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Case Report

Treatment of severe crowding with constricted arches in a patient with high angle Class I malocclusion: A case report

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ABSTRACT

The goal of orthodontic treatment in a severely crowded malocclusion is to obtain a harmonious face with a well-balanced soft tissue profile, functional occlusion and a consonant smile. Etiology involving both genetic and non-genetic factors are associated with severe crowding. This case report is on correction of class I severely crowded malocclusion in a vertical grower treated with extraction of all first premolars. Intra oral, extra oral and radiographic examination revealed skeletal Class I with straight profile, hyper divergent growth pattern, increased overjet and severe crowding in maxillary and mandibular dentition, constricted arches, potentially competent lips with increased lip strain and a non-consonant smile arc, treated with extraction of all 1st premolars, significant improvement in patient's smile, profile and occlusion were obtained. The successful results were obtained due to correct case selection and proper treatment planning. The meticulous space analysis and management without anchorage loss is a result of proper anchorage planning prior to extractions.

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1. Introduction

In this modernizing world, patients with the smallest degree of misaligned teeth demand orthodontic correction to improve their smile and facial profile. Among Angle's classification, Class I malocclusion is the most common followed by Class II and Class III and various other subclasses and divisions of malocclusion.^{1,2} The need for extractions in orthodontics has always been controversial. This case presents the correction of crowding in the constricted arches with a Class I malocclusion in a patient with a vertical growth pattern, by extraction of maxillary and mandibular 1st premolars, proper space analysis and anchorage planning followed by fixed appliance therapy using conventional MBT of 0.022×0.028 inch slot brackets.

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The extractions planned in this case is suggestive of how a non-consonant smile can be converted into a consonant one by orthodontic treatment with retraction and decrowding of extraction spaces without any complex mechanism.³

2. Case Report

2.1. Extra-oral features

18 year old male patient reported to our department with the chief complaint of irregularly placed upper and lower front teeth. Extra-oral examination reveals the patient had a straight facial profile, symmetrical face, a Leptoprosopic facial form, mesocephalic head and potentially incompetent lips with increased lip strain. On Smiling, crowding in the maxillary anterior region with an unpleasant aesthetic non-consonant smile arc was noticed.

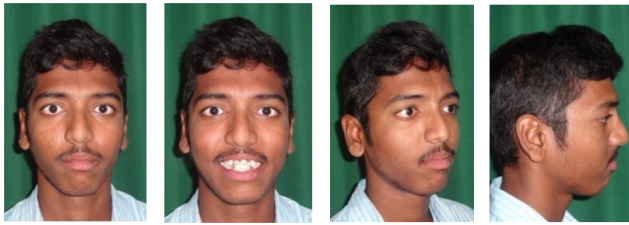


Fig. 1: Pre treatment extra oral photograph

2.2. Intra-oral features

Frontal view showed crowded maxillary and mandibular anterior teeth. On lateral view the patient had a bilateral Class I canine and molar relationship with increased overjet of 4mm. Occlusal view showed labially erupted canines in upper and lower arches, instanding upper laterals and a presence of a constricted arch form.



Fig. 2: Pre treatment intra oral photographs

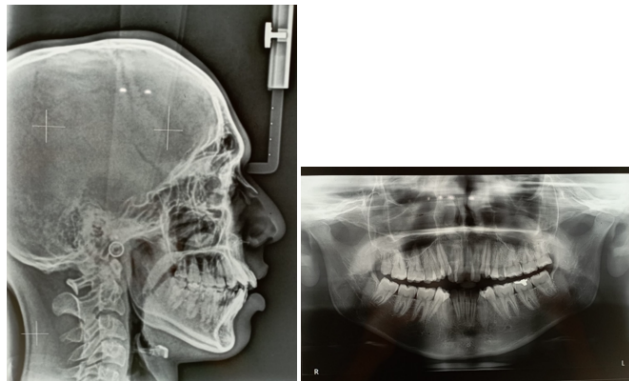


Fig. 3: Pre-treatment lateral cephalogram and OPG

2.3. Diagnosis

18 year old male patient was diagnosed with angle's class I malocclusion on a Class I Skeletal base with a vertical growth pattern, which was complicated by severe crowding and constricted upper and lower arches, potentially competent lips with a non-consonant smile arc and increased lip strain.

Table 1: Cephalometric analysis

Parameters	Pre- treatment	Post- treatment
SNA	83°	82°
SNB	81°	80°
ANB	2°	2°
WITS	1mm	-1mm
N-PERP to PT A	2mm	1mm
N-PERP to POG	-4mm	-2mm
IMPA	97°	92°
Nasolabial Angle	112°	106°
U1 to NA Degrees	34°	22°
U1 to NA mm	7mm	2 mm
L1 to NB Degrees	32°	24°
L1 to NB mm	7mm	3mm
U1/L1 Angle	111°	136°
FMA	35°	34°
L1 to A-POG	5mm	2mm
Lower Lip- E plane	2mm	1mm

2.4. Problem finding

1. Severe crowding in maxillary and mandibular dentition
2. Constricted maxillary and mandibular dentition
3. Potentially competent lips
4. Increased lip strain
5. Non-consonant smile

2.5. Treatment objectives

1. To relieve crowding in maxillary and mandibular dentition.
2. To improve the lip competency.
3. To decrease the lip strain.
4. To correct the smile arc.
5. To maintain a Class I canine and molar relationship after decrowding.
6. To achieve a balanced profile and stable functional occlusion.

2.6. Plan of treatment

1. Extraction of all first premolars.
2. Fixed mechanotherapy with MBT prescription of 0.022 bracket slot.
3. Initial leveling and alignment with Mulligans bypass arch.
4. Retraction and space closure.
5. Tongue crib in upper for tongue thrust habit.
6. Retention plan by begs wrap around retainer in upper and fixed lingual retainer with co axial wire in lower.

2.7. Course of treatment

Complete strap up in both maxillary and mandibular dentition was done and initially Mulligans bypass arch of

0.016 inch Australian wire was used to retract canines and then allow for decrowding by using round super elastic Niti archwires. After 15 months of alignment NiTi round wires were discontinued. Levelling was done by rectangular NiTi of 0.017×0.025 inch. Retraction and closure of existing spaces was then started by use of 0.019 x 0.025 inch rectangular stainless steel wires. Reverse curve of Spee in the lower dentition and exaggerated curve of Spee in the upper dentition was given in the working archwires to prevent the bite deepening by counteracting the extrusive force vectors during retraction. Anchorage was maintained and continuously observing the already existing Class I molar relationships on both sides. Retraction and closure of existing residual spaces was done with the help of Niti closed coil springs engaged from molar band hooks posteriorly to crimpable hooks anteriorly. Finishing and detailing was done by bracket repositioning and then followed by occlusal settling class I elastics. There was improvement in occlusion and almost all the ideal objectives of finishing and detailing were achieved.

3. Result

The improvement in patient's dental and facial features was the most important part of the treatment. 3mm retraction of upper and lower canines was achieved. Correction of crowding, lower incisors inclination was obtained. The smile showed a consonant arc. Normal overjet and overbite was achieved. The molar relations were maintained to class I during the course of treatment. Post treatment photographs and lateral cephalogram and superimpositions showed that the maxillary and mandibular incisors had proper torque and proper planned incisor position. Extra orally the lip strain factor was corrected and a consonant smile arc was achieved.

4. Discussion

Studies of Drobocky suggested the patients treated with all 4 first premolar extractions suggested average reduction of 3.4 mm and 3.6 mm in upper and lower lip procumbency respectively in accordance to Rickett's E-line. If extraction of premolars is executed then the treatment plan must take into consideration for closure of extraction space which requires adequate anchorage maintenance, since mesial movement of the posterior segment may cause anchorage loss and might not fully retract anterior segment of teeth.^{1,2,4,5}

When canine retraction is performed first for anchorage control, only 0 to 2.4mm of molar protraction is observed. Type A anchorage has been considered favourable in such cases. In our case, we used TPA in upper and lingual arch in lower as it is easier in fabrication and reliable method to preserve anchorage. Since the patient had vertical growth pattern any attempt of extrusion of posteriors was

prevented to avoid worsening the growth pattern. The selection of appliance and course of treatment and possible biomechanics depends on intra oral and extra oral findings. The highlighting feature is to consider all first premolar extractions.^{3,6-8} On scrutinizing the findings thoroughly and taking into account all pretreatment cephalometric analysis and model analysis along with clinical judgement, a plan was formulated of executing with the treatment by extracting all four first premolars and successful use of Mulligans bypass arch technique as the patient had severe crowding. Crowding was relieved and normal overjet and overbite was achieved with consonant smile arc. Favourable results were obtained, the overall treatment time was 24 months. The profile of this 18 year old male patient improved drastically as seen in the post treatment records, superim positions and photographs. Begg's wrap around retainers for upper dentition and lower fixed lingual retainers were made and patient was followed up one year post treatment and had favourable stable results without any significant risk of relapse.



Fig. 4: Strap-up intra-oral photographs



Fig. 5: Post treatment extra-oral photographs



Fig. 6: Post treatment Intra-oral photograph

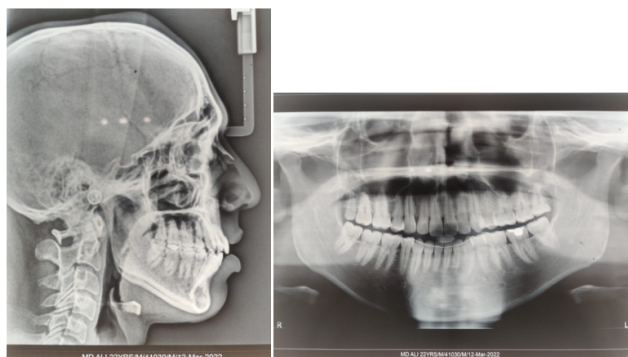


Fig. 7: Post treatment lateral cephalogram and OPG

5. Conclusion

This clinical case report highlights how a case with crowding can be managed with Extraction of four premolars by appropriate use of Mulligans bypass arch technique in conventional MBT prescription along with meticulous preservation of anchorage. Treatment included the retraction of canines into extraction space followed by decrowding and retraction of anterior segment of teeth. Proper intercuspation of the teeth was achieved with a Class I molar and canine relationship. The maxillary and mandibular teeth were found to be esthetically satisfactory in the line of occlusion. Patient had an improved smile and profile.

6. Source of Funding

None.


7. Conflict of Interest


The authors declare no conflict of interest.


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