

ROLE OF BOTULINUM TOXIN IN THE MANAGEMENT OF VERTICAL MAXILLARY EXCESS

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ABSTRACT

The purpose of this study was to check the feasibility of botulinum toxin efficacy to eliminate the residual soft tissue defects following Lefort 1 osteotomy. Severe skeletal discrepancies treated by orthognathic surgery is not satisfactory at times. Moreover, soft tissue changes following orthognathic surgery are minimal. Injection of botulinum as an adjunctive to orthognathic surgery produces desirable outcome in soft tissue changes. Five cases of maxillary excess were treated with Lefort 1 osteotomy followed by administration of botulinum toxin.

Botulinum was injected in the muscles around the lip and the nose. The injection sites were determined by muscle animation(smiling) and palpation on contraction to ensure precise muscle location before injection. Five patients were included in the present study of which 4 were females and one was male. This study was done in Adiparasakthi dental college and hospital between 2009 and 2011. The results were markedly noticeable at 2 weeks following administration of botulinum toxin. Pre surgical and post surgical soft tissue cephalometric analysis performed on the patients showed satisfactory changes. The results were consistent for six months.

This study revealed botulinum toxin to be a minimally invasive ,effective alternate for the correction of gummy smile caused by upper lip elevator muscles. Therefore, it can be used as an adjunct to enhance esthetics and improve patient satisfaction where orthognathic surgery alone may have proved inadequate.

Key words: Botulinum toxin, orthognathic surgery, gummy smile

INTRODUCTION

Modern orthognathic surgery plays a major role in improving facial esthetics.¹ Dissatisfaction with the facial appearance and functional problems is a major reason for seeking professional help.² Gummy smile is defined as the exposure of excessive gingival tissue in maxilla. This condition makes the patient more anxious and embaressed. At extreme situations it even affects them psychologically.^{3,4} Many surgical and non surgical options have been described in the etiology of gummy smile. It includes Lefort 1 osteotomy, crown lengthening procedures, maxillary incisor intrusions, micro implants headgears, self cure silicone implant injected at ANS with myectomy and partial resection

of levator labii superiors with muscle repositioning. But these procedures do not help in reducing the hyperactivity of the muscles and hence non surgical treatment may be a desirable option.⁵

Lefort 1 osteotomy will be ideal if there is true skeletal excess with a minimal gummy smile. Severe skeletal discrepancies, excessive teeth show, short upper lip managed with conventional Lefort 1 osteotomy doesn't yield a satisfactory result. A modification of Lefort 1 osteotomy called Horse shoe osteotomy has been described in the literature to target major movements in the maxilla.⁶ However, it is not commonly practised.

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Massetric hypertrophy⁷, excessive muscular contraction⁸, strabismus⁹, cervical dystonia¹⁰, blepharospasm and hemifacial spasm¹¹ have been successfully managed with botulinum toxin. In addition it has emerged to be an effective non surgical option for cosmetic correction of hyper-functional facial lines.¹¹ Various studies have been conducted on botulinum toxin efficiency in combating gummy smile and hyperfunctional lip.

The purpose of the present study was to assess the efficiency of botulinum toxin along with Lefort 1 osteotomy, and V-Y plasty in an effort to recreate smile.

METHODOLOGY

Five patients of which 4 were females and one was male were included in this study.

Inclusion criteria: Vertical maxillary excess with Gummy smile and hyperfunctional lip. Incompetent lips and hypertonic upper lip

Exclusion criteria: Pure skeletal vertical maxillary excess, Bimaxillary protrusion

Presurgical Cephalometric Analysis

Cephalometric analysis [COGS] showed skeletal class II pattern with prognathic maxilla with anterior vertical excess between 4 to 18 mm and a posterior excess between 3 to 5 mm. Three patients had increased lower facial height between 6 to 10 mm and a retrognathic chin.

SURGICAL PROCEDURE

All the patients underwent presurgical orthodontics which consisted of decompensation of upper and lower arches with 0.022" MBT appliance. A conventional Le fort 1 osteotomy was done with a superior and posterior setback along with segmental osteotomy in the anterior maxilla to combat the prognathic maxilla. Autorotation of mandible following setback was insufficient in 2 cases. So they were treated with advancement genioplasty. A V-Y plasty was done simultaneously for all the patients to lengthen the lip.

Post surgically there was significant improvement in patient profile and smile but there was 3 to 8mm of gingival exposure in all the patients. The dissatisfac-

tion expressed particularly female patients led us to consider another treatment option, botulinum toxin. The pros and cons of injecting botulinum toxin were discussed with the patient who were very receptive with this idea which targeted their chief complaints of gummy smile.

Administration of botulinum toxin

Purified botulinum toxin (Type A) is a sterile vacuum dried neurotoxin complex produced from fermentation of hall strain clostridium botulinum (Type A) grown in medium containing Casein hydrolysate, glucose and yeast extract.

The toxin was diluted according to the manufacturer's recommendations to yield 2.5 units per 0.1 ml by adding 4 ml 0.9% of normal saline to 100 units of vacuum dried botulinum toxin. Under sterile conditions 2.5 units were injected at two sites per side. The injection was given at the labial component of the levator labii superioris alequae 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 (Fig 3,4). Reference points used for measurements were:¹³

A-Lowest margin of upper lip perpendicular and superior to the midportion of maxillary central gingival margin.

B-The maxillary central incisors gingival margin at its midpoint.

C-The midpoint of the incisal edge of the maxillary central incisor. (Fig 3, 4)

Patient was recalled at 2, 4 weeks and then once every month for 6 months to record the changes.

RESULTS

The results were markedly noticeable at 2 weeks. At A-B i.e. from the lowest margin of upper lip to the gingival margin, there was no exposure of the gingiva. At A-C, there was on an average a 3-8mm reduction in exposure from the lowest margin of the upper lip to the incisal edge (Fig 1,2). The results were consistent in 4 patients and mild relapse was noted in one patient after 6 months.



Fig 1: Pre-surgical gingival exposure



Post-surgical gingival exposure



Fig 2: Pre op



Six months follow-up



Fig 3: Overlapping area of levator Labii superioris and Zygomaticus minor



Fig 4: Overlapping area of levator Labii superioris alaeque nasi and levator labii superioris

TABLE 1: SITE OF INJECTION

S No	Site of injection
1	Overlapping area of levator Labii superioris alaeque nasi and levator labii superioris
2	Overlapping area of levator Labii superioris and Zygomaticus minor

DISCUSSION

Patients who undergo orthognathic surgery give more importance to aesthetic aspects than functional aspects. Many adjunctive soft tissue procedures can be performed to solve this problem.¹⁴ Lefort 1 osteotomy with superior setback is the procedure of choice to treat skeletal vertical maxillary excess coupled with gingivectomies.⁴ However conventional Lefort 1 has a limitation of nasal congestion in severe skeletal cases. A Horse shoe osteotomy(modified Lefort 1) is indicated in major superior repositioning^{5,15} is considered which leaves the nasal floor intact.^{6,15} But this has a

TABEL 2: MEASUREMENTS OF GINGIVAL EXPOSURES PRE AND POST BOTULINUM

	S No	Measure-ments	Pre Treatment	2 Weeks	4 Weeks	2 Months	3 Months	6 Months
Case 1	1	A-B	6 mm	0 mm	0 mm	0 mm	0 mm	2 mm
	2	A-c	17mm	10 mm	10 mm	10 mm	10 mm	12 mm
Case 2	1	A-B	5 mm	0 mm	0 mm	0 mm	0 mm	1 mm
	2	A-c	16mm	9 mm	9 mm	9 mm	9 mm	10 mm
Case 3	1	A-B	7 mm	0 mm	0 mm	0 mm	0 mm	2 mm
	2	A-C	16 mm	10 mm	10 mm	10 mm	10 mm	11 mm
Case 4	1	A-B	4 mm	0 mm	0 mm	0 mm	0 mm	0 mm
	2	A-C	18 mm	11 mm	11 mm	11 mm	11 mm	12 mm
Case 5	1	A-B	5 mm	0 mm	0 mm	0 mm	0 mm	2 mm
	2	A-C	15 mm	9 mm	9 mm	9 mm	9 mm	10 mm

limitation of undercorrecting the vertical dimension causing the incisal edges hidden beneath upper lip making the patient to appear prematurely aged.¹⁶ The V-Y lip lengthening increases lip length by 2-3 mm only which is marginal.¹⁴ So correcting the vertical dimension to the desired extent would still leave a gummy smile due to the hypertonic lip.

The use of Botulinum toxin for various cosmetic procedures have been described extensively in literature.^{7-10,17} Botulinum toxin blocks the neuromuscular transmission by binding to acceptor sites on motor or sympathetic nerve terminals, thereby inhibiting the release of acetylcholine. This inhibition occurs as botulinum toxin cleaves the synaptosomal-associated protein (SNAP-25). Therefore, when injected intramuscularly at therapeutic doses, it produces partial chemical denervation of the muscle resulting in localized reduction in muscle activity.¹⁸ Levator labii superioris, Zygomatic major and superior fibres of buccinator muscles under the nasolabial fold responsible for the production of full smile. The gummy smile is dominated by the excessive contractions of levator labii superioris.

By injecting at the predetermined sites, botulinum toxin brings about reduction in gummy smile by weakening the contractibility of upper lip elevator muscles and also marked effacement of 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 Zygomaticus major and as a consequence a "joker" smile may result.¹⁹ Since the dose injected was minimal, there was no perceivable hypokinesis at 6 months follow up.

The results achieved in the present study were compared with others and it seemed to be satisfactory.²⁰

CONCLUSION

When compared to other surgical procedures botulinum toxin has been proved to be a minimally invasive, effective alternate for the correction of gummy smile caused by upper lip elevator muscles. To conclude injecting botulinum toxin is a useful adjunctive procedure to enhance aesthetics and to improve patient satisfaction where orthognathic surgery alone is inadequate.

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