is very effective at neutralizing the pull of the platysma muscle under the chin and so preventing horizontal banding lower down on the neck (Fig. 9.9). It is also effective in the treatment of 'turkey neck' – the vertical folds of platysma lying between the mandible and the clavicle.

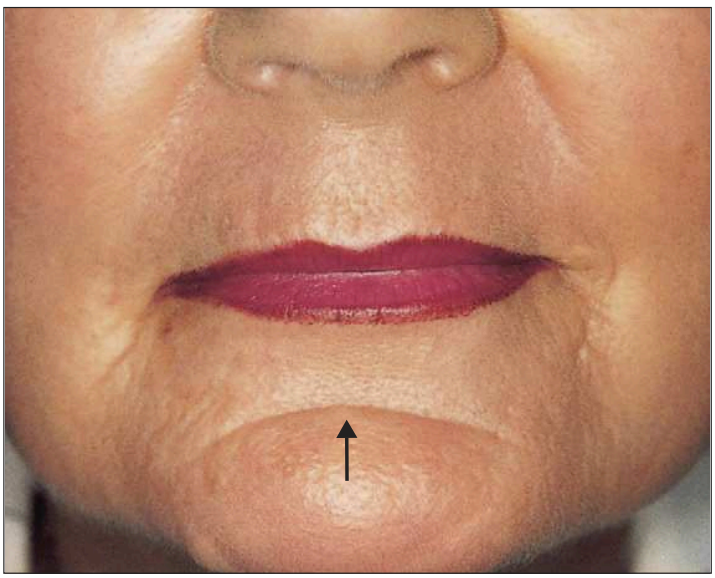


Fig 9.8 Horizontal crease in chin.

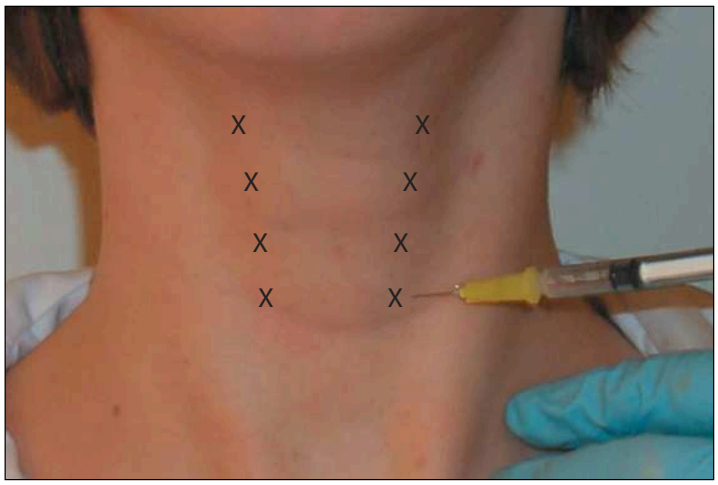


Fig 9.9 Horizontal neck wrinkles. X, 0.05 ml.

The platysma spreads out from its origin at the base of the mandible and parotid fascia, down the neck and along the pectoral fascia. A reduction in the pull of the platysma tends to give the illusion of elevating the lower facial muscles and, in some patients, even of a reduction in their marionette folds.

Care must be taken to prevent diffusion of the toxin towards the esophagus, which is extremely sensitive to it, as there have been several reports of unexpected dysphagia from earlier treatments, using doses similar to the frontalis ones. Care must also be taken to avoid the larynx as hoarseness has also been reported, along with difficulty in lifting the head.

The subcutaneous injection of 0.05 ml of botulinum toxin is recommended. Divide the prominent area visually into units, and aim to space the injections 1.5 cm apart. Treat only the 'band' that is obvious at rest sitting upright, and not the flat part of the platysma that protrudes on effort. Treatment of the band often suffices and reduces the volume of botulinum toxin required (Fig. 9.10).

Finally, remember that some patients with prominent neck banding and 'jowls' would benefit from a lower facelift. Always discuss this surgical option with them and then refer them to a plastic surgeon.

BOTULINUM TOXIN FOR SCARS

Patients who normally heal well in other parts of their face tend to heal badly if they have a linear scar perpendicular to the direction of pull of a facial muscle. Muscle pull stretches and thins scars, which often remain red. This is particularly true for the frontalis muscle. The muscle can also pucker and 'dip', particularly in the perioral region and when parallel to the muscle action e.g. after a midforehead brow lift.

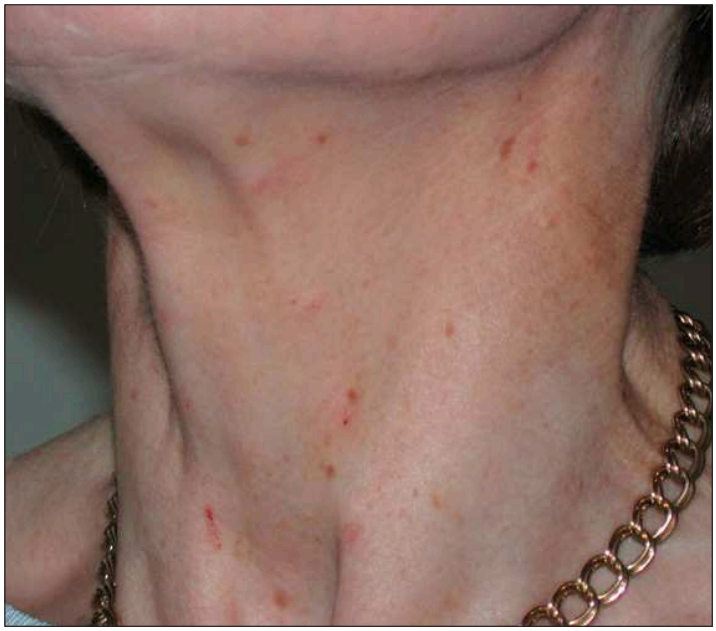


Fig 9.10 Platysma: vertical neck wrinkles. Note injection marks.

The traditional way of correcting unsightly forehead scars has been to re-excise them, taping the incision firmly with steristrips and then bandaging the forehead for up to six weeks in an effort to keep tension off the margins of the scar. Botulinum toxin will provide a tension free zone for up to 14 weeks (sometimes longer in the frontalis area). NeuroBloc® will create the same effect for 6 weeks.

Frontalis scars

Inject the frontalis muscle evenly across the whole forehead, as in the treatment of rhytids (Fig. 9.11). This keeps tension off the scar while preventing asymmetry of the forehead, which would occur with injections localized to the scar itself. Make sure that every centimeter along the scar receives botulinum toxin, giving it at 0.5 cm on either side of the scar. The dose per site used is 0.05 ml.

Peri-oral scars

Great care must be taken to avoid the toxin diffusing towards the lip elevators or sphincter muscles of the mouth. Begin with the lowest dose, and increase this until an effect is achieved. Review the patient after 10–14 days to decide on this. Figure 9.12ab shows a scar that followed a road traffic accident, in a patient who requested laser resurfacing. Examination showed that the scar was much more unsightly 'in motion', i.e. while the patient was talking, than 'at rest'. Botox® 0.0125 was therefore injected on either side of the scar, at sites one centimeter apart. The scar appeared to flatten over the next week and the

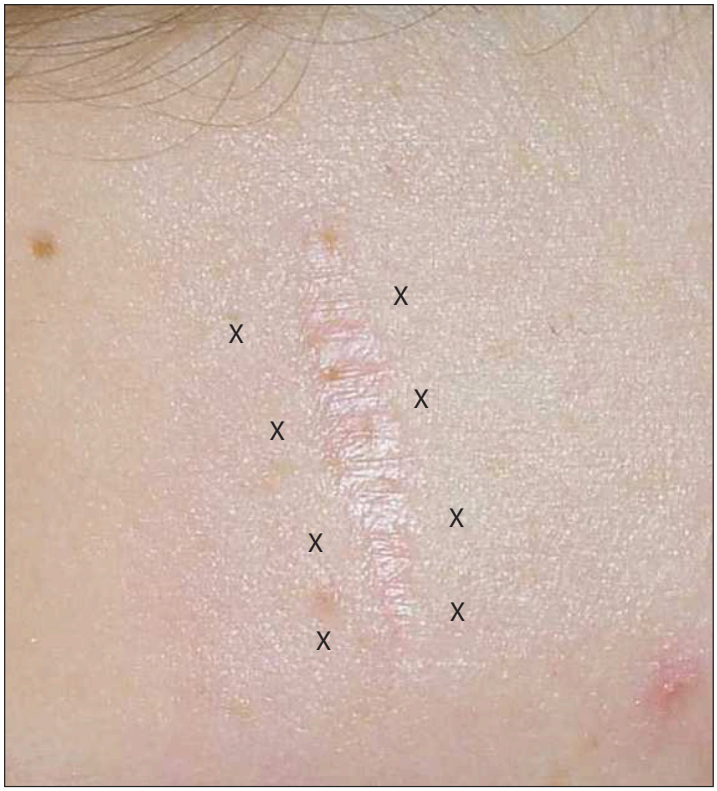


Fig 9.11 Typical forehead scar for excision and botulinum toxin treatment. X, 0.05 ml.

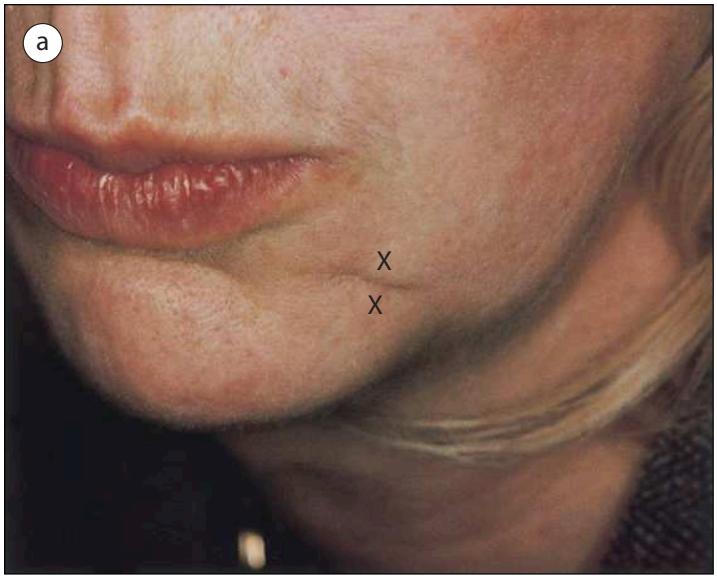


Fig 9.12 (a) before and (b) after botulinum toxin to scar on chin. X, 0.0125 ml.

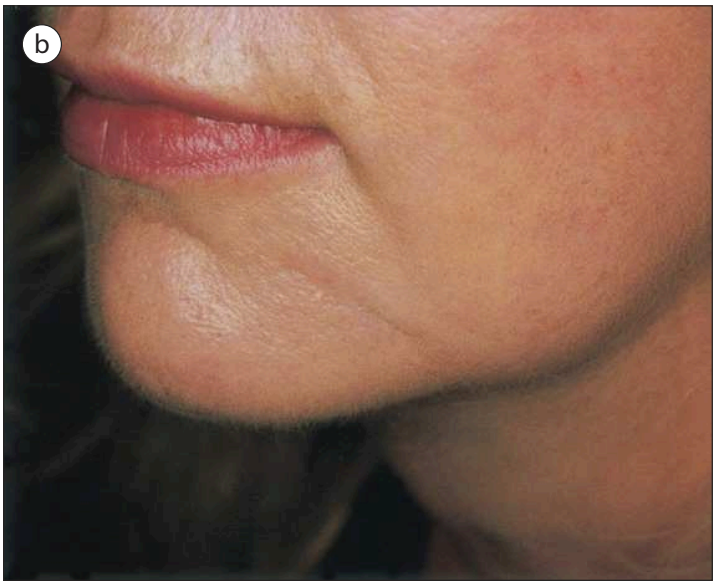


Fig 9.12 *cont'd.*

patient was extremely happy. Follow up treatment with the same dose, 14 weeks later, gave the patient the feeling of a 'drag' on that side of her mouth. This could not be detected on examination, but the botulinum treatment schedule was modified to annual sessions with occasional injections of hyaluronic acid if required (Chapter 11).

DÉCOLLETÉ

Excellent results from the botulinum treatment of décolleté wrinkles have been reported by Dr Petra Becker-Wegerich of Düsseldorf (personal communication). The author has not tried this but has seen impressive photographs of the results.

10 Other indications for botulinum toxin

An excellent summary of this subject can be found in the 'Handbook of Botulinum Toxin Treatment' by Peter Moore (see bibliography).

Botulinum toxin blocks the release of acetylcholine from cholinergic nerve terminals. This action at the neuromuscular junction weakens striated muscle, but it can also affect other cholinergic terminals such as those of the sympathetic and parasympathetic systems. This can lead to autonomic dysfunction – for example there have been reports of gall bladder dysfunction – and opens up possibilities for several uses in areas other than those listed below (Table 10.1).

Botulinum toxin was originally licensed for the treatment of strabismus after pioneering work by Dr. Alan Scott of the Smith Kettlewell Eye Research Foundation in San Francisco. Injecting the toxin into an overactive extraocular muscle causes it to relax. The first strabismus patient was injected in 1977 and, by 1982, Dr Scott had also treated patients for nystagmus, hemifacial spasm, lid retraction, torticollis and spasticity of the legs.

The initial license for botulinum toxin was for strabismus; and this was followed by licenses for dysthyroid ophthalmopathy, nystagmus and medical tarsorraphy. Since then botulinum toxin has been the treatment of choice for blepharospasm and hemifacial spasm. It is widely used for dystonias and new applications are constantly emerging. Recent work has focused on its non-muscular effects, such as those on the skin.

Table 10.1. Current uses for botulinum toxin.

System	Disorder
Gastrointestinal	Dysphagia
	Achalasia of the cardia
	Hypertrophic pyloricstenosis
	Hirschsprung's disease
	Anal fissure
	Hemorrhoids
	Proctalgia fugax
Ophthalmic	Blepharospasm
	Nystagmus
	Oscillopsia hyperlacrimation
	Medical tarsorraphy strabismus
Sweating	Hyperhidrosis
	Gustatory sweating
Abnormal movements	Palatal tremor
	Limb myoclonus
	Head and neck tremor
	Tics
Dystonias	Cervical dystonia
	Oromandibular dystonia (Meige's syndrome)
	Laryngeal dystonia
	Limb dystonia
	Hemifacial spasm
Palsies	Cerebral palsy
	Post Bell's palsy synkinesis
	Facial palsy (for symmetry)
Other	Myofascial pain
	Migraine
Cosmetic	See elsewhere in this book

STRABISMUS

In strabismus (a squint) there is an imbalance in the way the extraocular muscles contract. This can be congenital and appear in childhood, causing an eye to turn in (esotropia) or out (exotropia). Other causes include nerve palsy. Both eyes work together as a result of neural signals traveling simultaneously to the agonists of one eye (e.g. the medial rectus) and to the antagonists of the other (e.g. the lateral rectus). The intensity of the signal is balanced between opposing muscle groups (Herring's law). An excessive relaxation of one muscle (for example, from a right sixth nerve palsy) can lead to an excessive contraction of the opposite antagonist (in this example, the right medial rectus muscle), causing the eye to squint towards the nose.

The eyes must be straight for proper vision to develop, as the visual cortex of the brain requires a sharp image from each eye (until around 8 years of age) to mature properly. If an eye squints, then it will become amblyopic ('lazy') if not straightened in time, and never develop its full visual potential. This effect can be reduced by occluding the opposite eye, by using certain glasses or by surgery. In a developed eye, strabismus (e.g. from a sixth nerve palsy) leads to double vision as the image falls on different points in the two eyes.

The treatment of strabismus may be cosmetic, but initially is aimed at developing normal vision and preventing diplopia. Traditionally, a 'tight' contracting muscle was 'cut' surgically and repositioned. Alan Scott discovered that a 'tight' muscle could be relaxed temporarily by injecting botulinum toxin.

Such injections for strabismus are usually given under electromyographic control, with an electrode being inserted into the muscle, under topical anesthesia. Botulinum toxin is particularly useful for the treatment of paralytic nerve palsies. It is used to assess the degree of the palsy, by relaxing the opposite contracting muscle and reducing the work that the paralyzed muscle has to do.

The main benefit of botulinum toxin in strabismus stems from its use as an adjunct to conventional squint management, for example by predicting postoperative diplopia. Other types of restrictive squints benefit too, as do certain types of nystagmus.

IDIOPATHIC BLEPHAROSPASM AND HEMIFACIAL SPASM

Botulinum toxin is the treatment of choice for dystonic movement disorders. These are due to a functional defect in the interneural circuitry of the brain and spinal cord, sometimes related to problems with the basal ganglia.

Idiopathic blepharospasm may begin in childhood with twitching and excessive blinking. Usually however it presents in the fifth to seventh decade, and is more common in women than men.

Idiopathic hemifacial spasm may follow irritation of the facial nerve by a branch of the anterior or posterior inferior cerebellar arteries. Spasm occurs in the muscles supplied by the facial nerve. It is seen rarely with posterior fossa tumors but, in childhood, is always associated with intracranial pathology. The spasm may improve during moments of excitement, and during periods of concentration, for example on mental arithmetic or other activities. It can spread from one muscle group to a neighboring one, and may be provoked by irritation such as that associated with a dry eye.

Botulinum toxin can be injected into the orbicularis and other spastic muscles; but first the focal point of the spasm has to be established. The injections are placed so as to discourage transmission of the impulse between muscle groups, especially in facial hemispasm where contraction of the

orbicularis oris can spread to the orbicularis oculi. The treatment schedule selected will depend on the degree of spasm. Most patients return within three months for repeat injections, the doses used being titrated against the side effects, such as ptosis.

SPASMODIC TORTICOLLIS AND OTHER DYSTONIAS

Spasmodic torticollis (cervical dystonia) is the most common type of dystonia. It usually presents in the early 40s and may be preceded by trauma. It can also be transmitted as an autosomal dominant trait, sometimes in association with bilateral tremor of the hands.

Tonic spasm of the neck muscles is associated with jerks or tremor. Seventy percent of patients suffer from pain, and there may be associated brachial symptoms (paraesthesiae or pain radiating to the arm and hand). Functional impairments include difficulty in looking at the road while driving and in placing food in the mouth during a jerk. Many patients are overwhelmingly embarrassed by their condition.

Some patients develop tricks to overcome the spasm, such as sucking a pen, but botulinum toxin injections have revolutionized management, replacing most surgical alternatives. Cases unresponsive to botulinum toxin may benefit from systemic medication with anticholinergics (e.g. trihexyphenidyl (benzhexol)), or benzodiazepines such as clonazepam, carbamazepine and baclofen.

HYPERHIDROSIS

The treatment of hyperhidrosis with botulinum toxin was first suggested in the early 1800s by a German physician, Justinus Kerner, who noted that his patients with botulism sweated less than usual.

Primary idiopathic hyperhidrosis is a common cause of excessive sweating of the palms, axillae, face (Frey's syndrome, gustatory sweating) and feet. It can be embarrassing and disabling enough to warrant medical management. Traditional treatments have included topical aluminium chloride salts, oral anticholinergic drugs and tap water iontophoresis. Surgical treatment is based on removing the nerve supply to the glands (endoscopic transthoracic sympathectomy) or a local excision of the axillary sweat glands. Surgery has only a 66% success rate because of post-operative compensatory hyperhidrosis. Its side effects include Horner's syndrome, gustatory sweating, neuralgia and pneumothorax.

Botulinum toxin inhibits the release of acetylcholine at the eccrine sweat glands and this has revolutionized the management of hyperhidrosis. The treatment is easy to master, particularly when guided by the Minor

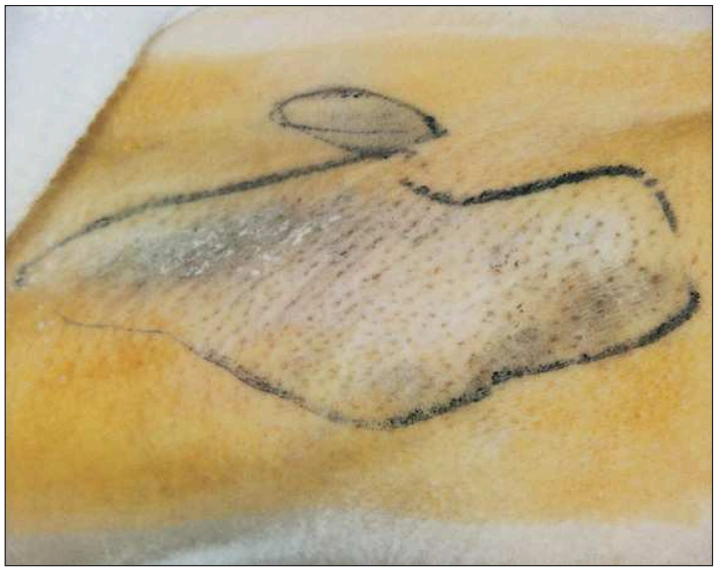


Fig 10.1 Starch iodine test to axilla for botulinum toxin treatment of hyperhidrosis.

starch-iodine test (Fig. 10.1), though with experience this is not necessary. The area to be treated is divided into a grid pattern along which the toxin is injected. The response is dose related: 50 units of Botox® or 50 units Dysport® injected subcutaneously across a grid in each axilla will usually stop sweating for 8 months.

Treatment of the palms has to be intradermal to avoid transient neuromuscular weakness, but this is painful and requires a nerve block. However, the results are even better than those for axillary hyperhidrosis, though it is recommended that the two hands are treated three weeks apart because of possible weakness.

11 Other solutions

- **Hyaluronic acid**
- **Laser resurfacing**
- **Laser blepharoplasty**
- **Combination treatments**
- **Face-lift, brow lift**
- **Microdermabrasion**
- **Chemical peels**
- **Skin protection and rejuvenation products**

INTRODUCTION

Botulinum toxin is good at preventing wrinkles in certain age groups. It is the ideal treatment for 'wrinkles in motion' and can even dissolve 'wrinkles at rest' in patients with good skin tone (see Fig. 7.2ab). However patients with poor skin tone, and deep crow's feet at rest will not get a good response from botulinum toxin alone (Fig. 11.1). Those with furrowed brows but a low lash–brow distance, poor tone of their forehead skin, and/or an excess of upper lid skin (dermatochalasis), will actually look worse if they lose further muscle tone after botulinum toxin. They need an alternative treatment.

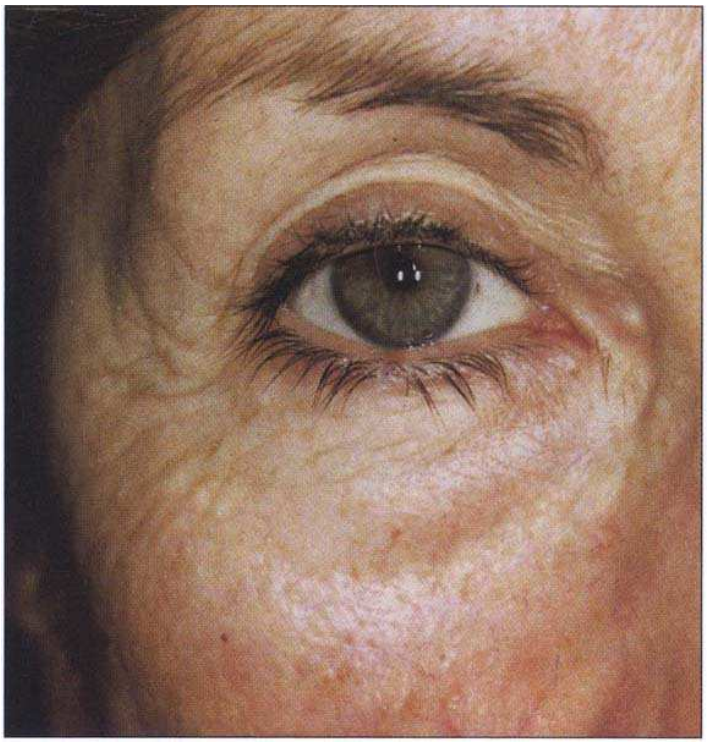


Fig 11.1 Deep crows feet at rest (static rhytids)

Ageing skin sags for several reasons. The skin loses collagen, becoming thinner and less transparent as the parallel collagen fibers become cross-linked and misaligned. This is greatly accelerated by smoking and exposure to ultraviolet A and B rays. The time at which ageing starts is genetically predetermined: if a mother doesn't have a wrinkle until the age of 55, then her daughter with the same genes and habits may not either. Clearly the extent to which the skin ages also depends upon environmental factors. If a mother has had an excessive exposure to the sun and smokes, she will probably become severely wrinkled within a short time when she begins to age at 55. On the other hand, if her daughter – with the same genes – avoids UV damage and smoking, she may well retain the tone in her skin for much longer.

It is sensible to educate all botulinum toxin patients on the subject of skin protection and recovery ('stopping the clock'). Aesthetic nurse practitioners may spend time assessing the patient's skin regime and, if necessary, Retin-A® can be prescribed.

Ageing of the face is also due to the recession of its skeletal support. The antero-posterior diameter of the skull lessens with time, and this encourages sagging in spite of an otherwise excellent skin tone. The diameter of the orbit increases from superomedially to inferolaterally, reducing support for the

orbicularis oculi muscles and skin. Traditional cosmetic surgery replaces this lost support by excising skin and muscle (face lift, blepharoplasty). More recently, implants, such as malar and chin ones, have been used. Laser resurfacing can tighten and 'lift' sagging structures. Brow lifts are being replaced by brow repositioning (internal brow fixation or an endoscopic brow lift), while blepharoplasties often include lateral canthal tendon plication to tighten the sagging areas over an expanded orbital rim.

There is currently a movement towards the replacement of lost collagen and fat by fillers that replenish the tone of the skin and plump up lips, as well as supplementing lost skeletal support.

The ways in which patients should be selected for botulinum toxin are discussed in detail in Chapters 5,7,8 and 9. Some alternatives are discussed here.

HYALURONIC ACID AND OTHER FILLERS

USER TIP

Fillers are an essential part of a good cosmetic botulinum toxin practice.

'Fillers' are volume-replacing products that can be inserted or injected into the skin. The principle behind their use is that, with age and sun damage, the face loses volume and so the skin sags.

Fillers are an essential part of a botulinum practice. Like botulinum toxin, they are injectable and associated with almost no downtime. Unlike botulinum toxin, the most advanced fillers give an instant result. Within minutes a patient can leave the office looking up to ten years younger. This sort of result is often addictive and many of our patients routinely book in for a 'top up' of their filler at the same time as their follow-up botulinum appointment. Current legislation in Ireland prohibits the injection of botulinum toxin by a nurse practitioner, although this is allowed under medical supervision in other countries such as the UK. Nurse practitioners are, however, allowed to inject fillers and to inject submucosal anesthesia (but not nerve blocks).

Hyaluronic acid

Hyaluronic acid occurs naturally in the body and is the main component of the vitreous gel of the eye. It was originally derived from cockerel combs but is now produced synthetically. Since the 1980s it has been used extensively in cataract surgery to prevent the cornea collapsing and to protect the corneal endothelium during surgery. It is now available in different consistencies for intraocular injection. Restylane® was developed by an ophthalmologist in QMed for injection into the skin.

Hyaluronic acid is a pure substance and the incidence of allergic reactions to it is very low. Patch testing is not required.

Many other fillers are currently available on the market. Having started with collagen (Zyplast® and Zyderm®) and Softform® implants, the author now favors hyaluronic acid, which is not yet freely available in the USA. However similar results can be achieved with collagen, albeit for a shorter time and with increased side effects. Fat transplantation offers a permanent solution, but is a semi-surgical procedure requiring time off work, and often more than one treatment session.

Hyaluronic acid is available in several forms, including two ranges: Perlane®, Restylane® and Restylane fine line® by QMed (Fig. 11.2), and Hylaform Plus®, Hylaform® and Hylaform fine line®. Juvederm® appears to have a similar effect although its duration of action is less well established. Perlane®, Restylane®, and Restylane fine line® last for nine months. Their molecules are gradually absorbed and replaced by water, which maintains the volume enhancement until the molecular framework collapses (Fig. 11.3). Hylaform Plus®, Hylaform® and Hylaform fine line® last for only six months but have their own advantages.

The author's personal choice of product, based on experience, is currently as follows:

Perlane® appears to be the most viscous, most enduring and the best for deep rhytids.

Fig 11.2 Photo of Restylane®, Perlane® and Restylane® fine line. Courtesy of Q-Med, AB, Uppsala, Sweden.

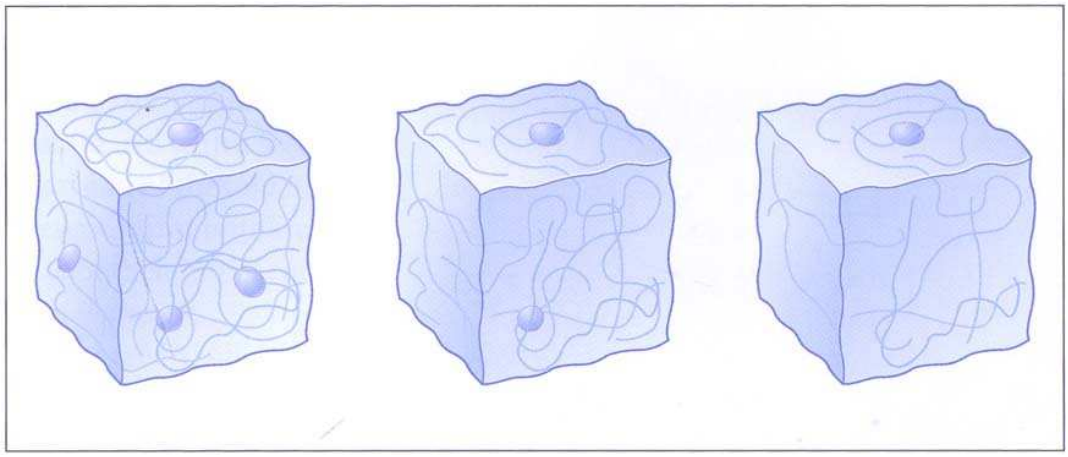


Fig 11.3 Structural framework of Restylane® and Perlane® molecules. Initial volume is maintained throughout the degradation phase.

- **Restylane® is of moderate viscosity, long lasting, good for deeper and superficial injections and the most versatile (deep, superficial and lips).**
- **Hylaform Plus® is less viscous than Perlane®, making it ideal for smooth insertion into lips.**
- **Hylaform fine line® and Restylane fine line® come with a 32-gauge needle and smoothly fill fine superficial rhytids, e.g. crow's feet.**

Indications

The choice of product depends on the area to be filled and on the volume required. Patients may also be restricted financially in their choice of treatment which can be adapted in order to give the best value for their money. For example, Perlane® may be best for deeper rhytids, but if a patient has both superficial and deep rhytids (e.g. a glabellar crease and nasolabial folds), and can only afford one syringe, 0.7ml of Restylane® may be used to treat both. Patients can be advised to plan for a full Perlane® syringe in the future, and they should be made aware that the deepest rhytids compress the gel most quickly, and require a top-up sooner. If there are no budgetary constraints, open as many syringes as are necessary to achieve the desired result (Fig. 11.4ab). Failure to do so always leads to a dissatisfied patient.

It is important to analyze the facial features and then tell patients exactly what volume is required for an optimal result, e.g. 2 x Perlane® 0.7 for deep nasolabial folds; 1x Hylaform Plus® 0.75ml for lips; 1x Hylaform fine line® for cheeks. They will then appreciate that suboptimal results will be achieved with less, and will not telephone the next day to say 'the lines are still there' if they buy only one syringe.

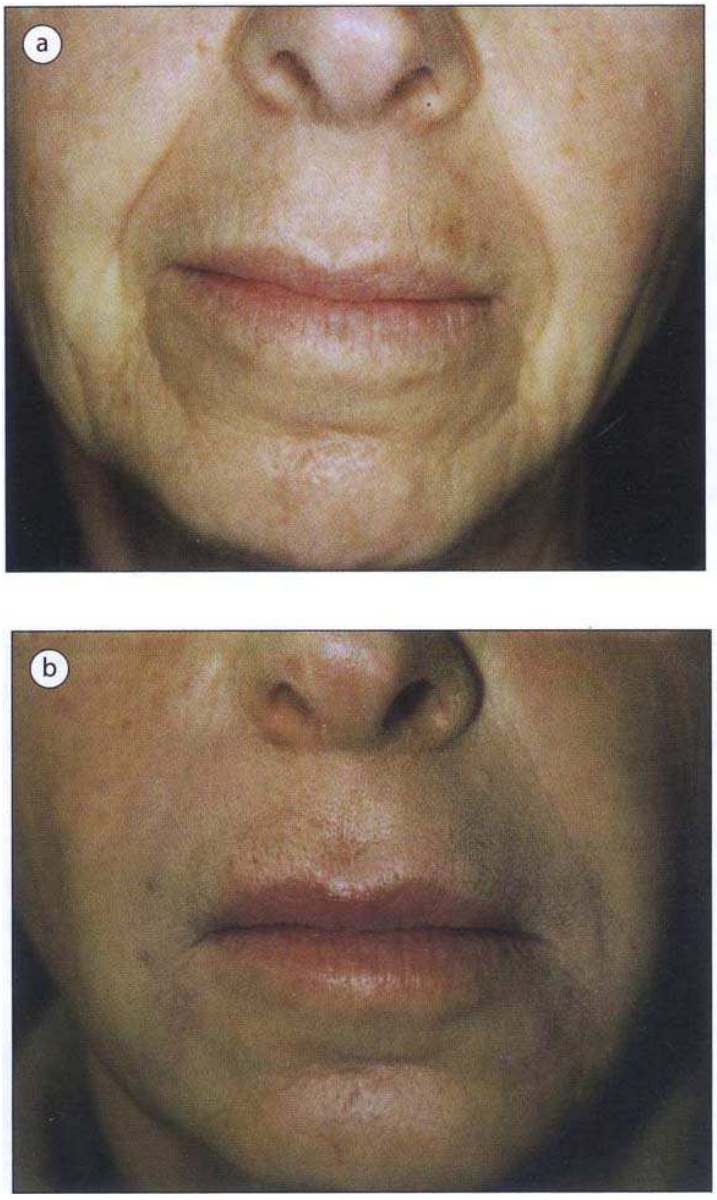


Fig 11.4 Before (a) and after (b) four syringes of 0.7 ml Restylane®.

Patient Preparation

Injections of hyaluronic acid are sore – the pain being a sensation of pressure rather than the 'sting' of botulinum toxin. Injections are usually superficial and so can be effectively anesthetized topically with Emla® or Amotop®. Deeper injections, for example to the lips, can be very painful. It is recommended that a local anesthetic is infiltrated submucosally first.

Patients should be warned that preparation takes at least 30 minutes. They should arrive early, in order that the nurse can apply Emla® and cover (with OpSite® or cling film) the area to be treated. They can then relax before treatment. For the lips, tetracaine gel is applied to the gums after these have been dried with a swab. A dental syringe with a short 30-gauge needle is used to infiltrate Citanest® (or lidocaine (lignocaine)) submucosally in the fornix. This works in 10 to 20 minutes. Sterex® antiseptic cream is applied after the treatment and patients are allowed to apply make-up.

Nasolabial folds

Some nasolabial folds, particularly those associated with a short upper lip, respond well to botulinum toxin treatment. Deeper folds, in older patients, are best treated with a face-lift, although it is not uncommon for a deepening of the nasal end of the fold to persist after an effective operation. Most patients presenting for botulinum toxin are not ready to consider major surgery at the time of their initial consultation, and are thrilled to have a short term 'cheat' with Perlane®.

Superficial filling can be very effective (Fig. 11.5ab) and achieved either with Perlane® or Restylane®. Deep filling may take more than one session (Fig. 11.6ab). We place Perlane® in the superficial dermis, deep to the epithelium. Deeper placement often fails to 'lift' the skin and may be 'lost' towards the sinuses. Warn patients that this layer will become slightly

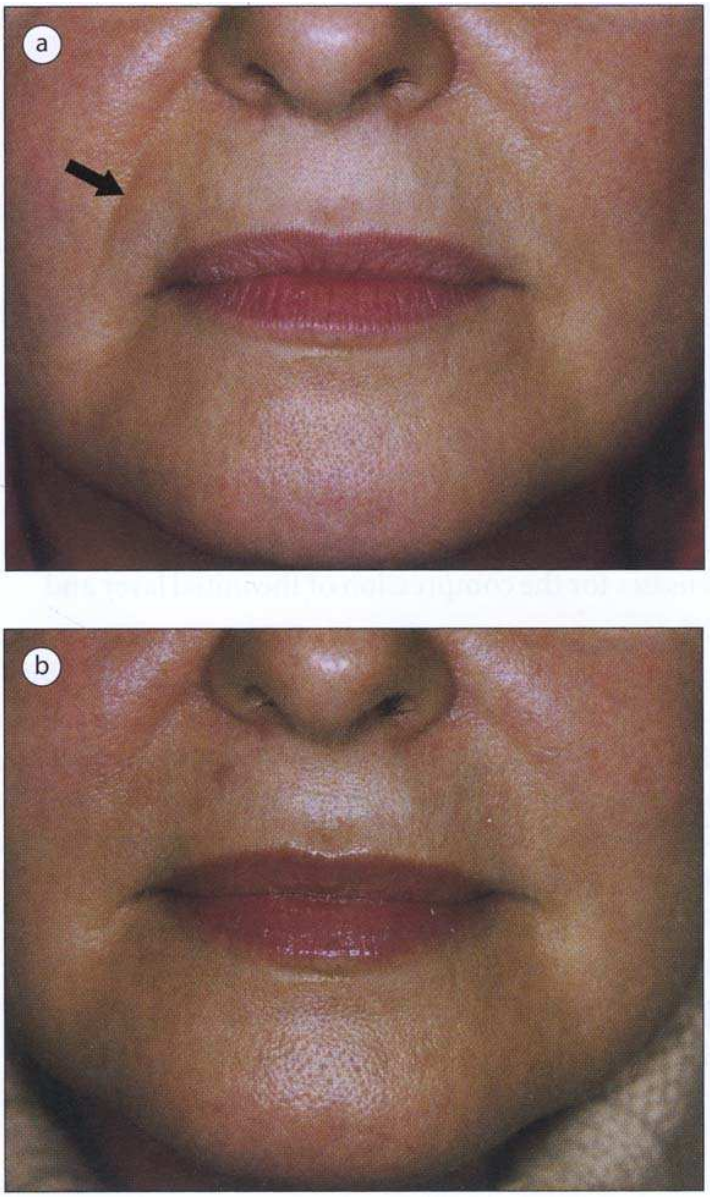


Fig 11.5 Before (a) and after (b) treatment of fine nasolabial line with 0.4 ml Restylane®.

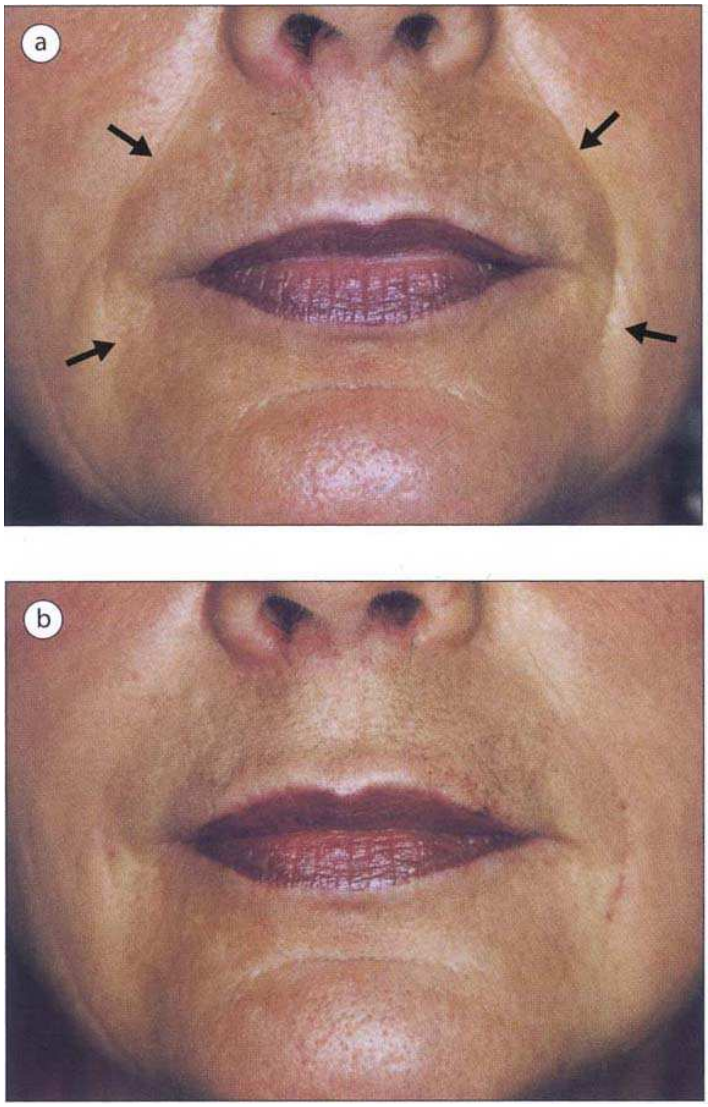


Fig 11.6 Before (a) and after (b) treatment of deep nasolabial folds with Perlane® 0.7 ml.

compressed by facial movements and recommend a top-up over the same layer after six weeks. This compensates for the compression of the initial layer and achieves a long-lasting effect.

Marionette lines

These can be improved greatly by lower face-lift surgery. Some patients tend to slide their lower jaw back, emphasizing the downturn of the corners of the mouth. Discuss the need for a dental opinion with such patients and refer them back to their own dentist if appropriate. The treatment of marionette lines with a filler is rewarding (Fig. 11.7ab). As with the resolution of a frown, the elimination of these descending lines can alter a patient's countenance and create the illusion of lifting the whole face. The author prefers Perlane® or Restylane® for this area.

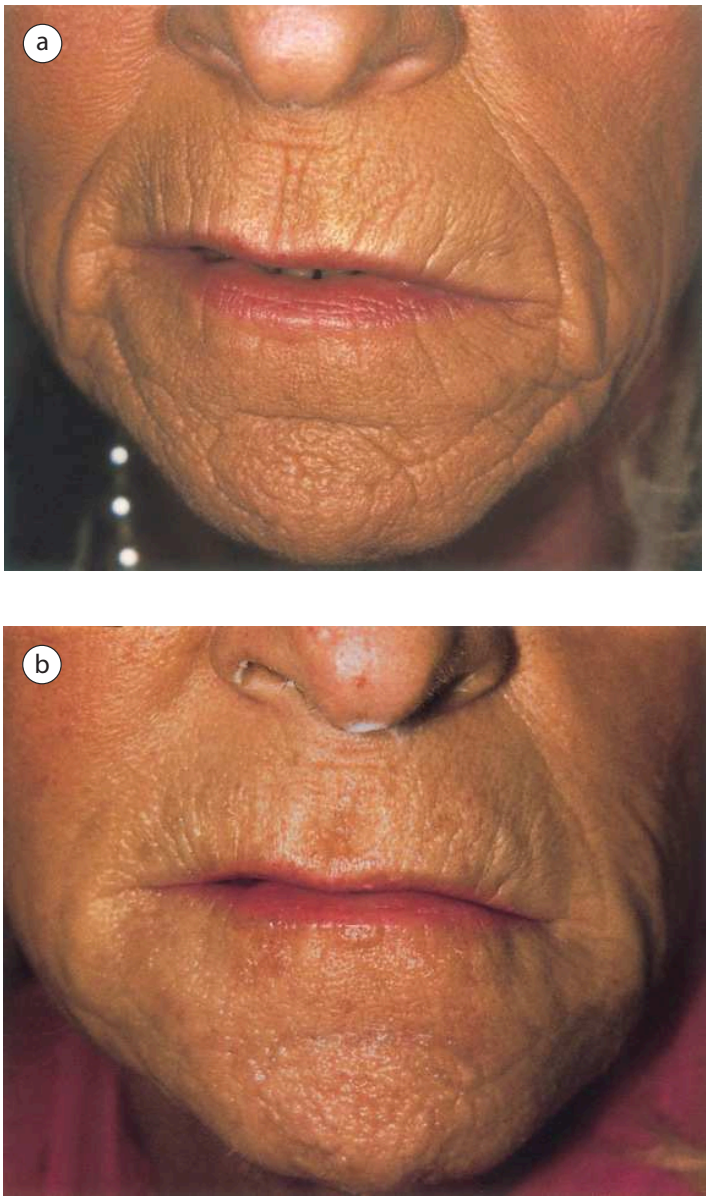


Fig 11.7 Before (a) and after (b) Restylane® to marionette and perioral lines.

USER TIP

Do not overfill an area of skin with hyaluronic acid as this can cause local necrosis and bruising. It is better to bring the patient back after six weeks for further treatment to the same area. This allows for some compression of the initial gel and achieves a greater 'lift'.

Glabellar crease

The treatment of a glabellar crease with botulinum toxin is discussed in detail in Chapter 8. Hyaluronic acid offers an instant 'fix' if a patient is waiting for procerus and corrugator muscle bulk to diminish. It is also ideal for those who

are unsuited to full-blown botulinum treatment because of brow ptosis. The author favors Restylane® for this area but has often placed some 'left-over' Perlane® in the deeper dermis, or Hylaform fine line® more superficially. Fine rhytids respond very well to Restylane® or Hylaform®. Usually less than 0.2 ml of hyaluronic acid is needed to treat this area. A small syringe (e.g. 0.4 ml) can be opened and sometimes the remains can usefully be placed periorally or nasolabially.

The upper lip

Patients complain of upper lip rhytids (especially smokers), or of a thinning of the upper lip, or both. The nose-lip distance elongates with age and some plastic surgeons shorten this surgically with an elliptical excision of skin from under the nose. Most patients are unaware of this elongation.

Look carefully before the anesthetic is applied or injected. Ask the patient to pout and observe the gaps between the fibers of the orbicularis oris. Examine the distance from lip to nose. Look for rhytids at rest, and deeper rhytids in motion. Examine the symmetry of the lips and discuss this with the patient.

Care must be taken with 'wrinkles in motion only': inject Restylane® or Hylaform® into the gap that is seen with pouting (Fig. 11.8). Inject the superficial dermis and take care not to leave a bleb above the surface of the skin at rest. If a 'lump' forms, massage the area between two fingers and disperse the gel. Instruct the patient to do the same over the following few days.

'Wrinkles at rest' are best treated with a combination of laser resurfacing and Restylane®. Many patients will go ahead with fillers while waiting for the right time for resurfacing.

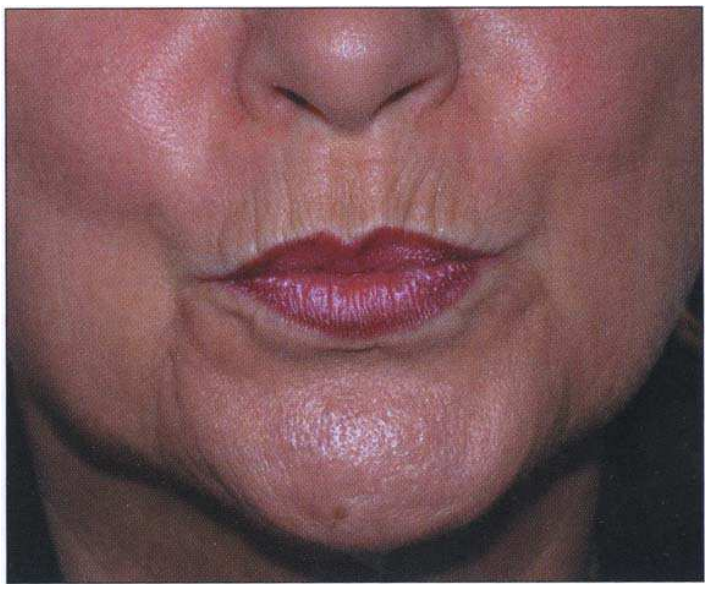


Fig 11.8 Wrinkled upper lip emphasized by pouting.

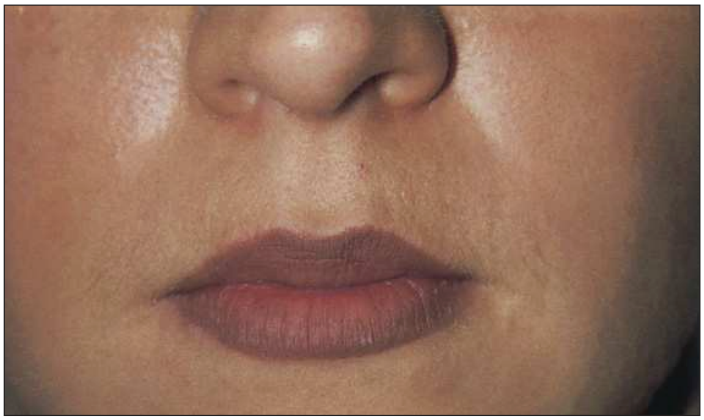


Fig 11.9 Cupid's bow/philtrum.

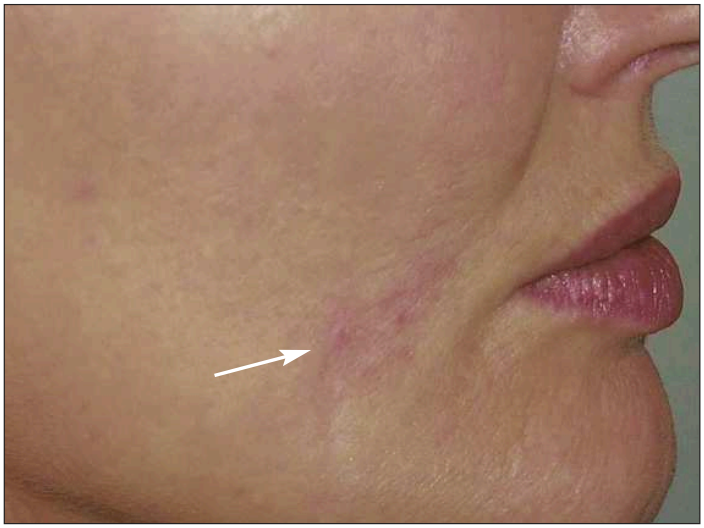


Fig 11.10 Fine line injections.

Increasing the convexity of the upper lip with injections between the orbicularis oris fibers shortens the lip nicely and improves its appearance. The philtrum can be reconstructed, again rejuvenating the lip instantly (Fig. 11.9), and a small amount may also be placed at the Cupid's bow.

Deep 'rhytids at rest' can be kept at bay with Hylaform fine line® injected very superficially into the epithelium (Fig. 11.10).

Lip enhancement depends largely on taste. The author prefers not to enhance an upper lip that will protrude noticeably above the lower one, even if the upper is much thinner. It is not always possible to guarantee vertical volume and, in particular, with certain types of dentition, the gel can expand the lip anteriorly. The vermilion border alone may be enhanced for a subtle improvement (Fig. 11.11ab). Restylane® is excellent for providing symmetry to lips. It is also useful for patients with cleft lip deformities and, when layered with Perlane®, a nice anterior displacement of the upper lip can be achieved.

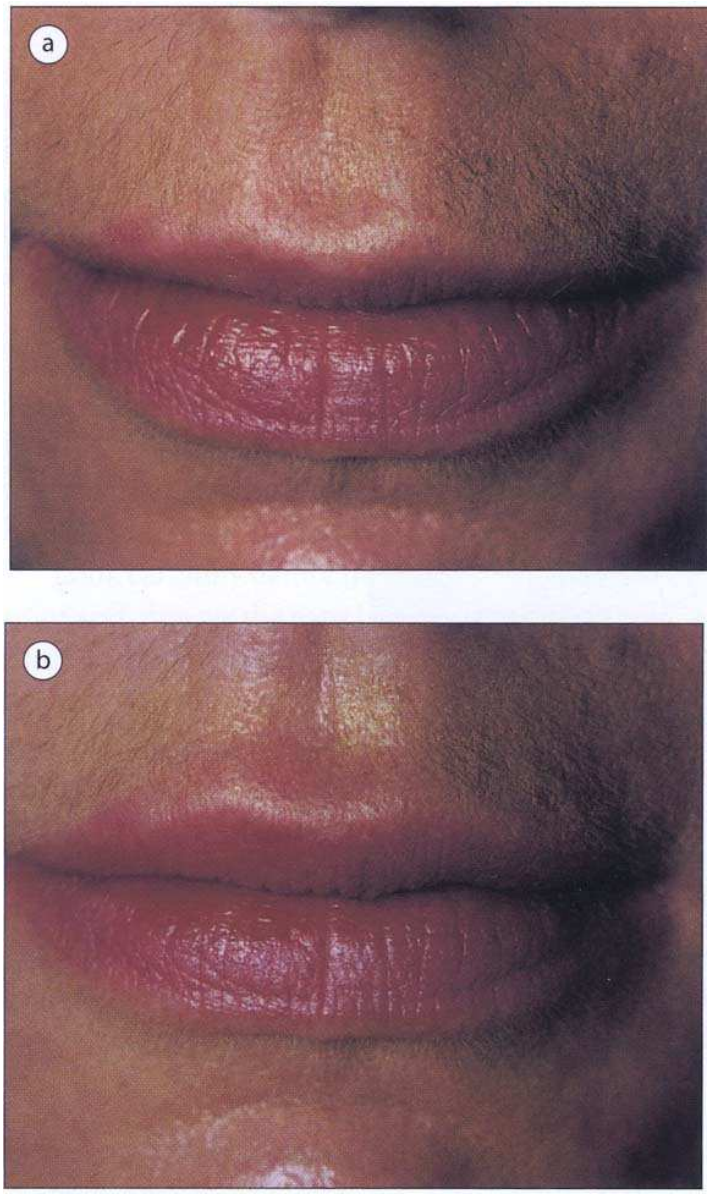


Fig 11.11 Before (a) and after (b) Restylane® to vermilion border, upper lip, prior to hair removal laser to upper lip.

Scars

Hyaluronic acid is useful for the volume expansion of scars (Fig. 11.12ab). Treatment with botulinum toxin is dealt with in Chapter 9.

Crow's feet

Botulinum toxin will erase some crow's feet and laser resurfacing will erase the rest. It is important, however, to identify 'hooding' before treatment. Patients with a fold of skin at the outer corner of their eyes will be disappointed with botulinum toxin if it is not demonstrated to them that their fold is due not to

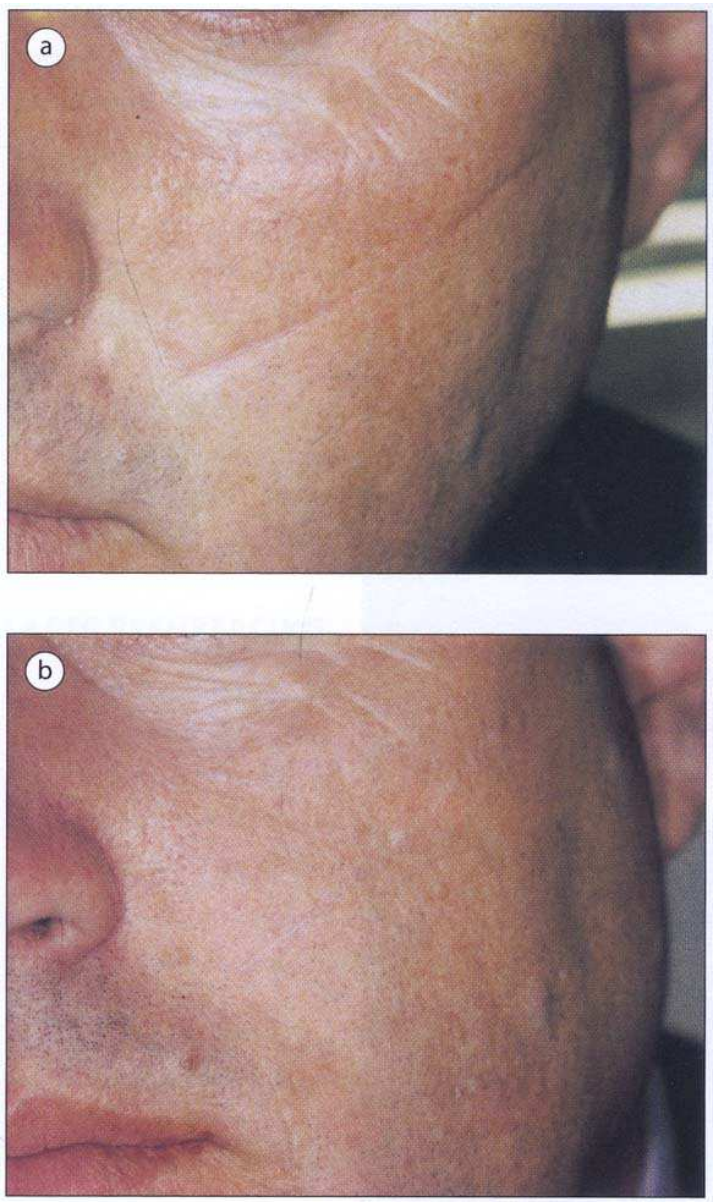


Fig 11.12 Before (a) and after (b) Perlane® to facial scar.

contraction of the orbicularis oculi, but to sagging of their lateral brows and temporal areas. In this case, the correct treatment is by an endoscopic brow lift. Temporary correction may be possible by upper blepharoplasty, with extension of the scar along the crease, or sometimes with internal brow fixation. (Fig. 11.13ab).

Patients with hooding can sometimes cheat with Hylaform® or Restylane fine line®. The 32-gauge needle is inserted just below the epithelium, and gel is injected along the rhytid. Another method is to place a series of gel micro-blebs. The result is an instant improvement although some patients experience temporary edema at the injection site. Fine line gel is also good for infraorbital rhytids, although laser resurfacing may be preferred rather than risk irregularities in the fine periocular skin.

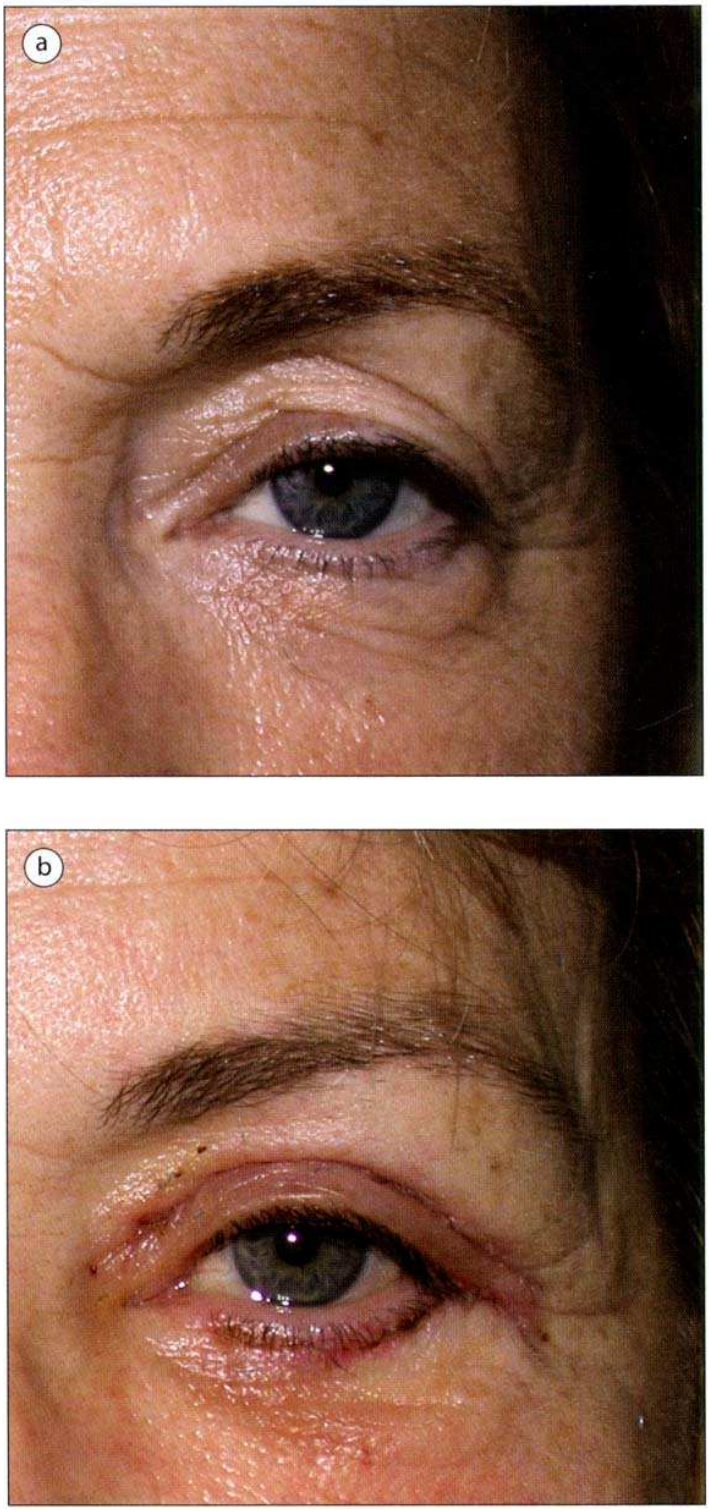


Fig 11.13 (a) Before internal brow fixations, upper blepharoplasty, lower transcutaneous blepharoplasty and lateral canthal tendon plication. (b) scar at 6 days post-op. Note extended scars to treat 'hood'.

The chin

The use of botulinum toxin is an effective way of reducing 'pebbly chin' (see Fig. 9.7). Perlane® or Restylane® may be recommended for irregularities in this area, particularly over dimples.

Cheeks

Botulinum toxin is not indicated for sagging cheeks: the treatment of choice is a face-lift. Laser resurfacing will also tighten the cheeks significantly but there is a growing movement towards volume enhancement with hyaluronic acid. Dr Rita Rakus, London (personal communication) recommends a grid pattern of enhancement across the full cheek. The author has had considerable success with Hylaform® and Restylane fine line® to the fine rhytids of the cheeks, particularly those lying lateral to the orbicularis oris (see Fig. 11.10).

USER TIP

Avoid placing hyaluronic acid in the epithelium of a nasolabial rhytid or the cheeks if the skin is fine and translucent (e.g. in a model). Translucent skin will show a grey/white mark of gel at the injection site.

LASER RESURFACING

Botulinum toxin is excellent for 'crow's feet in motion' and may diminish some 'rhytids at rest' with time. However the complete removal of crow's feet is best achieved with laser resurfacing or Coblation. Laser resurfacing is the treatment of choice for perioral rhytids, with or without fillers.

Three main types of lasers are used for resurfacing:

- **Carbon dioxide (e.g. Sharplan Feathertouch®, Coherent Ultrapulse®)**
- **Erbium**
- **Combined carbon dioxide and erbium.**

All of the results shown in this book were achieved with the Feathertouch laser.

Patient selection is discussed in detail in Chapter 5, but make sure that the patient is informed about static wrinkles and laser resurfacing before giving botulinum toxin. Failure to do so will lead to unrealistic expectations and disappointment.

USER TIP

Botulinum toxin is essential for the long-term results of the laser resurfacing of crow's feet. Counsel patients carefully about the natural return of rhytids after the laser resurfacing of crow's feet without paralysis of the orbicularis oculi (Fig. 11.14 abc). Suggest botulinum toxin injections are given a week before, and three months after treatment, as part of the resurfacing procedure.

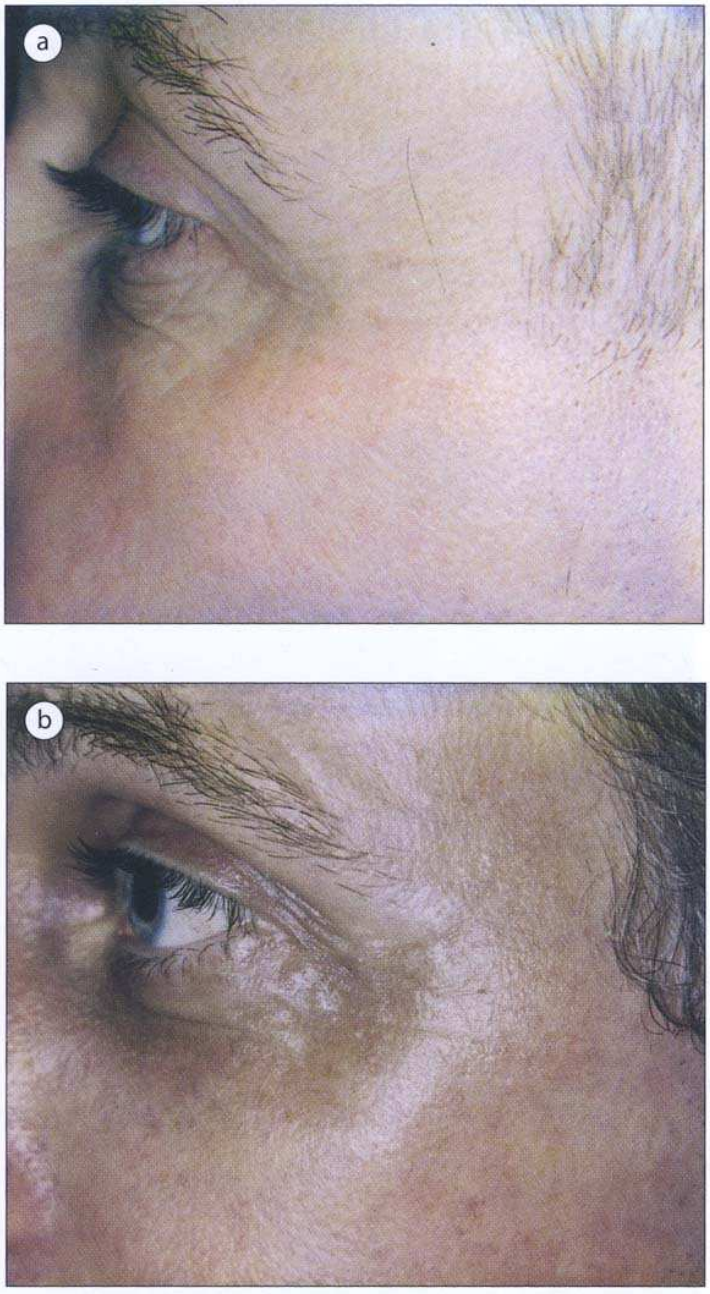


Fig 11.14 (a) before CO_2 skin resurfacing, (b) 6 weeks after CO_2 resurfacing: note return of crows feet, before Botox®, and (c) 6 weeks after Botox®, 12 weeks after CO_2 resurfacing; note wrinkles have disappeared.

Most patients who require botulinum toxin for crow's feet are happy to have the injections once they understand that their 'wrinkles at rest' may diminish and that the 'wrinkles in motion' will improve greatly. Most do not want the downtime of laser resurfacing. It is important at the initial consultation, however, to offer resurfacing as a long-term solution. If your practice is not involved in resurfacing, it is important to provide the following information – and a referral, if requested, to a laser practice.

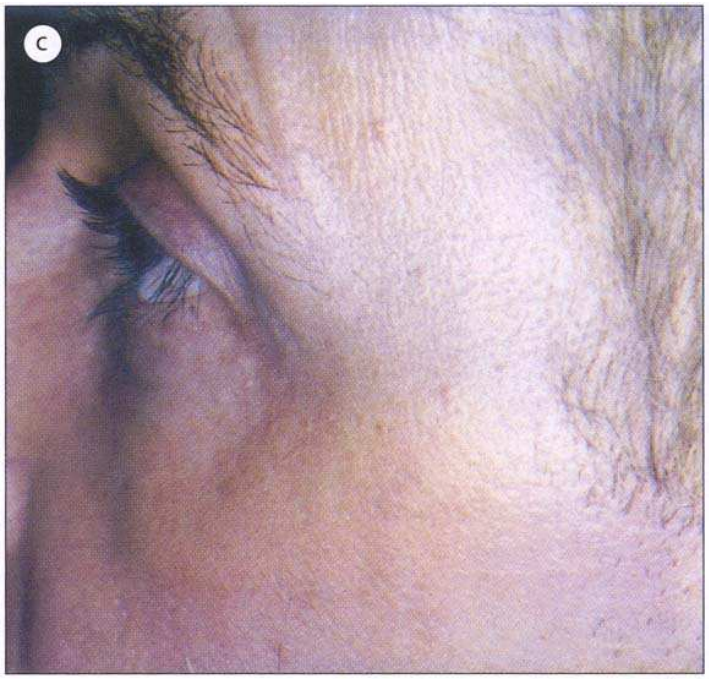


Fig 11.14 *Cont'd.*

Basic facts about laser resurfacing for wrinkles

- A laser vaporizes the superficial layer of the skin, carrying the wrinkled layer with it.
- Treatment is under local anesthetic and takes 15 minutes for crow's feet.
- The skin will heal in six to ten days.
- The skin will have a dressing or ointment on it.
- Following treatment, the skin will be red, brown or even paler than before.
- Freckles will be obliterated, providing a contrast with freckled skin.
- Treatment itself is painless but simple analgesics may be needed over the first 24 hours.
- The patient must rest in an elevated position and apply cold packs for the first 24 hours.
- The patient must be available for post-treatment examinations by the practice nurse – daily if necessary – for six to ten days.
- Ideally the patient should take two weeks off work and socializing, although some can return to work with camouflage make-up after six days.
- The initial results will be greatly improved after three months when new collagen has been formed in the skin.

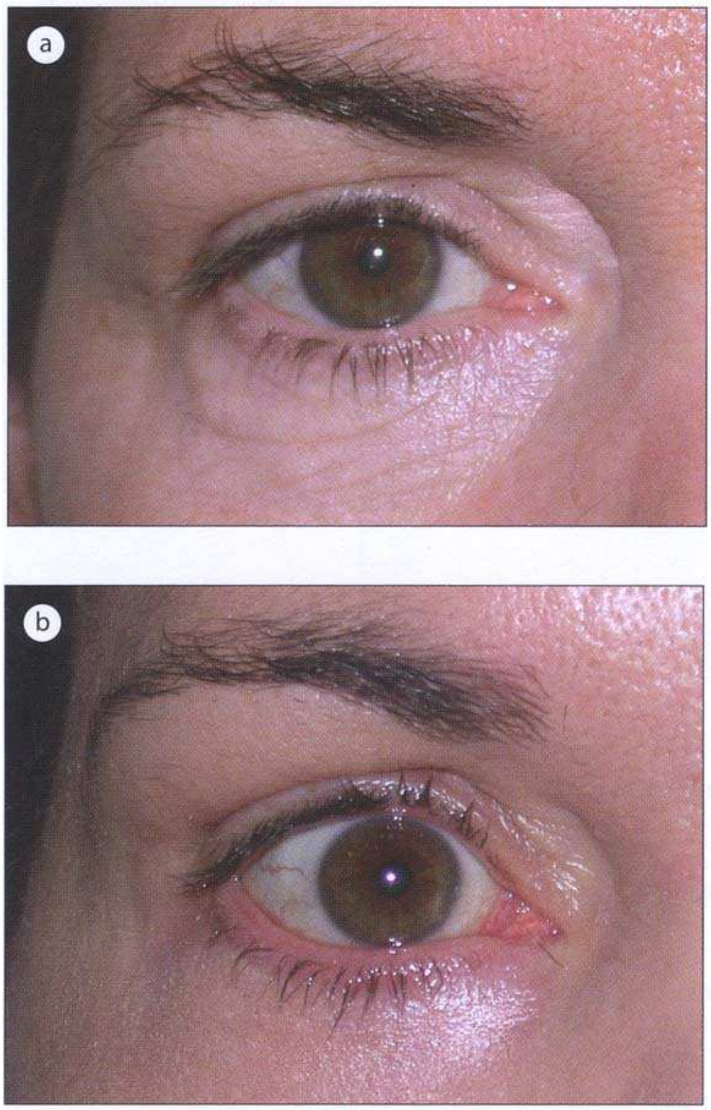


Fig 11.15 Before (a) and (b) 4 weeks after CO_2 resurfacing to eye zone, endoscopic brow lift and upper blepharoplasty.

- **Botulinum toxin is essential to keep the skin flat until this happens (Fig. 11.15ab).**
- **The patient must avoid sunburning the new skin while it is healing.**
- **The patient must appreciate that sun exposure at six weeks will darken the treated area. The use of a sun block is very important even though the pigmentation is reversible.**
- **Complete eradication of rhytids is not uncommon, but the patient should be warned to expect only a 50% improvement of the deeper ones.**
- **The patient will still benefit from hyaluronic acid injections for volume replacement to the lip as the 'new collagen' is never enough.**
- **Non-lasered skin can be blended with the treated area by using intense pulsed light (IPL), Retin-A®, AHAs, microdermabrasion, chemical peels and sun block.**

UPPER LID BLEPHAROPLASTY

Ageing patients who have an excess of skin over their upper lids (dermatochalasis) will often elevate their brows subconsciously using the frontalis muscle. This lifts the skin off their lids, restores the deep crease, and takes 'the weight off their lids'. This excessive brow elevation will cause deep horizontal frown lines to develop. Such patients often ask for these wrinkles to be removed with botulinum toxin (as discussed in detail in Chapter 8). However treatment of the frontalis with botulinum will drop their brows to their normal position and accentuate the dermatochalasis. It is important to explain to these patients that they will look tired and older if their frown is paralyzed. They must choose between frown lines and an upper blepharoplasty. Some patients may also need brow repositioning if their brows have sagged.

Some patients complain that using botulinum toxin for their forehead made their 'lids swell'. This is because a loss of brow elevation may also allow normal orbital fat to protrude. Figures 11.16ab and 11.17ab illustrate pre- and post-laser blepharoplasty patients. Making transcutaneous incisions and vaporizing excess fat using a CO_2 laser reduces hemorrhage, edema and recovery time.

If your practice does not perform oculoplastic surgery, then the following information may be given to patients, along with an appropriate referral.

Basic facts about upper lid blepharoplasty

Blepharoplasty means the excision of skin and/or fat from the eyelids.

An incision will be made in the lid crease.

The surgery takes place under local anesthesia and lasts for between 30 and 60 minutes.

Stitches will be removed between 4 and 7 days after the operation.

The scar will usually be hidden in the crease (Fig. 11.18).

The patient must rest in an elevated position for the first 24 hours.

Rest is important for the first 4 days to prevent late complications such as hemorrhage.

One week off work usually suffices.

The most common complication is bruising (reduced with laser incision).

Rare complications include infection, prolonged swelling and hematoma formation.

Results last until ageing causes further sagging of the skin i.e. forever in some patients and at least 10 years in most.

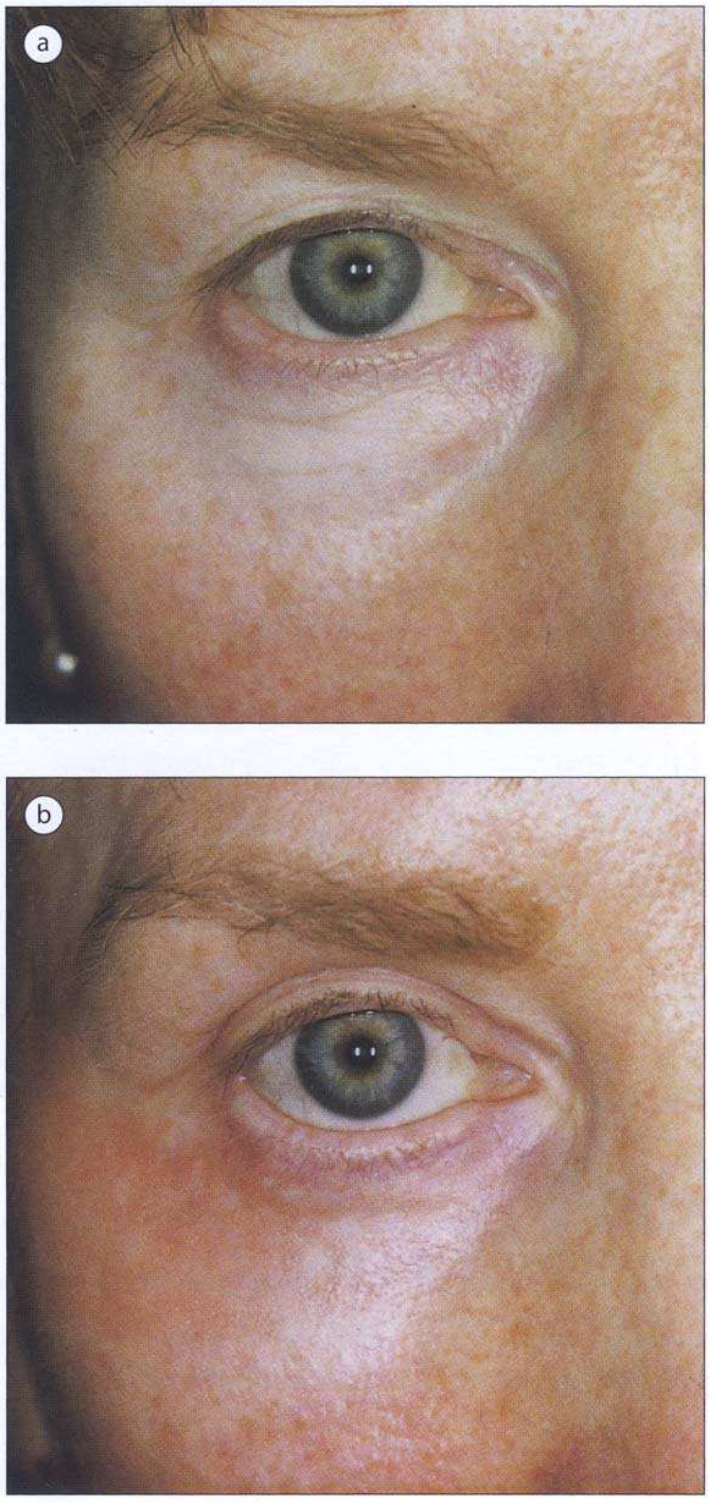


Fig 11.16 Before (a) and three weeks after (b) CO_2 laser blepharoplasty to upper lids with internal brow fixation, and lower lid transconjunctival blepharoplasty with CO_2 resurfacing. Note: erythema at 3 weeks in type 1 skin.

Lower lid blepharoplasty

Ageing causes the skin under the eyes to sag. Laxity of the orbital septum behind the skin and muscle also allows the lower orbital fat pads to protrude, emphasizing the 'bags', which are often held in the orbit by the tone of the

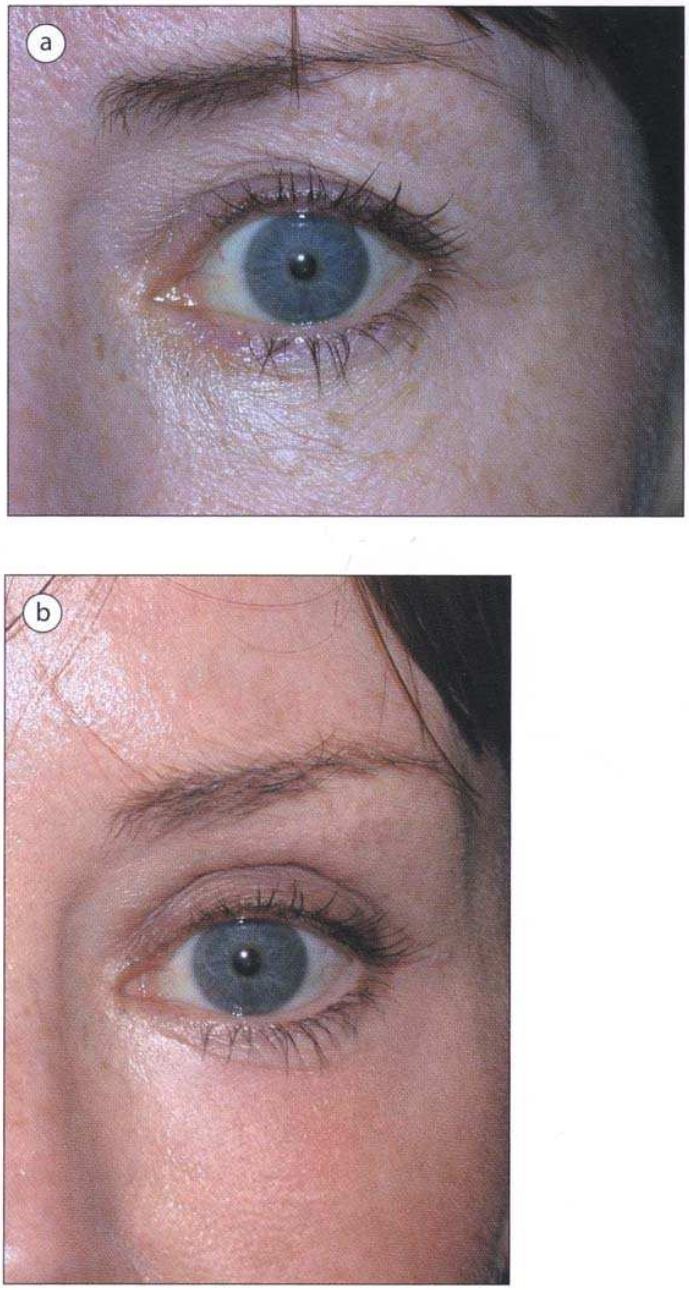


Fig 11.17 Before (a) and three weeks after (b) CO_2 laser blepharoplasty with lower lid transconjunctival blepharoplasty and eye zone CO_2 laser resurfacing. Note pink discolouration that usually fades over 6 weeks.

orbicularis oculi muscle. It is very important not to inject botulinum toxin into the lower lid orbicularis muscle if it seems to be restraining fat in this way. Such patients must be told that they can only have their lateral rhytids (crow's feet) treated if they have lower lid blepharoplasties.

Traditional lower lid blepharoplasty is transcutaneous, through an incision underneath the eyelashes (sub-ciliary) (Fig. 11.19). A skin/muscle flap is raised, the fat is excised, and the flap is trimmed and sutured. Limitations of this procedure are a visible scar, a tendency to pull the lateral eyelid vertically and so

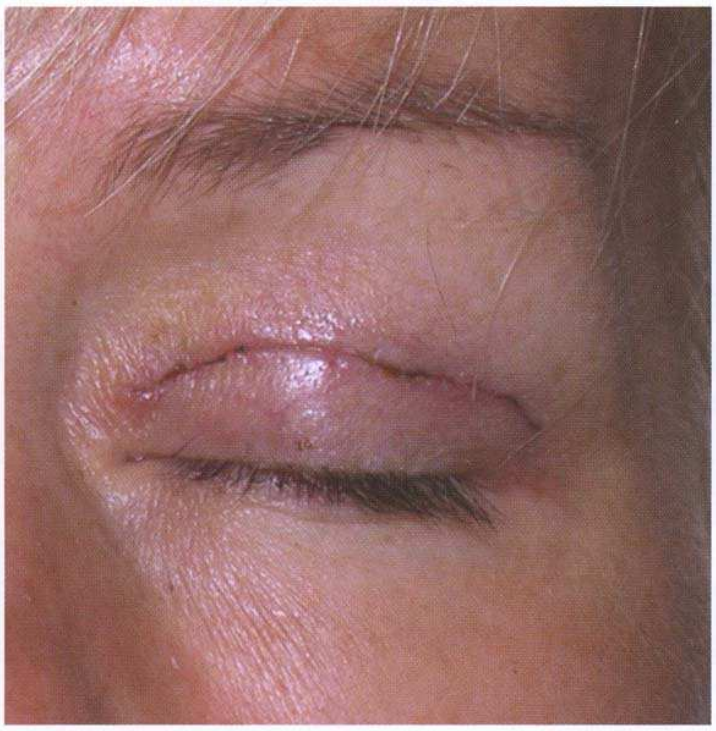


Fig 11.18 Typical lid crease scar day 6 post blepharoplasty.

Fig 11.19 Before (a) and after (b) traditional transcutaneous blepharoplasty with subcilary incision.

'round' the lateral canthus, and increased problems with hemorrhage and bruising.

This procedure may be restricted to those who are not suitable for laser resurfacing e.g. sun bathers with sun damaged skin on their faces and no desire to blend old skin with new; patients with excessive orbicularis folds who require muscle shortening; and the many men who would find it embarrassing to wear make-up to hide the erythema that follows resurfacing.

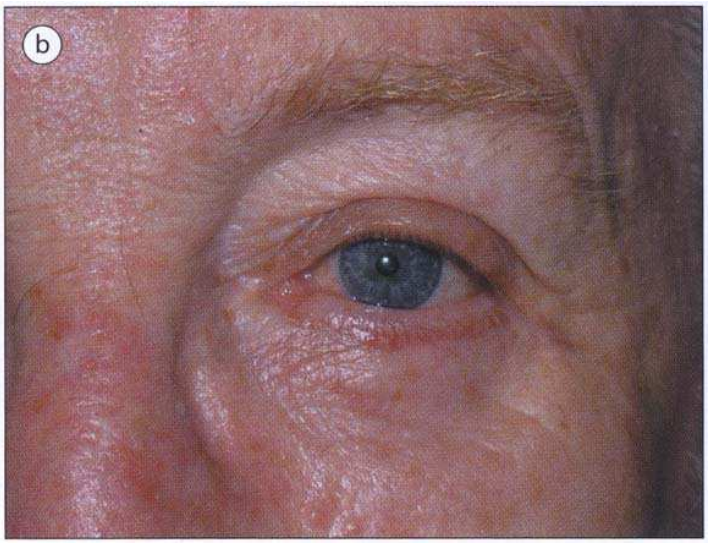


Fig 11.19 *Cont'd.*

USER TIP

Do not inject botulinum toxin into the lower eyelids if there is an excess lower lid skin and fat. This causes the prolapse of fat, with protrusion of 'bags', until the orbicularis muscle tone returns.

The author prefers to perform transconjunctival fat removal. An incision is made through the conjunctiva in the lower lid fornix. Fat is then vaporized. This may be done without skin resurfacing (Fig. 11.20ab – thyroid) but most patients want their skin tightened too, and two passes with the Feathertouch® CO_2 laser can achieve this (Fig. 11.21ab).

Basic facts about lower lid blepharoplasty

- **This is the removal of lower lid fat bags with tightening of the skin.**
- **Skin can be tightened by a cut under the eyelashes or with a laser.**
- **If the skin is cut, the sutures will be removed between 4 to 6 days. There will be a fine scar, which can easily be concealed with an eyeliner pencil. Most people should take one week off work**
- **If the skin is lasered, there will be no scar but the resurfaced skin will take six to ten days to heal. Post-operatively the resurfaced skin may be red, brown and then pale (as above). Make-up can be applied as camouflage as soon as the skin has healed. Most people should take two weeks off work.**
- **The eye may be bloodshot after the surgery – due to bruising.**

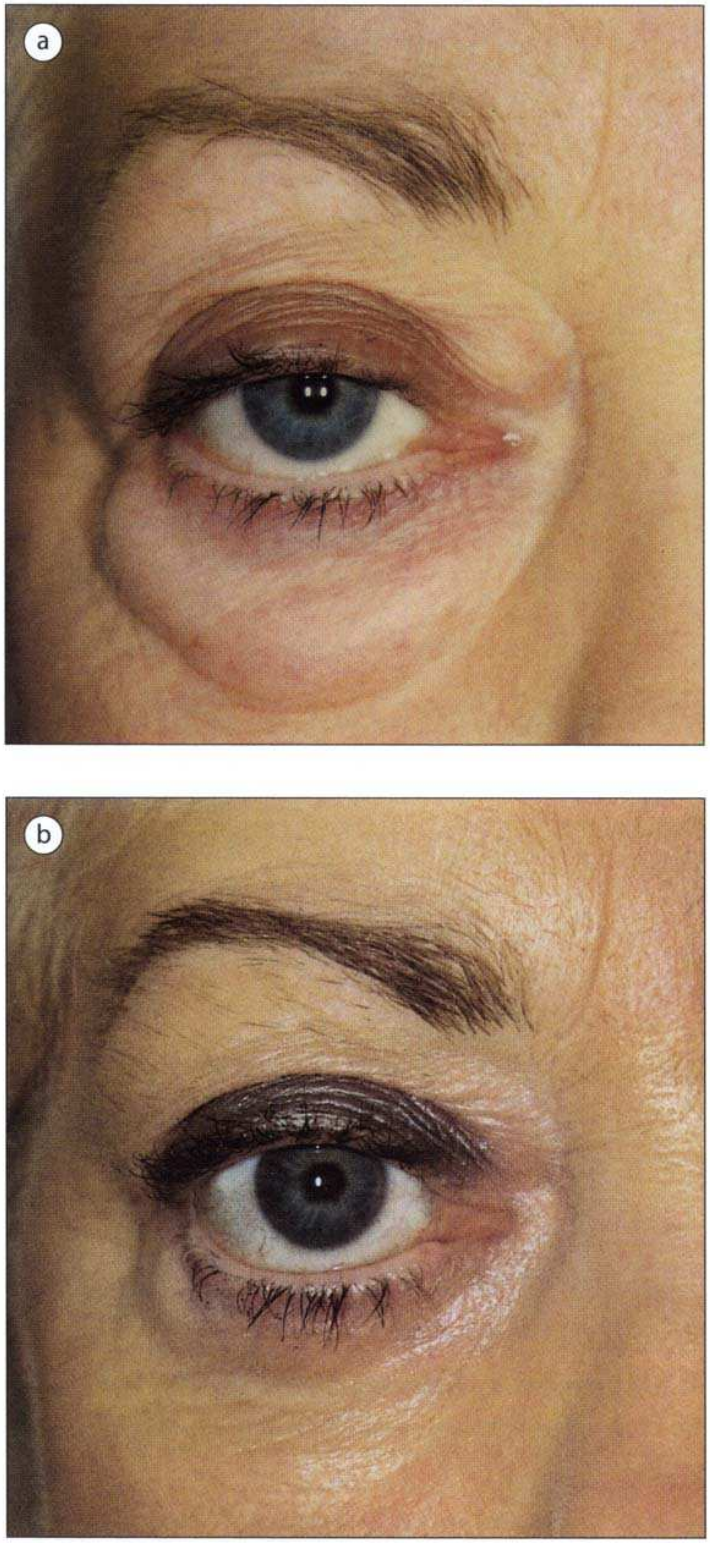
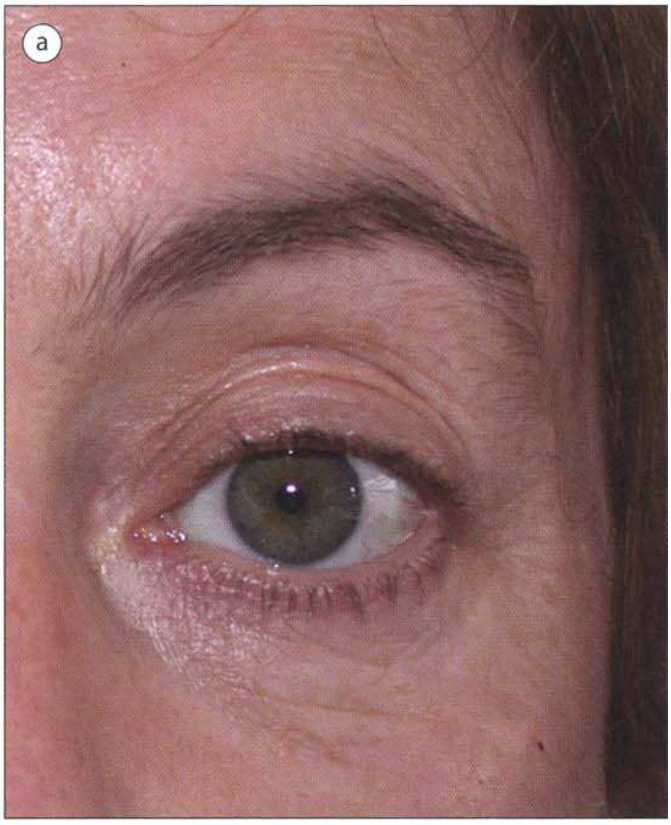


Fig 11.20 (b) transconjunctival fat removal without skin/muscle excision or CO_2 laser resurfacing in a patient with thyroid eye disease.



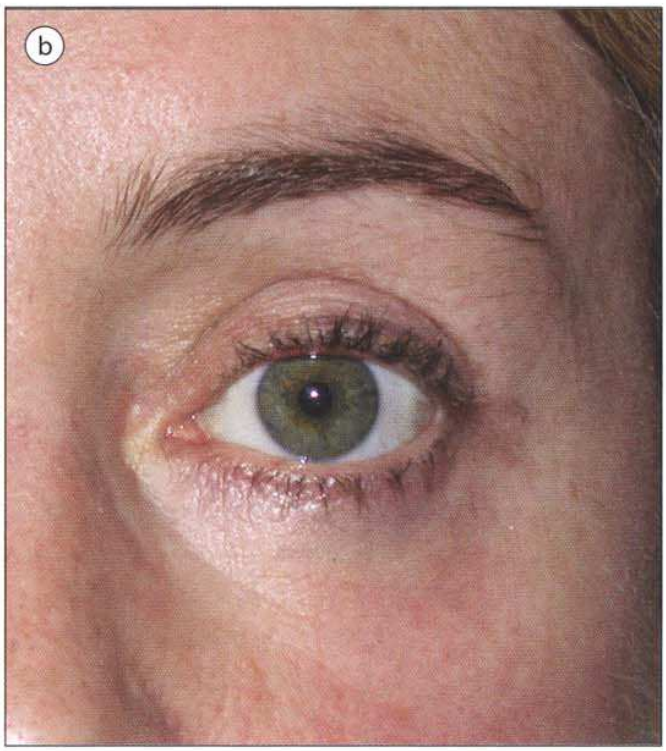


Fig 11.21 Transconjunctival lower lid blepharoplasty with CO_2 resurfacing (upper blepharoplasty also).

The patient may require lateral canthal tendon plications (tightening of the outer corner of the lids through fine incisions in the upper and lower corners) to prevent 'rounding' of the eye contour

COMBINATION TREATMENTS

Some patients need botulinum toxin in combination with a filler, blepharoplasty and laser resurfacing to achieve the best result.

USER TIP

Do not give botulinum toxin injections at the same time as surgery. The effect may be altered by a local or general anesthetic and in the author's experience has been unpredictable. In contrast, fillers can be injected during surgery with good effect.

Lips

Figure 11.22a shows a patient who underwent laser resurfacing of her upper lip. Figure 11.22b shows the same patient post-operatively, with residual clefts between her orbicularis oris rhytids. Botulinum toxin had little effect on reducing the depth of these. Figure 11.22c demonstrates the lip immediately after an injection of Restylane.

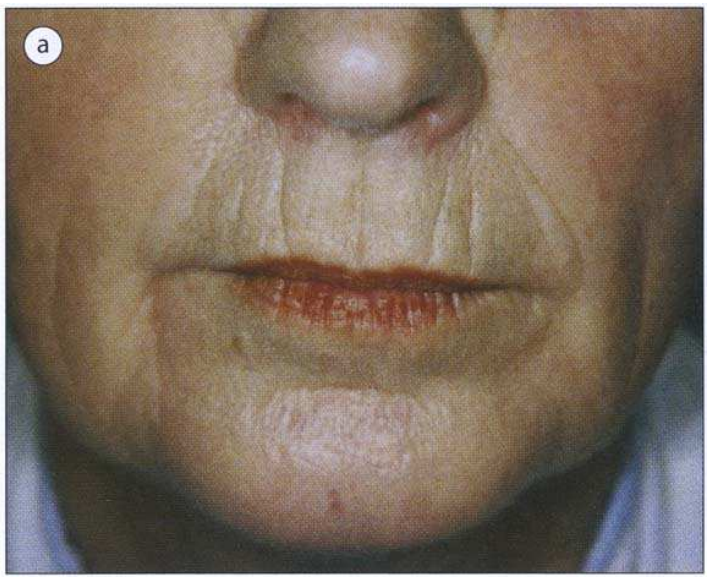
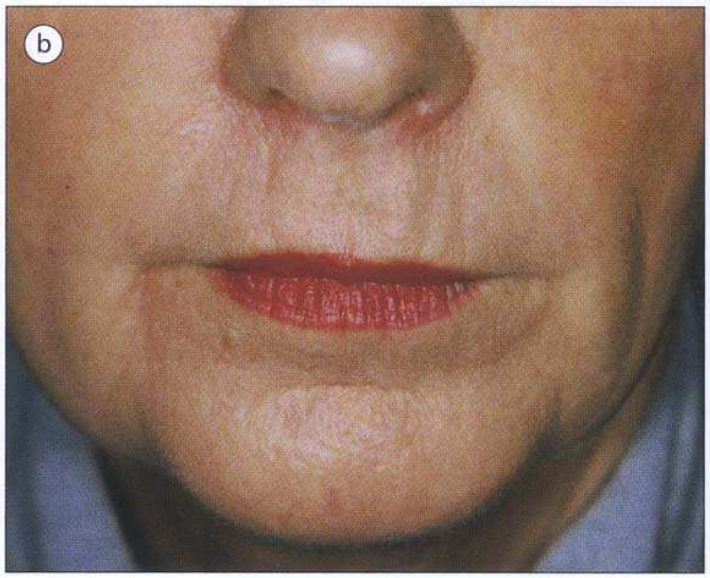


Fig 11.22 Before (a), after (b) CO_2 laser resurfacing to upper lip and (c), after Restylane® to vertical rhytides.



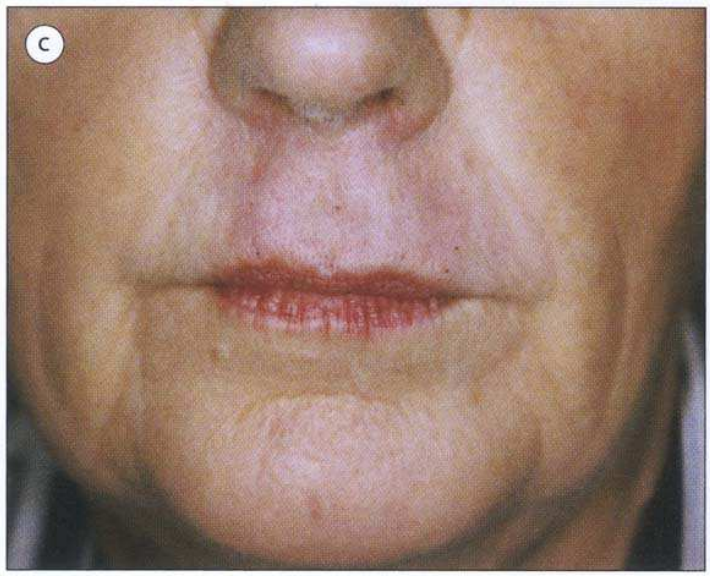


Fig 11.22 *Cont'd.*

Frown

Botulinum toxin will reduce the size of hypertrophic frown muscles – the 'mountains' on either side of the valley of the frown. The skin will, however, remain wrinkled at the point of chronic compression. Figure 11.23ab shows a patient who had Botox® to her glabellar muscles, laser resurfacing of the sun damaged rhytid, and Restylane® to the base of the rhytid.

Figure 11.24ab shows a patient before, and three months after, laser resurfacing and Botox® to her glabella.

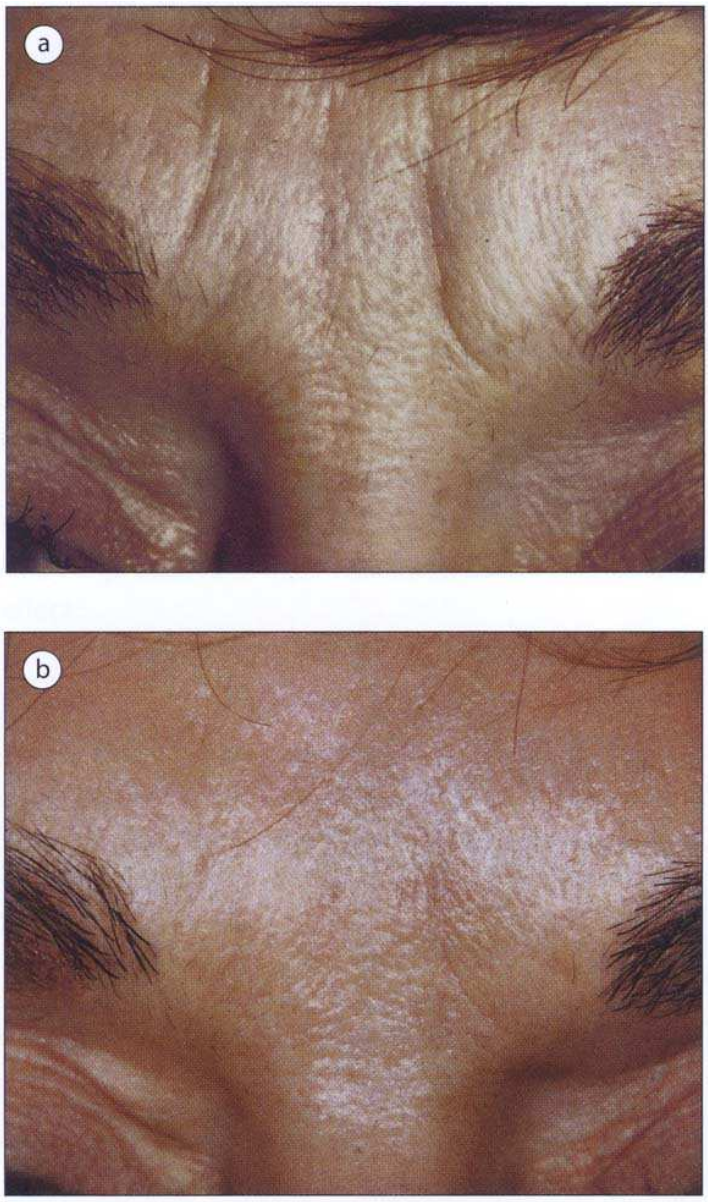


Fig 11.23 Before (a) and after (b) CO_2 resurfacing , Botox® and Restylane® to glabella.

Face

Figure 11.25ab shows a patient before and after full face CO_2 resurfacing including the upper lids, with Botox® to crow's feet and frown, and Restylane® to upper lip and perioral rhytids.

Rejuvenation of the skin

It is important when considering the management of crow's feet or frown lines to address the underlying causes. Inform patients that smokers have damaged 50% of the collagen in their skin at the age of 50 compared to non-smokers. Demonstrate their sun damage by comparing the skin on the inside of the upper arm with that on their face. Tell them that laser resurfacing might achieve

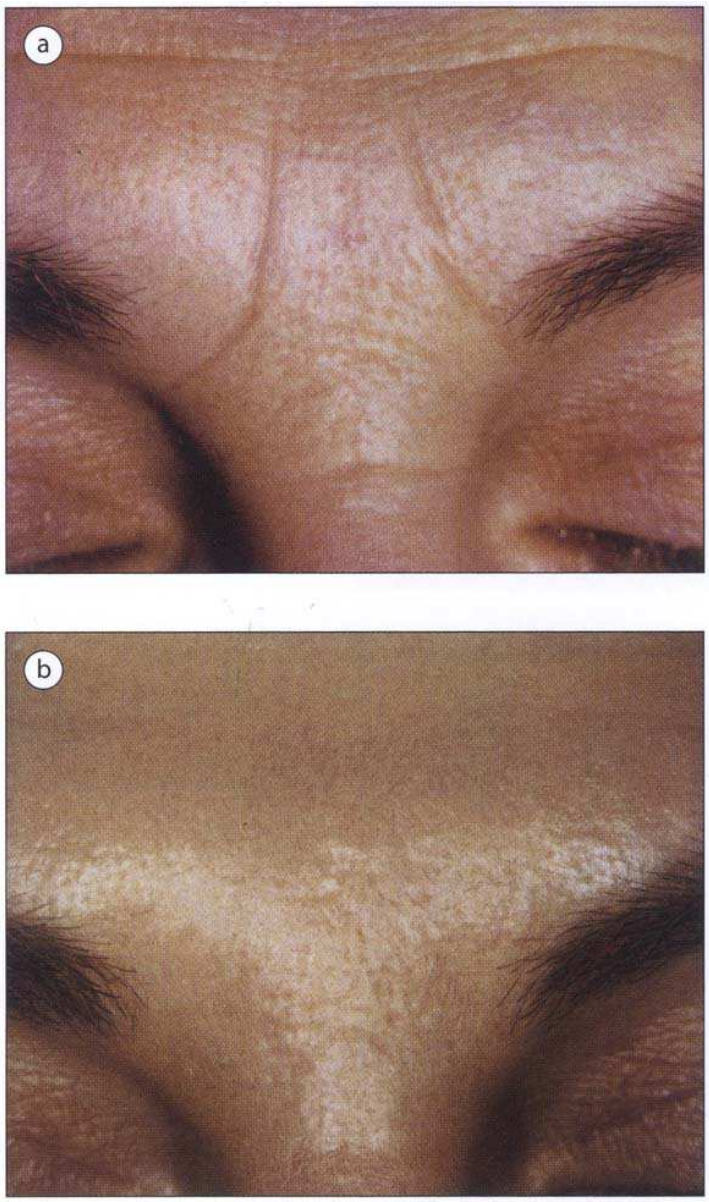


Fig 11.24 Before (a) and after (b) CO_2 resurfacing and Botox® to glabella.

the translucency of skin undamaged by the sun, but that this must then be blended in with the skin on their neck and the rest of their face.

An aesthetic nurse can spend time at the initial consultation explaining the effects of UVA and UVB on the skin, discussing different types of sun block, and giving suitable samples. Interested patients can be provided with an anti-ageing regime that includes vitamin C and E and alpha hydroxy acids. Retin-A® may be prescribed when appropriate. Such a regime, in combination with botulinum toxin alone, can provide dramatic results.

Patients who have booked laser resurfacing of their crow's feet with botulinum toxin are strongly recommended to have a course of intense pulsed light (IPL) and/or particle skin resurfacing to micro-dermabrade the damaged

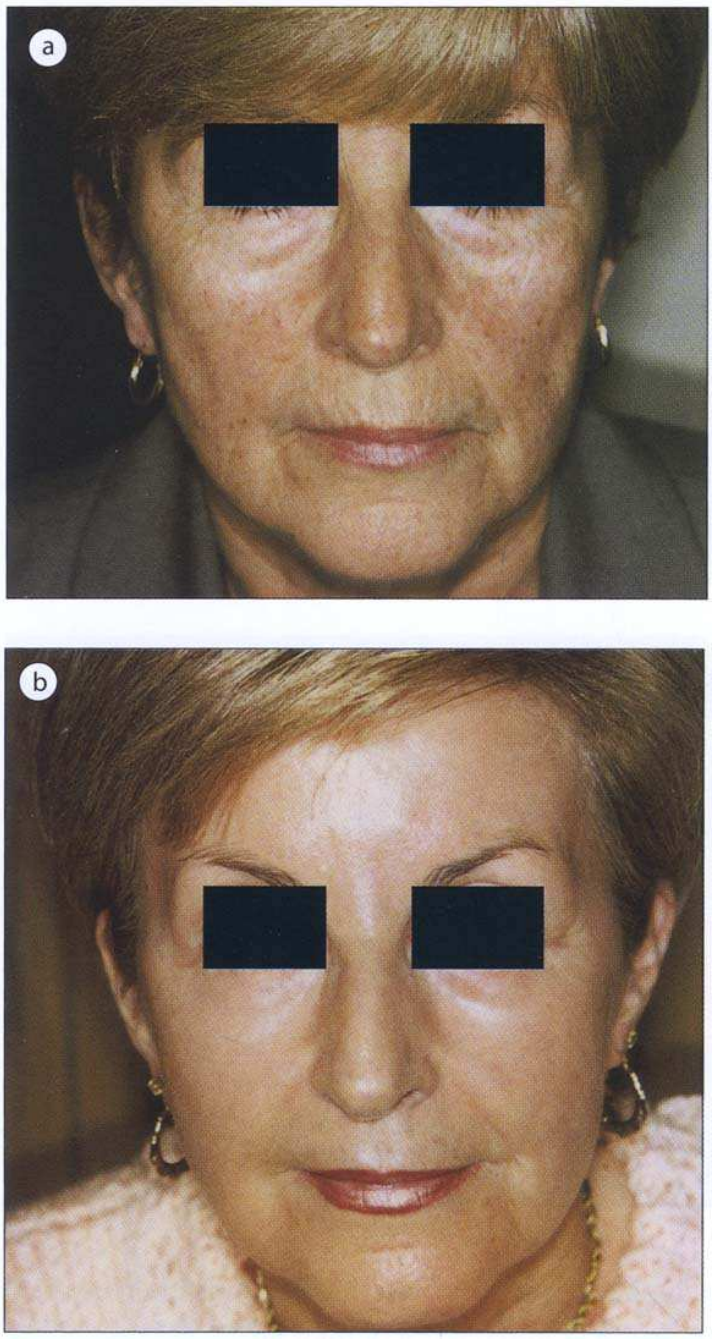


Fig 11.25 Before (a) and after (b) full face CO_2 resurfacing, Botox® and Restylane® to upper lip.

stratum corneum and to stimulate collagen production in the adjacent skin and neck.

NON-ABLATIVE COLLAGEN STIMULATION

Chemical peels and microdermabrasion stimulate collagen production. More recently, the results of stimulating collagen with light are emerging e.g. by the use of IPL®, N-Lite® and Cooltouch®. These systems offer a gradual

stimulation of collagen production with no downtime but are currently associated with considerable discomfort. The results of further developments in this promising area are awaited.

Table 11.1. Indications for alternative treatments with or without botulinum toxin

Indication	Treatment
Crow's feet at rest	Laser resurfacing, coblation, hyaluronic acid
Lower lid bags	Laser blepharoplasty
Vertical frown with low lash brow distance	Endoscopic brow lift, hyaluronic acid
Frown with heavy upper lid skin	Upper lid blepharoplasties, brow repositioning, hyaluronic acid
Upper lip rhytids, mouth zone rhytids	Laser resurfacing, hyaluronic acid
Platysma bands, neck rhytids	Lower face lift, ligation of platysma, submental tuck.
Poor skin tone, sun damage	IPL microdermabrasion, chemical peels, Retin-A®, alphahydroxy acid skin regime, vitamin C and E serum, sun protection

12 Guide to good cosmetic practice

Many doctors who use botulinum toxin will already be involved in a cosmetic practice e.g. oculoplastics or plastic surgery; for others, however, its use will be the only aesthetic procedure offered in a busy medical clinic. This chapter offers the latter some suggestions on how to run a cosmetic practice.

LOCATION OF PRACTICE

Confidentiality is an important part of any medical practice: in a cosmetic practice this is mingled with a strong desire on the part of the patient for privacy. Many patients do not want to be seen approaching the clinic or, more particularly, leaving it. An ideal cosmetic clinic, therefore, would have a separate entrance in an inconspicuous part of the building, perhaps with a separate exit too, so that patients do not meet one another. A separate waiting room could be offered to each patient.

However most practitioners are not in a position to relocate when they start a cosmetic practice. The following considerations should then be taken into account:

Waiting room

In a general clinic, the real purpose of a patient's visit need not be apparent to others as, for example, a patient attending for a regular Botox® visit may equally well be keeping a routine appointment with another practitioner for a routine spectacle examination. In the same way, a waiting room shared with non-cosmetic practitioners also enables patients to remain inconspicuous, if

the receptionist rather than the cosmetic practitioner calls the patients from the waiting room – preferably without using their full name.

Telephone

The receptionist should always avoid mentioning one patient's name in the presence of another, particularly when making appointments and confirming details. Members of the practice should never identify themselves to others when telephoning a patient unless that patient has given prior approval. Similarly, they should not leave a message on an answering machine that could be intercepted by someone other than the patient.

Account

Avoid dealing with one patient's account in the presence of another patient as this could reveal the extent and nature of the treatment. A receptionist should ideally meet patients in a private room to settle their accounts and to make follow-up appointments.

Exit

Some patients may be bruised after treatment. A private exit is invaluable for them, and can conveniently be used too as an entrance for patients with a high public profile.

PATIENT INFORMATION

Repeat visits for botulinum toxin take very little time, but the initial consultation can take up to 90 minutes. Patients must be fully informed about the risks and side effects of every chosen procedure. This information must be given verbally and in writing. It is important to ensure that the patient has 'heard' the information and understands it fully. It is also advisable to record that patients have received this information. Always remember that some patients smile in an understanding fashion but may not be capable of comprehending the information given to them.

It is useful to appoint a fully trained aesthetic nurse to counsel patients. Such a nurse can see patients before their medical consultations: if so, the practitioner must double check that they fully understand the information given by the nurse, and correct any misunderstandings or unrealistic expectations.

PATIENT COUNSELING

Counseling should include taking a detailed medical history (see Chapter 5 on patient selection). Written and verbal information about the treatment and its likely outcome should be given and the patient carefully photographed.

Table 12.1. Sample information checklist

Information	Yes	No	Comment
Family history of neuromuscular disorders			
Bleeding disorders			
Advised about bruising			
Advised that BTX lasts 12–14 weeks			
Advised that BTX may not work until 5–7 days			
Advised about allergies to protein etc.			
Warned that treatment is contraindicated in pregnancy			

Information may also be provided on alternative solutions and adjunctive treatments, such as blepharoplasty and microdermabrasion. Again, there should be documentation to show that this information has been given. The author's practice uses a customized software package with an auditable trace (no information entered can be altered without this being detected). It includes checklists, which the nurse fills in as each topic is covered with the patient (Table 12.1).

PHOTOGRAPHY

Photography before treatment is essential. Patients may telephone to say that the botulinum toxin has not worked, but are usually pleasantly surprised when shown their pre-treatment pictures. Many patients attend for repeat treatments, and regular photography is a useful record of facial changes and progress. Most of all, photography provides essential medical evidence that cannot be refuted.

A 35 mm camera has long been the traditional choice for medical photography. Its main drawbacks are a lack of immediate confirmation of the desired result, and the expense of films and their development. Advances in digital photography have now resulted in digital cameras of high resolution.

A Polaroid™ macro camera is very useful. The focusing system allows for repeated photography from exactly the same distances; this is ideal for an inexperienced photographer. Disadvantages include a limited ability to photograph both eyes simultaneously at a moderately high magnification, although an attachment is now available to help this. Color reproduction is also poor, with different batches of film giving different skin color tones. Film is expensive.

The digital cameras currently used in the author's practice are the Kodak™ 260 zoom and the Nikon Coolpix™. It is possible to select the degree of resolution desired. The important thing about digital photography is to have an auditable database for storing the photographs. They may be uploaded into a patient file with auditable software (e.g. Ocuco™) or moved to a non-reusable cd-rom for retrieval and storage. It must not be possible to alter either the image or the date on which it was taken, otherwise the record will not be acceptable legally.

The cameras mentioned above are easy to use but lighting and flash settings may have to be altered to maximize the recording of wrinkles and contours. An automatic focus setting is fine for most photographs but can create a problem in patients whose large nose attracts the automatic focal point instead of their nasolabial fold or eyelid. Practice makes perfect; and practice nurses perform all photography in the author's clinic.

Digital images eat up a computer's memory. It is often enough to select a lower resolution that requires less disc space. One full-face photograph and two side views suffice as most software packages allow adequate zoom to enlarge separate face zones from the one image. This also saves computer space.

A patient's written consent should always be obtained before displaying any photographs in practice albums or elsewhere.

A BASIC BOTULINUM TOXIN CLINIC

Botulinum toxin clinics are often run from general surgeries. The following requirements should then be considered.

Cold storage (see Chapter 4)

Reconstituted Botox®, Dysport® powder, and NeuroBloc® solution also have to be kept cold – try an insulated container such as a vaccination box (Fig. 12.1) or a wide thermos flask. Remember that reconstituted botulinum toxin should not be frozen. Take great care not to agitate vials of reconstituted solution during transportation. A small refrigerator (must operate at 2–8°C) and a freezer (must freeze to minus 5°C) can easily be purchased (Figs 12.2 and 12.3).

Basic botulinum toxin kit

- **Protective gloves**
- **Alcohol swabs**
- **1.0 ml or 0.50 ml syringes (e.g. insulin or tuberculin syringe)**
- **25-gauge and 32-gauge needles**
- **Vials of normal saline**

Fig 12.1 Insulated container for transport of botulinum toxin.

Fig 12.2 Small fridge full of botulinum toxin.

Fig 12.3 Small freezer unit for storage of frozen Botox®.

- **Gauze swabs or tissues (for pressure on injection sites to prevent bruising)**
- **Sealed sharps disposal unit (for sharps, toxic and blood contaminated materials)**
- **Cold storage as above**

The aesthetic nurse

Highly trained aesthetic nurses are an invaluable asset in any cosmetic practice. They can be trained to do the following:

- **Prepare patients for botulinum toxin**
- **Prepare patients for fillers**
- **Patient counseling**
- **Patient photography**
- **Rejuvenating skin care (chemical peels etc.)**
- **Microdermabrasion**
- **Preparation and storage of botulinum toxin**
- **Laser hair removal**

Non-ablative collagen stimulation

Patients may be offered a consultation with the aesthetic nurse while waiting for their medical appointment.

Botulinum toxin is highly effective when combined with skin rejuvenation. An aesthetic nurse examines and classifies the skin. A regime of care (in particular, sun protection) is advised and this may include alphahydroxy acids, bleaching agents, and a recommendation for a prescription of Retin-A®.

Rhytid management is discussed. Microdermabrasion, chemical peels and intense pulse light (IPL) can be discussed too, if indicated. Information on cosmetic surgery (see Chapter 11) is given, particularly if it involves treatment of the presenting complaint, for example eyelid bags.

Laser nurse

A nurse can also be trained to remove hair effectively using a laser. This is often requested by older patients who have attended for the treatment of upper lip rhytids.

Many patients with sun damaged skin want their facial telangiectasia and 'age spots' removed. In many countries, a qualified nurse can treat these under medical supervision.

In the author's clinic, a Gentlelase Alexandrite™ laser (Candela™) is used for hair removal, and a KTP Yag laser for telangectasia.

All patient should be examined by a doctor and treated with an initial test patch.

Laser safety

It goes without saying that safety is paramount. All staff involved in laser treatment should have attended a laser safety course – run by a suitably qualified professional body, a university or a laser company – and be aware of laser safety issues. The laser room must be adequate for its purpose, with signal lights above the door to show when the laser is in use, and non-reflective surfaces. Specific laser requirements must be adhered to. Information on laser safety guidelines and on compliance with health and safety legislation is available from national departments of health, and from laser companies.

Fillers

A skilled nurse can be trained to administer submucosal anesthesia before lip treatment. In the author's clinic, nurse practitioners are allowed to inject fillers and submucosal anesthesia (though not nerve blocks) and this has greatly improved the service to patients. All injections are given with a doctor on the premises.

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