

Fixed Orthodontic Treatment and Space Closure with Second and Third Molar Protraction into First Molar Extraction Space- A Case Report on Correction of Mutilated Malocclusion

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ABSTRACT

This case report evaluates the management of an 18 year old female patient with bi-maxillary dento-alveolar protrusion having a mutilated malocclusion with missing right and left maxillary and mandibular first molars. The right and left maxillary and mandibular first molar extraction spaces were closed by 50% protraction of the second and third molars and 50% reciprocal retraction of the incisors and the premolars. The amounts of protraction for the second molars were 5 mm on the right and left side and the amount of incisor and premolar retraction were 5mm on the right and left side. Following fixed orthodontic treatment by removal of grossly decayed first molars in the upper and lower arch with protraction of posterior 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. Excellent occlusion and correction of the mutilated malocclusion were achieved without tipping, rotation of the posterior teeth, or other problems. The profile changes and treatment results were demonstrated with proper case selection and good patient cooperation with fixed appliance therapy

Keywords: Molar Protraction, Bimaxillary Dentoalveolar Protrusion, Fixed Orthodontic treatment, Missing first molars, Orthodontic Camouflage.

INTRODUCTION

When a mandibular first molar is lost, orthodontic replacement with second and third molars would be an excellent treatment option if success were guaranteed. Stepovich presented the possibilities of these methods without severe complications, such as root resorption and tipping of adjacent teeth.^[1] Roberts et al,^[2,3] used endosseous implants placed in the retromolar area to close missing first molar spaces by mesial movement of the mandibular molars. In recent years, orthodontic miniscrews, which are more convenient, simple, and cheaper than endosseous implants, have been used widely. Kyung et al,^[4] reported a 9-mm mesial movement of mandibular second molars, and Nagaraj et al,^[5] reported an 8-mm movement using miniscrews to close bilateral missing mandibular first molar spaces. Kravitz and Jolley

discussed problems, such as buccal proclination,^[6] during mandibular molar protraction with miniscrews. Treatment is difficult when protraction of the second and third molars is achieved without use of these implants. In such case, a careful conservation of anchorage is required and both protraction of molars and retraction of anterior teeth have to be monitored carefully thus preventing any untoward movement of teeth. Our patient had grossly decayed maxillary and mandibular first molars which needed extraction. She had a bi-maxillary dento-alveolar protrusion too which needed addressal. Hence we decided to go about with this case by closing 50% of the extraction space by protraction of second and third molars and closing another 50% of the remaining space by retracting the anterior teeth thus addressing the proclined maxillary and mandibular anterior teeth. After treatment, good occlusion was achieved, extraction spaces were completely closed and treatment continued for a total duration of 18 months.

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CASE REPORT

Chief Complaint and Etiology

A young female patient, aged 18 years 6 months, sought an orthodontic evaluation with a chief complaint of forwardly placed upper and lower front teeth. She also wanted to close down the missing maxillary and mandibular first molar spaces by orthodontic tooth movement, if possible. The right and left maxillary and mandibular first molars had been extracted 2 months previously, because of severe caries.

Extra-Oral Examination

On Extra-oral examination, the patient had a convex facial profile, grossly symmetrical face on both sides, potentially incompetent lips, moderately deep mentolabial sulcus and an acute Nasolabial Angle, a Mesoprosopic facial form, Dolicocephalic head form, average width of nose and mouth, minimal buccal corridor space, a consonant smile arc and slightly posterior divergence of face. The patient had no relevant prenatal, natal, postnatal history, history of habits or a family history. On Smiling, there was excessive show of maxillary anterior teeth. The patient also had a toothy smile.

Pre Treatment Extraoral Photographs



Pre Treatment Intraoral Photographs



Intra-Oral Examination

Intraoral examination on frontal view showed presence of an average overjet and overbite with coincident upper and lower dental midlines. On lateral view the patient showed the presence of Class I incisor relationship, a Class I Canine relationship

bilaterally. Both maxillary and mandibular first molars were missing, as they were extracted 2 months prior to orthodontic treatment due to carious decay. The upper and lower anterior teeth were proclined as the patient had bi-maxillary dento-alveolar protrusion. The upper and lower arch showed the presence of a "U" shaped arch form. To achieve a Class I occlusal relationship, the second molars would need to be protracted and anterior teeth needed to be retracted into the first molar extraction space in all 4 quadrants.



Pre Treatment Cephalometric Readings

Parameters	Pre- Treatment
SNA	83°
SNB	82°
ANB	1°
WITS	0mm
MAX. Length	78mm
MAN. Length	98mm
IMPA	115°
Nasolabial angle	89°
U1 TO NA Degrees	35°
U1 TO NA mm	8mm
L1 TO NB Degrees	32°
L1 TO NB mm	7mm

U1/L1 Angle	103°
FMA	24°
Y AXIS	68°

Cephalometric Evaluation

- 1) Steiners analysis shows a prognathic maxilla and a prognathic mandible, Class I Skeletal pattern, An average growth pattern, proclined maxillary and mandibular anterior teeth, forwardly placed maxillary and mandibular anterior teeth and protrusive upper and lower lips
- 2) Tweeds analysis shows a Horizontal growth pattern and proclined mandibular incisors
- 3) Wits appraisal shows AO and BO coinciding indicating Skeletal Class I pattern
- 4) Ricketts analysis shows a horizontal growth pattern, average positioned condyles and proclined maxillary and mandibular anterior teeth.
- 5) McNamara analysis shows a prognathic maxilla and mandible, a horizontal growth pattern, average lower anterior facial height, an acute Nasolabial Angle and proclined maxillary and mandibular incisors
- 6) Rakosi Jaraback analysis shows a horizontal growth pattern and proclined maxillary and mandibular incisors
- 7) Holdaway soft tissue analysis shows increased maxillary and mandibular sulcus depth and increased strain of lips along with an average chin position
- 8) Downs analysis shows a Class I Skeletal pattern, a horizontal growth pattern and proclined maxillary and mandibular anterior teeth.

Diagnosis

This 18 year old female patient was diagnosed with a Class I malocclusion with a prognathic maxilla and mandible and a horizontal growth pattern, average overjet and overbite, proclined upper and lower incisors with missing first molars in all four quadrants, moderately deep mentolabial sulcus , an acute Nasolabial angle , potentially incompetent lips and a convex facial profile.

List of Problems

1. Prognathic maxilla and mandible
2. Proclined maxillary and mandibular anterior teeth
3. Missing first molars of all four quadrants
4. Convex facial profile
5. Decreased Nasolabial angle
6. Potentially Incompetant lips
7. Increased lip strain

Treatment Objectives

1. To correct maxillary and mandibular prognathism
2. To correct proclined maxillary and mandibular anterior teeth
3. To correct the posterior divergence of face
4. To replace all four first molars
5. To correct the decreased Nasolabial angle
6. To decrease the lip strain
7. To maintain Class I Incisor and Canine relationship
8. To achieve a pleasing smile and a pleasing profile

Treatment Alternatives

Spaces caused by missing maxillary and mandibular first molars could be corrected by prosthetic bridges, dental implants, auto transplantation of third molars, or mesial orthodontic movement of second and third molars. Prosthetic bridges offered the advantage of short treatment time but must be accompanied by significant tooth preparation. Dental implants permit conservation of tooth structure but require surgery. Auto transplantation also required surgery, and successful transplantation could not be guaranteed. Our patient finally chose orthodontic replacement, because she wanted to correct both the proclined anterior teeth as well as close down the residual extraction spaces. However, impants were not used in this case and the first molar extraction spaces in the maxillary and mandibular arch were closed down by protraction of second and third molars as well as retraction anterior teeth.

Treatment Plan and Treatment Progress

After two months of extraction of carious first molars, fixed appliance therapy was started which included banding of all second and third molars and bonding with MBT 0.022 inch bracket slot. Initial leveling and alignment with 0.012", 0.014", 0.016", 0.018", 0.020" NiTi arch wires was done following sequence 'A' of MBT. After 6 months of alignment and leveling NiTi round wires were discontinued. 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 maintain the normal overjet and overbite. Anchorage was conserved by light retraction and protraction forces constantly monitoring the already well settled occlusion until the second premolars. This is the most important step in a mutilated malocclusion case wherein anchorage conservation is of utmost importance Retraction and closure of spaces was done using 0.019" x 0.025" rectangular NiTi followed by 0.019" x 0.025" rectangular stainless steel wires. 50% of extraction spaces were closed by retraction of upper and lower anterior segment by consolidation of second and third molars with figure of 8 ligature ties until the maxillary and mandibular anterior proclination was reduced. Thereafter, consolidation in upper and lower arch from second premolar to second premolar with the help of figure of 8ligature ties and sequential protraction of second and third molars to close remaining 50% of extraction space was done. Retraction and closure of spaces was done with the help of Elastomeric chains delivering light continuous forces and were 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 intercuspation. Final finishing and detailing was achieved with 0.014"

round stainless steel wires. Retention was achieved by means of Begg's wrap-around retainers along with lingual bonded retainers in the upper and lower arch.

Post Treatment Cephalometric Readings

Parameters	Post-Treatment
SNA	82°
SNB	80°
ANB	2°
WITS	0mm
MAX. Length	77mm
MAN. Length	97mm
IMPA	97°
Nasolabial Angle	105°
U1 TO NA Degrees	27°
U1 TO NA mm	2mm
L1 TO NB degrees	24°
L1 TO NB mm	2mm
U1/L1 Angle	136°
FMA	23°
Y AXIS	69°

Post Treatment Extraoral Photographs



Post Treatment Intraoral Photographs





Treatment Results

All of the original treatment objectives were achieved. The maxillary and mandibular arches were well aligned and coordinated without midline deviations. Normal overbite and overjet were maintained. The Class I incisor and canine relationship was maintained bilaterally. The second and third molars were protracted without any untoward rotation of molars. The chief complain of forwardly placed upper and lower front teeth was addressed, also the molar extraction space was completely closed.

The posteriorly divergent face changed to orthognathic, the reduced nasolabial angle pre-treatment was improved, lips changed from being potentially incompetent to competent and lip strain reduced significantly at the end of treatment. Wire fixed retainers were attached to the lingual aspect of each tooth from the right to the left canines in both arches. The patient wore a Begg’s wrap around retainer for 15 hours per day for the first 2 months, followed by another 10 months of nighttime wear.

DISCUSSION

Treatment of a mutilated dentition with all four missing first molars 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 with bi-maxillary dento-alveolar protrusion might have any number of a combination of the skeletal and dental component. Hence, identifying and understanding the etiology and expression of malocclusion and identifying differential diagnosis is helpful for its correction. The patient's chief complaint was forwardly placed upper and lower front teeth with excessive show of front teeth. Patient also wanted to close down the spaces caused due to missing first molars in the maxillary and mandibular arch. The case was of bimaxillary dentoalveolar protrusion with considerably proclined upper and lower anterior dentition with missing first molars thus making it a mutilated case. 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. After analysing the case thoroughly and reading all pretreatment cephalometric parameters along with evaluating the patients profile clinically, a decision was made to retract the upper and lower anterior segment until 50% of the extracted molar space was closed. Remaining 50% of the space was closed by protracting the second and third molars. There was improvement in occlusion, smile arc, profile and Nasolabial angle. Successful results were obtained after the fixed MBT appliance therapy within a stipulated period of time. The overall treatment time was 18 months. After this active treatment phase, the profile of this 18 year old female patient improved significantly as seen in the post treatment extra oral photographs. Removable Begg's retainers were then delivered to the patient along with fixed lingual bonded retainers in upper and lower arch. Patient was very satisfied at the end of the treatment.

Comparison of Pre and Post Treatment Cephalometric Readings

Parameters	Pre- treatment	Post-treatment
SNA	83°	82°
SNB	82°	80°
ANB	1°	2°
WITS	0mm	0mm
MAX. Length	78mm	77mm
MAN. Length	98mm	97mm
IMPA	115°	97°
Nasolabial Angle	89°	105°
U1 TO NA Degrees	35°	27°
U1 TO NA mm	8mm	2mm
L1 TO NB Degrees	32°	24°
L1 TO NB mm	7mm	2mm
U1/L1 Angle	103°	136°
FMA	24°	23°
Y AXIS	68°	69°

Comparison of Pre, Mid, Pre Finishing and Post Treatment Profiles



CONCLUSION

Bilateral orthodontic traction of the mandibular second and third molars into the mandibular first molar edentulous spaces was possible without using implants in a complicated case with a mutilated dentition. This case report shows how a bimaxillary dento-alveolar protrusion case with all four missing first molars can be managed by means of appropriate use of simplified fixed orthodontic treatment and efficient conservation of anchorage at the same time. The planned goals set in the pretreatment plan were successfully attained. Good intercuspation of the teeth was maintained with class I molar relationship. Treatment of the Prognathic appearing upper and lower jaw included the retraction and retroclination 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 facial profile. The correction of the malocclusion was achieved, with a significant improvement in the patient aesthetics and self-esteem.

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