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Case Report

Nonsurgical management of class II division 1 malocclusion in an adult patient using fixed functional appliance: A case report

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ABSTRACT

This case report highlights the effective and efficient usage of fixed functional appliance in the management of class II div 1 malocclusion with retrognathic mandible and deep overbite in an adult individual. Orthognathic surgery and Orthodontic camouflage with premolar extraction were not considered in the present case. The Mandibular Protraction Appliance (MPA type 2) was considered due to ease of fabrication, placing it simultaneously along with fixed mechanotherapy.

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1. Introduction

Most of the class II malocclusions presents with various etiological factors. The factors which contribute to class II division I malocclusion are craniofacial growth, diet, habits and ethnicity. Such malocclusions generally exhibit either upper jaw prognathism, lower jaw deficiency and a combined effect of two jaws.

Hence Orthodontic treatment planning depends on age, aetiology and nature of the malocclusion, skeletal and dental characteristics.¹

Adult patients with mandibular deficiency may benefit from either surgical or non-surgical management technique. The ideal option in a nongrowing individual is Orthognathic surgery involving repositioning of mandible anteriorly and advancement genioplasty. The second option is camouflage which Involves extraction of upper first premolars bilaterally, thus leading to en-masse retraction of maxillary flared incisors leading to overjet and overbite correction.² Fixed functional appliances provide

a conservative management approach to treat such a malocclusion.

Fixed bite jumping appliances are to be used in residual growth or in nongrowing individuals. The first appliance to be used was Herbst rigid fixed functional appliance. Apart from using the Herbst appliance, there are various other fixed functional appliances such as the Jasper Jumper, the MARA, AMF and MPA.³⁻⁶ The distinct features present in Mandibular Protraction Appliance (MPA) are it is easy to fabricate by the Orthodontist, easy to place along with fixed mechanotherapy, hence it reduces the total duration of Orthodontic treatment and the chances of post retention stability are high.⁷

In this case report we present the conservative management of class II division I malocclusion with deep overbite in an adult non growing patient using Mandibular Protraction Appliance (MPA) fixed functional appliance.

2. Case Report

The chief complaint of an adult male of age 23 years was protrusive maxillary upper teeth.

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Extraoral examination showed presence of a convex facial profile, posterior divergence, absence of passive lip seal with lip trap, nasolabial angle was acute, deep mentolabial sulcus, backwardly placed lower jaw. Temporomandibular joint disorder was absent. There was no medical history or no correlation was found of similar malocclusion in family members.

Class II molar and canine relationship was present bilaterally on intraoral examination, there was overjet of 13 mm, and 100% deep bite, proclined and spaced maxillary anteriors, mild crowding of the lower incisors (Figures 1 and 2).

The pretreatment panoramic radiograph showed the presence of well-developed third molars in lower arch and no morphologic changes were present in both the condyles. The pretreatment lateral cephalogram revealed horizontal growth pattern, well-positioned maxilla, retrognathic mandible with skeletal class 2 pattern and marked maxillary incisor proclination with lower incisors well positioned (Figure 3 and Table 1).

2.1. Treatment objectives

To achieve pleasant facial aesthetics, reduce the overjet and overbite maintain a stable occlusion post treatment, class I molar and canine relationship, balance the lip musculature

2.2. Treatment alternatives

Patient was presented with two management approaches. The surgical option includes fixed mechanotherapy and Orthognathic surgery which includes Mandibular advancement and Reduction Genioplasty in order to achieve the objectives.

The nonsurgical option includes Orthodontic Camouflage by upper first premolar extractions. The patient was reluctant for the first and second option, a third alternative which includes nonsurgical and nonextraction approach was chosen. The application of Mandibular Protraction Appliance (MPA) was planned for the sagittal correction.

2.3. Treatment progress

First molars were banded in all the four quadrants and bonding was done using pre-adjusted edgewise brackets (0.022×0.028 -inch slot, MBT prescription). First stage of Alignment and Levelling was done using 0.014-inch Nickel Titanium (NiTi), 0.016- inch NiTi, 17x25 Niti in upper and lower arches. Intrusion Retraction Utility arch was placed in the maxillary arch to obtain bite opening and close spaces in the maxillary arch (Figures 4 and 6). In maxillary arch 19x25SS with helix mesial to molar tube and in mandibular arch 0.021 \times 0.028 SS archwire with a helix between canines and premolars for installation of the MPA were placed (Figure 5).

The appliance was continued for a total duration of 10 months. The initial lower arch advancement was kept at 6 mm. to achieve an edge- to-edge relationship the appliance was kept for another 4 months. The appliance was discontinued after correction of the molar relationship and improvement in facial profile was observed. Finishing and detailing was done to achieve occlusal stability.

The compliance of the patient proved a pivotal role in the correction of malocclusion. The appliance was discontinued and debanding and debonding was performed after a total duration of 26 months. Modified Hawley plate along with fixed lingual retainers were bonded in both the upper and lower arches.

3. Results

An improved facial profile was observed in the post treatment extraoral photographs (Figure 7). The posttreatment intraoral photographs showed presence of Class I molar and canine relationships, normal overjet and overbite along with good interdigitation, post treatment OPG exhibited good proximal contacts and root parallelism (Figures 8 and 9 and Table 1). Pleasant facial profile and stable occlusion was maintained after two year of retention also. (Figure 10)



Fig. 1: a: Pre treatment extraoral frontal view; b: Pre treatment extraoral frontal smile view; c: Pre treatment extraoral profile view

4. Discussion

Adult individuals either exhibit residual growth or lack of growth. This was supplemented by studies of Baccetti et al. who showed presence of the fifth cervical vertebral maturation stage (CVMS V) and above in the lateral cephalogram and classified them as adults.⁸ Management of class II division I malocclusion with mandibular deficiency in nongrowing individuals involves surgical correction as an ideal treatment option. In the present case, patient refused the surgical treatment planning owing to intensive nature of surgery and cost factor. Nonsurgical option of Orthodontic camouflage involves extraction of the upper first premolars or upper and lower first premolars, which is often indicated, is the most effective protocol. However, in the present case worsening of the facial profile was assessed with extraction

Table 1: Showing cephalometric values pre and post treatment

Parameters	Mean Value	Pre Treatment	Mid treatment	Post Treatment	Difference
Maxilla to cranium					
SNa Angle	82+2	78.5	78	78	.5
N Perp To Pt A	0+1	-6	-4	-3	3
Eff Max Length		85	91	90	5
Mandible to cranium					
SNb Angle	80+2	74	77	78	4
N Perp To Pog	0	-12	-10	-7	5
Eff Mand Length		112	116	114	2
N Pog To FH Angle	90	86	98	110	24
Maxilla to mandible skeletal					
Anb Angle	2+2	4.5	1	0	4.5
Wits	0	4	3	3	1
Co Gn-Co A		27	26	19	8
Vertical relationship					
Y Axis Angle	53-66	60	60	60	0
Facial Axis Angle	90	90	90	90	0
Fma Angle	25	18	19	19	1
GoGn-Sn	32	25	27	27	2
Occ To Sn Angle	14	15	13	14	1
UFH:LFH	0.7	0.8	0.8	0.9	0.1
PFH:AFH	62.65%	72	70	70	2
Sum Of Posterior Angles	396+6	380	385	384	4
Maxillary dental					
U1 To Na Angle	22	47	41	23	25
U1 To Na mm	4	8	7	5	3
U1 To Pt A	5	16	10	6	10
U1 To Sn	102+2	125	121	110	15
Mandibular dental					
L1 To Na Angle	25	20	20	25	5
L1 To Na mm	4	5	5	6	1
L1 To Pt A	1	3	2	3	0
Impa	90	98	97	95	3
Maxilla to mandible dental					
U1 To L1	130	112	115	120	8
Soft tissues					
GSnPg	124+4	21	18	17	4
Nasolabial angle	102+8	90	90	98	8
E Line-U	0+1	1	1	0.5	0.5
E Line-L	2+1	-2.5	-2	-1.5	1

approach and also, patient was not willing for extractions.^{2,9} Fixed functional appliances were found to be reliable and efficient in nongrowing individuals. Amongst all, mandibular protraction appliances (MPAs) has distinctive features like easy to fabricate chair side, cost effective and easy installation of this appliance.

Since MPA is a fixed appliance, full- time patient compliance is also more predictable.⁷ Hence, treatment selection in class II div 1 malocclusion is dependent on anteroposterior discrepancy, age and patient compliance. Considering these factors and cost-benefit ratio MPA was chosen to correct the sagittal discrepancy. In the present case, flared and spaced incisors with increased overjet

and deep overbite was seen. It has been reported that such malocclusions may present with tongue thrust habit or it may be the cause of malocclusion. Tongue thrust habit still remains a topic debate and discussion.¹⁰ In our case, when anterior spaces were closed thrusting of tongue was not observed. However, it was observed that the management of such malocclusions using fixed bite jumping appliances like MPA was attributed largely due to dento-alveolar changes rather than skeletal changes (Figure 10). Severe root resorption was observed in maxillary and mandibular anterior teeth at end of treatment. Combination of movements i.e. simultaneous retraction and intrusion of upper anterior teeth was done in order to correct deep



Fig. 2: a: Pre treatment intraoral frontal view; b: Pre treatment intraoral right lateral view; c: Pre treatment intraoral left lateral view; d: Pre treatment intraoral maxillary occlusal view; e: Pre treatment intraoral mandibular occlusal view

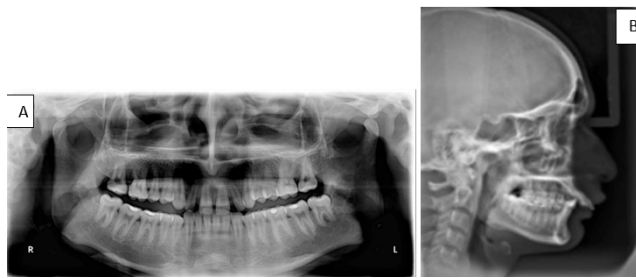


Fig. 3: PretreatmentOPG and Lateral Cephalogram

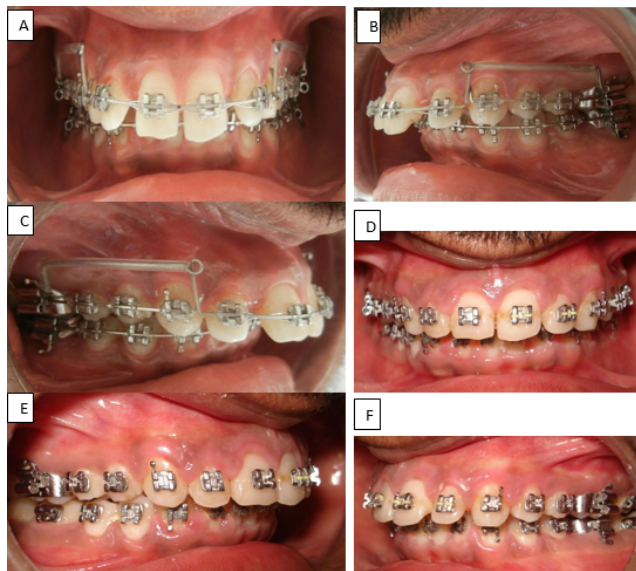


Fig. 4:

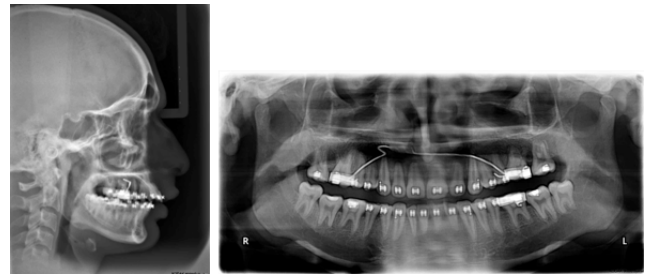


Fig. 5:

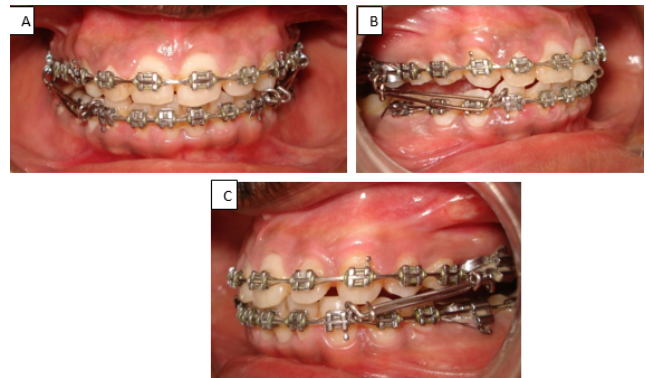


Fig. 6:

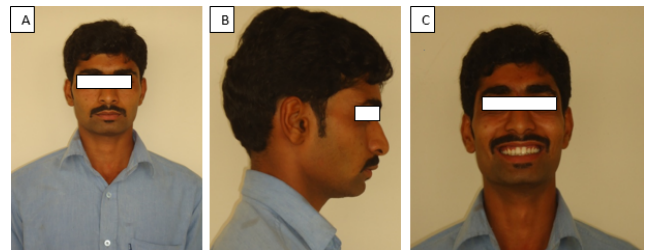


Fig. 7: a: Post treatment extra oral frontal view; b: Post treatment extra oral frontal smile view; c: Post treatment extra oral profile view

overbite with increased overjet. This movement produces concentration of forces on root especially at apex leading to root resorption. Similar results were seen in other studies where intrusion and retraction were carried out. It has been correlated that incisor with accentuated curve of spee and increased overjet are more susceptible to resorption.^{11,12} Hence clinicians should take precautions in order to avoid or reduce the severity of root resorption.

5. Conclusion

Correction of class 2 malocclusion with camouflage is challenging.

In relation to the cost benefit ratio, in non growing individual’s correction using fixed functional appliance constitute a viable treatment option.

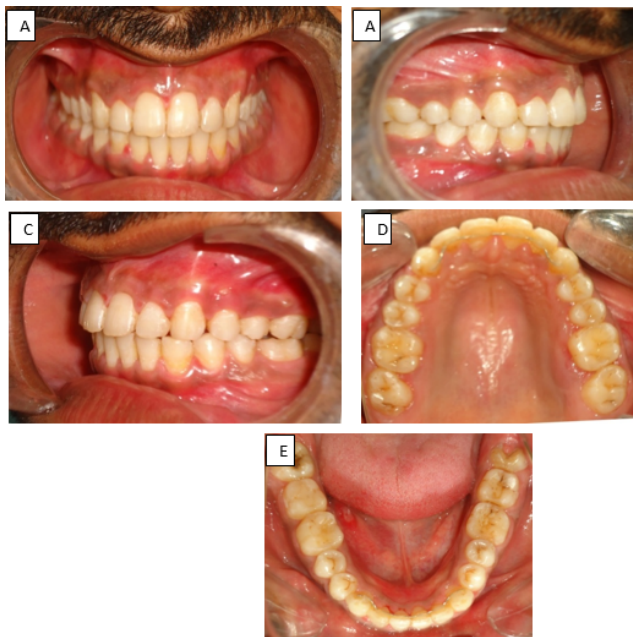


Fig. 8: a: Post treatment intraoral frontal view; b: Post treatment intraoral right lateral view; c: post treatment intraoral left lateral view; d: Post treatment intraoral maxillary occlusal view; e: Post treatment intraoral mandibular occlusal view

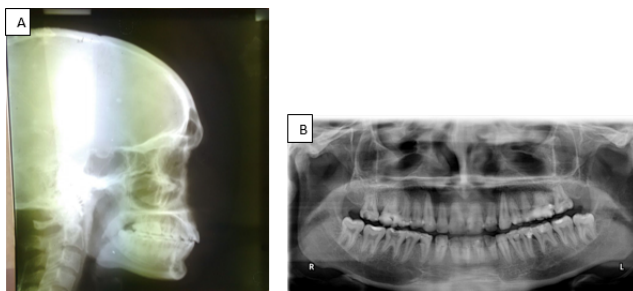


Fig. 9: Post-treatment OPG and Lateral Cephalogram

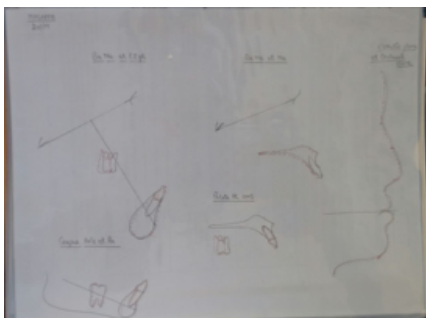


Fig. 10:

In this case report, use of fixed functional bite jumping appliance greatly improved the facial profile, pleasant aesthetics, and good dentoalveolar stability.

6. Source of Funding

None.


7. Conflict of Interest


None.

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