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"Non-Surgical Management of Facial Asymmetry by Fixed Orthodontic Treatment and Temporary Anchorage Devices" – A Case Report

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Abstract **Case Report**

The following case report shows management of class I bimaxillary protrusion malocclusion with facial asymmetry 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. The patient presented with an occlusal cant on clinical evaluation and presence of a facial asymmetry on PA cephalogram. Lateral cephalometric evaluation revealed a Class I skeletal pattern and clinical examination revealed presence of facial asymmetry with chin deviation towards the patients left side, 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 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. Facial asymmetry was corrected non-surgically, simply by application of appropriate biomechanics with the help of temporary anchorage devices (TADs).

Keywords: Facial asymmetry, chin deviation, canted smile, occlusal cant, Fixed Orthodontic Mechanotherapy, Class I malocclusion, Crowding, non-consonant smile arc, Mesoprosopic facial form, Aesthetic Improvement, 1st Premolar Extractions, Orthodontic Camouflage, Unaesthetic smile, Therapeutic Extractions, Bimaxillary protrusion, Hyperdivergent Case, case report.

INTRODUCTION

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 acnchorage 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 a 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. This is commonly achieved by extraction of four first premolars followed by retraction of anterior teeth using maximum anchorage mechanics. This case presents the correction of crowding with a Class I malocclusion in an adult female patient with proclined

maxillary and mandibular anterior teeth with occlusal cant and facial asymmetry, merely simply by executing extraction of maxillary and mandibular 1st premolars followed by fixed appliance therapy using conventional MBT fixed appliance mechanotherapy. A marked improvement was seen in the asymmetric face without any surgical intervention, simply by fixed orthodontic treatment. Temporary anchorage devices were used in this case for the purpose of retraction and also to maintain an absolute anchorage. TADs were also used for correction of patient's occlusal cant. 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 4 premolars followed by retraction and closure of spaces.

CASE REPORT

Extra-Oral Examination

A 24 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 asymmetrical face with chin deviation towards the left, a Mesoprosopic 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 mild crowding in the maxillary anterior region with an excessive show of upper front teeth with an unaesthetic non-consonant smile arc. The smile also revealed presence of an occlusal cant. 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 mild crowding in the maxillary and mandibular anterior region with presence of a midline shift. The maxillary dental midline was shifted to the left by 1 mm and mandibular dental midline was shifted to the patient's right by 2mm. On lateral view the patient showed presence of Class II Division 1 incisor relationship, a Class I canine relationship on left side, an End-On canine relationship on the right side and a class I molar relationship bilaterally with an increased overjet of 5mm and proclined and forwardly placed upper and lower anterior teeth.

Fig-2: Pre-Treatment Intra-Oral Photographs

Radiographic Examination

Lateral Cephalogram shows presence of proclined and forwardly placed upper and lower anterior teeth with a vertical growth pattern. PA cephalogram shows presence of an occlusal cant and lower facial deviation towards the left side. The angle of mandible seems to be differently positioned on right and left side

Fig-3: Pre-Treatment Radiographs

Table-1: Pre Treatment Cephalometric Readings

PARAMETERS	PRE- TREATMENT
SNA	82°
SNB	80°
ANB	2°
WITS	1mm
MAX. LENGTH	93mm
MAN. LENGTH	107mm
IMPA	103°
NASOLABIAL ANGLE	89°
U1 TO NA DEGREES	34°
U1 TO NA mm	4mm
L1 TO NB DEGREES	29°
L1 TO NB mm	3mm
U1/L1 ANGLE	116°
FMA	29°
Y AXIS	75°
L1 TO A-POG	3mm
CONVEXITY AT PT. A	2mm
LOWER LIP- E PLANE	2mm
N-PERP TO PT A	82°
N-PERP TO POG	80°
CHIN THICKNESS	2°

Diagnosis

This 24 year old female patient was diagnosed with a Class II malocclusion on a Class I Skeletal base with a vertical growth pattern, jaw asymmetry with chin deviated towards the left, occlusal cant, non-coincident dental midlines proclined upper and lower incisors, increased overjet, crowding in upper and lower anterior region, potentially incompetent lips with increased lip fullness, a non-consonant smile arc, reduced nasolabial angle with increased lip strain.

List of Problems

1. Proclined maxillary and mandibular anterior dentition.
2. Mild crowding in maxillary and mandibular anterior region.
3. Occlusal cant.
4. Jaw asymmetry with chin deviated towards the left.
5. Deviated dental midlines.
6. Increased overjet.
7. Decreased Nasolabial angle.
8. Potentially incompetent lips.
9. Increased lip strain.
10. 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 occlusal cant.
4. To correct the jaw asymmetry and deviated chin.
5. To achieve congruent dental midlines.
6. To achieve ideal overjet.
7. To correct the decreased Nasolabial angle.
8. To improve the lip competency.
9. To decrease the lip strain.
10. To correct the smile arc.
11. To achieve a Class I incisor and canine relationship.
12. To maintain a Class I molar relationship.
13. To achieve a pleasing smile and a pleasing profile.

Treatment Plan

- Extraction of 14, 24, 34 and 44 with banding [24], bonding with MBT prescription brackets.
- 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 and16, 25 and 26, 35 and 36, 45 and 46.
- Palatal inter-radicular implant between 15 and 16.
- 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. Occlusal cant was corrected by running an elastomeric chain from the buccal implant between 15 and 16, passing occlusally and ending on the palatal implant between 15 and 16. These E-chains were progressively replaced periodically until the occlusal cant was completely corrected. 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 patient's chief complaint of irregularly; forwardly placed and excessive show of anterior teeth was addressed.

Treatment Result

The occlusal cant and chin deviation seen in the pre-treatment photographs was completely resolved as observed in the post treatment photographs. This change in the patient's facial esthetics was the most imposing and miraculous part of the treatment. No surgery was involved in this case and the treatment objectives were achieved merely simply by applying appropriate biomechanics with the help of TADs. With extraction of the first premolars, 4 mm retraction of upper anteriors was achieved. Correction of crowding, lower incisors inclination and 3mm retraction was achieved in lower anteriors. Dental midlines were congruent at the end of the treatment. 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.

Table-2: Mid Treatment Cephalometric Readings

PARAMETERS	MID- TREATMENT
SNA	82°
SNB	80°
ANB	2°
WITS	1mm
MAX. LENGTH	92mm
MAN. LENGTH	106mm
IMPA	98°
NASOLABIAL ANGLE	97°
U1 TO NA DEGREES	29°
U1 TO NA mm	3mm
L1 TO NB DEGREES	27°
L1 TO NB mm	1mm
U1/L1 ANGLE	126°
FMA	28°
Y AXIS	73°
L1 TO A-POG	1mm
CONVEXITY AT PT. A	1mm
LOWER LIP- E PLANE	1mm
N-PERP TO PT A	82°
N-PERP TO POG	80°
CHIN THICKNESS	2°

Fig-4: Mid-Treatment Extra-Oral Photographs

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 [13-20]. It has been reported that when canine retraction is done with some adjunctive appliance for anchorage control only 0 to 2.4 of molar mesialization 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 archwire's that bypass the premolar and segmented archwires with auxiliary depressing arch [7, 21-25]. Anchor bends in Begg's technique and Rickett's utility arch are example for the continuous method [8, 9, 26-32]. Burrstone three piece intrusion [26, 33-38] and mini-implant assisted intrusion are an example for the segmented method. Since the patient was hypodivergent, molar intrusion 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 (1996) [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 front teeth and seeked treatment for the same. The patient presented with an occlusal cant on clinical evaluation and presence of a facial asymmetry on PA cephalogram. Lateral cephalometric evaluation revealed a Class I skeletal pattern and clinical examination revealed presence of facial asymmetry with chin deviation towards the patients left side. Occlusal cant was corrected by running an elastomeric chain from the buccal implant between 15 and 16, passing occlusally and ending on the palatal implant between 15 and 16. These E-chains were progressively replaced periodically until the occlusal cant was completely corrected. The occlusal cant and chin deviation seen in the pre-treatment photographs was completely resolved as observed in the post treatment photographs. This change in the patient's facial esthetics was the most imposing and miraculous part of the treatment. No surgery was involved in this case and the treatment objectives were achieved merely simply by applying appropriate biomechanics with the help of TADs. 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, 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 excessive show of incisors was corrected. Occlusal cant and deviated chin position was completely corrected after the use of TADs and successful results were obtained after the fixed appliance therapy within a stipulated period of time. The overall treatment time was 19 months. After this active treatment phase, the profile of this 24 year old adult 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-3: Post-Treatment Cephalometric Readings

PARAMETERS	POST - TREATMENT
SNA	81°
SNB	80°
ANB	1°
WITS	0mm
MAX. LENGTH	92mm
MAN. LENGTH	106mm
IMPA	93°
NASOLABIAL ANGLE	107°
U1 TO NA DEGREES	25°
U1 TO NA mm	1mm
L1 TO NB DEGREES	23°
L1 TO NB mm	1mm
U1/L1 ANGLE	132°
FMA	28°
Y AXIS	73°
L1 TO A-POG	1mm
CONVEXITY AT PT. A	0mm
LOWER LIP- E PLANE	0mm
N-PERP TO PT A	81°
N-PERP TO POG	80°
CHIN THICKNESS	1°

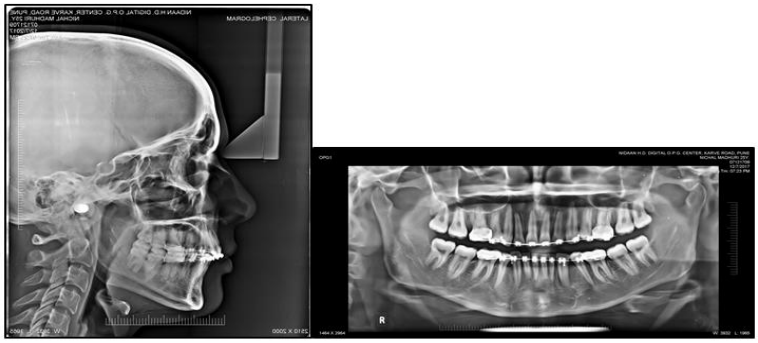

Fig-5: Pre-Finishing Radiographs

Table-4: Comparison of Pre, Mid and Post Treatment Cephalometric Readings

PARAMETERS	PRE-TREATMENT	MID-TREATMENT	POST-TREATMENT
SNA	82°	82°	81°
SNB	80°	80°	80°
ANB	2°	2°	1°
WITS	1mm	1mm	0mm
MAX. LENGTH	93mm	92mm	92mm
MAN. LENGTH	107mm	106mm	106mm
IMPA	103°	98°	93°
NASOLABIAL ANGLE	89°	97°	107°
U1 TO NA DEGREES	34°	29°	25°
U1 TO NA mm	4mm	3mm	1mm
L1 TO NB DEGREES	29°	27°	23°
L1 TO NB mm	3mm	1mm	1mm
U1/L1 ANGLE	116°	126°	132°
FMA	29°	28°	28°
Y AXIS	75°	73°	73°
L1 TO A-POG	3mm	1mm	1mm
CONVEXITY AT PT. A	2mm	1mm	0mm
LOWER LIP- E PLANE	2mm	1mm	0mm
N-PERP TO PT A	0mm	0mm	0mm
N-PERP TO POG	0mm	0mm	0mm
CHIN THICKNESS	12mm	12mm	12mm

Fig-6: Post-Treatment Extra-Oral Photographs

Fig-7: Post-Treatment Intra-Oral Photographs

CONCLUSION

This case report illustrates how a case with occlusal cant, facial asymmetry and bimaxillary dentoalveolar protrusion 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. 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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