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RESEARCH ARTICLE

CLASS II CORRECTION BY MOLAR DISTALIZATION WITH PENDULUM APPLIANCE- A CASE REPORT.

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Abstract

12-year female patient presented skeletal class I jaw base with unilateral Class II molar relationship with well aligned lower arch and lower incisors upright over basal bone. Distalization was planned in upper arch to correct Class II molar relation and mild upper incisor proclination. Modified Pendulum appliance was used to distalize upper molar. Bilateral Class I molar relationship was achieved and incisor proclination reduced in a span of 18 months.

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Introduction:-

Correction of Angle's Class II malocclusion with a non-extraction approach requires distal movement of the maxillary dentition or mesial movement of the mandibular dentition or combination of both. A myriad of devices have been developed over the years in this regard which have been used to distalize the maxillary molars and shown agreeable clinical outcomes. The creation and use of intra maxillary intraoral appliances for molar distalization in Class II malocclusion have been made possible through advancements in biomechanics and technology and materials that have allowed the delivery of light and constant forces over a wide range of deactivation¹. With extra oral mechanisms implementing molar distalization, the success of the treatment will decisively rely on the patient's compliance². Since the early 1980s, therapeutic approaches and devices have been focussed increasingly on options for correcting malocclusions in which patient compliance could be almost ignored. As a main approach of noncompliance appliances, intra arch devices for molar distalization have been introduced. Clinical application of Pendulum appliance, Repelling magnets,^{3,4} Acrylic Cervical occipital (ACCO),⁵ Wilson Bimetric Distalizing Arch (BDA),^{6,7} Distal jet,^{8,9} K-loop,¹⁰ and Jasper jumper¹¹ etc. demonstrated promising results. However, almost all the appliances show adverse reciprocal effects, such as flaring of the anterior teeth, mesial movement of the mandibular teeth, and extrusion of the premolars¹².

It has been widely accepted that clinical management of intra arch devices is simple and efficient. As an important part of this intra arch system, the Pendulum Appliance was first introduced by Hilgers in 1992.¹³ Since then, many variations have emerged and the clinical application of the pendulum appliance has demonstrated good result. The Pendulum appliance is simple, non compliant, easy to fabricate in the dental lab and easy to activate. This case report describes unilateral distalization of molar with modified Pendulum appliance in Class II subdivision malocclusion.

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Patient Selection:-

Distalization therapy is indicated in cases with Class II molar relation with Class I skeletal jaw base, brachyfacial or mesofacial pattern, horizontal growth pattern, healthy temporomandibular joint and upright lower teeth along with good alignment. It is imperative to determine the space available for maxillary first molar with respect to the Ricketts' pterygoid vertical line on the lateral cephalogram. As a rule, this distance is calculated as the patient's age plus 3 mm in growing individuals and a minimum of 18 mm in non growing individuals.

Case Report:-

12-year female presented with the chief complaint of having proclination of her upper front teeth. No relevant medical history was present. On clinical appraisal, no abnormality was detected with temporomandibular joint. Her facial form was mesoprosopic and symmetric, with a straight and harmonious soft tissue profile (Fig. 1).



Fig. 1:-Pre treatment extra oral photographs.



Fig. 2:-Pre treatment intra oral photographs



Fig. 3:-Pre treatment panoramic and lateral cephalometric radiographs

Intra orally, she had an end-on molar relation on the left side and Class I molar relation on the right side, 3 mm overjet and 20 % overbite (Fig. 2). Upper midline was shifted to right side by 2 mm with respect to facial midline. Lateral cephalogram showed ANB of 2° and Wits appraisal of 3 mm, indicative of a Class I skeletal relation. The skeletal pattern was horizontal as evidenced by the SN-MP angle of 28°. Patient had proclined maxillary incisor with U1-SN 110°, normally inclined lower incisor with L1-MP 95°(Fig. 3). The distance between Ricketts' PTV line and distal surface of maxillary first molar was 13.5 mm.

Treatment Objectives:-

Treatment objectives were to correct end-on molar and canine relation with respect to upper left quadrant, dental midline correction with respect to facial midline and to reduce mild incisor proclination.

Treatment Plan:-

Unilateral distalization of the maxillary molars was planned using a modified Pendulum Appliance with respect to upper left quadrant, followed by fixed appliance therapy. The distance between Ricketts' PTV line and distal surface of maxillary first molar was 13.5 mm. According to Ricketts', minimum distance required for 12 year female patient was 12 mm. So distalization was possible.

Table 1:- Cephalometric Findings.

Variable	Standard	Pre-treatment	Post-treatment
Skeletal			
SNA	82° ± 2°	80°	79°
SNB	80° ± 2°	78°	77°
ANB	2°	2°	2°
Go Gn – SN	32°	32°	30°
Wits appraisal	0 /+1 mm	3 mm	1 mm
DENTAL			
U1 – SN	102° ± 2°	110°	105°
U1 – NA	4 mm / 22°	6 mm / 25°	5 mm / 23°
L1 – NB	4mm / 25°	4 mm / 25°	5 mm / 28°
IMPA	92° ± 5°	95°	100°
U6 – PtV	Age + 3 mm	13.5 mm	8.5 mm
SOFT TISSUE			
NASOLABIAL ANGLE	90-110°	99°	98°
U LIP – S LINE	0 mm	1 mm	1 mm
L LIP – S LINE	0 mm	1 mm	1 mm

Treatment Progress:-

Modified Pendulum appliance was fabricated and inserted onto the banded maxillary first molars. The appliance was activated by 90°, which delivered approximately 220 grams of force. The molar started moving distally. At the end of four months, the molars showed a distal movement of 5 mm (Fig. 4). This was followed by the use of Insta Nance Appliance as a means of retention (Fig. 5). A mid-treatment lateral cephalogram showed distalization of first molar and revealed bone deposition on the mesial aspect (Fig. 6). After the desired distalization was achieved, 0.022×0.028" MBT brackets (Ecolite) were bonded. Alignment and levelling in the both arches was carried out by following wire sequence: (a) 0.016" heat activated nickel-titanium arch wires (b) 0.018" SS arch wires and (c) 0.017×0.025" SS arch wires. The arch wires were cinched distal to molar to avoid maxillary and mandibular incisor proclination. Class II elastics were used on 0.017×0.025" stainless steel wire to augment anchorage and to correct canine relation. Coordination of both the arches was carried out on 0.019×0.025" stainless steel wire (Fig.7). Finishing was accomplished with 0.021×0.025" titanium molybdenum alloy wire. The treatment was completed in eighteen months. At the debond visit, the patient was given a maxillary and mandibular bonded lingual retainer. The patient is being recalled every six months for follow up.



Fig. 4:-Distalization with modified pendulum appliance



Fig. 5:-Insta-nance appliance



Fig. 6:-Post distalization lateral cephalogram



Fig. 7:-Upper and lower 19 × 25 stainless steel wire with class II elastics

Treatment Result:-

A good occlusion was established resulting in bilateral Class I molar and canine relation along with normal overjet and overbite (Fig. 8 and 9). The maxillary first molar was distalized by 5 mm in 4 months. The upper dental midline was corrected in relation to facial midline. The position and inclination of the upper incisors were normalized. The nasolabial angle presented within the normal range and upper and lower lips exhibited a normal position in relation to the E-line (Fig.10).



Fig. 8:-Post treatment facial photographs



Fig. 9:-Post treatment intraoral photographs



Fig. 10:-Post treatment orthopantomogram and lateral cephalogram

Discussion:-

Modified Pendulum appliance consists of a Nance button that incorporates four occlusal rests that are bonded either to the deciduous molars or to the first and second bicusps. An alternative method is to solder retaining wires to bands on the maxillary first bicusps. Two 0.032" TMA springs inserted into 0.036" lingual sheath on the maxillary molar bands are used as active elements for molar distalization. The springs are mounted as close to the centre and distal edge of the acrylic button as possible to produce a broad, swinging arc (or pendulum) of force. Each spring consists of a closed helix, an omega-shaped adjustable horizontal loop for molar expansion and prevention of the cross-bite following the palatal movement of the molar¹⁴. Force is applied occlusally with respect to the centre of resistance of the molar. Therefore, the molars are not distalized in a bodily fashion, but distal tipping followed by uprighting is expected.

Modified Pendulum appliance was successfully used for the unilateral distalization of maxillary first molar into a Class I molar relationship in this case. The patient's second molar had also erupted. Influence of second molar on the distal movement of the first molar remains a matter of debate. Some authors reported that the presence of second molar increases the treatment duration,¹⁵ produces more tipping of molar,¹⁶ and more anterior anchorage loss.¹⁷ On the contrary, some authors have reported that the presence and the position of second molar does not affect the amount and the type of maxillary first molar distal movement.¹⁸⁻²⁰ Previous studies have indicated that the pendulum appliance produces a molar distalization between 3.14 and 6.1 mm.^{21,22} In our case, 5 mm of distalization of first molar was achieved in a duration of 4 months. After the first phase of distalization treatment with Pendulum appliance, the Insta-Nance appliance was placed to stabilize the molar until the retraction of the canine was accomplished. This had the purpose of encouraging the spontaneous distal drift of the first and second premolars owing to the action of trans-septal fibers. Upper anterior teeth were retracted in the space created by distalization. There was anchorage loss of anterior teeth which was corrected during fixed appliance phase.²³⁻²⁷

Unilateral distalization has the advantage of stronger anchorage because the whole contralateral side is incorporated in the anchorage unit. Unilateral distalization seems to be associated with less anchorage loss and less tipping of the molar than bilateral distalization.²⁸ Caprioglio et al revealed that subjects using Pendulum appliance showed lesser anchorage loss for a greater amount of distal molar movement.²⁹ Superimposition showed U1 to SN was reduced from 110° to 105°, it indicated that the upper incisors were retracted. L1 to MP was increased from 95° to 100° which revealed that the lower incisors were slightly proclined during treatment. These changes were not significant and did not affect post treatment stability.

Conclusion:-

Modified Pendulum appliance was found to be efficient, non-invasive and non compliant appliance for attainment of molar distalization. 5 mm of distalization was achieved in 4 months and Class I molar and canine relation was achieved.

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