SKELETAL AND DENTAL CORRECTION OF SKELETAL CLASS II DIVISION 2 MALOCCLUSION IN THE EARLY PERMANENT DENTITION – A Case Report

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Abstract

Although most Class II orthopedic treatments have been recommended during the juvenile and adolescent growth stage (mixed dentition) using removable functional appliance, the introduction of fixed functional appliance has successfully stretched the boundaries of growth modification even in young adults with permanent dentition. One of the protocols for a patient towards the end of growth phase with Class II division 2 malocclusion has been Fixed Functional Appliance. Here a case report is presented where a similar malocclusion has been managed with Preadjusted edgewise mechanotherapy combined with Fixed Functional Appliance taking into consideration certain key factors that aid in long term retention.

Key words

Fixed functional appliance, Burstone intrusion arch, Registration Point and Retention.

Class II malocclusions are frequently observed in orthodontic practice. Droeschl found it to be 37% among the children between 6 and 15 years of age. Mc Namara reported mandibular retrusion as the most common characteristic of Class II malocclusion.

Class II division 2 malocclusion is a clinical entity which presents considerable difficulty in the provision of a stable treatment result. Angle defined "Division II as a syndrome characterized specifically by distal occlusion of the teeth in both lateral halves of the lower dental arch, but with retrusion instead of protrusion of the upper incisors. The tipping downward and inward of the upper incisors from their normal angle and the tipping lingually of the lower incisors in cases belonging to this division are caused by the lack of posterior alveolar growth. With this type of occlusal development, many of these patients may have excessive freeway space. A severe phenotype of this malocclusion with extremely deep overbite (100% overbite) covering at least one mandibular incisor in occlusion has been called cover-bite, or "Deckbiss" in its early German descriptions. Generally in Class II Division 2 malocclusions the mandibular denture is more distally placed in relation to the maxillary denture, as a compensating effect of this retrusion is a pronounced chin point, which partially offsets some of the facial profile disharmony. Many of these patients have well-developed or hypertrophied mentalis muscles, which increases the chin prominence from the standpoint of both soft-tissue and the skeletal dimension. In addition the lack of proportionate vertical growth may lead to over closure of the mandible, which projects the chin further forward. Cephalometrically these patients have a low mandibular plane angle, parallelism of the palatal-to-mandibular plane and a diminished anterior facial height.
However in this presented case, the malocclusion is primarily attributed to a high lip line. Orthodontic treatment of these cases should include intrusion of the maxillary incisors, to eliminate the non-physiologically high pressure exerted by the lower lip on these teeth and consequently to reduce the high risk of a post-orthodontic relapse.

Interincisor angulation is commonly held to be a critical factor in determining overbite depth. It was found that the anteroposterior relationship of the lower incisor edge to the upper incisor root centroid is more strongly related to overbite depth and it is suggested that this is a useful factor to take into account in planning treatment in Class II cases.

One such patient who displayed a severe Class II Div 2 tendency with problems in all three planes of space treated with Multibanded therapy combined with Fixed Functional appliance is discussed in this case report.

Fig: (1) Pre-treatment Photographs and Radiographs

Case Report

A 12-year male patient reported to our department with the chief complaint of irregularity of upper and lower teeth and difficulty in chewing. The general health of the patient was good with no significant medical history.
Clinical examination

The patient's height and weight was normal for that age.

Extraoral examination

In the frontal view, the patient exhibited decreased lower facial height and competent lips. The profile examination displayed convex profile with obtuse nasolabial angle, deep mentolabial sulcus with prominent chin and a decreased clinical FMA. Frontal smile showed high smile line.

Intraoral examination

Intraoral examination revealed square shaped upper arch with crowding in the anterior region. The upper centrals are retroclined and overlapped by the lateral incisors. Buccal Cross Bite was seen in relation to 14, 24, and 25. Severe Deep Bite present. Lower arch is V shaped with anterior crowding.

Radiographic examination

The panoramic radiograph showed the presence of all permanent teeth. The lower left 3rd molar bud is seen.

Cephalometric analysis

Revealed Class II skeletal base with Reduced Mandibular Length, Low mandibular plane angle, decreased lower facial height. A hypo divergent skeletal pattern was characterized by the long mandibular ramus and square gonial angle. Dental analysis showed retroclined upper incisors, intrusion of molars and extrusion of the anterior teeth. The maxillary incisors were retroclined resulting in an increased inter incisal angle.

CERVICAL VERTEBRAE shows distinct concavities in relation to Inferior Borders of C2, C3 and C4 corresponding to SMI 7 and 8, indicating Deceleration stage with 10 to 25% of adolescent growth left.

Diagnosis

Angle's Class II division 2 malocclusion on a Class II skeletal base with decreased mandibular body length and decreased lower facial height.

Treatment objectives

As one of the protocol for treatment at the end of growth phase in a class II division 2 malocclusion has been accepted as Fixed functional appliance, it was decided to treat this patient with Premadjusted edgewise mechanotherapy combined with Forsus fixed functional appliance. The objectives of treatment were defined as:

1. To correct the skeletal Class II pattern
2. To correct the Class II molar relationship.
3. To obtain an optimal overbite-overjet relationship.
4. Resolve the upper and lower anterior crowding.
5. Intrusion of maxillary anteriors.
6. Buccal Cross Bite correction of 14, 24 and 25
7. Correction of Bolton Tooth Size Discrepancy.

Treatment progress

Case was started using 022 slot Roth prescription with MBT prescription only for lower anteriors having -6° Torque to reduce the proclining effect of the Forsus Appliance. Initial alignment was completed with 016 Superelastic NiTi wire. Upper and Lower second molars were banded. This was followed by 016, 018, 020 Round Stainless Steel wires and then stabilized with Upper and Lower 19 X 25 Stainless Steel wire.

FORSUS Fixed Functional Appliance was attached at this stage. Acrylic incisal capping was cemented on Lower anteriors as an additional device to reduce the proclination of Lower Incisors caused by the Fixed Functional Appliance. Fixed Functional Appliance was removed after 1 year when the Class II Molar Relation was corrected. The Lower Cemented Incisal capping was also removed at this stage. This was followed by Burstone 3 piece Intrusion Retraction Arch. Then Upper and lower 19X25 Heat activated Rectangular NiTi wires were placed.
Fig: (2) Initial alignment and Leveling showing excessive overjet

Fig: (3) Forsus fixed functional appliance Occlusal view showing lower Acrylic incisal capping to prevent proclination

Fig: (4) Burstone Three-piece intrusion retraction arch.

At the end of the treatment Composite Build Up was done for the Upper Anteriors to compensate for the Bolton Discrepancy. Proximal stripping was done in lower anterior region for stability of results.

Treatment results

The active treatment time was 3 years 1 month. The treatment results are:

- Increase in mandibular length and improvement in facial profile
- Increase in lower anterior facial height.
- Proclination of upper and lower anteriors with decrowding. Intrusion of maxillary anteriors leading to ideal overbite. In Addition to the skeletal changes, Class I molar relationship was achieved on both sides by the distal movement of upper molars and mesial movement of lower molars
- Increase in inter incisal angle

Radiographically the root paralleling was good and the patient was reviewed every 6 months. The results achieved were found stable during the last 2 years and 5 months. Superimposition of cephalometric tracings showed downward and backward rotation of mandible, which resulted in an increased lower facial height and 3mm intrusion of maxillary incisors.
DISCUSSION

A non-extraction treatment was planned mainly because of lip competence, and an obtuse nasolabial angle. Results achieved showed an overbite of around 3-4mm (30-40%) which is slightly above normal. The rationale behind leaving an overbite of 4mm was that the Intersection/Registration point described by some gnathologist as the ideal point for lower incisor contact is defined as the apex of a wedge formed by the meeting of the lingual inclines of the upper incisor. Overbites of 30-40% can take advantage of this wedge by making the contact area more horizontally oriented, increasing the stability of lower incisors. An orthodontic patient treated to 20% or less overbite has an occluding upper incline that is too vertically oriented; this can lead to moments tending to tip the lower incisor lingually.
Fig 6A showing 30%-40% overbite making contact area horizontally oriented – More stability
Fig 6B showing less than 20% overbite making contact area vertically oriented - Less stability

A Burstone 3 piece Intrusion Retraction Arch was used to deliver an intrusive and retractive force in the anteriors. The Class II molar relationship was corrected primarily by skeletal changes. Forsus Appliance also produced a 1mm distilization of the Upper Molar, which was also beneficial in correcting the Molar Relationship.

Fig 7A

Fig 7A & B) Superimposition of pre and post treatment cephalometric tracings

The maxillary and mandibular incisors were proclined, which resulted in ideal axial inclination. The ideal axial inclination has been sited as factor in overbite stability. At end of the treatment, patient displayed good facial esthetic with normal lower facial height and a pleasing smile arc.
<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>PRETREATMENT</th>
<th>POST-TRT</th>
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<tr>
<td><strong>Sagittal Skeletal Relationship:</strong></td>
<td></td>
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<tr>
<td>SNA</td>
<td>83°</td>
<td>81°</td>
</tr>
<tr>
<td>SNB</td>
<td>73°</td>
<td>76°</td>
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<tr>
<td>ANB</td>
<td>10°</td>
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<tr>
<td>Wits appraisal</td>
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<td>4 mm</td>
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<td><strong>Dental Base Relationship:</strong></td>
<td></td>
<td></td>
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<tr>
<td>Upper incisor to NA (mm/deg)</td>
<td>-6 mm and 13°</td>
<td>3 mm and 19°</td>
</tr>
<tr>
<td>Lower Incisor to NB (mm/deg)</td>
<td>5 mm and 25°</td>
<td>7 mm and 28°</td>
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<td>Upper Incisor to SN Plane</td>
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<td>111°</td>
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<td><strong>Dental Relationship:</strong></td>
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<tr>
<td>Inter- incisal angle</td>
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<td>Lower incisor to APo line</td>
<td>0 mm</td>
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<tr>
<td>Over bite</td>
<td>9 mm</td>
<td>4 mm</td>
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<tr>
<td>Overjet</td>
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<td>3 mm</td>
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<td><strong>Vertical Skeletal Relationships:</strong></td>
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<td>Maxillary - mandibular planes angle</td>
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<td>17°</td>
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<td>SN Plane – Mand Plane</td>
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<td>Upper anterior face height</td>
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<tr>
<td>Maxillary Length</td>
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<td>121 mm</td>
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<td><strong>Soft Tissues:</strong></td>
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<td>+2 mm</td>
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<tr>
<td>Nasolabial Angle</td>
<td>112°</td>
<td>107°</td>
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RETENTION.

An upper Hawley's upper Retainer with Anterior Bite Plate was delivered and for the Lower Arch a Fixed Lingual Bonded Retainer was placed. Patient was recalled periodically to check the stability of the results achieved, it was realized that Good Intercuspation was the key factor in maintaining the stability. However a mild deepening of the bite was observed and the patient was instructed to continue wearing the Bite Plane Appliance. TMJ form and function was found to be normal during the Retention Period.

![Retention images](image)

Fig – 8 Retention-Extra Oral and Intra Oral photographs taken 2 ½ years after Debonding

Conclusion

Correction of skeletal Class II pattern in a patient towards the end of growth period has several limitations. Precise treatment planning taking clinical and radiological findings into consideration and with an efficient appliance system, we can overcome most of the limitations and aim to achieve the essential goals of treatment, thereby stretching the boundaries of Growth Modification Treatment.

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References


