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Case report

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Non-surgical treatment of anterior open bite in adult patient: a case report

Abstract

Dental anterior open bite is a condition which is characterised by decreased incisor dentoalveolar height. The occlusal planes in the dental anterior open bite usually diverge from the mesial to the first premolar forwardly. This case report describes the treatment of dental anterior open bite. A male patient aged 23 years presented 6.0 mm anterior open bite along with increased lower anterior facial height. Other features included incompetent lip, deficient incisor display during rest and smile, irregular upper and lower anteriors. Management included extrusion of both upper and lower anterior teeth with camouflage non-extraction therapy. There was no recurrence of anterior open bite, and a balanced occlusion was maintained during the follow up of next 2 years after treatment completion which suggested a long-term stability of occlusion.

Keywords: Dental Anterior Open Bite, Fixed Orthodontic Appliances, Non-extraction Treatment

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Introduction

Anterior open bite is defined as condition in which there is a vertical gap between the maxillary and mandibular anterior teeth in centric relation.[1] Open bite is classified as skeletal and dental. Dental anterior open bite is characterised by decreased incisor dentoalveolar height, normal or less anterior and posterior vertical dimensions, incompetent lips, decrease incisal display at rest and smile.[2,3] There are several etiologies for an open-bite like unfavorable growth patterns, heredity, oral habits, and tongue function and posture.[4] Dental anterior open bite can be treated in various way such as extrusion of both upper and lower incisor teeth, Fixed orthodontics in conjunction with high-pull headgear therapy to intrude 1st molar teeth, temporary anchorage devices to intrude molar teeth, 2nd premolar extractions which facilitates the closure of anterior open bite by producing a counterclockwise rotation of mandible without molar intrusion, multiple-loop edgewise archwire (MEAW) therapy in conjunction with vertical elastic.[3,5-7]

Anterior open bite patients with hyperdivergent growth pattern and retrognathic mandible requires complex orthodontic treatments.[8,9] Aetiology of such malocclusion is due to inadequate mandibular posture.[8,10] Such patients present three mandatory morphologic-functional features: a) deficient ratio between posterior and anterior facial heights, giving rise to a long and convex facial profile;[11,12] b) decreased masticatory function, with weak bite forces when compared to normal and hypodivergent subjects,[13-15] and c) narrower dental arches, especially the maxillary one, with tendency of posterior crossbite occurrence. Oral breathing is another environmental factor involved in the development of facial hyperdivergence.[16] Facial hyperdivergence has been related to clinical conditions such as enlarged adenoids,[17-21] allergic rhinitis,[22,23] enlarged tonsils,[24] and obstructive sleep apnea.[25] Eating habits and consequently muscle strength are environmental factors related to facial hyperdivergence.[26,27] In such patients, it has been postulated that vertical dimensions and mandibular morphology are already established at 6 years of age.[28] The maxilla presents excessive dentoalveolar growth in the posterior region. Ramus of the mandible are shorter, Gonial angles are greater, dentoalveolar growth is excessive in the posterior region as well, the mandibular symphysis is taller and thinner, anterior lower facial height is increased and the mandibular plane angle is steeper.[8] Such features are associated with clockwise rotation of mandible, and lesser chin projection.[8] Transversally, hyperdivergent subjects present narrow maxillary dental arch when compared to normal and hypodivergent subjects.[29-31] Mandibular rotation is frequently camouflaged by remodelling of mandible, and only apparent rotation[32,33] is clinically detected by orthodontists. Contrary to common sense, evidence that support the relationship between anterior open bite and this facial pattern is weak, mainly because anterior open bite is clearly more dentoalveolar than skeletal[34-36] Various treatment protocols have been presented for management of hyperdivergent retrognathic patients, such as high-pull headgears,[37] dental extractions,[38-42] posterior bite-blocks and vertical-pull chin cup[43-45] and orthognathic surgeries.[46] ***Buschang et al.***[47] showed consistent results pursuing molars intrusion. They described intrusion of upper molars and secondary intrusion (actual or relative) of lower molars, with the use of coil springs and miniscrew implants. The following case report will illustrate the treatment of Angle Class I malocclusion with anterior open bite of 6.0 mm, a steep mandibular plane angle, and a Class I skeletal pattern.

Case report

A 23 years old male patient came to the Department of Orthodontics and Dentofacial Orthopedics of Bhojia Dental College and Hospital, Baddi, Himachal Pradesh (India) for Orthodontic treatment with chief complaint of irregularly placed upper and lower front teeth not meeting together. On extraoral clinical examination patient showed a convex profile with potentially competent lip, deficient incisor displays at rest and smile (Figure 1). Intraoral examination revealed 6.0 mm anterior open bite with Angle's Class I molar relationship on left side and missing first molar on right side (Figure 2). Examination of panoramic radiograph showed permanent dentition with all teeth

present including the third molars in all quadrants (Figure 3). The lateral cephalometric radiograph revealed average growth of maxilla (SNA: 78°), retrognathic mandible (SNB: 77°), skeletal Class I malocclusion (ANB: 1°), and vertical growth pattern (FMA: 37°). Upper anterior dentoalveolar height (UADH) was 23.0 mm and lower anterior dentoalveolar height (LADH) was 35 mm, which was reduced from normal value and indicated that this case was a dental anterior open bite malocclusion (Figure 3).

Figure 1 Pre-treatment Intraoral and Extraoral Photographs.

Figure 2 Pre-treatment study Models.

Treatment objectives

The treatment objectives were

(1) To improve the anterior open bite with ideal overjet and overbite

(2) To establish an acceptable functional occlusion

(3) To correct upper and lower inclinations

(4) Improve aesthetic smile

Treatment alternatives

The following treatment alternatives were proposed: 1) Mesialization of second molar in place of 1st molar in 4th quadrant, 2) Implant to be placed to rehabilitate the 1st molar place in 4th quadrant. The patient rejected the first option as it was increasing the treatment time.

Treatment plan and applied orthodontic mechanics

The selected treatment plan was conservative, commensurate

with the patient and parents' wishes. Pre-adjusted brackets and buccal tubes (0.022-in, MBT prescription, American Orthodontics, Sheboygan, WI, USA) were bonded on all the teeth, including second molar in right lower quadrant. Levelling and alignment were achieved with NiTi and stainless-steel arch wires starting from 0.012" NiTi till 0.017" x 0.025" SS. Reverse curve of spee (RCS) was incorporated in 0.017" x 0.025" SS wire followed by 0.018" x 0.025" SS then exaggerating it in 0.019" x 0.025" SS arch wire resulting in extrusion of anteriors and intrusion of posteriors. After 3 months of RCS wires, simultaneous extrusion of both maxillary and mandibular anterior teeth was achieved by using vertical box elastic. Inter-maxillary elastics (3/16-in light) were used as needed in the posterior segments, for occlusal settling (Figure 4). For retention, upper modified Hawley's retainer with tongue crib (to prevent abnormal tongue function and posture) was given. In the mandibular arch, a co axial wire was also bonded from canine to canines. The patient was instructed to wear the removable retainers for at least 24 months.

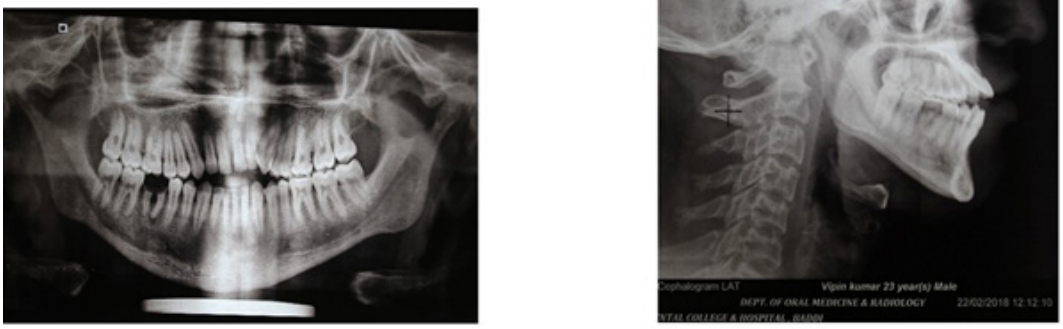

Figure 3 Pre-treatment Orthopantomogram and Lateral Cephalograms.

Result

The post-treatment facial photograph showed a change in smiling view of the patient, with more upper incisor teeth visible and upper lip rested on gingival margin during smiling (Figure 4). Intraoral photograph showed acceptable occlusion with improved overbite of 2 mm and the overjet of 2 mm (Figure 5-7). The periodontal tissues remained healthy during and after active orthodontic treatment. Cephalometric evaluation showed that improved inter-incisal angle (IIA) and UADH (Figure 6). Superimpositions showed a remarkable improvement in the profile and dentoalveolar structures (Figure 8). After two years of retention, there was no relapse tendency of anterior open bite (Figure 9).

Discussion

It was decided to treat this patient by simultaneous extrusion of both maxillary and mandibular anterior teeth with pre adjusted edgewise fixed orthodontic appliance. However, patient also had reduced UADH and LADH indicated dental anterior open bite malocclusion. Therefore, UADH is considered as an important landmark of orthodontic treatment, in case patient has hyperdivergent facial growth,[5,48] and the extrusion of the maxillary incisors may be considered during the treatment instead of intrusion of molar teeth or surgical correction. Furthermore, anterior open bite is known as one of the severe occlusal traits and proper management depends on the severity of the skeletal discrepancies. The high relapse tendency of anterior open bite cases is approximately 20% whether it is corrected by surgical or non-surgical.[3,7] There is not obvious justification for this instability and the complex interaction of all possible etiologic factors of the open bite cases. If the management does not address the possible etiologic factor, relapse is more prone to happen.[49] Furthermore, overcorrection is highly recommended for such malocclusion and should incorporate upper and lower fixed retainers that include the first premolars as a retention of this malocclusion.

Stability of the final occlusal and facial results is dependent on control of the factors that caused the anterior open bite. One possible explanation could be the influence of the tongue on the corrected tooth positions. If the tongue as an etiologic factor is ignored, the relapse of the anterior open bite closure could be caused by the tongue function or posture. ***Huang et al.*** [50] showed that crib therapy over a several year periods was helpful in achieving stability of the orthodontic correction of the open bite malocclusion. So, if stable correction of the open bite malocclusion is to be achieved, tongue posture and function must play a role. It is important that an assessment of the intraoral musculature is always critical but especially for the patient who has an open bite malocclusion. The tongue habit or tongue thrust is an abnormal positioning of the tongue that can develop or maintain anterior open bites.

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Figure 4 Midtreatment Extraoral and Intraoral photographs.

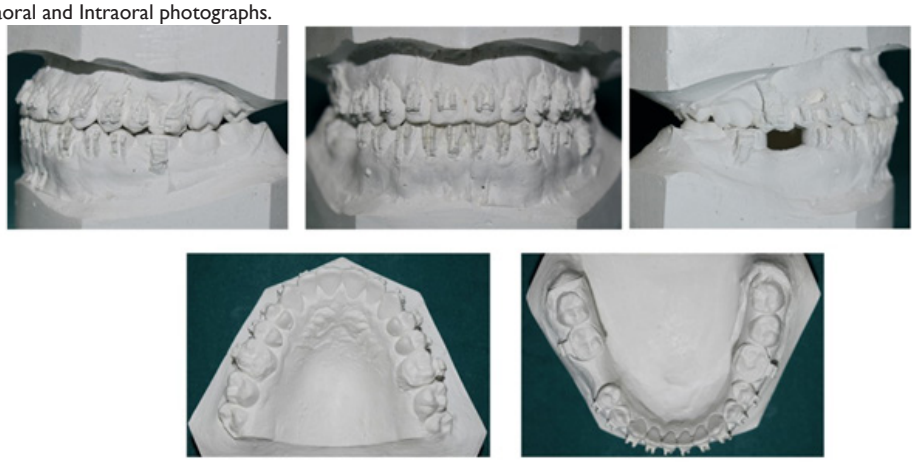

Figure 5 Mid treatment study models.

Figure 6 Posttreatment Orthopantomogram and Lateral Cephalogram.

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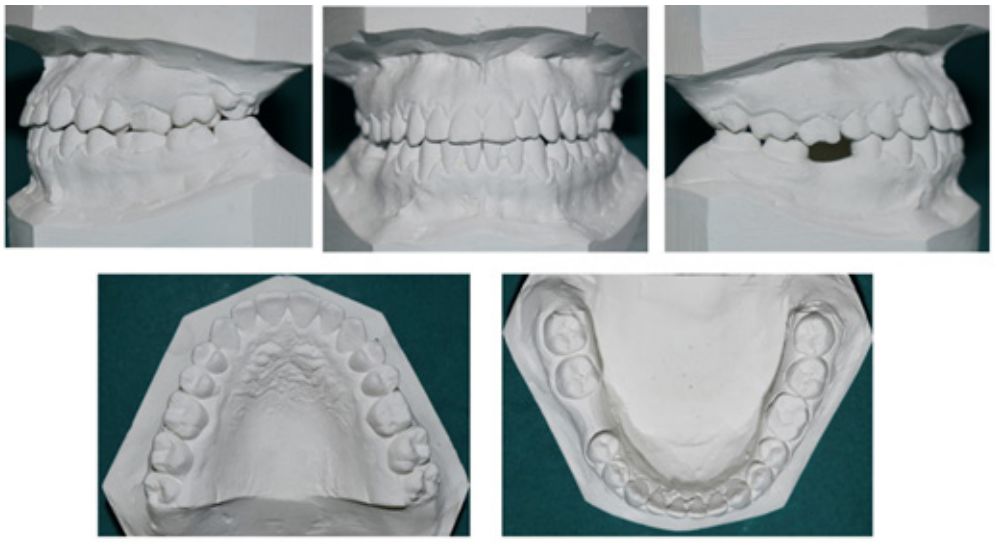

Figure 7 Postreatment study models.

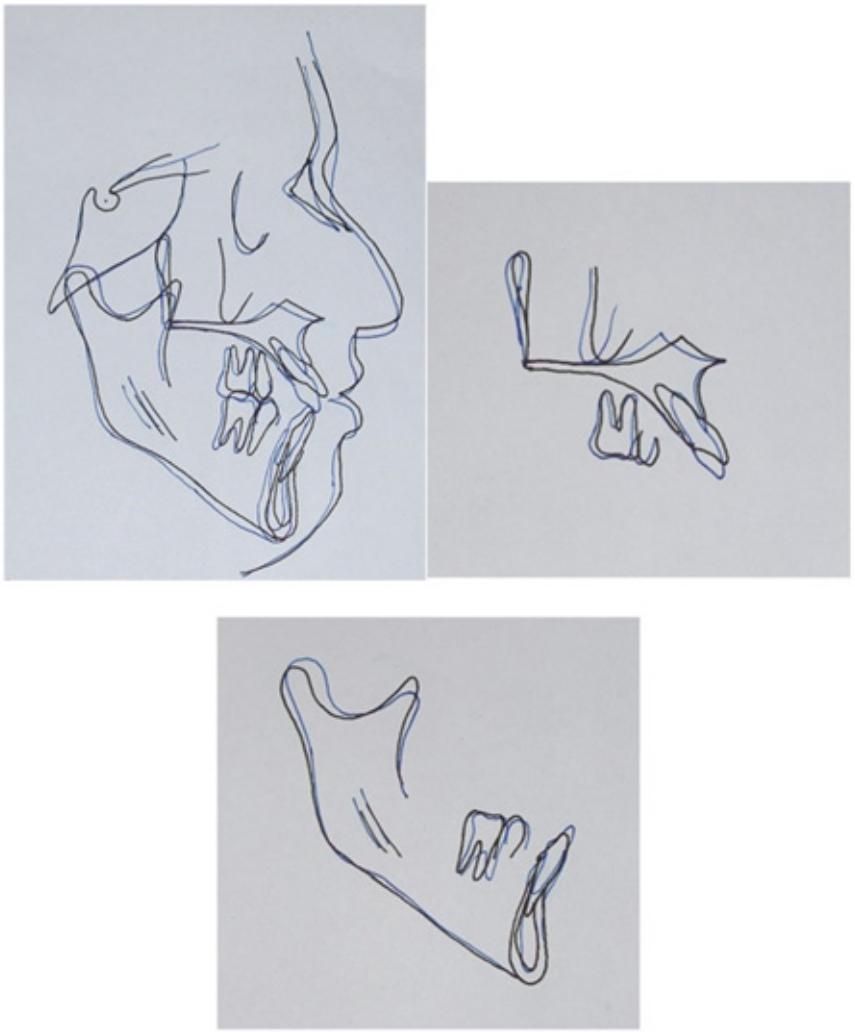

Figure 8 Superim positions.

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Figure 9 posttreatment Extraoral and Intraoral Photographs after 2years of follow up.

Various tongue exercises can be taught to the patient with a tongue thrust. These include positioning the tongue in the palate to produce a "click." This click position can be used as a quick reference to the proper tongue position when the patient swallows. The next step is to position the tip of the tongue in the click position and force the tip of the tongue upward. This isometric motion retrains the tongue muscles. It should be done in sets of 10, three times a day. The last exercise is coined the "3-S's": slurp, squeeze, and swallow. The patient is asked to collect saliva, which is the slurp; bring the teeth together and activate muscles of closure, the squeeze; and lastly, with the tongue in the click position, the patient swallows. This technique of tongue thrust modification has been successful with all ages of patients. The mature patient seems to have more predictable results than an immature child. Addressing the muscle habit is essential to long-term orthodontic stability of the correction of an open bite malocclusion. Studies have not been able to confirm these clinical findings but future inquiries into this subject should be interesting.

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