



ORIGINAL RESEARCH PAPER

Orthodontology

A REVIEW ON MOLAR DISTALIZATION IN ORTHODONTICS

KEY WORDS:

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ABSTRACT

The distalization of molars is of significant value for treatment of cases with minimal arch discrepancy & mild class II molar relationship associated with a normal mandibular arch & acceptable profile. A variety of treatment modalities includes those that are heavily dependent on patient compliance to non-compliance such as extraoral traction, removable appliances, fixed intra & intermaxillary. Advances in mechanotherapy and changes in treatment concepts has been made possible by better understanding of tooth movement, bone physiology, biomechanics and newer biomaterials. Refinement of appliances has concentrated mainly on achieving bodily movement of the molar rather than tipping. An increase in implant usage for distalization is appreciated and have ushered a better orthodontic treatment. The need of the hour is an appliance which embodies the advantages of the intraoral, extraoral methods and eliminates the disadvantages of both. Further researches are necessary before coming to a final stand on the issue.

INTRODUCTION

Over the past decade, non extraction treatment & non compliance therapies have become more popular in the correction of mild to moderate class II malocclusions. Conventional treatment of class II cases requires distal movement of maxillary molars to achieve a class I molar & canine relation. One of the non-compliance therapies and fairly recent concept is the molar distalization which has been effectively used in the correction of malocclusion. Advances in mechanotherapy and changes in treatment concepts have reduced or minimized the need for extraction in severe discrepancies. Various techniques are currently employed in non-extraction therapy in the treatment of a malocclusion. An appliance system independent of the patient cooperation was needed and then evolved the molar distalizers (other than headgears). The magnitudes of moments, forces, moment to force ratio and their constancy should be taken care of while designing the appliance (Burstone)⁴.

HISTORICAL PERSPECTIVE

Distal movement of maxillary first molars is a common goal in the treatment of class II molar relationship and in the resolution of tooth size/arch length discrepancy in the maxillary arch. After early cephalometric studies have showed that little or no distal movement of upper molars was produced by class II elastic treatment of that era, the head gear was reintroduced as a means of moving the upper molars back. Patient compliance plays a major role in success of head gear therapy. The extraoral traction (headgear) has been used to redirect the maxilla & distalize the maxillary denture. **N.W.Kinsley(1892)** was the 1st person to try to move the maxillary teeth backwards, with the help of extraoral forces. While **Weingberger (1926)**, in "Historical review in orthodontics" states extra-oral anchorage was first given by **Gunnel** in 1822 and **Guiford** using headgear for correction of protruded upper teeth in 1866. **Knapp(1899)** proposed the 'tooth regulating device'. **Kloehn(1947)** designed headgear we know today, since then based on his concept number of headgears have been developed. **Gould(1957)** used cervical & occipital pull for distalization. The difficulties of headgear and patient cooperation requirement stimulated researchers to develop new intraoral techniques for molar distalization. **Wilson(1978)** utilized three dimensional biometric distalizing arch. **Blechman and Smiley(1978)**, **Gianelly et al(1992)** used Japanese NiTi Coils; **Bondemark and Kuroi(1994)** used magnets. **Hilgers(1992)** developed the pendulum appliance. **Jones (1992)** used an open coil jig; **Varun Kalra(1995)** K-loop molar distalizer; **Aldo A and Testa M 1996** distal jet

appliance; **Greenfield(1995)**, developed fixed piston appliance; **Erverdi and Koyutürk(1997)** used magnets and Ni-Ti coil springs for correction of Class II molar relationship. **Arturo Fortini(1999)**, introduced first class appliance; **Keles and Sayinsu(2000)** introduced intraoral bodily molar distalizer; **Byloff et al(2006)** introduced bone anchored pendulum appliance⁴; **Seung-Min Lima; Ryoan-Ki Hong(2008)** used mini-implant system¹².

CLASSIFICATION

The appliances for molar distalization into two categories

- I. Extraoral or intaoral appliances
- II. Removable appliances or fixed appliances⁸.

EXTRAORAL APPLIANCES

- **Removable appliances** are:
 - Extra oral traction
 - Sagittal appliance
 - Tube plates
 - ACCO
 - Removable maxillary distalization splint.

INTRAORAL APPLIANCES

Fixed appliances are

I. INTRA-ARCH APPLIANCES - includes

A) FLEXIBLE PALATALLY POSITIONED DISTALIZATION SYSTEM

- Pendulum appliance & its modifications
- Distal jet & its Modifications
- Intraoral bodily molar distalizer
- Simplified molar Distalizer
- Keles slider
- Fast back appliance
- Nance appliance with NiTi coil springs

B) FLEXIBLE BUCCALLY POSITIONED DISTALIZATION SYSTEM

- Jones jig & its modifications
- NiTi coil springs
- Magnets
- NiTi wires
- Biometric distalizing arches
- Carriere distalizer

C) FLEXIBLE PALATALLY & BUCCALLY POSITIONED

- Green field molar distalizer

D)RIGID PALATALLY POSITIONED SYSTEM

- New distalizer
- Veltris distalizer

E) HYBRID APPLIANCE

- First class appliance

F) TRANPALATAL ARCHES FOR MOLAR DISTALIZATION

- Distalix
- TMA transpalatal arch
- Kele's TPA
- Nitanium palatal expander

II) INTER-ARCH APPLIANCES

- Herbst appliance
- Jasper jumper
- Mandibular protraction appliance

III) SKELETAL ANCHORAGE USING IMPLANTS

- Graz implant supported pendulum
- Straumann orthosystem
- Implant distal jet
- Miniscrew with transpalatal arches

IV) MANDIBULAR DISTALIZATION APPLIANCES

- Lip bumper
- Franzulum appliance
- Frozat appliance

DIAGNOSTIC CRITERIA

Distalization often has adverse effects of uncontrolled tipping, anchorage loss and third molar impaction. The focus will be on Diagnostic criteria for patient selection and countering strategies to combat the side effects⁵. Includes

I. INDICATIONS OF DISTALIZATION:

1. In non-extraction treatment of Class II malocclusion cases (minimal crowding or spacing anteriorly)
2. A minimal anterior- posterior maxillo mandibular discrepancy (ANB angle < 5°).
3. In low & average mandibular plane angle cases.
4. Magnitude and direction of mandibular growth during treatment should be favorable. Optimum results are obtained if treatment is done during active growth period. Generally 11 – 13 years for females & 14-16 years for males.
5. Profile should be acceptable with minimal facial changes.
6. In patients with mild arch length discrepancy; this should only be used in cases with less than 6mm of arch length discrepancy in the upper arch & a nicely aligned lower arch with minimal arch length discrepancy.
7. In cases where the upper permanent molars have moved mesially due to early loss of deciduous molars.
8. In patients where the second molars extractions are planned or where it has not yet erupted.
9. In second molar extraction cases where the third molars are well formed and erupting properly.

II. CONTRAINDICATIONS OF DISTALIZATION

1. Full or protrusive profiles.
2. In high mandibular plane angle cases.
3. Skeletal and Dental open bite
4. Class II & III skeletal pattern
5. Severe arch length discrepancy patients

CONCLUSION

In the early 90's, non-compliance therapies in various forms have become more prominent than ever before. The distalization of maxillary molars is of significant value for treatment of cases with minimal arch discrepancy & mild class II molar relationship associated with a normal mandibular arch & acceptable profile. A variety of treatment modalities have been suggested, including those that are heavily dependant on patient compliance to non compliance such as extraoral traction, removable appliances, fixed intra & intermaxillary appliances.

Extraoral traction with the headgear has been one of the earliest methods used to distalize which was shown to be very effective, but major disadvantage is lack of patient cooperation. There is also a risk of injury to the patient. This pitfall has been overcome by the non compliance intraoral appliances. But in intraoral methods the major disadvantage is the undesirable movement of the anchorage unit, the rate of breakage and relatively high cost of the appliance.

The need of the hour is an appliance which embodies the advantages of the intraoral, extraoral methods and eliminates the disadvantages of both. In this space-age were advancements are being made each and every day, one should expect that this lacuna will be filled in near future. The newer materials like Niti, Magnets, and composite plastics will no doubt revolutionize the procedure of molar distalization. Who knows one day the so called next generation force system by minimotors may be delivering effective distalizing forces on the molars intraorally¹¹. But as on today there is no all-in-one molar distalizing appliance.

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