

# Lip stabilisation with botulinum toxin

Dr Bob Khanna examines the use of BTX for the treatment of 'gummy smiles'

## Abstract

This article examines a non-surgical treatment option for reducing the excessive gingival display ('gummy smiles'), which can be found in many patients. I have termed this 'lip stabilisation with botulinum toxin'. If carefully administered, this procedure is a very quick, reliable and predictable treatment option for most appropriate cases and should be considered as a viable modality before embarking on any anterior cosmetic dentistry or indeed facial aesthetic treatment for the lips themselves

## Introduction

Treating patients with a high lip line has always added to the complexity of the cosmetic dental case. Apart from the obvious un-aesthetic appeal of an excessive gingival display in the smile, the skill of both dentist and technician are put to the ultimate test to ensure that the margins of the indirect restorations placed are undetectable. This becomes even more of a challenge when implant supported restorations are an integral part of the anterior aesthetics.

Fortunately, there have been a number of treatments described so as to help alleviate the excessive gingival display however, many of these options are indeed invasive and despite being fairly successful do not allow a patient to 'test drive' the final aesthetic outcome.

## Botulinum Toxin (BTX) lip stabilisation

In order for us to understand how to incorporate this extremely valuable treatment modality in our clinical practice we must first explore the basic principles of *functional smile musculo-dynamics*.

Rubin (1974, 1999) described three types of functional smiles in his studies.

### (i) Mona Lisa Smile - Figures 4 and 13 (approximately 67% of patients studied)

Characterised by a sharp elevation of the corners of the mouth and a mild elevation of the cen-

tral upper lip. This resultant smile will typically expose approximately 80% of the upper central incisors and canines and often all of the lateral incisors.

In such cases the dominant muscles are zygomaticus major and to a lesser extent zygomaticus minor (Figure 1).

### (ii) Canine smile - (31- 35% of patients studied)

In such patients a high central elevation of the upper lip occurs initially before the corners of the lip are elevated. The dominant muscles here are the levator labii superioris and levator labii superioris alaeque nasi and to a lesser extent depressor septi nasi. If excessive activity of these centre lip elevators occurs during the smile dynamics then an excessive gingival display is likely as well as well pronounced nasio-labial furrows (Figures 3 and 11).

### (iii) Full denture smile - Figure 16 (approximately 2% of patients studied)

This is characterised by all the upper and lower lip retractors contracting simultaneously to reveal a large percentage of the upper and lower dentition.

Hence a comprehensive assessment of the patient must be made prior to treatment to establish the musculo-dynamics of the smile and

SURGICAL	NON-surgical
Maxillary osteotomy	Orthodontic intrusion
Lip repositioning surgery	
Crown lengthening	Botulinum Toxin (BTX)



Figure 1: A diagram of the muscles of facial expression (The deeper muscles are depicted on the left side)

the relative position of the free gingival margins of the upper and lower incisors. Naturally before contemplating any aesthetic dental work the lip positions must be evaluated and a position chosen from which the usual smile design parameters can be organised.

As is universally accepted, in an aesthetic smile the lower border of the upper lip will rest approximately at the free-gingival margins of the upper incisors and canine teeth. The curvature of the upper border of the lower lip will follow the same curvature of a line extrapolated from the incisal edges of the upper teeth.

## Case studies

The following cases will demonstrate the concept of using BTX for reducing an excessive gingival display.

### Case 1 (Figures 2-9)

Dr Alexis Zander, a 26-year-old GDP from Adelaide, Australia presented to me with a desire to minimise her 'gummy smile.' Alexis also



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Figure 2: The patient in case 1 at rest before BTX treatment



Figure 3: The patient in case 1 before treatment at maximal smile position. An average of 7mm excessive gingival display was recorded



Figure 4: The same patient in case 1, three weeks after 'BTX lip stabilisation' treatment (compare with Figure 3)



Figure 5: The patient in case 1 at maximal smile (profile view)



Figure 6: The patient in case 1 after BTX lip stabilisation at maximal smile (compare with Figure 5)



Figure 7: The patient in case 1 at rest three weeks after BTX lip stabilisation and BTX brow lift (compare with Figure 2)



Figure 8: The patient in case 1 before BTX treatment (profile view)



Figure 9: The patient in case 1, three weeks after BTX lip stabilisation – Note no change in the lip position at rest (compare with Figure 8)

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# Facial aesthetics



Figure 10: The patient in case 2 at rest before treatment



Figure 11: The patient at maximal smile before treatment – an average of 8mm excessive gingival display was recorded



Figure 12: The patient in case 2 at maximal smile before treatment (profile view)

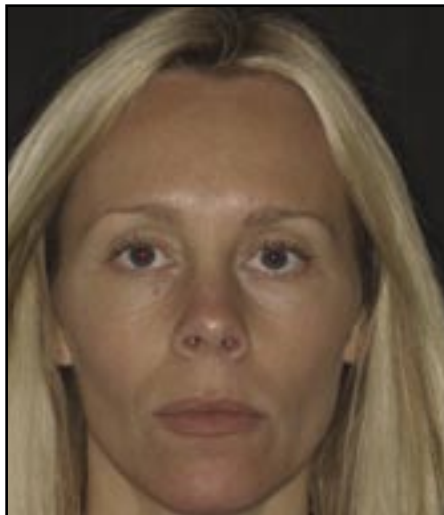


Figure 13: The patient in case 2 at maximal smile 3 weeks after BTX lip stabilisation (compare with Figure 11)



Figure 14: The patient in case 2 three weeks after BTX lip stabilisation (compare with Figure 12)



Figure 15: The patient at rest three weeks after BTX treatment – Note no change to the resting position of the lips



Figure 16: the patient in case three at maximal smile – a 'full denture smile' before BTX lip stabilisation. An average of 8mm gingival display was recorded. Also, note the excessive activity of depressor labii inferioris



Figure 17: The patient in case 3, three weeks after BTX lip stabilisation (compare with Figure 16)

requested a moderate chemo-brow lift to help improve the shape and contour of her eyebrows (Khanna, 2007).

On examination, an average of 7mm gingival display was recorded at maximal smile. This was measured from the mid-points of the free gingival margins of the central incisors and canines on both sides to the lower border of the upper lip. Naturally, all the possible treatment options available were given to Alexis (Table 1) but she was keen to have the non-invasive approach with BTX.

In order to 'normalise' the display in this case the levator labii superioris and levator labii superioris alaeque nasi and depressor septi nasi were targeted with intra muscular injections of BTX using a 30 gauge needle. A total dose of 35 I.U. Dysport (approximately 12 I.U Botox) was administered.

The patient was reviewed after three weeks and the results can be seen in Figures 4 and 6.

The important point to note here is that the goal of treatment was of course to convert the smile to a 'mona lisa' smile without affecting the rest position of the upper lip (Figures 2, 7, 8 and 9). In this way, not only can the lip aesthetics be maintained, but the phonetics are unaffected by the carefully controlled chemo-denervation of the selected muscles.

### Case 2 (Figures 10-15)

Sarah, a 34-year-old nurse was presented to me with a similar complaint. On examination, an average of 8mm gingival display was noted (using the parameters described in case 1). After treatment acceptance the levator labii superioris and levator labii superioris alaeque nasi muscles were injected both sides with a total dose of 30 I.U Dysport (10 I.U Botox). These muscles were the dominant central elevator muscles in this case (note the excessive elevatory pull in the canine regions compared to case 1).

The depressor septi nasi was not targeted here as it was felt that if treated this may have contributed to a further nasal lip elevation and un-aesthetic larger nasio labial angle (Khanna, 2007).

The patient was reviewed after three weeks and the result is shown in Figures 13 and 14.

The smile dynamics were fully normalised without affected the rest position and phonetics. Note also the softening of the nasio-labial folds particularly towards the ala of the nose.

### Case 3 (Figures 16 and 17)

Francis, a 43-year old teacher was referred to me by her GDP for a full mouth aesthetic rehabilitation. As part of her full case assessment, it transpired that the patient was very dissatisfied with the appearance of her obviously very 'gummy' smile. She exhibited a typical 'full denture smile' as described earlier.

On examination, an average of 8mm gingival display was noted for the upper arch. Additionally as can be seen, the lower lip took on an un-aesthetic appearance on maximum smile. The dominant muscles in this case are therefore the levator labii superioris and levator labii superioris alaeque nasi and to a lesser extent depressor septi nasi. The lower lip was being depressed in a position dictated by the excessive bilateral action of depressor labii inferioris. The upper central lip elevators received a total dose of 35 I.U Dysport (approx 14 I.U Botox). The depressor labii inferioris received a total of 20 I.U Dysport (10 I.U/side).

The three-week review photograph is shown in Figure 17. Note the slight asymmetry on the patients left side of the upper lip is maintained. If desired this could be alleviated by an extra chemo-denervation with BTX to the left levator labi superioris alaeque nasi. However, caution must be exercised in administering different doses across the midline of the mouth so as to avoid the possibility of phonetic impairment.

### Discussion

I have deliberately termed the treatment of excessive gingival display with BTX as lip stabilisation as opposed to lip repositioning since the former describes a limiting action on the smile dynamics following treatment as opposed to bodily repositioning the lip, which as has been

discussed is not the goal of treatment. Clearly an accurate and comprehensive assessment of the smile dynamics must be made prior to treatment and particularly prior to any anticipated anterior dental aesthetic treatment.

As with other facial muscles, the duration of treatment results with BTX is typically three to four months. However, the patients in my experience of such treatment over the last four years is that the patients slowly return to the starting position within the period of time, as opposed to a dramatic return to the day 0 position. An additional observation that has been made is that repeated treatments of BTX lip stabilisation have resulted in sustained results and a lowered required dose of BTX in subsequent treatment episodes. One can postulate that this is due to the induced atrophy of the muscles being targeted coupled with a change in the habitual smile dynamics.

Hence, BTX lip stabilisation is certainly a valuable treatment option for both operator and patient. Typically such treatments will take less than a minute to perform, and if carefully conducted in trained hands, is a relatively painless and predictable procedure.

I would like to thank all my patients used in this article for their kind permission to depict their clinical photographs.

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