Case Report

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Achieving Class-I Molar Relation in Patients with Unstable Occlusion Using Pendulum Appliance – A Case Report

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ABSTRACT

A 21 years old male patient, presented with the chief complaint of irregularly placed upper and lower front teeth and difficulty in chewing. Medical history was non-significant. Extraoral examination revealed a mesofacial face with grossly facial symmetry, straight profile, and average to high mandibular plane angle with a toothy smile. Lower lip was thick and everted. Functional examination revealed a normal temporomandibular joint. He was treated with a non-extraction treatment plan that involved bilateral maxillary molar distalization using Hilgers pendulum appliance followed by fixed mechanotherapy.

Key words: Molar distalization, Non-extraction treatment, Pendulum appliance.

INTRODUCTION

Orthodontists have in their hands the ability to change the physiognomy of the human race. Not only do they hold the patient's appearance in their hands, but they also hold his health. It is the orthodontist's responsibility to secure for the patient not only the improved appearance given him, but the best ultimate positioning of the teeth and jaws in relation to one another so that the patient has continued use and comfort from them, and is more secure from periodontal breakdown than he was before treatment. Broadest spread of roots and the widest base is seen in upper first molar.[1] In order to support this broad base, nature has furnished skulls with a correspondingly broad buttress of bone on which the upper first molar rests. This buttress upper maxilla. Atkinson more aptly and conveniently entitles it the "key ridge".[2] The key ridge remains constant to the bones of the cranium throughout life, regardless of race or type, and regardless of what happens to the teeth or alveolar process. In orthodontic diagnosis the value of the key ridge has been established beyond a doubt.

In orthodontic treatment strategies there is a definitive paradigm shift from one that is based on hard tissues to one based on soft tissues[3]. This has resulted in orthodontists becoming more observant with extraction treatment plans and exploring possible non-extraction treatment approaches. Maxillary molar distalization is one such method. An estimated 25-30% of all orthodontic patients can benefit from maxillary expansion, and 95% of Class II cases can be improved by molar rotation, distalization, and expansion[4]: Therefore, distal movement of the upper molars is usually involved in class II treatment to achieve class I molar and canine relationships.

Extraoral traction is the traditional approach to distalize molars, especially in the maxilla:[5] Headgear is effective in maxillary molar distalization, however, this method of class II correction depends greatly on patients cooperation[6]. The advantage of this method is the stability of extraoral anchorage with fewer side effects on the non-distalized teeth. Such a treatment requires much compliance from the patient. In the treatment of dental class II malocclusions, several methods[7-11] have been introduced for molar distalization. Among these, non-compliance intraoral appliances are gaining popularity because they minimize the dependence on patient cooperation.

In 1992, Hilgers introduced the Pendulum appliance for distalization without the need for patient compliance[9]. Since then, other intraoral maxillary first-molar distalizers such as the Distal Jet[12], Jones Jig[13], and Frog appliance[14] have been developed. The Pendulum appliance is simple, noncompliant, easy to fabricate in the dental lab and easy to activate. The main objective of the pendulum appliance is to move teeth bodily minimizing the risk of root resorption. The objective of case report is to present a distalization of molar with Pendulum appliance in Class II malocclusion in which removal of the teeth is not a choice.

Case Report

Section I: Pretreatment assessment:

History and clinical examination

A 21 years old male patient, presented with the chief complaint of irregularly placed upper and lower front teeth and difficulty in chewing. Medical history was non-significant Extraoral examination [Figure 1] revealed a mesofacial face with grossly

facial symmetry, straight profile, and average to high mandibular plane angle with a toothy smile. Lower lip was thick and everted. Functional examination revealed a normal temporomandibular joint.

The intraoral examination [Figure 2] revealed a permanent dentition except the right mandibular third molar. Patient exhibited good oral hygiene and periodontal health. Patient exhibited Angle's class II malocclusion and a class I incisor relation with 4 mm of overjet and 6 mm overbite. Maxillary arch showed mild proclination of the maxillary incisors and mild crowding. There was mild crowding in the mandibular arch with blocked out right canines. Lower midline was shifted to the left by 1 mm of upper midline. [Figure 2]

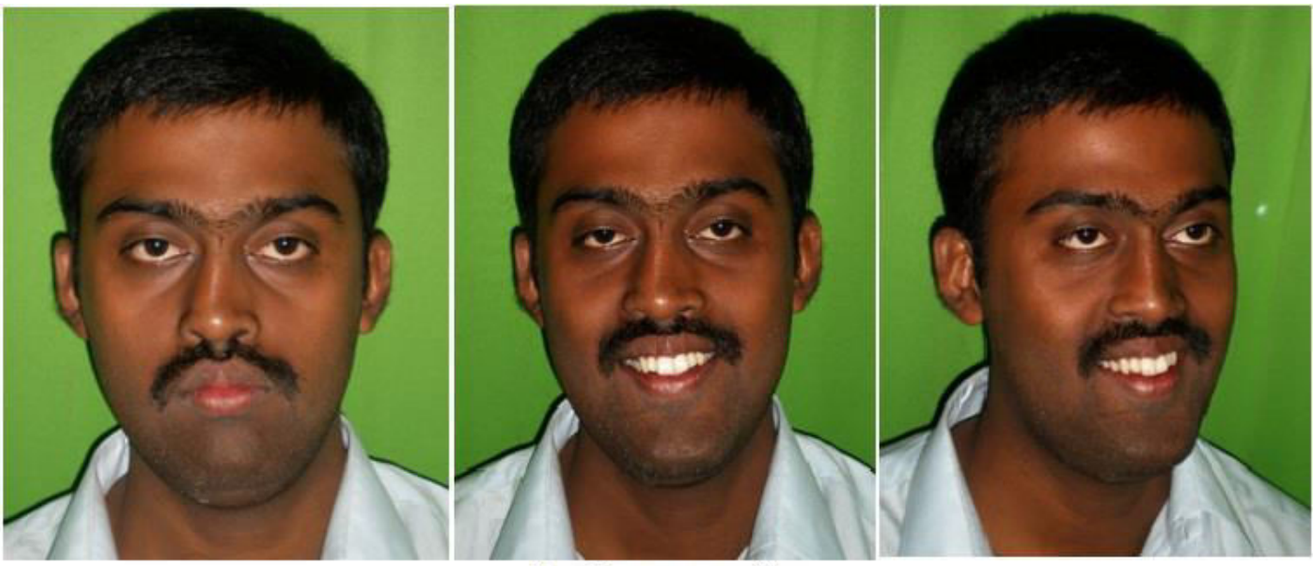

Figure 1: Pretreatment extraoral photos

GENERAL RADIOGRAPHIC EXAMINATION

Pretreatment radiographs taken were panoramic radiograph [Figure 4] and lateral cephalogram [Figure 5].

Panoramic radiographic examination revealed the presence of all the permanent teeth and impacted 48.

Figure 2: Pretreatment intraoral photos

The alveolar bone levels and root morphologies of the teeth were normal. Temporomandibular joint space appeared optimal with normal size, shape, and position of condyle heads.

Panoramic radiographic examination revealed the presence of all the permanent teeth and impacted 48.

Figure 3: Pretreatment study models

Cephalometric evaluation [Table 1] revealed skeletal Class I jaw bases, horizontal growth pattern, decreased lower anterior facial height, mild proclination of the maxillary incisors, increased overjet and overbite, straight profile, and acute nasolabial angle and normal mentolabial sulcus.

Figure 4: Pretreatment panoramic radiograph

Figure 5: Pretreatment lateral cephalogram

The alveolar bone levels and root morphologies of the teeth were normal. Temporomandibular joint space appeared optimal with normal size, shape, and position of condyle heads.

Variable	Pre-treatment	Post-treatment
I) Sagittal skeletal relationship		
SNA (°)	80	80
SNB (°)	78	78
ANB (°)	2	2
II)Dental base relationship		
Upper incisor to NA (mm/°)	12/36	12/29
Lower incisor to NB (mm/°)	8/28	11/38
Upper incisor to SN plane (°)	115	108
Lower incisor to mandibular plane angle (°)	98	109
III)Dental relationship		
Lower incisor to APog line (mm)	5	8.4
Overbite (mm)	6	2
Overjet (mm)	4	2
IV)Vertical skeletal relationship		
SN planet to Mand plane (°)	25	28
Face height ratio	37:62	56:86
Jarabak ratio (%)	71.9	69
V)Soft tissues		
Nasolabial angle (°)	82	90

Table 1: Pre and post treatment cephalometric values

Cephalometric evaluation [Table 1] revealed skeletal Class I jaw bases, horizontal growth pattern, decreased lower anterior facial height, mild proclination of the maxillary incisors, increased overjet and overbite, straight profile, and acute nasolabial angle and normal mentolabial sulcus.

MODEL ANALYSIS

Model analysis revealed 5.5 mm crowding in maxillary arch and 4 mm crowding in mandibular arch. Both Carey's and Ashley Howe's indices indicated non-extraction case. Bolton analysis showed both total maxillary and anterior maxillary excess.

DIAGNOSIS AND ETIOLOGY

Patient with Angle's Class II malocclusion on a skeletal Class I base with horizontal growth pattern, mild crowding in maxillary and mandibular arch, mild proclination of maxillary incisors, increased overjet and overbite, impacted 48, with mandibular midline shifted to the left by 1mm of upper midline, straight profile, and acute nasolabial angle with decreased lower anterior facial height.

Probable etiology may be early loss of maxillary deciduous posteriors leading to mesial movement of the maxillary permanent buccal segment.

TREATMENT OBJECTIVES

- To establish bilateral Class I buccal segment relationship
- To resolve maxillary and mandibular arch crowding
- To correct upper incisor proclination
- To establish normal overjet and overbite
- To correct dental midlines
- To normalize the acute nasolabial angle
- To achieve soft tissue balance and harmony.

TREATMENT PLAN

Considering the patient's growth status and horizontal growth pattern, it was decided to treat the patient with a non-extraction treatment approach with the help of maxillary molar distalization with pendulum appliance to open up space to align crowded maxillary anteriors and simultaneously correct the Class II molar relation.

Appliance

Hilgers pendulum appliance for maxillary molar distalization followed by fixed mechanotherapy with preadjusted edgewise appliance (MBT Prescription, 0.022″ slot).

SPECIAL ANCHORAGE REQUIREMENT

Nance's palatal button to be used immediately after completion of the molar distalization.

PROPOSED RETENTION STRATEGY

Fixed lingual bonded retainers for the upper and lower anteriors and removable wrap around retainers extending till the second permanent molars in both the arches.

Figure 6: Pre-distalization with pendulum appliance photos

SECTION II: TREATMENT MECHANICS

Treatment was started with the extraction of upper third molars and banding of the maxillary first molars followed by alginate impression for the laboratory fabrication of the pendulum appliance. After the fabrication of the appliance, it was cemented with the desired activation as suggested by Hilgers. Molar distalization phase continued for 7 months till Class I molar relation bilaterally with some overcorrection was achieved [Figure 7]. After the completion of the distalization, the pendulum appliance was removed, and a Nance palatal button was given on the next day as anchorage reinforcement. Fixed mechanotherapy was started using preadjusted edgewise appliance, MBT prescription 0.022″ slot. After the initial alignment with 0.016″ NiTi and leveling with 0.019″×0.025″ of maxillary teeth, 0.019″×0.025″ stainless steel wire was given, with active tie-backs to retract the maxillary premolars bilaterally.

In the mandibular arch, alignment was started using 0.014″NiTi archwire and was followed by placement of open coil spring between lower right lateral incisor to first premolar on 0.018″SS arch wire. Subsequent to the adequate space opening for the mandibular right canine, piggyback 0.014″nickel–titanium (NiTi) archwire was used to move the canine.

After adequate leveling in lower arch 0.019″×0.025″ NiTi archwires were given followed by 0.019″×0.025″ SS archwires.

Figure 7:Post-distalization photo

Later on, both upper and lower second molars were banded, and 0.016″ NiTi archwires were given along with settling elastics for the appropriate occlusal settling. Active treatment lasted for 2 years and 4 months after which fixed appliance was removed.

Figure 8: Open coil spring in lower arch

Figure 9: Treatment progress photos

Lingual and palatal bonded retainer of 0.0175″coaxial

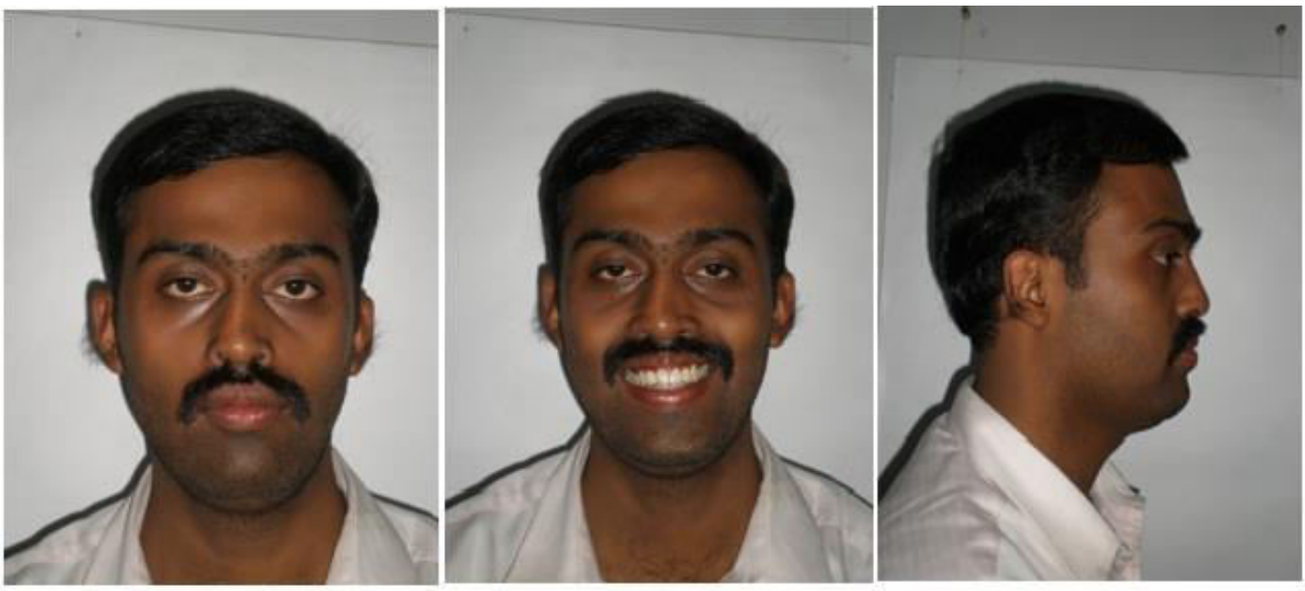

Fig 10: Post-treatment extraoral photos

Figure 11: Posttreatment intraoral photos

stainless steel wires were fixed immediately post debonding. Upper and lower impressions were made and wrap around retainers were also delivered [Figures 10-12].

INTERPRETATION OF POST-TREATMENT CEPHALOMETRIC VALUES

Post-treatment radiographs taken were panoramic radiograph and a lateral cephalogram [Figures 13 and 14]. Both maxillary and mandibular incisor inclinations were normalized along with a normal overjet and overbite.

RESULTS ACHIEVED

Maxillary molar distalization helped in achieving stable class I molar relation and gaining adequate space for crowded maxillary anteriors to be aligned along with correcting the incisor proclination. Soft tissue profile improved drastically due to the correction of the maxillary incisor proclination. Ideal overjet and overbite were achieved at the end of treatment.

The posttreatment occlusion revealed Class I incisor, canine, and molar relation with good buccal segment intercuspation. Dental

Figure 12: Posttreatment study models

midlines were matching. Evaluation of post-treatment panoramic radiograph showed good root parallelism along with normal alveolar bone levels. A consonant smile arc was achieved and smile esthetics was improved significantly.

Figure 13: Posttreatment lateral cephalograms

APPRAISAL

CRITICAL

The 21 year, old male patient with Angle's Class II malocclusion on a skeletal Class I base with horizontal growth pattern, mild crowding in maxillary and mandibular arch, mild proclination of maxillary incisors, increased overjet and overbite. The post-treatment results achieved were highly satisfactory with good posterior occlusion and excellent facial soft tissue balance and

Figure 14: Posttreatment panoramic radiograph

harmony. The patient and parents were highly satisfied with the treatment result. The use of a non-extraction treatment approach such as molar distalization, helped in avoiding over retraction of maxillary incisors and dishing in the patient's profile. The case report also emphasizes the cautious use of extraction treatment protocol .Post-treatment dental midlines were matching with the Class I canine and molar relation bilaterally and normal overjet and overbite.

Post-treatment panoramic radiograph showed good root parallelism which will ensure good stability of the results

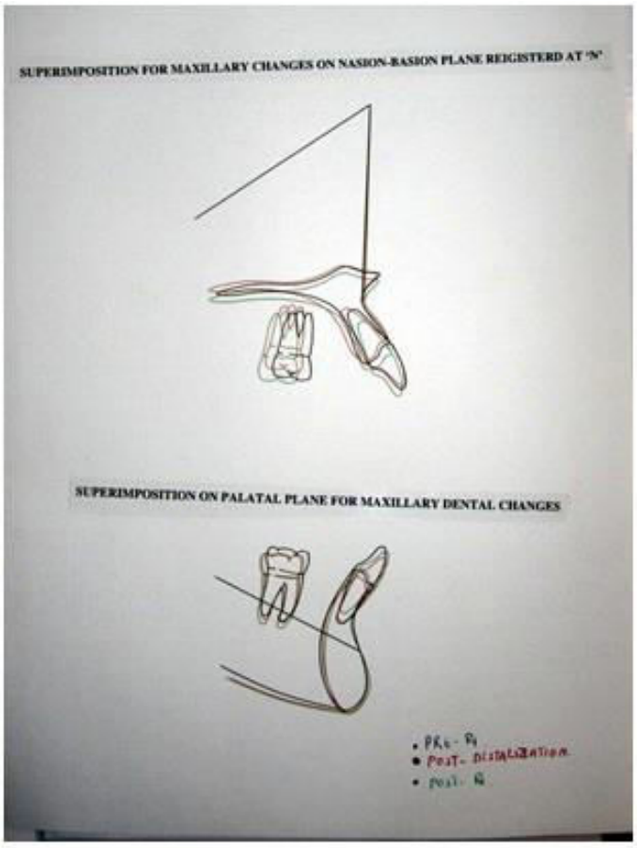

Fig 15: Superimposition tracings

achieved. The patient was advised that the unerupted third molar in the fourth quadrant may warrant extraction at a later date.

DECLARATION OF PATIENT CONSENT

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient has given his consent for his images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

CONFLICTS OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Atkinson, Spencer, R. Some Anatomic Factors Guiding Treatment Therapy, Am. J. orthodontics 1942;28:704–720.
2. Atkinson SR. Discussion, JADA 1926; 13: 1097.
3. Nene SS. Indian Board of Orthodontics case report: Orthodontic management of a Class II malocclusion in a growing patient with bilateral maxillary molar distalization. J Indian Orthod Soc2016;50:264-9.
4. Corbett, M.C.Slow and continuous maxillary expansion, molar rotation, and molar distalization, J. Clin. Orthod 1997;31:253-263.
5. Cangialosi TJ, Meistrell ME Jr, Leung MA, Ko JY. A cephalometric appraisal of edgewise Class II nonextraction treatment with extraoral force. Am J Orthod Dentofacial Orthop 1988; 93:315-24.
6. Marure PS, Patil RU, Reddy S, Prakash A, Kshetrimayum N, Shukla R. The effectiveness of pendulum, K-loop, and distal jet distalization techniques in growing children and its effects on anchor unit: A comparative study. J Indian Soc Pedod Prev Dent 2016;34:331-40.
7. Gelgör IE, Büyükyilmaz T, Karaman AI, Dolanmaz D, Kalayci A. Intraosseous screw-supported upper molar distalization. Angle Orthod 2004;74:838-50.
8. Cangialosi TJ, Meistrell ME Jr, Leung MA, Ko JY. A cephalometric appraisal of edgewise Class II nonextraction treatment with extraoral force. Am J Orthod Dentofacial Orthop1988;93:315-24.

9. Hilgers JJ. The pendulum appliance for Class II non-compliance therapy. J Clin Orthod 1992;26:706-14.
10. Ghosh J, Nanda RS. Evaluation of an intraoral maxillary molar distalization technique. Am J Orthod Dentofacial Orthop1996;110:639-46.
11. Byloff FK, Darendeliler MA. Distal molar movement using the pendulum appliance. Part 1: clinical and radiological evaluation. Angle Orthod 1997;67:249-60.
12. Carano, A. and Testa, M.The Distal Jet for upper molar distalization, J. Clin. Orthod 1996;30:374-380.
13. Brickman, C.D.; Sinha, P.K.; and Nanda, R.S.: Evaluation of the Jones Jig appliance for distal molar movement, Am. J. Orthod 2000;118:526-534.
14. Bayram, M.; Nur, M.; and Kilkis, D.: The Frog appliance for upper molar distalization: A case report, Kor. J. Orthod 2010;40:50-60.