REVIEW ARTICLE

Reliable molar distalizer: A review

P. Vasanthan1, J. Sabarinathan2, S. Sabitha3, R. C. Sathishkumar1

1Department of Orthodontics, Vinayaka Mission's Sankarachariyar Dental College, Ariyanoor, Salem, Tamil Nadu, India, 2Department of Orthodontics, Penang International Dental College, Penang, Malaysia, 3Department of Oral & Maxillofacial Surgery, Vinayaka Mission's Sankarachariyar Dental College, Ariyanoor, Salem, Tamil Nadu, India

Abstract

Current orthodontic philosophies have been oriented toward various conservative treatment methods to eliminate extractions and also try to avoid the demand for patient compliance. The distalization of molars creates additional space within the alveolar arch, and it is of important value for the cases with minimal arch length discrepancy and Angle’s Class-II molar relationship associated with normal mandible. Several appliances have been advocated to distalize molars in the upper arch. But, recent advances in molar distalization appliance design provide more precise control in bodily movement of teeth enabling better treatment options in orthodontics.

Keywords: Conventional pendulum appliances, modified pendulum appliances, molar distalization

Correspondence

Dr. P. Vasanthan, Department of Orthodontics, Vinayaka Mission’s Sankarachariyar Dental College, Ariyanoor, Salem, Tamil Nadu, India. Email: orthovasu@gmail.com

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Introduction

Every time orthodontists have a treatment plan for the patient is “do we need to extract teeth, or else necessary space be created without extractions?” As we know, there is no clinically significant growth in the alveolar bone. Therefore, alternative solutions must be found to obtain space in which the teeth can be moved to correct the malocclusion.

In recent years, the percentage of patients having extraction as a part of orthodontic treatment has decreased considerably as experiments has shown that premolar extraction does not necessarily obtain stability of teeth alignment.

Distalization of molars is a popular method of creating additional space within the arch. It is of significant value for treatment of cases with minimal arch discrepancy and mild Class-II molar relationship associated with normal mandible.[1]

Indications

- Class-II molar relationship due to maxillary dentoalveolar protrusion
- Class-II molar relationship due to impacted/high labially placed cuspids
- Class-II subdivision cases requiring unilateral distal molar movement
- Class-II molar relationship due to ectopic eruption of either first/second bicusps
- Midline discrepancy cases
- Regaining the space loss due to mesial drift of first molars following premature loss of deciduous teeth
- Anchorage loss during active orthodontic treatment.

Treatment timing

Perhaps the best time to start distalization is late mixed dentition period, and it may be late after eruption of upper second molars. There appears to be some combined effect as dentition transit from deciduous to permanent. Because clinically erupting canines and premolars often appear to follow molars as they moved distally.

Treatment planning and sequence (Figures 1-3)

- First phase/space gaining phase
- Second phase/consolidation phase.

Objectives of the first phase/space gaining phase

- To distalize the upper molars bodily
- To achieve generalized spacing through dento-alveolar widening
To correct molar inclination, rotation, and cross bite.

Objectives of the second phase/consolidation phase

- To achieve intrusion and retraction of the upper front teeth
- To close residual spaces.

Conventional Pendulum Appliance

Conventional pendulum appliance was developed by Hilger in 1992.\(^3\) It has right and left pendulum springs, formed from 0.032” titanium molybdenum alloy (TMA) wire, consists of a recurved molar insertion wire, a small horizontal adjustment loop, a closed helix, and a loop for retention in the acrylic button. Springs are extended as close to the center of the palatal button as possible to maximize their range of effect, to allow simplest insertion into the lingual sheath and to minimize forces to an acceptable range. Anterior part of appliance can be retained by banding first premolar and then soldering a retaining wire and then use these teeth as major anterior anchorage source. Nance acrylic button is made as large enough to prevent any tissue impingement. Jack Screw is incorporated into the Nance button if expansion is required. Screw is activated about one-quarter turn for every 3 days. This appliance is called Pend-X [Figure 1].

Preactivation and Placement

Spring is bent parallel to the midpalatal line. After insertion of pendulum spring arm into the lingual sheaths, one-third of activation is lost. It obtains 60° activation. Molar bands are cemented without springs engaged and anterior portion of appliance is adjusted and placed properly. Once appliance is placed the pendulum spring is brought forward with finger pressure the mesial end of the required loop is held with a weingart pliers and spring is seated in lingual sheath. The horizontal adjustment loop allows for some lingual compression of spring during placement. As the molar is moved distally, it moves an arc towards the midline of the appliance [Figure 4].

Reactivation and Stabilization

Patient should be recalled every 3 weeks. Activation of spring is done by holding the helix with plier and pushing the spring distally toward midline and then reinserted.

Molars can be stabilized in any of the four ways.
1. Nance portion is removed, and full fixed appliance is bonded
2. Upper utility arch holds molar back with incisors as anchorage.
   The buccal segments are retraced using elastomeric chain.
   Nance button is placed after removal of pendulum appliance
3. Whole arch is bonded, and arch wire is placed with omega loops placed mesial to molar tube
4. Headgear is given for stabilization.\(^4\)

Advantage

Use of 0.032 TMA springs delivers continuous force to the upper first molar without affecting the palatal button.\(^5\) Activation can be done before appliance placement.
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Disadvantage
Pure bodily movement of the molar is not seen, and hence, a tendency toward cross bite occurs.

Modifications
M-pendulum
In 1999, Schuzzo, Pisani and Takemoto, introduced M-pendulum appliance. Horizontal loop is inverted mesially. This allows bodily movement of both roots and crown of the molars. Once distal movement has occurred, the loop is opened and activated which produces a buccal and distal uprighting of the root. The inverted loop should not be activated until the spring is deactivated following each stage of distalization [Figure 5].

Advantages
True bodily movement of the molars is achieved.

Modified Pendulum Appliance with Removable Arm
Pisani and Takemoto along with Vecchia (2000) introduced this particular modification to the appliance.[6]

Appliance design
7 mm-9 mm length of 0.032” TMA wire is doubled over to form bayonets. Each bayonet is attached to M-pendulum arm using a laser welder or by wrapping 0.010” ligature around the arm and soldering the unit. Each bayonet is embedded in the acrylic used to create Nance button producing sheaths to insert the removable arm and are activated in the working cast as desired. The appliance is placed in the oral cavity, and terminal ends of arms are inserted into lingual molar band sheath. Removable arms can be reactivated with debonding the occlusal rest of Nance button [Figure 6].

Advantages
It produces a distal molar movement at a continuous rate of 1.5 mm/month for as long as necessary as compared to the conventional pendulum or M-pendulum which produce 3 mm distalization in 3-4 months.

Modified Pendulum Appliance for Anterior Anchorage Control
This latest modification was introduced by Pablo Echarri and Schuzzo in the year 2003.

Appliance design
This design consists of four removable arms for both first and second molars. The internal diameter of four stainless steel (SS) tubes embedded in the acrylic corresponds to that of removable TMA arms. The second molars are distalized after which arms are left passively in place for anchorage and first molar arms are activated for distalization.[7] Pendulum is replaced with a Nance button after first molar distalization. A 0.016 SS passive arch wire is placed to avoid any incisor protrusion. E-chain is used.
to distalize second and first bicuspid. If the anterior anchorage is critical, palatal acrylic should be kept out of contact with the incisors. Second bicuspid arm should not be cut for spontaneous distalization to prevent the incisor protrusion [Figure 7].

Advantages
Greater anchorage control is achieved.

Conclusion
Distalizing teeth has always been a challenge to orthodontist of which molar distalization is most difficult. Hilger’s conventional pendulum appliance and its modifications distalize the upper molars with mild class II molars relationship associated with normal mandible. Pendulum and its modification appliances provide more precise control in bodily movement of teeth enabling better treatment option.

References