

The Disintrusion Splint: A Tad Assisted Modified Intrusion Splint- A Case Report

**Dr. Mahesh Kakunje Bhat¹, Dr. Heeral Mahlawat², Dr. Ashith M.V^{3*}, Dr. Amoli Singh⁴,
Dr. Shravan Shetty⁵**

^{1,2} MDS, Alumnus, Department of Orthodontics and Dentofacialorthopaedics, Manipal College of Dental Sciences, Mangalore; Affiliated to Manipal Academy of Higher Education, Manipal, Karnataka

³ MDS, Associate Professor, Department of Orthodontics and Dentofacialorthopaedics, Manipal College of Dental Sciences, Mangalore; Affiliated to Manipal Academy of Higher Education, Manipal, Karnataka

⁴ BDS, Final Year Post Graduate Student, Department of Orthodontics and Dentofacialorthopaedics, Manipal College of Dental Sciences, Mangalore; Affiliated to Manipal Academy of Higher Education, Manipal, Karnataka

⁵ MDS, Assistant Professor, Department of Orthodontics and Dentofacialorthopaedics, Manipal College of Dental Sciences, Mangalore; Affiliated to Manipal Academy of Higher Education, Manipal, Karnataka
Email: ³ashith.mv@manipal.edu

ABSTRACT

Cause of anterior open bite is generally multifactorial, which involves a combination of dental, skeletal and functional effects. It is one of the most difficult problems to treat in orthodontics. In severe adult cases, treatment usually requires surgical repositioning of the maxilla or mandible. When a patient rejects surgery, alternatives include extraction treatment, molar intrusion with skeletal anchorage, a vertical-pull chin cup, multiloop edgewise archwire (MEAW) therapy, or nickel titanium archwires with intermaxillary elastics. Although extrusion or eruption of anterior teeth is a common method of bite closure, it has been reported that extruded anterior teeth are less stable than intruded teeth. Extrusion of maxillary anterior teeth might also compromise facial esthetics, especially in a patient with a gummy smile and high mandibular plane angle. In such cases intrusion of upper posterior teeth is the treatment of choice.

The maxillary posteriors can be successfully intruded using infrazygomatic screws which will cause autorotation of the mandible.

This case report shows the use of a "Disintrusion Splint" which can achieve both intrusion and distalization simultaneously in cases where the proclination also needs to be corrected.

Keywords

Infrazygomatic Crest Screws, Intrusion, Open Bite, Splint, Orthognathic like Orthodontics

INTRODUCTION

Anterior open bite malocclusion can be seen because of multiple factors, which involves a blend of skeletal, dental and functional effects.¹⁻⁴ Probable reasons are unfavourable growth patterns⁵, digit-sucking habits^{6,7}, enlarged lymphatic tissue^{6,8}, heredity^{7,9}, and oral functional matrices¹⁰. Most common features of anterior open bite are proclination of incisors in addition to overeruption¹¹⁻¹⁴ and other features that can be seen are excessive gonial, mandibular and occlusal plane angles; short mandibular body; excessive lower anterior facial height; reduced

lower posterior facial height and upper anterior facial height; divergent cephalometric planes; and incompetent lips⁵.

Studies have stated a relationship amid weak orofacial musculature, long face and consequent anterior open bite^{15,16}.

Anterior open bite malocclusion is amongst the most difficult problems to deal with in the field of orthodontics. For severe adult cases, treatment usually requires surgical orthodontics for repositioning of the maxilla or mandible. When a patient rejects surgery, alternatives include extraction treatment,¹⁷ intrusion of molar with skeletal anchorage, a vertical-pull chin cup, multiloop edgewise archwire therapy (MEAW), nickel titanium archwires with interarch elastics.¹⁸ Although extrusion of anterior teeth is among the commonly used method for closing the bite, Reitan and Rygh have stated that extruded anterior teeth show less stability than intruded teeth.¹⁹ Extrusion of upper anterior teeth can also compromise facial esthetics, especially in patients with gummy smile.

The following case report illustrates nonsurgical method of treatment of dental anterior open bite malocclusion with increased crowding in lower arch.

DIAGNOSIS AND TREATMENT PLANNING

A 25-year-old female patient reported to our department with an anterior open bite and incompetent and protrusive lips with deficient chin. She had no underlying medical condition and had undergone root canal treatment 2 years back for 1st and 2nd molar in 4th quadrant and 1st molar in the 3rd quadrant. Facial analyses showed symmetry with increased lower anterior facial height. Patient did not like the gaps present anteriorly between both teeth. On examining intraorally, the patient had presented with a severe anterior open bite extending from left to right maxillary canine. Also, the molar relationship was Class 1 with severe crowding in both the arches (FIG 1).

Cephalometric analyses indicated a skeletal Class I base, with vertical growth pattern, labially proclined maxillary and mandibular incisors. Overjet was normal with a reduced overbite (-4mm).

COGS analysis showed increased posterior maxillary height and increased gonial angle. Occlusal plane was also tipped in a clockwise direction. (Table 1)

Treatment goals aimed to improve facial esthetics, decrease the height of lower third of the face, and improve the projection of mandible and lip incompetence thereby reducing the anterior open bite. Since the patient presented with convex profile, the treatment strategy would include mechanics to improve mandibular projection by intruding of the posterior part of the maxillary arch followed by autorotation of the mandible.

TREATMENT OBJECTIVE AND TREATMENT ALTERNATIVES

The usual diagnostic examinations were done for the patient which included: alginate impressions, intraoral and facial photos, panoramic radiographs, lateral cephalogram and cephalometric tracing. The diagnosis for the patient was Class I malocclusion on an underlying skeletal class I base with vertical facial pattern, bimaxillary dentoalveolar proclination, anterior open bite, crowding in both the arches.

The treatment plan suggested was posterior impaction of maxillary arch with clockwise rotation of the maxilla as the palatal plane was tipped in counterclockwise direction. Followed by 4

premolar extraction and genioplasty, but the patient was not willing to undergo orthognathic surgery.

Consequently, an alternate plan for treating was proposed that included intrusion of upper posterior segment which will lead to auto-rotation of the mandible with distalization of maxillary arch followed by extraction for correction of severe protrusion in lower arch.

TREATMENT PROGRESS

Preadjusted .022" × .028" slot brackets were bonded in the upper arch, and an .014" nickel titanium archwire was used segmentally to align the upper anteriors from canine to canine.

A modified maxillary splint called disintrusion splint was given in the upper posterior segment. Posterior segment bilaterally was covered by acrylic bite planes. The two segments were joined with the help of two 0.9 mm stainless steel wires passing between the molars and premolars, the ends of which acted as an attachment to the closed coil springs which were placed between the splint and the IZC miniscrew. (FIG 2). The biomechanics of the same are seen in FIG 3.

In the lower arch 1st molars were extracted bilaterally and 0.016 NiTi was placed for alignment without involving the lower anterior teeth which was done by placement of a bumper sleeve (FIG 2).

After 3 months there was intrusion seen in the upper posterior segment with reduction in anterior open bite. Alignment was done of upper anterior teeth (FIG 3).

TAD (miniscrews) were placed near the extraction site in the lower arch from which an e-chain was placed to prevent mesial tipping of the canine and simultaneous retraction to reduce proclination of anterior segment (FIG 3).

After 6 months, intrusion and distalization was continued in the maxillary arch. In the mandibular arch a rectangular wire was placed with a step included in the anterior region to exclude the lower anteriors and continue retraction of canines and premolars bilaterally. Alignment was done of lower anteriors simultaneously using NiTi wires (FIG 4).

After 7 months of treatment posterior intrusion was done completely with distalization for Class I canine relation in upper arch with elimination of anterior open bite followed by placement of a trans palatal arch with ligatures tied buccally to the IZC screws in the maxillary arch to prevent extrusion. 0.018 ss was placed in the upper arch for alignment and higher wires were placed accordingly for adequate torque expression (FIG 5).

In the lower arch boot loop was placed for molar protraction into Class I molar relation followed by placement of higher wires for proper torque expression.

Subsequently vertical settling of teeth using posterior vertical elastics was done. The treatment was completed in a time period of 29 months.

Once proper overbite and overjet was achieved, the fixed appliances were removed. Retention should be mainly focused on preventing relapse in the vertical dimension. Upper and lower 3-3 retainers made of multistranded 0.0215-inch stainless steel wire was bonded. The patient was instructed to wear it for six months for 24 hours, then for three months at night only, and then three times a week at night (FIG 6).

TREATMENT RESULTS

The profile was improved noticeably, subsequent harmony between the upper and lower lips, and Class I molar and canine relationships bilaterally were accomplished (FIG 5). A panoramic radiograph taken instantly after treatment showed satisfactory root angulations, no evidence of root resorption, and stable bone levels.

By the end of treatment, in the upper arch posterior intrusion was completely achieved with distalization for Class I canine relation with elimination of anterior open bite.

In the lower 2nd molars had moved into 1st molar extraction space. Lower incisor inclination was well improved between pre-treatment and end of treatment. (TABLE 1 & FIG 7)

Patient was advised genioplasty at the end of treatment for further profile improvement, but they were not willing to undergo any surgical procedures.

Our patient was contented with the overall esthetics and results of the treatment.

DISCUSSION

The ideal treatment of anterior open bite malocclusion is a blend of orthodontics and orthognathic surgery. The advantages of the surgical option are that the overbite can be overcorrected with auto-rotation of the mandible, and increased post-treatment stability.²⁰ In a case of nonsurgical plan, orthodontic treatment involves camouflaging the skeletal discrepancies, so that overcorrection and ideal esthetics and function can be achieved to the extent possible. Nonsurgical correction is more complicated and usually requires longer treatment.²¹

Sarver and Weissman proposed guidelines which were helpful for nonsurgical treatment of open bite malocclusion in fully-grown patients with no possibility for growth modification, based on an approach using extraction and retraction.²² Though only a certain amount of open bites are acquiescent to this method of treatment, the authors recommended that potential candidates would include those with proclined upper or lower incisors, with reduced or no display of gingiva on smiling, a standard craniofacial pattern, and less than or equal to 2-3mm of upper-incisor visibility at rest. Our patient did meet many of these conditions.

Extrusion of anterior teeth to close an open bite has been disparaged of being unstable, especially considering that the vertical height of the anterior maxilla is already excessive in an open-bite case.²³

Furthermore, stability is a main concern with any open-bite malocclusion. Studies of long-term results of orthodontic treatment by Lopez-Gavito and colleagues²⁴ and surgical treatment by Denison and colleagues²⁰ indicate that the relapse rate can range from 35% to 42.9%. This study suggested that the relapse was caused by dentoalveolar rather than skeletal changes.²⁰ Although these data may seem discouraging, they comprised of some patients who had experienced overbite reduction after treatment but did not lead to an open bite. Chang and Moon reported that extraction treatment is more stable than nonextraction treatment.²⁵

It is of utmost importance to sustain the treatment results with fixed or removable retainers, especially to prevent proclination of the anterior teeth. Retainers covering the occlusal area may be helpful in avoiding further eruption of molars, particularly in patients who have not grown fully. If tongue posture and aberrant function were the causes of the open bite, they may also contribute to post-treatment relapse. Use of a tongue crib or lingual spurs during or after treatment may therefore improve stability.²⁶⁻²⁸

REFERENCES

- [1] Almeida, R.R.; Almeida-Pedrin, R.R.; Almeida, M.R.; Ferreira, F.P.C.; and Pinzan, A.; Insabralde CMB. Displasias verticais: Mordida aberta anterior -- Tratamento e estabilidade, Rev. Dent. Press Orthod. Ortop. Facial 8:91-119, 2003.
- [2] Almeida, R.R. and Ursi, W.: Anterior open-bite, etiology and treatment, Oral Health 80:27-31, 1990.
- [3] Pedrin, F.; Almeida, M.R.; Almeida, R.R.; Almeida-Pedrin, R.R.; and Torres F.: A prospective study of the treatment effects of a removable appliance with palatal crib combined with high-pull chin cup therapy in anterior open-bite patients, Am. J. Orthod. 129:418-423, 2006.
- [4] Torres, F.; Almeida, R.R.; de Almeida, M.R.; Almeida-Pedrin, R.R.; Pedrin, F.; and Henriques, J.F.: Anterior open bite treated with a palatal crib and highpull chin cup therapy: A prospective randomized study, Eur. J. Orthod. 28: 610-617, 2006.
- [5] Bell, W.H.: Correction of skeletal type of anterior open bite, J. Oral Surg. 29:706-714, 1971.
- [6] Atkinson, S.R.: Open-bite malocclusion, Am. J. Orthod. 52:877-886, 1966.
- [7] Mizrahi, E.: A review of anterior open bite, Br. J. Orthod. 5:21-27, 1978.
- [8] Linder-Aronson, S.: Adenoids: Their effect on mode of breathing and nasal airway and their relationship to characteristics of the facial skeleton and the dentition, Acta. Otolaryngol. Suppl. 265:1-132, 1970.
- [9] Sassouni, V.: A classification of skeletal facial types, Am. J. Orthod. 55:109-123, 1969.
- [10] Moss, M.L. and Salentijn, L.: Differences between functional matrices in anterior open-bite and deep overbite, Am. J. Orthod. 60:264-280, 1971.
- [11] Jones, O.G.: A cephalometric study of 32 North American black patients with anterior open bite, Am. J. Orthod. 95:289-296, 1989.
- [12] Hsu, B.S.: The nature of arch width difference and palatal depth of the anterior open bite, Am. J. Orthod. 113:344-350, 1998.
- [13] Proffit, W.R. and Fields H.W.: Contemporary Orthodontics, 2nd ed., Mosby, St. Louis, 1993, pp. 128-129, 446.
- [14] Melsen, B.; McNamara, J.A. Jr.; and Hoenie, D.C.: The effect of bite blocks with and without repelling magnets studied histomorphometrically in the rhesus monkey (Macacamulatta), Am. J. Orthod. 108:500-509, 1995.
- [15] Proffit, W.R. and Fields, H.W.: Occlusal forces in normal- and long-face children, J. Dent. Res. 62:571-574, 1983.
- [16] Straub, W.: Malfunctions of the tongue, Am. J. Orthod. 46:404-424, 1960.
- [17] Smith, G.A.: Treatment of an adult with a severe anterior open bite and mutilated malocclusion without orthognathic surgery, Am. J. Orthod. 110:682-687, 1996.
- [18] Enacar, A.; Ugur, T.; and Toroglu, S.: A method for correction of open bite, J. Clin. Orthod. 30:43-48, 1996.

- [19] Reitan, K. and Rygh, P.: Biomechanical principles and reactions, in *Orthodontics: Current Principles and Techniques*, 2nd ed., ed. T.M. Graber and R.L. Vanarsdall, Mosby, St. Louis, 1994, pp. 168-169.
- [20] Denison, T.F.; Kokich, V.G.; and Shapiro, P.A.: Stability of maxillary surgery in openbite versus nonopenbite malocclusions, *Angle Orthod.* 59:5-10, 1989.
- [21] Hiller, M.E.: Nonsurgical correction of Class II open bite malocclusion in an adult patient, *Am. J. Orthod.* 122:210- 216, 2002.
- [22] Sarver, D.M. and Weissman, S.M.: Nonsurgical treatment of open bite in nongrowing patients, *Am. J. Orthod.* 108: 651-659, 1995.
- [23] Ellis, E. III and McNamara, J.A. Jr.: Components of adult Class III openbite malocclusion, *Am. J. Orthod.* 86: 277-290, 1984.
- [24] Lopez-Gavito, G.; Wallen, T.R.; Little, R.M.; and Joondeph, D.R.: Anterior open-bite malocclusion: A longitudinal 10-year postretention evaluation of orthodontically treated patients, *Am. J. Orthod.* 87:175-186, 1985.
- [25] Chang, Y.I. and Moon, S.C.: Cephalometric evaluation of the anterior open bite treatment, *Am. J. Orthod.* 115:29-38, 1999.
- [26] Huang, G.J.; Justus, R.; Kennedy, D.B.; and Kokich, V.G.: Stability of anterior open bite treated with crib therapy, *Angle Orthod.* 60:17-26, 1990.
- [27] De Cuebas, J.O.: Nonsurgical treatment of a skeletal vertical discrepancy with a significant open bite, *Am. J. Orthod.* 112:124-131, 1997.
- [28] Justus, R.: Correction of anterior open bite with spurs: Long-term stability, *World J. Orthod.* 2:219-231, 2001..