

ROTATIONS: THE NEGLECTED KEY OF OCCLUSION IN THE TREATMENT OF CLASS II MALOCCLUSION

Mukesh kumar¹, Manish Goyal², Ashish kushwah³, Sumit Kumar⁴, Prateek Bhushan⁵

Professor¹, Principal and Head², Senior lecturer^{3,4}, Post graduate student⁵

Department of orthodontics and dentofacial orthopedics, Teerthanker Mahaveer Dental college and Research Centre, Delhi Road Moradabad, Uttar Pradesh, India
Senior lecturer³ Department of orthodontics and dentofacial orthopedics, institute of dental education and advance studies, Gwalior, MP

Abstract

Background: Treatment of Class II malocclusion has always been a matter of great debate and controversy specially in camouflage line of treatment. In the present case only upper first premolars were extracted instead of all four premolar extraction in order to correct the severe arch length tooth material discrepancy in lower arch by derotation of mandibular premolar, thus utilizing the often neglected key of occlusion i.e. absence of rotation. Hence, this signifies the role of proper diagnosis in the process of treatment planning.

Results: The post treatment facial photographs showed marked improvement in smile and facial profile. Maxillary anterior teeth protrusion was corrected, and a Class II molar relationship was maintained on left side and achieved on right side along with correction of over jet and overbite. The upper incisors to NA angle had decreased from 32° to 28° and the lower incisors to NB angle decreased from 32° to 30° (Table 1). IMPA had reduced from 93° to 91°. The retraction of the maxillary incisors contributed to the correction of the soft tissue profile.

Conclusions: The main goal of orthodontic treatment generally include obtaining good facial balance, optimal static and functional occlusion which follows the Andrew's keys to occlusion and thus helps in maintaining stability of treatment results.

Key words: Class II Malocclusion, rotations, Andrews six keys, Camouflage, Intrusion arch, Upper premolar extraction.

Introduction

The overall health of the oral cavity and harmony of the stomatognathic system to a large extent depend upon well alignment of teeth and also influence the personality of the individual. Class II, div I malocclusion is one of the most commonly encountered type of malocclusion in India. It is both challenging and controversial to plan a perfect treatment for Class II malocclusion in a non-growing patient. The frequency of Class II malocclusion is 14% among children between 12 -14 years of age [1]. There has been a steady rise in the awareness of adults towards orthodontic treatment and demand high quality treatment in the shortest possible time period possible [2]. The treatment of Class II malocclusion often involves the use of a myofunctional appliance in growing patients and an orthognathic surgery or selective removal of permanent teeth, with a subsequent dental camouflage to mask the skeletal discrepancy. In non-growing patients, the extractions can involve 2 maxillary premolars or 2 maxillary and 2 mandibular premolars [3]. The main goal of orthodontic treatment is to obtain functional occlusion, aesthetics and stability which meets Andrews six keys to normal occlusion. One of the criteria for obtaining a functional occlusion is to have an absence of rotation at the end of active treatment. [4] Tooth rotation may be defined as an observable mesio-lingual or disto-lingual intra alveolar displacement of the tooth

around its longitudinal axis (at least 20°). [5]



A rotated molar or bicuspid occupies more space than normal. Alignment of such teeth creates space.

The space created depends upon the tooth (Molar > Premolar) and the amount of rotation present. Thus in the present case this phenomenon of space gaining by derotation of posterior teeth was used in mandibular arch instead of extraction of mandibular first premolars.

Rotation is of two types:

1. Centric rotation - rotation around the long axis and angulation of the long axis of the tooth remains unaltered). fig 2(a)
2. Eccentric rotation- rotation along with tipping of the tooth and the tooth protrudes from the row of teeth. fig2(b)

If the body rotates about its center of resistance, it is called pure rotation.

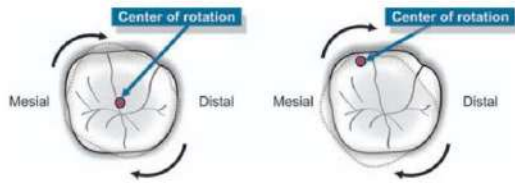


Fig 2-Types of rotation.

Baccetti, T. has said that the most common rotated teeth were the mandibular second premolars followed by mandibular first premolars and maxillary central incisors.

Alignment of rotated posterior teeth:



Fig 3(a)

3(b)

The posterior teeth are broader labiolingually hence occupy more space when they are rotated. Alignment of such teeth creates space.

The space created depends upon the tooth (Molar > Premolar) and the amount of rotation present.

	NORM	PRETREATM ENT	POSTTREATM ENT
SNA	82°	83°	82
SNB	80°	79°	79°
ANB	2°	4°	3°
WIT'S Appraisal	0 mm	3 mm	2 mm
MPA	32°	30°	30°
U1-NA	22°	32°	28°
U1/NA	4.0mm	8.0mm	4.0mm
L1- NB	25°	32°	30°
L1/NB	4.0mm	6.0mm	4.0mm
IMPA	90°	93°	91°
I/1	131°	110°	129°

In the present case we utilised the often neglected 4th key to occlusion i.e. absence of rotation and derotated the premolars in the mandibular arch to gain space instead of the traditional method of all 4 extraction.

Table 1: Readings of the Patient's Lateral Cephalograms Tracing.

Case report:

A female patient of 16 years of age reported to the department with chief complaint of forwardly placed upper front teeth. The patient gave no relevant medical or habit history.

Extra oral examination revealed a mesocephalic and mesoprosopic form with convex profile and a posterior facial divergence with no gross facial asymmetry fig 6. The nasolabial angle was acute, with potentially competent lips.

Intraoral examination revealed that the patient had Class II molar relationship (half cusp on the right side and full cusp on the left side) and Class II canine relationship with a "U shaped" maxillary and mandibular arch form and proclined maxillary incisors with an increased overjet and overbite along with spaces present in the upper and lower anteriors. The lower midline was coinciding with respect to the upper midline. There was Mesio-lingual rotation in 16, 26, 35, & 45. Fig6. The oral hygiene status was average. Temporomandibular joint (TMJ) assessment revealed no history of pain or clicking on maximum opening and closure. The right and left excursive movements were normal. Maximum mouth opening was 39 mm.

Cephalometric Assessment

A pretreatment ANB of 4° and MPA 30° was pointing towards a Class II skeletal base and a hypodivergent growth pattern (Table 1). As clinical examination already revealed proclined upper and lower incisors hence the 1/NA, 1/NB and IMPA angulations were found to be increased i.e. 32°, 32° and 93° respectively.

Model analysis

Arch perimeter analysis concluded a 2 mm of maxillary tooth material excess and Carey's analysis showed 2 mm mandibular tooth material excess. Bolton's analysis revealed a mandibular anterior tooth material excess of 1.61mm while overall mandibular tooth material excess was 1.61mm.





FIG4. PRE-TREATMENT RECORDS

Treatment goals

- To achieve good facial balance.
- To achieve a static and functional occlusion
- To maintain stability of the treatment results.

Treatment objectives:

- Correction of proclined upper anteriors.
- Correction of molar and premolar rotations.
- To achieve an ideal overjet and overbite.
- To obtain competent lips.
- To obtain an optimal functional occlusal
- Obtain Class II molar and a Class I canine relationship.

Treatment alternatives: We decided upon two treatment plans:

1. Extraction of all first premolars
2. Extraction of upper first premolars only.

As not much discrepancies or severe crowding of the mandibular arch was seen, the second treatment plan was opted and the little space required in the mandibular arch was gained by derotation of premolars rather than extracting the lower premolars.

Treatment progress

After the extraction of upper first premolars patient underwent a fixed orthodontic mechanotherapy with a preadjusted edgewise appliance (0.022-inch slot). Banding and bonding was done along with TPA as it was a high anchorage case. Levelling & aligning was commenced on 0.012" NiTi (3M Unitek Nitinol Super elastic wire) and gradually reached a thicker gauge wire of 0.019" X 0.025" SS in the upper arch in a period of six months.

In upper arch, extraction space was utilised for correction of proclination of upper incisors, rotations & lip strain. It was performed using Class I mechanics. The wire used for this purpose was 0.019" x 0.025" stainless steel. An intrusion arch (.016" A.J Wilcock) was piggybacked on upper central incisors to maintain vertical control and torque during retraction with Class I force (fig5).

After 6 months of treatment in the upper arch, lower arch was banded and bonded along with placement of 0.016" Ni-Ti followed by placement of 0.016" S.S wire. Beggs brackets were bonded on the Mesio buccal and disto

lingual surface of 35 and buccal surface and lingual surface of 45 to correct rotation by applying a couple force with the help of E-chain. E-chains were engaged from buccally bonded beggs brackets on the mandibular second premolars to molar hooks and by lingually engaging them with lingual button bonded on the ipsilateral canine. (fig 6) The space gained by derotation of premolars was utilised for the correction of the proclined lower incisors.



Fig 5. Intrusion arch



Fig 6 couple mechanics



Fig 7- Settling elastics(Class II bilaterally)

A round 0.016" A.J Wilcock wire was used in upper & lower arch along with Class II elastics for detailing of occlusion (fig 7)

After 28 months of active treatment, Class II molar relation bilaterally, ideal overjet and overbite with pleasing soft tissue profile was achieved (Fig.8). Following this, debonding was done and post treatment records were taken. The post treatment cephalometric measurements are displayed in Table 1 .

The patient was very much satisfied and pleased with his treatment and his soft tissue profile. Fixed retainers were placed in both the arches.

Result:

The post treatment facial photographs showed marked improvement in smile and facial profile. Maxillary anterior teeth protrusion was corrected, and a Class II molar relationship was maintained on left side and achieved on right side along with correction of over jet and overbite. The upper incisors to NA angle had decreased from 32° to 28° and the lower incisors to NB angle decreased from 32° to 30° (Table 1). IMPA had reduced from 93° to 91°. The retraction of the maxillary

incisors contributed to the correction of the soft tissue profile (Fig 8)

Cephalometric superimpositions illustrate reduction in proclination of maxillary and mandibular incisors and mesialization of maxillary right molar.(fig 9)

Par Scoring Assessment:

PAR SCORING SHEET

Name _____

CASE NUMBER	Pre-Treatment						Date		
PAR COMPONENTS	RIGHT			LEFT			UN-WEIGHTED TOTAL	WEIGHTED TOTAL	
	Upper anterior segments	3-2	2-1	1-1	1-2	2-3			
Lower anterior segments	3-2	2-1	1-1	1-2	2-3		7	7	
Buccal occlusion	Antero-posterior		Right	Left			2	X12	
	Transverse		Right	Left			0	X10	
	Vertical		Right	Left			0	X10	
Overjet	Positive		2	Negative			2	X6 ²	
Overbite	Overbite		2	Openbite			2	X2 ⁴	
Centre line							0	X4	
TOTAL							17	29	

CASE NUMBER	Post-Treatment						Date		
PAR COMPONENTS	RIGHT			LEFT			UN-WEIGHTED TOTAL	WEIGHTED TOTAL	
	Upper anterior segments	3-2	2-1	1-1	1-2	2-3			
Lower anterior segments	3-2	2-1	1-1	1-2	2-3		0	X1	
Buccal occlusion	Antero-posterior		Right	Left			0	X1	
	Transverse		Right	Left			0	X1	
	Vertical		Right	Left			0	X1	
Overjet	Positive		0	Negative			0	X6	
Overbite	Overbite		1	Openbite			1	X2 ⁴	
Centre line							0	X4	
TOTAL							1	2	

ASSESSMENT OF OUTCOME

PAR SCORE	IMPROVEMENT	
Change in PAR score	Greatly improved	16
% change in PAR score	Improved	
	Worse or no different	

Peer assessment rating (PAR) index was assessed under the headings of anterior segments (upper and lower), buccal occlusion, overjet, overbite and centreline for pre-treatment and post-treatment intra-oral records .There was a significant improvement in the PAR scoring changing from 17 pre-treatment to 1 post treatment suggesting the malocclusion was greatly improved.



Fig. 8 -Post treatment Records

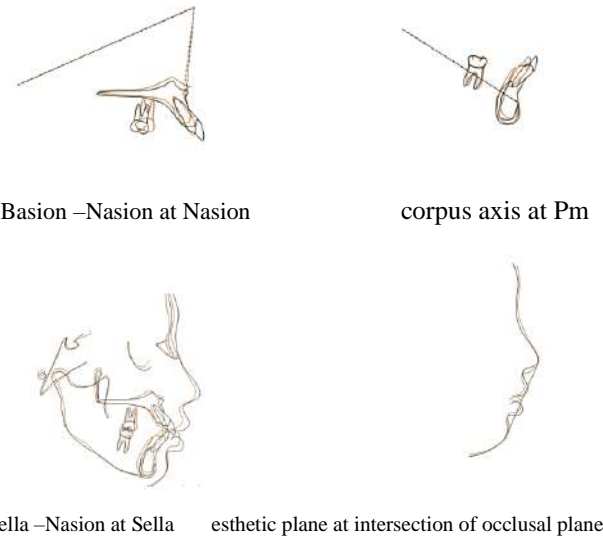


Fig 9 - superimpositions (black pre-treatment & red post-treatment)

Discussion:

Acceptable dental occlusion and an aesthetic facial appearance is the main goal of camouflage treatment. A careful diagnosis and a treatment plan which involves aesthetic, occlusal, and functional considerations are the prime requisites in the treatment of an adult Class II patient requires [10]. There has always been a controversy regarding extractions in orthodontic practice and the premolars which are conveniently located between the anterior and the posterior segments are probably the most commonly extracted teeth for orthodontic purposes [11-13]. In cases with crowding in the mandibular arch, a cephalometric discrepancy, or a combination of both, four premolar extraction is primarily indicated in growing patients to achieve a stable occlusion which follows the principle of Andrew's keys to occlusion. In the present case we utilised the often neglect 4th key to occlusion i.e. absence of rotation and derotated the premolars in the mandibular arch to gain space instead of the traditional method of all 4 extractions as neither significant discrepancies existed, nor any severe crowding of the mandibular arch was to be seen, coinciding with what proposed by Strang in 1957 and Bishara in 1995 [13-14]

Conclusion

1. the main goal of orthodontic treatment generally include obtaining good facial balance, optimal static and functional occlusion which follows the Andrew's keys to occlusion and thus helps in maintaining stability of treatment results.

2. Extraction of premolars to camouflage ,if done should be done only after a complete diagnosis and treatment planning.

extractions. *Am J Orthod Dentofacial Orthop* 1995; 107: 28-37.

Corresponding Author

Dr. Sumit Kumar

Senior lecturer

Department of Orthodontics and Dentofacial

Orthopaedics TMDCRC, Moradabad

Email: drsktomar848@gmail.com

References

1. Emrich RE, Brodie AG, Blayney JR. Prevalence of Class I, Class II, and Class III Malocclusions (Angle) in an Urban Population - An Epidemio- logical Study, *J Dent Res.* 1965;44: 947-53.
2. Khan RS, Horrocks EN. A study of adult orthodontic patients and their treatment. *Br J Orthod.* 1991;18(3):183-94.
3. Cleall JF, Begole EA. Diagnosis and treatment of Class II Division 2 malocclusion. *Angle Orthod.* 1982;52:38-60.
4. Andrews LF. The six keys to normal occlusion. *Am J Orthod* 1972;62:296-309.
5. Baccetti, T. "Tooth rotation associated with aplasia of nonadjacent teeth." *The Angle Orthodontist* 68.5 (1998): 471-474.
6. Parisay, Iman, et al. "Treatment of severe rotations of maxillary central incisors with whip appliance: Report of three cases." *Dental research journal* 11.1 (2014): 133.
7. Yanez, Esequiel Eduardo Rodriguez. 1,001 tips' for orthodontics and its secrets. 2008.
8. Faber, Jorge. "Tying twin brackets." *American Journal of Orthodontics and Dentofacial Orthopedics* 118.1 (2000): 101-106.
9. Rammanohar, Mala. "Bracket Ligation with a Difference." *The Journal of Indian Orthodontic Society* 48.4 (2014): 286.
10. Kuhlberg, A and Glynn, E: Treatment planning considerations for adult patients, *Dent.Clin. N. Am.* 1997; 41:17-28.
11. Case CS. The question of extraction in orthodontia. *American Journal of Orthodontics.* 1964; 50:660-91.
12. Case CS. The extraction debate of 1911 by Case, Dewey, and Cryer. Discussion of Case: the question of extraction in orthodontia. *American Journal of Orthodontics.* 1964; 50: 900-12.
13. Tweed C. Indications for the extraction of teeth in orthodontic proce- dure. *American Journal of Orthodontics.* 1944; 30: 405-28.
14. Strang RHW. *Tratado de orthodoncia.* Buenos Aires, Argentina: Editorial Bibliografica; 1957. Pp. 560-570, 657-571.
15. Bishara Se, Cummuns DM, Jakobsen JR, Zahar AR. Dentofacial and soft tissue changes in Class II, division 1 cases treated with and without