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Chapter 4

Adjuvant Botulinum Toxin Harmonisation in Minimally Invasive Facial Aesthetic Surgery

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Abstract

Botulinum toxin (BT) has been utilised as a non-invasive injectable treatment for aesthetic facial enhancement since 1992 after Carruthers JDA and Carruthers JA published their study observing that BT improved glabellar lines. Numerous aesthetic indications were steadily devised, enabling aesthetic medical practitioners to utilise BT as a stand-alone treatment strategy. However, while effective stand-alone BT treatments are functionally limited to targeted attenuation of muscular hyperactivity. Furthermore, BT treatment outcomes are of relatively short duration, requiring repeated treatments at approximately 12–16-week intervals to maintain effectiveness. Minimally invasive treatment strategies such as volumising filler injections, thread lifting, injectable/photo-thermal biomodulation and blepharoplasty are relatively durable aesthetic treatments that can be enhanced by adjuvant BT treatments. Accordingly, rather than relying on the commonly isolated utilisation of BT, the authors suggest a more comprehensive treatment model, whereby the synergistic interplay between minimally invasive treatments and adjuvant BT is demonstrated to advance and harmonise aesthetic outcomes.

Keywords: botulinum toxin, adjuvant, harmonisation, minimally invasive, blepharoplasty, fillers, fat grafting, suture lifting

1. Introduction

In 1817–1822, the German physician/poet Justinus Kerner described "botulinum toxin" as a "sausage poison" and "fatty poison". Bacterium often caused poisoning by growing in improperly handled or prepared meat products. Kerner first conceived a possible therapeutic use of botulinum toxin. In 1870 Müller, another German physician, coined the name "Botulism" [1].

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Botulinum neurotoxins are produced by various strains of Clostridium botulinum, resulting in seven known serotypes, of which A and B had been developed for routine clinical use [2].

Botulinum toxin (BT) has been utilised as a non-invasive injectable treatment for aesthetic facial enhancement since 1992 after Carruthers JDA and Carruthers JA published their study observing that BT improved glabellar lines [3]. Numerous aesthetic indications were steadily devised, enabling aesthetic medical practitioners to utilise BT as a stand-alone treatment strategy.

However, while effective, stand-alone BT treatments are functionally limited to targeted attenuation of muscular hyperactivity. A recent review of the literature found that duration of effect was between 2 and 6 months, with most patients experiencing loss of maximal contraction for 3–4 months. Treatments may last between 3 and 4 months, and occasionally up to 6 months [4].

Minimally invasive treatment strategies such as volumizing filler injections, thread lifting, injectable/photo-thermal biomodulation and blepharoplasty are relatively durable aesthetic treatments that can be enhanced by adjuvant BT treatments.

Accordingly, rather than relying on the commonly isolated utilisation of BT, the authors suggest a more comprehensive treatment model, whereby the synergistic interplay between minimally invasive treatments and adjuvant BT is demonstrated to advance and harmonise aesthetic outcomes.

Ingeniously designed minimally invasive interventions have transformed treatment rationales for improving facial aesthetics.

These interventions have evolved since the 1980s and encompass both minimally-invasive surgical and non-surgical techniques. Prior to this evolution only invasive surgical interventions could be proposed to patients seeking facial rejuvenation and aesthetic enhancement.

Open surgical interventions such as face lifting (rhytidectomy), brow lifting, blepharoplasty, rhinoplasty and neck lifting were often overly zealous, with radical excisions and resections designed to achieve long term outcomes. Sub-nasal resection and open lip lifts were developed for enhanced vermillion display. Facial implants followed for the purpose of facial contouring. However successful the surgery may have appeared to be, patients had to endure the penalty of relatively high risk-high complication procedures [5].

Moreover, patients were to become disappointed that these radical surgical techniques did not fulfil the expectation of permanency as a trade-off for the post-operative pain, lengthy recovery and unsightly scars. Additionally, outcomes were often unnatural and morphed the patients into an appearance that sometimes barely resembled the original self.

Regrettably, this type of surgery persists to this day, championed by surgeons who have not accepted or incorporated less aggressive, innovative techniques into their treatment repertoire.

Signature features that characterise the inherent uniqueness of a person are often sacrificed, rendering that person curiously unrecognisable. Many celebrities have been divested of a certain special character, ultimately extinguishing the very celebrity they sought to maintain through rejuvenation surgery.

Since the 1990s an evolution of minimally Invasive and non-invasive treatments has occurred.

These treatments are mostly performed outside a hospital and without a general anaesthetic setting.

Pain, downtime, side effects and complications are greatly reduced and outcomes are far more natural. The rejuvenation occurs without the penalty of misrecognision. The intention is for rejuvenation and beautification without a radical change to the appearance.

Of all the non-invasive techniques that have been devised, the administration of injectable botulinum toxin (BT) remains the most famous intervention.

There are many reasons for the popularity of this phenomenon. In the hands of expert injectors, the treatments are expedient, well tolerated, affordable and the outcomes subtlety beautifying. The side effect profiles and complication rates are low and if present are usually easily corrected at a subsequent visit.

The downside is that while effective and pleasing, the treatments generally last for only 12–14 weeks and are limited in what can ultimately be achieved or promised in a "stand alone" treatment approach.

Indeed, patient expectations can often exceed what can be attained with BT alone.

Accordingly, the authors suggest that BT can be utilised to even great effect adjuvant, to other minimally invasive procedures.

Any intervention to create aesthetic enhanced features must recognise that humans prefer attractive faces over unattractive ones. This preference for attractive faces exists from early infancy and applies across age, gender and ethnicity. Facial beauty can be defined several facial features. Important are the central facial features of eyes cheeks and mouth. The spatial relations between facial features dates back to antiquity, when the Ancient Greeks believed beauty was represented by a golden ratio of 1:1.618 [6].

2. Upper and lower blepharoplasties

Blepharoplasty addresses redundant skin on the upper lids and fat prolapse (plus or minus skin) on the lower lids. The hallmark of a meticulously performed upper and/or lower blepharoplasty is to create natural framing of the patient's eyes. Attractive eyes along with a well contoured, proportioned midface and generous lip display, are the key central features of attractive face aesthetics.

In circumstances where adjuvant fine-tuning of the outcome with BT can be anticipated preoperatively, BT can often be administered at the time of blepharoplasty while patients are still sedated. Thus, if required and pre-treatment planning is secure and properly factored, an experienced surgeon can use BT injection immediately in the forehead, glabella area, bunny lines, lips and neck.

However, one should avoid its use in the periocular area if a lower eyelid blepharoplasty is to be performed with skin and orbicularis excision. In these cases, it is better to wait for 3 months as BT can further weaken the orbicularis muscle causing a lid retraction and ectropion. If the blepharoplasty was performed transconjunctivally, BT can be administered as early as 3 weeks later. By that time most of the major swelling has subsided and the periocular muscles have regained their activity.

Alternatively, after a contemporary conservative blepharoplasty procedure has matured by some 6 weeks and particularly where brow ptosis is evident, BT can be injected into the brow depressors (Corrugator, Procerus and lateral Orbicularis Occuli muscles) to correct this negative aesthetic mimic. Conversely, judicious BT to the frontalis muscles may be required to gently control any hyper-elevation of the brow [7]. These positive effects on aesthetic brow balance and elevation are natural and of course far less invasive than surgical brow lift procedures.

Similarly, targeted BT treatments can be further considered in the longer term post-surgery. As the orbit ages and enlarges though bone atrophy (osteopenia-osteoporosis), the brow tends to prolapse into the widening orbit. After the utilisation of filler injection to the Retro Orbicularis Occuli Fat (ROOF) to augment superior orbital rim, BT can again be injected into the brow depressor musculature to augment brow elevation.

Medial to the orbit, the depressor supercilli, nasalis and Levator labii superioris alaeque nasi muscle can be injected with BT to address any dynamic rhytids compressing the medial orbit region.

The authors use in their practice is to treat negative expressive periorbital compression with BT. However, when dermatochalasis is evident and disturbing to the patient, a blepharoplasty procedure is indicated.

To summarise, when surgery is necessary, BT in the hands of an experienced surgeon can be used contemporaneously with the blepharoplasty surgery as earlier described. However, a simple and more conservative algorithm for ocular and periocular aesthetics is suggested, whereby a blepharoplasty is performed and followed after 6–12 weeks by adjuvant BT injection to any periocular musculo-compressive phenomena.

3. Injectable fillers

Injectable fillers are now fundamental in the minimally invasive surgeon's toolbox. While BT can relax overactive negative mimic musculature, fillers of variable rheological qualities can restore and beautify facial proportions and contours.

Fillers can be utilised to strengthen the frame of a face. Firstly, from the superior aspect of the forehead then across to the temple fossae. Secondly, descending into the periauricular region and then down to the mandibular angle across the jawline to the chin.

Rheologically volumising fillers are utilised for injection into the deeper fat pads such as the suborbicularis oculi fat (SOOF). The volumising fillers are anatomically stabilised in situ by retaining ligaments. The most commonly used fillers today are the hyaluronic fillers which can last for up to 2 years.

BT has an excellent role to releasing negative expressive vectors that compound the age related involuting face after correction with injectable fillers.

It has been suggested that in facial aesthetics optimal outcomes are predicated on practitioner appreciation of negative aesthetic muscle hyperactivity, volume depletion, and insufficient

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contours. Accordingly, improvements could be achieved through relaxing musculature, volume restoration and recontouring using BT and injectable fillers alone or in combination [8].

In the upper face, BT is fundamental, with the addition of hyaluronic acid fillers to enhance results. Typically, hyperactivity of the Corrugators, Procerus and lateral orbicularis creates a negative, overly concerned or even a perceived hostile appearance. There can be deficit of the arched female brow and elevatory upper lid loss along with forfeiture of the upper lid crease feature. Injectable fillers can augment the female forehead by restoring its aesthetic convex contour followed by positive effects of BT on frontalis muscle induced forehead compression.

The BT augmented eyebrow lateral arch can be further stabilised by injecting filler to the ROOF in the region of the lateral orbital rim.

In the midface, fillers are elemental in the restoration of aesthetic volumes and proportions. BT can be adjunctly injected into the lateral orbicularis oculi musculature to reduce superior cheek rhytids when smiling.

Age related mandibular involution ageing can significantly alter facial harmony. In the lower face was BT and hyaluronic acid in combination can be utilised to strengthen the mandible and reduce negative vector muscle hyperactivity.

Addressing this lower face deficit can be achieved by the firstly augmenting the angle of the jaw, jawline and chin with high viscosity fillers. The improvement in mandibular height and projection can prove remarkable with such filler injections. If necessary 2–3 weeks post filler injections, adjuvant BT to the mentalis and depressor angular oris musculature can further reduce chin retraction and the negative vector mimic of the downturned oral commissures.

Occasionally despite improvement of the mandible with injectable fillers, masseter hypertrophy can distort lateral lower face aesthetics and may require BT to form effective correction.

4. Fat transfer grafting

Fat harvested for grafting is an ideal filler naturally integrating into tissues. It is autologous, 100% biocompatible and a dynamic tissue composed of several different cell types. These include adipocytes, fibroblasts, smooth muscle cells, endothelial cells, and adipogenic progenitor cells (pre-adipocytes). Fat also contains Adipose derived stem cells which have proved to be particularly promising for regenerative therapies [9].

Fat harvested consequent to the liposuction of redundant fat in the submandibular region is an ideal paradigm for correcting facial proportion imbalance. Both the neck redundancy is corrected and the resultant harvested fat is utilised for correction of any malar insufficiency [10].

Post successful fat grafting BT can be utilised after 12 weeks to relax any exposed platysmal bands in the neck. In the recipient grafted malar region, BT can reduce any related negative or compressive hyperactive muscles as previously described in the adjuvant use of BT after of injectable fillers.

5. Per-cutaneous suture and thread lifting

There now are many minimally invasive per cutaneous suture or thread lifting techniques that have been devised to suspend redundant, lax skin. The authors have used the closed approach transcutaneous Serdev Suture® lifts in their clinics. These techniques were invented by Prof. N Serdev and have several overriding advantages. Of particular importance is that the technique incorporates the principal concept of stable suturing and fixation of mobile fascias to immobile periosteum, tendons and fascias. This results in suture suspension and/or volume augmentation and/or tissue repositioning [11].

Post suspension lifts, in appropriate cases, BT can be used to relax underlying musculature that has been elevated or repositioned along with the attendant retinacula and retaining ligaments.

BT judiciously injected into selected regional muscles of the face affected by stretching can be relaxed avoiding distortions and facilitating tissue remodelling to progress naturally.

Post brow, temporal and midface lifts, judicious BT injections into the frontalis, mid brow depressors orbicularis oculi can relax underlying muscle tension allowing for natural tissue remodelling and reduce patient discomfort. Similar possibilities apply to lower face and neck lifts techniques. Whether BT treatment is ongoing is a decision made on a case by case basis.

6. Photo-thermal skin therapies; collagen induction skin needling induced collagen induction; chemical peels; autologous growth factor and stem cell bio-rejuvenation

Lasers, photothermal devices, chemical peels, skin needling and more recently autologous growth factors/stem cell have all been successfully utilised in cosmetic facial skin and subcutaneous rejuvenation. Many technical modifications and advances continue to be developed.

Administration of BT injected into the negative mimic musculature some 2 weeks prior to such treatments facilitates a relaxed skin target with an even tissue plane for ideal healing to occur.

BT has an ongoing place in the post-treatment phases of these many techniques. Along with many other measures including sun avoidance and topical cosmeceuticals, relaxing negative vector hyperactive musculature can prevent the redevelopment of rhytids and autonomous negative facial expressions.

7. Conclusion

In the last decade, minimally invasive aesthetic procedures have become technically advanced and rising exponentially in popularity. Botulinum toxin injections have become the aesthetic

backbone of many cosmetic proceduralist's practices. This status notwithstanding, there are limitations in the use of BT as a stand-alone treatment. While it is well appreciated that BT is an excellent tool, it is functionally restricted to the relaxation of negative aesthetic vector muscle expression. There is much more to aesthetic improvement than through the utilisation of BT for this function alone.

In fact, BT is an excellent adjuvant treatment delivered pre and/or post several other more challenging minimally invasive procedures as outlined in this chapter. Utilised in this manner, sophisticated and often synergistic aesthetic outcomes are achievable.

Conflicts of interest

Nil.

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