

MOLAR DISTALIZATION WITH CUSTOM MADE BILATERAL PALATAL DISTALIZER

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ABSTRACT

Class II malocclusion with moderate space deficiency in the maxillary arch and relatively well-aligned Mandibular arch can be treated with both extraction and non-extraction strategies. In case of therapeutic extractions however, bite opening may become a problem, particularly in excessive overbite. In non-extraction mechanics, the aim is to distalize the maxillary first molars to class I molar relationship in order to gain space in the buccal segments for retraction of cuspids and anterior teeth. Different methods may be used for maxillary molars distalization, namely extra oral traction, combination of removable and extra oral appliances and intra oral fixed distalizers. The last being the most recent approach, specifically in Dental Class II malocclusion where skeletal effect is not needed. Amongst the intra oral fixed molar distalizers, the palatal or lingual distalizer system comprises the latest approach, being more aesthetic and most effective. This presentation reports on a female patient of 15 years, who presented with a mild Class II malocclusion. Her prominent nose and excessive overbite did not allow therapeutic extractions. The final treatment plan came to be the Bilateral Palatal Distalizer, which was custom made and modified in its design from an existing Italian appliance. The appliance was used for seven months with excellent results attaining an average of 5.5mm distalization of maxillary first molars.

Key words: Molar distalization, Bilateral Palatal distalizer.

INTRODUCTION

Treating mild skeletal or dental Class II malocclusions with relatively well aligned mandibular dental arch and normal or horizontal growth pattern with extra oral appliances or combination of extra and intra oral appliances, demands patient's cooperation. Results with such appliances also depend upon patient's compliance. Intra oral fixed mechanics, on the other hand, being fixed and independent of patient's compliance produce excellent results. These appliances comprise the recent approach of molar distalization.

William L. Wilson, Robert C. Wilson' described the modular first phase appliance for multidirectional functional class II treatment. The appliance

consisted of maxillary three dimensional bimetric distalizing arch and a three dimensional mandibular lingual arch with class II elastics. Class I molar relation was reported as a result of maxillary molar distalization and mesial movement of the mandibular first molars.

Richard D Jones, J White Michael' reported distal movement of the molar to Class I relationship with an open coil Nickel Titanium jig that delivered 70-75 gm of force. The Nance used by Jones was $\frac{1}{2}$ an inch in diameter with out vertical addition of acrylic.

A. A Gianelly, P. W Bonds and W.M. Johnson' achieved effective molar distalization using a modified Nance with repelling magnets. They reported 1.7mm per month of molar distalization with out second molar

eruption, 0.75 to 1.0mm per month with second molar eruption. The anchorage loss in this study was calculated as 20%.

Bondemark and Kurol⁴ reported an effective molar distalization together with distobuccal rotation using repelling magnets

A.A Gianelly⁵ obtained an average of 1-1.5 mm molar distalization per month by 8-10mm activation of super elastic Nickel Titanium coil spring using a modified Nance as an additional means of anchorage reinforcement. N. Erverdi, O. Koyuturk⁶ conducted a comparative study between Niti coil springs and repelling magnets using 225gm force per side. They concluded that molar distalization with coil spring was 1.6mm greater than the magnets.

The most recent approach for molar distalization is the palatal distalizer system being most effective, aesthetic and easy to insert. Moreover an added advantage with this appliance is that active Nance can be easily converted into passive one to hold and stabilize the distalized molar. Aldo Carano, Giuseppe Sciciliani⁷ presented two case reports, illustrating bodily distalization of the maxillary molars, without the loss of anchorage, using palatal distalizer. The active components were 0.9mm stainless steel wire segments containing stainless steel coil spring and a clamp. The force exerted by the spring was 150gm and reactivation of the appliance was done by sliding the clamp closer to the molar once in a month. The mean distal movement attained was 4mm in four months duration. The rate of distalization was reported to equal the magnets or the Jone's Jig, without any tip or rotation.

Tracy J Reiner⁸ conducted a study on 12 patients to see the effect of modified Nance for unilateral molar distalization. The results were comparable to that produced by Gianelly et al using magnets and modified Nance, and there was no clinical evidence of increased over jet. Joy Deep Gosh, R. Nanda⁹ conducted a study on 41 subjects to determine the effects of the pendulum appliance on distalization of maxillary first molars and reciprocal effects on the premolars and incisors. The pendulum spring was constructed from 0.032 inch T.M.A wire with one time activation of 60°. The mean molar distalization attained was 3.37mm with a distal tip of 8.36°. The mean reciprocal mesial movement of the first premolar was 2.55mm with the mesial tip of

1.29° and extrusion of 1.7mm the pendulum appliance was found to be an effective and reliable method of distalizing maxillary first molars.

Arturo Fortini, Massimo Lupoli and Massimiliano Parri¹⁰, Conducted a study on 62 class II patients (37 female, 25 males) using First class appliance for rapid molar distalization. Age of the sample size ranged from 8.7 to 14.5 year. The average period for distalization was 42 days with a range of 28 to 95 days and the mean distal movement attained was 4.8 mm. The study concluded that the first class appliance produced rapid distalization of the maxillary first and second molars with out anterior anchorage loss or changes in vertical dimension. The appliance can be used both in deciduous as well as permanent dentition. Moreover the device can be left in place as a passive Nance to hold the distalized molars.

A. Keles, K. Sayinsul¹ conducted a study on 15 patients to see the effects of intra oral bodily molar distalizer (I.B.M.D) appliance on distalization of maxillary first molars. The distalizing spring was modified using square section 0.032 X 0.032 inch T.M.A wire with one time activation of 60° built into the spring design. The Nance however did not include second premolars in anchorage unit. The results showed that maxillary first molars distalized bodily an average of 5.23mm with out any tip or rotation. Extrusion was negligible. Anchorage loss with this appliance was however greater, that was relapsed in two month during stabilization period of holding the distalized molars, with out any orthodontic mechanics. The study concluded that IBMD achieved bodily distal movement of the maxillary first molars and did not require head gear wear for up righting of the roots of the distalized first molars.

Ahmet Keles, Abida Ij az" conducted a comparative study between two molar distalization appliances on 29 patients. The IBMD (Intra oral bodily molar distalizer) which is a fixed appliance was applied to 14 patients. The ACCO (Acrylic Cervical Occipital Anchorage) appliance which is a combination of removable and fixed appliance, was used in 15 patients. The results showed that with IBMD, maxillary molars distalized bodily an average of 4.5mm and an anchorage loss was found to be 4.5mm. Whereas with ACCO the mean distal movement of the maxillary first molars was 4.38mm

with a mesial tip of 3.03 degree. However the anchorage loss with ACCO appliance was 2.11mm, due to the use of head gear and anchorage reinforcement means provided in the device. Moreover, the IBMD was not patient dependent device. On the other hand in ACCO, patient's compliance was found to be a must. This study suggested involving second premolars in the anchorage unit for IBMD and adjusting vertical position of the outer bow in case of ACCO appliance.

This case reports on a healthy female of 15 years with permanent dentition who presented with bonded upper arch. Her presenting complaint was crooked, irregular and prominent upper teeth. The history described hereditary etiology and an interview with the parents revealed father with convex profile and a very prominent nose. On Extra oral Examination her face was symmetrical with a tendency towards high angle. Midface was found to be the longest of the equal thirds. The lips were competent and the most prominent feature on her face was the nose, which was quite conspicuous both from the front as well as from the side view.

INTRA ORAL EXAMINATION

The interarch relationship showed both right and left class II molars and class II canines. The front view showed mildly crowded upper arch, increased over jet (8mm) and excessive overbite (5mm). Both upper and lower mid lines were shifted to the left (upper shift 2.5mm, lower shift 1.5mm). The lower dental arch was more or less aligned. On occlusal view, the upper buccal segments were slightly constricted where as the lower dental arch was ovoid in shape.

CEPHALOMETRIC ANALYSIS

The Sagittal elements of the cephalometric analysis revealed normal maxillary apical base and mildly deficient mandible (table 1) whereas the vertical analysis determined a border line case. On the basis of the data, the patient was classified as a mild Skeletal Class II, because of hypoplastic mandible, Dental class II and a tendency towards high angle.

PROBLEM LIST

- Crowded and Proclined upper Incisors
- Constricted upper buccal segments

- Gross Overjet
- Increased Overbite
- Mid line Shift
- Mildly convex profile

TREATMENT OBJECTIVES

The objectives of the camouflage treatment were based on the problem list and were as follows.

- Resolution of crowding
- Improvement in antero posterior jaw and occlusal relationships.
- Correction of the mid line discrepancy

TREATMENT PLAN

Her prominent large sized nose and consequently, the profile and relatively well aligned Mandibular dental arch did not allow any extractions. Therefore the treatment plan was rapid palatal expansion followed by molar distalization.

APPLIANCE DESIGN

The cast was poured with bands on maxillary first premolars, second premolars and first molars on both sides. Wire segments from 0.9mm stainless steel wire were soldered to the first pre molar bands and head gear tube was soldered to second premolar and first molar bands on both sides keeping it parallel to the occlusal plane. First molar band along with the tooth was detached from the cast and then 0.9mm stainless steel wire (about 80mm long) containing NiTi coil (0.012 x 0.032 inches) one inch long, was passed through second premolar band and the proximal end was given a terminal bend in the apical region. First molar band along with contained plaster tooth was slid from the distal end of the wire anteriorly to its original position, compressing the coil spring between second premolar and first molar. The extra hard plaster was then placed to fix up the first molar band along with the plaster tooth. On setting of the plaster, posterior bending of the wire frame work was started distal to the second molar, curving the wire anteriorly to terminate in the apical region of the maxillary first molar. The acrylic fabrication comprised Nance modified from conventional Nance that was originally designed in the form of a button of 1/2 inch

diameter soldered to first molars as well as from Gianelly's Nance that covered anterior aspect of the palate till cinguli of the anterior teeth to provide Occlusal clearance and involved first premolars for anchorage purpose.

In this custom made appliance acrylic covered anterior palate but not the cingular area as disocclusion was not planned in this design. Posteriorly the acrylic of the Nance extended as far backward as the maxillary second molar area, making this appliance more rigid anchorage reinforcement device. The appliance on full compression generated 277gm of force on each side.

TREATMENT PROGRESSION

According to the treatment plan her treatment was started with soldered hyrax and expansion was done at the rate of two turns of 45° each, twice daily for 10 days. Occlusal radiograph was taken before insertion of expander and on seventh day of expansion that revealed opening of mid palatal suture. The expanded hyrax was fixed and retained for three months.

After retention of the expanded arch, molar distalization was proceeded which could otherwise be possible immediately after expansion. Gianelly's wider Nance was further modified by involving second premolars into the anchorage unit as recommended by Gosh and Nanda. The Nance was cemented and on the buccal segments, a heavy rectangular stainless steel segmental, arch containing Niti open coil (0.012x0.032") compressed to one third of its length was applied to both sides. The appliance was monitored every three weeks. The activation was done at the rate of six weekly addition of the piece of tubing or compressed coil equal to the amount of distalized molar. This treatment continued for about seven months but could not produce effective results. The molars did not distalize more than 1.5 mm on an average. Considering age of the patient being 16 years at that time, it was presumed that bone might have become more or less matured. More over position of the third molars might also be a source of hindrance. Maxillary third molars were therefore extracted and open coil springs were further used for another three months or so, yet the treatment was not responsive.

The next option was to design such an appliance that could be reliable and effective and of course cost effective and independent of patients compliance. The ultimate appliance designed was the bilateral palatal distalizer. The idea for this device was borrowed from the first class Leone Molar Distalizer designed by Dr. A. Fortini and Dr. M. Lupoli. The Leone distalizer consisted of a wire frame work bent from 0.045mm stainless steel that extended anteriorly to the mesial of first premolars and posteriorly to the distal of upper second molars. This wire frame work contained 10mm long Niti open coil (0.010x 0.045 inch). Teeth involved in the anchorage unit are second premolars and first molars. On the buccal surface of this appliance system, the screw rod is tightened to the soldered tube to the second premolars. The screw activation is recommended in counterclockwise direction at the rate of 45 degree opening of the screw twice daily .The Nance in first class distalizer is modified by extending backwards till distal of first molars Anteriorly however, it does not extend till cingular area nor does it incorporate vertical addition of the acrylic.

In the custom made appliance both efficacy and cost effectiveness were considered. The appliance design was modified from Leone first class distalizer firstly by reinforcing anchorage unit with inclusion of first premolars into the Nance, and secondly by incorporating Ni-Ti open coil on the buccal sides instead of screw attachments. One time activation was incorporated into the appliance. The appliance was monitored every three weeks. Distal movement of the molars was productive with this device.

TREATMENT COMPLETION

On completion of this phase the molars were distalized to super class I relationship, in about seven months duration. The results were based on the measurements from the pretreatment and post distalization cast photocopies and cephalometric analysis (Table 1). On the cast photocopies, the reference plane (RP) was drawn (from the mark on the most prominent rugae), perpendicular to the midline drawn over the mid palatal suture. Linear and angular measurements were then drawn as described by Champagne (1992).

For the cephalometric analysis, Sella-Nasion plane from the pre treatment cephalogram was superim-



Fig 1. Pre treatment front view



Fig 2. Pre treatment profile



Fig 3. Intra oral front view

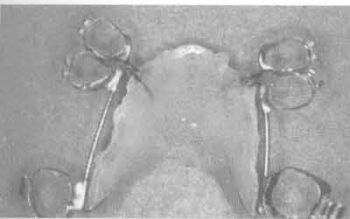


Fig 4. Custom made bilateral palatal distalizer



Fig 5. Appliance on insertion 227 grams each side

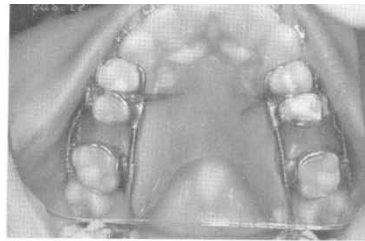


Fig 6. Completion stage. Molar distalized to super class I (7 months)

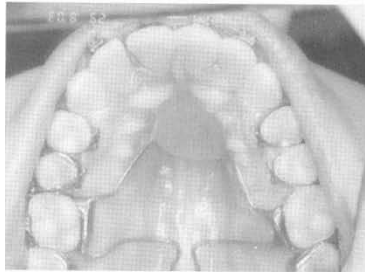


Fig 7. Treatment progression (8 months after distalization of molars)

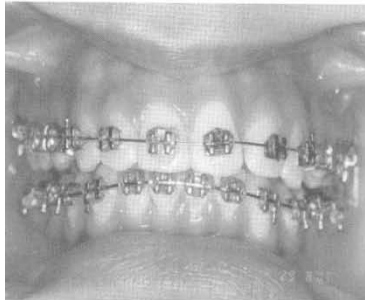


Fig 8. Final stage of comprehensive fixed mechanics



Fig 9. Post treatment front view



Fig 10. Post treatment profile

TABLE 1: PRE AND POST TREATMENT
CEPHALOMETRIC ANALYSIS LINEAR
MEASUREMENTS IN MILLIMETERS ANGULAR
MEASUREMENTS IN DEGREES

Name: Komal Ilyas	Age/Sex	15 years	Female
Skeletal Analysis	Pre	Prog	Diff
Sagittal			
SNA	80	82	2
SNB	75	76	1
ANB	5	5	0
AO-BO Distance	5.5	5	-0.5
Facial Angle	76	78	2
Vertical			
SN Mand	39	32	-7
FMA	29	26	-3
Sum of Posterior Angles	395	393	-2
Ratio of PFH to AFH	67%	(0.93
Ratio of TFH to LFH	58.26%		-1.78
Dental Analysis			
U1-SN	107	104	-3
U1-PAL	114	112	-2
IMPA	92	100	8
HA	125	122	-3
U1-NA Distance	4	4	0
U1-NA Angle	27	22	-5
L1-NB Distance	5	6	1
L1-NB Angle	22	30	8
Soft Tissue Analysis			
UL to E Line	-7	-7	0
LL to E Line	-2	-1	1
UL to S Line	-2	-3.5	-1.5
LL to S Line	1.5	1	0.5
Nasolabial Angle	113	117	4

TABLE 2: PRE TREATMENT AND POST
DISTALIZATION ANALYSIS FROM THE CAST
PHOTOCOPIES. THE LINEAR MEASUREMENTS
IN MILLIMETRES. FROM THE REFERENCE
PLANE RP. DISTAL MOVEMENT (+), MESIAL
MOVEMENT (-)

	Pre	Post	Diff
Maxillary right first molar	20	28	6 (8-2)
Maxillary Left first molar	20.5	26.5	5 (6-1)
Maxillary right second premolar	11.5	13.5	2
Maxillary left second premolar	12	12	0
Maxillary right first premolar	6	7	1
Maxillary left first premolar	5.5	5.5	0
Maxillary right central incisor	13	12	1

TABLE 3: PRE TREATMENT AND POST
DISTALIZATION CEPHALOMETRIC ANALYSIS.
THE LINEAR MEASUREMENTS IN
MILLIMETRES FROM THE TRUE
HORIZONTAL. EXTRUSION (+), INTRUSION (-)

	Pre	Post	Diff
Maxillary first molars	74	76	2
Maxillary second premolars	78	78	0
Maxillary first premolar	78.5	79	0.5
Maxillary right central incisor	82	83	1

posed over post treatment cephalogram and then the rest of tracing was carried out. For parameters related to the maxillary dental changes, true horizontal and

then the true vertical were drawn. Linear measurements from the true horizontal were made to measure extrusion or intrusion of the involved teeth. Angular measurements were made to show the tip whether mesial or distal of the concerned teeth from the anterior angle between long axis of the tooth and the true horizontal. The maxillary first molars distalized 5.5mm on an average (table 2) and extruded 2mm (table 3). The mesiobuccal rotation seen was 14 degree on average

TABLE 4: THE ANGULAR MEASUREMENTS IN DEGREES FROM THE TRUE HORIZONTAL. DISTAL TIP (+), MESIAL TIP (-)

	Pre	Post	Diff
Maxillary first molars	102	100	-2
Maxillary second premolars	91	105	14
Maxillary first premolars	88	98	10
Maxillary right central incisor	68	70	2

(table 5) along with the mesial tip of 2 degree (table 4) unlike the usual distal tip with molar distalizers. The maxillary second premolars however showed a distal movement of 1mm and measured the distal tip of 14 degree, unlike the usual anchorage loss. It did not show any extrusion nor intrusion movements. The first premolars did not show any linear movement whether mesial or distal. The mean extrusion found was 0.5 mm (table 3) and the distal tip measured on average was 10 degree (table 4). The maxillary central incisor measured a distal movement of 1mm (table 2), unlike the usual anchorage loss. Rather it showed a distal tip of 2 degree (table 4). Extrusion measured with this tooth was 1mm.(table 3).

DISCUSSION

Goal of this phase of treatment was to distalize molars to class I relationship in order to create space and accommodate crowded anteriors. This article describes the effect of Bilateral Palatal Distalizer, which was fixed to the upper buccal segments involving first and second premolars and the first molars.

Molars were distalized to class I relationship in 7 months period. The molar distal movement attained was 5.5mm, on an average. The mean mesiobuccal rotation observed with this tooth was 14 degree that resulted in improvement of the rotational position of this tooth, rather these angular measurements showed an over correction of 6 degrees on an average that could be managed Gianelly's comprehensive fixed mechanics. With this appliance, the mesial molar tip of 2 degree was seen, unlike the distal tip of molar with pendulum appliance or Gianelly's Distalizers. This mesial tip may reflect over correction, due to reaction from the open

TABLE 5: ANGULAR MEASUREMENT FROM THE CAST PHOTOCOPIES USING MIDLINE REFERENCE PLANE.

	Pre	Post	Diff	Normal
Maxillary right first molar	14	28	14	20
Maxillary left first molar	15	29	14	20

coil spring. Extrusion of the molars observed with this appliance was however 2mm which may partly be the result of hyrax expander as well as the effect of Distalizer. Second premolars did not show any extrusion, nor did they show any anchorage loss. Rather it measured a distal movement of 1mm along with 14degree distal tip. This again shows over correction due to excessive force from the force system and suggests regulating the distalizing forces. Maxillary first premolars did not show any mesial movement and mesial tip that other wise appears with conventional molar distalizers. Rather a distal tipping movement of 10 degree was observed with this appliance, which again determines over correction and indicates the need of regulating the distalization forces in the device. The mean extrusion measured of this tooth was 0.5mm. The maxillary central incisor too, did not measure any anchorage loss unlike conventional distalizers. Instead it showed a distal movement of 1mm and mto 104ed a distal tip of 2degrees there by improving axial inclination of the tooth from pretreatment 107 to104 degree (table 1).This tooth showed an extrusive movement of 1mm. As mentioned earlier it may partly be the effect of distalizer as well as an effect of expander. The median space created by expansion device might have accommodated the proclined and crowded incisors to improved sagittal and axial position of these teeth. As a matter of fact cast and cephalogram would have been recorded immediately before molar distalization after the retention phase of expansion, so as to rule out dental effects of expansion.

CONCLUSION

The custom made bilateral palatal Distalizer was given in a female patient at the age sixteen and half years. Successful results were attained with this device and on the basis of these results; following conclusions may be drawn;

- This appliance is an effective and reliable method of distalizing the maxillary first molars.
- It induced negative anchorage loss.
- It incorporates one time activation.
- It is esthetic and easy to insert.
- It is independent of patient's compliance.
- It can be easily converted into passive Nance.
- The appliance can be used in the late teens.

Further modifications are suggested in the appliance fabrication by involving two-step impression technique in order to eliminate errors because of dimensional changes. Moreover force system needs to be regulated in this device to get bodily distal movement of maxillary first molar.

REFERENCES

- 1 Wilson William L., Wilson Robert C. Multi Directional 3D Functional Class 2 Treatment. JCO1987; 21:186-189
- 2 Jones D Richard, White Michael J. Rapid Class 2 Molar Correction with an Open Coil Jig. JCO 1992; Oct: 661-664.
- 3 Gianelly A.A. Bednar, J. and Dietz V.S. Japanese Niti Coil Used to Move Molars Distally. AJO 1991; 99: 564-566.
- 4 Bondemark, Kurol, J. Distalization of Maxillary First and Second Molars Simultaneously with Repelling Magnets. Eur.J. Orthod 1992; 14: 246-272.
- 5 Gianelly A A, Bonds, P.W and Johnson, W.M. Distalization of Molar with Repelling Magnets. JCO 1988; 22:40-44.
- 6 Erverdi N, Koyuturk O, Niti Coil Springs and Repelling Magnets. British J. Orthod 1997; 24: 147-53.
- 7 Carano Aldo, Sciciliani Giuseppe. The Lingual distalizer System European J.Orthod 1996; 18: 445-448.
- 8 Reiner J. Tracy Modified Nance Appliance for Unilateral Molar Distalization. JCO 1992; 26: 402-404.
- 9 Ghosh J, Nanda R. Evaluation of an Intraoral Maxillary Molar Distalization Technique, AJO 1996; 110:672-677.
- 10 Fortini A, Lupoli M, Parri M, The First Class Appliance for Rapid Molar distalization, J.C.O 1999; 33 : 322-328.
- 11 Keles A, Sayinsu K. A new approach in maxillary molar distalization: intra oral bodily molar distalizer AM J Orthod Dentofacial Orthop 2000; 117:39-48.
- 12 Ijaz A. A comparative study of two molar distalization appliances. Pakistan Journals of Orthodontics, Pediatric and community dentistry 2002; 01:27-32.