CASE REPORT

NON-EXTRACTION APPROACH TO CORRECT THE OPEN BITE

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ABSTRACT

Introduction: An adult female patient with anterior open bite appears dento- alveolar component with skeletal class III malocclusion , hyperdivergent growth pattern and tongue thrusting habit.
Objective: Aim of this case report is to show the effect of habit breaking appliance along with the fixed orthodontic treatment in a non- growing Class III patient with dental open bite with marked improvement in overjet, overbite and profile of the patient.
Results: The goal of the treatment has been achieved according to patient's desire and satisfactory interdigitation.
Conclusion: The treatment resulted in an aesthetic, functional, and stable occlusion, along with an improved facial profile.

Keywords: Non-extraction orthodontic, open-bite, non-growing, class III malocclusion.

INTRODUCTION

Now-a-days, many adult patients are seeking orthodontic treatment as it plays a major boon in modifying and improving the facial esthetics. One such factor which majorly affects the facial esthetics is the vertical overlap of teeth. According to Profitt, overlap of the incisors where the incisal edges of the lower teeth lie slightly below the cingulum of upper incisors is known as overbite, however, if this vertical overlap is not present then the condition is known as Open bite. The term "open bite" was coined in 1842 by Caravelli.[1-2] It may be seen in a single tooth or a group of teeth.[3] It is found more commonly in African and Afro-Caribbean populations[4] with overall prevalence ranging from 25% to 38%.17% of the patients seeking orthodontic treatment show up with this problem[5-7] which along with the esthetics, poses problems with anterior and canine guidance, tearing of food, language problems and TMJ disorders.

Due to the difficulty in both treatment and bite closure retention, anterior open bite is considered as a complex malocclusion. It develops as a result of interaction of various factors such as skeletal disharmonies, tongue thrust and digit sucking habits, airway obstruction etc.[8-11] It can be divided into 2 categories - Dental open bite, where skeletal pattern does not contribute to the malocclusion and skeletal open bite, which is a result of influence of skeletal pattern with elongated lower third of face.[12]

Dental open bite is usually seen from canine to canine with protruded and proclined maxillary anterior due to prolonged oral habit and is easier to treat in comparison to the skeletal open bite. Literature and different authors have described different treatment modalities depending on the severity and age of the patient for both dental and skeletal open bites including lingual cribs, myofunctional appliances, wires, fixed appliances, elastics, aligners with elastics, surgeries etc.[13-14] Mizrahi and Ngan have also emphasized on the removal of etiology as the major corrective approach. Many studies have found favorable results in the treatment of dental open bite using habit breaking appliance and fixed orthodontic treatment.

Aim of this case report is to show the effect of habit breaking appliance along with the fixed orthodontic treatment in a non-growing Class III patient with dental open bite with marked improvement in overjet, overbite and profile of the patient.

CASE REPORT

A female patient aged 18 years presented to the department for the initial consultation with the chief complaint of 'improper facial esthetics with inability to cut food'. Her medical and dental histories were non-significant showing good state of general health with no signs of temporomandibular dysfunction and good oral hygiene. In terms of functional activity, she presented alteration in the tongue position during swallowing showing a habit of tongue thrust with dental indentations on both the sides of tongue.

DIAGNOSIS

Pretreatment extra-oral examination revealed mesocephalic head form with mesoprosopic facial pattern, convex profile with divergent pattern and incompetent lips **Fig (1).** Smile of the patient was symmetric with reduced gingival and incisal display

on smiling showing a low smile line and high smile index. Lateral view revealed a skeletal Class III hyperdivergent growth pattern with prognathic mandible.

Her intraoral examination demonstrated a symmetric 'U' shaped maxillary arch with spacing in anteriors and prominent midline diastema of almost 4mm. Mandibular arch was also symmetric and 'U' shaped with spacing in anteriors and rotations in premolar region. The molar relation was Angle's Class III on right side and Class I on left side with Class I canine relation bilaterally, reverse overjet of almost 2.5 mm and open-bite of 4mm. Midlines were discordant with lower midline shifted to left by 2mm with gingival recession and bone loss in relation to 31 and 32 showing marked proclination in mandibular anteriors. **Fig (2)** Swallowing pattern of the patient showed tongue thrust habit with tip of tongue touching the anteriors instead of palate and thus providing a thrust for both proclination and spacing of anteriors.

Figure (1) Pre-treatment Extraoral photographs

Figure (2) Pre-treatment Intraoral photographs

The panoramic radiograph revealed developed 3rd molars in all the quadrants with generalized bone loss. **Fig (3)** Lateral Cephalogram of the patient showed CVMI-Stage V with Cephalometric findings showing a skeletal Class III pattern with ANB of 1.5° and Wits reduced to -6 mm and APP-BPP reduced to 0mm with prognathic maxilla and mandible **Table (1).** Patient had a hyperdivergent growth pattern with Frankfort –Mandibular plane angle increased to 34° and SN-MP angle increased to 38°. Gonial angle of the patient was increased to 135°increased lower facial height. Maxillary incisors were proclined with a value of U1-NA 6mm/31° while the mandibular incisors were both protruded and proclined with a value of L1-NB being 10mm/40° and IMPA increased to 100° **Table (2).**

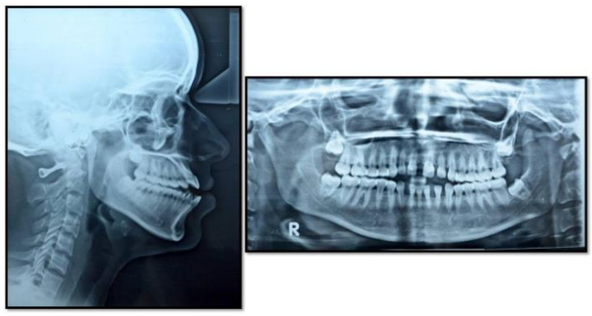

Figure (3) Pre-treatment radiographs (Lateral Cephalogram and OPG)

Cephalometric
Hard tissue findings

	Pre-treatment	Post- treatment
SNA	85°	85°
SNB	83.5°	83°
ANB (3.12°±1.8°)	1.5°	2°
Wits	-6mm	-5mm
APP- BPP (5mm)	0mm	0mm
MM bisector (-5mm)	-8mm	-8mm

Table (1) Cephalometric findings showing Pre-treatment Skeletal Class III base

	Pre-treatment	Post-treatment
FMA (23.83±2°)	34°	33°
SN-MP (32-35°)	38°	38°
Y Axis (59.62°±3)	62°	62°
Bjork's sum (394°)	129+136+135=400°	128+138+135=401°
J ratio (59-63%)	62%	62%
Gonial angle (123±7°)	135°	135°
Upper anterior facial height (45%)	44%	44.5%
Lower anterior facial height (55%)	56%	55.5%
Mx 1 to A-Pg: (6.74±1.3mm)	7mm	6mm
Mx 1 to NA: (4.92±2.05mm)	6mm	4.5mm
Mx 1 to NA: (24.02±5.82°)	31°	26°
Mx 1 to Palatal Plane (71°)	55°	60°
Md 1 to A-Pg (-2mm to 2mm)	10mm	3mm
Md 1 to NB (6±1.7mm)	10mm	5mm
Md 1 to NB (27±4.3 °)	40°	22°
IMPA (91°)	100°	83°
Inter-incisor Angle (123°)	108°	130°

Table (2) Cephalometric findings showing hyperdivergent growth pattern and pre-treatment proclined maxillary and mandibular anteriors

TREATMENT OBJECTIVES

- Cessation of tongue thrust habit
- Achieve Class I molar and canine relationship bilaterally
- Correction of spaced dentition
- Correction of reverse overjet
- Correction of open bite
- Align and level the maxillary and mandibular dental arches
- Correction of protruded lips and to attain optimum soft tissue relationship

TREATMENT PLAN

Use of fixed orthodontic appliance was planned along with fixed tongue crib to guide the movement of tongue and reduce its effect on the anteriors. The crib was given from the starting of treatment and was continued throughout. Elastics were used at the end to attain a proper overbite and occlusion. MBT prescription was planned except for the mandibular anteriors as their roots were already prominent due to which standard edgewise was used in the lower anterior segment.

TREATMENT PROGRESS

Pre-adjusted straight wire appliance was chosen for treatment in this case except for the lower incisors where standard edgewise brackets were used due to their root prominence. MBT appliance with 0.022 × 0.028″ slot was used. The treatment started with banding and bonding with a fixed crib for tongue control that was soldered to the molar bands followed by leveling and Alignment that was done with a series of Nickel-Titanium wires followed by stainless steel wires like 0.016″ nickel-titanium, 0.018″ Nickel titanium, 020” Nickel titanium, 0.017×0.025″ nickel titanium, 0.019×0.025″ nickel titanium and 0.019×0.025″ stainless steel arch wires in a sequence. Once the rotations were corrected, figure of eight was continuously done so as to consolidate the space and reduce the proclination of incisors. The open bite went on reducing due to continuous figure of 8 and use of fixed crib. After proper alignment at 19 x 25 stainless steel lingual root torquing was started in the mandibular arch in order to reduce the root prominence. Then at 21 x 25 stainless steel torquing was done **Fig (4)**. Due to reduction in proclination of the lower anteriors and also continuous torquing, the root recession also got corrected by itself. This was followed by the use of diagonal elastics for the correction of midline that was off by almost 1mm. Finally after all the corrections, finishing & detailing phase was carried out using flexible round wire and settling elastics **Fig (5).** A panoramic radiograph was taken to evaluate the roots and their angulations and after getting satisfactory results the patient was debonded after a period of 26 months.

Figure (4) Torquing of lower anteriors

Figure (5) Settling carried out using round wire and settling elastics

At the end of the treatment all the treatment objectives were achieved with a Class I molar and canine relationship bilaterally, overjet of 2mm and overbite of 20% shown in **Fig (6) and (7)** and patient was highly satisfied with her facial esthetics. **Fig (8) and (9)** shows extraoral and intraoral comparison of the patients pre and post- treatment photographs.

After removing the fixed appliance, retainers were given in both the arches with removable Hawley’s retainer with a tongue crib in the upper arch and a fixed canine-to-canine bonded lingual retainer in the lower arch and she is been recalled every month for reevaluation.

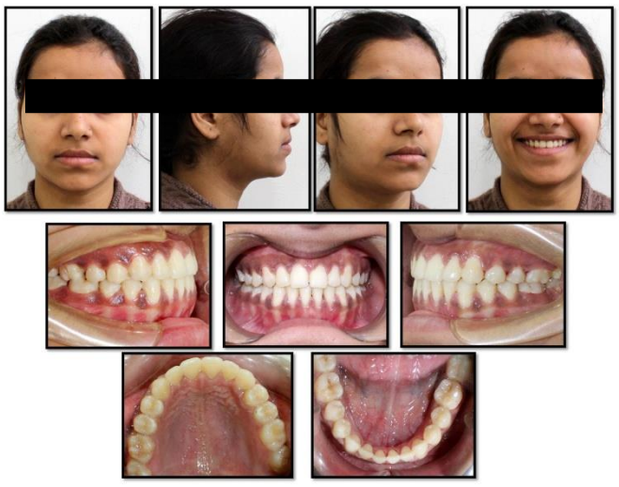

Figure (6) Post treatment Extraoral and Intraoral photographs

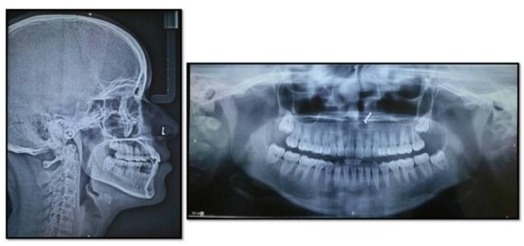

Figure (7) Post treatment radiographs (Lateral cephalogram & OPG)

Figure (8) Pre and Post treatment Extraoral comparison

Figure (9) Pre and Post Treatment intraoral comparison

DISCUSSION

Open bite is considered as one of the most difficult malocclusions to manage not only due to the problem in attaining positive overbite but also due to difficulty in maintaining the results achieved as there are high chances of relapse. Hence, 2 factors must essentially be analyzed for its treatment – objectives of the treatment and stability of the specific case. Management of skeletal open bite is even more difficult as more the severity of open bite in a non-growing patient higher is the chances of surgical approach where the treatment aims at intrusion of maxillary anteriors and counterclockwise rotation of mandible.

Several treatment approaches are available for its treatment but what more important is to detect the cause and then to work towards its removal and malocclusion correction.[15-18] The patient's compliance is equally important along with the long-term wearing of appropriate retainers to maintain the beautiful results achieved.

Depending on the patient's facial pattern and anatomical characteristics, interruption of a non-nutritive oral habit before 5 years of age helps in the natural correction of anterior open bite in almost 80% of cases.[19,20] Orthodontic intervention will be required in a more persistent non-nutritive sucking habit. Our patient also presented with a tongue thrust habit that lead to an open bite from canine to canine. Since the open bite in our patient was dental in nature, we thought of giving a fixed palatal crib that helped us in controlling the nature of tongue. Different studies have shown a positive and effective result with a palatal crib although the skeletal effects and stability has been controversial and have varied among studies.[21,22] However, in our case the use of palatal crib in combination with fixed orthodontic treatment showed great results. We opted for a non-extraction approach as the arch was quite wide and the amount of space available in the arch helped us in getting a positive overjet and overbite with satisfactory improvement in the profile of the patient. The crib-fixed treatment combination along with the elastics helped us in improving the U1- NA from 6mm/31° to 4.5mm/ 25°and L1-NB from 10mm/40° to 5mm/22°. IMPA got reduced from 100° to 83° and inter-incisal angle improved from 108° to 130°. Also, upper and lower lip fall were seen that added on to the improvement in profile.

Till date the results achieved are stable however, in such cases stability has always been a concern as chances of relapse are always high due to growth related and etiological characteristics that are unlikely to change. According to a report by Lopez-Gavito, more than 35% of anterior open bites treated with conventional appliances relapsed 3mm or more at 10 years post-retention.[23] However, a good stable occlusion adds on to the stability in orthodontic cases in our case also we expect it to be quite stable over a longer period of time.

CONCLUSION

Open bite is a multifactorial problem.There is no best time of treatment, functional problems should be treated as soon as possible.Treatment objectives must be definitively established, elimination of etiologic factors and pressure habits should be achieved followed by correction of dental and skeletal dysplasia.Open bite problems of skeletal nature in growing patient require orthopedic intervention. Severe skeletal open bite in nongrowing patients usually requires treatment with orthodontic-surgical procedures. The treatment of open bite remains a challenge to the clinician, and careful diagnosis and timely intervention will improve the success of treating this malocclusion.Despite the statistically significant relapse of anterior open bite, clinically significant stability was found in 66.7% of the patients, there are many patients who will benefit considerably from treatment with only orthodontic appliances.

REFERENCES

1. Sanjay Prasad Gupta., et al. "Anterior Open Bite Correction by Molar Intrusion using Temporary Anchorage Device: A Case Report". Acta Scientific Dental Sciences 3.2 (2019): 113-120.

2. W.R. Proffit, H.W. Fields, D.M. Sarver.Ortodonciacontemporánea.4a edición, Elsevier, (2008), pp. 290-298

3. J.M. Denny, M.A. Weiskircher, J.C. Dorminey.Anterior open bite and overjet treated with camouflage therapy.Am J Orthod Dentofacial Orthop., 131 (2007), pp. 670-678

4. A. Phelan, L. Franchi, T. Baccetti, M.A. Darendeliler, J.A. McNamara Jr.Longitudinal growth changes in subjects with open-bite tendency: a retrospective study.Am J Orthod Dentofacial Orthop., 145 (2014), pp. 28-35

5. Tausche, E.; Luck, O.; and Harzer, W.: Prevalene of malocclusion in the early mixed dentition and orthodontic treatment need, Eur. J. Orthod. 26:237-244, 2004.

6. Zuroff, J.P.; Chen, S.H.; Shapiro, P.A.; Little, R.M.; Joondeph, D.R.; and Huang, G.J.: Orthodontic treatment of anterior open-bite malocclusion: Stability 10 years postretention, Am. J. Orthod. 137:302e1-302e8, 2010.

7. Espeland, L.; Dowling, P.A.; Mobarak, K.A.; and Stenvik, A.: Three-year stability of openbite correction by 1-piece maxillary osteotomy, Am. J. Orthod. 134:60-66, 2008.

8. Vasconcelos, F.M.; Massoni, A.C.; Heimer, M.V.; Ferreira, A.M.; Katz, C.R.; and Rosenblatt, A.: Non-nutritive sucking habits, anterior open bite and associated factors in Brazilian children aged 30-59 months, Braz. Dent. J. 22:140-145, 2011.

9 Heimer, M.V.; Tornisiello Katz, C.R.; and Rosenblatt, A.: Non-nutritive sucking habits, dental malocclusions, and facial morphology in Brazilian children: A longitudinal study, Eur. J. Orthod. 30:580-585, 2008.

10. Artese, A.; Drummond, S.; Nascimento, J.M.; and Artese, F.: Criteria for the diagnosis and stable treatment of anterior open-bite, Dent. Press J. Orthod. 16:136-161, 2011.

11. De Sousa, R.V.; Ribeiro, G.L.; Firmino, R.T.; Martins, C.C.; Granville-Garcia, A.F.; and Paiva, S.M.: Prevalence and associated factors for the development of anterior open bite and posterior crossbite in the primary dentition, Braz. Dent. J. 25:336-342, 2014.

12. P. Ngan, H.W. Fields.Open bite: a review of etiology and management.Pediatr Dent., 19 (1997), pp. 91-98Medline

13. J. Smithpeter, D. Covell Jr. Relapse of anterior open bites treated with orthodontic appliances with and without orofacial myofunctional therapy.Am J Orthod Dentofacial Orthop., 137 (2010), pp. 605-614

14. J.H. Park, T.W. Kim.Open-bite treatment utilizing clear removable appliances with intermaxillary and intramaxillary elastics.World J Orthod., 10 (2009), pp. 130-134Medline

15 Z.M. Arat, M.O. Akcam, E. Esenlik, F.E. Arat.Inconsistencies in the differential diagnosis of open bite.Angle Orthod., 78 (2008), pp. 415-420

[16]G. Janson, M.V. Crepaldi, K.M. Freitas, M.R. de Freitas, W. Janson.Stability of anterior open-bite treatment with occlusal adjustment.Am J Orthod Dentofacial Orthop., 138 (2010), pp. 14.e1-14.e7

[17]J. Smithpeter, D. Covell Jr.Relapse of anterior open bites treated with orthodontic appliances with and without orofacial myofunctional therapy.Am J Orthod Dentofacial Orthop., 137 (2010), pp. 605-614

18. J.H. Park, T.W. Kim.Open-bite treatment utilizing clear removable appliances with intermaxillary and intramaxillary elastics.World J Orthod., 10 (2009), pp. 130-134Medline

19.. De Sousa, R.V.; Ribeiro, G.L.; Firmino, R.T.; Martins, C.C.; Granville-Garcia, A.F.; and Paiva, S.M.: Prevalence and associated factors for the development of anterior open bite and posterior crossbite in the primary dentition, Braz. Dent. J. 25:336-342, 2014.

20. Borrie, F.R.P.; Bearn, D.R.; Innes, N.P.; and Ilheozor-Ejiofor, Z.: Interventions for the cessation of non-nutritive sucking habits in children, Cochrane Database Syst. Rev. 3:CD008694, 2015.

21. Huang, G.J.; Justus, R.; Kennedy, D.B.; and Kokich, V.G.: Stability of anterior openbite treated with crib therapy, Angle Orthod. 60:17-24, 1990.

22. Feres, M.F.; Abreu, L.G.; Insabralde, N.M.; de Almeida, M.R.; and Flores-Mir, C.: Effectiveness of open bite correction when managing deleterious oral habits in growing children and adolescents: A systematic review and meta-analysis, Eur. J. Orthod. 39:31-42, 2017.

23. Diana Elizabeth Rodríguez Sánchez, Jessica Raquel Hernández Gómez, Guillermo Pomar Cotter, Jacqueline Adelina Rodríguez Chávez, Carlos Orozco VarelaAnterior open bite correction in a skeletal class II patient. Case reportRevista Mexicana de Ortodoncia. 2016;4:e93-910.1016/j.rmo.2016.10.013.