

“Treatment of Severe Crowding and Bimaxillary Dental Protrusion in a Patient with Angle’s Class I Malocclusion and a Vertical Growth Pattern” – A Case Report on Orthodontic Camouflage

Dr. Bhushan Jawale¹, Dr. Lishoy Rodrigues^{2*}, Dr. Anup Belludi³, Dr. Shrinivas Ashtekar⁴, Dr. Anand Patil⁵, Dr. RK Suryawanshi⁶

¹Dr. Bhushan Jawale | Professor, Dept of Orthodontics and Dentofacial Orthopedics, Sinhgad Dental College and Hospital, Vadgaon Bk, Pune, Maharashtra, India

²Dr. Lishoy Rodrigues | PG Student, Dept of Orthodontics and Dentofacial Orthopedics, Sinhgad Dental College and Hospital, Vadgaon Bk, Pune, Maharashtra, India

³Dr. Anup Belludi | Professor and HOD, Dept of Orthodontics and Dentofacial Orthopedics, KLE Dental College and Hospital, Bangalore, Karnataka, India

⁴Dr. Shrinivas Ashtekar | Professor, Dept of Orthodontics and Dentofacial Orthopedics, VPDC Dental College and Hospital, Sangli, Maharashtra, India

⁵Dr. Anand Patil | Professor, Dept of Orthodontics and Dentofacial Orthopedics, SDM Dental College and Hospital, Dharwad, Karnataka India

⁶Dr. RK Suryawanshi | Professor and HOD, Dept of Oral and Maxillofacial Surgery, Sinhgad Dental College and Hospital, Vadgaon Bk, Pune, Maharashtra, India

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*Corresponding author: Dr. Lishoy Rodrigues

Abstract

The aim of orthodontic treatment in a bimaxillary protrusion case is to obtain an esthetically pleasing face with harmonious soft tissue profile, stable occlusion and pleasant smile. The etiology of bimaxillary protrusion is multifactorial involving both genetic and environmental causes like mouth breathing, tongue and lip habits and tongue volume. The following case report is management of class I bimaxillary protrusion malocclusion in a hyperdivergent case with extraction of all first premolars. The effective management of space without losing anchorage is itself a big challenge. The results produced a pleasant facial profile with attainment of good occlusion. The case required extraction of 1st premolars for correction of the proclined, forwardly placed and crowded upper and lower anterior teeth. Clinical and cephalometric evaluation revealed skeletal Class I pattern and clinical examination revealed presence of an orthognathic facial profile, a vertical growth pattern, increased overjet and average overbite, crowding in maxillary and mandibular anterior region, potentially incompetent lips, increased lip fullness and lip strain, a gummy smile with an unaesthetic smile arc and a decreased nasolabial angle. Following fixed orthodontic treatment by removal of all 1st premolars and with retraction of anterior segment, a marked improvement in patient's smile, facial profile and occlusion was achieved and there was a remarkable increase in the patient's confidence and quality of life. The profile changes and treatment results were demonstrated with proper case selection and good patient cooperation with fixed appliance therapy.

Keywords: Gummy smile, Fixed Orthodontic Mechanotherapy, Class I malocclusion, Crowding, non-consonant smile arc, Leptoprosopic facial form, Aesthetic Improvement, 1st Premolar Extractions, Orthodontic Camouflage, Unaesthetic smile, Therapeutic Extractions, Management of Bimaxillary dento-alveolar protrusion, Hyperdivergent Case.

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INTRODUCTION

Bimaxillary protrusion is a malocclusion characterized by proclined upper and lower incisors giving a convex facial profile. Management of bimaxillary protrusion in a hyperdivergent case requires an efficient anchorage system. This anchorage system

should provide effective stability of anchorage unit with minimum discomfort to the patient. This can be managed by efficient use of mechanics along with devices like transpalatal arch, nance palatal arch and sometimes temporary anchorage devices which provides an efficient absolute anchorage in such cases [1]. The etiology of bimaxillary protrusion is

multifactorial involving both genetic and environmental causes like mouth breathing, tongue and lip habits and tongue volume [2]. The goals of orthodontic treatment in an adolescent bimaxillary protrusion patient with hyperdivergent growth pattern requires retraction of maxillary and mandibular incisors along with control of vertical dimension of face for esthetic soft tissue profile [13-19]. This is commonly achieved by extraction of four first premolars followed by retraction of anterior teeth using maximum anchorage mechanics [20-27]. This case presents the correction of crowding with a Class I malocclusion in an adolescent male patient with proclined maxillary and mandibular anterior teeth, merely simply by executing extraction of maxillary and mandibular 1st premolars followed by fixed appliance therapy using conventional MBT fixed appliance mechanotherapy. Temporary anchorage devices were used in this case for the purpose of retraction and also to maintain an absolute anchorage. The Extraction protocol shown in this case is indicative of how an unesthetic smile can be converted into a pleasant one by routine fixed Orthodontic treatment with extraction of 4 premolars followed by retraction and closure of spaces.

CASE REPORT

Extra-oral examination

A 16 year old male patient presented with the chief complaint of irregularly placed upper and lower front teeth and excessive show of upper gums. On Extra-oral examination, the patient had an orthognathic facial profile, grossly symmetrical face on both sides, a Leptoprosopic facial form, Dolicocephalic head form and average width of nose and mouth, potentially incompetent lips with increased lip strain , an acute Nasolabial Angle with increased upper and lower labial fullness. The patient had no relevant prenatal, natal, postnatal history, history of habits, medical or a family history. On Smiling, there was presence of crowding in the maxillary anterior region and a gummy smile with an unaesthetic non-consonant smile arc. The patient was very dissatisfied with his smile.



Pretreatment extra-oral photographs

Intra-oral examination

Intraoral examination on frontal view showed presence of crowding in the maxillary and mandibular anterior region. On lateral view the patient showed presence of Class II Division 1 incisor relationship, a Class I canine and molar relationship bilaterally with an increased overjet of 5mm and proclined and forwardly placed upper and lower anterior teeth. Occlusal view showed presence of partially erupted canines in upper arch along with multiple rotated teeth both in upper and lower arch and presence of a “U” shaped arch form.



Pre-treatment Intra-oral photographs

Pretreatment cephalometric readings

PARAMETERS	PRE- TREATMENT
SNA	82°
SNB	80°
ANB	2°
WITS	1mm
MAX. LENGTH	92mm
MAN. LENGTH	109mm
IMPA	99°
NASOLABIAL ANGLE	92°
U1 TO NA DEGREES	34°
U1 TO NA mm	6mm
L1 TO NB DEGREES	29°
L1 TO NB mm	4mm
U1/L1 ANGLE	118°
FMA	29°
Y AXIS	76°
L1 TO A-POG	3mm
CONVEXITY AT PT. A	1mm
LOWER LIP- E PLANE	3mm
N-PERP TO PT A	1mm
N-PERP TO POG	-2mm
CHIN THICKNESS	11mm

Bolton ratio:- Maxillar anterior excess:- 3.54 Mandibular Overall excess:3.652	Arch Perimeter Analysis : Need to extract first premolar
Ashlev howe's index:- Borderline case	Careys Analysis : Need to extract first premolar
Pont's Index : Need of expansion	Chadda's Index : Expansion Needed

Model analysis

Diagnosis

This 16 year old male patient was diagnosed with a II malocclusion on a Class I Skeletal base with a vertical growth pattern, proclined upper and lower incisors, increased overjet, crowding in upper and lower anterior region, potentially incompetent lips with increased lip fullness, gummy smile with a non-consonant smile arc, reduced nasolabial angle with increased lip strain.

List of problems

1. Proclined maxillary and mandibular dentition
2. Crowding in maxillary and mandibular anterior region
3. Gummy smile
4. Decreased Nasolabial angle
5. Potentially incompetent lips
6. Increased lip strain
7. Non-consonant smile arc

Treatment objectives

1. To correct proclined maxillary and mandibular anterior dentition
2. To correct crowding in maxillary and mandibular anterior teeth
3. To correct the existing gummy smile
4. To correct the decreased Nasolabial angle
5. To improve the lip competency
6. To decrease the lip strain
7. To correct the smile arc
8. To achieve a Class I incisor relationship
9. To maintain a Class I canine and molar relationship
10. To achieve a pleasing smile and a pleasing profile

Treatment plan

- Extraction of 14, 24, 34 and 44 with banding, bonding and fabrication of trans-palatal arch in the maxilla
- Fixed appliance therapy with MBT 0.022 inch bracket slot
- Initial leveling and alignment with 0.012", 0.014", 0.016", 0.018", 0.020" Niti archwires following sequence A of MBT
- Inter-radicular implants between 15, 16 and 25,26

- Retraction and closure of spaces by use of 0.019" x 0.025" rectangular NiTi followed by 0.019" x 0.025" rectangular stainless steel wires.
- Absolute anchorage with TADs in the upper and lower arch to maintain a Class I molar relationship bilaterally and for en-masse retraction of the proclined anterior teeth
- Final finishing and detailing with 0.014" round stainless steel wires
- Retention by means of Hawley's retainers along with lingual bonded retainers in the upper and lower arch.

Treatment progress

Complete bonding & banding in both maxillary and mandibular arch was done, using MBT-0.022X0.028" slot. Initially a 0.012" NiTi wire was used which was followed by 0.014, 0.016", 0.018", 0.020" Niti archwires following sequence A of MBT. After 6 months of alignment and leveling NiTi round wires were discontinued. Retraction and closure of existing spaces was then started by use of 0.019" x 0.025" rectangular NiTi followed by 0.019" x 0.025" rectangular stainless steel wires. Reverse curve of spee in the lower arch and exaggerated curve of spee in the upper arch was incorporated in the heavy archwires to prevent the excessive bite deepening during retraction process and also to correct the already existing gummy smile. Anchorage was conserved in the upper and lower arch with the help of temporary anchorage devices, thus constantly monitoring the already existing Class I molar relationship bilaterally. Retraction and closure of existing spaces was done with the help of Elastomeric chains delivering light continuous forces and replaced after every 4 weeks due to force decay and reduction in its activity. Retraction with the help of inter-radicular implants enabled getting the incisors from Class II relationship to a Class I incisor relationship. Thus an ideal overjet and overbite was achieved at the end of the treatment. Finally light settling elastics were given with rectangular steel wires in lower arch and 0.012" light NiTi wire in upper arch for settling, finishing, detailing and proper intercuspation. The upper and lower anterior proclination was corrected with an ideal occlusion at the end of the fixed appliance therapy. The Nasolabial angle improved significantly at the end of treatment, thus improving the profile even further. There was improvement in occlusion, smile arc and profile at the end of the treatment and the patients chief complaint of crowding and gummy smile was addressed.

Treatment result

The change in the patient's facial esthetics was the most imposing part of the treatment. With extraction of the first premolars, 4 mm retraction of upper anteriors was achieved. Correction of crowding, lower incisors inclination and 4mm retraction was achieved in lower anterior. The soft tissue revealed esthetic smile, reduced lip incompetency with improvement in nasolabial angle and mentolabial sulcus. Ideal overjet

and overbite was established. The molar relation and vertical dimension were maintained during orthodontic treatment. Post treatment intraoral photographs and lateral cephalogram showed that the maxillary and mandibular incisors were inclined appropriately. The soft tissue chin thickness improved as the lip strain was reduced.

DISCUSSION

Bimaxillary proclination is characterized by severe proclination of anterior teeth of both the arches and is common among various ethnic groups, like Asians and Americans of African descent [3]. According to Drobocky and Smith the patients treated with first premolar extraction show an average reduction of 3.4 mm and 3.6 mm in upper and lower lip procumbency in relation to Rickett's E-line [4]. With extraction of premolars, the treatment plan must account for closure of extraction space which requires adequate anchorage maintenance, since mesialization of the posterior segment may compromise retraction of anterior teeth. It has been reported that when canine retraction is done with some adjunctive appliance for anchorage control only 0 to 2.4 of molar mesialisation is observed [5]. Group A anchorage has been considered effective in such cases. Absolute anchorage may be provided by various means including headgear and implants, etc [6]. In our case, we used TADs as it is considerably economical and the most reliable method to augment anchorage. Leveling by intrusion can be skilled with continuous archwires that bypass the premolar and segmented archwires with auxiliary depressing arch [7]. Anchor bends in Begg's technique and Rickett's utility arch are example for the continuous method [8, 9]. Burrstone three piece intrusion and mini-implant assisted intrusion are an example for the segmented method. Since the patient was hyperdivergent, extrusion was avoided and upper anteriors were intruded with inter-radicular mini-implants. Ebru Senisik [10] and Esen Aydogdua [11] observed 0.31mm/month of intrusion by utility arch. Frank J. Weiland [12] concluded that for intrusion low forces of segmented arch technique is better than continuous arch technique. The patient's chief complaint was irregularly placed upper and lower front teeth and excessive show of upper gums and sought treatment for the same. The selection of orthodontic fixed appliances is dependent upon several factors which can be categorized into patient factors, such as age and compliance, and clinical factors, such as preference/familiarity and laboratory facilities. The most important point to be highlighted here is the decision to extract the premolars. After analyzing the case thoroughly and reading all pretreatment cephalometric parameters along with evaluating the patients profile clinically, a decision was made of proceeding with the treatment by extracting all four 1st premolars as the patient presented with severe maxillary and mandibular proclination with crowding and gummy

smile, hence the case could not be managed without extractions. The treatment after closure of extraction spaces improved the patients profile changing the Nasolabial angle from acute to average at the end of the treatment. There was a significant decrease in the lip strain and lip fullness with increased competency of lips. Crowding was unraveled, an ideal overjet and overbite was achieved, smile arc was consonant and the pre-treatment gummy smile was corrected. Successful results were obtained after the fixed appliance therapy within a stipulated period of time. The overall treatment time was 18 months. After this active treatment phase, the profile of this 16 year old male patient improved significantly as seen in the post treatment Extra-oral photographs. Hawley's retainers were then delivered to the patient along with fixed lingual bonded retainers in upper and lower arch. Patient was very happy and satisfied with the results of the treatment



Post treatment Extra-oral photograph



Post treatment Intra-oral photograph

Post-treatment cephalometric readings

PARAMETERS	POST - TREATMENT
SNA	82°
SNB	80°
ANB	2°
WITS	0mm
MAX. LENGTH	92mm
MAN. LENGTH	108mm
IMPA	93°
NASOLABIAL ANGLE	107°
U1 TO NA DEGREES	23°
U1 TO NA mm	1mm
L1 TO NB DEGREES	22°
L1 TO NB mm	1mm
U1/L1 ANGLE	132°
FMA	28°
Y AXIS	75°
L1 TO A-POG	1mm
CONVEXITY AT PT. A	0mm
LOWER LIP- E PLANE	0mm
N-PERP TO PT A	0mm
N-PERP TO POG	-1mm
CHIN THICKNESS	12mm

CONCLUSION

This case report illustrates how a case with crowding and gummy smile can be managed with Extraction of 4 premolars by means of appropriate use of conventional MBT prescription along with efficient conservation of anchorage at the same time. The planned goals set in the pre-treatment plan were successfully attained. Good intercuspation of the teeth was achieved with a Class I molar, incisor and canine relationship. Treatment of the proclined and forwardly placed upper and lower anterior teeth included the retraction of maxillary and mandibular incisors with a resultant decrease in soft tissue procumbency and facial convexity. The maxillary and mandibular teeth were found to be esthetically satisfactory in the line of occlusion. Patient had an improved smile and profile. The correction of the malocclusion was achieved, with a significant improvement in the patient aesthetics and self-esteem. The patient was very satisfied with the result of the treatment.

Comparison of pre and post treatment cephalometric readings

PARAMETERS	PRE-TREATMENT	POST-TREATMENT
SNA	82°	82°
SNB	80°	80°
ANB	2°	2°
WITS	1mm	0mm
MAX. LENGTH	92mm	92mm
MAN. LENGTH	109mm	108mm
IMPA	99°	93°
NASOLABIAL ANGLE	92°	107°

U1 TO NA DEGREES	34°	23°
U1 TO NA mm	6mm	1mm
L1 TO NB DEGREES	29°	22°
L1 TO NB mm	4mm	1mm
U1/L1 ANGLE	118°	132°
FMA	29°	28°
Y AXIS	76°	75°
L1 TO A-POG	3mm	1mm
CONVEXITY AT PT. A	1mm	0mm
LOWER LIP- E PLANE	3mm	0mm
N-PERP TO PT A	1mm	0mm
N-PERP TO POG	-2mm	-1mm
CHIN THICKNESS	11mm	12mm

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