

EFFECTS OF JONES JIG APPLIANCE IN MAXILLARY FIRST MOLAR DISTALIZATION

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ABSTRACT

The purpose of this study was to evaluate treatment effects of Jones jig appliance during class-II molar correction with a focus on the magnitude of maxillary first molar distalization, its tipping, extrusion and rotation as well as anchorage loss at premolar- incisor unit. A complete set of pre and post distalization records including history, clinical examination, Lateral cephalometric radiograph, Orthopantomogram, study casts and photographs was taken for each patient. Pre and post distalization lateral cephalometric radiographs were traced for evaluation of molar, premolar and incisors movements while models were used to find out molars rotation. Results showed that there was 5.30 mm space created between molar and premolar during 5.65 months; out of which 3.30 mm (62.26 %) showed molar distalization and 2.00mm (37.74 %) anchorage loss. There was 6.70° molar tipping with 0.70 mm extrusion while second premolar showed 7.58° tipping and 1.58 mm extrusion. Incisors exhibited an insignificant labial tipping of 0.75°. Both right and left molars showed 2.00° and 2.55° highly significant disto palatal rotation

Key words: Jones Jig, Distalization, Molar correction, Anchorage loss.

INTRODUCTION

The primary goal of orthodontic treatment is attainment of an "ideal occlusion", this involves placement of first molars in class I relationship. The most common presentation for orthodontic treatment is Class-II malocclusion, which is characterized by "post-normal" molar relationship¹.

Non-extraction approaches to orthodontic treatment have increased interest in appliances and techniques that help to create additional space within the dental arches². Many researchers have developed numerous treatment modalities for Class-II molar correction from compliance oriented headgear treatment to non-compliance treatments using intra-oral devices to distalize the maxillary first molars into class I occlusion^{3,4}.

Patient compliance is one of the problems with orthodontic treatment. The techniques that require patient cooperation are headgear (extraoral traction), Class-II intermaxillary elastics, Wilson bimetric distalizing arch system, Molar distalizing bow, Acrylic Cervical Occipital appliance (A.C.O .0) and removable functional appliances⁵.

The intra-oral molar distalizing appliances include inter-arch and intra-arch. The inter-arch appliances include Herbst appliance, Jasper jumpers, adjustable bite corrector, MARA (Mandibular Anterior Repositioning Appliance), Eureka spring, Saif spring, Klepper super spring and these depend upon opposing arch for anchorage requirements^{3,5}. On the other hand, the intra-arch appliances include, Ni Ti coil springs, Nickel titanium arch wires, repelling magnets, Jones jig and distal jet appliance. These appliances rely on Nance acrylic palatal button for anchorage attached to banded maxillary first premolars, second premolars or deciduous second molars^{5,6,7}.

Jones and White⁸ introduced the Jones Jig appliance for molar distalization, in which an open coil nickel titanium spring is used to deliver 70-75 grams of force over a compression range of 1-5 mm, to the maxillary molars. Jones jig has been recommended for bilateral as well as unilateral molar distalization and also molar derotation in the treatment of Class-II malocclusion. The Jones jig appliance contains 15 mm nickel titanium coil spring as an active force component that can be activated by 1-5 mm compression to exert optimum force for distalization of maxillary first molars⁸.

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Numerous studies have been carried out to evaluate treatment effects of Jones jig appliance either as a single appliance or in comparison with similar appliances, but no such study has been established on Pakistani population^{9,10,11,12}. The purpose of this study was to evaluate treatment effects of Jones jig appliance with a focus on the magnitude of maxillary first molar distalization, its tipping, extrusion and rotation as well as anchorage loss at premolar- incisor unit.

MATERIALS AND METHODS

Thirty patients (18 males and 12 females) of both sexes with an age range of 12-14 years (mean age 12 years 10 months; 154.26±2.04 months) were selected from orthodontics department of de'Montmorency College of Dentistry/ Punjab Dental Hospital, Lahore, Pakistan.

Selection Criteria

The sample in this study was judged Class-II if a 2mm or more discrepancy existed from the mesiobuccal cusp of the maxillary first molar and buccal groove of the mandibular first molar. Mandibular arch was planned for non-extraction treatment where there was no arch length discrepancy or mild crowding, maxillary arch length discrepancy ranged between 5-7 mm. Normal or low angle vertical pattern with SN- mandibular plane angle 32 degrees or less, maxillary — mandibular plane angle 25 degrees or less. Class I or mild Class-II skeletal pattern with ANB 4-5 degrees. Class-II division I with mild proclination and Class-II division II with mild crowding. No other orthodontic treatment or molar distalization procedure performed before or during the study. All the permanent teeth especially maxillary second molars fully erupted into occlusion. A complete set of records including history, clinical examination, Lateral cephalometric radiograph, Orthopantomogram, upper/ lower study casts, extra oral and Intraoral photographs was taken for each patient and same records were repeated after distalization. Informed consent from every patient/ parents was taken before treatment.

Jones Jig Appliance (Fig-1)

Jones and Whites introduced the Jones jig appliance*. This system includes an active arm and an anchorage unit. The active arm or jig assembly is a 0.0303twire that holds a nickel titanium coil spring and a sliding hook. Anchorage unit is a modified Nance appliance off of the maxillary second premolars, with 0.0363tstainless steel wire used to unite the premolar bands and palatal acrylic button of about 1.003tdiameter.

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Components of Jones jig Appliance (Fig 1)

1. Jones jig 0.303" wire with two arms (one for insertion into 0.0453" headgear tube and other into 0.0183" main slot) and a Hook for elastic ligature attachment.
2. Sliding islet for activation.
3. Nickel-Titanium spring.
4. Maxillary second premolar bands.
5. Maxillary first molar bands.
6. Modified Nance appliance attached to Maxillary second premolar bands.

Fabrication of Modified Nance appliance⁸

After getting sufficient separation between maxillary first molars and second premolars, appropriate size premolar bands were selected and fitted in the patient's mouth and impression made with the bands in situ. These bands were gently removed from the patient's mouth and carefully seated in the impression and, then model poured in dental stone.

A 0.0363" stainless steel wire with a central loop was adopted on the palatal surface of cast, extending it as far as the canine anteriorly and soldered to the second premolars bands. Quick cure acrylic was mixed and placed around the central loop of the wire to make an acrylic button of about 1.03" in diameter. The acrylic button was extended anteriorly up to incisive papilla without impingement, and posteriorly up to the distal level of second premolars. After polymerization, the appliance was removed from the cast, finished and polished.

Cementation of Modified Nance appliance and Insertion of Jones jig

On the subsequent visit this modified Nance appliance was cemented to the maxillary second premolars and appropriate size first molar bands were selected and cemented. The length of Jones jig assembly was adjusted according to the patient's arch (molar tube to middle of canine), excessive was cut, nickel titanium coil spring and sliding hook rolled over the Jones jig, then anteriorly it was bent into an eyelet adjacent to the canine. Jones Jig has got two arms; one arm was fitted in to 0.0453" headgear tube and other in to the main arch wire slot of the maxillary first molar band. After fitting the Jones Jig in to the corresponding tube and slot, the appliance was held in place by tying a 0.0103" steel ligature wire around the molar tube and hook of Jones jig. Applying elastic ligature on hook of molar tube and Jones jig enhanced further stability. After fitting the Jones jig into the corresponding molar tube and slot, the appliance was activated by tying the activation islet with a 0.103" steel ligature off of the maxillary second premolars. Activation of Jones jig

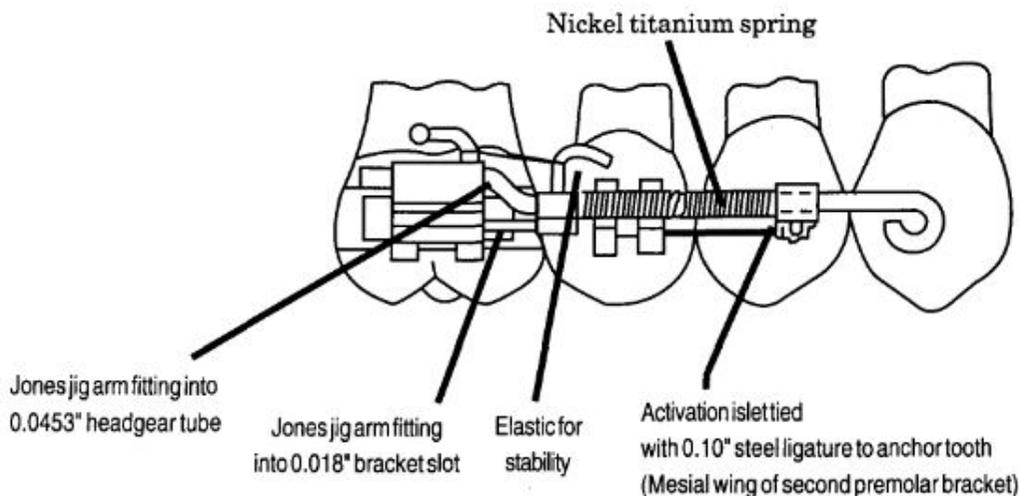


Fig 1. Jones-Jig-Appliance

appliance was achieved by applying 100-gram force on maxillary first molars measured with **Corex force measuring gauge**.

This combination appliance utilized modified Nance button as anchorage and Jones jig with nickel titanium spring to deliver 100 grams force for maxillary molar distalization. All the patients were instructed to maintain good oral hygiene.

Reactivation

The patient's were reviewed on regular interval of 4 weeks; the coil springs were reactivated to maintain the constant 100 grams force at every visit. This monthly activation was carried out till the achievement of desired class I molar relationship with 1 mm over correction or slight Class-III position i.e. Mesio-buccal cusp of maxillary first molar occlude 1 mm distal to buccal groove of mandibular first molar.

Fabrication of Nance Holding Appliance for Retention

After removal of Jones jig and Nance appliance, Nance holding arch was fabricated for retention and stability of distalized molar position. Maxillary impression was made in alginate impression material and poured with the molar bands in situ, 0363" stainless steel wire was soldered to the palatal aspect of molar bands. Anteriorly this wire was embedded in to acrylic button with cold cure acrylic. Appliance finished, polished and cemented into the patient's mouth⁸.

A) Cephalometric Analysis

Cephalometric radiographs were taken at the following times:

- Ti = Immediately prior to placement of appliances.
- T2 = Immediately after the removal of appliances.

Cephalometric radiograph were traced manually using 0.1 mm black marker on 0.003-inch thick acetate paper with a variable contrast view box used for illumination. The Cephalometric landmarks were marked manually and all the planes and angles were constructed as illustrated on (Fig 3 & 4).

All double images were traced with the distal and smaller outline of the structure. The term centroid was used in this analysis to signify a constructed point on the permanent molars and premolars. The centroid is located at the mid point of a line drawn from the mesial and distal greatest convexity of the individual molars and premolars^{3,9,13}. All the measurements were made nearest to the 0.5° for angular and 0.1mm for linear changes".

Method Error

To evaluate the error of landmarks identification and tracing; 15 cephalogram were randomly selected and retraced by the same examiner after one month of the original landmarks identification and tracing. Tracing error was calculated based on the differences

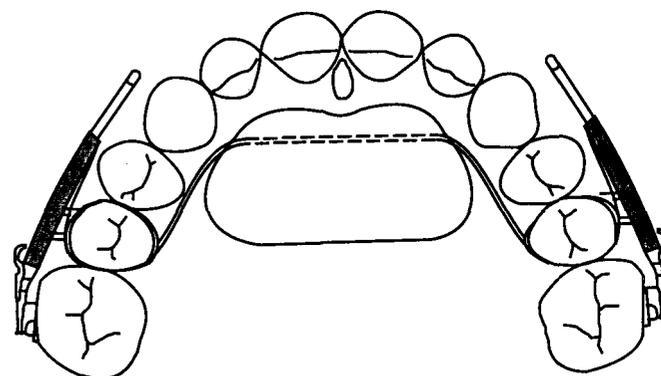
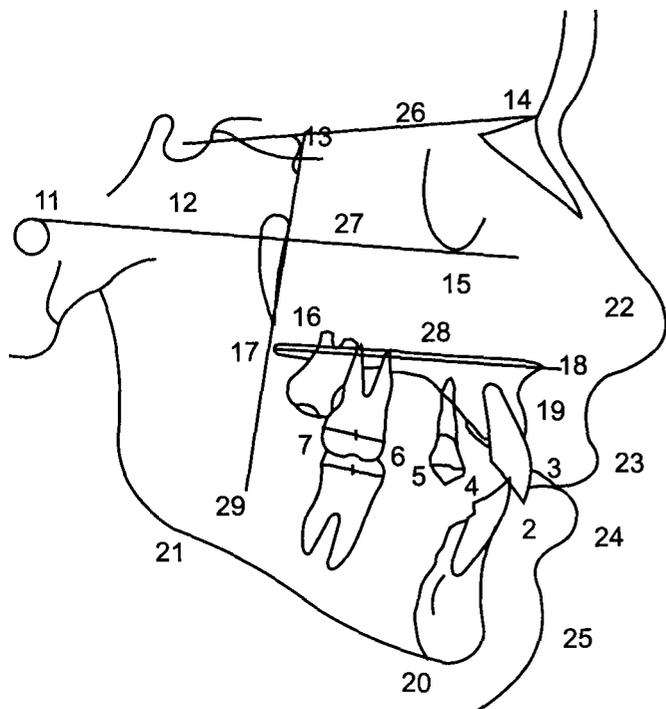


Fig 2. Typical bilateral application of Jones jig appliance with palatal acrylic button (occlusal view)



1-Maxillary incisor apex, 2- Maxillary incisor tip, 3- Maxillary incisor labial contour, 4- Maxillary premolar mesial, 5-Maxillary premolar distal, 6- Maxillary Pt molar mesial, 7- Maxillary 1st molar distal, 11- Porion, 12- S-sella turcica, 13-SE point, 14-N-Nasion, 15- Orbitale, 16-Ptm point, 17-PNS, 18-ANS, 19-point-A, 20-Menton, 21-Go, 22-Pn-pronasale, 23-Upper lip, 24- Lower lip, 25-soft tissue Pogonion, 26. S-N plane, 27.FP- Frankfort plane, 28. PP- Palatal plane, 29-PTV- Pterygoid vertical plane

Fig 3. Cephalometric Landmarks and Planes

between the original Cephalometric values and the same values for retracing. All the variables of the original tracings were compared to the retracing variables and a paired t-test was applied to determine significance of difference. The results of the statistical analysis demonstrated that none of the variables used in this study showed an error of statistical significance at $p < 0.05$.

Cephalometric measurements (Fig 4)

All radiographs were analyzed for Cephalometric changes in the following way:

1. Cephalometric measurements at **T1**.
2. Cephalometric measurements at T2.
3. T1-T2 Changes

Pterygoid vertical (PTV) was used as the reference plane to evaluate linear changes of maxillary first

molar and second premolar in sagittal plane by constructing lines perpendicular to PTV- plane passing through the centroid of each tooth (fig 4).

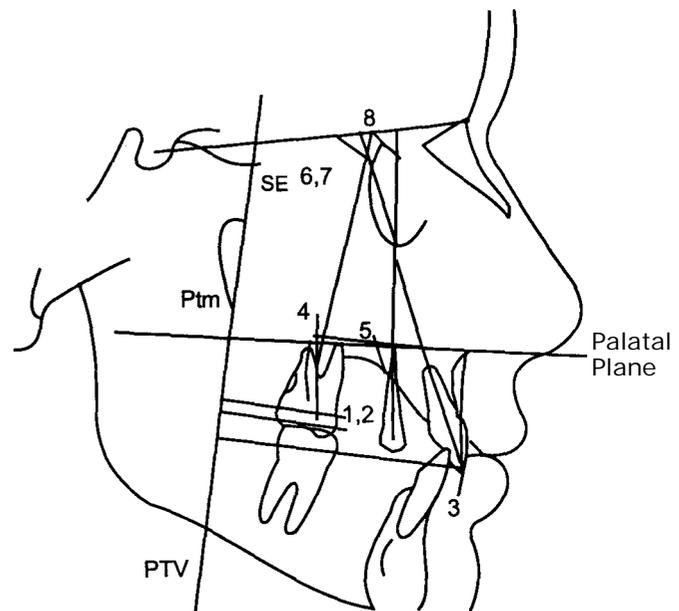
Dental changes in vertical plane as extrusion of maxillary first molar and second premolar were assessed by measuring the vertical distance from palatal plane to the centroid of these teeth.

Linear distance of maxillary incisor was measured by drawing perpendicular line from PTV-plane to incisor tip (Fig.4).

Angular measurements were obtained by constructing a line from centroid of each molar and premolar perpendicular to the mesial- distal line of the respective tooth being measured. The angle that was formed between perpendicular line from the centroid of each tooth and SN plane was used to measure angular changes associated with distalization.

The inclination of maxillary central incisor was measured to the anterior cranial base by passing a line through the long axis of tooth and measuring the inferior posterior angle relative to SN plane. (Fig 4)

All cephalometric values were measured and divided in to following two groups":



- 1-PTV-maxillary first molar centroid, 2-PTV-maxillary second premolar centroid, 3-PTV-maxillary incisor tip, 4-PP-maxillary first molar centroid, 5-PP-maxillary second premolar centroid, 6-SN-maxillary central incisor, 7-SN-maxillary premolar, 8-SN-maxillary first molar

Fig 4. Cephalometric Dental Linear and angular Measurements

1. Dental-linear measurements

- PTV- maxillary first molar centroid (mm)
- PTV- maxillary second premolar centroid (mm)
- PTV- maxillary central incisor tip (mm)
- PP- maxillary first molar centroid (mm)
- PP- maxillary second premolar centroid (mm)

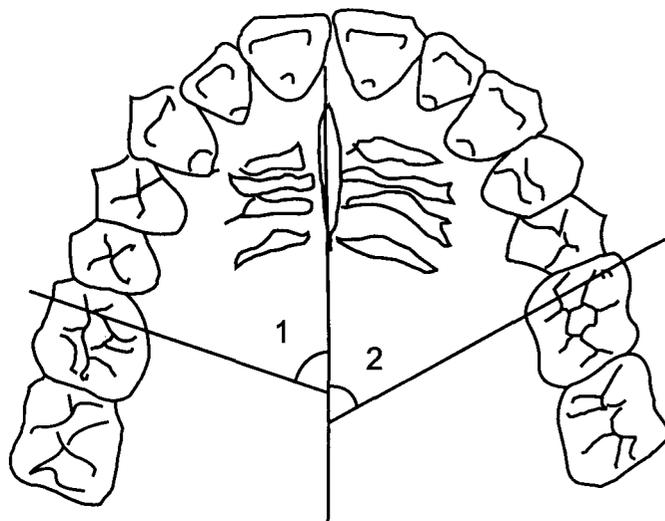
2. Dental-angular measurements

- SN- Maxillary central incisor long axis (degrees)
 - SN- Maxillary first molar long axis (degrees)
 - SN- Maxillary second premolar long axis (degrees)
- b. Cast Analysis (Figure-5)**

Pre- distalization (T1) and post-distalization (T2) maxillary casts were taken and then analyzed to determine rotation of the maxillary first molars^{3, 14}. The models were photocopied to a 1:1 ratio¹⁵. A line was drawn from incisive papilla along the median palatal raphae to construct midline. The angle formed between the midline and a line passing through the mesiobuccal and mesiopalatal cusp tips of the maxillary first molars determined the rotation of the molars (Fig 5). All the measurements were made nearest to the 0.5° for angular changes¹².

STATISTICAL ANALYSIS

The data was analyzed using SPSS version 8.0 software to deduct mean, standard deviation and stan-



1) Angle between palatal midline and a line bisecting the right mesiobuccal and mesiolingual cusp tips, 2) Angle between palatal midline and a line bisecting the left mesiobuccal and mesiolingual cusp tips.

Fig 5 Maxillary Model Measurements

dard error of mean of each series of sample at T1 and T2. A paired t-test was applied to analyze intra group differences between pre and post-distalization variables to determine significant changes.

The level of significance was chosen at:

P< 0.001= Highly significant; P< 0.01= Significant; NS = Non significant

RESULTS

The results of statistical analysis for the sample are given in tables 1-4, where **Table 1** shows number of patients, mean, standard deviation, standard error mean, minimum and maximum dental linear, dental angular, pre distalization cephalometric measurements made at T1, i.e. before application of Jones jig appliance.

Table 2 shows number of patients, mean, standard deviation, standard error mean, minimum and maximum dental linear, dental angular, post-distalization cephalometric measurements made at T2, i.e. the time at completion of molar distalization and removal of Jones jig appliance.

Table 3 shows mean distalization time, predistalization (T1) and post-distalization (T2) means, difference of means, and p-value from pre to post distalization dental linear, dental angular, cephalometric measurements.

Table 4 shows predistalization (T1) and post-distalization (T2) means, standard deviation, standard error mean, p-value and rotation of right and left molars from pre to post distalization **cast** measurements.

Linear Measurements

a) Sagittal plane

Mean pretreatment measurement from PTV-plane to maxillary first molar centroid was 24.80 ± 2.75 mm and mean post distalization measurement was 21.50 ± 2.64 mm. There was 3.30 mm difference of means which showed distalization of maxillary first molar at significance level of ($p < 0.001$).

Mean pretreatment measurement from PTV-plane to maxillary second premolar centroid was 33.60 ± 2.61 mm and mean post distalization measurement was 35.60 ± 2.76 mm. There was 2.00 mm difference of means, which showed mesial movement of maxillary second premolar significant at ($p < 0.01$).

Mean pretreatment measurement from PTV-plane to maxillary incisor tip was $55.20 \pm$ mm and mean post distalization measurement was 56.90 ± 2.93 mm. There was difference of 1.70 mm which showed forward movement of maxillary incisors that was significant at ($p < 0.01$).

TABLE-1: (T1) DETAIL OF DENTAL LINEAR AND ANGULAR MEASUREMENTS WITH MEANS, SD, S.E.M, MINIMUM AND MAXIMUM PREDISTALIZATION CEPHALOMETRIC MEASUREMENTS

MEASUREMENTS	Mean	SD	s.e.m	Minimum	Maximum
Dental linear (30)					
PTV- maxillary first molar centroid (mm)	24.80	2.75	0.50	19.80	30.00
PTV-maxillary second premolar centroid (mm)	33.60	2.61	0.47	28.50	38.50
PTV- maxillary incisor tip (mm)	55.20	2.41	0.40	50.00	59.00
PP- maxillary first molar centroid (mm)	21.00	2.53	0.46	16.50	25.8
PP- maxillary second premolar centroid (mm)	21.40	2.79	0.51	16.00	26.00
Dental Angular (30)					
SN-maxillary incisor (degrees)	103.25	5.17	0.94	92.00	112.00
SN-maxillary second premolar (degrees)	71.60	3.68	0.67	65.00	79.00
SN-maxillary first molar (degrees)	71.10	3.54	0.65	65.00	79.00

TABLE-2: (T2) DETAIL OF DENTAL LINEAR AND ANGULAR MEASUREMENTS WITH MEAN, SD, S.E.M, MINIMUM AND MAXIMUM POST-DISTALIZATION CEPHALOMETRIC MEASUREMENTS

MEASUREMENTS	Mean	SD	s.e.m	Minimum	Maximum
Dental linear (30)					
PTV- maxillary first molar centroid (mm)	21.50	2.64	0.48	16.00	26.90
PTV-maxillary second premolar centroid (mm)	35.60	2.76	0.50	30.50	40.50
PTV- maxillary incisor tip (mm)	56.90	2.93	0.53	50.00	61.00
PP- maxillary first molar centroid (mm)	21.77	2.58	0.47	17.00	26.80
PP-maxillary second premolar centroid (mm)	22.98	2.68	0.49	17.80	28.50
Dental angular (30)					
SN-maxillary incisor (degrees)	104.00	5.50	1.00	92.50	114.00
SN-maxillary second premolar (degrees)	78.30	3.93	0.72	70.00	85.00
SN-maxillary first molar (degrees)	63.70	3.57	0.65	57.00	70.50

b) Vertical Plane

Mean pretreatment measurement from Palatal plane to maxillary first molar centroid was 21.00±2.53 mm and mean post distalization measurement was 21.77±2.58 mm. There was 0.77 mm difference of means that showed insignificant extrusion of maxillary first molar.

Mean pretreatment measurement from Palatal plane to maxillary second premolar centroid was 21.40±2.79 mm and mean post distalization measurement was 23.00±2.68 mm. There was 1.60 mm difference of means, which showed extrusion of maxillary second premolar at significance level of (p<0.01).

Angular Measurements

Mean pretreatment measurement for angle between SN-plane to maxillary incisor long axis was 103.25±5.17° and mean post distalization measurement was 104.00±5.50°. There was difference of 0.75° that showed statistically insignificant forward tipping of maxillary incisor

Mean pretreatment measurement for angle between SN-plane to maxillary premolar centroid was 71.60±3.68° and mean post distalization measurement was 78.30±3.93°. There was difference of 6.70° that showed mesial tipping of maxillary second premolar statistically significant at (p<0.001)

Mean pretreatment measurement for angle between SN-plane to maxillary first molar centroid was 71.10±3.54° and mean post distalization measurement was 63.70±3.57°. There was difference of 7.40° that showed distal tipping of maxillary first molar statistically significant at (p<0.001)

Molar Rotation

The results of sample showed pretreatment and post distalization measurements for right maxillary molar 56.33±3.74° and 58.33±4.13° with insignificant difference of 2.00°. Pretreatment and post distalization measurements of left molar were 56.58±3.62° and 59.13±4.32° with significant difference of 2.55° at p<0.001. These results showed that right and left maxillary first molars were rotated 2.00° and 2.55° with Jones jig appliance.

TABLE-3: T1- T2 DETAIL OF DENTAL LINEAR AND ANGULAR MEASUREMENTS INCLUDING MEAN DISTALIZATION TIME, MEAN OF PRE AND POST DISTALIZATION DIFFERENCE OF MEANS AND P-VALUE FROM PRE TO POST DISTALIZATION

MEASUREMENTS	Rx time months	Mean T1	Mean T2	Diff of means	P- value
Dental linear (30)					
PTV- maxillary first molar centroid (mm)	5.65	24.80	21.50	3.30	P<0.001
PTV-maxillary second premolar centroid (mm)	5.65	33.60	35.60	2.00	P<0.001
PTV- maxillary incisor tip (mm)	5.65	55.20	56.90	1.70	P<0.01
PP- maxillary first molar centroid (mm)	5.65	21.00	21.70	0.70	NS
PP- maxillary second premolar centroid (mm)	5.65	21.40	23.00	1.60	P<0.01
Dental angular (30)					
SN-maxillary incisor (degrees)	5.65	103.25	104.00	0.75	NS
SN-maxillary premolar centroid (degrees)	5.65	71.60	78.30	6.70	P<0.001
SN-maxillary first molar centroid (degrees)	5.65	71.10	63.70	7.40	P<0.001

P<0.001=Highly significant difference
NS=Non significant difference

P<0.01= Significant difference

TABLE- 4: MAXILLARY RIGHT AND LEFT FIRST MOLAR ROTATION; MEAN, STANDARD DEVIATION, STANDARD ERROR OF MEAN AND P-VALUE FOR PRETREATMENT (T1) AND POST DISTALIZATION (T2) MEASUREMENTS.

		n	Mean	SD	s.e.m	p-value
Maxillary Right first molar	T1	30	56.33°	3.74	0.68	N.S
	T2	30	58.33°	4.13	0.75	
Maxillary Left first molar	T1	30	56.58°	3.62	0.66	P<0.001
	T2	30	59.13°	4.32	0.79	
Mean Rotation			Right 2.0°		Left 2.55°	

P<0.001=Highly significant difference
NS=Non significant difference

P<0.01= Significant difference

DISCUSSION

This study was conducted on thirty patients to Unerll the clinical effects of Jones Jig molar distalizing appliance. A force of 100 grams was exerted from nickel titanium spring and it took average of 5.65 months for correction of Class-II molar relationship. Results of this study were also compared with previous studies.

Molar Distalization, Tipping and Extrusion

During a period of 5.65 months, the Jones jig distalized the maxillary first molars an average of 3.30 mm /side to correct Class-II molar relation ship in to class-I occlusion. For the present sample of 30 patients treated with Jones jig appliance, the maxillary first molars were also tipped distally an average of 6.70° and extruded 0.70 mm. These changes are similar but slightly differ wit Unerll study, rickman et al" where maxillary molar was distalized 2.51 mm and tipped

distally 7.53° with 0.10 mm insignificant extrusioT2 Haydar and Unerll found 2.20 mm molar distalization with 7.96° distal tipping and 0.72 mm extrusion. The results of this sample are greater than all other studies that may be due to 100 grams force as compared to 70-75 grams force used in other studies. The comparison of distalization seen in this sample with other distalization devices showed 2.1mm with Herbst appli-ance¹⁶, 2.16 mm mean distalization with Wilson arches seen by Muse et al¹⁷ and 2.1 mm mean distalization seen by Itoh et al¹⁸ with repelling magnets.

Rate of Molar Distalization

The rate of maxillary molar distalization seen in this study was 0.58 mm per month as compared to 0.19 mm per month in Brickman et al.¹³ study, 0.89 mm per month in Hayder and Unerll study, 0.35 mm per month in. Rung et al.⁹, 0.92 mm per month in Gulati et al. ¹⁰ study with Jones jig appliance.

Space Creation

During molar distalization with Jones jig appliance, 5.30 mm space was created between maxillary first molar and second premolar, however (3.30 mm) 62.26 % of this space was due to distal movement of molars, while (2.00 mm) 37.70 % was anchorage loss due to mesial movement of second premolars.

Anchorage Loss

The forces used to distalize the maxillary first molars has a reciprocal force that must be resisted in order to fully distalize the maxillary first molar to the desired class I position, however the premolar -incisor segment cannot fully resist and subsequently displaced mesially. The aim of all intra-oral molar distalization modalities is to correct Class-II molar relationship with minimum side effects. The anchor unit in this study consisted of a modified Nance appliance off of the maxillary second premolars with 1.003size acrylic button coverage in the depth of palate. The anchor unit was unable to completely resist the reciprocal mesial force of Jones jig appliance¹³. In this sample maxillary second premolar was mesialized 2.00 mm (37.70%), tipped mesially 7.58° and extruded 1.58 mm. The results of Brickman et al.¹³ showed 2.00 mm (44.50 %) mesialization, 4.76° mesial tipping and 1.88 mm extrusion of maxillary second premolar. Gulati et al.¹⁰ noted 2.23 mm (44.60 %), 2.60° mesial tipping of maxillary second premolars. The results of this sample showed similar anchorage loss at second premolar as compared to the results of Brickman et al.¹³, Hayder¹¹ Rung⁹ and Gulati¹⁰ studies. The anchorage loss seen with other molar distalization appliances exhibited in different manner.

The maxillary central incisor was proclined an average of 0.75° relative to SN line that was statistically insignificant; this was less than 2.60° reported by Brickman et al.¹³, 3.00° seen by Rung et al.⁹ and 1.00° found by Hayder and Uner¹¹. The incisor tipping found in this study was much less than the 6.00° reported by Bondemark and Kurol¹², 3.8° by Itoh et al.¹⁸ with repelling magnets and 2.4° reported by Ghosh and Nanda³ with the pendulum appliance.

CONCLUSIONS

On the basis of results achieved with this study conducted on thirty patients, following conclusions were drawn:

- 1- Jones jig appliance distalized maxillary first molars quite effectively.
- 2- There was 5.30 mm space created between maxillary first molar and second premolar, out of which

3.30 mm showed molar distalization while 2.00 mm was anchorage loss as mesial movement of second premolar.

- 3- There were some unwanted effects produced by Jones jig appliances in terms of molar and premolar extrusion as well as tipping and also molar rotation.

Jones jig is simple, effective, easy to use and comfortable appliance for maxillary molar distalization.

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