

Case Report

“Orthodontic Management of Class I Malocclusion and Severe Crowding in a Hypodivergent Patient with an Unaesthetic Smile Arc” – A Case Report

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Article History

Received: 21.04.2021

Accepted: 31.05.2021

Published: 06.06.2021

Journal homepage:

<https://www.easpublisher.com>

Quick Response Code



Abstract: 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 shows management of class I crowding in a hypodivergent case with extraction of all first premolars. The results of the treatment 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. Cephalometric evaluation revealed a Class I skeletal pattern with a horizontal growth pattern and clinical examination revealed presence of an orthognathic facial profile, an average overjet and overbite, crowding in maxillary and mandibular anterior region, potentially incompetent lips, increased lip fullness and lip strain 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: 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, Hypodivergent Case.

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INTRODUCTION

In adolescents, tooth movement is affected by growth while in adults we deal strictly with tooth movement alone. In addition, orthodontic treatment in the adults is often based on symptoms detected by the patient while in adolescents; it is based more often on signs detected by practitioners or parents. Of equal significance is the fact that the adolescents seeks treatment more often for esthetic reasons and hence is

likely to have unreasonable expectations about the outcome of the treatment, is less adaptable to the appliance and is uncompromising in his appraisal of the treatment results. Fixed Appliance treatment can significantly alter and improve facial appearance in addition to correcting irregularity of the teeth. Facial Esthetics has been in increasing demand in today's century. Nowadays, patients with the slightest misalignment of teeth demand Orthodontic treatment to get it corrected and improve their smile and facial

profile. Fixed Appliance treatment can significantly alter and improve facial appearance in addition to correcting irregularity of the teeth [1]. The number of patients seeking orthodontic treatment has increased significantly [1, 19, 26-30]. In Today's times, Fixed Appliance treatment can significantly alter and improve facial appearance in addition to correcting irregularity of the teeth. Class I malocclusion is the most prevalent followed by Class II and Class III malocclusion [2-3, 14-15]. Over the last few decades, there has been an increase in the awareness about orthodontic treatment which has led to more and more adolescents, especially girls demanding high quality treatment in the shortest possible time with increased efficiency and reduced costs [4, 16-18]. There are many ways to treat Class I malocclusions, according to the characteristics associated with the problem, such as antero-posterior discrepancy, age, and patient compliance [5-6, 20]. The indications for extractions in orthodontic practice have historically been controversial [7-9, 21]. On the other hand, correction of Class I malocclusions in growing patients, with subsequent dental camouflage to mask the skeletal discrepancy, can involve either retraction by non-extraction means simply by utilizing the available spaces or by extractions of premolars [10-11]. Lack of crowding or cephalometric discrepancy in the mandibular arch is an indication of 2 premolar extraction [12- 13, 22-25]. Fortunately, in some instances satisfactory results with an exceptional degree of correction can be achieved without extraction of permanent premolars [31-35]. This case presents the correction of crowding with a Class I malocclusion in an adolescent female patient with proclined maxillary and mandibular anterior teeth, merely simply by executing extraction of 4 premolars followed by fixed appliance therapy using conventional MBT fixed appliance mechanotherapy. The Extraction protocol shown in this case is indicative of how an unaesthetic smile can be converted into a pleasant one by routine fixed Orthodontic treatment with extraction of premolars followed by retraction and closure of spaces.

CASE REPORT

Extra-Oral Examination

A 16 year old female patient presented with the chief complaint of irregularly placed upper and lower front teeth and excessive show of upper teeth. 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 an excessive show of upper front teeth with an unaesthetic non-consonant smile arc. The patient was very dissatisfied with her smile.



Fig-1: Pre-treatment extra-oral photographs

Intra-Oral Examination

Intraoral examination on frontal view showed presence of crowding in the maxillary and mandibular anterior region and lower midline shift to the patient's left by 2mm. Frontal view also shows presence of an in-standing maxillary right lateral incisor. On lateral view the patient showed presence of Class I incisor, canine and molar relationship bilaterally with an average overjet and overbite and proclined and forwardly placed upper and lower anterior teeth. Occlusal view showed presence of maxillary and mandibular lower anterior crowding with multiple rotated teeth both in upper and lower arch and presence of a "U" shaped arch form.



Fig-2: Pre-treatment intra-oral photographs

Table-1: Pre Treatment Cephalometric Readings

PARAMETERS	PRE- TREATMENT
SNA	82°
SNB	80°
ANB	2°
WITS	1mm
MAX. LENGTH	89mm
MAN. LENGTH	109mm
IMPA	99°
NASOLABIAL ANGLE	89°
U1 TO NA DEGREES	29°
U1 TO NA mm	4mm
L1 TO NB DEGREES	27°
L1 TO NB mm	4mm
U1/L1 ANGLE	125°
FMA	24°
Y AXIS	66°
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	-1mm
CHIN THICKNESS	11mm

Diagnosis

This 16 year old adolescent female patient was diagnosed with a Class I malocclusion on a Class I Skeletal base with a horizontal growth pattern, crowding in upper and lower anterior region with lower dental midline shift to the patient’s left, proclined upper and lower incisors, potentially incompetent lips with increased lip fullness, a non-consonant smile arc, reduced nasolabial angle with increased lip strain.

List of Problems

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

Treatment Objectives

1. To correct crowding in maxillary and mandibular anterior teeth.
2. To correct proclined maxillary and mandibular anterior dentition.
3. To achieve congruent dental midlines.
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 pleasing smile and a pleasing profile.

Treatment Plan

- Extraction of 14, 24, 34 and 44 with banding²⁴, 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
- 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.
- 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. 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. 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

intercuspatation. 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, dental midlines were congruent and crowding was unraveled 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 patient’s chief complaint of crowding and excessive show of anterior teeth was addressed.

Treatment Result

All pre-treatment goals were achieved at the end of this fixed appliance treatment. The change in the patient’s facial esthetics was the most imposing part of the treatment. With extraction of all first premolars, 4 mm retraction of upper and lower anteriors was achieved. Correction of crowding was achieved in upper and lower anterior teeth and dental midlines were congruent at the end of the treatment. The soft tissue revealed esthetic smile, reduced lip incompetency with improvement in nasolabial angle. Ideal overjet and overbite was established. The molar relation and vertical dimension were maintained during orthodontic treatment. A pleasing smile and a pleasing profile were achieved.

DISCUSSION

Fixed Appliance treatment can significantly alter and improve facial appearance in addition to correcting irregularity of the teeth. Facial Esthetics has been in increasing demand in today’s century. Nowadays, patients with the slightest misalignment of teeth demand Orthodontic treatment to get it corrected and improve their smile and facial profile. Fixed Appliance treatment can significantly alter and improve facial appearance in addition to correcting irregularity of the teeth. Treatment of maxillary and mandibular crowding with extraction of 4 premolars in an adolescent patient is challenging. A well-chosen

individualized treatment plan, undertaken with sound biomechanical principles and appropriate control of orthodontic mechanics to execute the plan is the surest way to achieve predictable results with minimal side effects. Class I malocclusion might have any number of a combination of the skeletal and dental components. Hence, identifying and understanding the etiology and expression of Class I malocclusion and identifying differential diagnosis is helpful for its correction. The patient’s chief complaint was irregularly placed upper and lower front teeth and excessive show of upper front teeth 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 4 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 1st premolars as the patient presented with severe maxillary and mandibular crowding, hence the case could not be managed without extractions. 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, upper and lower dental midlines were coincident, smile arc was consonant with minimal buccal corridor spaces. Successful results were obtained after the fixed appliance therapy within a stipulated period of time. The overall treatment time was 15 months. After this active treatment phase, the profile of this 16 year old female 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

Table-2: Post-Treatment Cephalometric Readings

PARAMETERS	POST - TREATMENT
SNA	82°
SNB	80°
ANB	2°
WITS	0mm
MAX. LENGTH	88mm
MAN. LENGTH	108mm
IMPA	93°
NASOLABIAL ANGLE	97°
U1 TO NA DEGREES	23°
U1 TO NA mm	1mm
L1 TO NB DEGREES	22°
L1 TO NB mm	2mm
U1/L1 ANGLE	132°
FMA	24°
Y AXIS	65°

PARAMETERS	POST - TREATMENT
LI TO A-POG	1mm
CONVEXITY AT PT. A	0mm
LOWER LIP- E PLANE	0mm
N-PERP TO PT A	0mm
N-PERP TO POG	0mm
CHIN THICKNESS	12mm



Fig-3:Post-Treatment Extra-Oral Photographs



Fig-4: Post-Treatment Intra-Oral Photographs

Table-3: 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	89mm	88mm
MAN. LENGTH	109mm	108mm
IMPA	99°	93°
NASOLABIAL ANGLE	89°	97°
U1 TO NA DEGREES	29°	23°
U1 TO NA mm	4mm	1mm
L1 TO NB DEGREES	27°	22°
L1 TO NB mm	4mm	2mm
U1/L1 ANGLE	125°	132°
FMA	24°	24°
Y AXIS	66°	65°
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	-1mm	0mm
CHIN THICKNESS	11mm	12mm

CONCLUSION

This case report illustrates how a case with crowding 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 crowded, 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.

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Cite This Article: Bhushan Jawale *et al*. “Orthodontic Management of Class I Malocclusion and Severe Crowding in a Hypodivergent Patient with an Unaesthetic Smile Arc” – A Case Report. *EAS J Dent Oral Med*, 3(3), 86-93.