

An Evaluation of Maxillary Molar Distalization Using 0.032" TMA Pendulum Appliance, Jones Jig and Lokar Distalizer

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ABSTRACT

Background: The Purpose of this study was to determine the effects of the three different maxillary molar distalizers. THE PENDULUM APPLIANCE, *JONES DIG* & LOKAR DISTALIZER*** on distalization of maxillary first molar and the reciprocal effects on the anchor premolars/deciduous molar. The maxillary molar distalization and anchorage loss was evaluated by obtaining pre and post molar distalization cephalometric radiograph and in oral periapical Xrays and study casts.

Keywords: Molar distalization, pendulum appliance, Jones jig.

INTRODUCTION

In recent years, the percentage of patients having extraction as part of Orthodontic treatment has decreased considerably from its peak in the 1960s. There are several reasons, Experience has shown that premolar extraction does not necessarily guarantee stability of tooth alignment. Premolar extraction is also controversial because of removal of a tooth which is perfectly normal and no patient wants to sacrifice any part of his/her body which is normal and God gifted. In addition, dentists have realized that the general public often prefer fuller and more prominent lips than the orthodontic standards of the 1950s and 1960s. With careful analysis, it now seems possible to treat some patients without extraction who would have been thought to require it earlier and facial esthetics in these "borderline cases" are considered better without extraction by both dentists and others. This has led to a "NEO-ANGLE" school of treatment planning, with modified fixed appliance techniques (especially, Expansion & molar distalization) to facilitate non extraction treatment.

MATERIALS & METHOD

Subjects were chosen from the patients who reported to the department of Orthodontics PATNA

DENTAL COLLEGE AND HOSPITAL, Patna for Orthodontics treatment but were not willing to undergo therapeutic extractions. Ten patients were selected with the mean age of 11.8 years (ages ranging from 10 years to 14 years). Out of the 10 selected subjects nine were females and one male. Gender differences were not taken into consideration because of the short duration of use of the molar distalizing appliances.

All the patients fulfilled the following criteria.

1. Use of molar distalizer as the first phase of orthodontic treatment for bilateral or unilateral distalization of the maxillary first molar teeth for correction of the class II molar relationship and/or gaining space in the maxillary arch.
2. Nonextraction treatment plan.
3. Good oral hygiene and no damage to the appliance.
4. Good quality radiographs and study casts.
5. No other molar distalization procedure eg headgear or elastics, performed in the time period between radiographs.

Alginate impressions of the maxillary and mandibular dental arches were taken and study

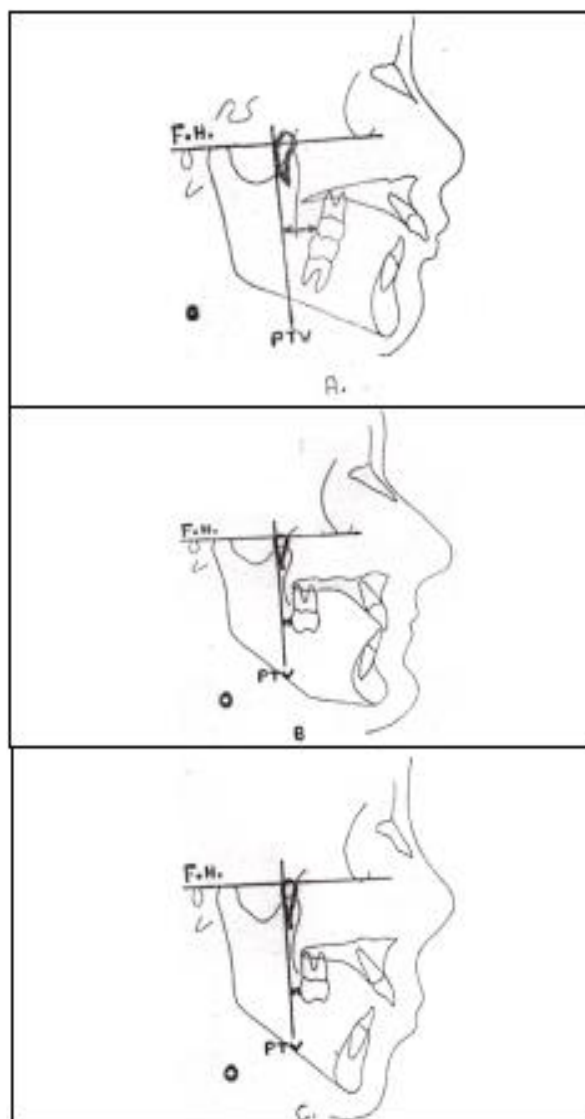
Received: June. 3, 2019; Accepted: July. 17, 2019

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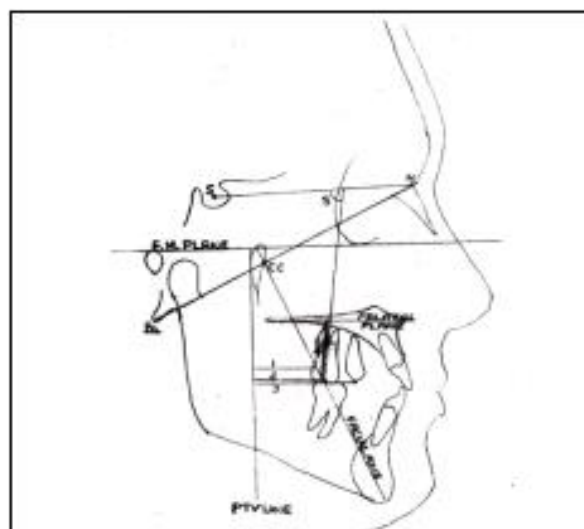
model were fabricated. Cephalometric Radiographs and intraoral periapical radiographs of the maxillary molars were taken prior to the insertion of the appliance and after the completion of molar distalization, and removal of the molar distalizer, extraoral and intraoral pre treatment photographs of the subjects were taken for record purpose. The intraoral post molar distalization photograph were repeated after molar distalization. Before insertion of the molar distalizer, the periodontal status of the teeth clinically examined, evaluated and rectified if needed.



A. Upper molar to pterygoid vertical

B. Favourable growth pattern–Sufficient space distal to upper molar for eruption of remaining molars.

C. Skeletal open bite pattern (Unfavourable)



CEPHALOMETRIC RADIOGRAPH MEASUREMENTS USED IN THIS STUDY

1. Upper Molar to PTV line
2. Maxillary first molar centroid to PTV line
3. Premolar/second dec. molar centroid to PTV line
4. Palatal plane to maxillary first molar centroid
5. SN– maxillary first molar angle

UPPER MOLAR POSITION

Cephalometrically, according to Ricketts Analysis, Upper molar position is the horizontal distance from petrigoid vertical line or PTV line (a vertical line drawn through the distal radiographic outline of Pterugomaxillary Fissure and perpendicular to the Frankfort Horizontal) to the distal surface of the maxillary first permanent molar.

On the average, this measurement should equal the age of the patient + 3.00 mm (eg., a patient 11 years of age has a norm of $11+3=14$ mm; one mm is added per year for age adjustment). This measurement assists in determining whether the malocclusion is due to the position of upper or lower molar and also is useful in deciding whether extractions are necessary. This linear measurement is an indication of the forward position of the upper molar and suggests whether sufficient space is present or not for the second and third molars. This measurement indicated or contraindicates maxillary molar distalization.

CEPHALOMETRIC ANALYSIS

Centroid points were constructed for the crowns of maxillary first molar and deciduous second molar and the maxillary first pre molar as the midpoint between the greatest mesial and distal convexity of the crowns of these teeth, as seen on the cephalometric radiograph. For cephalometric radiograph evaluation following measurements were made from pre and post molar distalization cephalograms:

1. Upper molar to Pterygoid Vertical Line (PTV) → to evaluate the upper molar position and amount of maxillary first molar distalization.
2. Maxillary first molar centroid to PTV Line → to evaluate the amount of maxillary first molar distalization.
3. Second deciduous molar ot/premolar centroid to PTV Line → to evaluate the mesial movement of these teeth or the anchorage loss.
4. Palatal plane to maxillary first molar centroid → to evaluate the extrusion or intrusion (vertical plane) of maxillary first molar.
5. SN-Maxillary first molar angle → to evaluate the distal tipping (angular) of maxillary first molar.

The pre and post molar distalization cephalometric radiograph were super Imposed on Basion- Nasion plane at CC point to appreciate the effects of distalization on maxillary dentition and mandible.

INTRAORAL PERIAPICAL RADIOGRAPHIC ANALYSIS

For the intraoral periapical radiograph evaluation, the molar distalization was measured from the distal surface of second premolar or/deciduous second molar to the mesial surface of maxillary first molar.

STUDY CAST ANALYSIS

For the study cast evaluation, intermolar width (mesiobuccal cusp tip of one side to the other and distobuccal cusp tip of one side to the other), before and after molar distalization were recorded and compared. Molar distalization were recorded between the distal surface of maxillary second premolar/deciduous second molar and the mesial surface of maxillary first molar.

THE MOLAR DISTALIZERS USED IN THIS STUDY

The Pendulum Appliance: The Pendulum Appliance which is a Hybrid that uses a large Nance Acrylic button in the palate for anchorage, along with 0.032" TMA springs that deliver a light continuous force to the upper first molars without affecting the palatal button. Thus, the appliance produces a broad, swinging arc-or pendulum of force of from the midline of the palate to the upper molars.

The right and left pendulum springs from 0.032" TMA wire consist of a recurved molar insertion wire (modification simple 90° bent), a small Horizontal adjustment loop (modification elimination of this loop), a closed helix and a loop for retention in the acrylic button. The springs are extended close to centre of palatal button to have a maximum range of action, to have easier insertion and to reduce forces to an acceptable range.

Lingual sheath on the upper molars should be 0.036" to accommodate 0.032" wire loosely. Earlier Nance button was held in place with occlusally bonded rest on either the deciduous molar or the first and second bicusps. The recent modification suggest banding the upper first bicuspid or first deciduous molars, soldering a retaining wire to bands and using these teeth as major anchorage for the appliance.

If expansion of the upper arch is needed, a mid-palatal jackscrew can be incorporated in the centre of Nance button and the screw is activated one quarter turn every 3 days, after a week. This version is known as "Pend-X". It is better to pre activate the springs before appliance placement by bending them parallel to the midline of the palate or perpendicular to the body of appliance. A 60° activation of the pendulum springs produce a force of 230 gms per side.¹ Molar bands are cemented and adhesive is put over the occlusal rests and smoothed. Then, the pendulum spring is brought forward with finger pressure and mesial end of the recurved loop is grasped with Weingart Plier and spring is seated in Lingual Sheath, Elastic "O" ring can be used for safe seating of the spring in lingual sheath. As the molars are driven distally, it moves on an arc towards the midline of the appliance-towards cross bite. It can be counteracted by opening the adjustment loop slightly to increase the expansion and molar rotation. The patient should be seen about every three weeks so the spring

pressure can be checked. For reactivation. Spring is removed from lingual sheath, centre of helix is held with bird Beak Plier and spring is reactivated by pushing it distally toward the midline and again reinserting in the sheath.

Since the distal movement of the upper molars occurs so rapidly (5 mm in three to four months) there is a transient bite opening due to driving these teeth back into the wedge of occlusion. This is commonly not a problem with brachyfacial types, as muscular rebound and growth more than compensate for this initial bite opening. In fact, in extremely strong muscular patterns, this response can be very beneficial in the bite opening process. But in vertical growth patterns with weak muscular rebound, bite opening can be harbinger of further negative side effects. Once the bite opens, the tongue goes into the interspace, sometimes initiating a reverse swallow/tongue thrust (if it doesn't already exist). Severely tipping the upper molar only aggravated this problem because the bite can be propped open on the inclines of these teeth, allowing the buccal segments to supererupt. So, this type of appliance should be chosen only in mesofacial and brachyfacial types where the muscular pattern, growth and subsequent mechanics can compensate for this response. Fortunately approximately 65% of all class II malocclusions fall into this category, in the others, a more conservative approach should be utilized.

Five patients were treated with the pendulum appliance 0.036" Lingual Sheath were placed on the palatal side of the maxillary first molar bands. A retaining 19 gauge wire was soldered to first premolar or/deciduous second molar bands which tips into the Nance acrylic button which acts as the anchorage. 0.032" Titanium Molybdenum Alloy (TMA) pendulum springs that originated from that palatal acrylic was engaged in lingual sheaths of maxillary first molar. The pendulum springs were pre activated before placement, i.e. parallel to the mid line and with finger pressure engaged into the lingual sheath. For the reactivation. Spring was removed from the lingual sheath and bent towards, the mid line and subsequently again engaged back into the lingual sheath.

There are various methods of stabilization of distalized maxillary first molar in their changed position. They are:

1. Overcorrection
2. Quick-Nance (Hilgers)
3. Short-term headgear
4. Stops on archwires
5. Upper utility arch
6. Push coil spring at cuspids
7. Early bonding in the upper arch
8. Class II elastics
9. Upper tip bumper
10. Hawley – or – clear type retainers
11. Bionator
12. Short-haul Herbest appliance
13. Long-haul Herbest appliance

In all of the five patients Quick Nance (Nance appliance) was placed as the method of stabilization to prevent relapse, before fixed appliance therapy.

Jones Jig

The Jones Jig assembly can be used with full arch fixed appliance, with partial banding or as a pre-fixed appliance treatment. Three patients were treated with the Jones Jig. The maxillary first molars and premolars were banded. The double buccal molar tube were welded over the bands with the headgear tube being kept gingivally. An alginate impression of the maxillary arch was taken with the premolar bands in-situ. The bands were transferred to the impression and a stone cast is prepared. 0.036" stainless steel round wire was formed to the palate on the cast and was extended as far as the canines, it was soldered to the premolar bands. After that an acrylic button was made in the region of maximum contour of palate with the help of cold cure acrylic which was about ½" in diameter. The impingement of the acrylic on the papillae or the teeth was avoided as it could have caused irritation.

The sectional jug assembly which is constructed by using an 0.036" stainless steel round wire and 0.022" X 0.028" stainless steel rectangular wire. These two wires are soldered together at the mesial end of the molar tube and the round wire is extended till the first premolars. The jig uses an open coil Nitinol spring which delivers 150 gms of force over a compression range of 1 to 5 mm. The Jones Jig assembly was inserted posteriorly into the double buccal tube on the first molars. The modified Nance appliance along with the premolar bands was cemented on the teeth. The molar bands were cemented as free units. The Jig assembly was

inserted into molar tubes. It was activated by using ligature ties from the cleats on the second premolars to the spots on the round wire just anterior to the open coil Nitinol springs. After the molars were distalized, a nance acrylic button is cemented joining molar to molar to stabilize the molars.

Lokar Distalizer

The Lokar Distalizer is a very efficient in maxillary molar distalization. It utilizes continuous, ideal Table 1: Cephalometric radiograph analysis.

forces if NITI springs to generate repid molar movement while minimizing the patient discomfort. It is easy to insert, to ligate and to use. Precise distalization can be accomplished usually with one activation. It can be used unilaterally and is easy to adjust. It can be used in early treatment or with appliance in place. Anchorage can be achieved with Nance button or by employing full-sized arch wire with fixed appliances.

Patient Name and Age	Upper molar – PTV Line			Molar centroid – PTV Line			Pre molar/p.m – PTV Line			Pat.plane molarcentroid –			SN – max. molar angle		
	Pre (mm)	Post (mm)	Diff. (mm)	Pre (mm)	Post (mm)	Diff. (mm)	Pre (mm)	Post (mm)	Diff. (mm)	Pre (mm)	Post (mm)	Diff. (mm)	Pre (mm)	Post (mm)	Diff. (mm)
Miss. R. Sangeetha 11 Yrs/F	15	9	4	20	13	7	31	30	1	20	20	0	60	55	5
Miss. Kayalvezhi 11 Yrs/F	15	11	4	21	15	6	30	30	0	16	16	0	74	60	14
Miss. Balambigai 11 Yrs/F	11	6	5	18	11	7	35	36	1	16	18	2	75	57	18
Miss. Sangeetha 12 Yrs/F	16	12	4	21	18	3	39	43	4	19	22	3	65	57	8
Miss. Bhuwana. S 11 Yrs/F	11	7	4	22	11	10	31	25	6	19	21	2	60	40	20
Miss. Uma. R 12 Yrs/F	13	9	4	20	15	5	30	30	0	21	22	1	66	66	0
Miss. Mullai 12 Yrs/F	16	12	4	22	18	4	31	31	0	21	21	0	72	65	7
Miss. Ramys. 14 Yrs/F	17	13	4	23	19	4	30	30	0	17	16	-1	72	65	7
Master. Haripragadesgh 13 Yrs/F	15	11	4	21	18	3	30	32	2	19	20	1	70	60	10
Miss. Bhagyam Sheela 11 Yrs/F	16	11	5	22	11	10	30	30	0	19	18	-1	65	55	10

Table 2: Table 2. IOPA X-Ray analysis.

Patient Name and Age	IOPA X-ray MOLAR DISTALIZATION	
	Right (mm)	Left (mm)
Miss. R. Sangeetha 11 Yrs/F	5	5
Miss. Kayalvezhi 11 Yrs/F	5	5
Miss. Balambigai 11 Yrs/F	5	5
Miss. Sangeetha 12 Yrs/F	5	5
Miss. Bhuwana. S 11 Yrs/F	5	5
Miss. Uma. R 12 Yrs/F	5	5
Miss. Mullai 12 Yrs/F	5	5
Miss. Ramys. 14 Yrs/F	5	–
Master. Haripragadesgh 13 Yrs/F	5	5
Miss. Bhagyam Sheela 11 Yrs/F	5	5

Table 3: Study and analysis.

Patient Name and Age	Inter molar width						Maxillary Molar distalization	
	Rt. MB cusp tip to Lt.			Rt. DB cusp tip to Lt.				
	Pre (mm)	Post (mm)	Diff. (mm)	Pre (mm)	Post (mm)	Diff. (mm)	Right (mm)	Left (mm)
Miss. R. Sangeetha 11 Yrs/F	48	50	2	52	50	-2	6	5
Miss. Kayalvezhi 11 Yrs/F	47	51	4	50	50	0	4	4
Miss. Balambigai 11 Yrs/F	54	60	6	57	59	2	4	5
Miss. Sangeetha 12 Yrs/F	46	47	1	47	45	-2	5	5
Miss. Bhuwana. S 11 Yrs/F	50	50	0	52	52	0	5	4
Miss. Uma. R 12 Yrs/F	47	49	2	50	50	0	5	4
Miss. Mullai 12 Yrs/F	50	52	2	52	52	0	5	5
Miss. Ramys. 14 Yrs/F	50	50	0	50	51	1	5	-
Master. Haripragadesgh 13 Yrs/F	53	55	2	54	54	0	4	6
Miss. Bhagyam Sheela 11 Yrs/F	53	55	2	55	55	0	6	4

This treatment time for the molar distalization for all of the 10 patients used in this study was 2 to 3 months, till the maxillary first molars were distalized to the desired extent. According to the pre and post cephalometric radiograph tracing over the acetate paper, the maxillary first molar distalization were recorded.

Five patients were treated with the pendulum appliance. For the first patient Miss. P. Sangeetha, maxillary first molar distalization of 4 mm, recorded cephalometrically was achieved in 3 months and 8 days. The anchorage loss was not evident. There was no change in the vertical position molar were distally tipped 5°. The IOPA radiograph revealed 5 mm of maxillary first molar distalization bilaterally. No root resorption was observed. The study cast analysis showed an increase in the width between mesiobuccal cusp of right and left first molar teeth by 2 mm. Where as that between distobuccal cusp decreased by 2 mm. This implies a favourable mesiobuccally rotation of the molar. From the study cast the maxillary first molar were found to be distalized by 6 mm on the right side and 5 mm on the left side.

For the second patient. Miss. Kayalvezhi maxillary first molar distalization of 4 mm, recorded cephalometrically, was achieved in 2 months and 20 days. The anchorage loss not evident. There was no change in the vertical positional of the maxillary first molar eg., extrusion or intrusion. The maxillary first molar were distally tipped 14°. The IOPA radiograph revealed 5mm of maxillary first molar distalization bilaterally. No root resorption was observed. The study cast analysis showed and increase in the width between mesio buccal cusp of right and left first molar teeth by 4mm where as that between distobuccal cusp showed no increase. This implies a favourable mesiobuccally rotation of the molar. From the study cast the maxillary first molar were found to be distalized by 4mm on the right side and 4mm on the left side.

For the third patient. Miss. Balambigal maxillary first molar distalization of 5mm, recorded cephalometrically, was achieved in 3 months. The anchorage loss was 1mm as premolar centroid to PTV line increased from pre-treatment of 35 mm to post treatment of 36 mm. the maxillary first molars were extruded 2mm. the maxillary first molar was distally tipped 18°. The IOPA radiograph revealed 5 mm of maxillary first molar distalization bilaterally,

No root resorption was observed. The study cast analysis showed an increase in the width between mesio buccal cusp of right and left first molar teeth by 6 mm. where as that between distobuccal cusp also increased by a minimal of 2mm. this implies a favourable mesiobuccal rotation of the molar. From the study cast the maxillary first molar were found to be distalized by 4 mm on the right side and 5mm on the left side.

For the fourth patient, Miss. Sangeetha maxillary first molar distalization of 4mm recorded cephalometrically, was achieved in 2 months and 25 days. The anchorage loss was recorded to be 4mm by mesial movement of first premolar. The maxillary first molars were extruded by 3mm. the maxillary first molars were distally tipped 8°. The IOPA radiograph revealed 5mm of maxillary first molar distalization bilaterally. No root resorption was observed. The study cast analysis showed an increase in the width between distobuccal cusp decreased by 2mm. this implies first molar were found to be distalized by 5mm on the right side and 5mm on the left side.

For the fifth patient, Miss. Bhuvana Saraswathy maxillary first molar distalization of 4mm, recorded cephalometrically, was achieved in 3 months. The anchorage loss was not evident. The maxillary first molar were extruded by 2mm. the maxillary first molars were distally tipped 20°. The IOPA radiograph revealed 5mm of maxillary first molar distalization bilaterally. No root resorption was observed. The study cast analysis showed no increase in the width between mesio buccal cusp and distobuccal cusp of right and left first molar teeth. From the study cast the maxillary first molar were found to be distalized by 5mm on the right side and 4mm on the left side.

Two patients were treated with Jones Jig for molar distalization. For the sixth patient, Miss. P. Uma. Maxillary first molar distalization of 4 mm, recorded cephalometrically, was achieved in little less than 3 months. The anchorage loss was not evident. The maxillary first molar were extruded by 1mm. the maxillary first molar showed no distal tipping and were moved bodily. The IOPA radiograph revealed 5mm of maxillary first molar distalization bilaterally, No root resorption was observed. The study cast analysis showed an increase in the width between mesio buccal cusp of right and left first

molar teeth by 1 mm. Where as that between distobuccal cusp showed no increase. This implies as favourable mesiobuccal rotation of the molar. From the study cast the maxillary first molar were found to be distalized by 5 mm. on the right side and 4mm on the left side.

For the ninth patient, Master Haripragadesh maxillary first molar distalization of 4 mm recorded cephalometrically, was achieved in 2 months and 20 days. The anchorage loss was found to be 2mm by the mesial movement of second premolar. The maxillary first molars were extruded by 1 mm. The maxillary first molars were distally tipped by 10°. The IOPA radiograph revealed 5mm of maxillary first molar distalization bilaterally. No root resorption was observed. The study cast analysis showed an increase in the width between mesio buccal cusp of right and left first molar teeth by 2mm. Where as that between distobuccal cusp showed no increase. This implies favourable mesiobuccal rotation of the molar. From the study cast the maxillary first molar were found to be distalized by 4mm on the right side and 6mm on the left side.

One patient was selected to be treated with Jones Jig on right side and Lokar distalizer of left side for molar distalization. And it was our Tenth patient, Miss. Bhagyam Sheela for whom maxillary first molar distalization of 5mm, recorded cephalometrically, was achieved in 3 months. The anchorage loss was not evident. The maxillary first molars were intruded by 1mm. the maxillary first molars were distally tipped by 10°. The IOPA radiograph revealed 5mm of maxillary first molar distalization bilaterally. No root resorption was observed. The study cast molar teeth by 2mm where as that between distobuccal cusp showed no increase. This implies a favourable mesiobuccal rotation of the molar. From the study cast the maxillary first molar were found to be distalized by 6mm on the right side and 4mm on the left side.

DISCUSSION

History repeats itself and after the peak of Tweed's and Begg's extraction era. Once again Angle's Non-Extraction Philosophy is knocking at our door. Maxillary Molar Distalization is supposed to be one of the pillarstone of the Non-Extraction Therapy. Its popularity shows its importance. Every other day, a

A new Maxillary molar distalizer is introduced to the orthodontic for distalization of maxillary molars into a Class I relationship.

The indications for maxillary first Molar Distalization are:-

1. There is mesial tipping or migration of maxillary first molars eg., Carious attack of primary molars, Ectopic eruption of maxillary first molar, iatrogenic mesial drift because of early extraction of primary molars.
2. The discrepancy anterior to the first molars does not exceed 2-3 mm on either side and when there is no evidence of developing posterior crowding.
3. Incisors are retroclined or when the profile can afford some proclination.
4. Patients have a normal to near normal mandibular arch with upright or slight retroclined incisors, no crowding with flat Curve of Spee.
5. Upper molars placed normally buccopalatally in the cancellous bone.
6. An end-on or full class II molar relationship due to maxillary protrusion.
7. An end-on full class II molar relationship due to maxillary cuspids being either impacted unerupted or erupted labially and high in the vestibule.
8. An end-on full class II molar relationship due to the ectopic eruption of either the first or second bicuspid.

The contraindications include:

1. Excessive proclination of anterior teeth
2. Posterior crowding
3. An end-on full class II molar relationship due to regognathic mandible
4. TMJ Problem
5. Unfavourable growth pattern

James. J Hillers² stated that with maxillary molar distalization, there is a tendency for anterior bite to open. This open bite generally corrects by itself in brachyfacial patients but can be a problem in

dolichofacial with tongue thrust habits. He recommends treating vertical growth patterns conservatively with extractions, directional headgear and transpalatal bars. Whereas David J. Snodgrass³ suggested that any Expansion and distalization appliance tends to extrude the molars and therefore molar distalization should be done with caution in patient with vertical growth pattern. But in our study we could not find significant amount of extrusion of maxillary first molars. From the five patients who received Pendulum appliance treatment, 2 patients had 1-2 mm of extrusion whereas patient has intrusion of 1mm.

About the timing of distalization, Joseph M. Sims⁴ suggested that the patient should be treated before the age of 9 years as the root of the molar to be moved has not completed its growth and the orthodontic distal tipping or distal bodily movement is easier. Whereas the subjects used in this study were ranged from 11 to 14 years but then also appreciable amount of molar distalization was achieved.

Many clinicians suggest that molar distalization is very efficient, if carried out where the second molar crown is at the apical third of the first molar. In this study the patient were aged between 11 to 14 years and it was found that the maxillary first molars were efficiently distalized in all the cases even with second molars.

Langford & Sims⁵ suggested that the distal movement of upper molar roots against adjacent unerupted teeth could cause resorption. But in this study, after carefully observing the introral periapical radiographs, resorption could not be well appreciated.

Hilgers² suggested that when a great deal of distal movement is needed and it is preferable not to extract the upper first bicuspid, it is always beneficial to remove the upper second molars and let the third molars, drift into place. The extraction of second molar delivers almost double the space gained by bicuspid extraction. It offers relief as crowding in both the anterior and posterior segment simultaneously. Chipman⁶, Graber⁷ and Bishara⁸ have also advocated second molar extraction in conjunction with the maxillary first molar distalization. In this study, all the subjects

were treated with a non extraction approach without second molar extractions.

The five subjects treated with the Pendulum appliance showed an average of 4.2mm of maxillary molar distalization cephalometrically. The anchorage loss was not evident as it was of an average of -0.4mm. the maxillary first molars extruded an average of 1.4mm. The maxillary molar tipped distally an average of 11°. The IOPA radiograph showed an average of 5mm molar distalization bilaterally. The width between the mesiobuccal cusps of the right and left first molar teeth increased by 2mm. Whereas that between the distobuccal cusp showed no increase. This implies a favourable mesio buccal rotation of the molar. Ghosh and Nanda also found an increase of 1.40mm between the mesio buccal cusps of the right and left first molar teeth. From the study cast an average of 4.8mm, for the right side and 4.6mm for the left side of molar distalization was recorded.

Two of the patients treated with the Jones Jig bilaterally, showed an average of 4 mm of maxillary molar distalization cephalometrically. The anchorage loss was not evident. The maxillary first molars extruded an average of 1 mm. the maxillary molar tipped distally an average of 3.5. The IOPA radiograph showed an average of 5 mm molar distalization bilaterally. The width between the mesiobuccal cusps of the right and left first molar teeth. Increased by 2 mm. whereas that between the distobuccal cusps showed no increase. This implies a favourable mesio buccal rotation of the molar. From the study cast the molar were found to be distalized to an average of 5 mm on the right side and 4.5 mm on the left side.

Two of the patients were treated with the Lokar Distalizer and they showed an average of 4 mm of maxillary molar distalization cephalometrically. The anchorage loss was found to an average of 1 mm by the mesial movement of second premolar. The maxillary first molars extruded an average of 1 mm. there was no change in the vertical position of the maxillary first molars. The maxillary molar tipped distally an average of 8.50. The IOPA radiograph revealed an average of 5 mm of molar distalization bilaterally. The width between the mesiobuccal cusps of the right and left first molar teeth increased by an average of 1 mm, whereas that between the distobuccal cusp showed no increase.

This implies a favourable mesio buccal rotation of the molar. From the study cast an average of 4.5 mm. of molar distalization was recorded on the right side and 6 mm on the left side. One of the two patients was being treated unilaterally for right side only.

One of the patient was chosen to have Jones Jig on the right side and Lokar distalizer on the left. She showed a molar distalization of 4 mm cephalometrically. The anchorage loss by the mesial movement of second premolar was 2 mm. the maxillary first molars were extruded by 2 mm and it was distally tipped 100. The IOPA radiograph showed 5 mm distalization bilaterally. The width between the mesio buccal cusps and the distobuccal cusps of right and left first molar teeth showed no increase. This implies a favourable rotation of the molar teeth showed no increase. This implies a favourable rotation of the molar. From the study cast she had a molar distalization of 6 mm on the right side and 4 mm on the left.

It has been found in this study that distal tipping of maxillary first molar is more with the Pendulum appliance than with either Jones Jig or the Lokar distalizer which produces more of distal bodily movement.

CONCLUSION

The results of this study have shown that the Pendulum Appliance, Jones Jig and the Lokar distalizer are all effective and reliable methods for distalizing maxillary molar. However molar distalization is at the expense of moderate anchorage loss, which could possibly be reduced if the anchor unit is adequately reinforced by full palatal coverage and incorporation of all the teeth in the appliance. The major advantages of these appliances lie in their minimal dependence on patient compliance, ease of fabrication, easy activation and patient acceptance.

It is clear that the future of orthodontic mechanotherapy will include more and more form of noncompliance therapy. Quality results will depend on predictability and less on the whims and responsibility levels of individual patients. This is a socialized phenomenon over which we have very little control. Larry white's description of

noncompliant patients as “turtles without shells” seems to be an apt metaphor.

Lastly, I conclude by stressing on the fact that compared to the Pendulum appliance, both the Jones Jig and Lokar distalizer minimally tip the molars distally. The lokar distalizer is highly economical, utilizes continuous, ideal forces of NiTi springs to generate rapid molar movement while minimizing the patient discomfort, easy to insert, to ligate and to use, precise distalization can be accomplished usually with one activation, can be used unilaterally, easy to adjust and can be used in early treatment or with appliance in place. And so the Lokar Distalizer comes out to be the best among the rest of the molar distalizers used in this study.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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