# Advanced Botulinum Toxin

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## Pharmacology

### What is Botulinum Toxin?

Botulinum Toxin is a neurotoxic protein secreted anaerobically by the Bacterium **Clostridium Botulinum**, commonly found in the soil.

It is considered the most powerful neurotoxin ever discovered.

It causes Botulism, a rare but serious paralytic illness.

Symptoms were first described by Kerner, a German physician in 1817, as "sausage poisoning" from eating badly prepared meat products.

Symptoms include, diplopia, ptosis, reduced secretions, difficulty swallowing and speaking. Eventually widespread muscular paralysis and an inability to breathe.

### What does Botulinum Toxin Do?

Botulinum Toxin acts as peripheral neuromuscular blocking agent.

### How does it Act?

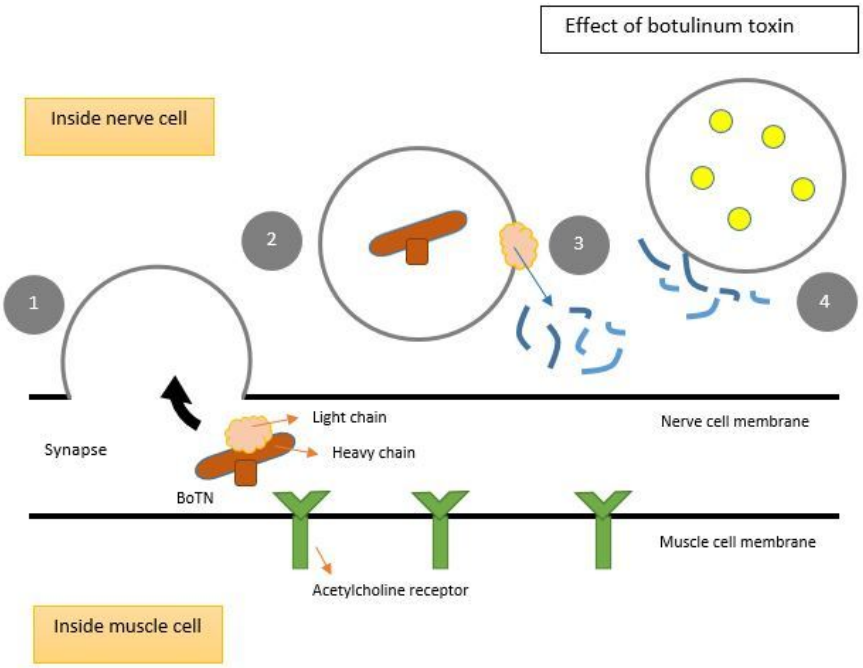
It acts by irreversibly binding to the presynaptic terminal of the neuromuscular junction preventing the release of the neurotransmitter **Acetylcholine,** thereby preventing muscle contraction.

There are 3 steps involved in this process.

1. Binding

2. Internalisation

3. Blocking




The Botulinum Molecule has a molecular weight of 150KD (kilodaltons). This is comprised of a **heavy chain** weighing 100KD and a **light chain** weighing 50KD.

**Binding** is the process that results in the Botulinum Toxin molecule attaching itself to receptors on the outer nerve cell membrane. The heavy chain is responsible for this process.

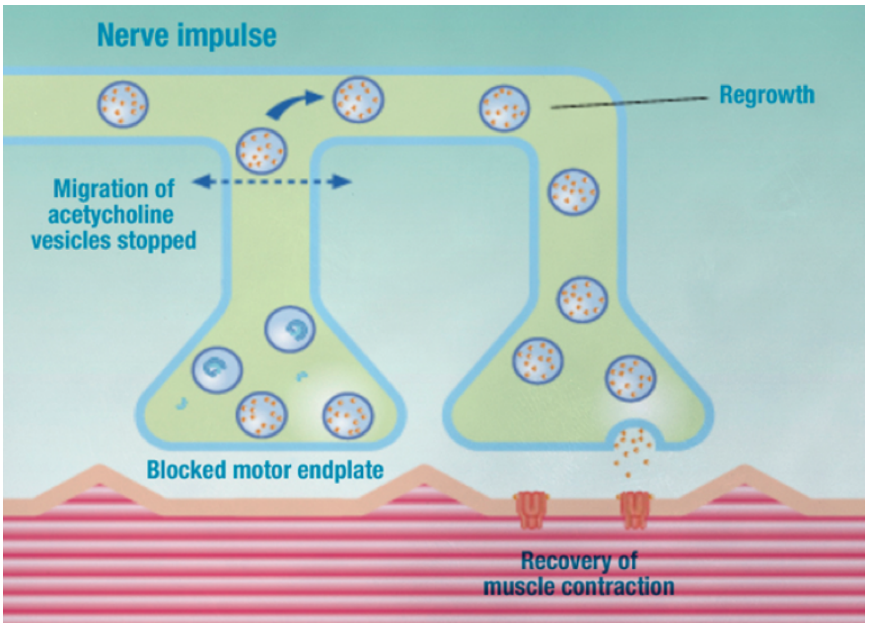
**Internalisation** is the process by which the Botulinum Toxin molecule is taken into the nerve end cell and encapsulated. The light chain subsequently sheers from the main molecule and is released into the nerve cell.

**Blocking** is the process whereby the Botulinum Toxin light chain damages the Snare Complex resulting in an inability of the acetylcholine vesicles to bind to the inner wall of the nerve cell membrane thereby preventing release of neurotransmitter to the muscle cell. The Snare Complex is a collection of proteins which act as a release receptor allowing acetylcholine vesicles to bind and release their contents.

**What happens to the nerve once blocked?**

In response to nerve paralysis, new synapses with adjacent muscle fibres begin to develop.

This gradually restores neuromuscular transmission and muscle function, explaining the temporary nature of Botulinum Toxin paralysis.




Function of the original synapse eventually returns and as a result the new sprouts disappear.

**What are Botulinum Toxin Serotypes?**

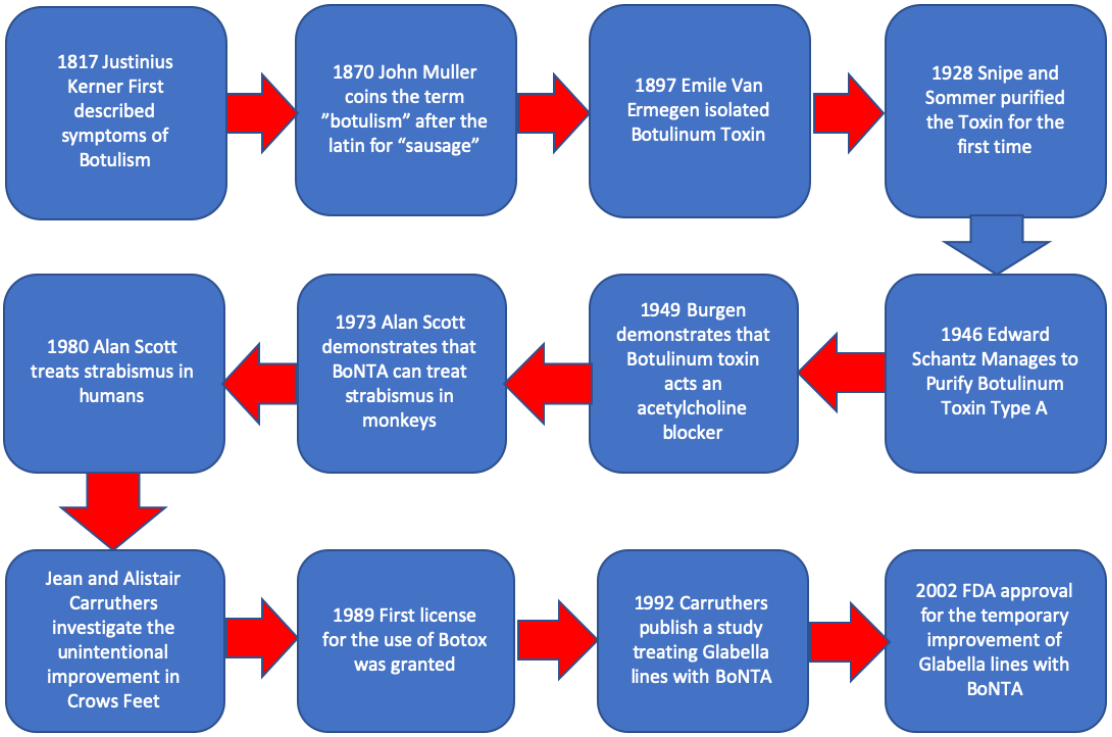
A serotype is a serologically distinguishable strain within a single species of microorganism.

**8 Botulinum** Toxin serotypes have been identified all with distinct structures. **A-H.**

The A serotype is the most powerful and is most commonly used in facial aesthetics

We will refer to Botulinum Toxin molecule as **BoNTA** from now on. **Botulinum Neurotoxin Type A.**

## Historical Timeline




### Other interesting Historical Landmarks

**1989** FDA approval for Botox for the treatment of strabismus, blepharospasm and hemifacial spasm.

**2002** FDA approval for Botox for the temporary improvement of Glabella lines.

**2010** FDA approval for Botox for the management of migraine and upper limb spasticity.

**2013** Botox receives FDA approval for the cosmetic treatment of Crows Feet.

**2017** Botox receives FDA approval for the cosmetic treatment of Forehead lines.

In addition to Botox Xeomin (Bocouture) is licensed for the treatment of all 3 upper face areas.

Dysport ( Azzalure ) is licensed for the treatment of Glablla lines and Crows Feet only.

Dysport was developed as a joint collaboration between clinicians and the Applied Microbiology Research Facility at Porton Down in Salisbury UK. It acquired a licence in 1990 to treat dystonia.Hence the name.

**Dys**tonia and **Port**on Down-**DYSPORT.**

## Brands

The most commonly used brands include Botox™, Azzalure™, Dysport™, Bocouture™ and Xeomin™.

All are derived from the same strain of **BoNTA.**

### Botox™

Onabotulinum Toxin A. It's a 900 KD BoNTA molecule. Produced by Allergan™.

100 BU per vial. Also contains 0.5mg Human Albumin and 0.9mg Sodium Chloride.

Vacuum dried. Must be refrigerated prior to use, and once reconstituted, at 2-8˚.

Botox™ is licensed for use in all 3 upper face areas- glabella, forehead and lateral canthal lines.


**Vistabel™** is also Onabotulinum Toxin A produced by Allergan™ but in a 50 BU vial.

## Azzalure™

Abobotulinum Toxin A. It's a 500-900 KD BoNTA molecule. Produced by Ipsen™ and commercialised by Galderma™.

125 Speywood Units (SU) per vial. Also contains Human Albumin and Lactose.

Lyophilised (freeze dried) and stored as a powder. Must be refrigerated prior to use, and once reconstituted, at 2-8˚.

Azzalure™ is only licensed for use in the glabella and lateral canthal lines.


**Dysport™** is also Abobotulinum Toxin A produced by Ipsen™.

It is available in 300 SU or 500 SU vials. It is also stored at 2-8˚.

## Bocouture™

Incobotulinum Toxin A. It's a 150 KD BoNTA molecule. Produced by Merz Pharma Group™.

50 Bocouture Units per vial. Also contains 0.5mg Human Albumin and 2mg of Sucrose.

Bocouture is available in a 100 Bocouture unit vial.

**Free** from complexing proteins. Complexing proteins are thought to protect the free Neurotoxin molecule from the gastrointestinal tract and aid stability.

Lyophilised and stored as a powder. Bocouture™ **can** be stored at room temperature, but must be refrigerated, after reconstitution, at 2-8˚.

Bocouture™ is licensed for use in all 3 upper face areas-glabella, forehead and lateral canthal lines.


Xeomin™ is also Incobotulinum Toxin A produced by Merz Pharma Group™.

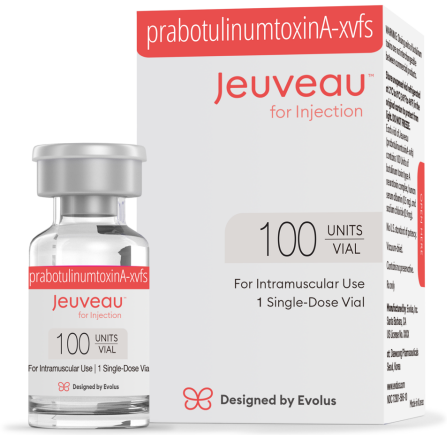
It is available in 50 and 100 Xeomin Unit vials.


Note Bocouture™ and Xeomin™ are identical.

Other FDA approved Neurotoxins.

**Myobloc™**. This is Rimabotulinum Toxin B. Currently approved for cervical dystonia. Very limited use cosmetically due to poor duration and discomfort of injection.

**Jeuveau™**. This is Prabotulinum Toxin A produced by Evolus Inc ™. It's a 900 KD BoNTA. It has received FDA approval for the treatment of Frown lines. It comes in a 100 Jeuveau Unit vial and dosing is said to be on a 1:1 ratio with Botox™. Jeuveau™ was available for use in the US in 2019.




**Please Note.**

The Dosing Units are **NOT** interchangeable.

Although independent studies have suggested a ratio of;

Botox™ **(1BU)** : Bocouture™ **( 1 Bouture Unit )** : Azzalure™ **(2.5 SU ).**

**Also,** all Neurotoxins are defined as **medicines** and as such need to be prescribed by a Doctor, Dentist or Nurse with prescribing privileges.

## Preparation

### What consumables will you Need?

1. Sterile dressing pack with sterile swabs.

2. Gloves.

3. Cleansing solution.e.g. Chlorhexidine, Clinisept.

4. 1ml or 2.5ml syringes to add diluent.

5. 21 or 23 G needle to add diluent.

6. Cap-off device to remove metal collar from vial. This allows the rubber bung to be removed.

7. 0.3ml, 0.5ml and 1.0ml Insulin syringes with 30G-32G needles. To administer dosing.

8. Removable marker pencil to mark injection points.

9. Bacteriostatic Saline to act as a diluent and Toxin of choice.

### Reconstitution

This is done in clinical practice with **Bacteriostatic Saline**. All inserts will advise using non-preserved saline. However, it appears that using Bacteriostatic saline results in significantly less discomfort for the patient.

**Botox™ 100 BU**

Recommended dilution is with 2.5mls. of Bacteriostatic Saline.

The resulting concentration is **4 BU per 0.05mls**. of solution.

Allow the vacuum to pull the Bacteriostatic Saline into the vial. Do not agitate but gently roll the vial to ensure full dissolution of product.

**Azzalure™ 125 SU**

Recommended dilution is with 0.63mls. of Bacteriostatic Saline.

The resulting concentration is **10 SU per 0.05mls**. of solution.

Allow the vacuum to pull the Bacteriostatic Saline into the vial. Do not agitate but gently roll the vial to ensure full dissolution of product.

**Bocouture™ 50 U**

Recommended dilution is with 1.25mls. of Bacteriostatic Saline.

The resulting concentration is **4 Bocouture Units per 0.05mls**. of solution.

Allow the vacuum to pull the Bacteriostatic Saline into the vial. Do not agitate but gently roll the vial to ensure full dissolution of product.

**Preparing to Inject**

After reconstitution The BoNTA solution can be withdrawn from the vial with either a 0.3ml, 0.5ml or 1.0ml Insulin syringe depending on your dosing. Remove metal collar and remove rubber bung prior to withdrawl.

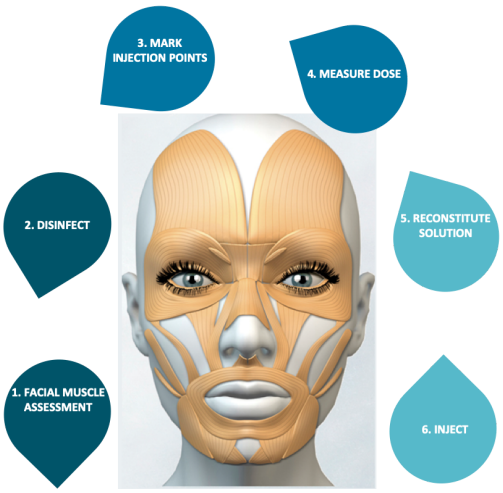
These syringes have a needle as well are are very vulnerable to blunting. So take care not to touch the inner surface of the glass vial when withdrawing. Also withdraw slowly to limit the amount of air bubbles taken up.

My preferred brand of syringe are the FMS syringes.


Once reconstituted, BoNTA should only be used to treat a single patient, during a single session.

Remember to remove any makeup and disinfect the skin prior to marking and injection.

**The injecting process involves a number of steps.**




We will cover a number of these steps later in the course.

**Field of Effectiveness**

The active Neurotoxin in all BoNTA products separate immediately from their complexing proteins when reconstituted. When injected this creates a field of effectiveness.

Any spread around the injection points depends on dose, volume and injection technique, as opposed to variations in complex size.

The active Neurotoxin across all BoNTA products is identical ( 150 KD )

Consequently, it is felt that other proteins in the toxin complex play no part in the spread of BoTNA and its field of effectiveness.

**Diffusion and Spread of BoNTA**

Diffusion and spread are often confused as the same, but they are notably distinct.

**Spread** is the physical motion of molecules moving from one area to another, which is dependent on injection technique, volume and possibly applied forces rather than the product properties.

**Diffusion** is a kinetic process, which occurs when a high concentration of any compound is introduced to an area with a low concentration.

Diffusion is a slow process which could explain why the full benefits of treatment are often seen days later.

## Contraindications

1. Under 18 years of age. This is certainly the case for Aesthetic use.

2. Pregnancy and Breast feeding.

3. History of known allergy to Neurotoxin or any excipients e.g. Lactose, Human Albumin.

4. Infection at the site of injection.

5. Those with a history of Myasthenia Gravis, Lambert-Eaton Syndrome or Amyotrophic Sclerosis.

Care should be taken in those with;

1. History of dysphagia or aspiration.

2. Those with prolonged bleeding times.

3. Patients with very unrealistic expectations.

## Therapeutic Indications for BoNTA

BoNTA is approved in more than 75 countries to treat a wide variety of disorders primarily neuromuscular.

Examples Include:

Cervical Dystonia. Neck muscle spasm causing the head to be pulled back or sideways.

Hemifacial Spasm. Involuntary contractions on one side of the face.

Blepharospasm. Rapid blinking or forced eye closure.

Bladder Dysfunction. Detrusor Instability with symptoms of urinary urgency and frequency.

Chronic Migraine. Unresponsive to other medical interventions.

Strabismus.

Upper and Lower Limb Spasticity.

Equine Foot Deformity in Childhood.

Focal Hyperhidrosis. Hands, feet and Axillary.

## Licensing

Botulinum Toxin, as indicated in the sections above, is licensed for a number of medical conditions but has limited licensing for cosmetic procedures.

In fact, the only cosmetic licenses are for the upper part of the face.

All cosmetic/aesthetic treatment for the lower face and neck are "off license".

Another point in the UK is that there is a clear demarcation between an aesthetic treatment and a medical treatment.

The treatment of "Disease, Disorder and Injury" in the UK are deemed regulated activities and as such should be performed by medical professional in a Care Quality Commission registered premises.

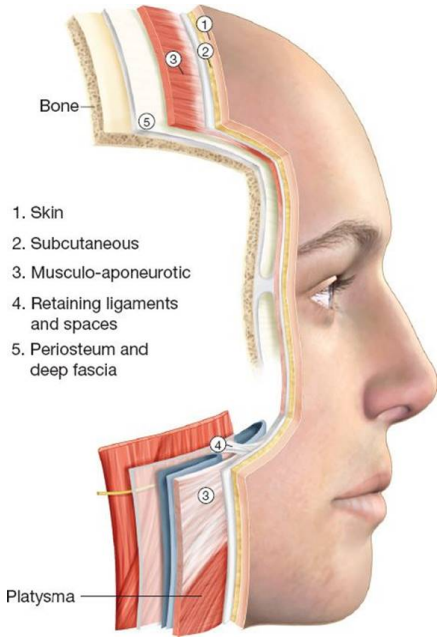
The medical management of axillary hyperhidrosis is deemed a regulated activity and as such should be performed in a CQC registered premises by a registered medical professional.

## Anatomy

An understanding of facial anatomy is key to all aspects of Facial Aesthetics.

This ranges from a knowledge of the function of skin to the underlying structures including the muscles and vasculature.

The face is made of **layers**. In fact, the face has 5 distinct layers.




**Layer 1. Skin**.

This is composed of the epidermis and dermis.

The skin is the largest organ of the body and serves 3 basic functions. Protection, Sensation and Regulation.

**Layer 2. Subcutaneous Fat**.

This layer serves to cushion and contour the face. It also acts as a store of energy. In the face this fat layer can be further divided into various compartments separation by fibrous septa and ligaments.

**Layer 3. Fibromuscular Layer**.

In the face and neck this is known as the SMAS (Superficial **M**usculo-**A**poneurotic **L**ayer). This is a network of muscles and fibrous tissue connecting the facial muscles to the skin via fibrous septa and allowing these muscles to work in a coordinated manner.

**Layer 4. Deep Fat**.

This layer sits above the periosteum. This layer contours and acts as a glide plane for the overlying muscles.

**Layer 5. Periosteum and Bone.**

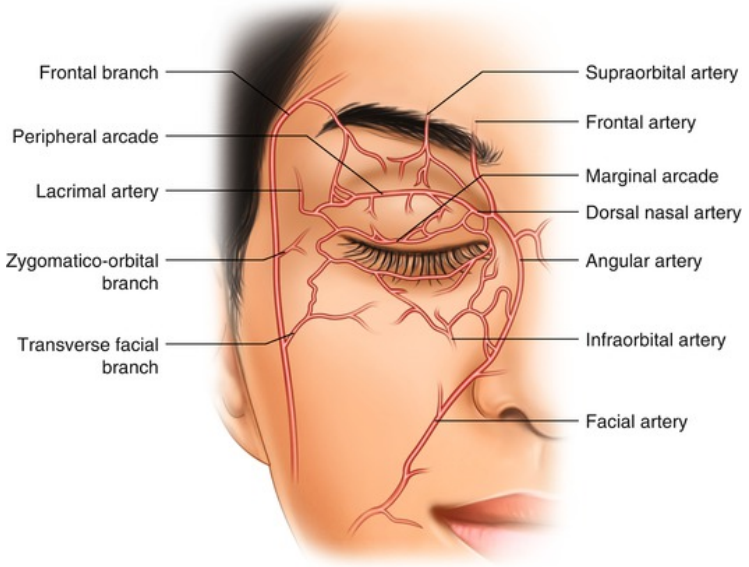
**Facial Arteries and Nerves**

Running through the various layers of the face are the essential arteries and nerves.

**Arteries**

A full and thorough appreciation of the facial vasculature is probably the most important part of Facial Aesthetics. Not only understanding the course of the various vessels but perhaps more importantly the **depth** of the vessels. This will be further discussed in subsequent courses relating to Anatomy and Dermal Fillers.

Reassuringly, with regards to Botulinum Toxin, there are potentially **No** serious issues related to intra-arterial injection at cosmetic doses.

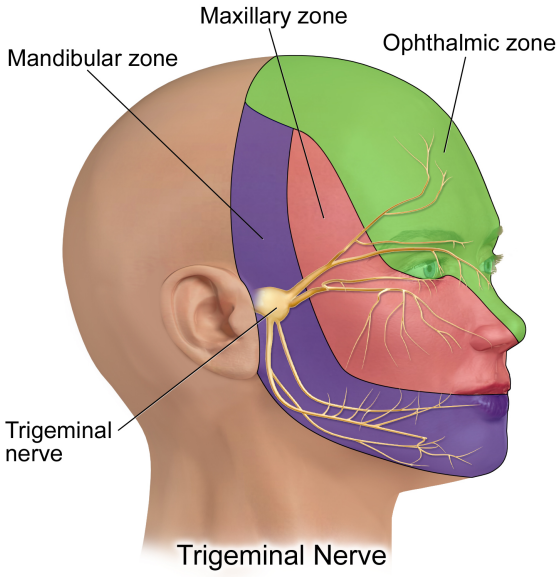



The upper part of the face derives its blood supply from both the Internal Carotid System and well as the External carotid System.

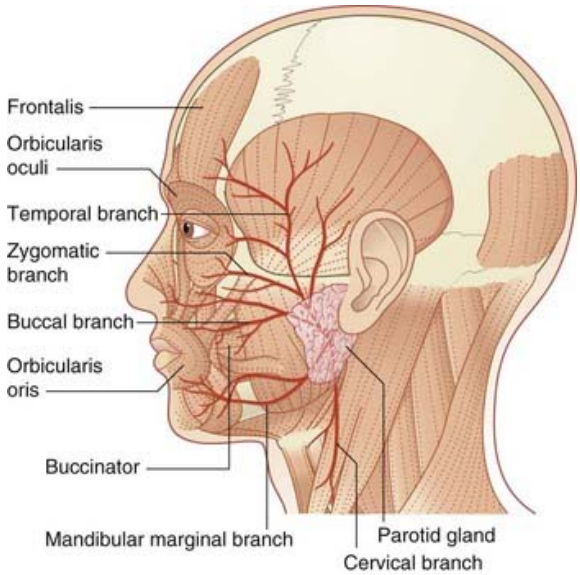
Blood supply to the lower part of the face is primarily derived from the Facial Artery, which is a branch of the External Carotid Artery.

### Nerves

The sensory innervation of the face come from the **Trigeminal Nerve**. It divides into 3 separate branches. The Ophthalmic, Maxillary and mandibular Branches.



The motor innervation of the face comes from **Facial Nerve**. The VII Cranial Nerve. This controls the muscles of facial expression.

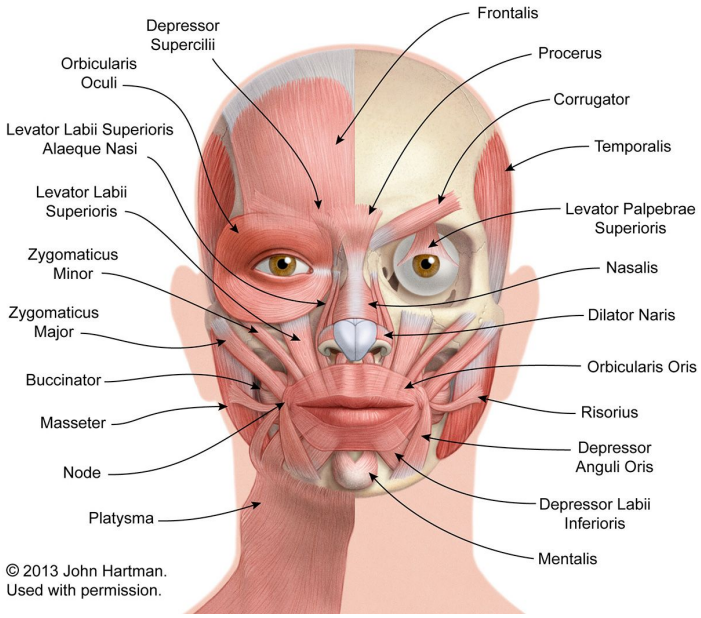



The Facial Nerve emerges through the stylo-mastoid foramen and traverses through the parotid gland.

It then divides into 5 branches supplying the face and neck.

Again, as with the arterial supply of the face, the risk of damage to the nerves of the face with Botulinum Toxin injections is extremely low.

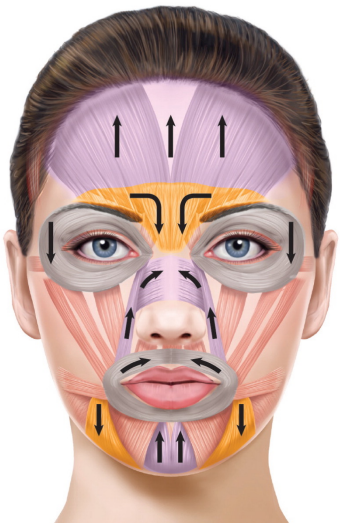
## Facial Muscles




The facial musculature is extremely complex.

With the exception of Orbicularis Oris, all the muscles have a boney origin and a skin insertion.

In addition, we should also understand that we can further divide these muscles into muscles that **elevate** and muscles that **depress** depending on their action.



In the upper part of the face Frontalis tends to be the principal elevator.

The principal depressors are Procerus, Corrugators and Lateral Orbicularis Oculi.

Understanding this principle is vital, if trying to prevent depression or, to create lift e.g. lateral brow lift.

In the lower part of the face the principle elevators are Nasalis, Zygomaticus Major and Minor, Levator Labii Superioris, Levator Labii Superioris Aleque Nasi, and Mentalis.

The principle depressors in the lower part of the face are Depressor Anguli Oris, Depressor Labii Inferioris and Platysma.

We will cover the individual muscles of the lower face, including their function and anatomy in the next lessons.

## Lateral Brow Lift

Contraction of the Orbicularis Oculi Muscle is responsible for eye closure.

Orbicularis Oculi is a brow depressor.

The supero-lateral fibres of Orbicularis Oculi pull the lateral brow down and oppose the lifting action of Frontalis.

### Injection Technique

The underlying principle here is to weaken the brow depressors, allowing the brow elevator to exert a lifting action.

This is achieved by injection the supero-lateral Orbicularis Oculi muscle.

The injection points are indicated in the image below.

Typically, 2-3 injection points are required.

Dosing is typically;

- 2-3 BU per injection point.
- 5 SU per injection point.

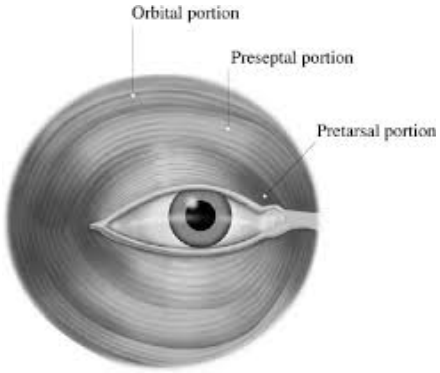
### Injection Tips

- Keep injection points 1cm away from the orbital rim to reduce the risk of diffusion and spread.
- Keep injection points superficial. This is an area prone to bruising.
- Moderate patient exceptions with regards to the degree of brow lift.
- Expected duration is 10-12 weeks.

## Eyelid Roll

Hypertrophy of the Orbicularis Oculi muscles can cause fullness of the lower eyelid.

The pretarsal portion of the lower lid contributes to this effect.



It is particularly seen income parts of the Asian population.

**Injection Technique**

BoNTA injections are placed in the mid-pupillary line 3-5mm below the lower lash line.

A single injection point per eye as indicated.

Typical dosing;

- 1-2 BU per eye.
- 2-5 SU per eye.

### Injection Tips

Patient selection is very important with this area of the eye.

- Always check the tone of the lower eyelid before injection.
- Perform a snap test. Pull the lower lid away from the globe and allow it to snap back. If the snap back is sluggish, DO NOT inject.
- If the patient has lower eyelid bags again consider not injecting. Weakening of this portion of Orbicularis Oculi can exacerbate the problem.
- Injection of the pretarsal portion of Orbicularis Oculi muscle can cause widening of the palpebral aperture and can lead to lower lid laxity, excessive scleral show, ectropion of the lower lid and dry eye.
- Bruising can occur in this area as well.
- Expected duration of effect 6-10 weeks.

## Bunny Lines and Nasal Flare

Bunny lines are dynamic wrinkles that run from the medial canthus of the eye inferio-medially to the dorsal of the nose.

Nasal Flare is noticeable in some individuals who flare their nostrils when talking.

They are caused by contraction of the muscle Nasalis.

Nasalis consists of two parts.

The Transverse Portion which contributes to bunny lines and the Alar Portion which is responsible for nasal flare.

Nasalis is a paired muscle that covers the dorsal of the nose.

The Transverse portion of Nasalis originates for the anterior maxilla and inserts into the aponeurosis on the bridge of the nose. It is responsible for compression of the nasal aperture.

The Alar portion of Nasalis originates from the maxilla and attaches to the alar cartilage. It is responsible for dilating the nostril.

**Blood** supply to Nasalis is from;

- Superior labial artery.
- lateral nasal artery.
- Infraorbital artery.

**Nerve** supply is from the Buccal Branch of the Facial Nerve.

**Injection Technique**

Botulinum Toxin (BoNTA) can be used to treat bunny lines and nasal flare.

For bunny lines a superficial injection of BoNTA into the belly of the Transverse portion of Nasalis bilaterally is recommended. As indicated by the black dot below.

Typical dosing is;

- 2-3 Botox Units BU per side.
- 5-10 Speywood Units SU per side.

For nasal flare reduction superficial injection of BoNTA into the Alar portion of Nasailis bilaterally recommended. As indicated by the black dot below.

Typical dosing is;

- 3-5 BU per side
- 10-15 SU per side.

### Injection Tips

- The lateral wall of the nose is highly vascular so keep injections superficial.
- This is an uncomfortable injection area so consider some analgesia e.g. ice or topical anaesthetic.
- Explain to the patient that results for bunny line and nasal flare are subtle and complete eradication is impossible.
- The lateral side wall of the nose is susceptible to bruising.
- Keep injections close to medial aspect of the nose. The main risk is injecting is too far laterally or spread of product laterally. This can result in inadvertent weakness if lip and cheek elevators resulting in lip ptosis and flattening of the cheek.
- Results are expected to last 8-12 weeks.

## Nasal Tip Lift

The Depressor Septi Nasi Muscle originates from the Orbicularis Oris muscle and insert into the base of the nasal septum and posterior portion of the Alar Nasalis.

Its function is to pull the wings of the nostril inwards. In addition, it has a depressor effect on the nasal tip.

**Blood** supply is from the columellar branches of the Superior labial artery.

**Nerve** supply is from the Buccal Branch of the facial Nerve.

Weakening of this muscle can result in elevation of the nasal tip and widening of the nasolabial angle.

### Injection Technique

BoNTA injection to the base of the columella in the midline. As indicated below.

Typical dosing;

- 2-3 BU as a single injection.
- 5-10 SU as a single injection.

### Injection Tips

- Patient selection is key. A patient with a severely ptotic nasal tip is unlikely to benefit.
- be careful in the older patient. Treatment here can cause lengthening of the upper lip or potential lip asymmetry.
- Manage patient expectations. The results are often subtle.
- Duration of effect 6-10 weeks.

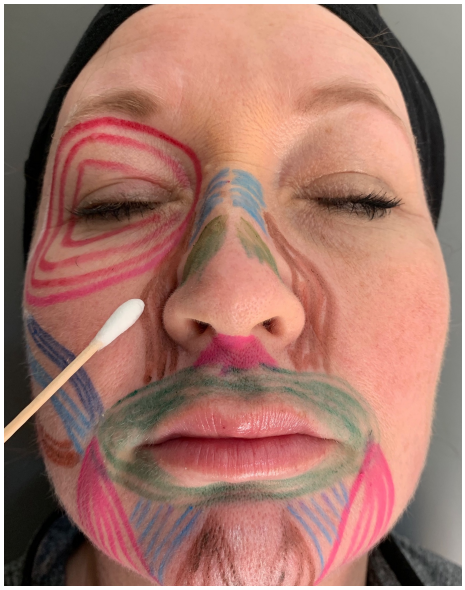
## Gummy Smile

The Levator Labii Superioris Alaeque Nasi muscle is often known as the "Elvis" or snarl muscle.

The action of the muscle is to dilate the nostril, elevate the wing of the nose and the upper lip.

It originates from the frontal process of the maxilla.

It inserts into the skin of the lateral part of the nose and the skin of the upper lip.



Some patients pull their upper lip over the teeth resulting in excessive dental show.

This is known as a "gummy smile".

In addition, some patients create a horizontal line just below the columella.

Both these problems can be treated with BoNTA.

**Blood** supply to this muscle is derived from;

- Facial artery.
- Infraorbital artery.

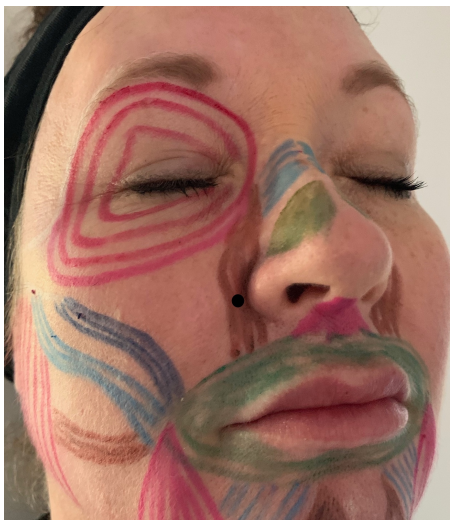
**Nerve** supply is via the Zygomatic Branch of the Facial Nerve.

**Injection Technique**

The Levator Labii Superioris Alaeque Nasi muscle travels just lateral to the nose.

Injecting the muscle in this area will weaken lip retraction and improve dental show.

Inject perpendicular to the skin and to a depth of 3-4 mm.



Typical dosing;

- 1-2 BU per side.
- 3-5 SU per side.

**Injection Tips**

- Patient selection is very important.
- This treatment can elongate the upper lip so care must be taken with older patients.
- Lip ptosis and lip asymmetry is not uncommon, so it may be prudent to start at a lower dose.
- Weakening of the upper lip area may be a concern for patients who sing or play wind instruments.
- Also warn the patient that they may have some difficulty with sucking through a straw.
- Duration of effect 6-12 weeks.

## Perioral Lines and Lip Lift

Orbicularis Oris is a complex circular muscle that surrounds the orifice of the mouth, forming the majority of the lips.

Its main function is to close the mouth and compress and protrude the lips.

It's also involved in mastication and phonation.

Repeated contraction of the Orbicularis Oris muscle contributes to the formation of perioral lines.

Other contributory factors include skin laxity, volume loss, boney resorption and smoking.

**Blood** supply is from;

- Superior and Inferior labial arteries.
- Mental artery.
- Transverse Facial artery.
- Infraorbital artery.

**Nerve** supply is derived from the Buccal Branch of the Facial Nerve.

**Injection Technique**

For perioral lines, BoNTA is injected at the vermillion border. Treatment must be symmetrical.

Either upper lip, lower lip or both lips can be treated.

Typical dosing;

- 1-2 BU per quadrant. Lateral injection points on upper lip 0.5 BU.
- 2-5 SU per quadrant. Lateral injection points on upper lip 1-2.5 SU.

For lip lift, BoNTA is injected into the vermillion border at the base of the philtrum.

The corresponding location on the bottom lip can also be injected.

The principle behind the lip lift is that Orbicularis Oris muscle pulls towards the centre of the mouth.

When this area of muscle is weakened the lip elevators and lip depressors can exert more of an effect and thereby create lip eversion. This can produce generally no more than 1-2mm increase in pink lip visibility.

Typical dosing;

- 1-2 BU per quadrant.
- 2-5 SU per quadrant.

Injection Tips.

- As always, patient selection in important.
- Be careful with patients who sing or play instruments. This can be compromised.
- Pronouncing certain letters may be difficult, especially P's and B's.
- Keep dosing and injection points symmetrical to reduce the risk of an asymmetric result.
- Duration of effect 6-10 weeks.

## Oral Commissures

Depressor Anguli Oris ( DAO ) is the muscle responsible for pulling the corner of the mouth downwards and associated with the facial expressions of frowning and sadness.

It originates from the mandible and inserts into the modiolus just lateral to the corner of the mouth.

**Blood** supply is primarily from the Inferior Labial artery.

**Nerve** supply is from the Mandibular Branch of the Facial Nerve.

BoNTA injections into the DAO muscle can elevate the oral commissures.

This can be used in isolation,- but it often combined with dermal filler injections.

Weakening of this depressor muscle allows face elevators to exert an enhanced lifting effect.

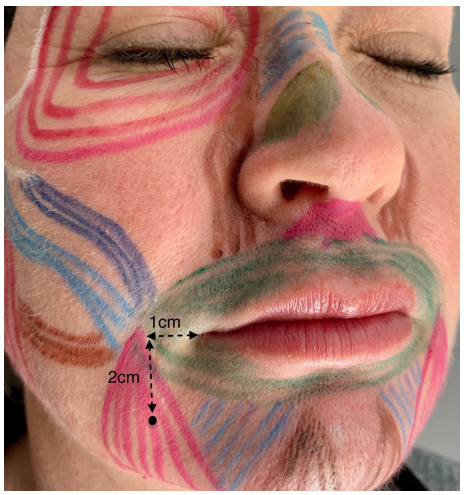
### Injection Technique

A single injection point per muscle is recommended.

Inject deeply into each muscle.

To locate the injection point you can;

- Mark 1cm lateral to the corner of the mouth and 2 cm down. As indicated.
- Ask the patient to contract the muscle i.e. "pull an upside-down smile". This can be difficult for the patient to do voluntarily. The muscle contraction will then be visible.




Typical dosing is;

- 2-5 BU per side.
- 5-10 SU per side.

### Injection Tips

- Patient selection is important. A patient with significantly depressed commissures is unlikely to see a pleasing improvement.
- The main complication of treatment is misplacement of product into other periorbital muscles.
- Placing BoNTA too close to the modulus can have an effect on mouth elevators.
- Placing product too medially can inadvertently affect the Depressor Labii Inferioris muscle leading to lower lip asymmetry.
- Duration of effect 8-12 weeks.

## Dimpled Chin

The paired Mentalis muscles are responsible for anterior rotation of the chin and dimpling of the chin.

They also support the bottom lip and produces a pout.

Facial expressions associated with contraction of these muscles are doubt and indecision.

The Mentalis originates from the incisive fossa of the mandible and inserts into the dermis of the chin skin.

**Blood** supply is from;

- Inferior labial artery.
- Mental artery
- Submental artery.

**Nerve** supply is from the Mandibular Branch of the Facial Nerve.

BoNTA injections placed directed into the belly of each muscle can help improve dimpling of the chin, aid forward rotation and soften the mental crease.

**Injection Technique**

Usually a single injection to each belly of Mentalis is required.

Injections are placed low and medially between the mental crease and menton of the chin.

Typical dosing;

- 2-5 BU per side.
- 5-15 SU per side.

### Injection Tips

- Inject symmetric doses of BoNTA into each belly of Mentalis.
- Ensure the injection points remain low on the chin.
- If injection points are too high, lip incontinence can result. Either Orbicularis Oris or Depressor Labii Inferioris can be inadvertently affected resulting in lower lip asymmetry and significant patient dissatisfaction.
- Inadequate dosing can also be problematic, resulting in abnormal muscular contraction. In this instance, additional dosing will be required.
- Duration of effect 6-12 weeks.

## Neck Treatments

Neck treatments with BoNTA include;

- Treatment of Platysmal Bands.
- Treatment of Necklace Lines.
- Nefertiti Lift.

Platysmal Bands are vertical thickenings of the Platysma muscle. They are often accentuated when the patient attempt to tighten the neck muscles.

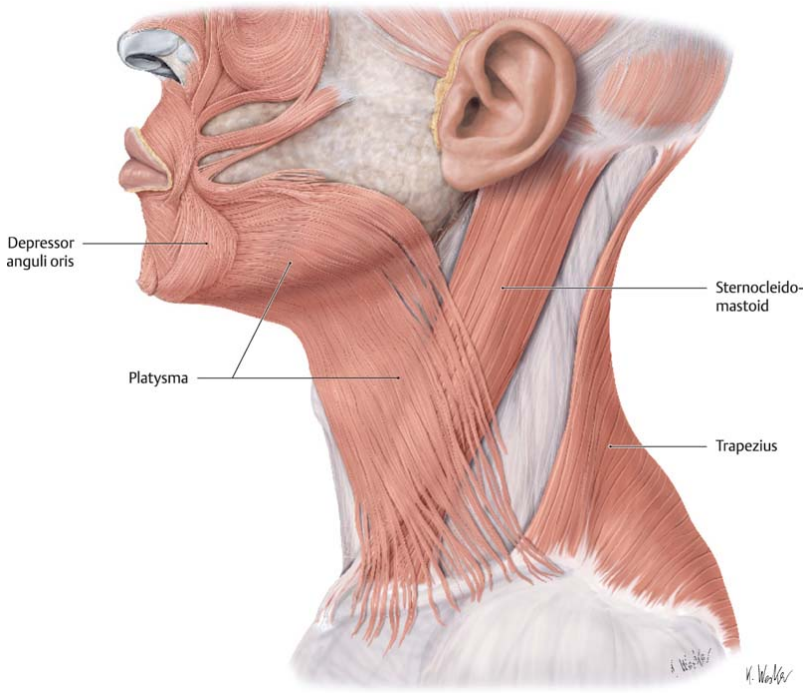
Necklace lines are dermal attachments to the underlying SMAS ( Superficial Musculo-Aponeurotic System ). They can be seen in the young but worsen with age.

The Nefertiti Lift is so named after the Egyptian Queen who supposedly had the perfect sculpted jawline. This was based on a statue found in Egypt in 1912.

In certain individuals, treating Platysma with BoNTA can create enhanced definition of the jawline.

## Anatomy

In all three treatment, the target muscle is Platysma.



Platysma is a wide flat superficial muscle extending from the lower part of the face to the upper thorax.

The platysma partly covers the pectoralis major and deltoid muscles. In the mouth area, the platysma divides in mandibular, labial and modiolar (nodular) parts.

The platysma originates from skin over the lower neck and the upper lateral chest area.

The platysma inserts on the inferior border of the mandible and into skin over the lower face and the angle of the mouth.

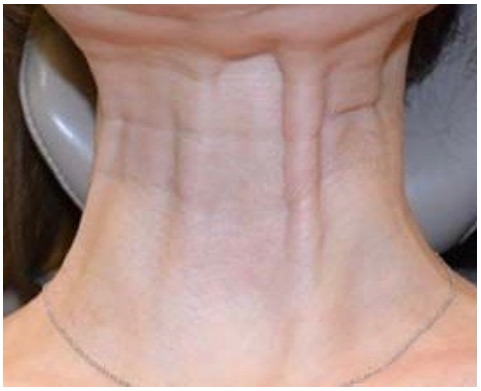
Contractions of the platysma depress and wrinkle skin of the lower face and the mouth. The platysma also contributes to forced depression of the mandible.

**Nerve** supply is from the Cervical Branch of the Facial Nerve.

**Injection Technique**

## Platysmal Bands

Platysma bands can be singular, exist in pairs and can be anterior or posterior in the neck. The patient below has one anterior pair and a posterior pair.

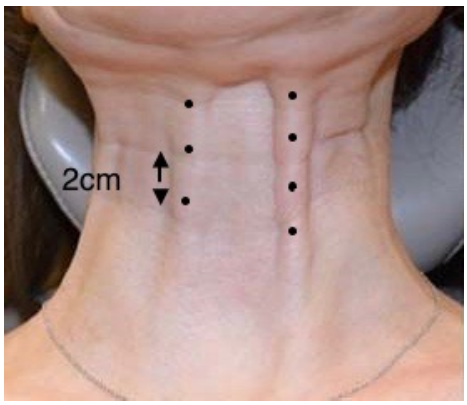


Ask the patient to tighten the neck and grasp the band between finger and thumb.

Inject along the line of the band, leaving about 2cm between injections. Inject deep into the band.

Start injecting at the cervico-mental angle working inferiorly.

Generally, only 3-5 injection points are required per band.

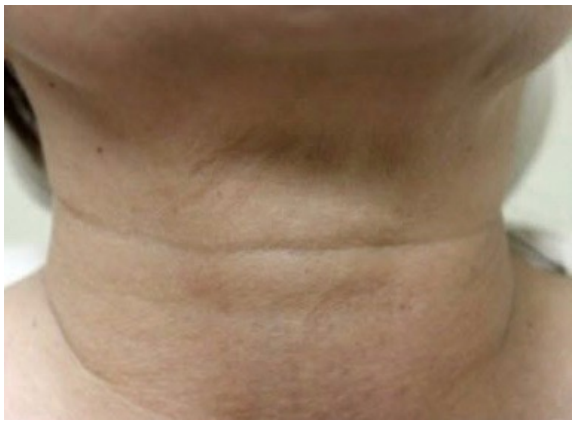



Typical dosing;

- 2-3 BU per point.
- 5-10 SU per point.
- Do not inject more than 40 BU or 100 SU in total to the neck in any one session.

## Necklace Lines

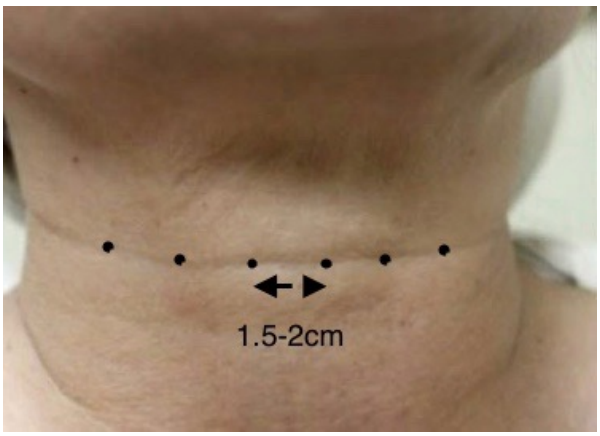
These are horizontal neck lines that tend to deepen with age. They can be improved but not completely removed with BoNTA.



Injections into these lines is intradermal.

Leave 1.5-2cm between injection points.

Generally, 3-6 injections per line.




Typical dosing;

- 1-2 BU per point.
- 2-5 SU per point.
- Do not inject more that 15-20 BU or 40-50 SU in total in any one session.

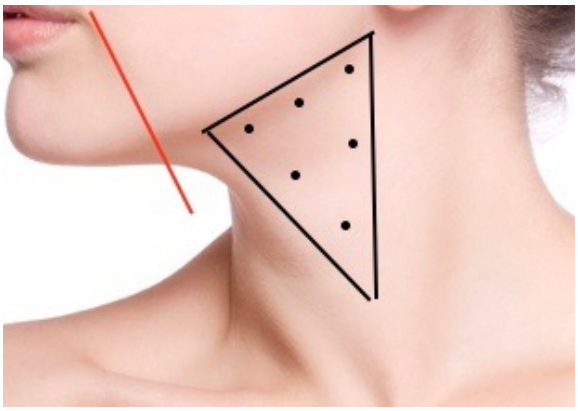
## Nefertiti Lift

In the neck the Platysma muscle acts as a depressor.

The underlying principle of the Nefertiti Lift is that weakening this depressor allows facial elevators to lift sagging tissue in the lower face and enhance jawline definition.

With this procedure patient selection is important as results can be subtle.

To assess, ask the patient to contract the neck muscles. If the patient loses definition of the mandibular border on contraction, then they should see a positive result after treatment.



The author's preferred technique involves diffusely weakening Platysma muscle on each side of the neck as seen below.

Keep injections behind the red line. This avoids inadvertent weakening of perioral muscles.

Start by injecting the lower border of the mandible and distribute the injections in a triangular fashion.

Typical dosing;

- 2-3 BU per point each side.
- 5-10 SU per point each side.

### Injection Tips

- Patient selection is important. A patient with a heavy neck will not be a good candidate.
- Watch the overall dosing in the neck. There have been reports of patients having problems with swallowing and speech following treatment. The author recommends no more than 40 BU or 100 SU in total in the neck in any one session.
- Bruising in the neck is not uncommon. Consider using ice post treatment.
- Expected duration 6-20 weeks.

## Axillary Hyperhidrosis

Primary axillary hyperhidrosis is excessive underarm sweating not necessarily caused by heat or emotion.

It is thought to affect 2% of the population and can be a cause of great concern and embarrassment for patients.

The eccrine sweat glands of the human body are under the control of the sympathetic nervous system primarily cholinergic fibres.

Acetylcholine is the neurotransmitter controlling these sweat glands.

BoNTA, being an acetylcholine blocker can have a pronounced effect on sweat production.

### Injection Technique

The treatment area is usually the hair bearing portion of the axilla, which is usually clearly visible.

Some practitioners still use the starch/iodine test to help delineate the treatment area.

This involves painting the axilla with iodine, allowing this to air dry, then brushing corn starch over the area. The areas of sweat will then turn black.

In the authors opinion, this is an unnecessary and messy test and generally not required.

- Cleanse the skin.
- generally anaesthetic is not required.
- Mark a simple grid on the axilla. This will serve as a guide and remind you of where you have injected.
- 20 intradermal injections per axilla.

Typical dosing is;

- 50 BU per axilla.
- 125 SU per axilla.

In the axilla, allowing spread of toxin is deemed advantageous.

With this in mind, the author dilutes the BoNTA with more diluent.

**For Botox™** the author dilutes 100U vial with 4mls of saline. This gives a concentration of 2.5u/0.1ml.

Each axilla is treated with 20 intradermal injections of 0.1ml.

**For Azzalure™** the author dilutes 125SU vial with 1ml of saline This gives a concentration of 6.25SU/0.05ml.

Each axilla is treated with 20 intradermal injections of 0.05ml.

### Injection Tips

- Inject intradermally, creating a wheal in the skin. Remember the sweat glands are located in the dermis.
- Deep injection can result in weakness of the small muscles of the hands.
- Wait 2 weeks before a touch up procedure.
- Results can last up to 12 months.

## Masseter Reduction

Treatment of Masseter usually has two indications;

- Aesthetic-slimming of the lower face.
- Medical-bruxism / teeth grinding.

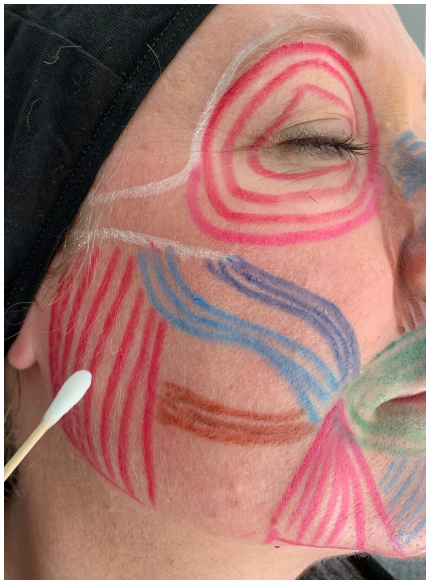
For aesthetic slimming of the lower face BoNTA injections can provide a pleasing improvement in contour. This is a treatment that is especially sought after in some Asian populations.

Medically, bruxism can be a multifactorial condition and may need both dental and psychological assessment.

The target treatment muscle is Masseter.

Masseter originates form the zygomatic arch and inserts into the lower posterior ramus of the mandible.

Contraction of Masseter elevates the mandible.



**Blood** supply is from the Masseteric artery which is a branch of the Maxillary artery.

**Nerve** supply is from Mandibular branch of the Trigeminal Nerve.

**Injection Technique**

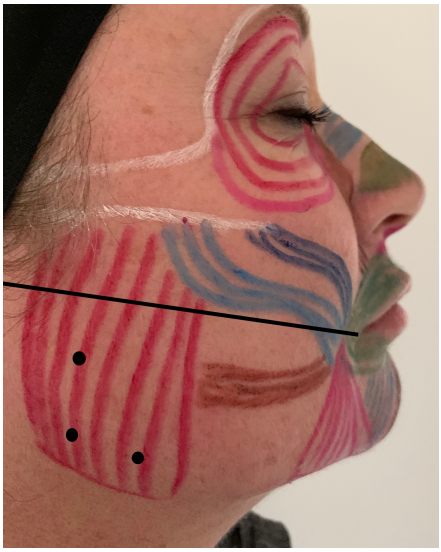
Initially locate the anterior and posterior margins on the Masseter. This can be achieved by asking the patient to clench their teeth. This form the anterior and posterior injection margins.

Then mark a line from the lobe of the ear to the corner of the mouth. This forms the superior injection margin. This keeps you away from the zygomatic muscles.

The lower injection margin is formed by the mandibular edge.

Usually three injection points are required distributed in a triangular fashion as illustrated below. Keep injection points 1cm away from the anterior and posterior margins.

Use a 12mm needle to ensure injections are located deep into the belly of the muscle.



Typical dosing;

- 20-30 BU per side in divided doses.
- 50-75 SU per side in divided doses.

### Injection Tips

- Patient selection is important. If in doubt, please consider not treating until a dental or psychological assessment is undertaken.
- Be mindful of the injection point boundaries. Keeping within these boundaries can reduce the risk of inadvertent treatment of muscles of facial expression or the parotid gland and duct.
- Bruising is not uncommon here. Consider using ice post treatment.
- Review patient after 6 weeks to assess whether further treatment is indicated.
- Results can be asymmetric so consider adjusting dosing accordingly.
- Expected duration can be 6-12 months.