

The use of botulinum toxin in bruxers and clenchers for facial contouring

Dr Bob Khanna discusses the facial aesthetic concerns pertaining to patients after parafunctional thus serving habits such as bruxism and clenching

Introduction

This article explores the benefits of carefully administered botulinum toxin in affected muscles so as to help alleviate the symptoms of such parafunction thus serving as a useful adjunct to conventional dental treatment as well as improving the overall facial aesthetics.

Bruxism and clenching

These highly common parafunctional habits are thought to affect up to 25% of all individuals and are one of the oldest maladies known to man (Christensen et al, 2001). The aetiology is somewhat controversial but research tends to show that people carry out such parafunctional habits at times of stress, anger, pain and frustration (Von Lindem et al, 2001).

Bruxism

This describes the habitual grinding of the teeth resulting in accelerated tooth wear and fracture and often accompanied by pain or spasm in the masticatory muscles. Bruxers



Dr Bob Khanna is a cosmetic and reconstructive dental surgeon. He runs clinics in Ascot, Harley Street and Manchester, and carries out a full spectrum of treatments from aesthetic dentistry,

surgical implantology and bone regeneration procedures to full-mouth rehabilitation. He was the first dentist in Europe to venture into facial aesthetic procedures utilising Botox™ and dermal fillers over 11 years ago. Internationally renowned as a leading lecturer, trainer and expert in aesthetic medicine, Dr Khanna has trained over 5500 doctors, dentists and plastic surgeons in non-surgical facial rejuvenation procedures and has pioneered many of the techniques. He is also the president of the International Academy for Advanced Facial Aesthetics (IAAFA). For further information see: www.drboobkhanna.com or tel: 07956 378526

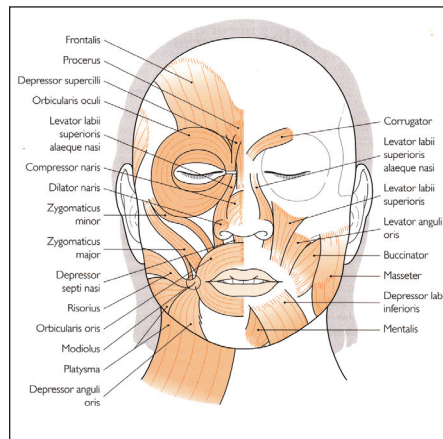


Figure 1: Diagram showing facial muscles

seem to grind their teeth in eccentric positions (canine and incisal guidance as well as working and non-working on both sides). Since a stable centric occlusion is often difficult to locate, restoring such patients can be complicated. This is why many clinicians have favoured to provide such patients with a long centric and wide centric occlusions with shallow incisal and canine guidances (i.e. 'freedom in centric').

Clenchers

Common variations of bruxism in which people tend to bite into centric occlusion with an intensity of vertical force of up to 14 times the norm. True clenchers tend not to carry out excessive eccentric movements and are often characterised by steep incisal and canine guidance patterns in their occlusion. Such patients tend to differentially wear their anterior teeth more aggressively compared to their posteriors. Generally, such patients are easier to rehabilitate than bruxers. Depending on the degree of tooth destruction, little or no increase in vertical dimension is required in order to replicate preoperative incisal and canine guidance angles and facilitate posterior disclusion.

According to Christensen et al (2001) non-bruxers and non-clencher wear tooth enamel at the rate of approximately 0.3mm in 10 years (0.03 mm/year) This provides an approximate guide when examining susceptible patients. Christensen feels that patients with

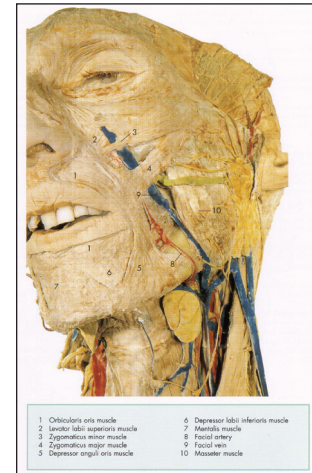


Figure 2: Vital related anatomical structures

destructive chewing habits can grind their teeth at up to 10 times the rate of normal people and that it is not uncommon to observe 2mm of tooth wear in people in their early 20s with bruxism or clenching.

Summary of interventional dental TX

Ideally, if susceptible patients of such destructive parafunctional habits can be treated in early in adolescence or early 20s then often occlusal splint therapy may all that is required in order to prevent continued tooth wear and help stop the bruxism or clenching.

However, if such patients continue in to middle age without being educated about their condition and any preventative therapy, then tooth destruction may well be very established and the dentition sensitive and unaesthetic. In such cases comprehensive restorative treatment will be required often preceded by occlusal equilibration to remove abnormal occlusal prematurities and develop a more stable and harmonious occlusion. Many, if not all, of the teeth will need full or partial coverage restorations and a post-operative splint required to help maintain such patients.

Facial characteristics of bruxers and clencher

Since the degree of severity of the parafunction can vary, often in mild cases , there may

Facial aesthetics

be no obvious facial shape alterations (see Figures 3 to 8).

However, in patients with moderate and severe conditions, particularly of the clenching type, the face will take on a squarer form. This is primarily due to masseteric hypertrophy caused by the over activity of both masseters.

Indeed, unilateral hypertrophy can exist if the malocclusion is such that one of the sides is working significantly harder than the other e.g. a patient with asymmetric edentulous areas.

Also in many patients the anterior fibres of temporalis will be hypertrophic (Da Silva and Mandel, 2006) (Figure 4c). Naturally this will only be obvious in patients with little or no hair in this area. Hence, normally this is only discernible in male patients. Such patients can be treated carefully with BTX in this area in conjunction with masseteric treatment if required. (I tend to use a range of 25-40 iu of Dysport (8-15 iu Botox) per side for such cases.)

Bilateral hypertrophy of the masseter and temporalis muscles remains a common observation in patients with bruxism and clenching habits and was first described by J.W. Legg in 1880 in a 10-year-old girl (Legg, 1880).

Anatomically the Masseter (Figures 1 and 2) originates at the inferior border and medial surface of the zygomatic arch. This quadrangular muscle then inserts on the lateral surface of the ramus of the mandible and coronoid process. The Temporalis originates in the temporal fossa and inserts deep to the masseter on the coronoid process.

The use of BTX in treating masseteric hypertrophy

Botulinum toxin in facial aesthetics is well recognised globally as the leading cosmetic procedure for facial rejuvenation (Khanna, 2007a, 2007b).

As described in my previous articles it acts by temporarily blocking the action of acetylcholine at the neuromuscular junction and thereby limiting muscle activity depending on the number of sites and dose. There is no doubt that a square facial form is considered by most cultures to be a more masculine appearance (Figure 4a) and hence the treatment described is much more suited to female patients wishing to have a more tapering and 'feminised' facial form (Figures 3, 5 and 8). However, we must not lose sight of the fact that many male patients may prefer a 'softer' appearance. More importantly, if we



Figure 3a: Patient before treatment



Figure 3b: Patient one month post bilateral treatment of BTX to infero-lateral aspect of masseters

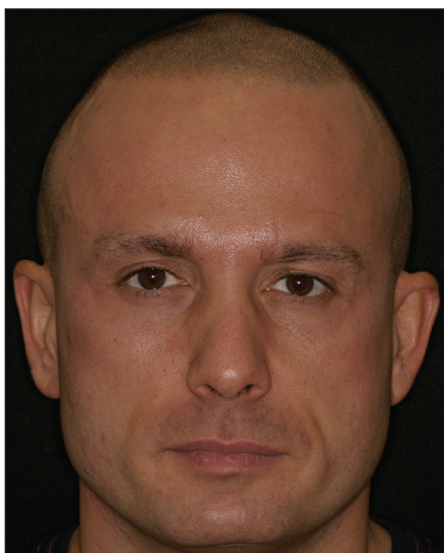


Figure 4a: Patient before treatment - patient had severe bruxism and clenching habits and migrainous neuralgia

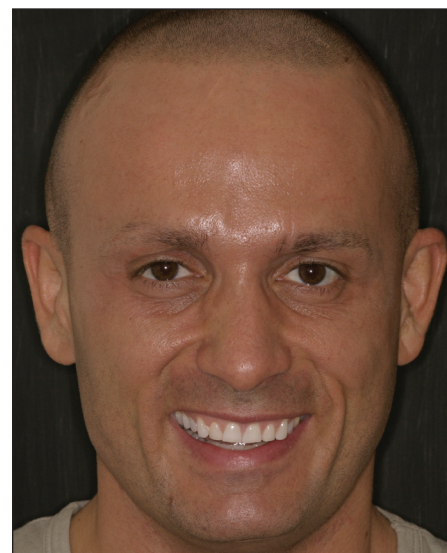


Figure 4b: Patient smiling - note excessive wear to anteriors



Figure 4c: Patient at rest - note the hypertrophic nature of anterior fibres of temporalis



Figure 4e: Patient clenching two weeks after BTX treatment - note the ball like lateral protusion on the right side (see text for explanation-under complications)

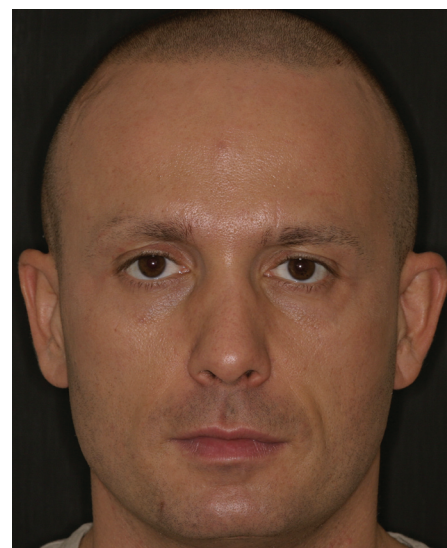


Figure 4d: Patient one month after BTX treatment - note softer jawline - the primary aim was to alleviate the symptoms of the parafunction and neuralgia not facial enhancement

are to help reduce the forces of contraction of the masseter and the temporalis from a dental standpoint, so as to protect the occlusion, then this may well have to be prioritised in the overall treatment plan. Therefore the treatment outlined below can serve as a stand alone measure for purely enhancing facial aesthetics or as a useful adjunct in a rehabilitative dental treatment programme.

Treatment

Although a number of techniques have been described in the literature (Black and Scholass, Von Lindem et al 2001), the treatment approach I have outlined below is my own modification and technique which I have been 'perfecting' over the last four years.

Patient assessment

Each patient presenting for treatment with BTX must be carefully assessed for suitability. This includes the following:-

- A comprehensive medical history (Khanna 2007a, Khanna 2007b)
- Digital photographic records (standardised) (Khanna 2007b)
- Patient questionnaire to ascertain the patients requirements.

A thorough examination is undertaken to establish the cause of the masseteric hypertrophy if present. This should ideally include a full dental assessment including radiographs to assess the level of cariogenicity and periodontal health and any TMJ disorders. A differential diagnosis must also be made of the unilateral or bilateral swellings such as parotiditis, parotid tumors, lipomas, benign or malignant muscle, vascular or mandibular tumors and of course dental abscesses and cysts. Although electromyography can help in the diagnosis of muscle hypertrophy, clinically I have not found it necessary.

BTX injection of masseters

If suitable the entire masseter is demarcated using an eyebrow pencil after alcohol disinfection of the area and asking the patient to clench their teeth forcibly.

The important related anatomical structures three dimensionally are also demarcated on the patients face as shown. These include the parotid gland and duct, the facial artery and vein and intimate muscle groups e.g. risorius, zygomatic major and minor, buccinator and platysma. This method of drawing on the patients face is a very common feature in all my courses so as to serve as revision of the vital anatomy as well as enabling the operator to establish a 'safe zone' for treatment. The patient is asked to again clench their



Figure 5a: Patient before treatment - note broad facial form



Figure 5b: Patient one month post treatment to masseters and mild dermal filler augmentation of nasiolabial lines - note how the face appears slimmer compared to Figure 5a



Figure 6a: Patient before treatment

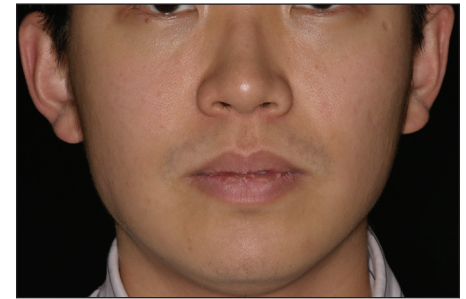


Figure 6b: Patient one month post treatment (compare with Figure 6a) - the primary aim here was to help alleviate the parafunction

teeth forcibly and using the eyebrow pencil injection sites are marked in the safe zone established (shown as black and white stars).

I typically use two to six injection sites depending on the case and the desired result. A dilution of 1ml in the BTX A is used (Botox® or Dysport®) to help reduce diffusion of the toxin in to the proximal muscle groups.

For the bilateral masseter hypertrophy patients a dose of 25 IU to 150 IU Dysport® is used in each masseter, again depending on the severity of hypertrophy and result desired. Generally speaking, females require a lower dose. If however the desire is to enhance cheek prominences and if the patient doesn't have any obvious masseteric hypertrophy, I will place two injections at the upper portion of masseter in conjunction with cheek augmentation with dermal filler (Article 5 and Figure 8). I use a 12.7 mm length 29 or 30 gauge needle to full depth (engage the ramus and retract 2-3mm) for the inferio-lateral aspect of masseter and 1/2 depth for the cheek sculpting cases.

Aspirating the syringe to avoid intravascular injection, and therefore potential haematoma, is advised. An ice pack can be used

pre and post-injection, though is rarely needed if a gentle approach is adopted.

Clinical audit (of cases treated by Dr Bob Khanna for bilateral masseteric hypertrophy from 2004-2007)

(Please refer to Table 1) Interestingly 149 out of the 156 cases treated(95.5%) had discernible occlusal signs commensurate with bruxism or clenching. These included premature occlusal wear and/or multiple fractured teeth. The remaining seven patients were all under 30 years old and had no obvious signs. Temporomandibular joint issues such as clicking and popping and deviation on opening were discluded as a reliable sign of parafunction, if present alone, since these signs and symptoms can be present in non-bruxers or clencherers. However, by way of an observation, of the 149 patients with occlusal signs 124 patients (83.2%) had indeed audible clicking and popping from either right or left TMJ's or both.

Complications

Of the four patients reporting complications

(0.03%), one was a mild haematoma of the right side, which lasted five days, being managed by non-steroidal anti-inflammatory analgesics, and cool packs. Two patients had signs of slight smile asymmetry that lasted no longer than one month. I postulate that in both cases deeper posterior fibres of the risorius may have been inadvertently affected resulting in the mild discrepancy.

One patient (Figure 4e) reported that on chewing a small ball of tissue the size of a ten pence piece protruded laterally in the right masseter. I postulate that this would have been due to deeper fibres of the masseter remaining active and forcing out the overlying redundant or inactivated superficial fibres on mastication. Therefore the importance of administering the BTX at the deepest level of masseter can therefore not be stressed enough. Remedial treatment was then carried out with 25 iu of Dysport® and the problem resolved within two weeks.

Discussion of the results of the clinical audit (of cases treated by Dr Bob Khanna for bilateral masseteric hypertrophy from 2004-2007)

134 of the 156 cases treated were either referred or presented at my clinics for a resolution to their masseteric hypertrophy as opposed to helping resolve or alleviate their bruxism or clenching.

All patients treated in this audit received a full dental assessment including OPG and bite-wing radiographs to fully evaluate any caries activity and monitor their periodontal health as well as assessing the degree of tooth wear and TMJ related derangement. Naturally, there were a number of patients that declined to have a full dental assessment and were treated, if appropriate, for their masseteric hypertrophies, and a strong recommendation made to seek dental treatment with their own dentists. (These patients were discluded from this particular clinical audit). Interestingly of the 149 patients treated with discernible occlusal issues only 37 patients were willing to undergo dental rehabilitation therapy.

In 16 of these 37 patients this involved just an occlusal splint. (Michigan or Tanner)



Figure 7a: Patient before treatment



Figure 7b: Patient one month post treatment - note how soft the patients facial form is compared to Figure 7a

whilst 21 patients went on to have extensive restorative work following the initial splint therapy. Hence, it can be concluded from my experience, patients are more concerned with their facial appearance than the state of their deteriorating dentitions. This could be because of financial issues, since such rehabilitation can be costly, and perhaps people are more concerned with their outward appearance.

It has also been my observation that many of the patients treated were not even aware that they had occlusal issues. Hence, I do feel that the dental profession needs to make more efforts to educate all such patients more comprehensively.

Of the 156 patients treated 92% felt that their facial appearance had significantly improved whilst 6% felt only a minor improvement was noticeable and 2% didn't feel any discernible change was visible. However, following discussions using the standardised pre and post photographs (e.g. Figures 3 to 8) all patients felt that they could see a positive improvement. This highlights the need to take good quality photographs to enable patient education as well as providing vital medico-legal records. None of the patients treated reported any difficulty in chewing

but most were aware that their biting force had reduced. This was of course highlighted to all patients prior to treatment as being a likely event.

Typically, all patients treated with BTX for masseteric hypertrophy will show noticeable improvement after two weeks which will usually be maintained for at least 8-12 weeks following treatment. Since there is induced and progressive misuse atrophy following the BTX treatment there is no doubt that aesthetic improvement can exceed this time period by as much as 24 months (article 7).

This prolonged effect may also be due to the exploitation of the nociceptive trigeminal inhibition reflex. Certain occlusal splints e.g. the NTI-TSS system appear to achieve this by preventing canine and posterior tooth occlusion

Conclusion

This article was intended to explore the benefits of BTX treatment in facial aesthetics, particularly for patients with bilateral masseteric hypertrophy.

However, it has been seen that by careful evaluation of a non-hypertrophic patient the overall facial aesthetics can also be positively improved e.g. enhancement of cheek prominences in females (Figure 8).

Above all the treatment is minimally invasive and carries a relatively low complication risk (0.03% in this audit) if administered in experienced and appropriately trained operators. I believe that a comprehensive assessment of the underlying aetiology of the hypertrophic facial appearance must be a

Number of cases treated	Age range(yrs)	Dose range/Masseter	Adverse complications
156 F=102 M=54	24-57	25-150 I.U Dysport® = 8 50 I.U BOTOX®	4

Table 1: Clinical audit (of cases treated by Dr Bob Khanna for bilateral masseteric hypertrophy from 2004-2007)

Facial aesthetics



Figure 8a: Patient before treatment



Figure 8b: Patient one month after BTX brow lift and upper aspect of masseters and dermal filler recontouring of nose, lips and cheeks



Figure 8c: Patient before treatment



Figure 8d (above): Injection sites as described in text-lower four black stars represent sites used by author for true hypertrophic cases. The upper two white stars represent the sites used to aid cheek sculpting in non-hypertrophic cases



Figure 8e (left): Patient one month post treatment (BTX to upper masseters, dermal filler contouring of cheeks, tear-troughs and nose) - note the sculpted and more balanced profile

firm pre-requisite for any treatment. This should include a thorough dental and skeletal analysis and any tests deemed necessary for a given patient e.g. sialography, CT and MRI Scans to disclude any other possible causes for the hypertrophy, as mentioned earlier.

Since it appears that the driving force for patients seeking treatment is their facial appearance, dental professionals are uniquely and ideally positioned to counsel such pa-

tients for rehabilitative dental treatment. This in the majority of such cases is required albeit with minimal intervention (e.g. occlusal splint therapy in some cases if caught early on). From a dental standpoint I feel that the ability to reduce the contraction force and therefore the forces that are transmitted to the dentition, is greatly beneficial and a very positive and exciting concept, particularly if restoring a full arch or arches.

Importantly when implant retained restorations are involved, the occlusal force transmitted here needs to be very carefully regulated and monitored to prevent implant failure through occlusal overload. Hence in my opinion a clinician must explore all minimally invasive treatment modalities such as BTX treatment to aid and benefit the patient. Naturally, following this article, I fully appreciate and expect to stimulate meaningful discussion on differences of professional opinion. That is progress after all.

Finally, I would like to thank all my patients that kindly allowed me to use their clinical photos for this article.

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Bob Khanna will be speaking at the World Aesthetic Congress to be held at The Queen Elizabeth II Conference Centre on 6 and 7 June 2008. Costs: dentist £567+vat subscriber dentist £510+vat, team member £310+vat. To book, please call Independent Seminars on 0800 371652 or visit www.independentseminars.com