



ISSN: 0975-833X

RESEARCH ARTICLE

MAXILLARY MOLAR DISTALIZATION WITH PENDULUM APPLIANCE FOR CORRECTION OF MINOR CROWDING WITH CLASS II DIV 1 SUBDIVISION MALOCCLUSION

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ARTICLE INFO

Article History:

Received 06th November, 2017
Received in revised form
23rd December, 2017
Accepted 14th January, 2018
Published online 28th February, 2018

Key words:

Molar Distalization,
Pendulum Appliance,
Class II Div 1 Subdivision Malocclusion,
Minor Crowding.

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Citation: Dr. Shruti Gupta, Dr. Kamlesh Garg, Dr. Sumit Jain, Dr. Ankita Sinha and Dr. Shikha Singh. 2018. "Maxillary molar distalization with Pendulum appliance for correction of minor crowding with Class II div 1 subdivision malocclusion", *International Journal of Current Research*, 10, (02), 65608-65613.

ABSTRACT

18-year female patient presented skeletal class I jaw base with unilateral Class II molar relationship with minor crowding in upper and lower arch. Unilateral distalization was planned in upper arch to correct end on molar relation and palatally block out permanent canine followed by extraction of deciduous canine and impacted third molar with respect to upper left quadrant. Pendulum appliance was used to distalize upper left molar. With Pendulum appliance distalization was achieved by 4 mm within the duration of 4 months. Bilateral Class I molar and canine relationship was achieved in a span of 18 months. Thus Pendulum appliance was proved to be simple, efficient and non complaint.

INTRODUCTION

In the orthodontic era, molar distalization of the maxilla is considered as a challenging treatment. Contemporarily, Maxillary molar distalization for non-extraction treatment of Class II patients has found more attention. A. M. Schwarz, suggested that the distalization of mesially drifting molars can be done by either an exclusively intraorally anchored plate-type appliance (Schwarz, 1947) or an extraorally anchored headgear device (Schwarz *et al.*, 1988; Teuscher, 1994; Vardimon, 1994). But Headgear has its unfavorable outcomes. Patient cooperation is one of them, which may lead to compromise the effect of the treatment results and increase the duration of treatment. These difficulties led many orthodontists to evolve the intraoral devices and techniques for molar distalization. Pendulum appliance, Repelling magnets (Gianelly, 1989; Bondemark *et al.*, 1992), Acrylic Cervical Occipital Appliance (ACCO) (Dietz, 2000), Wilson Bimetric Distalizing Arch (BDA) (Wilson, 1978; Wilson, 1978), Distal jet (Carano, 1996) K-loop (Kalra, 1995), and Jasper jumper¹³ exhibited limited implication in the clinical practice as they have the adverse reciprocal effects, such as flaring of the anterior teeth, mesial movement of the mandibular teeth, and extrusion of the premolars (Cope, 1994).

Though the Intra arch devices are simple, their effectiveness in the clinical practice led them to use frequently in the treatment. In 1992, Hilgers introduced the Pendulum appliance for distalization without the need for patient compliance. It has gained more acceptance as it is simple and non compliant. The easiness in the fabrication at the dental lab and its activation decreases the chair-side time. It is a combination of Nance acrylic button and 0.032" TMA (Titanium Molybdenum Alloy) springs. Nance acrylic button is placed in the palate for anchorage with 0.032" TMA (Titanium Molybdenum Alloy) springs where TMA springs provide a light, continuous force to the upper first molar without affecting palatal button. This case report describes unilateral distalization of molar with Pendulum appliance in minor crowding with Class II subdivision malocclusion.

Case History

18 year female presented with the chief complaint of irregularly placed teeth in the upper and lower front side of the jaw. Her medical history was non contributory. On clinical examination, no abnormality was found with temporomandibular joint. Her facial form was mesoprosopic and symmetric, with a straight and harmonious soft tissue profile (Fig 1). Intra orally, she had an end-on molar relation on the left side and Class I molar relation on the right side, retained deciduous upper left canine, palatally placed upper

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left permanent canine, crowding in upper and lower front teeth, 2 mm overjet and 20 % overbite. Upper midline was shifted to right side by 1 mm with respect to facial midline. (Fig.2). Panoramic radiograph showed third molars impacted. Cephalometric analysis indicated Skeletal Class I base, created by the combination of an orthognathic maxilla and a horizontal mandibular growth pattern (Fig 3)

Treatment Objectives

- To relieve maxillary and mandibular dental crowding.
- To correct end on molar with respect to upper left quadrant.
- Dental midline correction with respect to facial midline.



Fig. 1. Pre treatment Extra oral Photographs



Fig. 2. Pre treatment Intra oral Photographs

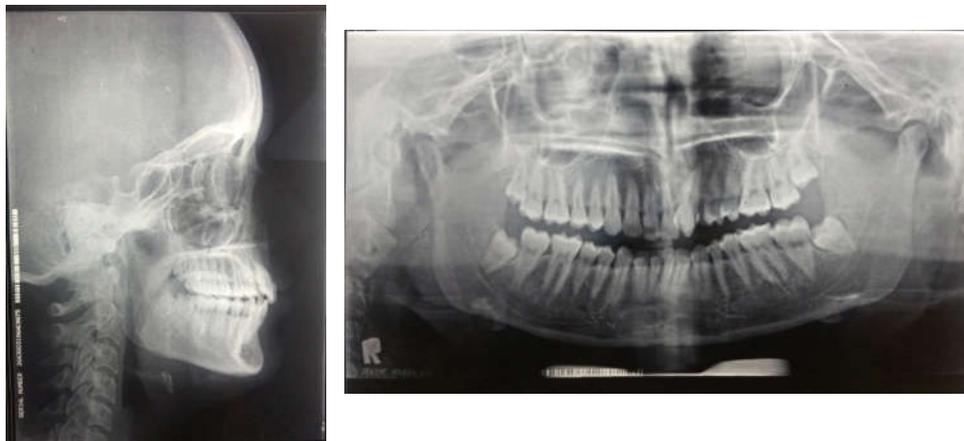


Fig. 3. Pretreatment panoramic and lateral cephalometric radiographs

Treatment plan

Extraction of deciduous canine and impacted third molar followed by unilateral distalization of the maxillary molar was planned using a Pendulum Appliance with respect to upper left quadrant, followed by fixed appliance therapy.

Treatment Progress

Fixed orthodontic appliance of 0.22" x 0.028" MBT (Ormco, Glandora, CA) self ligating brackets were placed along with molar bands on upper and lower arch except palatally placed upper left permanent canine followed by deciduous upper left canine was removed and 0.014" NiTi wire was placed in both arches. In next visit fabricated pendulum appliance was inserted in banded maxillary molars. (Fig 4) Before active distalization was started, the upper third molars were removed. The appliance was activated by 90° (Fig 5).



Fig. 4. Insertion of pendulum appliance

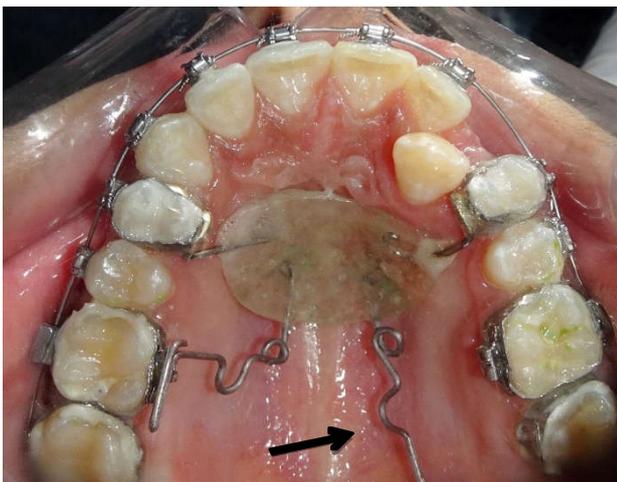


Fig. 5. Activation of pendulum appliance

The molar started moving distally. Along with pendulum, NiTi open coil spring was placed with 0.017" x 0.025" stainless steel wire between second premolar and first molar in upper left quadrant. At the end of four months, the molars showed a distal movement of 4mm. (Fig 6) In lower arch proximal stripping was done to relieve the crowding in anterior teeth. A midtreatment panoramic radiograph showed distalization of first molar and revealed bone deposition on the mesial aspect.



Fig. 6. After 4 months of molar distalization

This was followed by the use of transpalatal arch as a means of retention. Once enough space had been gained, the palatally placed canine was bonded and actively pulled into the arch with a piggy back 0.014" NiTi wire on 0.017x0.025" SS base arch wire. Open coil springs placed distal to upper left lateral incisor which led to the distalization of premolars (Fig 7). The upper and lower arch were leveled and aligned in 12 months. Coordination of both the arches was carried out on 0.019x0.025" stainless steel wire. The treatment was completed in 18 months. At the debond visit, maxillary and mandibular 3-3 lingual retainer was bonded and Begg's retainers for both the maxillary and mandibular arches were delivered.

Treatment Result

A perfect occlusion was obtained resulting in bilateral Class I molar and canine relation along with normal overjet and overbite. (Fig 8) The maxillary first molar was distalized by 4 mm within the duration of 4 months. The upper dental midline was coinciding to facial midline. The position and inclination of the upper incisors were within normal limits. Over all treatment outcome was much pleasing in delivering a consonant smile to the patient preserving the pleasing facial profile of the patient.

Table 1. Cephalometric findings

Variable	Pre treatment	Post treatment
SKELETAL		
SNA	80°	80°
SNB	78°	78°
ANB	2°	2°
GO GN-SN	28°	30°
DENTAL		
U1-SN	96°	100°
U1-NA	15°, 3mm	21°, 5mm
L1-NB	25°, 4mm	24°, 3mm
IMPA	100°	98°
SOFT TISSUE		
U LIP-S LINE	1mm	1mm
L LIP-S LINE	1mm	1mm

DISCUSSION

There are appliances which can be used in intraoral distalization of the molar for minimum patient discomfort and co-operation. Pendulum appliances though, succeeded by many non-complaint molar distalization appliances which provide a range of forces to produce a broad, swinging arc (or pendulum) of force from midline of the palate to the upper molars.



Fig. 7. Piggy back 0.014" NiTi on 17x25" SS Base arch wire



Fig. 8. Post treatment Facial Photographs



Fig. 8. Post treatment Intra oral Photographs

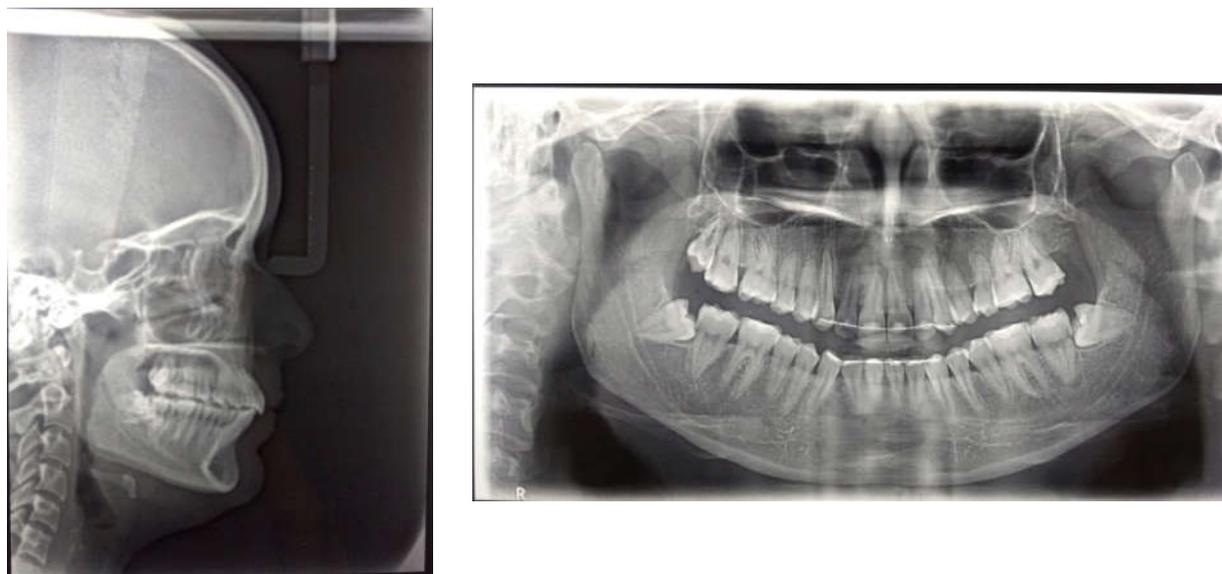


Fig. 9. Post treatment panoramic and lateral cephalometric radiographs

As the centre of resistance of the molar is being considered, the force is applied occlusally. Therefore, the molars are not distalized in a bodily manner, but distal tipping followed by uprighting is expected. Minor crowding in upper and lower anterior teeth, palatally blocked out canine predispose the case for non extraction protocol. The patient's second molar had also erupted. Influence of second molar on the distal movement of the first molar is always in controversy. Some clinicians reported that the presence of second molar increases the treatment duration produces more tipping of molar, and more anterior anchorage loss. Though literature showed that the molar distalization, is best achieved in the state when second molars are not erupted, a recent understanding on molar distalization by Kinzinger, who stated that molar distalization is even possible in fully erupted second molars and it is the angulation of second molar and third molar tooth bud, which is a detrimental factor not the eruption status that is necessary, to take a decision or not. Previous studies have showed that the pendulum appliance produces a molar distalization between 3.14 and 6.1 mm. In our case, 4 mm of distalization of first molar was gained within the duration of 4 months. After the first phase of distalization treatment with Pendulum the transpalatal arch was placed to stabilize the molar until the alignment of the canine was accomplished.

Conclusion

Pendulum appliance is a non complaint intraoral molar distalization appliance commonly used in the treatment of class II malocclusion. This case report provides a valuable insight in opting for molar distalization in Class II subdivision malocclusion. 4 mm of distalization was achieved in 4 months and Class I molar and canine relation was achieved.

Acknowledgement

The authors wish to acknowledge Dr. Nikhil Goyal for his support.

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