

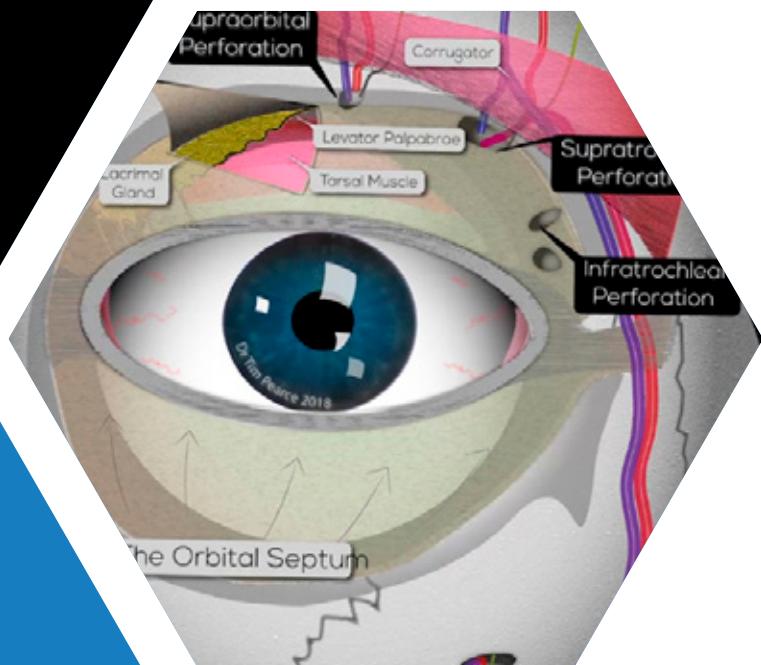
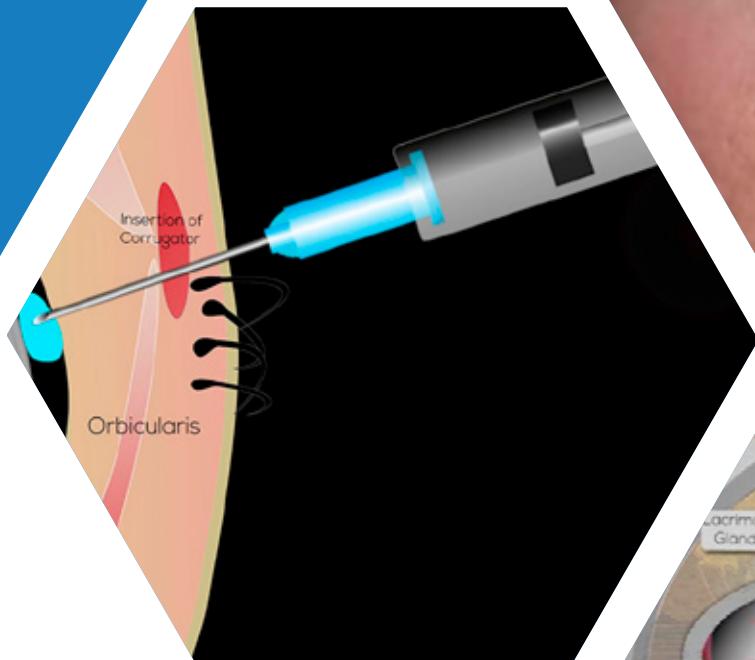
BOTULINUM TOXIN COMPLICATIONS HANDBOOK

BY DR TIM PEARCE

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1

EYELID PTOSIS

MODULE LINK

<https://drtimpearce.com/modules/eyelid-ptosis/>



Let's take a closer look first at eyelid ptosis by far the most serious of all side effects from botulinum toxin.

A droopy eyelid is much more than an aesthetic problem, in severe cases, it can affect the visual fields as the eyelid may partly cover the pupil. This may affect the patient's ability to work and drive and will cause significant distress as the patient's ability to engage in life are disrupted by both the physical limitations and the social limitations of the obvious asymmetry.

Patients often describe it as like having a stroke, and it becomes very upsetting to many.

The disruption of the patient's ability to work, drive and otherwise function properly is associated with medical-legal liability with expensive compensation likely if consent, diagnosis and management have not been handled properly.

For this reason, it is vital that you fully understand what causes eyelid ptosis how to diagnose it how to treat it and had to reduce the risk of it occurring.



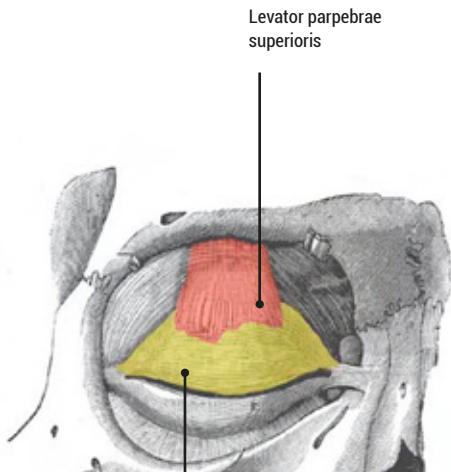
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- If you follow this lecture closely, you will soon understand exactly what you can do to reduce the risk of eyelid ptosis through a comprehensive understanding of the anatomy and simple correlation of your technique to the structures that you are injecting.
 - You also develop the confidence of how to diagnose and eyelid ptosis and differentiate it from brow ptosis and other causes of eyelid asymmetry that are not to do with botulinum toxin.
 - You will understand how to treat eyelid ptosis and reduce the symptoms of the problem.
 - You will be able to explain the diagnosis and management to your patient in a way that reduces anxiety and stress, and creates a smoother path to resolution.

It's my experience that you will reduce the incidence of eyelid ptosis way down from the published data rate which is 1 in 100, to closer to 1 in 10,000 with the knowledge you will gather from this module.

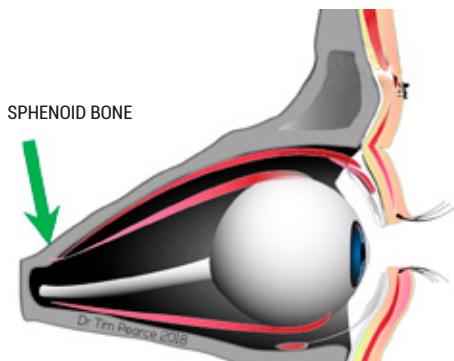
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BOTULINUM TOXIN COMPLICATIONS

EYELID PTOSIS



SUPERIOR TARSAL PLATE



SPHENOID BONE

I expect this knowledge if put into practice will save you enormous amounts of time, money, emotional stress and reputational damage that could result from having an unnecessarily high incidence of this problem, or from lacking diagnostic skills, management knowledge or communication expertise.

We're going to work through each component in detail so that you are fully prepared.

LET'S START WITH A LOOK AT THE ANATOMY

If you have a detailed and accurate three-dimensional mental model of the anatomy that you are injecting, you will naturally become a safer injector. If your knowledge is simpler or two-dimensional you will make important errors that lead to a higher risk of complications.

In my years as a trainer, I've noticed that many practitioners have an anxiety of injecting close to the eyelid, which I believe stems from a two-dimensional understanding of the anatomy in this area.

When you study the structure of an eye in an anatomy textbook, it is hard to understand that the muscles that lift the eyelids are in fact deeper and within the orbit and not actually primarily within the eyelid.

With this knowledge, you instantly realised that it isn't proximity to the eyelid that important but proximity to getting toxin within the orbit which is important.

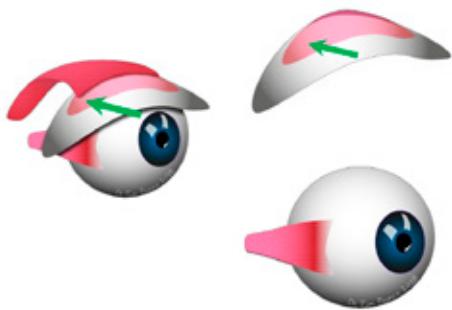
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BOTULINUM TOXIN COMPLICATIONS

EYELID PTOSIS

Let's take a look at which muscles elevate the eyelid.

TARSAL MUSCLE



By far the most important muscle for elevating the upper eyelid is the levator palpebrae superioris muscle. This muscle originates from the lesser wing of the sphenoid bone, right at the most posterior part of the orbit, slightly superior to the optic foramen. It becomes wider, thinner and more fibrous as it passes anteriorly, before becoming the levator aponeurosis, which then finally attaches to the skin of the eyelid and the tarsal plate.

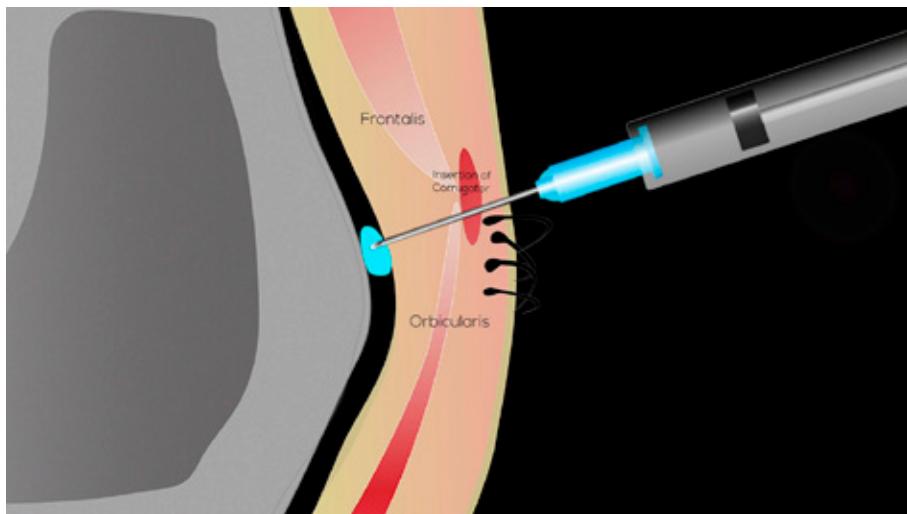
The levator palpebrae superioris is a skeletal muscle, and therefore innervated by the somatic nervous system and is under conscious control.

Lying within the lid, anterior to the body of levator palpebrae superioris and originating from inferior to it lies the superior tarsal muscle, which is a smooth muscle innervated by the sympathetic nervous system which originates from the spinal cord. This muscle also has acetylcholine receptors and will become weaker if exposed to botulinum toxin. It may also contract in response to sympathetic activity or a sympathomimetic drug unlike the levator palpebrae superioris.

You can see there are therefore different ways in which a ptosis may be caused.

The one we are most concerned with is toxin entering the orbit affecting the levator palpebrae muscle and associated structures. It is also possible for toxin to affect the superior tarsal muscle and cause a ptosis or to affect both muscles.

For this to occur the toxin or the needle must pass through several layers of tissue.



The layers of skin, hypodermis, orbicularis oculi, and the orbital septum.

The orbital septum is semipermeable, but also has significant perforations to allow the passage of supratrochlear and supraorbital nerves, arteries and veins from the orbit to the forehead.

It's important for the clinician to also consider other differentials such as a cranial nerve pathology cranial nerve 3 or damage to the sympathetic nerve supply, which is classically called Horner's syndrome and occurs, for example, with apical lung cancers and sometimes for unknown reasons.

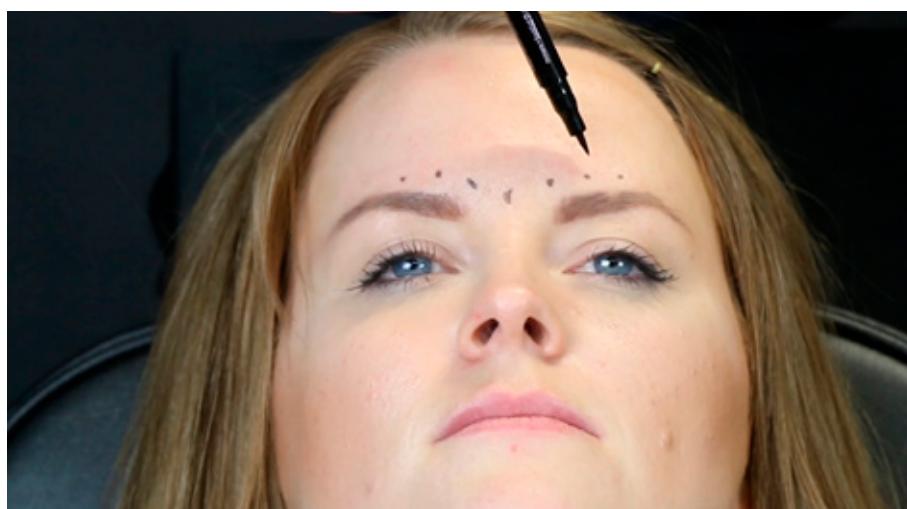
In summary:

- Two eyelid muscles are vulnerable to toxin
- Toxin that reaches deep in the orbital septum is a threat

INJECTION TECHNIQUE

While injecting botulinum toxins it's vital to consider these muscles in context to constrain your technique. Our goal is to relax the corrugator or orbicularis muscle but not to relax surrounding muscles such as the frontalis, or to affect structures in the orbit like the lacrimal gland or elevators.

Therefore, wherever possible, we should utilise the natural barriers of the face or keep the safest distance we can afford while still getting a result. The first muscle to consider is the most superficial muscle, the orbicularis oculi. This muscle in many ways acts as a protective barrier against toxins entering the orbit.



Many practitioners learn on foundation training the 1 or 1.5 cm rule for injecting toxin around the eye. This is useful particularly laterally when injecting the orbicularis Ocular as a part of treating the crow's feet area. Choose an entry point that is 1.5 cm from the bony orbital rim which we can palpate.

However, the second important safety margin as you now know is the depth of injection. This is most true when injecting the superior aspect of the orbit to affect the corrugator muscle.

Any injection which places toxin underneath the orbicularis oculi muscle is immediately a higher risk for unintended denervation of the tissues underneath, but it is necessary to inject underneath it when injecting the corrugator muscles.

This is thought to be the injections most likely to cause eyelid ptosis.

Let's consider the anatomy of the corrugator. The muscle starts deep at its origin at the level of the bone on the most medial part of the superciliary arch and then as it moves laterally, becomes increasingly superficial until inserting above the level of the orbicularis oculi into the skin just lateral to the mid pupillary line.

Inferior and posterior to the muscle lies the supratrochlear and supraorbital notches with their vessels which perforate the orbital septum. You can see there for how injection technique can be guided by this detailed knowledge. We can vary technique and three key ways: Depth, Dose and Angle.

You should track the depth of the corrugator starting deep with higher doses (perhaps 4 units) in the medial body of corrugator with the angle of the needle pointed in such a way as to make sure it's least likely to approach the orbital rim or the frontalis. This normally means aiming in parallel with the corrugator muscle as it tracks from its origin to its insertion just lateral to the mid pupillary line. The dose can also be varied from a higher dose in the thickest part of corrugator to lowest where it is thin and superficial laterally.

The angle of insertion should be controlled to aid depth control and reduce the chance of becoming too close to the orbital rim. You could consider an angle of 30° laterally and 45° medially to help you reach the correct depth, and to always point the needle towards the insertion point.

DIAGNOSIS OF PTOSIS

The diagnosis of ptosis is more difficult than you might think full stop.

Firstly, it is common for the client to self diagnose before seeing you, and report after a Google search that they have eyelid ptosis. This is more often than not an incorrect diagnosis and there are two other diagnoses, which happen more often. The first is pre-existing asymmetry with a nervous client, who doesn't look closely at their faces until after the procedure, they often spot an asymmetry which was present before and attributed to the treatment and a complication. Slight asymmetry in eyelid position is incredibly common and also easy to spot when looking for. Make sure that you take before and after pictures so you can compare your client before the procedure and when they come back for a follow up.

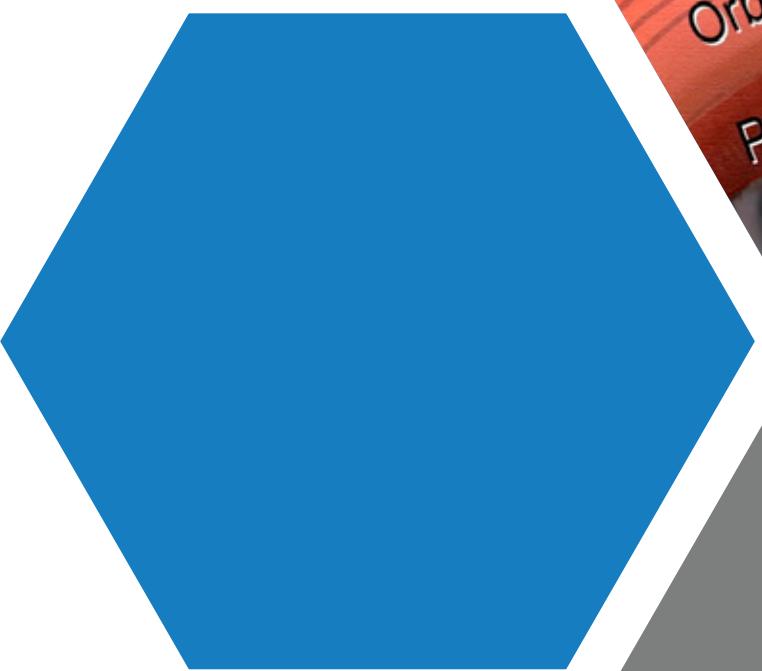
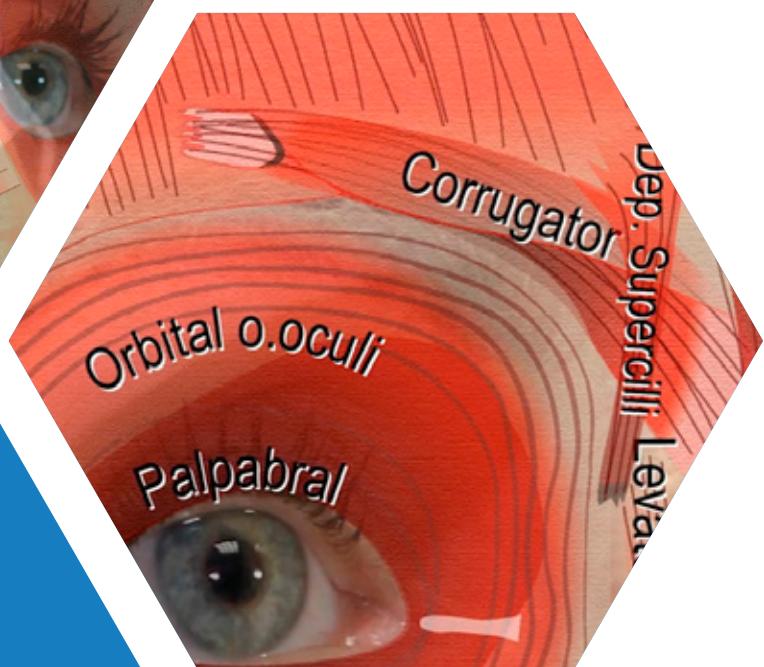
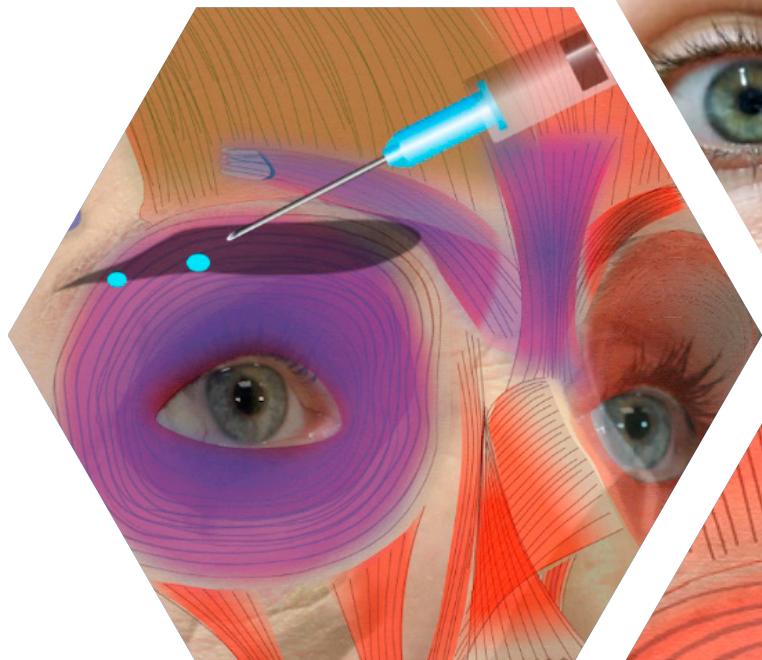
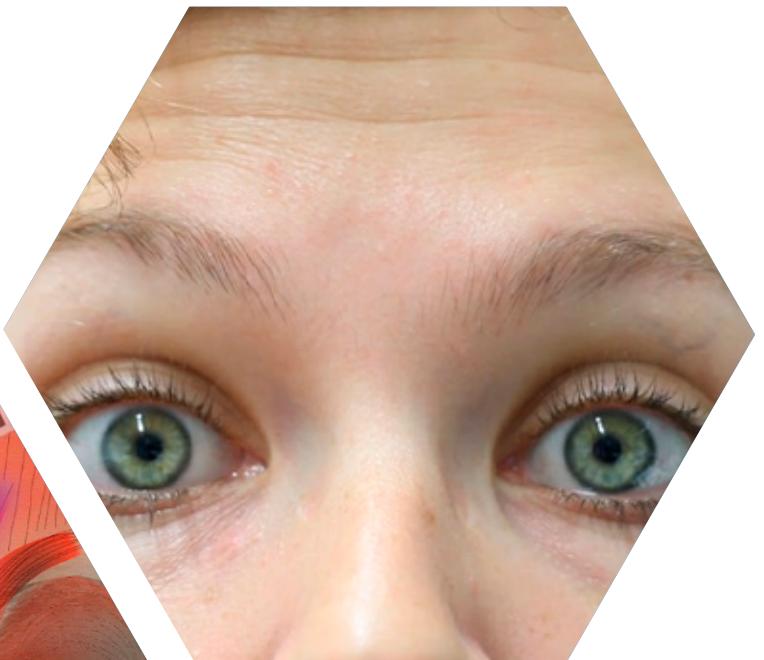
The second very common situation is that the patient actually has brow ptosis which affects their eyelid and this affects them more on one side than the other. It's very important to differentiate these two scenarios because you cannot treat brow ptosis in the same way as eyelid ptosis and expect results. Moreover, brow ptosis may actually be amenable to further toxin but eyelid ptosis will not. The correct diagnosis requires a physical examination of movement and symmetry in before and after photographs.

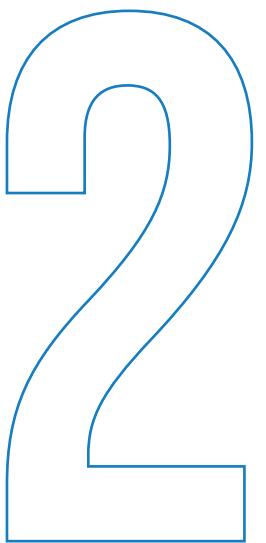
Start by looking at the patient in a static position and look for asymmetry of the eyelid line in comparison with the iris. Often brow ptosis will present with heavier eyelids but the eyelid line remains in the correct position. If there is a fold between the eyelid and the forehead, look carefully at the relative proportions of the fold on the affected and unaffected side to see if this highlights a droopy brow or a droopy eyelid. If the eyebrow has dropped you may notice there is less eyelid showing on the affected side.

Next, it is important to look at movement. Ask your patient to raise both eyebrows to see if the frontalis has been over treated asymmetrically. Next, ask the patient to follow your finger and make them look upwards to test upwards gaze. You may notice more asymmetry in the eyelid in this examination, or it could reveal a superior rectus palsy caused by the same injection. Though this is much rarer than an eyelid ptosis in isolation.



By the end of this process, you should have easily differentiated whether the ptosis was pre-existing or caused by the treatment and whether it's caused by brow ptosis or a true eyelid ptosis.





BROW PTOSIS

MODULE LINK**BROW PTOSIS**

<https://drtimpearce.com/modules/brow-ptosis/>

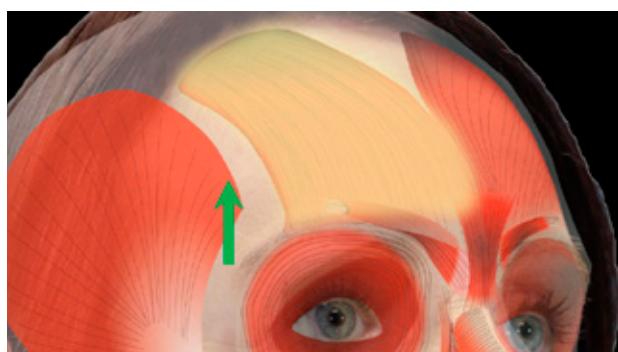
**PATHOPHYSIOLOGY: WHAT CAUSES IT?**

Eyebrow ptosis is a subjective or objective sense that the forehead skin has dropped and is often associated with loss of an eyebrow arch, particularly in women. The effect can be quite dramatic on the appearance of the individual as they may either appear very tired or angry and this has a significant effect on the way that they interact with people in life and therefore, can be extremely upsetting.

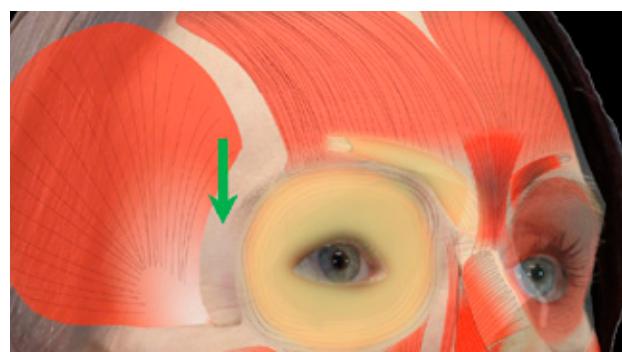
In women, a loss of function of the eyebrow is more significant than in men because they tend to apply makeup underneath the eyebrow every day and the inability to raise eyebrows can be upsetting and could be considered ptosis. For men there is no functional use of the eyebrows except for expression.

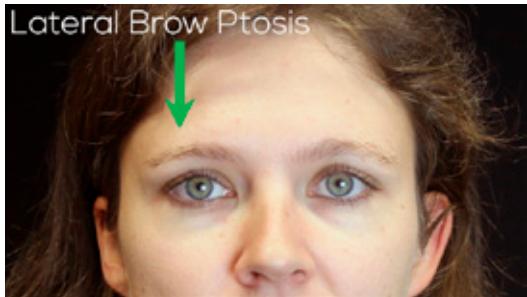
Brow ptosis is caused by a relative over relaxation of the brow elevators. Remember the brows are held in position by a number of opposing muscles and the force of gravity. The frontalis muscle both supports at rest and moves the eyebrows up, while the glabella complex and the orbicularis oculi pull the brow down. If the net effect is a disproportionate downward vector, the brows will drop.

FRONTALIS MUSCLE



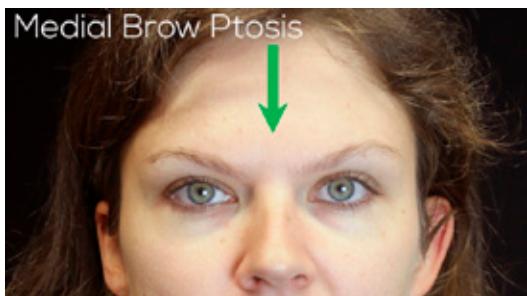
GLABELLA COMPLEX & ORBICULARIS OCULI





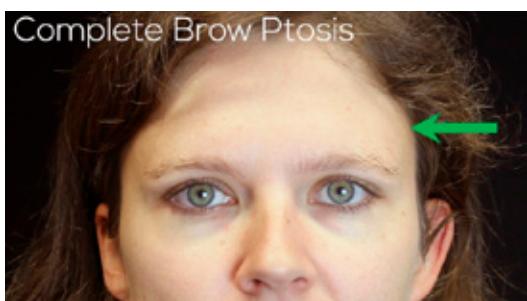
To reduce lines with botox we usually reduce movement, but in the process of reducing movement, it is possible to reduce support too and alter the vectors across the brows.

This means the skin of the forehead sinks down, causing one of three different variants of a drop.



If the drop occurs laterally, the eyebrow shape becomes flatter or depressed and the upper eyelid skin sometimes becomes compressed into the eyes giving a sense of tiredness.

In medial drops, the eyebrows can become arched or angled as the lateral elevator muscles lift but the medial muscles are so weak they drop.



If both occur together the patient can appear very tired or angry as the skin drops across the whole forehead.

The problem does not occur in every patient, even in very high doses, and patient selection is vital.

There are four variants to consider.

- Older people
- Those with hyperdynamic foreheads
- Those with skin that is a continuous surface all the way to the eyelashes
- Those with a bulky or heavy appearing forehead.

Aside from patient selection, ptosis is more likely if you inject higher doses, and or inject lower down and less likely when you inject higher up the frontalis with lower doses.

The lateral frontalis is probably a more common place for ptosis to occur and hence extra care should be taken with accuracy in this area to prevent asymmetry and heaviness.

DIAGNOSIS: HOW DO YOU IDENTIFY THE ISSUE AND DIFFERENTIATE IT.

It's useful to know how patients might present with the brow ptosis. When the message comes through that they need a follow-up, the patient may describe their symptoms in characteristic ways.

Some simply state that their forehead feels heavy, or that it feels like they're wearing a swimming cap or tight hat. Some report that they look tired or that other people are asking if they are tired, while others may complain that their eyebrows have dropped or changed shape.

Functionally, it can impact women who apply makeup, as they present with the complaint that they have to use a finger to lift their eyebrows apply makeup. Many will report that their eyelids have dropped often after googling botox symptoms and they will say that they have eyelid ptosis but in fact do not.

Asymmetrical drops are not rare and many patients will complain of the asymmetry often describing it in severe terms such as 'I look like I've had a stroke'. It's my experience that the appearance is not always as severe as the words used to describe it, and often patients simply want to get a quick response to have the problem solved as soon as possible.

Let's look in detail at the different types of brow drop.

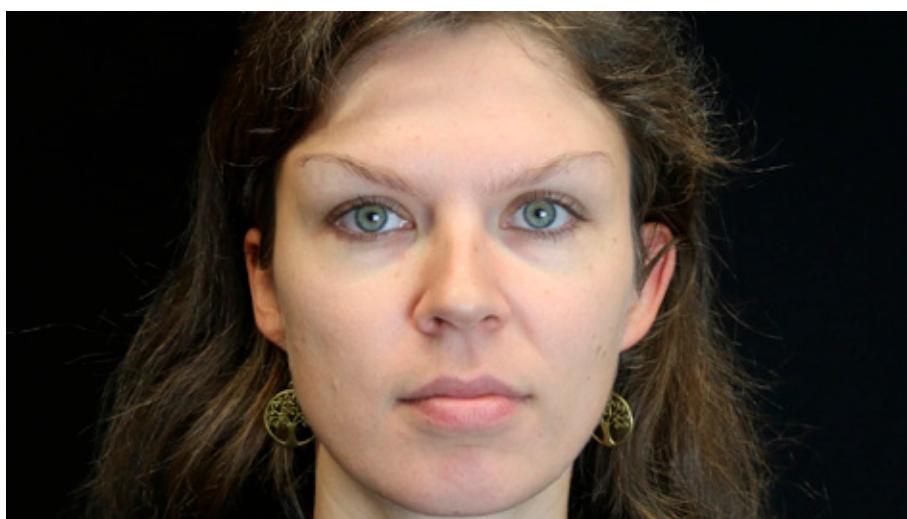
There are 3 types to know.

Medial brow ptosis is probably most common, and affects the glabella area, while a lateral forehead ptosis affects the eyebrow arches and the lateral aspect of the eyebrows, and of course in rarer instances ,drops could occur together across the whole forehead on the same patient.

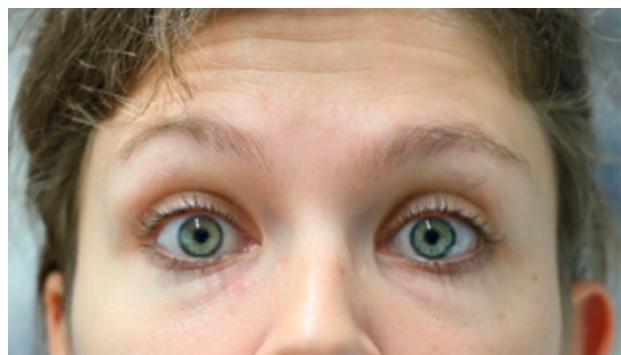
It's important to know how to differentiate these, If you don't get the diagnosis correct you will not be able to adequately explain or treat the patient, or improve your technique to reduce the chances of the same thing happening again.

Medial ptosis tends to make the patient look angry, while lateral ptosis tends to make the patient look tired or sad.

To diagnose brow ptosis correctly it's important to compare the after result with the before picture, as there are always elements of psychological interpretation of symptoms that can lead both patient and clinician astray from the physical changes.



To identify medial ptosis, it's useful to examine the angle of the eyebrows which often increase if the lateral movement is preserved. This occurs because the medial body of the eyebrow is lower and closer to the eyelid than the before picture. A lateral lift is common as usually, we place less product lateral to the mid pupillary line, and this combination of a medial drop and lateral lift is classic of Mephisto's sign. Mephisto is a marvel character whose eyebrows made him look evil.



With medial Brow ptosis, there is often considerable lateral movement but very little or no medial movement of the forehead when you ask the patient to raise their eyebrows.

It's also important in these patients to check that the corrugator muscle is not causing part of the medial ptosis. So as well as asking the patient to raise their eyebrows also ask them to frown. As well as examining for movement also check the position of the eyelid relative to the Iris and check for eyelid ptosis. This will inform your treatment plan later.

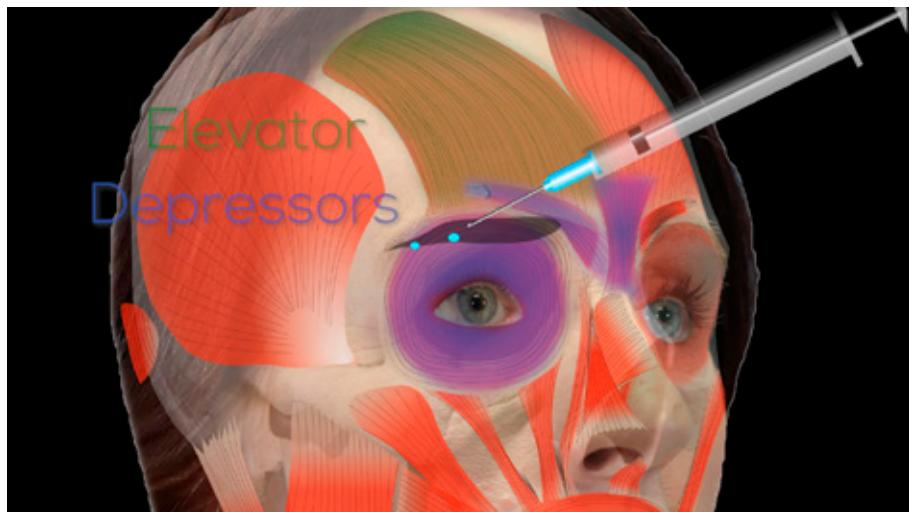


MANAGEMENT: HOW CAN YOU TREAT BROW PTOSIS?

Now let's have a look at how to manage medial and lateral brow ptosis.

Remember the underlying problem here is not always a simple drop, it can often be loss of balance between two opposing muscle groups, the elevators and the depressors.

Lateral eyebrow ptosis that makes the patient look tired, and is associated with a reduction of movement of the lateral frontalis. However, the actual drop could be considered a relative weakness of the elevators which means it could be helpful to treat the depressors and rebalance the position of the brow.

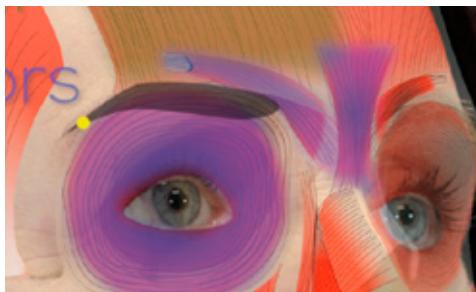


As part of your assessment, as well as testing how strong the elevators are, check to see how strong the brow depressors are. The muscles that pull the eyebrows down are also partly responsible for the drop. If you have not treated orbicularis oculi at all and there is also some movement of the frontalis muscle, it is very hopeful that you could lift the eyebrow with further treatment of the depressor muscles.

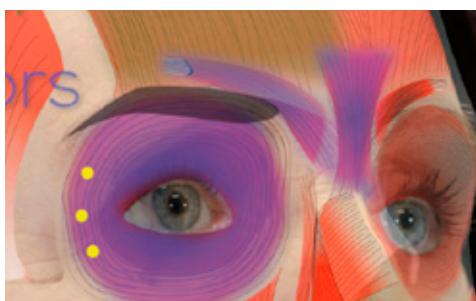
For this reason, a lateral eyebrow drop can be effectively treated by reducing depressor strength, and a way of restoring eyebrow position at rest.

There are three possible treatment options for combating a lateral Brow drop

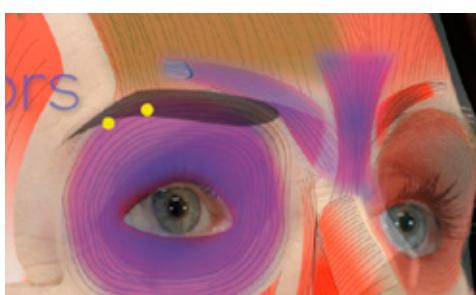
OPTION 1



OPTION 2



OPTION 3



Option 1 is to inject 4 units at the tail of the eyebrow in the orbicularis oculi muscles superior lateral component.

Option 2. Treat the lateral orbicularis oculi as you would for a crow's feet treatment this might be 3 injections of 4 units as per the licenced dose.

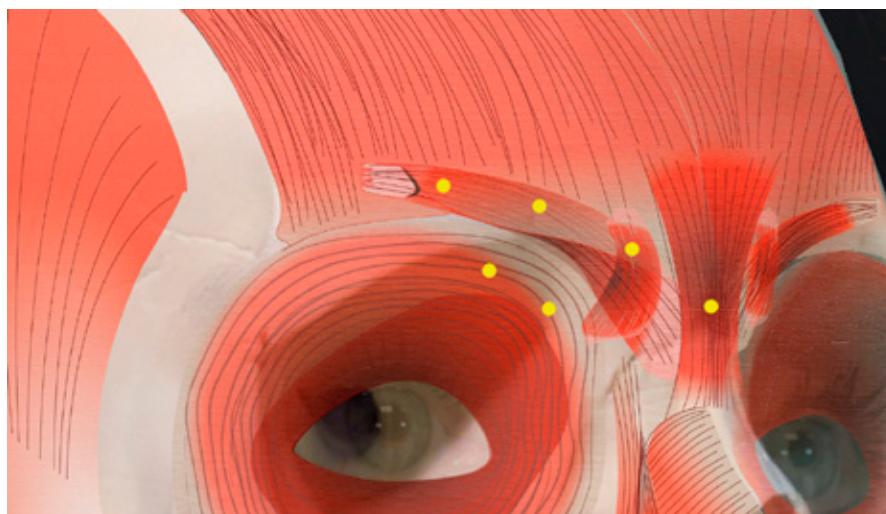
Option 3. If you have already treated the lateral canthal lines, and there's limited movement, check for movement of the superior aspect of orbicularis oculi underneath the eyebrow. If there is strong depressor activity you can place 1 unit injections underneath the arch and tail of the brow very superficially to reduce risk of affecting the eyelid or lacrimal gland.

A medial drop is caused by the relative weakness of the eyebrow elevator, the medial aspect of the frontalis muscle. The medial depressors of the forehead are of course the glabella complex, made up of the corrugator muscle, the depressor supercilli and the procerus.

In your assessment of the patient complaining of a drop, medial ptosis would confirm elevators have been significantly weakened. If the depressors/glabella complex is completely immobile there is little that can be done except to wait.

If there is some medial elevator activity and a drop with strong the glabella complex activity pulling the eyebrows down, there is a significant chance that you could improve the problem in 1 of 4 ways.

- Treat the procerus alone, reducing the downward pull of the most medial part of the forehead. Inject 4 units into the body of the muscle.
- Treat procerus and depressor supercilii on either side. Inject 4 units into each muscle, a total of 12.
- Treat the entire glabella complex, with a usual dose of 20 units.
- Treat all of the above and consider medial orbicularis oculi if it appears active- it can be treated with small doses very superficially. Please note this area is a higher risk for eyelid ptosis particularly if you go too deep or use higher doses.

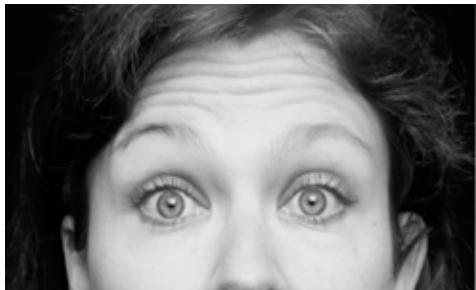


AVOIDING BROW PTOSIS

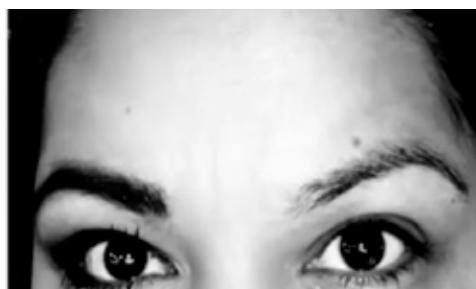
There are two important ways to avoid brow ptosis.

The first is client selection, you must learn to develop an eye for spotting people who will be prone to brow drops.

Characteristics include the following four features.



A hyperdynamic forehead. People with this characteristic use their frontalis muscle almost constantly and relaxing it quite easily causes a sense or an appearance of dropping.



A bulky, wide or full looking glabella can sometimes show medial drops more easily. Look out for a procerus crease, which often goes with a heavy brow more prone to dropping.



Skin that flows directly and uninterrupted to the eyelashes may show and feel small drops in the forehead easily because there's a direct connection to the eyes.

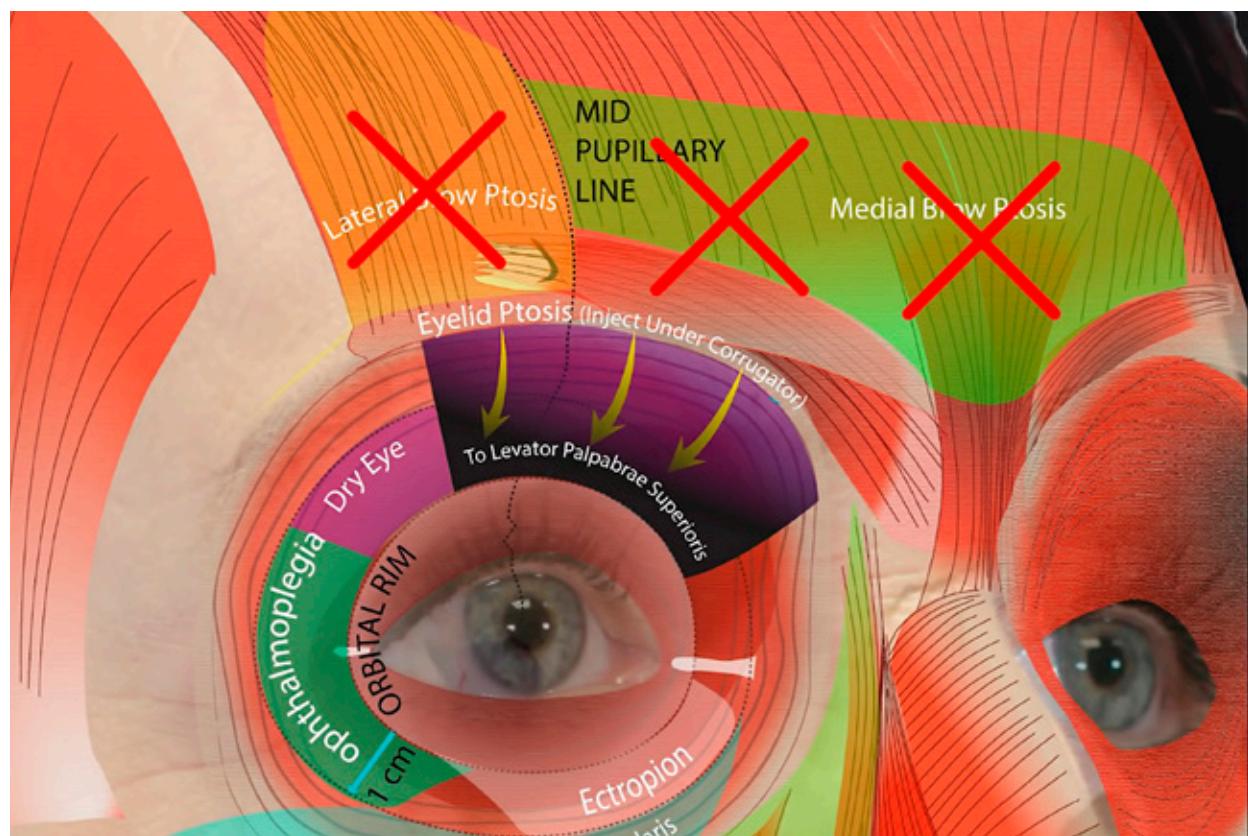
Lose or puffy skin over the eyelids can show drops more easily.

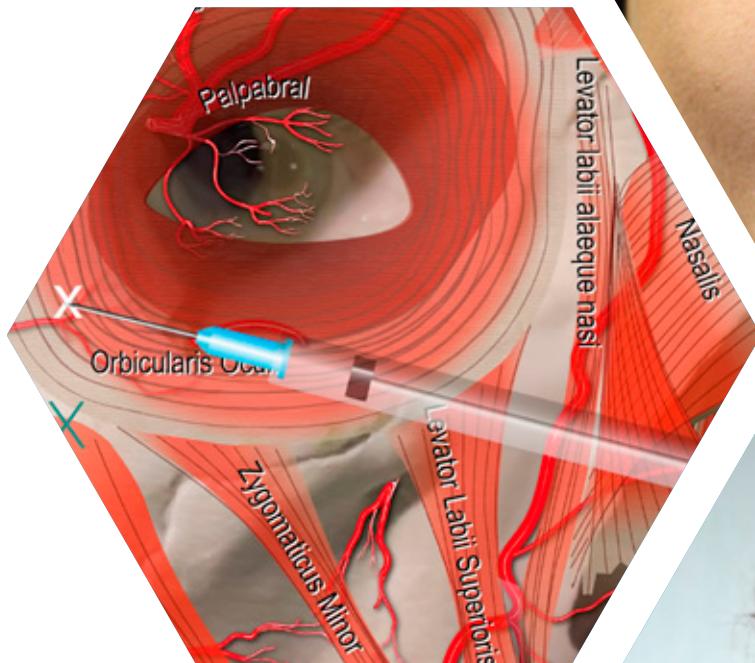


If you have suffered a medial or lateral brow ptosis it's a good time to reflect upon your technique and see what can be done to avoid the risk of this occurring in the future

As a general principle injections in the lower third of the frontalis muscle are most likely to cause eyebrow ptosis. Because of this, it's advisable not to attempt to treat any of the frontalis muscle between the orbital rim halfway up the frontalis muscle, or 2 cm from the orbital rim, leaving the lower half to one-third of the muscle untreated usually provides enough support to keep the eyebrows in the same position or slightly lifted while still getting rid of the vast majority of lines and wrinkles.

In females, it's vital to reduce the risk of the lateral brow ptosis or loss of the eyebrow arch, or asymmetry, and often the aesthetic goal is to lift the eyebrow as much as it is to reduce lines.





3

CHEEK PTOSIS

MODULE LINK

<https://drtimpearce.com/modules/cheek-ptosis/>



Cheek ptosis ranges from unnoticed by the patient to severely upsetting for a patient, but it's important to understand how and when this can occur so that you can reduce the risk.

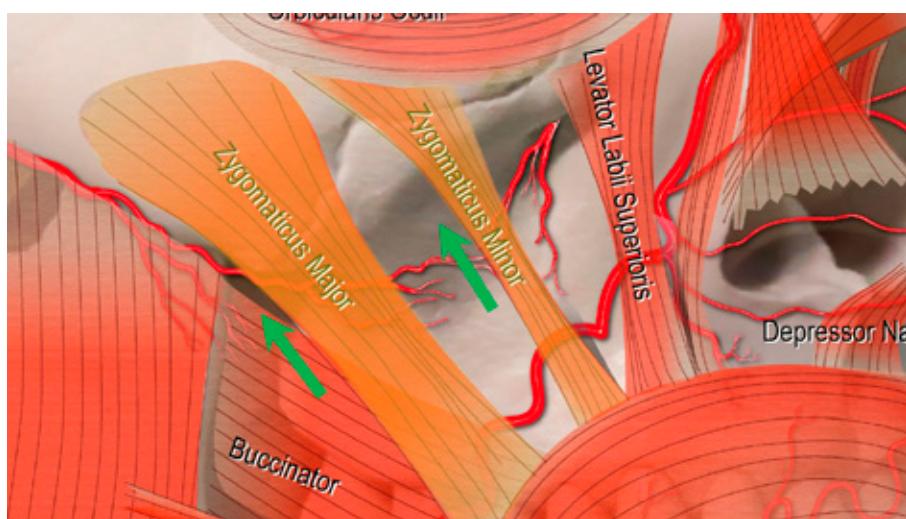
Often patients are fixated on the lines around their eyes and are more than happy just to see the lines fade. Expert analysis of before and after photographs will frequently show a reduction in the lateral uppermost projection of the cheek, which gives a less beautiful shape to the face during animation and a lack of expression to the eyes.



It's possible this can play a role in reducing the warmth that a patient communicates. The disadvantage this could cause to social relationships is incredibly difficult to measure but it is important to do our best to preserve these vital communication tools of expression whenever possible and to reduce the risk of treating one problem and causing another.

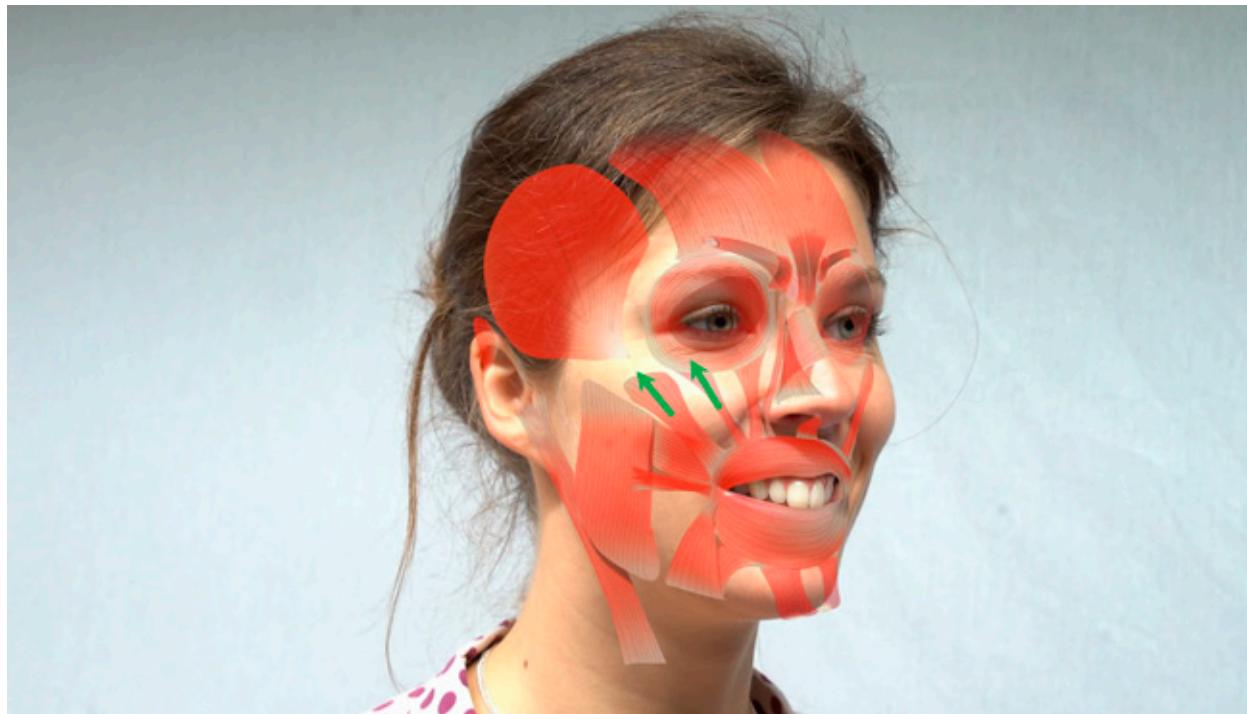
Let's take some time to understand what could cause the cheek to drop.

Consider the anatomy and you will see that there are several muscles that are engaged in pulling the cheek superolaterally during smiling. The most powerful elevators are the zygomatic muscles. These two muscles have their origins on the angle of the zygoma and insertions in the orbicularis oris at the modeolis.



As they contract they pull up the corner of the mouth and cheek, and cause lateral projection of the apex of the cheek through compression of the midface and associated anterior lateral projection of the cheek fat.

Aesthetically this complex should cause elevation of the cheek. It's often not acknowledged that in fact the orbicularis oculi is also a significant cheek elevator as during smiling it will pull the cheek superior laterally along with the Zygomatic major and minor muscles.



The end result is important elevation and projection of the cheek.

You can see then how the action of toxin on any of these muscles could cause varying degrees of cheek ptosis. Over relaxing the inferior lateral part of orbicularis oculi may reduce cheek elevation slightly, but the primary elevators are the zygomatic muscles, and it's toxin in these muscles that are responsible for causing more extreme drops of the cheek. To make matters worse, this tends to occur asymmetrically adding to the aesthetic discord.

SO WHAT CAN ACTUALLY BE DONE ABOUT A CHEEK PTOSIS?

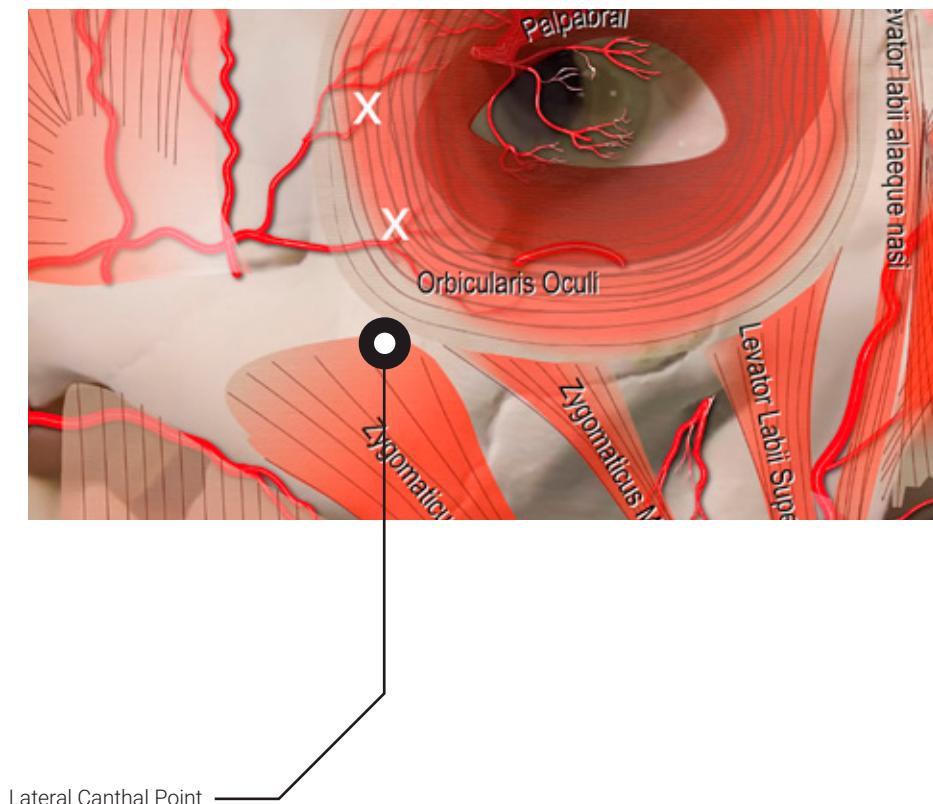
Management of cheek ptosis is limited. In some cases, it may be appropriate to replace cheek volume if the drop is exacerbated by volume depletion laterally, or has worsened the lateral lid cheek junction. Volume here may help the zygomatic muscles to compress the lateral lid cheek junction and convey expression to the eyes. This on its own will only improve mild ptosis.

Of course, full recovery is guaranteed simply by waiting for the muscle to recover its function, and it may help to advise facial exercise to speed up this process.

AVOIDING CHEEK PTOSIS

The most likely offending injection is the most inferior dose of toxin when treating orbicularis oculi. The licensed dose suggests 4 units are placed 1.5 cm and 30 degrees from the lateral canthal point.

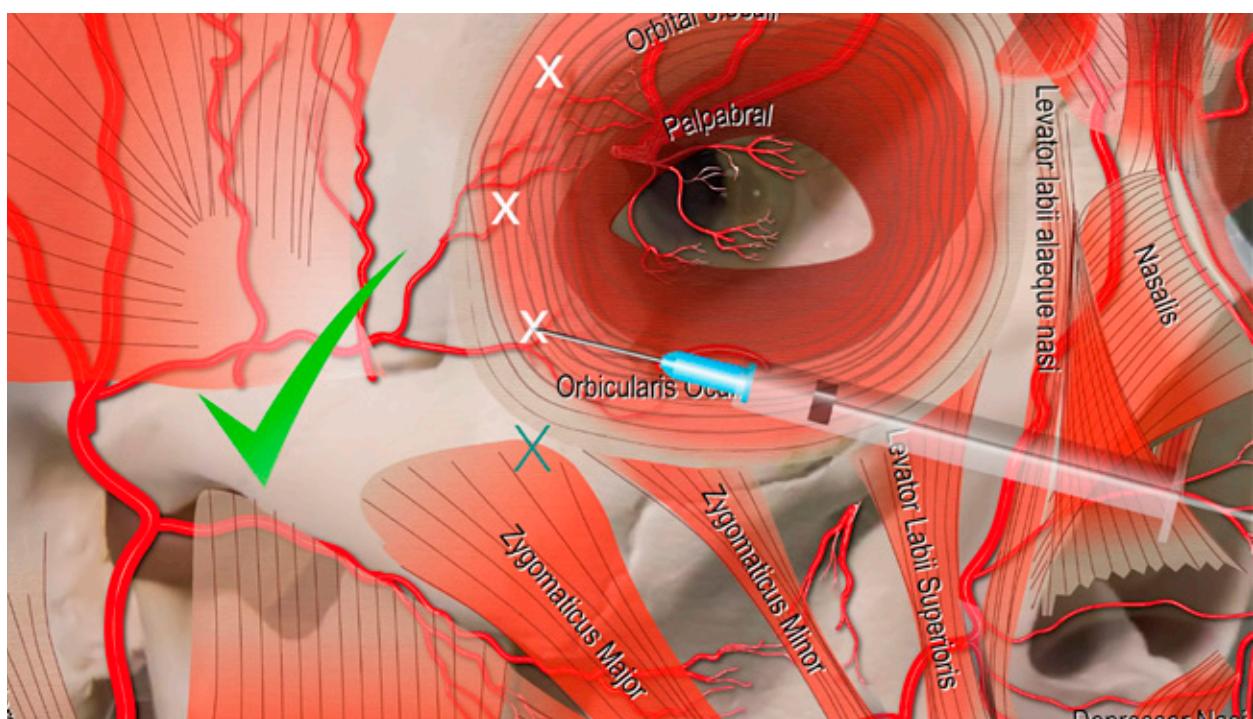
In most patients, this will be both superior and slightly lateral to the origin of zygomaticus major. However, there is significant variation between faces and often this point will be quite close to the important cheek elevators.



There are three ways you may reduce the risk during injection.

Firstly, keep the depth of the injection as superficial as possible. The orbicularis oculi is the most superficial muscle in this area and underneath it lies the sub orbicularis oculi fat and underneath that lies the origin of the zygomaticus major muscles.

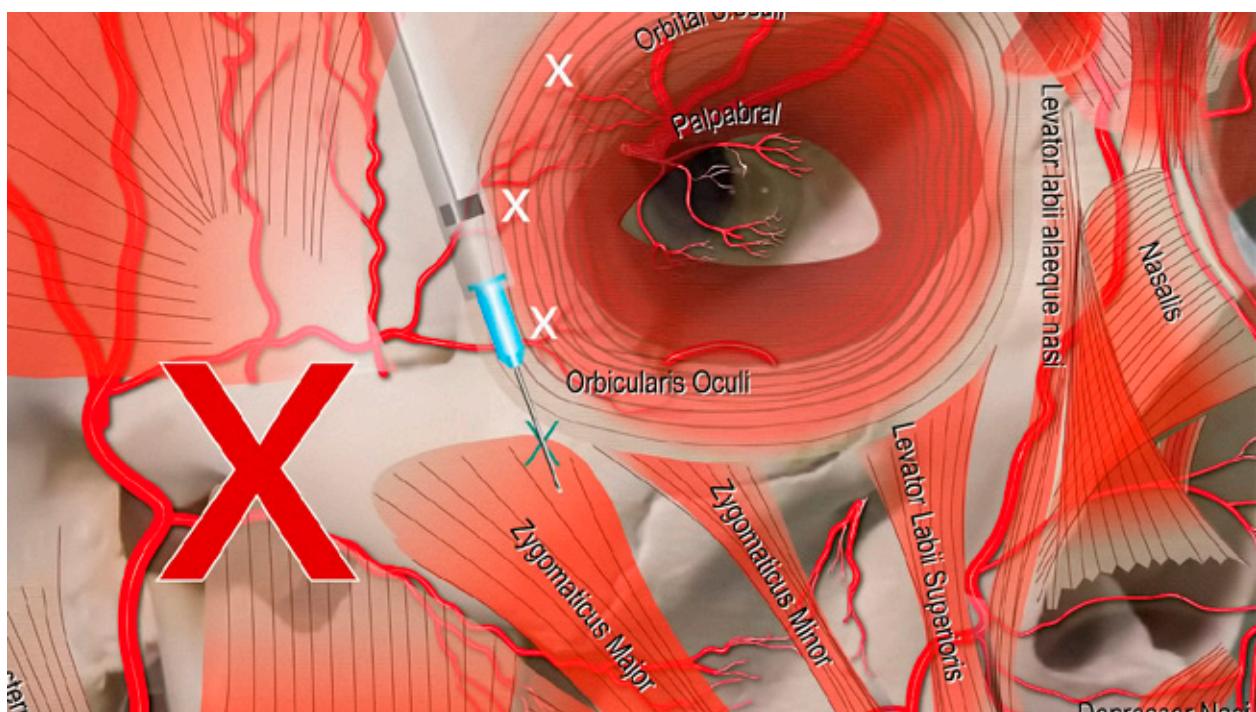
Therefore you should consider the orbicularis oculi like a shield to the zygomatic muscles. It is both safe and effective to inject very superficially just underneath the dermis in this area and place your boluses of toxin just above or slightly within the muscle.

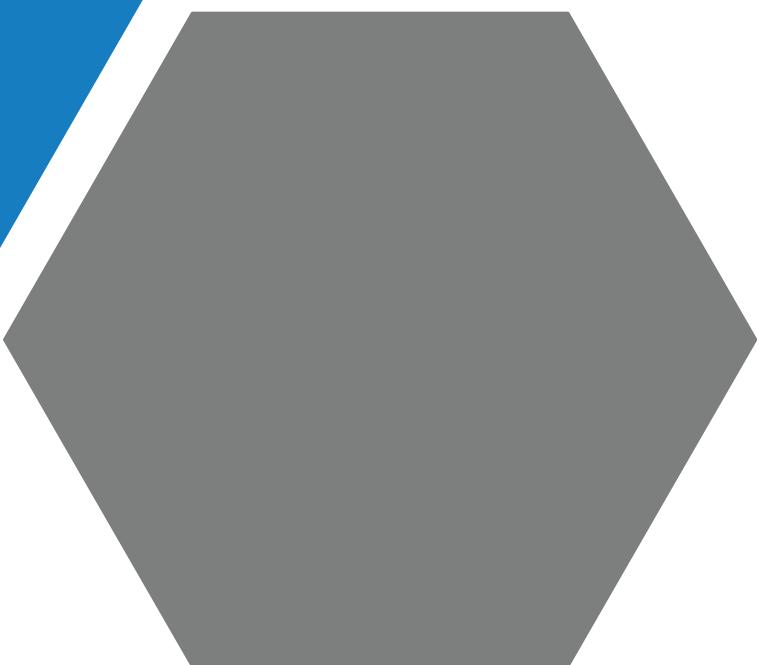
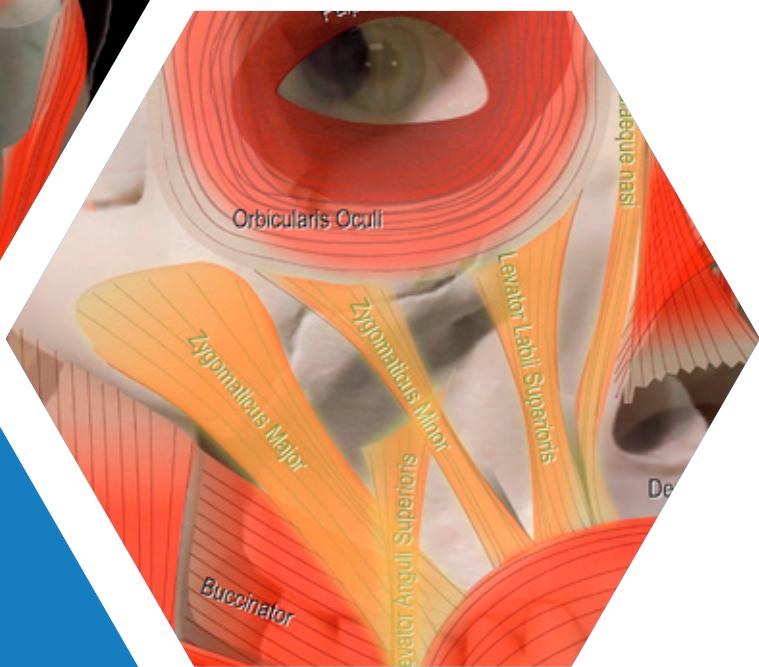
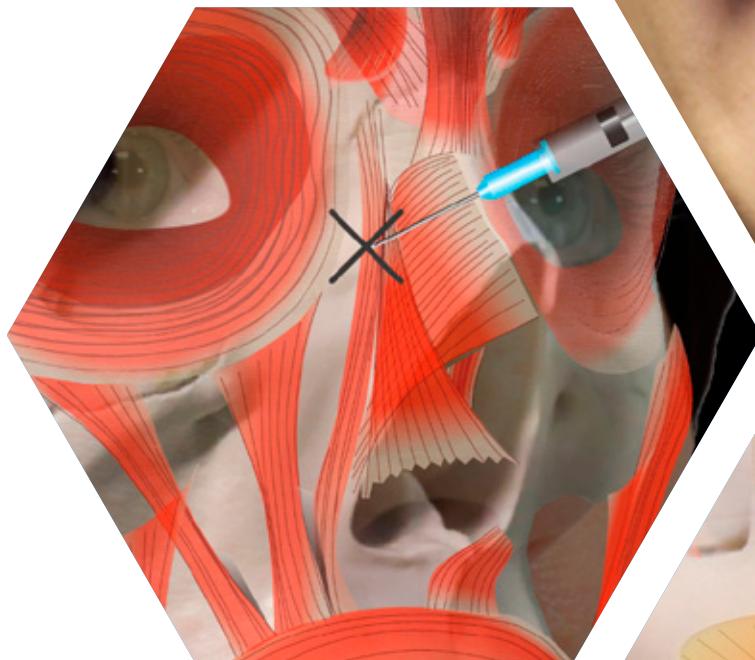
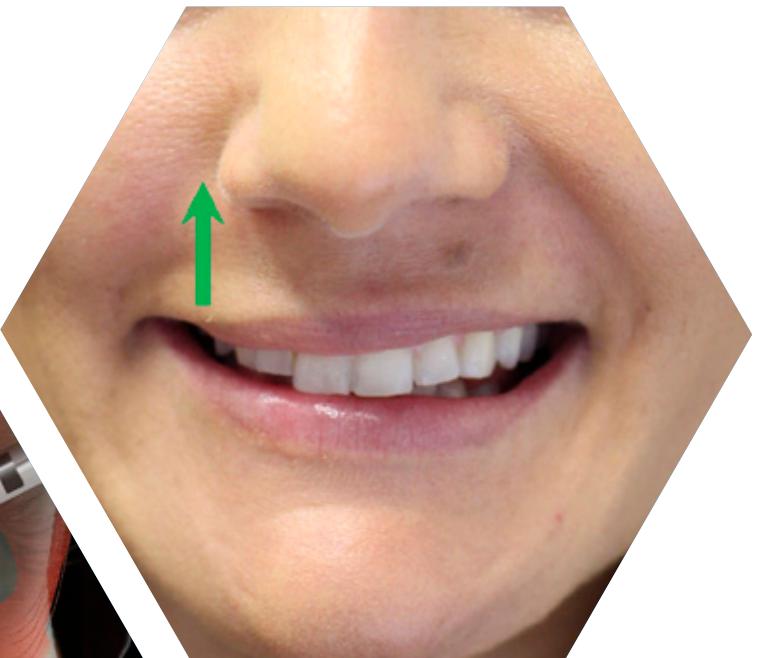


The most dangerous injection is an injection angled inferior and medially that also becomes too deep. These injections may allow a to be deposited near the origin of zygomaticus muscles instead of in the orbicularis oculi.

Secondly, keep the dose as low as you can while getting a result. 2 units may be more natural result in most patients than 4 in that inferior lateral point, reducing an over treated appearance.

Finally, keep your angle of entry oblique and at 90 degrees away from the nose, approaching at around 30 degrees or less to help keep the needle superficial and reduce the risk of a deeper tract allowing toxin near the zygomatic muscle.







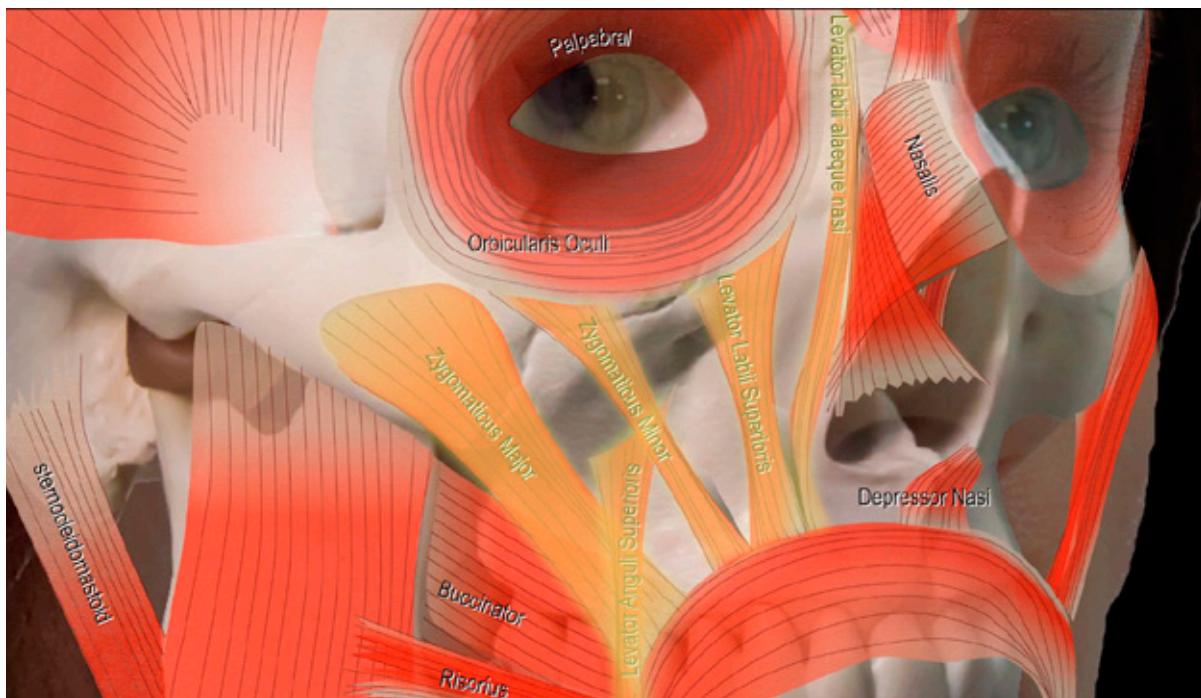
LIP PTOSIS

MODULE LINK

<https://drtimpearce.com/modules/lip-ptosis/>

PATOPHYSIOLOGY: WHAT CAUSES IT

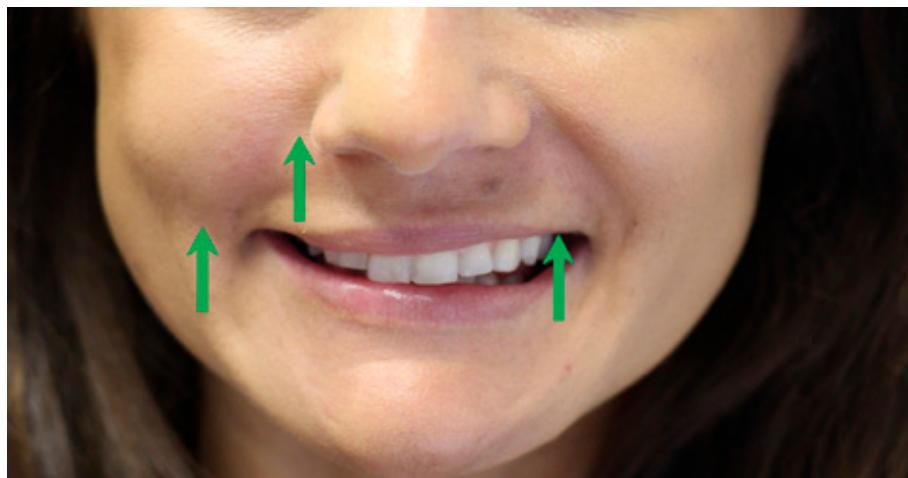
Lip ptosis is caused by botulinum toxin affecting any of the lip elevators. These can include the zygomatic muscles, levator labii superioris, levator anguli superioris and levator labii superioris alaeque nasi.

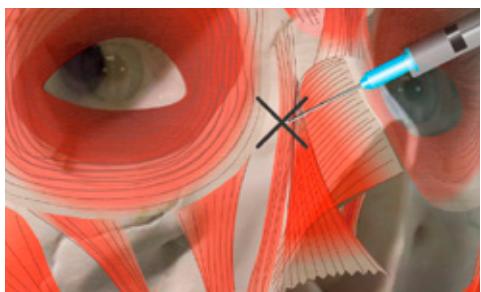
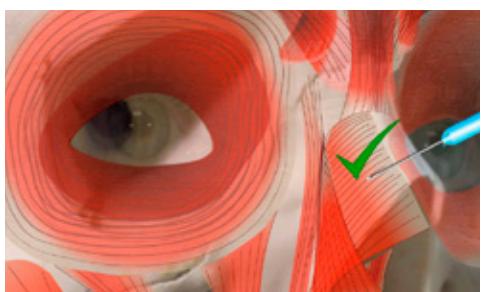
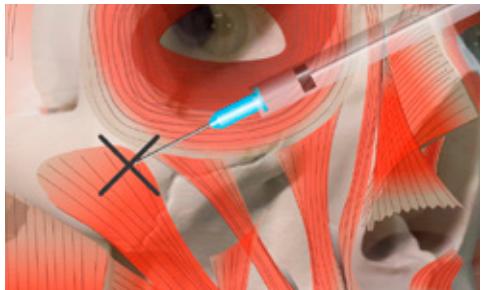


In most cases, the problem is asymmetrical and the patient notes the problem when smiling as do all their acquaintances, friends and family. Any change to a smile is noticed very quickly as it's such an important feature of someone's expressions.

Diagnosis is still made best using before and after photographs and this is one reason why you should always take dynamic pictures showing expression for any toxin-related treatment.

Look for asymmetry during contraction at the modiolus, the upper lip line and the nasolabial fold on animation. Usually, the clearest place to spot it is the lip line as it contrasts against the teeth during a smile.





Offending injections are either deep orbicularis oculi injections as per cheek ptosis,

Injections designed to soften bunny lines which penetrate the levator labii alaeque nasi muscle, or injections intended to soften a gummy smile which are overly affective or work asymmetrically.

To improve the safety of the bunny lines, remember that for many people the muscle being treated is medial orbicularis oculi. Though the fibres may be entwined with nasalis, this mindset will steer you away from deep injections near the lip elevators.

Treating the lip elevators with toxin in the case of a gummy smile is relatively difficult to get predictable results with. Many practitioners use 4 units at the alar base, but it may be safer keeping doses between 1-2 units each side and then follow up accordingly.

TREATMENT OF LIP PTOSIS

Unfortunately, the only remedy of lip ptosis is time, with most seeing improvement in 6 weeks and full recovery within 3-4 months.



5

OEDEMA

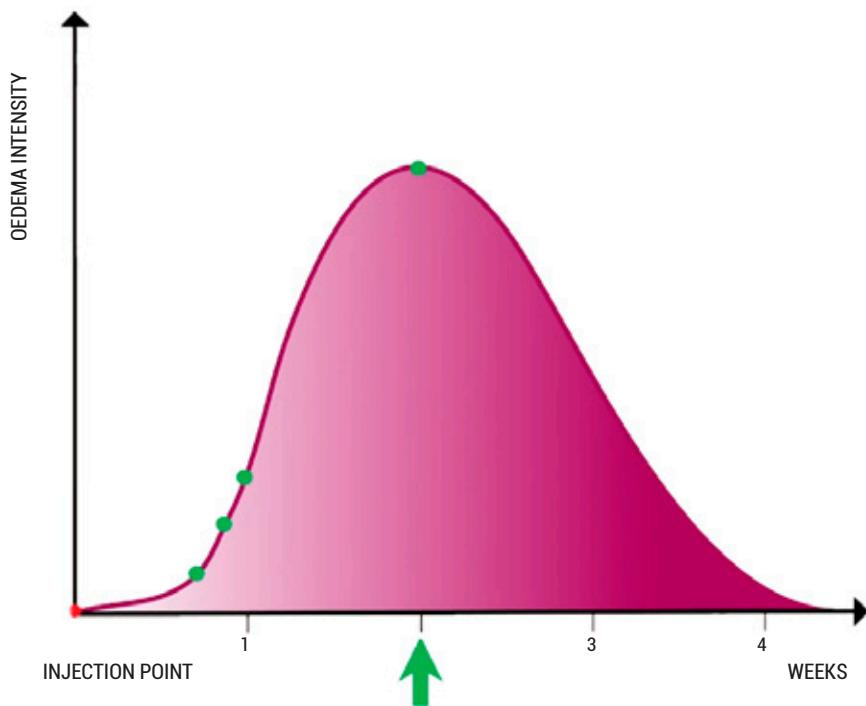
MODULE LINK

<https://drtimpearce.com/modules/botulinum-toxin-complications-oedema/>

**PRESENTATION**

Periorbital Oedema is an upsetting side effect of botulinum toxin, occurring in 1.4 % of reported cases.

Eyelid edema usually occurs around 5 to 7 days after initial treatment, but then may get worse peaking around two weeks post-procedure. The patient complains of an aesthetically disturbing puffiness and may fear they are having an allergic reaction.



SO WHAT CAUSES PERIORBITAL SWELLING AFTER BOTULINUM TOXIN?

Broadly speaking there are three possible causes.

First, is an allergic reaction to the constituents of the product which aside from botulinum toxin can include other stabilising proteins, human albumin and lactulose.

Second, trauma from the procedure, especially if there is bruising, and when the patient suffers from existing early morning oedema. This is self-limiting and can be treated with anti-inflammatories, compression and time.

Third, decreased lymphatic drainage as a result of muscle relaxation. .

It's important your client understands the reason for the side effect to put their minds at ease and you select the right course of treatment.

Oedema is rare in the literature, In one retrospective study of 5310 botulinum toxin injection treatments among 1819 patients, only 2 (0.04%) developed eyelid oedema.

ALLERGY

Immunogenicity of botulinum toxins Markus Naumann, Lee Ming Boo, Alan H. Ackerman, and Conor J. Gallagher

Various factors affect the immunogenicity of botulinum toxins, including the manufacturing process, total protein load, the presence of stabilising proteins, the overall dosages used, frequency of exposure and prior vaccination or exposure.

Overall the total risk of allergy and antibody formation is extremely low.

Allergy is likely to present in the first 48 hours or sooner, and be associated with itching and redness as well as swelling.

WHAT CAN BE DONE TO AVOID IT?

The chances of allergy are so low that allergy testing is not required. However, I would recommend an intradermal allergy test for anyone with a history of anaphylaxis especially if it was to multiple allergens. At the very least this is reassuring for the patient.

It's also worth considering makeup as a potential cause of local irritation and redness. For this reason, it's vital to thoroughly clean the skin before performing any injections.

Treatment would be as for any localized reaction, antihistamines and Prednisolone 30 mg daily for 5 days.

The most common cause of periorbital oedema is thought to be decreased lymphatic drainage. It likely occurs due to relaxation of the orbicularis oculi muscle.

It's useful for you to understand this mechanism so that you can accurately diagnose the problem, describe it to your patient, and manage its resolution.

There are three important concepts which play a role in the development of periorbital oedema.

Consider first the process at work. In normal physiology, there is a perfect balance between inflow and outflow of intracellular fluid to the area.

There are multiple factors which affect this balance and the appearance of oedema.

Osmotic potential of the fluids involved, which may be affected by salt intake, and rarely diseases which affect the osmotic potential of the blood, such as kidney and liver disease.

Gravity may reduce the rate of drainage when the patient lies down to sleep.

And of course, a major factor here is the very thin skin around the orbit, which expands easily in the area. It is a mere 0.2mm thick, 10 times thinner than skin the rest of the face. Of course, the factor that we are changing is key, and the muscle activity, especially when asleep, and sometimes when awake is a major part of maintaining local fluid balance.



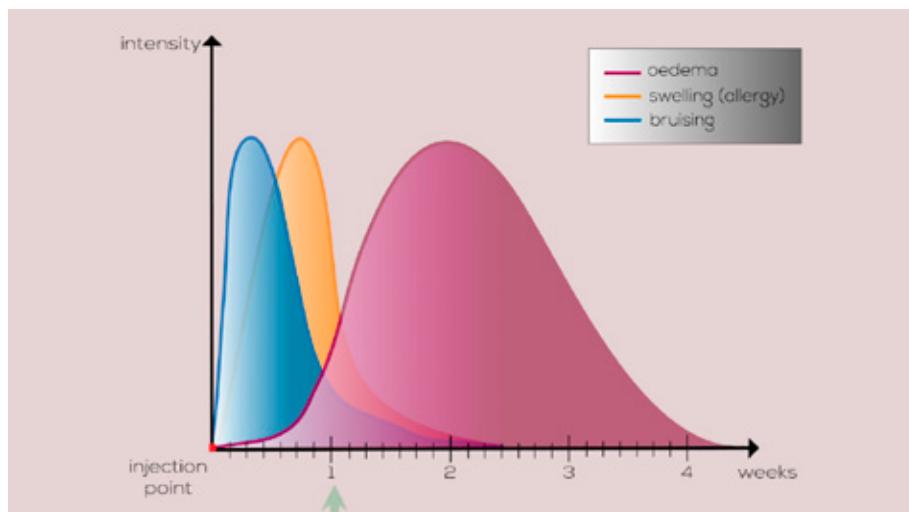
Just like how muscles in your legs are responsible for squeezing blood back to the heart, it is thought that contraction of the orbicularis oculi is responsible in large part for draining the area around the eye.

The sudden relaxation of a large muscle which exerts pressure on the whole cheek may slightly slow the rate of drainage. This causes a gradual accumulation of fluid over a period of hours to days, which is unfortunately very upsetting.

DIAGNOSIS

So how do we differentiate between oedema and inflammatory causes? Differentiation is fairly straightforward. The key is timing and the absence of inflammatory signs such as irritation and redness.

	OEDEMA	BRUISING	ALLERGY
PUFFINESS	✓	✓	✓
TENDERNESS		✓	
ITCHING			✓
REDNESS		✓	✓



The buildup of fluid should not start until the muscle starts to become relaxed. For most patients, this is around day 7 to 10. There is puffiness most severe in the morning and it is better later in the day. There should be no redness or irritation.

The puffiness is worst at day 14 and then starts to improve. The drainage system is usually compensated within two weeks and recovery occurs long before the botulinum effect has worn off.

It is, therefore, possible for you to reassure the patient that this is a self limiting problem.

What else can be done to improve the patients symptoms?

Remembering the simple cause of this problem, it may be able to improve symptoms with simple measures.

What can be done to compensate for the drop in local pressure?

Consider asking the patient to sleep with an eye mask.

Compress the area firmly for 5 minutes each morning and when the problem recurs.

Ask the patient to actively use the remaining muscles to contract firmly and repeatedly in 5-minute bursts of exercises.



In rare cases, some clinicians prescribe diuretics such as furosemide. Though it is effective it does layer in an extra component of medical risk which may not be appropriate without the full medical experience of these drugs and the ability to test renal function.

WHAT CAN BE DONE TO AVOID THIS PROBLEM?

There are three main factors a skilled clinician can modify.

- First, client selection. Be careful of patients with previous history of puffiness in the morning or at any time and for any reason if it is a consistent part of their life.
- Second, consider the doses you are using around the eyes. The use of high doses and of toxins known to diffuse are a risk.
- Position of the injections are a vital component. Consider dropping the most lateral doses where the orbicularis oculi overlaps with the cheek.



6

HAEMATOMA

MODULE LINK

<https://drtimpearce.com/modules/botulinum-toxin-complications-haematoma/>



Bruising, haematoma, ecchymosis, petechiae, purpura. These are all terms to describe different types of bruising. Bruising is a major issue for patients, and often seen as a minor issue for clinicians. I have reduced my rate of bruising substantially over the years, and it is vital for improving the client experience, client retention rate, after-care workload and reputation. Bruises are so much more to a patient than just blood beneath the skin. For many, they represent a story but other people made tell about them. Is it an injury from a drunken fall or abusive husband, or is it that you have been having botox!? They will need to explain the bruise to many concerned friends and they may see strangers wondering about the cause. For many, it simply represents an injury, when the patients says to you 'you bruised me last time' they're really saying 'you injured me!'. This is why it's so important to reduce the chances of bruising and to know how to explain it to your patients and help them through it. It's possible to reduce bruising. Although it may seem self-evident to you what causes a bruise, there is much to be gained by breaking this problem down into detail so that you have a greater ability to reduce bruising, to explain it to your patients (who frequently do not truly understand it), and to manage it more effectively.

SO WHAT MAKES A BRUISE?

Bruising of any type is blood which has escaped the vascular system, and spilled into the tissues. It can be caused in various ways during different procedures. The most common would be needles puncturing vessels, which may be veins, venules, arteries or arterioles, or capillaries, or by tearing vessels, often with a cannula.

Petechiae are the smallest pinpoint bruises 1-2 mm across you may see at needle entry points.



Ecchymosis is simply skin discolouration, the medical term for a common bruise.



Smaller bruises up to 1 cm may be called purpura while bleeding under the skin that forms a palpable lump of clotted blood is called a haematoma, the most severe form of bruising.

Each one of these scenarios will cause a different outcome, and we should be aiming to limit trauma to all these vessels as much as possible. Bruises are highly variable and you may find yourself occasionally getting severe bruises from minor procedures, or doing huge procedures and getting no bruising. There are many factors at work. Understanding bruising variables in detail will also increase the number of ways you can reduce this event.

You could break down bruising into three main factors:

- Firstly, there is the degree of trauma, that is the number of injections or the size of holes or tears in the tissue.
- Second, the volume of blood flowing through vessels in the area being treated.
- Finally, the rate of blood clotting once trauma has ensued.

The first factor, trauma, is the factor most easily controlled by the clinician. By focusing on technique it is possible to dramatically decrease bruising, but it takes a relentless intolerance to bruising, precise needle control, and anatomical knowledge to reduce trauma to a minimum.

The second factor, the volume of blood flowing through the skin, is affected by the cardiac output and states which increase blood diversion to the skin. A patient who rushed to get to your surgery may be flushed and have a higher rate of blood flow.

Most commonly, the cause is raised body temperature, as thermoregulation mechanisms automatically divert blood to the skin's surface. The ability to cool the body down comes from our ability to divert blood to more superficial tissues and then to perspire to lose heat as sweat evaporates. Veins and arteries become dilated and the quantity of bleeding and bruising increases proportionally.

In addition to temperature variations, hormones can also affect the blood in the skin. Blood flow prior to ovulation and diversion to the skin's surface increase and perimenopausal flushing may also affect the amount of blood in the area being injected.

Recent alcohol ingestion can also dilate vessels, as both alcohol and the breakdown products of alcohol - especially acetaldehyde cause vasodilation which is a risk for bruising.

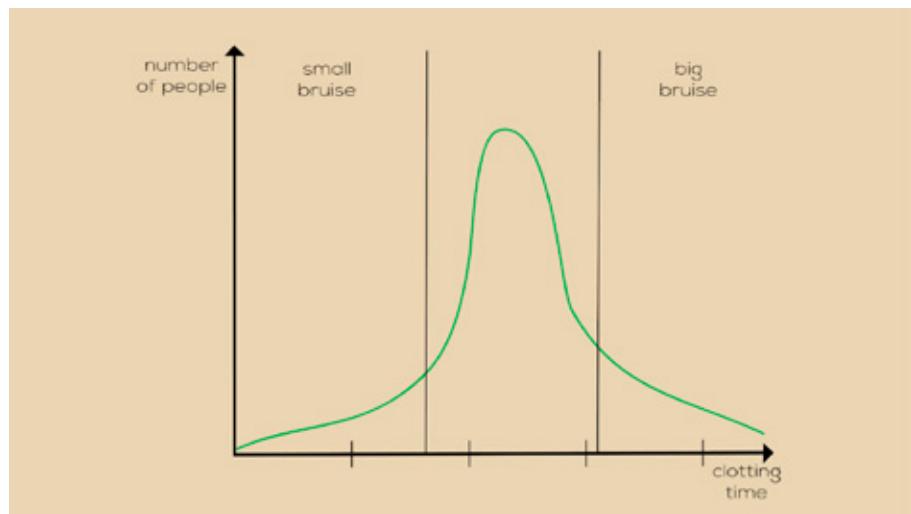
In these scenarios, the increased volume of blood in the skin makes bleeding more likely and increases the amount of blood which may escape from the vessel. Take note the next clinic you run on a hot summers day and you will observe an obvious change to the number of injection points which bleed and the total quantity of bleeding.

It's also worth noting that very heavy exercise post-procedure is a risk for severe bruising. I personally have witnessed cases of patients ignoring advice and returning from a long run with two black eyes after a tear trough procedure.



Thirdly, the rate of clotting is a significant risk factor for bruising. There are those patients who seem to stop bleeding rapidly, while others may slowly bleed under the skin for hours after the procedure.

Clotting, like so many natural phenomena, fits to a degree on a bell curve. Though most people clot within the average time there are those who will take longer for no specific reason, and bruise more easily.



There are of course many external factors that may affect clotting time too. The most common will be the use of blood thinners.

These include anticoagulants like warfarin, Low molecular weight heparins, and factor Xa inhibitors like rivaroxaban as well as anti-platelets like dipyridamole and aspirin.

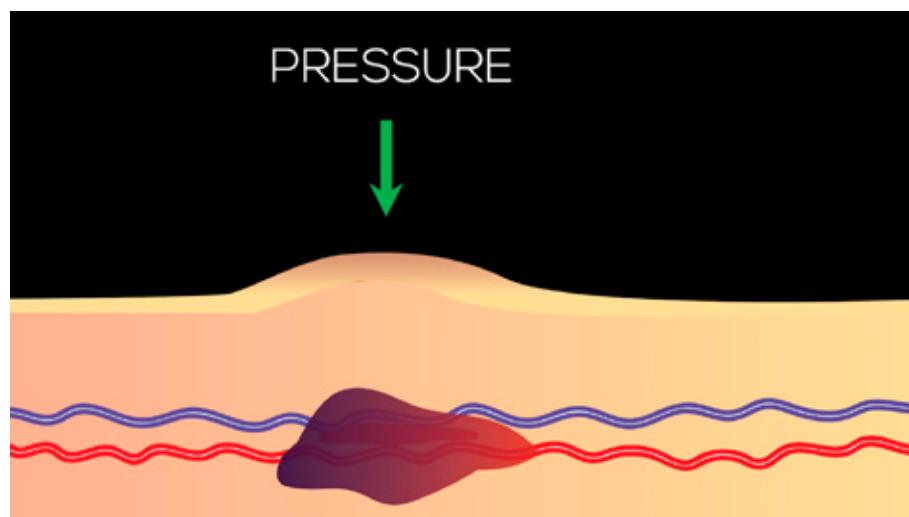
None of these drugs are a complete contraindication to having injectable procedures, but they do decrease the benefit to risk ratio and this should be carefully discussed with your patient during the consent process. Weigh up the impact of a bigger bruise, especially if it could last for a month and the benefit of a treatment, which may only last three months and make sure they accept that ratio.

Alcohol intake can both decrease and increase clotting times depending on the level of intake and individual variation.

TREATMENT OF BRUISES

The most effective time to start bruise management is as soon as it appears. Compress a developing bruise firmly for 5 minutes to massively reduce the size it reaches.

It may aid to compress a haematoma to spread it out and increase the surface area which will both reduce the risk of visible lumps and also increase the rate of breakdown as the blood is not lumped together. An established area of ecchymosis is not easily treated, but many people do use vitamin k and arnica creams. The evidence for these remedies working is absent, but belief in them is widespread and it may help people feel in more control which is valuable. Finally, there are very rare occasions when a haematoma may be so large that it is worth treating and hyalase is sometimes used to reduce the size of haematomas. It is possible to aspirate blood from a haematoma after you have injected hyaluronidase because it can help blood to liquefy. The process of injecting can also cause bleeding so this should be considered carefully depending on the context.



SO HOW CAN WE REDUCE BRUISING FROM INJECTIONS?

Seek out risk factors and limit them – alcohol, heat, exercise, and medication. Do not stop medication prescribed for secondary prevention of cardiovascular disease. The decision to stop any medication should be taken in the wider context of the patient's health, not with a narrow focus of reducing bruising.

Consider what you can do to avoid the major vessels? Make sure you know the most likely three-dimensional position of the arteries and

veins so that they may be avoided in each part of the face.

You can, of course, see veins, so you can spend some time finding the veins before a procedure and marking out the area so that they can be avoided. This is most simply done by lying the patient flat so that blood becomes distributed to their head and makes veins easier to see. Use good lighting and mark the safe areas to inject or the veins themselves with a pencil.



As blood is pooled when lying down, sit the patient up for injection so blood drains from their head and the veins empty again prior to the injection.

Reduce trauma

Control of your needle tip is one of the most significant ways to reduce bleeding and bruising. The vast majority of the improvements I have made have been as a result of these injection techniques. Next time you see a really experienced injector, observe their whole body, not just the needle tip. Reducing trauma all starts with getting perfect control of your needle, and perfect control starts from your feet up.

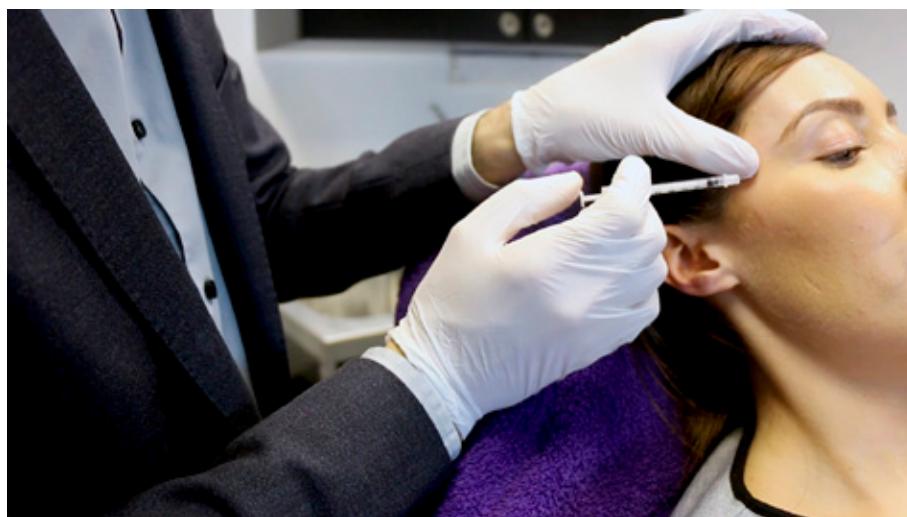
By following these tips I think you can reduce bruising by 90% compared with a novice injector. Increase needle control in the following ways: [1](#).

Controlling your needle

Control starts with your feet. You must be stabilised. Feet shoulder distance apart and with equal weight distribution across your feet.

Then stabilise your upper body by leaning against your bed with your upper body.

Stabilise your arm below the elbow. You can stabilise your hand at the wrist or below usually on the top of the bed or the patient's shoulder, forehead or cheek.



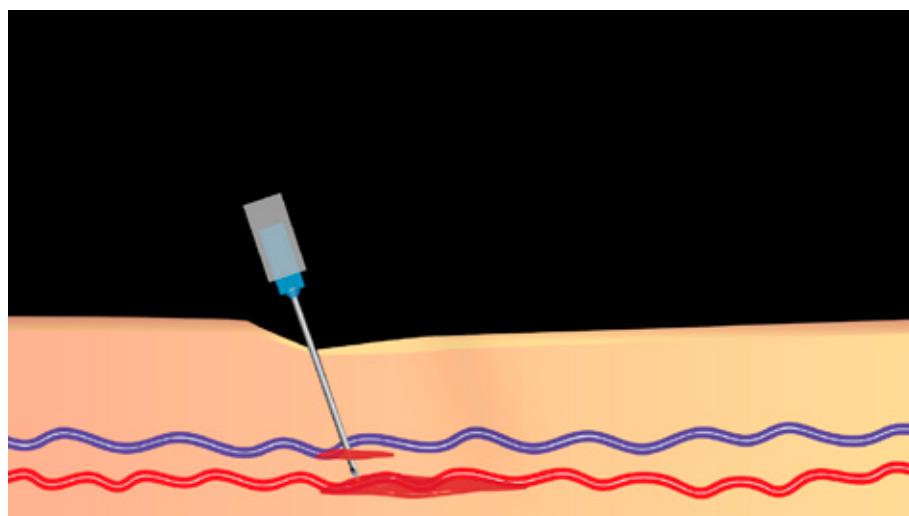
Make sure the patient's head is resting against the head of the bed and not being held up by their neck muscles which is not a position able to completely resist the forces of an injecting hand.

With your supporting hand, control the patients head position and the surface of the skin, so that it becomes a fixed, rather than easily moved by the injecting hand. Injecting unstable skin decreases control and will increase the depth of penetration

2. Make sure needles are always sharp

After a needle has been used a few times on the patient it becomes

dull, this increases the force required to penetrate the skin. The problem is skin is tough on the outside and tissues are much easier to penetrate deeper in, so at the moment it breaks through the epidermis, the skin snaps forward and the needle penetrates much deeper than intended and is more likely to traumatise arteries and veins.



3. Inject superficially

Inject as superficially as possible, taking the anatomy into account. Injecting around the eyes in particular, is much less likely to bruise if you only just penetrate the dermis, 1-2 mm is usually enough. Beneath this depth is a venous plexus and bruising is very likely.

4. Consider how to reduce immediate blood

Withdraw needles slowly, especially when deep which may give layers of tissue time to close up and decrease blood pooling.

Immediately compress any bleeders, and hold the area for 1 minute if the bleeding seems notable.

5. Reduce your injections

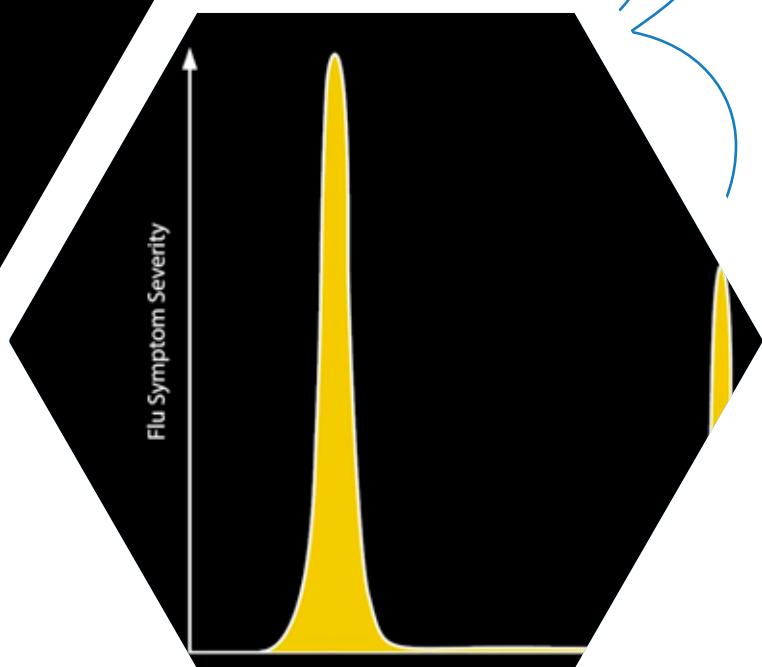
It's also useful to reduce the number of injections wherever possible, this can be done by fanning when you are injecting dermal fillers. In certain places you may be able to deliver product in two distinct areas using the same entry point by partially withdrawing, changing angle and strategically placing injections to reduce the total number of penetration required.

Use a cannula for dermal fillers where possible.

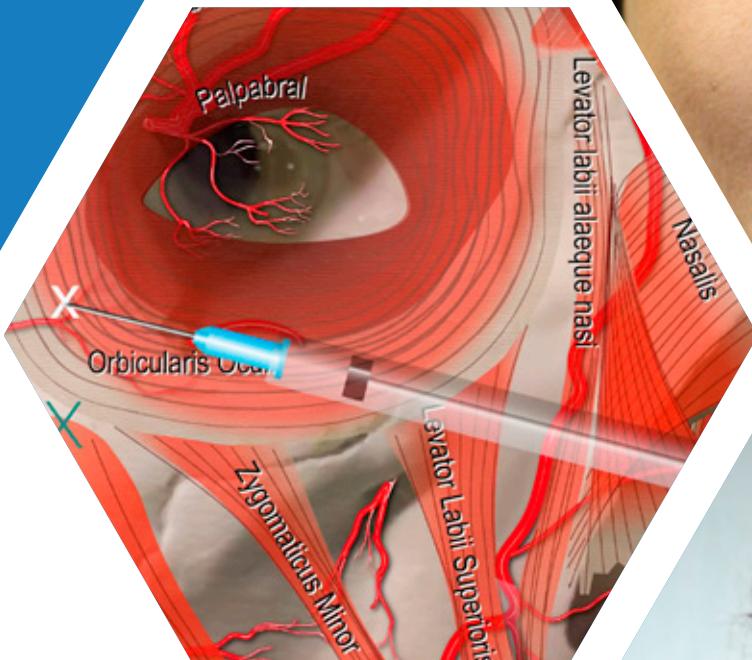
In summary, remember it's more than just a bruise to your patient, it's an injury and a story which others may tell about them. When you do get a bruise explain to your patient what has happened and why. Take time to hear how it is affected them and show that you care. give them clear expectations of what will occur next. small bruises recover in 5 to 10 days. Large bruises will take a month. In the most extreme cases, bruises may still show some signs of yellow in the skin at 6 weeks after injection.



Reflect on the injection that caused it and discuss with your patient ways that you may reduce the risk if they were to have the procedure again. This may restore trust if you feel they have lost it.



CHEEK PTOSIS



MODULE LINK

<https://drtimpearce.com/modules/flu-symptoms/>

**FLU-LIKE SYMPTOMS AFTER BOTULINUM TOXIN**

Depending on the study, between 1.7% and 20% of patients who receive botulinum toxin report flu-like symptoms which begin a few days to one week after injection and last up to a week on average.

Symptoms include fever, chills, sneezing, sore throat, cough, shivering, malaise, runny nose, headache, fatigue, weakness, joint aches, anorexia and more.

**SO WHAT IS CAUSING THESE FLU-LIKE SYMPTOMS?**

To understand this it's helpful to remember and explain to your patients that the vast majority of the symptoms that we get during viral infections like flu are actually caused by our immune system's inflammatory response to the infection and not the bug itself.

This immune response is triggered in part by neurotoxin-associated proteins (NAPs). These non-toxic proteins are designed to protect the toxin in acidic environments, especially the gut. They include hemagglutinins, proteins which cause blood to coagulate and are often part of the surface of viruses. They play various roles in attaching themselves to cell membranes and penetrating them to allow pathogens to enter and reproduce themselves.



Hemagglutinins are one of the major triggers of the immune system's reaction to infection.

They are also one of the complexing proteins included within most botulinum toxins preparations. In nature, they are designed to help the toxins enter the body by disrupting the paracellular barrier of the intestinal epithelium, but they are not required to enter the neuron once they are injected.

The NAPs and botulinum toxin actually dissociate almost completely following constitution with saline and before injection to the target muscle but have been proven to trigger an immunological response via the IL-6 pathway. Interestingly, these proteins, particularly hemagglutinin, evoke a stronger inflammatory reaction than the neurotoxin itself in animal studies.

The immune system, therefore, may respond as if there's an infection because it is picking up the presence of proteins which usually correlate with infections. The patient starts to feel unwell due to the inflammatory response, but there actually is no active infection. The result is simply the immune system's response to proteins which in nature would only ever be present if there was a pathogen to fight.

DIAGNOSIS

Diagnosis for research purposes is often based on the following criteria. The presence of at least one upper respiratory tract symptoms (cough, sneezing, sore throat, runny nose), combined with at least two systemic symptoms (fever, chills, shivering, malaise, fatigue, dyspnea, headache, weakness, muscle or joint aches, nausea and vomiting).

To be considered a reaction from exposure to toxin, these symptoms should start within 10 days of a procedure but be expected to occur sooner than that in the majority.

There should be no concomitant non-flu like symptoms such as diarrhoea or urinary tract symptoms, etc.

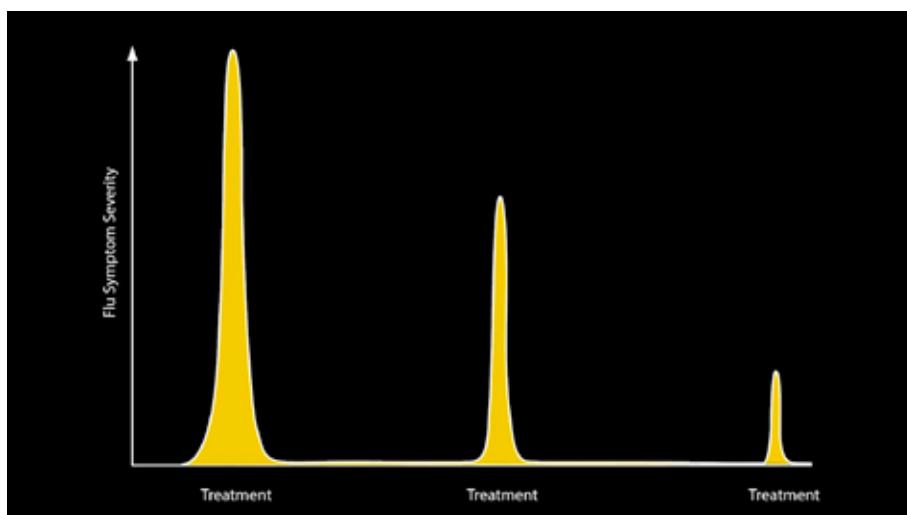
Remember that even with these criteria met, 3% of placebo-treated patients also get flu-like symptoms, so one could hypothesize that this is at least partly showing normal level of background incidence of infection, and would suggest a minimum of 15% of cases of flu symptoms which occur the week after a procedure are not caused by the procedure.

As a clinician, it's important to consider this when making the diagnosis. The patient must be informed that it is not clear these symptoms are related to toxin, and that if they deteriorate or feel very unwell especially if they have severe symptoms that they should seek the advice of their general practitioner.

MANAGEMENT

If your client experiences flu symptoms likely related to the treatment, explain to the patient why they have occurred and reassure that although it feels like an infection it is not. Be clear to advise them of what to do and to seek medical advice if things get worse, especially if they have symptoms of a severe infection which may have arisen by chance at the same time.

The patient can be reassured that the symptoms are self-limiting if it is a reaction. It is optional to treat them with over the counter analgesic and non-steroidal anti-inflammatories.



AVOIDANCE

Anecdotally, the severity of symptoms decreases with subsequent exposures, so it may not be as severe the next treatment which occurs.

If the problem persists there are two ways to reduce it, a reduction in total dose may be effective or using a botulinum toxin which has fewer stabilising proteins containing molecules such as hemagglutinin.

Currently, Bocouture (or incobotulinum) is the only product available without the stabilizing proteins and there is some evidence that this

reduces the incidence of flu like symptoms due to the lack of haem-agglutinin. This product has it's stabilising proteins removed during manufacture, but remember any foreign protein could cause this response and nothing except abstaining from treatment will reduce the risk to zero.

In summary:

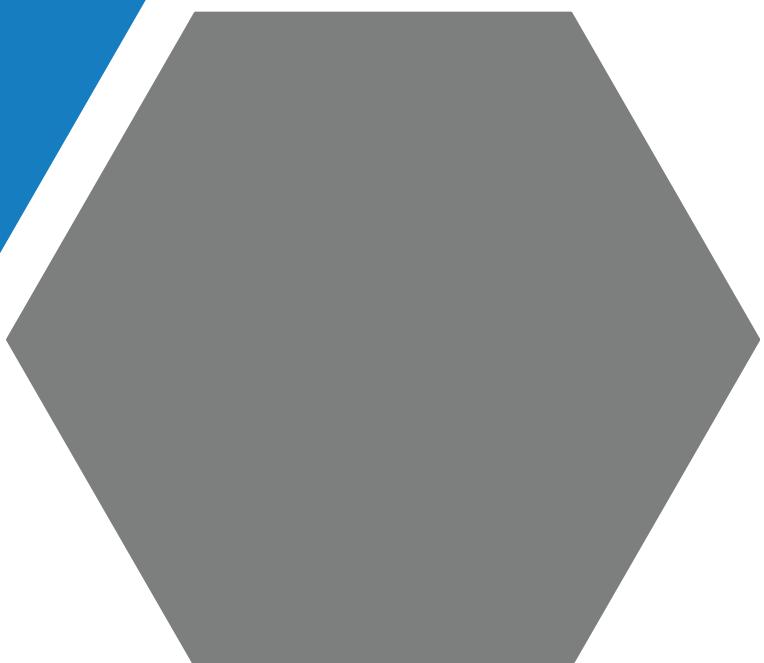
- You should now understand how to diagnose and exclude toxin as a cause of flu like symptoms.
- Be able to give a really good explanation to your client what is occurring, what to expect and how to manage the problem.
- Have treatment variations on hand for those who suffer intolerably after a treatment.

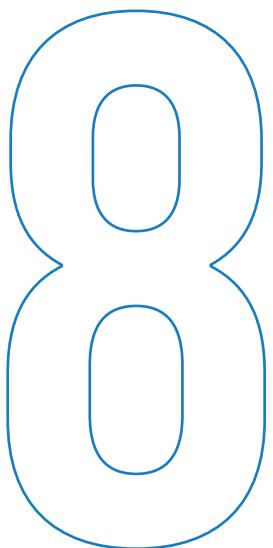
George, E. & Schneyder, N. (2014, May). Reduction in Post-Botulinum Toxin Flu-like Symptoms After Injection with Incobotulinum Toxin. Poster session presented at the meeting of the American Academy of Neurology, Philadelphia, PA. Available at: http://digitalcommons.wayne.edu/med_neurology/1

Flu-like Symptoms and Associated Immunological Response Following Therapy with Botulinum Toxins; José Fidel Baizabal-Carvallo, Joseph Jankovic; *Neurotox Res* (2013) 24:298–306

(PDF) *Flu-like Symptoms and Associated Immunological Response Following Therapy with Botulinum Toxins.* Available from: https://www.researchgate.net/publication/236912142_Flu-like_Symptoms_and_Associated_Immunological_Response_Following_Therapy_with_Botulinum_Toxins [accessed Oct 09 2018].

(PDF) *Flu-like Symptoms and Associated Immunological Response Following Therapy with Botulinum Toxins.* Available from: https://www.researchgate.net/publication/236912142_Flu-like_Symptoms_and_Associated_Immunological_Response_Following_Therapy_with_Botulinum_Toxins [accessed Oct 09 2018].





ASYMMETRY

MODULE LINK

<https://drtimpearce.com/modules/asymmetry/>



WHAT CAUSES ASYMMETRY?

Asymmetry is a very common outcome of botulinum toxin treatments.

There are 5 possible reasons why patients could perceive asymmetry after a procedure.

Firstly, it's worth pointing out that asymmetry in the face is normal. The area of asymmetry the patient is complaining about is often pre-existing, but not noticed by the patient or the clinician prior to the period of scrutiny triggered by the treatment.

Second, it may be possible that a well planned and executed treatment has an asymmetrical result because the treatment reveals a complex but hidden existing asymmetry in muscle size, receptor density, fat distribution or bone shape that was not easily apparent prior to the effect of botulinum toxin on the muscles.

Thirdly, even if the treatment plan is perfect, the amount of toxin finally delivered to the motor end plates can end up being asymmetrical for reasons I will discuss in detail.

Fourth, the treatment design may have been asymmetrical, the dose or position of the injection points may have predictably caused the problem .

Many may suggest that body dysmorphia is a cause of presenting with asymmetry that maybe does not objectively exist. In my experience, patients with body dysmorphia tend to fixate on small areas of real asymmetry, which other patients may spot too, but it's the severity of their emotional reaction to that asymmetry that differentiates them from other patients. Very small differences often seem to be deeply

upsetting and bring up feelings of self-loathing or a disproportionate anger at the practitioner if the self-loathing is projected outwards, both of which can be indicative of dysmorphia.

HOW TO DIAGNOSE ASYMMETRY

First, rule out psychosomatic causes: It is important to interpret all symptoms within the context that toxin treatments, in general, seem to have a tendency to make previously unnoticed details of the face apparent to the patient. If you do not rule out psychosomatic causes first you can end up chasing a ghost and possibly causing further asymmetry or side effects without any chance of achieving the goal.

It's not uncommon at all for patients to diagnose old asymmetries as new and caused by the treatment you delivered. The main reason for this is the manner by which toxin treatments tend to evolve slowly over 2 weeks and during that time there is uncertainty for the patient. In their attempts to understand and monitor what is going on they, scrutinize their face and see detail in it they have not seen before.

For these reasons, It's important to go through a process to establish which of these 5 factors is behind the client who is complaining of an asymmetrical result.

To achieve this you need good clinical processes before the client even comes back for a review.

Let's take a look at the preceding clinical process first asymmetry in the face

This starts in your consultation with careful analysis of the patient's face, looking for existing asymmetry both in static and dynamic poses, and looking not only for asymmetrical wrinkles but also for differences in fat, bone, teeth, muscle and skin. To make this real for you consider one of the most common asymmetries you will see if someone with lines or wrinkles above their eyebrows that are different on one side. Look carefully at the area underneath the wrinkle and you'll often notice that there is significant asymmetry of the fat pads above the eyebrows or sometimes even the frontal bone.

It's vital to point out these asymmetries when you see them so that the patient doesn't notice them for the first time after a treatment. The nervousness after a treatment, especially if it's the first time means it's not uncommon for a nervous patient to become concerned about freckles and thread veins which have been present for many years, and worry they have been caused by the procedure.

After examination, the next important step to include is to take photographs of your patient from all angles and while relaxed and with the key expressions, smiling (with teeth showing), frowning, eyebrows raised.

It's important to take some pictures with bright lights you can see the skin surface and some pictures with normal ambient light where you see more shadows in the face. The types of lighting give you the greatest chance of catching existing asymmetries and skin blemishes which may concern an anxious patient.

When the patient returns concerned about asymmetry you can retake pictures and compare the pictures in an honest attempt to accurately figure out what is going on.

It's also exceedingly helpful to take a picture of the points on the face where you injected so that you can more accurately understand how the treatment affected the result.

SO WHAT ARE THE CONTROLLABLE CAUSES OF ASYMMETRY?

We are most interested in this course in what causes asymmetry as a side effect, and how we can then reduce the rates of asymmetry.

There are several possible controllable factors that can result in unpredictable asymmetrical outcomes.

They can be broken down into what occurs just before, during and just after the treatment is delivered.

- The first are outcomes that arise from poor treatment design.
- The second, from factors affecting treatment delivery.
- And finally, come the factors after the procedure.

HOW TO AVOID ASYMMETRY

Let's consider how your process of analysis can reduce the risk of asymmetry.

Before you start make sure your head is positioned in a way that enables you to see their face square on. This will decrease the error of parallax. That is the ability of a point to look like it is in a different place depending on your point of view.

Examine the face at rest and during full contraction in every muscle group being treated and surrounding muscle groups that may be affected.

We must systematically look for symmetry of bone, fat, muscle and skin. Bone and fat are best assessed with the muscle at rest and you're looking here for differences in the curvature of the surface of the skin which reflect underlying fat and bone differences.

Areas where there is less fat or smaller bone tend to allow for more movement of the muscle and more lines and wrinkles. The latter may only become evident during a contraction which is arguably the most important part of the analysis.

To analyse muscle contraction, we need to make sure the patient has performed a full contraction of the muscles.

Often patients do not have conscious control of muscles. This is particularly true of the orbicularis oculi muscle. This is why we can often tell the difference between a forced and a genuine smile. In a genuine smile, the orbicularis oculi muscle contracts more fully, particularly in the superior lateral aspect.

This was first pointed out by the French neurologist Geeyum Duchenne:

(https://en.wikipedia.org/wiki/Duchenne_de_Boulogne)

Who was a pioneer in understanding facial expression? Duchenne did some rather interesting experiments on facial expressions, including using electrical stimulation. This is why a genuine smile is sometimes called a Duchenne smile in scientific literature.

It is one of the assessment skills of the injector to elucidate proper muscle contraction in the key areas of the face, doing so will directly decrease The risk of getting an asymmetrical result or a poor treatment outcome.

Best look at examples of muscle groups across the face and how you can make sure you get a full contraction during the analysis.

For the frontalis muscle, you can create a better contraction by asking them to look up or towards the wall behind them which often triggers frontalis contraction.

For the orbicularis oculi muscle, you need to say something that gets a genuine smile from them at the point of analysis. There are a million ways to make someone smile but one simple trick is just to point out what you're saying and say 'And now can I have a real smile?'

while they are doing the pretend smile. This moment of self-consciousness often makes people perform a Duchenne smile.

A frown or contraction of the glabellar complex is often difficult to achieve if it is not under self-control. Two ways I found effective in the past are to frown at the patient and ask them to copy you or to give them a mirror and ask them to frown into the mirror something about the visual feedback seems to enable them to control the muscle in these situations when they can't do it consciously.

In the lower face, the main area of difficulty is the platysmal bands and the depressor angularis oris. Probably the majority of people don't seem to be able to control these muscles consciously, so you need to try various positions to get them to contract them.

Often with the head slightly lifted off the bed and then asking them to look sad or to turn their chin up as much as possible will trigger Contraction of these muscles. Patience and persistence is required.

Observe closely for asymmetry of contraction and asymmetry at rest and while expressing normally. Do not only look at the lines or wrinkles, look closely for differences in the shape of the eyebrows, the hairline, the frontal bone contours and the fat pads that lie beneath the skin.

Look also at the positions of the eyelids and look for asymmetry where the forehead skin meets the orbit which is a common place for complaints.

The frontalis is by far the most difficult area to keep symmetrical as treatments strategy relies upon the fact that we are partially relaxing the muscle. Most asymmetry is caused by injections that are slightly different on the border of untreated and treated muscle on the lateral aspect of the frontalis where the muscles support the eyebrows. Movement and the contrast of the eyebrows against the skin make this area extremely visually important, and small asymmetries are obvious.

MARKUP

Markup carefully using your usual safety margins to protect the patient from brow ptosis.

Once you have marked up observe the area from a distance and from in front. Often when you are closely examining the area for injection you don't take in the bigger picture so one final check with movement is a vital part of the process to limit big picture errors such as a line of dots that are slightly higher on one side because you followed a line rather than identifying the muscle plate. Examine at rest and during contraction from straight on after you've marked up and make further adjustments as required to maximise the chance of creating a symmetrical result.

Remember to take a photograph of this when you are finished so that you can interpret symptoms at the follow-up if they were to occur.

INJECTION TECHNIQUE

Injection technique can be divided into the accuracy of positioning the needle and the accuracy of the delivery.

The most common problem with positioning is that the mark made during the treatment plan is used more as an area for entry rather than the final position of product placement. This means particularly in the lateral part of the forehead, that you could create up to 1 centimetre difference between either side even if you enter at the same point if you are angled in different directions. You can mitigate this risk by remembering that a bleb of the botulinum toxin solution should be placed underneath the mark you created. So that the mark becomes the highest point of the bleb. You achieve this by making sure the bevel of the needle is directly underneath the mark you made rather than using the mark as an entry point for the bevel of the needle. That way you know your injection point is eventually the epicentre of toxin delivery too.

PRODUCT FLOW

You will notice with experience that product sometimes flows underneath the skin in unpredictable ways. It's clearly tracking through potential spaces, and sometimes the bulk of product is up to half a centimetre away from the injection point.

One of the most significant causes of asymmetry could be that toxin is directed into vasculature as product flows into the veins or arteries of the face and therefore rapidly dissipated away from the area it was intended to be. This effectively means one side gets less toxin than the other side, causing an asymmetrical result, thankfully easily remedied at follow-up.

This sort of asymmetry is particularly noticeable at the boundaries between treated and untreated muscle, for example, the superior orbicularis oculi as it meets the eyebrow or the lateral frontalis muscle above the eyebrow or any of the lower face where small doses are used to get differences for example the depressor angularis oris we are relying on to units on each side to get a symmetrical result losing a small part of that goes could cause a noticeable asymmetry when the end result becomes apparent.

POST INJECTION

Post injection factors are relatively small. We do advise patients to avoid anything that would increase blood flow to the face primarily its pressure on the area that may squeeze toxins out of the intended location into a nearby location that might affect symmetry. Pressure may occur from wearing a hat, headband or commonly from resting the head while going to sleep on one side.

Despite this routine advice, it's actually been shown that the bulk of toxin is either attached to neuron cell membranes or washed out of the intracellular space within 10 to 20 minutes in animal studies.

The bulk of spread is therefore by convection which depends mainly on the volume and velocity of fluid injection rather than diffusion, which is limited in its effect by the rate of extracellular fluid replacement.

The critical period of avoiding pressure to the area injected is probably just the first 30 minutes or so. To be safe and reasonable, even two hours of extra precaution is probably enough to prevent spread that may cause asymmetry.