

Intraoral Approaches for Maxillary Molar Distalization: Case Series

DEVINDER PREET SINGH¹, SHEFALI ARORA², SUMIT KUMAR YADAV³, NEAL BHARAT KEDIA⁴

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. The present case series presents the efficacy of these appliances in Class II malocclusion patients with a mean age of 16 years (age range of 15-17 years) that reported with the chief complaint of irregular upper front teeth, since non-extraction approach in correcting Class II malocclusion is gaining a lot of attention.

Keywords: Intraoral distalizers, Malocclusion, Non-extraction

One of the traditional approaches for Class II molar correction and space gaining is distalization, which can be obtained with either Intraoral Appliances (IOA) or Extraoral Appliances (EOA). Nowadays non-extraction approach in correcting Class II malocclusion is gaining a lot of attention. Distalization of maxillary molars with intraoral appliances is one such approach.

Distalization procedures have been much refined over the years by a better understanding of bone physiology, tooth movement, biomechanics and newer biomaterials. Clinicians prefer IOA as compared to the EOA to achieve distal molar movement, the reason being IOA depends minimally on patient cooperation. The designing of IOA incorporate two elements: the active unit that distalize the maxillary molars and the anchorage one that countervail for the reciprocally acting force system. The anchorage unit is a collaboration of dental anchorage and soft tissue rests or absolute different skeletal anchorage systems [1].

The present case series presents the efficacy of Jones Jig, Lokar distalizer and Carrière distalizer in Class II malocclusion patients with a mean age of 16 years (age range of 15-17 years) who reported with the chief complaint of irregular upper/lower front teeth.

CASE 1

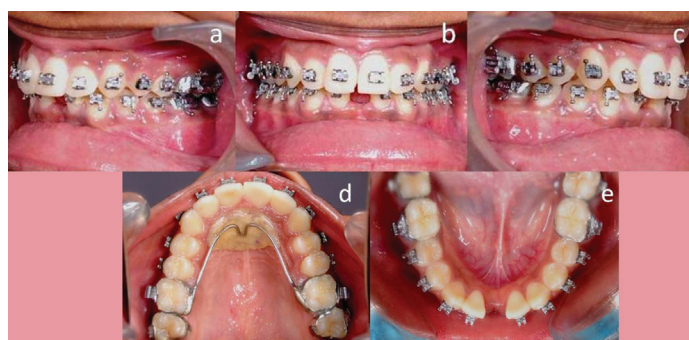
A 15-year-old female patient reported to the Department of Orthodontics with a chief complaint of forwardly placed upper front teeth. Intraoral clinical and radiographic examination revealed skeletal Class I jaw relationship with Angle's Class II subdivision left malocclusion. She had proclined and moderately crowded upper and lower anteriors with ankylosed left lower central incisor and missing right lower central incisor. Soft tissue profile indicated a straight profile with competent lips. Treatment involved correction of molar relationship by distalization with the help of Jones Jig appliance, extraction of ankylosed 31 and its replacement with a fixed bridge (implant was not placed as patient was not willing for it due to financial constraints) and correction of exhibited malocclusion using comprehensive fixed orthodontic mechanotherapy with pre-adjusted edgewise appliance. (Roth prescription, 0.022 slot).

The lower arch was completely bonded and the upper arch was partially bonded with brackets only on the upper central incisors

and lateral incisors. Bilateral distalization of the upper maxillary molars was initiated after the placement of the Jones Jig appliance to create space and align the upper incisor teeth [Table/Fig-1]. The distalization of the molars took about nine months and the total treatment time was about 18 months with the complete leveling and aligning of the upper and lower arches and attainment of Class I molar and canine relationships [Table/Fig-2].



[Table/Fig-1]: Intraoral photographs (Jones Jig): a) left lateral view; b) occlusal view; c) right lateral view.



[Table/Fig-2]: Intraoral photographs (post-treatment i.e., after 18 months): a) left lateral view; b) frontal view; c) right lateral view; d) maxillary occlusal view; e) mandibular occlusal view.

CASE 2

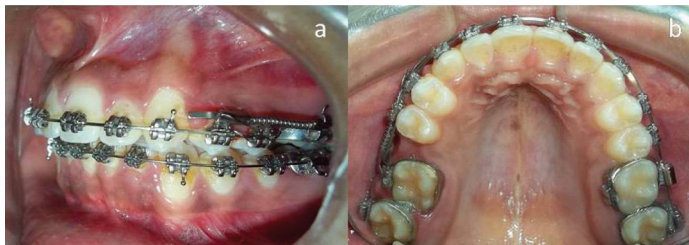
A 14-year-old female patient reported to the Department of Orthodontics with a chief complaint of irregular upper front teeth. Intraoral examination revealed skeletal Class I jaw relationship on the right side and Angle's Class II subdivision on the left. She had proclined and moderately crowded upper and lower anteriors with highly placed and blocked out left maxillary canine [Table/Fig-3]. Soft tissue profile indicated a convex profile with competent lips. Treatment involved correction of molar relationship by distalization of



[Table/Fig-3]: Intraoral photographs (pre-treatment): a) left lateral view; b) frontal view; c) right lateral view.

upper left first molar with the help of Lokar appliance and correction of exhibited malocclusion using comprehensive fixed orthodontic mechanotherapy with pre-adjusted edgewise appliance. (Roth prescription, 0.022 slot).

The upper and lower arches were completely bonded with brackets and unilateral distalization of the upper left maxillary molars was initiated after the placement of the Lokar appliance to create space and align the upper incisor teeth [Table/Fig-4]. The distalization of the molars took about eight months and the total treatment time was about 18 months with the complete leveling and aligning of the upper and lower arches and attainment of Class I molar relationship [Table/Fig-5]. [Table/Fig-6] summarizes the cephalometric analysis (Steiner analysis) of Case 2.



[Table/Fig-4]: Intraoral photographs (Lokar Distalizer): (a) left lateral view; (b) occlusal view.



[Table/Fig-5]: Intraoral photographs (post-treatment i.e., after 18 months): a) left lateral view; b) frontal view; c) right lateral view; d) maxillary occlusal view; e) mandibular occlusal view.

CASE 3

A 13-year-old female patient reported to the Department of Orthodontics with a chief complaint of irregular upper and lower front teeth. On intraoral examination she had skeletal Class I jaw relationship with Angle's Class II Div 1 malocclusion. She had crowded upper and lower anteriors with highly placed and blocked out both maxillary canines. Soft tissue profile indicated a convex profile with competent lips [Table/Fig-7]. Treatment involved resolving of the upper crowding by distalization of upper molars with the help of Carrière appliance and correction of exhibited malocclusion using comprehensive fixed orthodontic mechanotherapy with pre-adjusted edgewise appliance. (Roth prescription, 0.022 slot).

The Carrière distalizer was bonded in the upper arch and the lower arch was stabilized using the lingual arch made up of 19 gauge stainless steel round wire soldered to lower first molar bands [Table/Fig-8]. The patient was advised to wear heavy, 6.5oz, 1/4" Class II elastics 24 hours a day, except during meals, as the patient was a low-angle case with good perioral musculature. The elastics were not

Skeletal Analysis						
Measurement	Pre-treatment			Post-treatment		
	Value	Average	Difference	Value	Average	Difference
SNA	75.5	82.0±2.0	-6.5	77.3	82.0±2.0	-3.7
SNB	70.9	80.0±2.0	-9.1	72.8	80.0±2.0	-7.2
ANB	4.7	3.0±2.0	1.7	4.5	3.0±2.0	2.5
SND	72.4	76.0±2.0	-3.6	74.2	76.0±2.0	-1.8
Posterior condylin to S-N	26.7	22.0±2.0	4.7	20.4	22.0±2.0	-1.6
Po to S-N	45.0	51.0±2.0	-6.0	38.1	51.0±2.0	12.9
Occl. To S-N	26.5	14.0±4.0	12.5	27.1	14.0±4.0	13.1
GoGn to S-N	38.0	32.0±4.0	6.0	36.8	32.0±4.0	4.8
Dental Analysis						
UI to N-A (mm)	4.5	4.0±1.0	0.5	3.5	4.0±1.0	-0.5
LI to N-B (mm)	7.3	4.0±1.0	3.3	7.0	4.0±1.0	3.0
Po to N-B	4.1	4.0±1.0	0.1	2.6	4.0±1.0	-1.4
LI to UI (angle)	129.0	131.0±6.0	-2.0	124.3	131.0±6.0	-6.7
UI to N-A (angle)	19.6	22.0±2.0	-2.4	22.5	22.0±2.0	0.5
LI to N-B (angle)	26.7	25.0±2.0	1.7	27.8	25.0±2.0	2.8
Soft Tissue Analysis						
Upper lip protrusion	-4.7	0.0±0.0	-4.7	-4.5	0.0±0.0	-4.5
Lower lip protrusion	-0.9	0.0±0.0	-0.9	-1.6	0.0±0.0	-1.6

[Table/Fig-6]: Summary of the cephalometric analysis (Steiner analysis) of Case 2.



[Table/Fig-7]: Intraoral photographs (pre-treatment): a) left lateral view; b) frontal view; c) right lateral view.



[Table/Fig-8]: Intraoral photographs (Carrière distalizer): a) left lateral view; b) frontal view; c) right lateral view.

worn while chewing because of the vertical force vector produced by these movements [2]. The distalization of the molars took about ten months and the total treatment time was about 18 months with the complete leveling and aligning of the upper and lower arches and attainment of Class I molar relationship [Table/Fig-9]. [Table/Fig-10] summarized the cephalometric analysis (Steiner analysis) of Case 3.



[Table/Fig-9]: Intraoral photographs (Post-treatment i.e., after 18 months): a) left lateral view; b) frontal view; c) right lateral view; d) maxillary occlusal view; e) mandibular occlusal view.

Skeletal Analysis						
Measurement	Pre-treatment			Post-treatment		
	Value	Average	Difference	Value	Average	Difference
SNA	88.8	82.0±2.0	6.8	90.0	82.0±2.0	8.0
SNB	81.1	80.0±2.0	1.1	82.7	80.0±2.0	2.7
ANB	7.7	3.0±2.0	4.7	7.3	3.0±2.0	4.3
SND	79.8	76.0±2.0	3.8	79.9	76.0±2.0	3.9
Posterior condylin to S-N	17.6	22.0±2.0	-4.4	19.3	22.0±2.0	-2.7
Po to S-N	47.7	51.0±2.0	-3.3	57.3	51.0±2.0	6.3
Occl. To S-N	23.8	14.0±4.0	9.8	23.7	14.0±4.0	9.7
GoGn to S-N	30.8	32.0±4.0	-1.2	30.6	32.0±4.0	-1.4
Dental Analysis						
UI to N-A (mm)	0.0	4.0±1.0	-4.0	4.1	4.0±1.0	0.1
LI to N-B (mm)	7.5	4.0±1.0	3.5	9.8	4.0±1.0	5.8
Po to N-B	0.5	4.0±1.0	-3.5	-0.8	4.0±1.0	-4.8
LI to UI (angle)	125.9	131.0±6.0	-5.1	113.3	131.0±6.0	-17.7
UI to N-A (angle)	12.6	22.0±2.0	-9.4	1.3	22.0±2.0	-0.7
LI to N-B (angle)	33.9	25.0±2.0	8.9	38.1	25.0±2.0	13.1
Soft Tissue Analysis						
Upper lip protrusion	-0.4	0.0±0.0	-0.4	1.7	0.0±0.0	1.7
Lower lip protrusion	1.7	0.0±0.0	1.7	4.7	0.0±0.0	4.7

[Table/Fig-10]: Summary of the cephalometric analysis (Steiner analysis) of Case 3.

DISCUSSION

The intraoral molar distalization method has been a superlative option for patients who are not willing to wear headgear. Definitely, there is always a marked variation in patient's response to these appliances in terms of anchorage loss and skeletal effects [3]. Nowadays newer distalizing appliances, like the Jones jig, Lokar distalizer and Carrière distalizer, have been developed which comprised of compact designs and cause minimal discomfort to the patient. Detailed features of distalizing appliances (Jones jig, Lokar distalizer and Carrière distalizer) are summarized in [Table/Fig-11] [2,4-6].

First case of the present series uses the modified nance palatal arch i.e., Jones jig where distalization of molars occurred with the minimum amount of anchor loss, whereas in second case, Lokar distalizer was used where the rest of the bonded upper arch acted as the anchorage unit for the distal molar tooth movement. In the last case, Carrière distalizer was implemented and anchorage was taken from the lower first molars with augmentation of anchorage potential with the help lingual arch placed on the lower jaw. In the sagittal plane, there was mild proclination of the maxillary anterior teeth in this case which was due to the space required for the complete alignment of the maxillary anterior teeth including the highly placed blocked out canines. In the vertical plane, the lower molars extruded a little under the influence of the Class II elastic force which helped in the reduction of the deep overbite of the patient. In the transverse plane, the rotation occurred is very less as compared to the crossbites that occurred due to the usage of unilateral headgears as mentioned by Siatkowski and Cangialosi TJ et al., [7,8].

Recently alternative anchorage designs using implants or miniscrews have been used to overcome the problems associated with the use of intraoral molar distalizers such as anterior anchorage loss expressed as forward movement and proclination of the anterior teeth, and the distalized molar movement in forward direction while anterior tooth retraction during later stage of treatment. Keles A et al., suggested anchorage designs with osseointegrated palatal

Jones Jig (Compressed Coil Device)	Lokar distalizer	Carrière distalizer
Modified Nance appliance		
Introduced by Jones RD and White JM in 1992 [4]	Introduced by Scott in 1992 [2]	Introduced by Carrière L in 2004 [6]
It will be attached to the first premolars or 1° second molars with heavy round wire and a light wire projecting through molar tube, afterwards both wires will be soldered to a fixed attachment sheath and hook.	Used for distalizing an upper molar includes a main support shaft disposed in the arch wire receptacle of a molar tooth bracket.	Used for distalizing an upper molar & made up of mold-injected, nickel-free stainless steel. It is bonded to the canine and first molar.
70-75 gm of force can be delivered through activation of an open coil spring which results in 1 mm of anterior movement and 2.5-2.8 mm of molar distalization.	Slide shaft extending from the main shaft supports a slide collar which is tied via a tensile ligature to the bracket of a 2° tooth, such as a premolar. Compression spring is disposed between the slide collar and the slide shaft and is prevented from buckling by a centrally extending guide pin. The guide pin is attached at one end to the slide collar and the other end passes through a guide tube extending rigidly from the slide shaft. A mesial support ligature extends between the slide collar and an arch wire to prevent inadvertent dislocation of the appliance.	The canine pad, which allows distal movement of the canine along the alveolar ridge without tipping, provides a hook for the attachment of Class II elastics. This pad is the mesial end of an arm that runs posteriorly over the two upper premolars in a slight curve. The posterior end of the arm is a permanently attached ball that articulates in a socket on the molar pad.
Mavropoulos A et al., also noted the treatment results with a mean distal movement of 1.4 mm, increased overjet by 0.9 mm and decreased overbite by 1 mm without any significant changes in facial height [5].		
Disadvantage- it breaks easily under the oral stresses.		

[Table/Fig-11]: Detailed features of distalizing appliances (Jones Jig, Lokar distalizer and Carrière distalizer).

implant instead of Nance button which can be placed on the median palatine suture and which shows that the molars can be distalized bodily in five months, without any anchorage loss [9].

The three intraoral appliances used in this case report namely Jones Jig, Lokar and Carrière distalizer are effective means of distalization of maxillary molars with limited drawbacks such as anchorage loss resulting in incisor proclination and increased overjet, which can be reversed in phase II multi-bracket treatment, thus, it is advisable to delay bonding until the end of stabilization period when molars are uprighted.

CONCLUSION

The noncompliance intraoral molar distalization method has been a realistic compromise for patients who are unwilling to wear headgear. However, still future research is needed to comparatively assess their efficiency as well as studies to compare them with the conventional anchorage distalization methods.

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PARTICULARS OF CONTRIBUTORS:

1. Senior Lecturer, Department of Orthodontics and Dentofacial Orthopedics, Dr Harvansh Singh Judge Institute of Dental Sciences, Panjab University, Chandigarh, India.
2. Senior Lecturer, Department of Oral and Maxillofacial Surgery, Swami Devi Dyal Dental College and Hospital, Barwala, Haryana, India.
3. Reader, Department of Orthodontics and Dentofacial Orthopedics, Mithila Minority Dental College and Hospital, Darbhanga, Bihar, India.
4. Reader, Department of Orthodontics and Dentofacial Orthopedics, Buddha Institute of Dental Sciences and Research, Patna, Bihar, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Sumit Kumar Yadav,

604, FF, Omaxe Happy Homes, Rohtak-124507, Haryana, India.

E-mail: sky20083@gmail.com

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