Treatment of Class II Malocclusion by Nonextraction Therapy using Microimplants and Pendex Appliance

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ABSTRACT

The treatment of Class II cases is always challenging. Treatment modalities involve growth modulation, expansion of the maxillary arch or extraction of premolars and retraction. The patient compliance is key factor in success of the treatment. In the present article a male patient with Class II malocclusion was treated using a Pendex appliance to simultaneously expand the upper arch and distalize the molars. The maxillary anteriors were retracted using microimplants. The results were satisfactory. This approach can be used in patients with mild skeletal discrepancy and with slight increase in the gingival display.

Keywords: Class II malocclusion, Pendex appliance, Microimplants.

INTRODUCTION

Class II malocclusion is one of the most common problems in orthodontics, with an estimated one-third of all orthodontic patients treated for this condition. Many treatment options are available for the correction of Class II malocclusion, depending on which part of craniofacial skeleton is affected. In general, treatment of Class II malocclusion can include growth modification in terms of mandibular advancement (to treat patients with mandibular skeletal retrusion), maxillary retraction (to treat patients maxillary skeletal protrusion), maxillary molar distalization (to treat patients with maxillary dentoalveolar protrusion) treatment approaches include the use of functional or removable appliance, extraoral traction by means of headgears, and fixed appliances combined with Class II elastics.

Unfortunately, successful orthodontic treatment using these modalities often relies heavily on the patients willingness to wear the suggested appliance. For example, regarding the wearing of headgear, apart from the discomfort and extraoral appearance of the patient (factors that can reduce their cooperation), there is also a risk of headgear causing accidental injuries on eye and other facial tissue damage. In addition, the elastic cervical strap puts a nonphysiologic strain on the cervical spine and on the neck muscles and in some patients it causes irritation of the skin, furthermore, cephalometric evaluation has revealed that extraoral appliances can produce skeletal effects in addition to maxillary molar distalization which could be a drawback when there is no need for growth guidance.

For all the above reasons, nonextraction treatment as well as noncompliance approaches have become very popular for the correction of Class II malocclusions. Many treatment modalities, known as ‘noncompliance appliance’ have been introduced which minimize or eliminate the need for patient compliance in order to activate the relevant force system. A major category is the ‘noncompliance distalization appliance’ which is used for the treatment of patients with maxillary dentoalveolar protrusion. These appliances derive their anchorage in an intramaxillary manner and act only in the maxillary arch in order to move the molars distally, e.g. pendulum appliance, the distaljet, repelling magnets, the Jones jig, the new distalizer, etc. The force systems of these appliances can be flexible or rigid and can be positioned buccally or palatally.

Nickel-titanium coil springs have been used in conjunction with various noncompliance appliances to produce rapid maxillary molar movement because it was found that they have greater spring back and superelastic properties than stainless steel coils. Furthermore, the most important reason for their implementation in noncompliance distalization devices is their ability to exert a very long range of constant, light and continuous force.
Among the distalization appliances that use nickel-titanium coil spring as a buccally positioned flexible force system, the Jones jig is one of the most commonly used in noncompliance Class II orthodontic treatment.13

CASE REPORT

A 13-year-old male patient reported with the chief complaint of protruding anterior teeth. The pretreatment facial photographs showed a symmetric face and a convex facial pattern with a deep mentolabial sulcus and a retruded mandible constricted maxillary arch (Figs 1 and 2). Clinical examination showed complete permanent dentition without dental caries, intraoral photograph shown increase overjet of 5 mm and overbite of 6 mm and Class II molar and canine relationship.

Cephalometric analysis showed Class II skeletal base: ANB: 8 mm, SNA: 89°, SNB: 81°, U1 TONA: 30, 6 mm, L1 to NB: 32, 6 mm, L1 TOMP: 102°.

TREATMENT OBJECTIVES

1. Expansion of upper arch
2. Correction of the profile
3. Correction of proclination
4. Establishing Class I molar and canine relationship
5. Retention of correction

TREATMENT PLAN

Maxillary arch was expanded using Pendex appliance. The appliance consisted of an expansion screw in the center, and two distalizing screw springs made up of 0.30 TMA wire, appliance was stabilized with extensions bonded on the occlusal surface of premolars (Fig. 3).

The expansion was achieved in about 3 months and molar distalization was accomplished simultaneously followed by bonding of upper and lower arch with 0.022” slot MBT appliance, after leveling and aligning the upper anterior was retracted using microimplants placed between premolars (Fig. 4). Implants provided stable anchorage for retraction of anteriors. The molars were not taxed during this phase.

After 18 months of treatment, there was a good improvement in the profile esthetics. The upper and lower arches were well aligned, Class I molar and Class I canine relationship was achieved. There was a good intercuspation established between upper and lower arches (Figs 5 and 6).

PENDEX APPLIANCE

- Initial wire 0.014” u/l NiTi placed
- 0.016” u/l NiTi wire placed
- 0.017” × 0.025” NiTi wire placed
- 0.019” × 0.025” NiTi wire placed
- 0.019” × 0.025” stainless steel with soldered hooks placed along with miniscrew implants for retraction of anterior teeth.

DISCUSSION

Recently, many noncompliance appliances and approaches have been presented to overcome the problem of compliance and correct Class II malocclusion efficiently. However, when
Fig. 3: Pendex appliance occlusal view

Fig. 4: Midtreatment photographs

Fig. 5: Post-treatment extraoral photographs

Fig. 6: Post-treatment intraoral photographs
noncompliance distalization appliances are used to correct Class II malocclusion, three other problems are usually evident:

1. Anchorage loss of the anterior dental unit expressed as forward movement and proclination of the anterior teeth.
2. Distal tipping of the molars during active maxillary molar distalization.
3. Anchorage loss of the posterior dental unit also in the forward direction that takes place after distalization during the subsequent stage of anterior tooth retraction and final alignment of the dental arches.18

Lately, conventional implants have been used as stationary anchorage for maxillary molar distalization and other orthodontic purposes. These are complicated and invasive placement and removal surgical procedures must be done by an experienced oral and maxillofacial surgeon. They also need complex laboratory procedures, to facilitate safe and precise implant placement and to connect implant with the dentition. In addition, placement locations are limited, they are more expensive than other anchorage modalities, and a waiting period for osseointegration before loading the implants with orthodontic forces is necessary, increasing total treatment time.19

In contrast to conventional orthodontic implants, miniscrew implants as temporary anchorage devices are now in widespread use by orthodontists, because they are not associated with the above-mentioned problems of orthodontic implants. Miniscrew has the following advantages as temporary anchorage devices for orthodontic purposes:19

1. Their placement and removal do not require a particular surgical procedure, in contrast to orthodontic implants, miniplates and onplants that require flap surgery.
2. Miniscrew implants can be easily placed at chairside in a single appointment by the orthodontist.
3. There is no need for complicated clinical and laboratory procedures to facilitate safe and precise implant placement or to connect it with the teeth.
4. Miniscrew implants can be immediately loaded, reducing total treatment time.
5. Miniscrew implants, unlike conventional orthodontic implants, can be placed in a great variety of locations of the maxilla and the mandible.
6. The absolute anchorage they provide eliminates undesirable effects on the teeth that otherwise would have been used as anchorage.
7. Patient cooperation is limited to maintaining oral hygiene.
8. Miniscrew implants can be easily removed.
9. Cost is relative compared with other conventional methods used for anchorage, and much lower than orthodontic implants. Noncompliance maxillary molar distalization with miniscrew implants used as temporary stationary anchorage could be an efficient treatment option for correcting Class II malocclusion.

Our treatment results support this new type of treatment biomechanics, since our patient, with a Class II malocclusion and large overjet and overbite, was successfully and efficiently treated to a well-functioning Class I occlusion after 18 months without extractions and without a need for patient cooperation, except for maintaining, as much as possible, optimal oral hygiene. By using this, initially to distalize the maxillary molars and later with conventional full-fixed orthodontic appliances to retract and intrude the anterior teeth, after the total orthodontic treatment, a stable, functional occlusion with good posterior intercuspation and bilateral Class I molar and canine relationship were achieved, and lip competence and facial balance were improved.

As is obvious from the superimpositions of the tracings of the lateral cephalometric radiographs of the patient after maxillary molar distalization, there were no side effects of conventional noncompliance distalization appliances in terms of forward movement and proclination of the anterior teeth or distal molar crown tipping. The corresponding superimpositions after treatment showed that after active distalization and during anterior tooth retraction and final alignment of the dental arches, there was no anchorage loss of the posterior teeth in the forward direction.

Nevertheless, a unique advantage of this appliance is that it uses miniscrew implants for temporary and stationary anchorage to support both molar distalization and anterior tooth retraction, after a slight chairside modification. Thus, the side effects of anchorage loss of the anterior dental unit during molar distalization and the posterior anchorage loss in terms of mesial molar movement during anterior tooth retraction are eliminated (Figs 7A and B).

Figs 7A and B: Superimposition areas: Basion nasion plane at Ptm point, ANS-PNS at ANS
CONCLUSION

Expansion of maxillary arch along with distalization of molars provides an efficient way to handle the Class II dentoalveolar problems. The Pendex appliance along with microimplants can be used successfully for this purpose.

REFERENCES