



Geometric Botulinum Toxin Injections: A Simplified Reproducible Approach for Symmetric Face Rejuvenation

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Abstract

Introduction: Different approaches have been described for botulinum toxin (BTX-A) injections for face rejuvenation. Most techniques are based on the experience of the injecting physician and his/her learning curve. We describe a simplified approach to achieve accurate reproducible symmetric results with physicians of variable experience levels.

Aims: To study the outcome and complications with the use of botulinum toxin injections for face rejuvenation using a precise measurement technique.

Material and Methods: This is case series includes 320 patients who underwent BTX-A injections for face rejuvenation. Injections sites were predetermined by tape measurements and distances decided upon special needs of the patient e.g. required position of eye brows.

Results: No complications occurred apart from elevated lateral eyebrows in 7 (2%) patients. Retouching was needed in 26 patients (8%); 7 (2%) to lower eyebrows and 19 (6%) to deal with remaining lines

Discussion: Adverse effects, though rare, are frequently related to the site or asymmetry of BTX-A injection. Even the most experienced eye cannot act as an accurate measurement device that would place injections at exactly symmetrical positions on both sides of the face. We describe a simplified approach to achieve accurate reproducible results with physicians of variable experience levels.

Conclusion: Measured BTX-A injection technique is a simplified structured approach that is safe and aims at obtaining safe symmetric results.

Keywords

Botulinum toxin, Rejuvenation, Injection technique

rarely diplopia may occur if BTX-A is injected too medially, within 2 cm from the lateral canthus. Brow ptosis may occur if the frontalis injection is within 2 cm from the central eyebrow. Excessive lateral brow elevation may occur if the forehead injections are mainly focused in the central frontalis [4,5], preserving its lateral fibers. We describe a simplified approach to avoid complications related to the injection technique and achieve accurate reproducible results, with physicians of variable experience levels. The technique was presented in the International Masters Course on Aging Skin, Paris, Jan 2011 (Lectures 901 & 913) January 9, 2011.

Patients/Methods

This case series includes 320 patients who underwent BTX-A injections for face rejuvenation. Injections sites were predetermined by tape measurements and distances decided upon special needs of the patient e.g. required position of eye brows.

Main upper face indications included treatment for forehead lines, glabellar lines, cow's feet, and brow lift. Lower face and neck indications included marionette lines, mouth angle elevation, dimpled chin and neck bands. Symmetry regarding eyebrow position and angles of the mouth was obtained through precise measurements.

BTX-A dilution

BTX-A (100 units) were diluted in 1 ml saline for Glabellar and Depressor Anguli Oris injections, and in 2 ml saline for forehead, crow's feet and other sites.

Upper face injections

Forehead injections: Forehead injections included 5 points, 1 point in Midline, and 2 points on either side. All points placed at equidistance, from the eyebrows as well as the midline, measured by tape and marked. The injections were placed 3 cm above the eyebrows (2.5 for small foreheads) (Figure 1). The lateral forehead injection points were 4 cm from the midline (for narrow foreheads), while for broad foreheads, the lateral forehead injection points were up to 6 cm from midline (about 1 to 2.5 cm outside midpupillary line) (Figure 2). The remaining injections are placed at the middle point between the midline and lateral forehead injections. In our series we planned the measured injections high outside the midpupillary lines to avoid eyebrow elevation by the compensatory action of the lateral

Introduction

Since introduced in 1989, Botulinum toxin has become a mainstay in cosmetic medicine [1-3]. Several techniques were introduced to enhance results and reduce the possibility of adverse effects [4-6]. Most approaches are based on the experience of the injecting physician and her/his learning curve. Adverse events may arise if the site of injection of BTX-A is not precise. Lid ptosis or

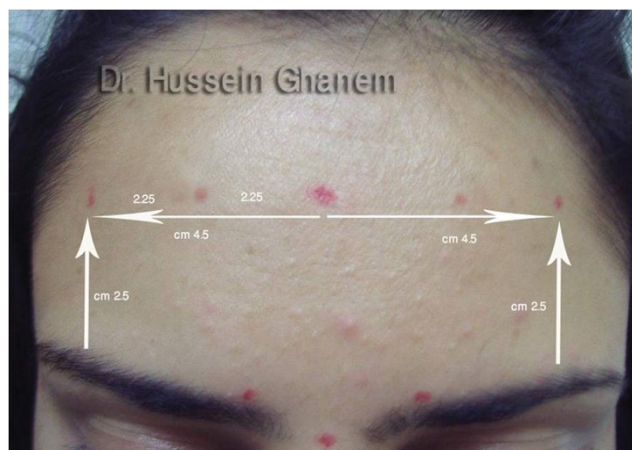


Figure 1: Forehead markings and measurements - Small Forehead.

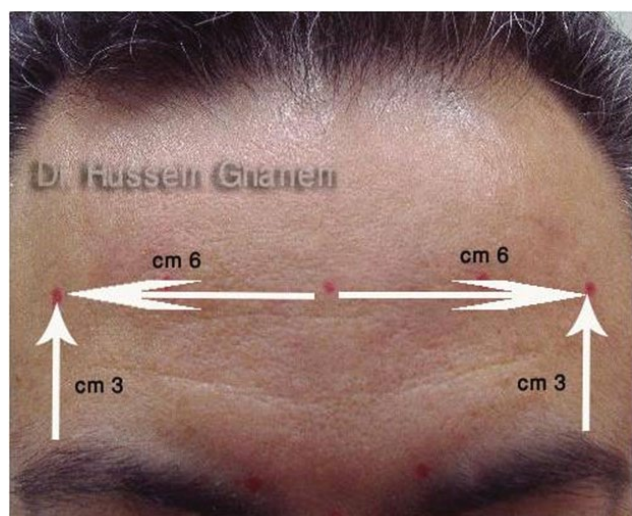


Figure 2: Forehead markings and measurements - Broad Forehead.

frontalis fibers (Figure 1 and Figure 2).

In male patients the distance from midline was increased (Figure 2) to avoid elevation of the lateral eyebrows by the remaining lateral frontalis muscle fibers. Injection depth was intramuscular without touching bone in all areas except for crow's feet where injection was intradermal, thus relying on diffusion into the muscle while avoiding the rich vessels around the eyes.

Glabellar injection: Glabellar injections included 3 points. Point 1 the Procerus muscle (5 units) in the point of the intersection of 2 imaginary lines between the inner canthus of the eye and the medial eyebrow. The position is then confirmed by asking the patient to frown to mark the maximum bulge of the procerus muscle. Points 2 and 3 (5 units each) are placed medially just above the eye brows in line with the medial canthus. The needle is directed upwards and laterally (Figure 3).

Midpupillary line injections (2.5 units) were performed 1 cm above the supraorbital notch for patients requesting an arched eyebrow.

Brow lift: The eyebrow position is controlled by the actions of opposing muscles; 1 elevator (Frontalis muscle) and 3 depressors (Procerus, Corrugator supercilii, and Orbicularis oculi). Though the use of BTX-A we can control the position of the eyebrows. Some patients request elevating their eyebrows while others prefer not to change the position of their brows. BTX-A elevates the eyebrows mainly through relaxing the brow depressor muscles. There are 3 main techniques to elevate the eyebrows.

One method is during the treatment of the transverse forehead lines where the frontalis muscle injections are placed at the central part

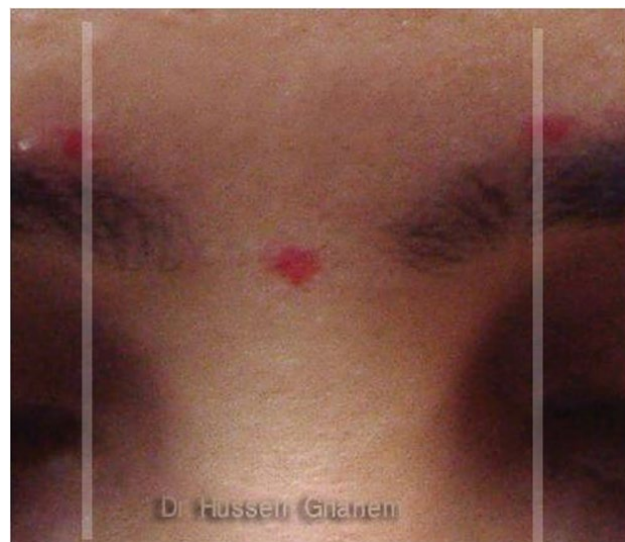


Figure 3: Glabellar Markings and Landmarks.



Figure 4: Measurements for Crows feet injection.

of the muscle, medial to the pupil line (mid-papillary line). Sparing the lateral fibers of the Frontalis muscle allows it to compensate for the relaxed medial portion resulting in lateral eyebrow elevation. The distance from the midline and the brow were measured and marked. This allowed accurate control of brow position, and lead to symmetrical and reproducible results.

Another technique is through relaxing the orbicularis muscle (the depressor muscle around the brow) at the desired point. The orbicularis muscle was injected at the temporal fusion line to obtain a lateral brow lift, or 1 cm above the supra-orbital notch for an arched brow. The third techniques is to obtain a medial brow lift through relaxing the medial depressors at the glabella area (as done while treating frown lines).

Brow asymmetry: Brow asymmetry was dealt with during frontalis injection by staying closer to the midline on the side needing elevation, and more lateral on the higher side.

Injections for crow's feet: The patient is asked to smile maximally; it helps to say something funny! Points are marked at least 2 cm from the lateral canthus or 1.5 cm from the lateral orbital margin (Figure 4). Injections did not go medial to a line drawn vertically down from the lateral canthus (Figure 5). Five to 15 units of BTX-A are injected at 2 to 3 points.

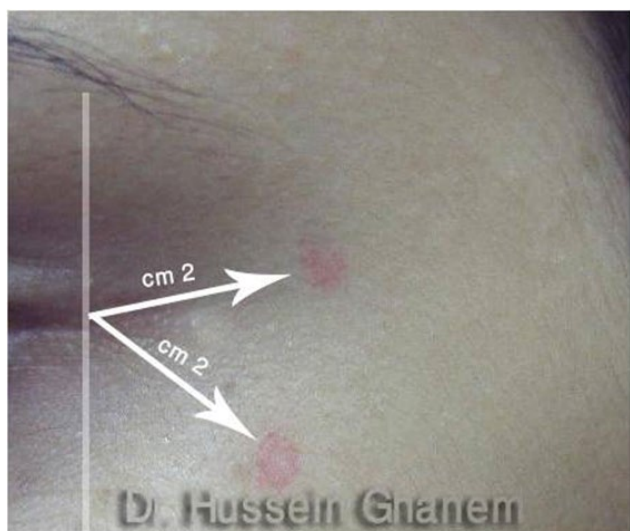


Figure 5: Markings for Crows feet.



Figure 6: Depressor Anguli Oris measurements.

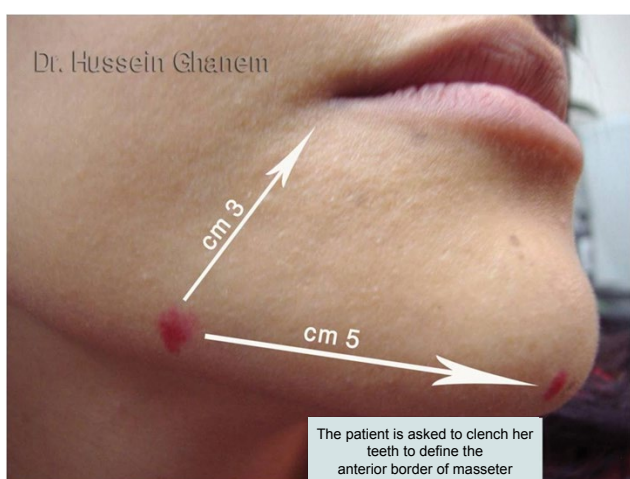


Figure 7: Depressor Anguli Oris markings.

Lower face and neck

Injections for marionette line, sad or drooping lateral angles of the mouth: The Depressor Anguli Oris (DEO) is injected at a point just medial to the Masseter muscle. The patient is asked to clench her/his teeth to define the front edge of the masseter, over the mandible. Symmetry was obtained through tape measurements (Figure 6 and Figure 7). That point is marked on either side as well as the midline of



Figure 8: Softening forehead and glabellar lines.



Figure 9: Complete clearance of forehead and glabellar lines while maintaining eyebrow position.

the chin (Figure 6). The distance from midline is measured to ensure symmetric injection of the DEO (Figure 7). Three units are injected on either side.

Dimpled chin: Five units of BTX-A are injected in the Mentalis muscle to treat the dimpled chin (peau d'orange).

Neck injections: Platysmal bands are identified, grasped between the fingers and injected. Five units are injected at 7 to 6 locations for a total of 20 to 30 units.

Results

Sufficient muscle relaxation to reach the desired esthetic outcome was obtained in 294 (92%), while 26 (8%) patients needed touch up

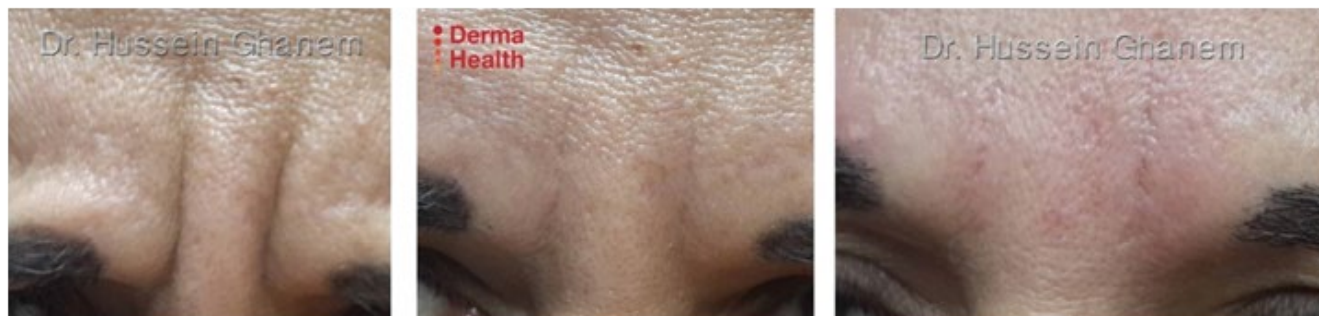


Figure 10: Softening of glabellar lines followed by addition of a hyaluronic acid filler for full clearance.

treatments. The degree of muscular response was variable from one patient to another. The doses and locations of injections erred to the side of safety.

No complications occurred apart from elevated lateral eyebrows in 7 (2%) patients. Retouching was needed in 26 patients (8%); 7 to lower the lateral eyebrows and 19 to deal with remaining lines. Though no serious complications occurred, retouching was needed in 26 patients. Most of the patients didn't wish to elevate the lateral eyebrows so in 7 cases retouching of the lateral frontalis was needed to lower the eyebrows. In 19 patients the dose injected was not sufficient to obtain satisfactory muscle relaxation so retouching was needed.

No eyelid ptosis was noted following glabellar injection, probably related to the high concentration of botulinum toxin used in this area to limit diffusion into the levator palpebrae superioris muscle (100 units diluted in 1 ml saline for the glabellar region).

Figure 8 demonstrates softening while figure 9 shows complete clearance of forehead and glabellar lines while maintaining eyebrow position. Figure 10 shows softening of glabellar lines followed by the addition of a hyaluronic acid filler for full clearance.

Discussion

Lid ptosis or brow ptosis, though self limiting, are disappointing outcomes of BTX-A injection that would lead to patient and physician disappointment. Diplopia is a rare but dreaded complication. Though the incidence of such adverse events is expected to decrease with increased experience levels of injecting physicians, yet they will always remain a source of concern [7,8]. Different approaches have been described for BTX-A injections for face rejuvenation. Most techniques are based on the experience of the injecting physician and expert recommendations [9].

Even the most experienced eye cannot act as an accurate measurement device that would place injections at exactly symmetrical positions (vertically and horizontally) on both sides of the face. We described a simplified approach to achieve accurate reproducible results with physicians of variable experience levels. Our choice of injection dosages and sites were consistent with published recommendations (Raspaldo et al, 2011) [9].

Placing BTX-A at exactly the same position (vertically and horizontally) on either side of the forehead (measured from the midline and the eyebrows) (Figure 1 and Figure 2) aims at decreasing the possibility of brow position asymmetry (one brow higher than the other), or asymmetric position of mouth angles (Figure 6 and Figure 7). Measuring the distance of BTX-A injection from the inner canthus ensures that a safety distance of 2 cm is maintained. Similarly, measuring the distance of the Depressor Anguli Oris (DEO) from the midline insures a symmetric injection and avoids having one lip corned higher than the other. With the measured injection technique no significant complications occurred. Retouching was needed in 26 patients; 7 to lower the lateral eyebrows and 19 to treat remaining lines. The measured geometric BTX-A injection technique is a simplified structured approach that is safe and aims at yielding symmetric reproducible results.

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