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International Journal of Oral Health Dentistry

Journal homepage: www.ijohd.org

Case Report

Keep it simple: correction of anterior cross bite – an ortho-perio interdisciplinary approach

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ARTICLE INFO

Article history:

Received 11-05-2023

Accepted 02-06-2023

Available online 26-06-2023

Keywords:

Interdisciplinary approach

Crowding

Anterior cross bite

Gingival recession

ABSTRACT

Background: This case report explores the treatment of a 13-year-old male patient with severe dental crowding and periodontal issues using non-extraction orthodontic treatment combined with a root coverage procedure. The patient presented with a skeletal class 1 base malocclusion, and multiple anterior crossbites, along with a compromised lower central incisor and gingival recession. Despite the option of extraction, the patient declined this approach, and the final goal was to achieve stable class 1 occlusion and an improved smile.

Materials and Methods: The treatment plan utilized pre-adjusted edgewise appliance (MBT 0.022 inch slot), distalization of the canine, inversion of the maxillary right lateral bracket, and the cautious use of open coil spring in the upper and lower anterior segments. After alignment was completed, a root coverage procedure was performed on the lower right central incisor. The treatment lasted for 20 months, and the results showed successful alignment of both arches, canine protected occlusion, and improved periodontal health.

Conclusion: Overall, this case report highlights the complex relationship between orthodontic treatment and periodontal health and the importance of careful treatment planning and patient communication to achieve successful and stable results. The non-extraction approach combined with root coverage procedure proved to be an effective treatment option for this patient, leading to an improved occlusion, smile, and periodontal health.

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1. Introduction

Orthodontic tooth movement occurs on the principle of application of continuous pressure on the teeth such that the bone surrounding the teeth remodels. Bone is selectively resorbed in some areas and deposited in others. Therefore, the tooth moves through the bone carrying its attachment apparatus with it. As, this response is mediated by the periodontal ligament, tooth movement is primarily a periodontal ligament phenomenon.

It is essential that good periodontal health exists before, during, and after orthodontic treatment. Carrying out orthodontic treatment while active periodontal disease prevails could be detrimental.

The orthodontic literature has presented various treatment options for the management of orthodontic patients with mild to moderate bone loss.¹

A well aligned dentition reduces the risk of development of periodontal diseases, while a crowded dentition may increase it. This could be attributed to difficulty in maintaining oral hygiene resulting in plaque deposition, buildup of calculus, and further progression of existing periodontal disease.²

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Many patients seek orthodontic treatment due to irregular front teeth. The orthodontist should not only focus on esthetics but also take into consideration of the existing periodontal health and whether the orthodontic treatment can improve the health of the periodontium.

Crowding or irregularity is greater in the anterior region.

Anterior cross-bite is defined as the malocclusion that results in maxillary anterior teeth being positioned lingual to mandibular anterior teeth.

Its prevalence in different countries around the world varies between 2.2% and 36%.

Etiology of anterior cross bite include supernumerary teeth, persistent primary teeth, lip biting habit, lack of space and trauma to the deciduous teeth.³

Anterior cross bite can be dento-alveolar, functional or skeletal in nature. The presence of the anterior dental cross bite can result in development of wear facets on the incisal edges of the upper incisors, thinning of the labial alveolar process of the lower incisors and gingival recession. Periodontal pathology can also occur due to occlusal trauma to the lower incisors, and they may present with mobility.⁴

This case report illustrates a non-extraction orthodontic treatment of severely crowded arches with multiple anterior crossbites and periodontally compromised lower central incisor combined with root coverage procedure.

2. Case Description

A 13 years old male patient reported to the department of orthodontics and dento-facial orthopedics, Government Dental College And Research Institute, Bangalore, India with the chief complaint of irregularly placed upper and lower front teeth. Patient's medical history showed no systemic disease that would interfere with orthodontic treatment. No relevant habit history was noted.

Extraoral examination revealed convex profile with mild posterior divergence, competent lips, negative lip step and obtuse naso-labial angle. No gross facial asymmetry was noted. Smile analysis revealed consonant smile arc with increased buccal corridor space. (Figure 1)



Fig. 1: Pretreatment extra-oral photographs

Intraoral examination revealed bilateral class I molar relationship, ectopically erupted 13, crowded upper and lower arches, anterior cross bite with respect to 11,12, gingival recession with respect to 41.(Figure 2)



Fig. 2: Pretreatment intra-oral photographs

Cephalometric analysis revealed Class I skeletal base with orthognathic maxilla and mandible, retroclined upper and lower incisors and average growth pattern.(Table 1) (Figure 3)

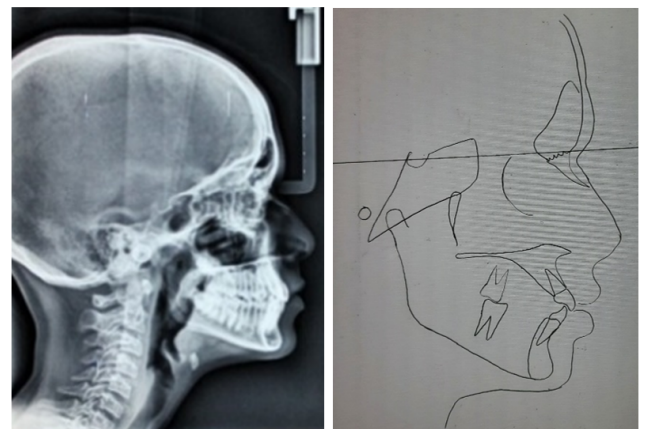


Fig. 3: Pretreatment lateral cephalogram and Tracing

An orthopantomogram revealed developing mandibular and maxillary third molars with no evidence of caries, restorations, or any other pathologies. (Figure 4)



Fig. 4: Pretreatment OPG

Carrey's and arch perimeter analysis revealed 4 mm tooth material excess in lower arch and 11 mm tooth material excess in maxillary arch.

2.1. Treatment objective

1. To level and align arches
2. To eliminate the cross bites
3. To enhance better periodontal health
4. To attain an ideal overbite and overjet
5. To attain a pleasing profile and smile.

2.2. Treatment alternatives

Treatment option involving extraction of 4 first premolars was presented to the patient. As the patient refused to undergo extractions, the alternate treatment plan was non extraction with arch wire expansion with pre-adjusted edgewise appliance (MBT 0.022" SLOT) and interproximal reduction followed by root coverage procedure.

2.3. Treatment progress

After obtaining an informed consent, pre-adjusted edgewise appliance (MBT 0.022" slot) brackets were bonded on all teeth except on 12 and 42 .0.014 inch heat activated NiTi arch wires were placed in the upper and lower arches posterior be turbos were bonded on mandibular second molars to open the bite anteriorly and eliminate cross bite with respect to 11.(Figure 5)



Fig. 5: Intra-oral strap up photographs

After initial alignment of the arches open coil spring were placed between 11 and 13 and between 41 and 43 on 0.018 stainless steel wire in order to gain space for the in-standing lateral incisors in both the arches. Simultaneously interproximal reduction of 14,13,11,21 and 44,43,41,31 was carried out. A total space of 3.5 mm in the upper arch and 2 mm in the lower arch was gained through inter-proximal reduction.

The lingually locked out incisors in both the arches were bonded after gaining sufficient space for their alignment. In the maxillary arch the lateral incisor bracket was inverted (flipped) to attain a negative torque of -10 degrees. 0.016 inch NiTi archwires were place in upper and lower arches to align the lateral incisors. Leveling and alignment of the arches were completed after 11 months. The archwire in sequence of 0.014 inch HANT, 0.016 NiTi, 0.018 inch Stainless steel, 0.019*0.025 inch stainless steel wires were used.0.019*0.025 inch SS wire was torqued in the region of

12.

Root coverage procedure on 41 was carried out by an experienced periodontologist using laterally moved coronally advanced surgical technique. No tooth movement were carried out for a period of 10 weeks to allow complete healing of the soft tissues.(Figure 6)



Fig. 6: Root coverage procedure and ten weeks following procedure

After sufficient healing final finishing and detailing of occlusion was carried out. Total treatment time was 20 months. Retention phase was initiated with upper Begg's wrap around retainer and lower fixed lingual retainer. (Figure 7)



Fig. 7: Post-treatment extra-oral and intra-oral photographs

Post-treatment cephalometric evaluation revealed proclination of upper and lower incisors within acceptable range. (Figure 8, Table 1)

The patient was followed up at intervals of 6 months and 1 year after debonding of appliance. No tendency towards relapse was noted, the posterior occlusion were well settled and the gingival recession with respect to 41 was completely eliminated.(Figures 9 and 10)

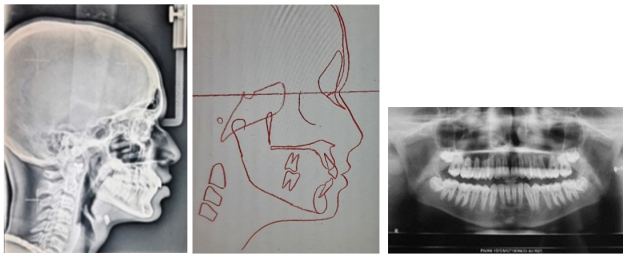


Fig. 8: Post treatment lateral cephalogram, tracing and OPG

Table 1: Post treatment lateral cephalogram, tracing and OPG

Parameter	Pre-treatment	Post treatment
SNA	84°	84°
SNB	82°	83°
ANB	2°	1°
SN-MPA	25°	26°
UI-NA	22° / 5mm	26° / 5mm
LI-NB	19° / 3mm	25° / 4.5mm
IMPA	88°	95°



Fig. 9: 6 months follow up intra-oral photographs



Fig. 10: 1 year follow up intra-oral photographs

2.4. Treatment result

At the end of the treatment, all the treatment objectives were achieved. An overjet of 2.5 mm and overbite of 2 mm was attained. A harmonious soft tissue, dental and skeletal relationship was achieved.

Post treatment lateral cephalogram revealed slight reduction in SNA and SNB angles. Upper incisors proclined by 1 degree and lower incisors proclined by 6 degrees

compared to pre-treatment values. Mandible showed clockwise rotation by 1 degree.

3. Discussion

Periodontal diseases are multifactorial in origin. Dental plaque is considered as the prime etiology for development of gingival periodontal diseases and hence any factor that promotes plaque retention is deterrent to periodontal health.

Crowded dentitions makes it difficult for the patient to maintain good oral hygiene thereby predisposes to plaque retention.⁵

Behlfelt et al found that the gingival health was better around aligned teeth than around malaligned teeth in the same individual. The findings of this study suggests that aligning of the dentition promotes good gingival condition around previously malaligned teeth.⁶

There exists significant variation in the dimensions of the gingiva and different areas of the masticatory mucosa, both among different individuals and within different parts of the mouth. Mandibular anterior teeth often presents with thin gingival biotype.⁷

Thin gingival biotypes are less stable, and are susceptible to marginal recession. Special considerations should be given in this type biotype during esthetic, restorative, and periodontal treatment. Regions of thin gingival biotype are prone to connective tissue loss and require special atraumatic treatment and oral hygiene techniques.⁸

Salzman defined anterior cross bite as the lingual placement of maxillary incisors in relation to the opposing mandibular teeth when both arches are in centric occlusion.⁹

An anterior crossbite in growing children can cause restriction of maxillary growth and further complicate the treatment plan. For these reasons, anterior crossbite should be corrected as soon as they are discovered.¹⁰

Prevalence of anterior cross bite of 24% -36% have been reported in orthodontic patients. Clinical manifestations of anterior cross bite include reverse over jet, gingival recession, mobility of the lower incisors involved in the cross bite, etc. Anterior crossbites are commonly unilateral and mostly affects right side. Lateral incisors are more commonly affected by anterior cross bite than central incisors. When the skeletal pattern associated with anterior cross bite was considered, class 1 relationship showed the highest percentage.¹⁰

Anterior crossbites can be corrected using various treatment modalities including removable and fixed orthodontic appliances. In this patient, fixed MBT mechanotherapy was opted as we aimed to achieve expansion of the dental arches and bodily movement of malaligned teeth.

Heat activated NiTi arch wires were used during aligning stages mainly due to their unique properties of superelasticity and shape memory which can efficiently align severely malpositioned teeth.¹¹

Several studies have shown that there is a tendency for the inter-canine width to increase even with the use of light round nickel–titanium alloy (NiTi) archwires.¹²

Open coil spring application and ineroproximal disking were performed to obtain sufficient space for alignment of lateral incisors in maxillary and mandibular arches.

During alignment of the in-standing maxillary lateral incisor the MBT bracket was inverted to obtain a -10 degree torque.¹³

After levelling and aligning both the arches 0.019*0.025 inch stainless steel archwires were inserted in upper and lower arches for torque expression.

Orthodontic tooth movement can sometimes cause adverse periodontaltissue changes such as gingival over growth, loss of attachment, recessions, etc. However, in this present case the gingival health was maintained well and periodontal health of lower right lateral incisor did not worsen.

After completion of active tooth movement, periodontal surgery involving coronally advanced flap technique was performed to obtain rooth coverage with respect to lower right lateral incisor.

This was later followed by root coverage procedure using laterally moved coronally advanced surgical technique.

Laterally moved coronally advanced surgical technique is modified approach of the coronally advanced flap technique and is found to be effective in treating isolated-type gingival recessions.

Advantages of this procedure include predictable soft tissue marginal morphology, improved post- operative patient comfort, distant sites are not involved for harvesting graft tissue.¹⁴

Orthodontic treatment was continued 10 weeks after the surgical procedure for further finshing and detailing.

6 month follow up after debonding appliances showed successful healing of the gingiva, and no tendency towards relapse was noted. 1 year follow up showed well maintained occlusion and gingiva showed no signs of recession.

4. Conclusion

Good clinical diagnosis and appropriate selection of treatment mechanics in a severely crowded permanent dentition of an adolescent patient resulted in achieving the designed treatment objectives while improving the periodontal health of the teeth and without need for extractions.

5. Source of Funding

None.


6. Conflict of Interest

There were no reported conflicts of interest that are pertinent to this article.

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Cite this article: NA, Ashwini B S, Shetty K S, Younus A A. Keep it simple: correction of anterior cross bite – an ortho-perio interdisciplinary approach. *Int J Oral Health Dent* 2023;9(2):142-146.