Intra Oral Molar Distalization - A Review

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Abstract

Molar distalization procedures have been very useful in non-extraction borderline case management. Over the years the procedures have undergone much refinement to achieve treatment objective more precisely. This has been made possible by a better understanding of bone physiology, tooth movement, biomechanics and newer biomaterials.

The first attempt at molar distalization has a extra-oral forces with head gear. The type and direction of headgear is determined during diagnosis and treatment planning. This led to the evolution of various intra-oral molar distalization appliances. Refinement in these appliances has concentrated mainly on achieving bodily movement of the molar rather than simple tipping. Implants are being increasingly appreciated and have ushered a new era in orthodontic treatment. Molar distalization is no exception. Further research is necessary before reaching a final stand on the issue.


Introduction

Recent developments in mechanotherapy & changes in concepts have reduced the need for extraction in several types of discrepancies (1). Management of borderline cases has always surmounted controversies. An estimated 25-30% of all orthodontic patients can be benefited from maxillary expansion, and 95% of class II cases can be improved by molar rotation, distalization & expansion(2).

With the recent trend towards more non-extraction treatment, several appliances have been advocated to distalize molars in the upper arch. Certain principles, as outlined by Burstone(3) must be borne in mind when designing such an appliance must have Magnitude of forces, Magnitude of moments, Moment-to-force ratio Constancy of forces and moments, Bracket friction (frictionless appliances are preferable), Ease of use.

Indication of Distalization

Controversy reigns supreme over the molar distalization. Careful selection of case is therefore mandatory. It is not that molar distalization is tooth movement of choice in all malocclusions. The extraction of first premolars is much the common most line of orthodontic treatment. However in certain reasonably well defined instances, the distal movement of upper buccal segments is the mechanical treatment of choice. The indications

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for the distal movement of upper buccal segment are described.
1. Long distal bases
2. Buccal segment relationship
3. Minimal crowding or Spacing Anteriorly
4. Well aligned lower arch
5. Overjet reduction not indicated
6. Mesially inclined upper first molars

Other Considerations for Molar Distalization

1. Growth pattern: Cases showing unfavorable or vertical growth tendency are contraindicated for distal movements of upper buccal segments as it acts as a wedge between maxilla and mandible.

2. Degree of Overbite: Distal movement of upper buccal segments is associated with spontaneous reduction in the overbite. This advantage in deep overbite cases is however a disadvantage in Class III cases and open bite cases.

3. Second Molar: Unerupted second molars rarely create resistance to the distal movement of the maxillary first molars. Worms et al. (1973)⁴ noted that erupted second molars contact with first molars created a resistance to distal movement. This, in effect altered the position of centre of resistance of the first molar. Armstrong (1971) suggests that this movement be complete before the eruption of second permanent molar. Alternatively Graber (1969)⁵ suggest second molar extraction to facilitate distalization of the maxillary molars in selected class II division I malocclusion cases.

4. Age of the patient: An important factor, affecting even patients whom the headgear force is of sufficient magnitude and duration, is the dental age of the patient. Dewel (1967) and Hass (1970) observed faster rate of molar distalization in patients in mixed dentition to those in the adult dentition.

5. Presence of other force system: A force system applied for distalization of first molars may be negated or augmented but the presence of other force system like intraoral or elastics, arch wires.

Historical Perspective

Class II malocclusions may be corrected by combinations of restriction or redirection of maxillary growth, distal movement of maxillary dentition, mesial movement of mandibular dentition, and enhancement or redirection of mandibular growth. To establish Class I molar relationship and create space in the buccal segments for the canines or premolars, in non-extraction treatment modalities, distalization of the maxillary first molars is the aim. Commonly use mechanics include extra-oral forces such as headgear. Norman William Kingsley (1892) in described for the first time a headgear apparatus with which Class I relationship of the molars could be achieved (Jeckel and Rakosi, 1991). While Morse and Webb, 1973 have quoted “Weingberger in 1926, in his “Historical review of orthodontics” states that extra-oral anchorage was first described by Gunnel in 1822 and Guiford used a headgear for correcting protruding maxillary teeth in 1866”. Subsequently, extra-oral anchorage was rarely discussed until Kloehn in 1947 designed headgear as we know it today, since then based similar concept number of headgears have been developed and more recently stress has been laid on non-compliance intraoral distalizing devices. A brief review of the important and published literature follows:

Klein Phillip (1957)⁶ evaluated the effect of cervical traction on the upper permanent first molar. With orthodontic thinking greatly restrained to the idea of the possibility of distal movement of the upper first molar, he proved the effectiveness of cervical traction in the correction of Class II malocclusions. The study proved that growth of basic maxilla was altered and distal bodily movement of first permanent molars was accomplished in majority of cases.

CLASSIFICATION OF MOLAR DISTALIZATION

Appliance systems which are designed to produce distal movement of first molars have been available for over a century. Several methods are known to cause molar distalization, none of which work for all patients in all patients in all situations.
Appliance traditionally used to distalize molar can be divided into two categories:

A. Extra-oral
B. Intra-oral

**Intra-Oral Application**

Vast number of intra-oral appliances also has been advocated for the purpose of molar distalization.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Appliance</th>
<th>Introducer</th>
<th>Year</th>
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<tbody>
<tr>
<td>1</td>
<td>ACCO Appliance (7)</td>
<td>Dr. Hebert Margolis</td>
<td>1969</td>
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<tr>
<td>2</td>
<td>Three dimensional biometric distalizing arch and three dimensional mandibular lingual arch (8,9)</td>
<td>Wilson</td>
<td>1978</td>
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<td>3</td>
<td>Crozat technique (10)</td>
<td>Dr. George Crozat</td>
<td>1985</td>
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<td>4</td>
<td>Nance appliance with unilateral distalization (11)</td>
<td>Ghafari Joseph</td>
<td>1985</td>
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<td>5</td>
<td>Molar distalizing magnets (12)</td>
<td>Itoh et al.</td>
<td>1991</td>
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<td>7</td>
<td>Molar distalizing bow (14)</td>
<td>Jecket and Rakosi</td>
<td>1991</td>
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<td>8</td>
<td>Jones Jig (15)</td>
<td>Jones and White</td>
<td>1992</td>
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<tr>
<td>9</td>
<td>Nance appliance with unilateral distalization (16)</td>
<td>Reiner</td>
<td>1992</td>
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<tr>
<td>10</td>
<td>Pendulum (17)</td>
<td>Hiligers</td>
<td>1992</td>
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<tr>
<td>11</td>
<td>Pend-X (17)</td>
<td>Hiligers</td>
<td>1992</td>
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<td>12</td>
<td>Superelastic NiTi wire (Locasystem) (18)</td>
<td>Locatelli et al.</td>
<td>1992</td>
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<tr>
<td>13</td>
<td>Molar distalization splint (29)</td>
<td>Ritto A.K.</td>
<td>1995</td>
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<td>14</td>
<td>K-loop molar distalizer (20)</td>
<td>Dr. Varun Kalra</td>
<td>1995</td>
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<td>15</td>
<td>Fixed Piston Appliance (20)</td>
<td>Greenfield</td>
<td>1995</td>
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<td>16</td>
<td>Distal Jet Appliance (21)</td>
<td>Aldo A and Testa M</td>
<td>1996</td>
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<td>17</td>
<td>Fixed Palatal Expander (22) (modifications of Pendulum appliances)</td>
<td>Snodgrass</td>
<td>1996</td>
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<tr>
<td>18</td>
<td>Lingual Distalizer system (9)</td>
<td>Carano Aldo, A. Mauro &amp; Siciliani Giuseppe</td>
<td>1996</td>
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**References**


