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Research Article

MAXILLARY MOLARDISTALIZATION WITH ANIMPLANT ANCHOREDDISTALIZATION APPLIANCE IN A VERTICAL GROWINGINDIVIDUAL: A CLINICAL STUDY

Amesh Golwara[1]., Monica RituKedia[2] and Priyankar Singh[3]

[1]Department of Orthodontics, Buddha Institute of Dental Sciences and Hosital, Patna
[2]Department of Periodontics,Buddha Institute of Dental Sciences and Hosital, Patna
[3]Department of Oral and Maxillofacial Surgery, Daswani Dental College, Kota

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A B S T R A C T

Introduction: To obtain an effective and compliance free molar distalization without an anchorage loss, keeping in mind bone anchored distalization appliance fabricated.
Aim: To evaluate the molar distalization in vertical growing patient without affecting or accentuating mandibular plane angle andproclining maxillary anteriors.
Material and method: Skeletal and dental changes were measured on cephalograms and dental casts of 10 patients (13± male and female) of BIDSH, Patna. Inclusion criteria:-

a) Permanent dentition with 3/4 cuspto half cusp class II relation.
b) Vertical growth pattern assessed by Steiners, Tweeds mandibular plane and Jaraback face height ratio.
c) Anterio posterior and vertical plane: Molar distalisation and incisor positions pre-treatment to post treatment assessed by Pancherz analysis,PTV perpendicular and burrstone cogs analysis.

Pre and post treatment patient's models were assessed bymillimetric evaluation of positional changes.Findings were sent for statistical analysis.
Result: Class I molar relationship was achieved in a mean period of 7.2 ± 1.9 months. Maxillary molar distalization shows changes of 4 ± 1.5mm. The mandibular plane rotated by 2 ± 0.1 degree anticlockwise directions.
Conclusion: Implant supported molar distalization appliance presented effective and minimally invasive compliance free alternative for intraoral molar distalisation in vertical growing individual without affecting incisors position.

INTRODUCTION

Norman William Kingsley (1892) described for the first time a headgear apparatus with which class I relationship of the molars could be achieved. Subsequently, extra oral anchorage was rarely discussed until Silas Kloehn(1947) reported the use of an occipital headgear attached by hooks to a maxillary 0.045-inch archwire stopped against the first molars. But when he noticed that this combination could produce marked and uncontrolled molar tipping, he modified the appliance by soldering the bows to the inner arch in the incisor area, creating the now familiar facebow of headgear as we know it today. Since then based on similar concept number of headgears have been developed and more recently, stress has been laid on non-compliance intraoral distalizing devices.[1]Class II malocclusions form a heterogeneous group of patients that represent a significant portion of the patients, who typically present for orthodontic treatment.[2]

Corresponding author:* **Amesh Golwara
Department of Orthodontics, Buddha Institute of Dental Sciences and Hosital, Patna

The frontiers of treatment strategies have surely and steadily expanded over the past few decades. The philosophy of non-extraction treatment by **E.H.Angle** and that of extractions advocated by **Charles Tweed** and later by **Raymond Begg**were universally accepted protocols. Both of them were correct in their own perspective that is some patients may benefit from one modality of treatment and some from the other.

Correction of class II malocclusion without an extraction requires maxillary molar distalization by means of intraoral or extra-oral forces.[3]

Theterm distalizationmeans the displacement of a structure to a position further posterior than which was accepted at the onset of treatment.[4] Molar distalization is a technique that has added a new column in the practice of every orthodontist to produce consistent, predictable and high quality results.[4]Distalization is an effective tool in gaining additional arch length.Case selection is a very important aspect in the success of distalization.

Since space is easier to gain in the maxillary arch than in the mandible because of increased trabecular structure of

supporting bone and increased anchorage afforded by palatal vault, the distalization of maxillary molar becomes of significant value for the treatment of cases with mild to moderate arch discrepancy and class II molar relationship associated with a normal mandible. Other targets for molar distalization therapy are the mesial position of upper first molar due to different causes and tooth size, arch size discrepancies at the maxillary arch.

Fig 1 Head gear

Extraoral orthopaedic appliance (headgear) is used for molar distalization (Fig 1) but it requires patient's cooperation. Most beneficial finding is simultaneously distal movement of premolars with molars due to stretched trans-septal fibres.[5] An unnecessary anterior movement has been avoided at the premolars and incisors. Furthermore, anterior crowding has been spontaneously solved out because of the stretched transseptal fibres. As a consequence total treatment time was shortened.

The success of molar distalization has been reported to depend on two main factors:[6]

1. The type of movement
2. The timing of the treatment.

What one should look for, to consider a case for molar distalization:[3]

1. Profile consideration: Well developed nose and chin, have better chances of tolerating slight proclination.
2. Age of the Patient: The success of molar distalization is greater in growing children, usually in late mixed dentition and early permanent dentition.
3. Inclination of Molars: OPG forms an ideal diagnostic tool. If the first and second molars are distally angulated, the case is contra-indication for molar distalization.
4. Amount of available posterior space and 3rd molars: Usually absence of 3rd molar is advantageous for molar distalization. Distal angulation of 3rd molars are, again a contra-indication and it is indicative of posterior crowding.
5. 5. Growth Pattern – Vertical growth pattern is a contra – indication for distalization.
6. Many devices have been developed and used to distalize the maxillary molars and show positive clinical results. However patient's cooperation is a serious problem. Orthodontic mechanics requiring minimal patient cooperation are desirable.[3]
7. Normal or near normal mandibular arch.

Both extra oral and intraoral appliances have been used. Intra oral appliances for maxillary molar distalization such as the pendulum, push coils, magnets, super elastics, nickel titanium wires, distal jet and the molar slider do not require extensive co-operation from patients.[7] These techniques effectively distalize both first and second molars but always develop reciprocal adverse side effects.

Anterior teeth tend to move forward during distalization of the molars and need to be retracted against the distalized molars later. The forward movement of the distalized molars during anterior tooth retraction often offsets the treatment effect of distalization appliances and prolongs treatment time.

The solution to this obstacle has been provided by recent improvements in implant dentistry. With the use of dental implants and mini plates as anchorage, the distal movement of anterior teeth or posterior teeth or both without anchorage loss is possible.[6] The mini implants have the advantages of easy placement and removal with minimal anatomic limitations because of their small size and low cost. Thus they have been adopted for distalization of molars.

Molar distalization is one of the essential tenets of non-extraction therapy for Class II malocclusions.[9] Several methods[9,10] have been used in molar distalization including headgears, removable and fixed appliances. Many patients reject headgear wear because of social and esthetic concerns, and the success of this treatment solely depends on patient's cooperation. Lack of cooperation results in anchorage loss and unsatisfactory treatment results. Another disadvantage in the use of headgear wear is the possibility of creating serious facial injuries.

Besides extra-oral traction,a combination of headgear and a removable appliance have also been used in the past **(Cetlin and Tehoeve1983).[7] Wilson (1978)[8]** used mandibular arch as mandibular anchorage for class II elastics on the maxillary arch but this led to mesialisation of the mandibular molar which was undesirable and therefore the concept did not gain much acceptance.

Subsequently the difficulty in the use of headgear wear motivated many investigators to develop the mechanics of intraoral molar distalization. Some investigators[11,12] have used the Nance appliance to obtain anchorage from the palate; however, in most of these patients anchorage loss was unavoidable and three major concerns came forth. The first was patient compliance, the second being anchorage loss of the maxillary premolars and last but not the least the loss of anchorage in terms of incisor proclination. Alsobecause the distalized molars must be used as part of anchorage during retraction of the premolars and the anterior teeth, aconsiderable amount of relapse was evident. Reduced hygiene under the acrylic resin button creating inflammation of the soft tissue was also frequently observed.

Newer appliances continue to evolve as trend changes from headgear to intraoral appliances that attempt to favourably alter the antero-posterior relationships of the jaws and occlusion without requiring much patient compliance. The search for an appliance that would require minimum patient compliance has moved from the use of compressed coil springs, repelling magnets to the implant supported distal jet, Bone Anchored Pendulum Appliance (BAPA), palatal implants, use of osseointegrated implants and miniplates

providing skeletal anchorage, thus enabling enmasse distalization of entire buccal segment rather than just the molar alone.

However,the appliance selection for each case must be determined by the analysis of malocclusion and one must always remember that ***"One should not select the patient for the appliance rather than appliance should be selected for the patient."***

Aim

The effectiveness of implant supported molar distalization appliance,change in mandibular plane angle in vertical growing patient,change in maxillary anterior teeth position pre and post distalization.

MATERIALS AND METHODS

The study group comprised of 10 patients aged 12±1 years selected from Buddha Institute of Dental Sciences And Hospital, Patna. Scaling and root planning was performed. Skeletal and dental changes were measured on a cephalogram.

Inclusioncriteria

- Good oral hygiene
- Vertical growing individual with Class I skeletal pattern (as per Steiner's analysis).
- Presence of permanent dentition, Molar relation 3/4 to half cusp class II with moderate space deficiency in the maxillary arch and minimal or no crowding in the mandibular arch.

Fig 2 Armamentarium

Case Report

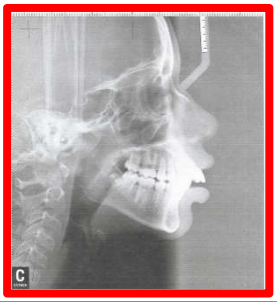


Fig 3 Pre-Treatment Records

Fig 4 Records after Arch Distalization

Appliance construction

- ***Transpalatal lever arms*** made of 0.9 mm stainless steel with soldered hooks.
- ***Titanium implant screws*** (2mm x 6mm) were used as a bone anchor. The implant axis is adjusted between 45 – 60 degrees. Screws were inserted in 3-4 mm para median region of the midpalatine suture.

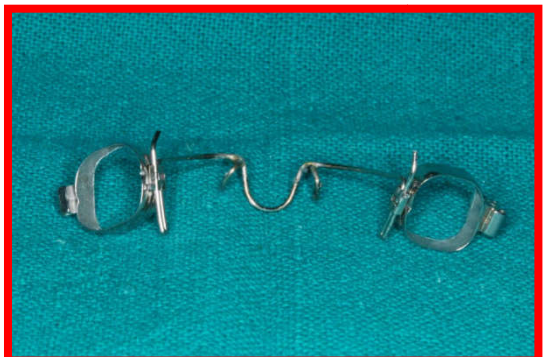


Fig 5 Appliance (TPA)

A Transpalatal Arch (TPA) with soldered hooks connecting both molars was retracted by elastic chain engaged to the hooks of the transpalatal lever arm (Fig 6).

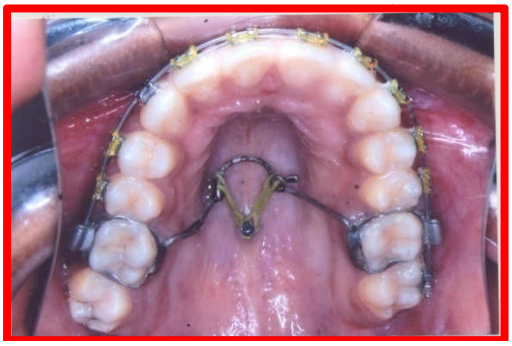


Fig 6 Intraoral TPA placed

Upper and lower arches were bonded and banded with 0.022 x 0.028 inch slot PEA brackets.

Upper and lower arches were strapped up after 3 to 4 months post initiation of distalization .

Statistical Analysis

Intra-examiner reliability was determined by kappa (k) value.
Statistics were calculated to locate the ***central tendency*** (mean) and ***spread*** (standard deviation).
Level of significance was fixed at 0.05.

All patients and parents were informed about the surgical procedure and they signed a consent form.

RESULTS AND DISCUSSION

The initial measurements were repeated after 1 week. The kappacoefficients were calculated to analyze repeatability. Coefficients were found to be 0.96. Nonparametric Wilcoxon sign rank test was used for comparison of paired values of the measurement. A probability of 0.05 was accepted as critical significance.

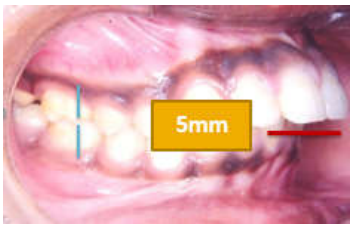


Fig 7

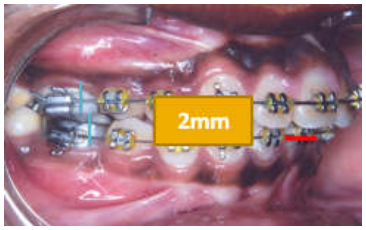


Fig 8

Class I molar relationship was achieved in a mean period of 18-20 months with an overjetreduction (Fig 7, 8).

Measurements	Pretreatment mean +_SD	After distalization mean +_SD	Difference mean +_SD
Skeletal (vertical)			
SN to Mandibular plane	37.1^0± 0.94	36.3^0±0.9	0.8^0±0.4*
FH to Mandibular plane	30.5^0±1.02	29.9^0±1.04	0.6^0±0.4*

*Non significant > 0.05
Wilcoxon Rank test was used

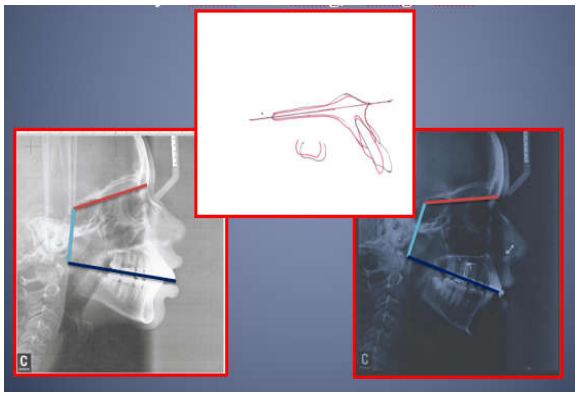
Maxillary molar distalization assessed by **Pancherz analysis** shows mean changes of **4.75± 0.4 mm** (occlusion line perpendicular to position of maxillary permanent first molar)which is well supported by study done by **Bicakci AA, Park,Lee.**

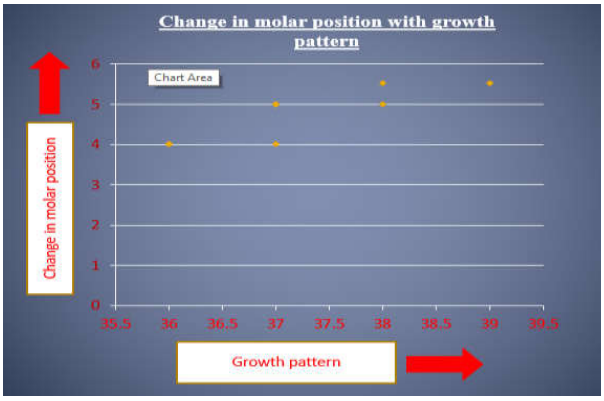
Maxillary molar distalization assessed by **Rickett's analysis** shows changes of **4.6±0.4 mm**(Maxillary first molar to Pterygoid vertical line).

Maxillary molars were intruded by an average of 0.7±0.1mmwhich is well supported by Yamada, Nalcaci *et al*.

Measurements	Pretreatment mean +_SD	After distalization mean +_SD	Difference mean +_SD
DENTAL			
Anterio -posterior change in molar position			
Occlusion plane perpendicular (OLP)to maxillary first molar (pancherz analysis)	61.95±2.7 mm	57.21. ±4 mm	4.75±0.4* mm
Maxillary first molar to PTV (Rickett's analysis)	18.8±0.97 mm	14.2±0.6 mm	4.6±0.4* mm
* Significant < 0.05 Wilcoxon Rank Test was used			

Maxillary incisor retraction assessed by Pancherz Analysis shows changes of 5.3 ±0.64 mm which is also well supported by work done by Voon J Eong, Jong Suk Lee *et al*.





CONCLUSION

Implant supported molar distalization appliance presented effective and minimally invasive, compliance free alternative for intraoral molar distalization in vertical growing individual without proclining the incisors. No significant vertical changes were observed during distalization.

Molar distalization as well as full arch distalization was achieved with implant supported distalizing appliance.

Besides the space gained in the posterior segment, a quantity of space was also gained in anterior segment and spontaneous alignment of anterior crowding was achieved during molar distalization.

Long term studies with large sample size has to be carried out to evaluate and judge the bodily movement of molars in account of true distalization.

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