

Botox as an Adjunct to Orthognathic Surgery For A Case of Severe Vertical Maxillary Excess

Adarsh S. Indra · P. P. Biswas · V. T. Vineet ·
T. Yeshaswini

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Abstract Large skeletal discrepancies are sometimes only minimised but not eliminated by orthognathic surgeries. Administration of Botox has been advocated as an effective minimally invasive procedure to tackle aesthetic compromises like gummy smile and the like. This article elaborates on the surgical management of a case of severe vertical maxillary excess with Botox as an adjunct therapy.

Keywords Gummy smile · Botox · Lefort I osteotomy

A smile is an inexpensive way to change your looks—Charles Gordy

Introduction

A paramount objective of modern cosmetic surgery is improvement in facial aesthetics [1]. A major reason for seeking professional help is dissatisfaction with the facial appearance in addition to functional problems [2]. The display of excessive gingival tissue in maxilla on smiling has been described as ‘gummy smile’. Patients with excessive gingival exposure are self-conscious and embarrassed about it and some others, psychologically affected

[3, 4]. Various surgical and non-surgical modalities have been described in the treatment of gummy smile which includes Lefort I osteotomy, crown lengthening procedures, maxillary incisor intrusions, microimplants, headgears, self curing silicone implant injected at ANS with myectomy and partial resection of levator labii superioris with muscle repositioning. However, these procedures do not help in reducing the hyperactivity of the muscles and therefore, non surgical treatment may be a desirable option [5].

If the gummy smile is skeletal, as in vertical maxillary excess, then, a Lefort I osteotomy is warranted. However, very large discrepancies have their surgical limitations. Horse-shoe osteotomy, a modification of Lefort I osteotomy has been described in literature to target major movements in maxilla [6]. However, it is not commonly practised.

Botox has been in clinical use since three decades for the treatment of several conditions associated with excessive muscle contraction [7] such as strabismus [8], cervical dystonia [9], blepharospasm and hemi-facial spasm [10] and the like. In the last two decades, botox has been widely used for cosmetic treatment of hyper-functional facial lines [11]. More recently, botox has emerged as an effective, minimally invasive tool to combat gummy smile for patients with hyper-functional upper lip [4].

This paper presents a case of severe vertical maxillary excess which was jointly treated with Lefort I osteotomy, V–Y plasty for lip lengthening and Botox in an effort to recreate smile.

Case

A 26-year-old male presented to the Department of Orthodontics and Dentofacial Orthopaedics with increased

A. S. Indra · T. Yeshaswini (✉)
Department of Oral & Maxillofacial Surgery, Coorg Institute of
Dental Sciences, K K Campus, Maggula PO, Virajpet, Coorg
571218, India
e-mail: yeshas26575@yahoo.com

P. P. Biswas · V. T. Vineet
Department of Orthodontics, Coorg Institute of Dental Sciences,
K K Campus, Maggula PO, Virajpet, Coorg 571218, India

gingival exposure during smile and proclined teeth. The patient had a convex profile with incompetent lips; short & hypertonic upper lip and increased lower anterior facial height. On smiling, the patient had a gingival exposure of over 9 mm (Fig. 1) with multiple teeth missing in the posterior segment. It was diagnosed as a mutilated case having a class II canine relation with an overjet of 10 mm. Cephalometric analysis revealed a skeletal Class II pattern with a prognathic maxilla with anterior vertical excess of 10 mm and a posterior excess of 4 mm. The patient had increased lower facial height of 12 mm and a retrognathic chin (Fig. 2).

After successful completion of pre-surgical orthodontics which basically consisted of decompensation of upper and lower arches with 0.022" MBT appliance, the patient was referred to the Department of Oral & Maxillofacial Surgery. A conventional Lefort I osteotomy with a superior impaction of 6 mm in the anterior and 4 mm in the posterior region along with a segmental osteotomy in the anterior maxilla was done to combat the prognathic maxilla. A V-Y plasty was performed on table in order to lengthen the lip. A genioplasty to advance the chin was also done simultaneously. Post surgery, although there was significant improvement in the patient profile and smile, there was still about 5 mm gingival exposure during smile (Figs. 3, 4). The dissatisfaction expressed by the patient led us to consider another treatment option, Botox. The pros and cons of injecting Botox were discussed with the patient who was very receptive to the idea which targeted his chief complaint of gummy smile.



Fig. 1 Pre-surgical gingival exposure



Fig. 2 Pre-surgical Cephalogram



Fig. 3 Post-surgical gingival exposure



Fig. 4 Post-surgical Cephalogram

Botox and Injection Technique

BOTOX (BTX-A: purified botulinum Toxin Type A), is a sterile, vacuum dried neurotoxin complex produced from fermentation of hall strain clostridium botulinum toxin type A, grown in a medium containing casein hydrolysate, glucose and yeast extract.

BTX-A was diluted according to the manufacturer's recommendations to yield 2.5 units per 0.1 ml by adding 4.0 ml 0.9% Normal Saline to 100 units of vacuum dried BTX-A. Under sterile conditions, 2.5 units were injected at two sites per side (Table 1).

The patient had a gummy smile associated with prominent nasolabial fold. Therefore, the injection was given at the labial component of the levator labii superioris alaeque nasii, at the bulge of the uppermost part of the nasolabial fold [12]. The injection sites were determined by muscle animation (smiling) and palpation on contraction to ensure precise muscle location before injection [13] (Figs. 5, 6).

Reference points used for the measurements were [13]:

A—Lowest margin of upper lip perpendicular and superior to the mid portion of maxillary central incisor gingival margin

B—The maxillary central incisors gingival margin at its midpoint

Table 1 Site of Injection

S. No.	Site of injection
1	Overlapping area of levator labii superioris alaeque nasi and levator labii superioris muscles.
2	Overlapping area of levator labii superioris and zygomaticus minor muscles.



Fig. 5 Overlapping area of levator labii superioris alaeque nasi and levator labii superioris muscles

C—The midpoint of the incisal edge of the maxillary central incisor (Fig 7)

A–B—5 mm & A–C—17 mm

Patient was recalled at 2, 4 weeks and then, once every month for 4 months to record the changes.

Results

The results were markedly noticeable at 2 weeks. At A–B i.e. from the lowest margin of the upper lip to the gingival margin, there was no exposure of gingiva. At A–C, there was a 5 mm reduction in exposure from the lowest margin of the upper lip to the incisal edge (Fig. 8). The results were consistent for 2 months. However, relapse was noted by the 3rd month (Table 2).



Fig. 6 Overlapping area of levator labii superioris and zygomaticus minor muscles

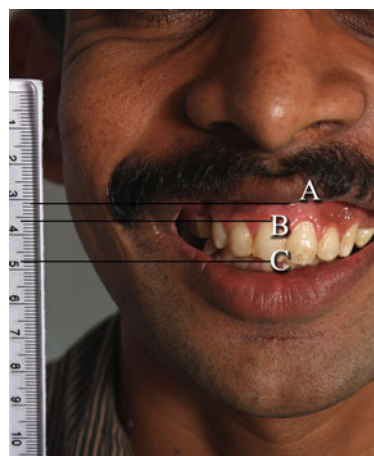


Fig. 7 Reference points used for measurements



Fig. 8 Post botox

Discussion

Esthetic improvement is paramount to functional aspects in orthognathic cases as the patient is more concerned with the former. Many adjunctive soft tissue procedures can be used to preclude this problem [14]. Lefort I osteotomy with superior impaction is most commonly adopted to treat skeletal vertical maxillary excess coupled with gingivectomies [4]. However, conventional Lefort I has a limitation of congesting the nasal airway function if performed in very severe cases of vertical maxillary excess. A modification of Lefort I, a Horse-shoe osteotomy is indicated when major superior repositioning of 5–15 mm is required which leaves the nasal floor intact [6, 15]. This is however, not commonly practised. Also, the principle is to under-correct in the vertical dimension, for, the incisal edges hidden beneath the upper lip causes the patient to appear prematurely aged and edentulous [16]. The V–Y lengthening done for a short upper lip, however, increases the length only by 2–3 mm which is marginal [14]. In the case under discussion, however, even correcting the vertical dimension to the desired extent would still leave a gummy smile due to the hypertonic lip.

The use of Botox for various cosmetic procedures have been described extensively in literature [7–10, 17]. Botox blocks the neuromuscular transmission by binding to acceptor sites on motor or sympathetic nerve terminals, thereby, inhibiting the release of acetylcholine. This



Fig. 9 At 8 months follow-up

inhibition occurs as Botox cleaves the synaptosomal-associated protein (SNAP-25). Therefore, when injected intramuscularly at therapeutic doses, it produces partial chemical denervation of the muscle resulting in localised reduction in muscle activity [18]. Levator labii superioris, zygomatic major and superior fibres of buccinators muscles under the nasolabial fold are responsible for the production of full smile. The gummy smile is dominated by the excessive contractions of the levator labii superioris muscles. By injecting at the predetermined sites, Botox brings about reduction in gingival exposure by weakening the contractibility of the upper lip elevator muscles and also, a marked effacement of the nasolabial fold [13]. Partial to complete upper lip drooping, due to hypotony or atony of the central elevators may lead to excessive upper lateral pulling of the zygomaticus major and as a consequence, a ‘joker smile’ may result [19]. Although, the results began to reverse by the 4th month, the exposure, however, never returned to the original values [13]. Since the dose injected was minimal, there was no perceivable hypokinesis at 8 months follow-up (Fig. 9).

Conclusion

As opposed to various other surgical procedures, Botox has proven to be a minimally invasive, effective alternate for the correction of gummy smile caused by upper lip elevator muscles. It, therefore, can be a useful adjunct to enhance

Table 2 Measurements of gingival exposures pre and post botox

Sl. No	Measurements	Pre treatment	2 weeks	4 weeks	2 months	3 months	4 months
1	A–B	5 mm	0 mm	0 mm	0 mm	2 mm	3 mm
2	A–C	17 mm	12 mm	12 mm	12 mm	14 mm	15 mm

the aesthetics and improve patient satisfaction where orthognathic surgery alone may prove inadequate.

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