How to Cite:
Ali, F., Soni, S., & Kaur, R. (2021). Molar distalization: A review. *International Journal of Health Sciences*, *5*(S2), 6–22. https://doi.org/10.53730/ijhs.v5nS2.5325

Molar Distalization: A Review

Faizan Ali
Department of Orthodontics & Dentofacial Orthopaedics, Desh Bhagat Dental College & Hospital, Desh Bhagat University, Mandi Gobindgarh, India

Sanjeev Soni
Department of Orthodontics & Dentofacial Orthopaedics, Desh Bhagat Dental College & Hospital, Desh Bhagat University, Mandi Gobindgarh, India

Rajdeep Kaur
Department of Orthodontics & Dentofacial Orthopaedics, Desh Bhagat Dental College & Hospital, Desh Bhagat University, Mandi Gobindgarh, India

***Abstract*---**Correction of Class II malocclusion by distalization of maxillary molars with intraoral appliances is a non-extraction treatment approach, which has been described as an alternative to Head Gear. From the past few years, the procedures have undergone rectification to achieve treatment objective more precisely. This has been made possible by a better understanding of bone physiology, tooth movement, biomechanics and newer biomaterials. Nowadays newer distalizing appliances, like the Jones Jig, Lokar distalizer and Carrière distalizer, have been developed which have compact designs and cause minimal discomfort to the patient. Refinement in these appliances is concentrated mainly on achieving bodily movement of the molar rather than simple tipping. These appliances are also operator friendly as these are easy to insert and remove. Researchers have focused on the simplicity and efficiency of these intraarch devices. Which improves the continuity and constancy of forces. Oral hygiene is easier to maintain and the need for patient compliance is eliminated.

***Keywords*---**molar distallization, malocclusion, tipping, head gear.

Introduction

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 several malocclusion. Molar Distalization in recent years has evolved as an alternative method of gaining space in the arch. Kingsley was the first person to try to move

***Corresponding author**: Ali, F.; Email: lonefaizan111@gmail.com*
Manuscript submitted: 18 Sept 2021, Manuscript revised: 9 Nov 2021, Accepted for publication: 12 Dec 2021

the maxillary teeth backwards in 1892 by using the headgear. Oppenheim pleaded that position of mandibular teeth is more correct and he advocated the use of occipital anchorage for moving maxillary teeth distally into correct relationship without disturbing mandibular teeth (1).

Molar distalization is one of the traditional approaches for class Il molar correction and space regaining with a normal mandible, could be obtained by either intraoral appliance (IOA) or the extraoral appliance (EOA). The main advantage of IOA over EOA distalizers is being not dependent on patient compliance. Appliance problems with headgear, like wearing time and aesthetic impairment lead to evolution of various intra oral distalizers and to its preference. Refinementin these appliances has concentrated mainly in achieving bodily movement of molars rather than simple tipping. Miniplates and mini-implants are increasingly appreciated in molar distalization and have ushered a new era in orthodontic treatment (2). Since patient compliance plays a major role in success of headgear therapy,these appliances are commonly utilized either for anchorage to support maxillary molars or for distalization of molars to correct the molar relation and to increase the arch length.These methods were found to be both efficient and reliablewhen used correctly3.In spite of their success in tooth movement, all these modalities have the major disadvantage of heavy dependence on the patient to comply and to follow directions.Thus appliances were introduced that minimized reliance on the patient and were doctor-controlled, so the intraoral molar distalizers were evolved (4).

Distalization is the process of gaining space within the arch by moving the terminal molars in a distal direction. The ideal time for distalization is during the mixed dentition period, prior to eruption of the second permanent molars. it is definitely much easier to move one molar distally as compared to two (ie first and second permanent molars). The amount of space gained is roughly equal to the amount of distal driving of molars. This approach is becoming popular due to the fact that the psychological trauma from extractions and extracting otherwise healthy teeth- can be avoided. Since space is easier to gain in the maxillary arch than in the mandible because of increased trabecular structure of supporting bone and increased anchorage provided by palatal vault, the distalization of maxillary molar becomes of significant value for the treatment of cases with mild to moderate arch discrepancy and class Il molar relationship associated with normal mandible (5).

Historical perspective

- *Kingsley* was the first person to try to move the maxillary teeth backwards in 1892 by means of headgear (6).
- *Oppenheim* advocated that position of mandibular teeth as being the most correct for individual and use of occipital anchorage for moving maxillary teeth distally into correct relationship without disturbing mandibular teeth. In 1944, he treated a case with extra-oral anchorage for distalizing maxillary molar.6

- *Renfroe* (1956) reported that lip bumper primarily devised to hold hypertonic lower lip caused a distal movement of lower molars sufficient to change class I to Class II.6
- *Gould* (1957) was first person to discuss about unilateral distalization of molars with extra-oral force.6
- Kloehn (1951) described the effects of cervical pull headgear.6
- Graber T-M. (1969) extracted the maxillary II molar and distalized the first molar to correct class II div1.7 Morse and Webb (1973) considered the indications for distalization of upper buccal segments. They demonstrated the construction and use of upper removable appliance to carry out upper molar distal movement.8Melson Birte (1978) studied the effects of cervical traction by using metallic implants in the maxilla as reference points as suggested by Bjork.9Baumrind et al. (1979) demonstrated from a study sample that it is physically possible to produce absolute distal displacement of maxillary molars by using headgear forces.10Hershey, Houghton, and Burstone (1981) evaluated and compared the effectiveness of five different face bow types in delivering unilateral distal force for orthodontic treatment requiring unilateral maxillary molar distalization.11Wilson and Wilson (1987) introduced modular phase appliances designed for multidirectional functional class II treatment by distallizing the molars.12Gianelly et al. (1988) demonstrated the use of intraarch repelling magnets to distalize maxillary molars in Class II malocclusion case.13Jones and White (1992) described the use of a new intraoral appliance for rapid Class II molar correction called Jones Jig (14).

Indications of molar distalization:

- 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 1st/2nd bicuspid.
- Midline discrepancy cases.
- Regaining the space loss due to mesial drift of 1st molars following premature loss of deciduous teeth.
- Anchorage loss during active orthodontic treatment.
- Contraindications for molar distalization6
- An end on or full Class-II molar relationship due to mandibular retrognathism.
- Retrognathic profile (Class-II skeletal with orthognathic maxilla and retrognathic mandible).
- Skeletal and dental openbite.
- Excessive lower anterior facial height (Dolicofacial form)
- Constricted maxilla.
- Patients with Class-II or Class-III molar relation.

Diagnostic criteria (case selection) 6

First step in diagnosis is to confirm forward positioning of maxillary molar position during centric relation through cephalometric records. Kotm cautioned against using extraoral force in patients with undiagnosed meniscus disorders who are borderline clickers with an "end on click". It may pushback maxillary molar; causing more posterior tooth contact backward (for true click), the mandible assumes its normal position but meniscus remains too far forward. Second step is to check the sagittal relationship by Pterygoid Vertical Plane (PTV)/Maxillary molar relationship and also by convexity prognosis.

Treatment timing

The mysteries of dentofacial growth and development have to be realized first before the start of treatment. Although there may be little consensus as to the best time to start molar distalization, there appears to be some agreement as to when it may be too late to start correction i.e. after eruption of the second permanent molar teeth. Best time to start/initiate molar distalization would be in late mixed dentition. Therefore:

- There appears to be some potential for synergistic effect as the dentition transitions from primary to permanent,
- Because clinically, erupting premolars and canines often appear to follow the molars as they are moved distally.

Intra Oral Methods for Distalizing Molars

K-Loop: 15

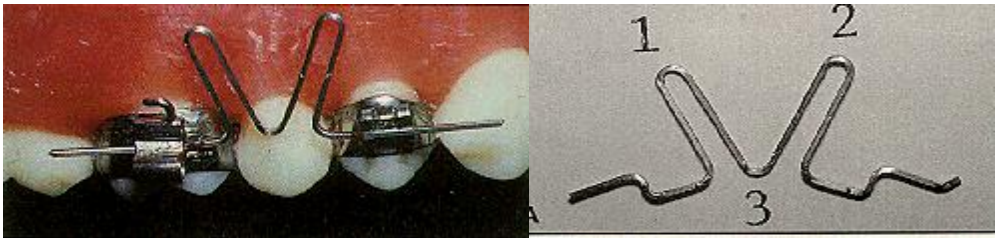


Figure 1. Introduced by *Varun Kalra* in 1995

Compones:

- 0.017" x 0.025" TMA wire K loopK Loop Reactivation
- Nance button to resist anchorage.

TMA can be activated twice as much as stainless steel before it undergoes permanent deformation, and the loop made of TMA produces less than half the force of one made with stainless steel. Pendulum Appliance:16
This was introduced by *Dr.Hilgers* in 1992. It is a hybrid appliance that uses a large nance acrylic button in the palate for anchorage, along with 0.032" TMA spring that deliver a light, continuous force to the upper 1st molars without

affecting palatal button. Thus, the appliance produces a broad, swing arc or pendulum of force from midline of the palate to the upper molars.

Appliance design

- Pendulum Spring (0.032" TMA): It is recurved and has a molar insertion with a small horizontal adjustment loop, a closed helix and a loop for retention in the acrylic button.
- Maxillary 1st molars are banded with 0.036" lingual sheath welded on them.
- Nance button: The palatal acrylic helps provide anchorage as well as retention for the pendulum springs and must be made as large as possible to prevent any tissue impingement.

Modified pendulum appliance/M-pendulum:17

It was introduced by *Dr. Scuzzo* et al in the year 1999. This was designed to overcome the unwanted tipping of maxillary molars during distalization. In modified pendulum appliance the horizontal pendulum loop is inverted, so that it will allow bodily movement of both the roots and crown of the maxillary molars. Once distal movement has occurred, the loop can be activated simply opening it. The activation produces buccal and/or distal uprighting of the molar roots and thus a true bodily movement, rather than a simple tipping or rotation.

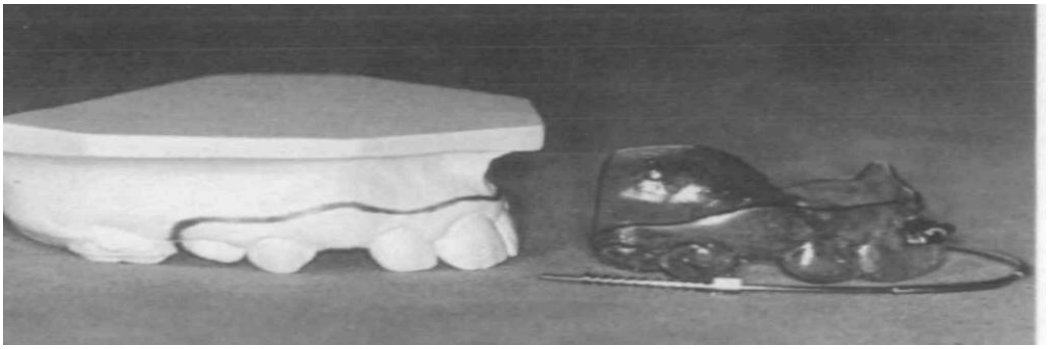
Jones Jig(1992) by jones and white14

The appliance design consists of open coil nickel titanium spring. The NiTi coil spring is slide over a .036 main frame, which has accessories for the attachment to the headgear tube and the arch wire slot in the triple tube of the upper molar. An eyelet tube is then placed anterior to the spring, such that when the eyelet tube is pushed distally the NiTi coil spring gets compressed exerting a distalization force on the molars'

Distal Jet for upper molar distalization:18,5
Developed by Dr.Carano and Dr.Testa in the year 1996. This was developed to overcome the disadvantages of other appliance.
Appliance Design:

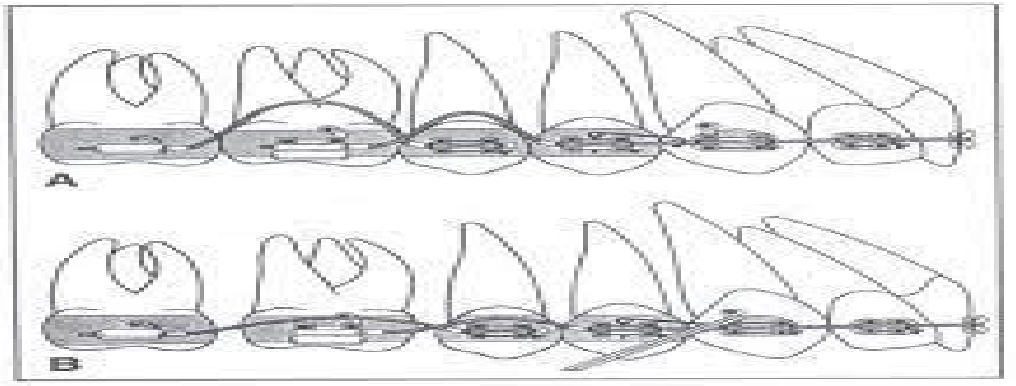
ilateral tubes of 0.036" internal diameter are attached to an acrylic nance button. A coil spring and a screw clamp are slide over each tube. (NiTi coil springs generate force of 150 Gms for children and 250 Gms for adult) The wire extending from the acrylic through each tube ends in a bayonet bends that is inserted into the lingual sheath of the 1st molar band. An anchor wire from the nance button is soldered to bands on the second premolars.

Molar distalization bow (MDB): 18,5



The molar distalizing bow (MDB) guarantees controlled distal Movement of the molars. It is easy to handle, can be removed at anytime and can be worn almost full time. There is not risk of injury by wearing the appliance.

Molar distalization with super elastic NiTi wire: 18,5



In this procedure (Neosentalloy) super elastic NiTi Wire with shape memory regular arch from is placed over the maxillary arch. As above shown in figure(A&B). 3 points are marked as follows on each side.

1. At the distal wing of 1st premolar bracket.
2. 5-7mm distal to the anterior opening of the molar tube.
3. Between the lateral incisors and canines

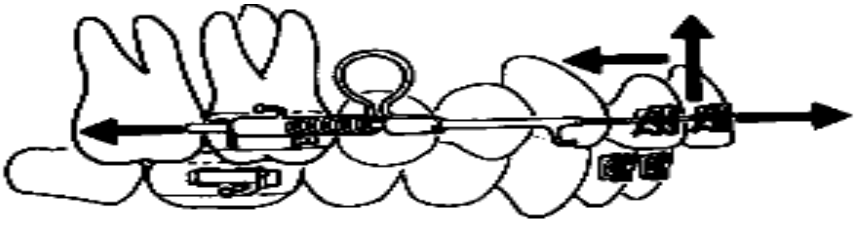
A stop is crimped to the arch wire at each of the posterior marks and hooks are added for intermaxillary elastics between the lateral incisors & canines.
Nickel – titanium Double loop system: 18,5. Once the second molars have erupted, the distal movement can be more difficult and time consuming and loss of anchorage is likely. In order to overcome this appliance was introduced. It is the product of DiGiancotti and Dr. Cozza (JCO 1998).

Appliance design

- The mandibular 1st and 2nd molars and 2nd bicuspids are banded & remaining mandibular teeth are bonded. A lip bumper is placed to prevent any extrusion from the use of elastics
- The maxillary molars & bicuspids are banded and anterior teeth are bonded the arch is ligated as usual.

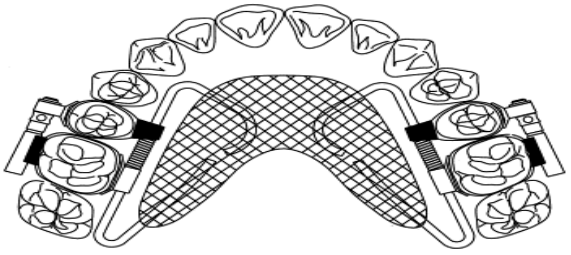
Molar distalization using NiTi coils: 18,5. This system uses 100gm super elastic coils to move maxillary molars distally using this with little / no patient cooperation, molars can be moved distally 1 to 1.5 mm / month with 8 to 10 mm activation of the 100gm coils that is used in conjunction with fixed appliance.
A passive 0.016" x 0.022" inch wire stops at about the incisal wings of premolar bracket is inserted and the coils are placed on the wire between the 1st premolar & the molars and the coils are activated 8-10 mm by compressing and maintaining them against the molars by crimpable hooks or gurin locks.

Wilson distalization mechanics: 18,5,12



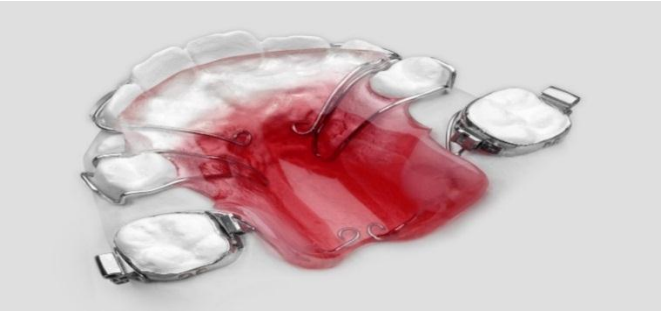
Wilson and Wilson (1988) have developed a system of removable Orthodontic appliances that can be used adjuncts to virtually any fixed appliance system. The Bimetric distalizing arch is used to produce distal movement of maxillary molars. This arch is Bimetric in that the anterior segment is made from 0.022" stainless steel. Elastic hooks are attached to the posterior segment in the region of the upper canines. An omega shaped stop is located in the premolar region. A 0.010" x 0.045" open round coil spring is placed between the distal leg of the omega stop and the face bow tube is located occlusally, it often is necessary to place to a vertical bayonet bend in the preformed blank in order to allow the anterior segment is made from 0.022" wire. The wire either lies over the slot in a 0.018" appliance or it can be located gingivally to the incisors brackets.

First class appliance: 18,5



This appliance is developed by Dr. Fortini, Lupoli, & Parri, in 1999. As the distal jet Appliance produced anchor loss as the molars are distalized, to overcome this 1st class appliance was developed. It can be used for both unilateral and bilateral distalization with minimal anchorage.

Modified Cetlin appliance 18,5



The removable distalizing plate is used to continue distalization of the upper molars when a super Class I relationship cannot be obtained using headgear. Gentle force of approximately 30 gms is used with minimal reaction on upper front teeth. Usually, they incline molar crowns distally and extrude the molars. For this reason, it is used along with extra oral force.

Transpalatal arch18,5

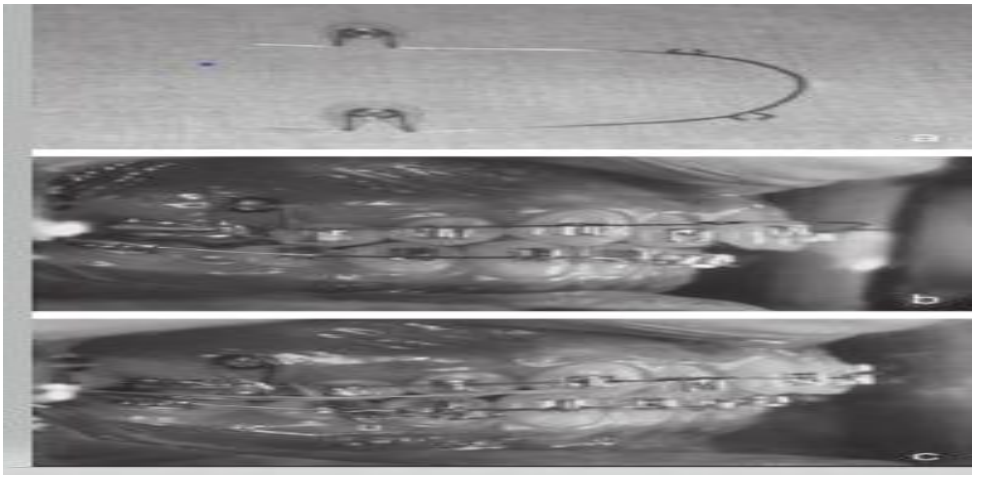
This type of arch, which spans the palate between the upper I molars, has been shown to be effective as an anchorage maintenance device by Nell as an active orthodontic appliance. Uses of the TPA: TPA has several functions including

- correction of molar rotation,
- molar stabilization or anchorage and
- molar distalization as well as other molar movements.

Upper molar distalization in Begg treatment: 18,5

In this method, the Bimetric arch principle of Wilson is gainfully employed. By using this method about 2 mm of arch length on each side can be gained by distalizing the upper molar, which helps in reliving moderate crowding in upper arch in growing child. This method not only distalizes the upper molar but also

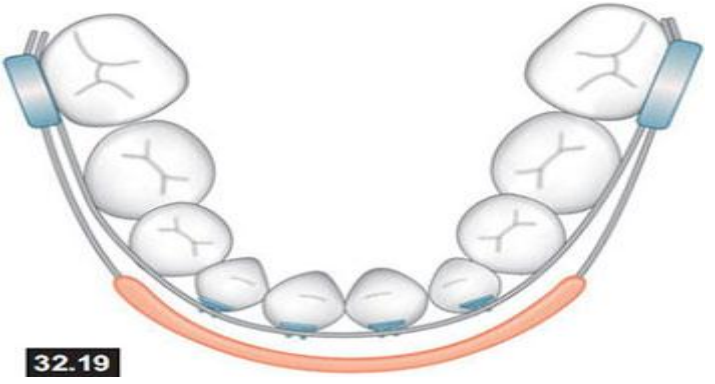
expands the upper canine, premolar area, besides opening the Ant. Deep bite so this method is especially useful in correction ofClass-II dental arches.



Arch wire design

The upper arch wire is made in 0.016" premium wire, the arch wire is shaped in an ideal form and there are no loops in the anterior area. The cuspid circles are kept abutting the cuspid brackets – 2 pear shaped loops (one on each side) are made touching the molar tubes. Their arms are 4 mm wide at the top and almost touching each other in the bottom. About 450 bite opening is placed. Equally distributed on either side of loop, a molar segment is given a wild toe in.

Denholz appliance: 18,5
It is the one, which uses muscle anchorage to distally drive the 1st permanent molars. Denholz appliance consists of molar bands with horizontal round buccal tubes, a base arch wire of .036" or .040" steel to fit the buccal tubes and a labial vestibular screen. Coil spring sections are added to the arch wire. Labial screen assembly is inserted into the tubes. The screen stands away from the anterior teeth.



32.19

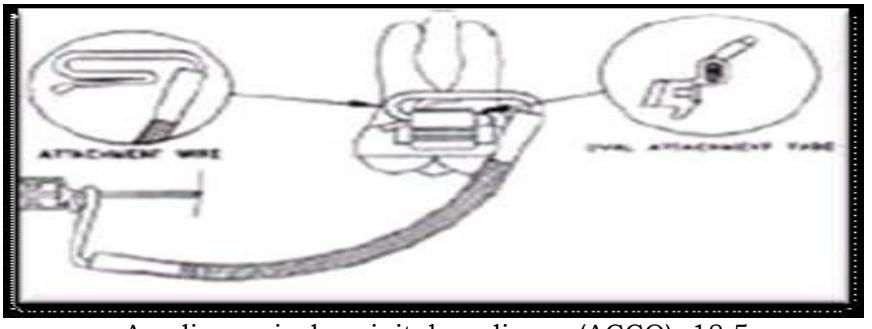
The wire and coil spring assemblage is usually worn only at home and during night, but it may be tied in place and worn at all times, if desired. The coil spring is attached to the acrylic labial screen, so that it is not lost through patient manipulation.If the patient exercises, one to two hours a day forcibly closing the lips over the labial screen will accelerate Treatment sequence.
Modified Nance appliance for unilateral molar distalization: 18,5

Modified Nance Appliance for Unilateral Molar Distalization TRACY J. REINER JCO 1992 Jul(402 - 404).
The appliance is a modification of the traditional Nance holding arch. The Class-II side of the .036" stainless steel wire frame work is finished with an anteriorly projecting arm like that of a quad helix, this arm is designed to resist the horizontal moment that would rotate the molars distally and cause expansion in the bicuspid region.

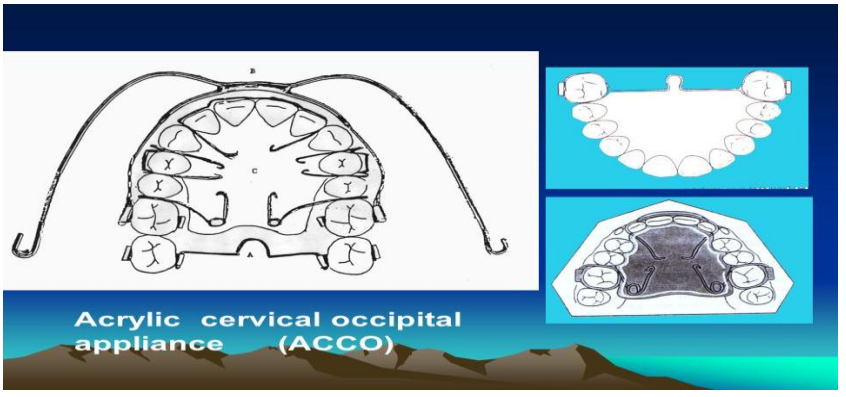
Lokar appliance: in 1994 by scott18,5

This appliance utilizes the continuous ideal force nickel titanium spring to generate rapid molar movement while minimizing patient's discomfort. Before placing the appliance, it is necessary to fabricate palatal anchorage system. In planning the anchorage system, one should remember that rigidity is mandatory for good anchorage. Equally important is the distribution of the reactive force generated by the appliance over a large area of the palate, which is the area of greatest curvatures.

Klapper Super Spring II: Introduced by Lewis Klapper,1997 for the correction of class II malocclusion. Flexible spring element that attaches between the maxillary molar and mandibular canine. The spring's open helical loop is twisted like a J hook into mandibular archwire.

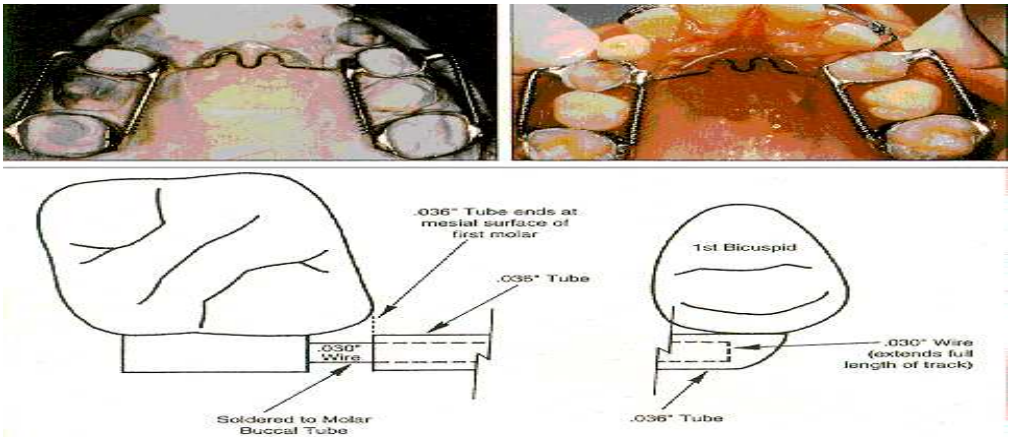


Acrylic cervical occipital appliance (ACCO): 18,5



Developed by Dr. Margolis.The appliance consists of a modified Adams clasps on the 1st premolars a labial bow across the incisors for detention and finger spring against the mesial aspects of the 1st molars.1 mm bite plate to disocclude posterior occlusion for the distal movement of molars.

Fixed piston appliance18,5



Most intraoral distalizing appliance tend to tip maxillary molar crowns distally. Greenfield (1995) designed an appliance for bodily movement of maxillary molars. The appliance components comprises of 0.036- SS tubing (soldered to bicuspids)

and 0.030' SS wires (soldered to first molars). Nance can be reinforced with 0.040" SS wire (for control of anterior anchorage). Superelastic NiTi wire having 0.055' (internal diameter) is used and 2 mm split rings as stops to mesial of buccal and lingual tubes are added every 6-8 weeks. Force exerted is 50 gms per tooth and movement achieved is 1 mm per month. It does not interfere with occlusal plane.

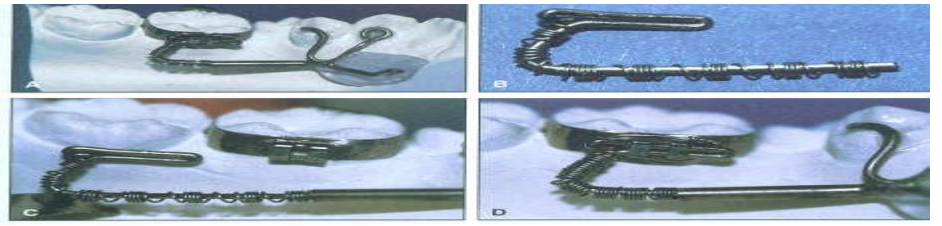
C-Space Regainer 18,5

Chung STet *al* (2000) used a removable appliance called the C-Space Regainer to achieve bodily molar movement without significant incisor flaring. It consists of a labial framework formed from 0.036" SS wire, and an acrylic splint. A closed helix is bent into the framework in each canine region. An open coil spring (0.010"xO.040") is soldered distal to the helix and 0.028" ball clasps are used to retain the appliance. Open coil spring should be 130% of lenglh between soldered point and mesial edge of head gear. When compressed it will exert 200 gms of force and move molars distally about 1-1.5 mm per month.

Repelling Magnets 18,5

Intra arch repelling magnets used to distalize molars were introduced by Gianelly *et* aF (1988). These are prefabricated repelling SamariumCobalt magnet (SmC05) with a pole face 2 x 5 m. The magnets areattached to headgear tube of maxillary first molar bands and repelling surfaces are brought into contact by 0.14" ligature wire. Forces measure to 200-225 gms but drop substantially as space opens beyond 1 mm. Movement of 3 mm is seen in 7 weeks if second molars are absent and 0.75-1 mm per month if present. Anchorage is reinforced by Nance appliance and Class II elastics against an (0.016" . 0.022") sectional arch wire. The rate of molar dislalization using magnet force is less than that observed with conventional mechanotherapy.

Franzulum appliance (2000 by Byloff) 18,5



Gaining space in the mandible is more difficult than in the maxilla. Extraoral appliances are seldom attached to the mandibular molars because of the pressure

they place on the condyles.An acrylic button of 5mm width is used as anchorage position lingually and inferiorly to the mandibular anterior teeth and extending from the mandibular left canine to the mandibular right canine.. This appliance rests on the cuspids and bicuspids through 0.032" wire. Niti coil springs are inserted into the tube which exerts 100-200gm of distalizing force on each side.

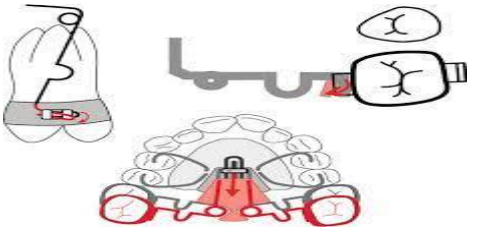
Keles Slider (2001 by Keles)
The sliding jig consists of a distalizing rod, a0.040″ SS ball tip, a lock, a 10 mm long NiTi heavy coil spring and a 0.045″ tube with wire extension which attaches to the cleat of the first molar bands. A light-cure triad acrylic gel material is applied chairside.

Frog Appliance (2003 by Kelvin Walde) 18,5

A frog appliance kit comprises of a screw, a preformed spring and a screw driver. Wires (0.028" SS) bonded to the premolars lying in the embrasures distal to the anchor teeth aids in the anchorage of the appliance. The distalization force was produced by the activation of the screw by simply turning the screw counterclockwise. Bodily molar movement occurs in just 4 months. Unilateral molar distalization can also be achieved.

Carriere Motion 3D Appliance [21] (2004 by Luis Carriere) 18,5
Appliance consists of two rigid bars bonded bilaterally to the maxillary cuspids and first molars. The canine pad has an attachment used for elastics. Posteriorly, the molded pad with a ball-and-socket joint is bonded to the first molar at its clinical center to facilitate molar derotation and distalization.

K pendulum (2005 by Kinzinger *et al.*) 18,5
One of the modifications of the conventional Pendulum appliance. A distal screw is put into the Nance button and an uprighting and toe-in bend in the region of the pendulum springs is incorporated to prevent the potential side effects like palatal movements of the molars and tipping of the dental crowns.19



Palatal Orthodontic Implants(2006)Beyza18,5

Idea of implant in median maxillary suture for anchorage was originally by Triaca. Mannchen(1999) implanted miniature gold fixation screws intothe alveolar bone between roots of teeth in young patients. Maxillary suture is a more reliable location than the alveolar bone between roots of teeth, for anchorage in adults. The basic principle of the appliance is to provide a rigid platform that is not attached to any single tooth. A yoke shaped palatal bar · made of Remaloy stainlesssteel wire with 4.5 mm long 0.022 x 0.028" rectangular tubes are attached on each end. 0.022" Damon SL brackets are welded to molar bands for receiving sectional arch wires.Distalization can be accomplished either with

sagillaly preactivated delta loops and long vertical legs or with straight sectional wires and push coil springs.

Conclusion

What was extraction case involving four premolars yesterday can be handled effectively with distalization procedures today. In addition orthodontists have realized that the public now prefer fuller smiles and prominent lips as compared to the standards of 1960s, with the recent trend towards more non-extraction treatment. "In orthodontics, as in every other science, each period reveals turns and steps in progress which proves the former theories and practices to have been wrong, so it behaves us not to be too dogmatic in our statements for we are dealing with the unknown, as at the best our concepts must be largely hypothetical.

References

1. Norbert Jeckel and Thomas Rakosi.Molar distalization by intra-oral force application European journal of Orthodontics 13(1991)41-46.
2. Singh Devinder. P et al. Intraoral Approaches for Maxillary Molar Distalization: Case Series.Journal of Clinical and Diagnostic Research. 2017 May, Vol-11(5): ZR01-ZR04.
3. Alogaibi. A .et al Distalization in Orthodontics: A Review and Case Series.
4. Joydeep Ghosh.Evaluation of an intraoral maxillary molar distalization technique
5. American Journal of Orthodontics and Dentofacial Orthopedics December 1996
6. D. N. Kapoor ,ArvoRazdan' and Sridhar Kannan. Effective Means of Intraoral Molar Distalization- An Overview.J Ind Orthod Soc 2002.
7. Chakraborty. et. Al. Revisiting molar distalization. International Journal of Applied Dental Sciences 2020; 6(2): 243-246.
8. T. M. Graber.Maxillary second molar extraction in Class II malocclusion .American Journal of ORTHODONTICS Volume 56, Number 4, October, 1969.
9. P. H. Morse & W. G. Webb. The Indication for Distal Movements of UpperBuccal Segments.British journal of Orthodontics volume 1,issue 1;1973.
10. LeonardBernstein.Edward H. Angle versus Calvin S. Case: Extraction versus nonextraction. Part I. Historical revisionism. Am. J. Orthod. Dentafac. Orthop.
11. Birte Melsen. Effects of cervical anchorage during and after treatment: An implant study.Am.J.Orthod vol.73 number 5 May1978.
12. Baumrind et al.Displacement of maxillary molars by using headgear forces.American journal of orthodontics and Dentofacialortrhopedics 1983.
13. Hershey, Houghton, and Burstone. Unilateral face-bows: A theoretical and laboratory analysis. Am. J. Orthod. March 1981.
14. William L Wilson, Rober! C Wilson : Mutidirectional Functional Class II treatment J. Clin.Orthod : 186-189, 1987.
15. Gianelly A.A., Vaistas A.S .. Thomas WM., Berger D.G. : Distalization of molars wilh repelling magnets. J. Clm. Orthod 1988 : 20: 40•44

16. Jones R.D., White J.M. : Rapid Class II molar correction with an open coil jig. J. Clin. Orthod 26 661•664, 1992.
17. Katra V : The K - loop molar distalizing apptiance.J. Clin. Orthod29: 298-301,1995

18. Hilgers J.J. : The Pendulum appliance for Class II non compliance therapy. J. CUn. Orthod 26 : 706•714. 1992.
19. Scuzzo G, Takemoto K : Maxillary molar distalization with a modified Pendulum appliance.J. CUn. Orthod 33 : 645 - 650, 1999
20. Chandra.p. et. al Intra Oral Molar Distalization - A Review. Journal of dento facial sciences Vol. 1 Issue 115-18 2012.
21. Kaur S et al. Pendulum appliance and its modifications – A review. Int. J. Curr. Res. Med. Sci. 2018; 4(3): 1-9