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Management of anterior open bite using temporary anchorage device: A 2 case report

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Abstract

Open bite is a condition in which there is absence of vertical overlap between upper and lower anterior teeth. It may occur in a single tooth or in a multiple teeth. It can occur as an edge to edge relationship or an open bite. Temporary anchorage devices (TADs) or mini-implants are being used to correct anterior open bite by molar intrusion. As compared to other orthodontic anchorage devices, TADs are simple to insert, less traumatic, no patient's cooperation, more secure under optimal force loads and a cost effective to treat anterior open bite. These case reports describe cases of 22 and 18 years old female patients having chief complaint of inability to close their mouth in the front region of jaws. These cases were treated with extraction using 0.022" slot preadjusted edgewise appliance (MBT). Molars intrusion was performed for open bite correction by the use of temporary anchorage devices on both sides. These devices are highly effective as they provide more options to correct malocclusions without any patient's co-operation.

Keywords: Mini screws, Intrusion, Malocclusions

Introduction

In anterior open bite vertical overlap between upper and lower anterior teeth does not occur[1]. The term "open bite" was given by ***Caravelli (1842).*** The "Glossary of Orthodontic Terms" defines open bite as a developmental malocclusion where no vertical overlap exists between upper and lower anterior or posterior teeth. This condition may occur in a single tooth or in multiple teeth [2]. Its severity varies from an edge to edge relationship or an open bite [3].

Its origin may be skeletal or dental[4] .The aetiology of the malocclusion may be genetic, anatomical and environmental as well as due to development oral habits,[5,6] The prevalence of anterior open bite is 3.5% (8 to 17 years of age)[7] .In Mexican population, at early ages, the open bite is related to habits in 96.6% of the cases[8].The incidence of open bite varies depending on age and ethnic group being more common in African and Afro-Caribbean populations [9]. Majority of anterior open bite patients seek orthodontic treatment for aesthetic reasons, but several problems such as lack of anterior and canine guidance, difficulty for chewing food, language pronunciation and TMJ disorders are among others [2,9,10].

Cephalometric analysis is used to differentiate between skeletal or dental open bite. A dental open bite is characterized by infraoccluded incisors or supraoccluded posteriors.[11] Divergence of the upper and lower occlusal planes indicates the severity of the case[12] .***Janson et al.*** reported that the upper and lower molars are more mesially inclined with respect to the occlusal plane, while the apices are exaggerated in a distal inclination in relation to the palatal and mandibular plane respectively[13].

Anterior open bite is considered to be a complex malocclusion to treat because of the difficulty in closing the bite and the challenges of retaining the closure of bite [14]. An Ideal diagnosis is necessary to develop an effective treatment plan with proper retention of the newly established bite [15] .Previous studies describes different treatment plans with the purpose of decreasing relapse which includes myofunctional appliances, fixed orthodontic appliances, lingual cribs, elastics, wires, molar intrusion, extrusion of the upper anterior teeth, aligners with elastics, orthognathic surgery, extractions, glossectomy or orofacial myofunctional therapy [16,17].

In the last few decades molar intrusion through the use of TAD's has been described to correct the skeletal anterior open bite thus causing a decrease in incisor extrusions. It has also been described to provide favourable aesthetic results such as a anticlockwise rotation of the mandible and a decrease in anterior facial height. It is been used as an alternative treatment for patients not undergoing orthognathic surgery[18,19] .There are numerous ways to perform molar intrusion with TAD's either placed palatally, buccaly or in both sides as well as with the help of other appliances[20,18,21-24].

As compared to other orthodontic anchorage devices, TADs are simple to insert, less traumatic, and more secure under optimal force loads [25,26]. Intrusion of the posterior teeth with skeletal anchorage has been found to be stable which is a highly advantageous in planning treatment in adult patients with high frequency of relapse [25-27]. Various authors have also shown that orofacial myofunctional therapy [28] or other muscle exercises [29] can contribute to the closure of anterior open bite malocclusion and help in preventing relapse.

Case Report 1

Etiology and diagnosis

A 22 year old female patient was reported to department of orthodontia for orthodontic consultation. Her chief complaint was irregular teeth and inability to close her upper and lower anterior teeth. She had no family history,

no prenatal, postnatal and medical history and no history of parafunctional oral habit (Figure 1)

On clinical examination she had a convex profile with symmetric face and potentially competent lips. Intraoral examination showed a Class I molar relationship on both sides and absence of vertical overlap between the upper and lower front teeth with anterior open bite of 6mm. Maxillary and mandibular arches were U-shaped with mild crowding. The cephalometric analysis depicted a skeletal Class III pattern with an ANB angle of -6° and vertical growth pattern, as shown by an FMA of 29° and SN-GoGn of 39°, proclined and protruded maxillary and mandibular incisors (Figure 2).The pretreatment panoramic radiograph showed the presence of all third molars. The alveolar bone level was with in normal limits (Figure 2).

Treatment objectives

The treatment objectives were to correct crowding, anterior open bite, and to establish Class I canine relationship with normal overjet and normal overbite.

Treatment plan

Patient had skeletal Class III bases with vertical growth pattern, as the patient had already crossed the active growth phase hence orthodontic camouflage was planned. All first premolars were extracted followed by fixed mechanotherapy.

Treatment progress

Maxillary and mandibular teeth were bonded with fully programmed preadjusted 0.022 slot MBT prescription brackets. The arches were aligned using the following sequence of arch wires; 0.012” NiTi, 0.014” NiTi, 0.016” NiTi, 17.25” NiTi and 19.29” NIiTi (Figure 3). Later, 19.25” SS wire was placed in both arches. Placement of miniscrew (size =1.6 mm x 8 mm) on both sides in upper arch between 2nd premolar and 1st molar on palatal side and between 1st molar and 2nd molar on buccal side. (Figure 3). Second maxillary molars were also banded later. In this case, highly placed canine was engaged with continuous 0.012” Niti arch wire. E-chain was placed by engaging the lingual sheath of the first molar on the palatal side to the miniscrew and on buccal side the E chain was stretched from miniscrew to the molar tube for posterior intrusion for the correction of open bite. Activation was done after every 14 days for the intrusion of the posteriors. Buccal flaring during intrusion will not occur because miniscrew were placed on both side (palatal and buccal), simultaneous intrusion n space closure was done.

In the later stages, 0.019 x 0.025” SS wire was placed to express the tip and torque of the bracket. Finishing and detailing was done, and the appliance was debonded. The total treatment time was 24 months. Modified Hawley’s retainers were placed in both the arches and an additional lower modified Hawley’s appliance with posterior bite plane for night time wear to prevent supraeruption of intruded maxillary molars was given.

Treatment results

The post treatment facial photographs showed improvement in patient profile and facial aesthetics (Figure 4).Intraorally, a well defined buccal occlusion with Class I molar, Class I canine relationship on both sides with normal overjet and overbite was achieved (Figure 4). There was proper canine and anterior guidance without balancing side interferences. The posttreatment cephalometric radiograph (Figure 5) and superimposed tracings (Figure 5) showed significant changes in the dental and skeletal measurements. There was anticlockwise rotation of mandible due to upper molar intrusion. The posttreatment panoramic radiograph showed remarkable root parallelism (Figure 5).

Case Report 2

Etiology and diagnosis

A 18 year old female patient reported to department of orthodontia for orthodontic consultation. Her chief complaint was forwardly placed upper and lower front teeth. She had no family history, no prenatal, postnatal and medical history and no history of parafunctional oral habit (Figure 6)

On clinical examination she had a convex profile with symmetric face and potentially competent lips. Intraoral examination showed Class II molar relationship bilaterally and increased overjet. Maxillary and mandibular arch were U-shaped with mild crowding. There was an open bite of 0.5 mm. The cephalometric analysis showed a skeletal Class I with an ANB angle of 4° and vertical growth pattern, as shown by an FMA of 32° and SN-GoGn of 36°, proclined and protruded maxillary and mandibular incisors (Figure 7).The pretreatment panoramic radiograph showed the presence of all third molars. The alveolar bone level was with in normal limits (Figure 7)

Treatment objectives

The treatment objectives were to correct crowding, proclination of upper and lower teeth, convex profile, mild open bite and to establish Class I molar and canine relationship with normal overjet and overbite.

Treatment plan

Patient had skeletal Class I jaw bases with vertical growth pattern, as the patient had already crossed the active growth phase hence orthodontic camouflage was planned. All premolars extraction (14,24,34,45) was done followed by fixed mechanotherapy.

Treatment progress

Maxillary and mandibular teeth were bonded with fully programmed preadjusted 0.022 slot MBT prescription brackets. The arches were aligned using the following sequence of arch wires; 0.012” NiTi, 0.014” NiTi, 0.016” NiTi, 0.17*0.025” Niti, 0.019*0.025” Niti, 0.019*0.025” SS wires were placed in both the arches (figure 8). Miniscrew was placed on the midpalate in the molar region just 1mm away from the mid palatine raphe. A modified TPA was used for intrusion. The TPA was placed 4 mm away from the palate and the intrusive force was given by connecting the TPA to the miniscrew by a closed coil spring. After every 14 days the closed coil spring was activated. Second maxillary molars were also banded later on. Palatal tipping was prevented by adding buccal crown torque in the molar region. Simultaneous intrusion n space closure was done. The miniscrew was placed 2mm distal to the molars which has to be intruded just to prevent the anchorage unit (Figure 8).

In later stages, 0.019 x 0.025” SS wire was placed to express the prescription of tip and torque of the bracket. Finishing and detailing was done, and the appliance was debonded. The total treatment time was 24 months. Modified Hawley’s retainers were placed in both the arches and additional lower modified Hawley’s with posterior bite plane for night time wear to prevent supraeruption of intruded maxillary molars was given.

Treatment results

The post treatment facial photographs showed a improvement in patient profile and facial aesthetics (Figure 9).Intraorally, a well defined buccal occlusion with Class I molar, Class I canine relationship on both sides with normal overjet and overbite was achieved. There was canine and anterior guidance with lateral excursion without balancing side interferences. The posttreatment cephalometric radiograph (Figure 10) and superimposed tracings (Figure 10) showed significant changes in the dental and skeletal measurements. Forward rotation of mandible due to upper molar intrusion was also

there. The posttreatment panoramic radiograph showed remarkable root parallelism (Figure 10).

Discussion

Management of open bites is often challenging because of high relapse rate, and patient's cooperation is highly important. When such open bites are of skeletal origin and the patient declines surgery, then an orthodontic option for treatment is opted for which needs more time and patient cooperation [30].

Hyperdivergent growth pattern develops when growth of condyle is less than the vertical growth of corpus of maxilla, vertical growth of maxillary 1st molar and vertical growth of mandibular 1st molar. There are 2 types of vertical excess- vertical excess with anterior open bite and vertical excess with normal anterior overbite.

According to the analysis done by ***Sean Biggerstaff et al.***[31] ,it was found that the malocclusion was caused due to deficiency in growth maxillary anterior portion, in comparison to the ***Ricketts*** palatal plane inclination which showed an excess of maxillary posterior growth. An excess of maxillary posterior portion, at the level of molars causes growth problems in backward direction [5].

To resolve this problem, intrusion of posteriors is necessary, resulting in total intrusion of the whole dentition. This phenomenon can be named as "slow impaction", because the result is achieved orthodontically and yet similar to that of the impaction osteotomy surgery[32].

Various studies have recommended TADs for the provision of anchorage in the extrusion and intrusion of posterior teeth [33,34,35,36]. Posterior intrusion with TAD's to correct an open bite is well described by various authors[4,18-24,37-41] . ***Cifter et al*** using a finite element model for transpalatal arch and mini-implants found that there is more intrusion of the buccal roots than the palatal roots[22] .When mini-implants are placed only on the palatal side some auxiliary appliances should always be placed to avoid an undesirable lingual crown torque as described by ***Buschanget and Xun et al.***[24,23].

It is important to decide which of the molar to be intruded either upper or lower or both. The efficiency and stability of upper molar intrusion is usually preferred. Lower molar intrusion should be considered in order to preserve upper incisor display in patients with insufficient amount of upper incisal show. Upper and lower posterior intrusion is treatment of choice in more severe cases where maximal closure of the mandibular plane angle is required. Intrusion from buccal side with TAD, tend to intrude posterior teeth along with buccal flaring of molars[42].in order to prevent this buccal flaring buccal root torque in the posteriors is given.

Myofunctional therapy has also been advocated as an adjunct in the reduction of open-bite treatment[43-45] .Several authors have reported that the risk of incisor protrusion is greater in cases in which there is altered tongue posture at rest, and it is smaller when there is only altered function (speech and swallowing). Therefore, speech therapy is indicated especially in cases in which altered tongue rest posture is present [43] .The presented patients refused myofunctional and speech therapy as recommended.

The orofacial muscle exercise is also a treatment choice that involves clenching at 80% of maximum force for five seconds, followed by five seconds of rest, for a total of six cycles, five times a day [29][46]. These exercises require sufficient amount of time and patient compliance, they are an important adjunct to the effective treatment of anterior open bite [47].

Daguchi et al. indicated that molar intrusion when combined with retraction of the anterior segment, it favours significant aesthetic changes due to a counter clockwise mandibular rotation and improves the stability

of the case in comparison to incisor and canine extrusion[41,48] .Various authors such as ***Scheffer et al., Härt et al, Kuroda et al, Buschang et al., Xun et al. and Alsafadi et al.*** stated that the intrusion of the upper posterior teeth are favourable in causing a mandibular rotation, hence improving chin projection, decreasing the facial height and the mandibular angle. Same results were also achieved in the present cases but not significantly [18,19,23,24,48,49].

In the above two cases, anterior open bite was treated by intrusion of maxillary posterior teeth using miniscrew. The miniscrew were placed on different location in the molar region. In one patient single miniscrew was placed on the palate n activation was done by closed coil spring and on another patient the miniscrew was placed on both palatal and buccal side.

In the 2nd case a modified TPA was made up of 19-gauge stainless steel wire, each end of the palatal arch was double backed over for insertion in to the lingual sheath which was welded on to the palatal surface of the maxillary first molar band. A closed coil spring was stretched from the miniscrew placed on the centre of the palate to the U loop of the modified TPA. Although an optimal force has not yet been suggested for the intrusion with miniscrews. Force greater than what is generally accepted for intrusion in conventional treatment are reported to be applied with miniscrew. Here we preferred 150 gm of force to intrude the molar. In 6 months of time 3mm intrusion of upper first molars was noted with no resorption of the roots. The amount of intrusion was measured by superimposition of the cephalograms.

The most critical factor in the intrusion of maxillary molars is the point of force application. Othodontic intrusion has been thought impossible to achieve with a force application on both side of the arch. We used a simple approach for molar intrusion with modified TPA and miniscrew, which had some advantage over other methods for posterior intrusion using miniscrew like no resorption of the root reported by this technique.

Conclusion

Diagnosing the aetiological factors and treatment of anterior open bite malocclusion is often challenging. Treatment modalities include myofunctional appliances in growing children and surgeries in adults. Minor cases can be managed by fixed orthodontics especially with TADs alongside with some habit-breaking appliances if any form of it is identified. Additional care should be taken while diagnosing and planning treatment for such cases as any mistake in identifying the etiological factor may lead to a poor end result. The present case reports detail the non-surgical orthodontic treatment of adult patients with anterior open-bites treated using a combination of skeletal anchorage for upper molar intrusion along with fixed appliances. Molar intrusion might be effectively achieved by using miniscrews as anchorage in patients with an anterior open-bite. Mechanics of upper molar intrusion is considered to be more stable than extrusion of the anterior teeth for an open bite closure. The use of TAD's on the palate provides excellent 3D control avoiding any unwanted upper molar tipping during intrusion. Therefore, this treatment modality can be considered an acceptable alternative to orthognathic surgery in selected cases in which the dental malocclusion rather than facial aesthetics is the primary patient concern. However, retainers to minimize extrusion of the posterior teeth should be used to improve stability.

References

1. Proffitt WR., et al. "Contemporary orthodontics". 4th edition. Elsevier (2008): 290-298.2.

2. Denny JM., et al. "Anterior open bite and overjet treated with camouflage therapy". American Journal of

Orthodontics and Dentofacial Orthopedics 131.5 (2007): 670-678.3.

3. Burford D and Noar JH. "The causes, diagnosis and treatment of anterior open bite". Dental Update 30.5 (2003): 235-241.4.

4. Park YC, Lee HA, Choi NC, Kim DH. Open bite correction by intrusion of posterior teeth with miniscrews. Angle Orthod. 2008; 78 (4): 699-710. doi: 10.2319/0003-3219(2008)078[0699:OBCBI O]2.0.CO;2.

5. Lin LH, Huang GW, Chen CS. Etiology and treatment modalities of anterior open bite malocclusion. J Exp Clin Med. 2013; 5 (1): 1-4. doi: 10.1016/j.jecm.2013.01.004.

6. Uribe FA, Janakiraman N, Nanda R. Chapter 9. Management of open-bite malocclusion. In: Esthetics and biomechanics in orthodontics. 2015; 147-179. doi:10.1016/B978-1-4557-50856.00009-6.

7. Proffi t WR, Fields HW, Moray LJ. Prevalence of malocclusion and orthodontic treatment need in the United States: estimates from the NHANES III survey. Int J Adult Orthodon Orthognath Surg. 1998; 13 (2): 97-106.

8. Oropeza LM, Meléndez Ocampo AF, Sánchez RO, López AF. Prevalencia de las maloclusiones asociada con hábitos bucales nocivos en una muestra de mexicanos. Rev Mex Ortod. 2014; 2 (4): 220-227. doi: 10.1016/S2395-9215(16)30038-1.

9. Phelan A., et al. "Longitudinal growth changes in subjects with openbite tendency: a retrospective study". American Journal of Orthodontics and Dentofacial Orthopedics 145.1 (2014): 2835

10. Justus R. "Correction of anterior open bite with spurs: long term stability". World Journal of Orthodontics 2 (2001): 219231

11. Graber TM, Vanarsdall RL VK. Orthodontics. Current Principles & Techniques. 4th ed.; 2005.

12. . Kim YH. Anterior openbite and its treatment with multiloop edgewise archwire. Angle Orthod. 1987; 57 (4): 290-321. doi: 10.1043/0003-3219(1987)057<0290:AOAITW>2.0.CO;2.

13. Janson G, Laranjeira V, Rizzo M, Garib D. Posterior tooth angulations in patients with anterior open bite and normal occlusion. Am J Orthod Dentofac Orthop. 2016; 150 (1): 71-77. doi:10.1016/j.ajodo.2015.12.016.

14. A Huang G. "Long-term stability of anterior open bite therapy: A review". Seminars in Orthodontics 8 (2002): 162-172.5. Beane RA Jr. "Nonsurgical management of the anterior open bite: A review of the options". Seminars in Orthodontics

15. Beane RA Jr. "Nonsurgical management of the anterior open bite: A review of the options". Seminars in Orthodontics 5 (1999): 275-283.

16. Smithpeter J., et al. "Relapse of anterior open bites treated with orthodontic appliances with and without orofacial myofunctional therapy". American Journal of Orthodontics and Dentofacial Orthopedics 137.5 (2010): 605-614.

17. Park JH and Kim TW. "Open-bite treatment utilizing clear removable appliances with intermaxillary and intramaxillary elastics". World Journal of Orthodontics 10.2 (2009): 130-134.

18. Hart TR, Cousley RRJ, Fishman LS, Tallents RH. Dentoskeletal changes following mini-implant molar intrusion in anterior open bite patients. Angle Orthod. 2015; 85 (6): 941-948. doi: 10.2319/090514-625.1

19. Kuroda S, Sakai Y, Tamamura N, Deguchi T, Takano-Yamamoto T. Treatment of severe anterior open bite with skeletal anchorage in adults: Comparison with orthognathic surgery outcomes. Am J Orthod Dentofac Orthop. 2007; 132 (5): 599-605. doi:10.1016/j. ajodo.2005.11.046.

20. Kuo CC, Chen YJ, Lai EHH, Yao CCJ, Chang JZC. Long-term stability of an adult class III open-bite malocclusion treated with multiloop edgewise archwire. J

Dent Sci. 2009; 4 (3): 149-158. doi:10.1016/S1991-7902(09)60020-9.

21. Erverdi N, Tosun T, Keles A. A new anchorage site for the treatment of anterior open bite: zygomatic anchorage. Case report. World J Orthod. 2002; 43 (3): 147-153. doi:10.1067/ mod.2002.128731.

22.Çifter M, Saraç M. Maxillary posterior intrusion mechanics with mini-implant anchorage evaluated with the fi nite element method. Am J Orthod Dentofacial Orthop. 2011; 140 (5): 233241. doi: 10.1016/j.ajodo.2011.06.019.

23.Buschang PH, Carrillo R, Rossouw PE. Orthopedic correction of growing hyperdivergent, retrognathic patients with miniscrew implants. J Oral Maxillofac Surg. 2011; 69 (3): 754-762. doi: 10.1016/j.joms.2010.11.013.

24. Xun C, Zeng X, Wang X. Microscrew anchorage in skeletal anterior open-bite treatment. Angle Orthod. 2007; 77 (1): 47-56. doi:10.2319/010906-14R.1.

25. Park YC., et al. "Open bite correction by intrusion of posterior teeth with miniscrews". The Angle Orthodontist 78 (2008): 699-710. 19.

26. Park HS., et al. "Factors affecting the clinical success of screw implants used as orthodontic anchorage". American Journal of Orthodontics 130 (2006): 18-25.20.

27. Paik CH., et al. "Correction of Class II deep overbite and dental and skeletal asymmetry with 2 types of palatal miniscrews". American Journal of Orthodontics 131 (2007): S106-S116.21.

28. Smithpeter J and Covell D Jr. "Relapse of anterior open bites treated with orthodontic appliances with and without orofacial myofunctional therapy". American Journal of Orthodontics 137 (2010): 605-614.

29. English JD and Olfert KDG. "Masticatory muscle exercise as an adjunctive treatment for open bite malocclusions". Seminars in Orthodontics 11 (2005): 164-169.23.

30. M. B. S. Stuani, A. S. Stuani, and A. S. Stuani, "Modified Thurow appliance: A clinical alternative for correcting skeletal open bite," American Journal of Orthodontics and Dentofacial Orthopedics, vol. 128, no. 1, pp. 118–125, 2005.

31. Biggerstaff RH, Allen RC, Tuncay OC, Berkowitz J. A vertical cephalometric analysis of the human craniofacial complex. Am J Orthod. 1977; 72 (4): 397-405. doi: 10.1016/00029416(77)90352-9.

32. Cheol-Ho Paik. "Molar Intrusion Using TADs: The Key Element to Correcting Anterior Open Bite and/or Vertical Excess Problems". AAO annual session. Philadelphia (2013).25.

33. Y. H. Kim, U. K. Han, D. D. Lim, and M. L. Serraon, "Stability of anterior openbite correction with multiloop edgewise archwire therapy: a cephalometric follow up study," American Journal of Orthodontics and Dentofacial Orthopedics, vol. 118, no. 1, pp. 43–54, 2000.

34. Y. C. Park, H. A. Lee, N. C. Choi, and D. H. Kim, "Open bite correction by intrusion of posterior teeth with miniscrews," The Angle Orthodontist, vol. 78, no. 4, pp. 699–710, 2008.

35. C. H. Moon, J. S. Lee, H. S. Lee, and J. H. Choi, "Non-surgical treatment and retention of open bite in adult patients with orthodonticmini-implants," TheKoreanJournalof Orthodontics, vol. 39, no. 6, pp. 402–419, 2009.

36. M.-J. Kim, S.-H. Park, H.-S. Kim et al., "Effects of orthodontic mini-implant position in the dragon helix appliance on tooth displacement and stress distribution: a three-dimensional finite element analysis," The Korean Journal of Orthodontics, vol. 41, no. 3, pp. 191–199, 2011.

37. Gurton AU, Akin E, Karacay S. Initial intrusion of the molars in the treatment of anterior open bite malocclusions in growing patients. Angle Orthod. 2004; 74 (4): 454-464.

doi:10.1043/00033219(2004)074<0454:IIOTMI>2.0.CO;2
.

38. Iscan HN, Sarisoy L. Comparison of the effects of passive posterior bite-blocks with different construction bites on the craniofacial and dentoalveolar structures. Am J Orthod Dentofacial Orthop. 1997; 112 (2): 171-178. doi:10.1016/S08895406(97)70243-9.

39.Erverdi N, Usumez S, Solak A, Koldas T. Noncompliance openbite treatment with zygomatic anchorage. Angle Orthod. 2007; 77 (6): 986-990. doi:10.2319/101206-422.1.

40. Ludwig B, Glasl B, Kinzinger GS, Lietz T, Lisson JA. Anatomical guidelines for miniscrew insertion: vestibular interradicular sites. J Clin Orthod. 2011; 45 (3): 165-173.

41. Deguchi T, Kurosaka H, Oikawa H, Kuroda S, Takahashi I, Yamashiro T et al. Comparison of orthodontic treatment outcomes in adults with skeletal open bite between conventional edgewise treatment and implant-anchored orthodontics. Am J Orthod Dentofac Orthop. 2011; 139 (4 Suppl): S60-S68. doi:10.1016/j.ajodo.2009.04.029.

42. Sanjay prasad gupta. Anterior Open Bite Correction by Molar Intrusion using Temporary Anchorage Device: A Case Report acta scientific dental sciences (issn: 2581-4893)volume 3 issue 2 february 2019.

43. Proffit WR, Mason RM. Myofunctional therapy for tongue-thrusting: Background and recommendations. J Am Dent Assoc 1975;90:403-11.

44. Frankel R, Frankel C. A functional approach to treatment of skeletal open bite. Am J Orthod 1983;84:54-68.

45. Matsumoto MA, Romano FL, Ferreira JT, Valerio RA. Open bite: Diagnosis, treatment and stability. Braz Dent J 2012;23:768-78.

46. Weiss CE and van Houten JT. “A remedial program for tonguethrust”. American Journal of Orthodontics 62 (1972): 499-506.

47. Paik CH., et al. “Differential Molar Intrusion with Skeletal Anchorage in Open-Bite Treatment”. Journal of Clinical Orthodontics 50.5 (2016): 276-289.

48. Alsafadi AS, Alabdullah MM, Saltaji H, Abdo A, Youssef M. Effect of molar intrusion with temporary anchorage devices in patients with anterior open bite: a systematic review. Prog Orthod. 2016; 17 (1): 9. doi:10.1186/s40510-016-0122-4.

49. Scheffl er NR, Proffi t WR, Phillips C. Outcomes and stability in patients with anterior open bite and long anterior face height treated with temporary anchorage devices and a maxillary intrusion splint. Am J Orthod Dentofac Orthop. 2014; 146 (5): 594-602. doi:10.1016/j.ajodo.2014.07.020.

Legend Figure

Figure 1: Pretreatment Intraoral and Extra oral photographs

Figure 2: Pretreatment radiographs

Figure 3: Mid treatment photographs

Figure 4: Postreatment Extra and Intraoral photographs

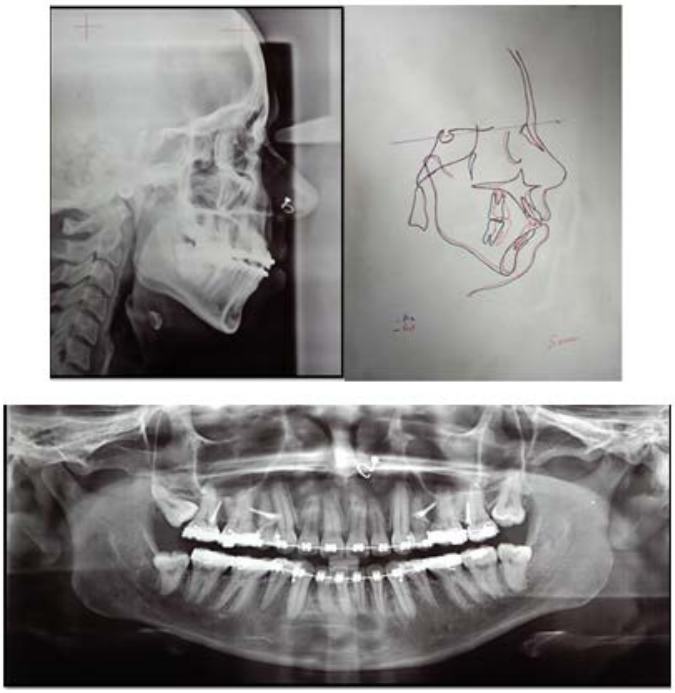

Figure 5: Posttreatment radiographs with superimpositions

Figure 6: Pretreatment Intraoral and Extraoral photographs

Figure 7: Pretreatment Radiographs

Figure 8: Mid treatment photographs

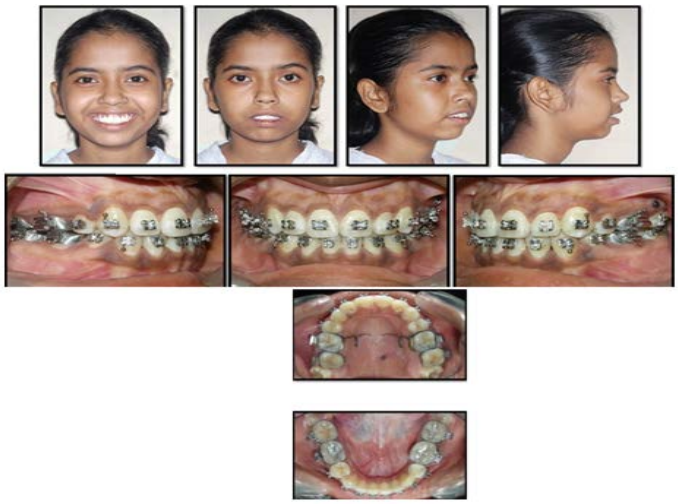

Figure 9: Posttreatment Extraoral and Intraoral photographs

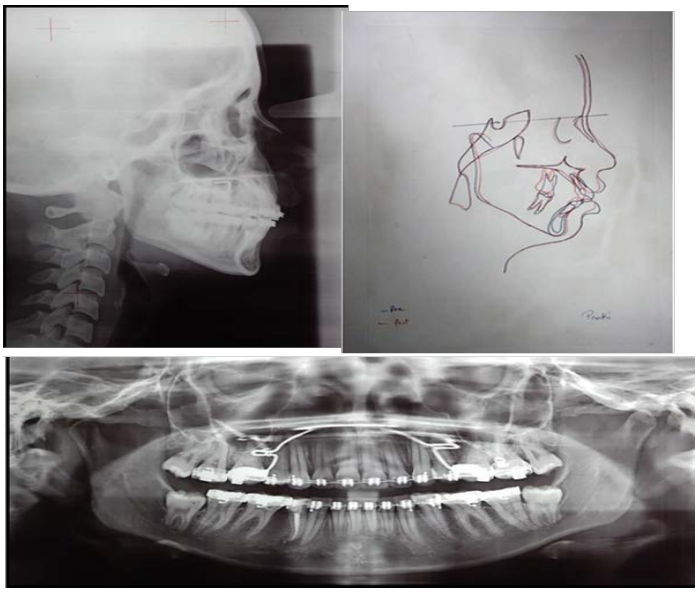

Figure 10: Posttreatment radiographs with superimpositions