

Optimizing Function and Esthetics in an Adult Patient with a Complete Crossbite

Oscar Mario Antelo^{1,2}, Fábio Rafael Tessarollo^{2,3}, Marcio Furtado Niwa², Susiane Queiroz Bastos², Orlando Motohiro Tanaka^{4,5}

¹Department of Orthodontics, Universidad Intercontinental, Mexico City, Mexico, ²The Center for Advanced Dental Education, Saint Louis University, St. Louis, Missouri, USA, ³Department of Orthodontics, School of Life Sciences, Pontifícia Universidade Católica do Paraná, ⁴Department of Orthodontics, Graduate Dentistry Program in Orthodontics, School of Life Sciences, Pontifical Catholic University of Paraná, Curitiba, ⁵Department of Orthodontics, AVANTIS, Balneário Camboriú, Brazil

Abstract

This case report describes the treatment of a 32-year-old woman with anterior and bilateral posterior crossbite, skeletal Class II and dental Class III relationship, with the removal of widely decayed teeth. Treatment options included orthognathic surgery, rapid maxillary expansion (RME), and orthodontic treatment associated with implant and prosthesis. The patient opted for nonsurgical treatment, without RME, extraction of the affected teeth by extensive caries lesions, closure of the remaining spaces by dental movement, and single-crown implant prosthesis.

Keywords: Dental implants, dental prosthesis, esthetics, orthodontics

INTRODUCTION

In general, dental positioning is a consequence of a skeletal discrepancy which characterizes the malocclusion, i.e., an unfavorable relationship between the maxilla and mandible will probably result in malocclusion.^[1] The difficulty of solving these kinds of cases can become even more serious when considering the age factor, since the rapid maxillary expansion (RME) becomes increasingly restricted in adult patients, due to the greater maturation of the median palatine suture.^[2,3]

The surgically assisted RME is considered an excellent treatment alternative in cases of a posterior crossbite in adults by the fact that it provides a better clinical result.^[4] However, the surgery requires hospitalization with attendant morbidity and time loss from work. In addition, orthodontists and adult patients have verified that orthodontic treatment performed without surgical procedures achieves good clinical results, without compromising any functional factor, eliminating the risks and costs of surgery.^[5]

Given these circumstances, this case report aimed to illustrate the nonsurgical orthodontic retreatment performed in an adult patient with an anterior and bilateral posterior crossbite, treated with three mandibular teeth extractions and placement of crown implant prosthesis.

CASE REPORT

A 32-year-old female has been reported for an orthodontic consultation with the chief complaint of “inverted bite.” Her medical history showed no contraindication to orthodontic therapy. The extraoral examination indicated a straight profile and a well-balanced face. Her forced smile had an acceptable gingival display but suggested retroinclined maxillary incisors [Figure 1].

Intraoral and dental cast examinations showed direct composite resin in the upper and lower molars, extensive loss of coronary structure by decay, and endodontic treatment performed in the mandibular right second premolar and second molar. Extrusion of the maxillary left third molar is shown in Figure 2. Anterior and bilateral posterior crossbite, negative overjet (−1 mm) and overbite of 10%, and maxillary/mandibular midline were coincident and absence of right maxillary and left mandibular third molars and both maxillary first premolars.

Address for correspondence: Dr. Orlando Motohiro Tanaka, Graduate Dentistry Program in Orthodontics, School of Life Sciences, Pontifical Catholic University of Paraná, R. Imaculada Conceição, 1155, Curitiba, PR, Brazil.
E-mail: tanakaom@gmail.com

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Figure 1: Pretreatment facial and intraoral photographs

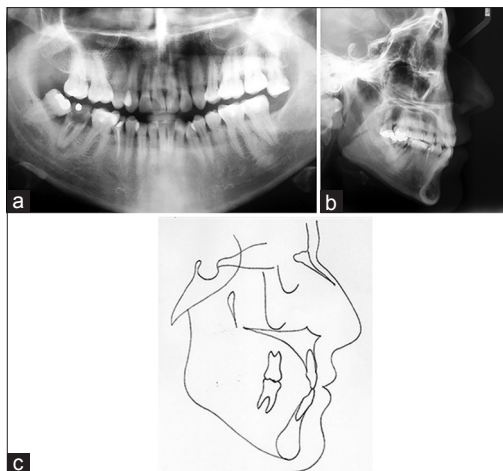


Figure 2: Pretreatment radiographs and tracing: (a) panoramic radiograph, (b) lateral cephalogram, (c) cephalometric tracing

The discrepancy between the centric relation and maximum intercuspation was 1 mm.

The cephalometric analysis showed a vertical skeletal pattern of growth (GoGn-SN, 45.0° and Frankfort-mandibular plane angle, 32.5°) and a skeletal Class II relationship with mandibular retrusion (SNA, 82.5°; SNB, 76.0°; ANB, 6.5°; and AO-BO, -4.0 mm). The maxillary incisors were retroinclined, and mandibular incisors were uprighted (incisor mandibular plane angle, 87.5°; 1.NA, 4°; 1-NA, -0.5 mm; 1.

NB, 26°; 1 NB, 7.5 mm; and interincisal angle, 144.5°). She had a straight profile.

Treatment objectives

The ideal treatment objectives were (1) align and leveling, (2) resolve the anterior and bilateral posterior crossbites, (3) re-adequate the space remaining after extraction of the tooth with furcation lesion, (4) establish satisfactory overbite and overjet, (5) obtain a stable occlusal relationship, and (6) improve the patient's facial and dental esthetics.

Treatment alternatives

The diagnosis was explained and discussed the possible treatment alternatives. Considering that the patient did not present more growth to correct skeletal changes, the possibility of performing orthognathic surgery was proposed; otherwise, it would still be possible to perform orthodontic procedures involving dental compensations with extractions in the lower arch.

Orthognathic surgery would involve transverse maxillary expansion for the correction of bilateral posterior crossbite, combined with orthodontic treatment and extraction of the lower arch for correction of anterior crossbite. These procedures would make it possible to achieve adequate occlusion and improvement in dentofacial esthetics. In any case, the patient refused to perform the surgical procedures.

For an adult who will perform an orthodontic retreatment and presents extensive caries and extensive loss of coronary

structure in several teeth, the dental movement involving skeletal camouflage is delicate, mainly for the reestablishment of the appropriate esthetics and function.

Treatment alternatives involved

1. Expansion of the upper dental arch, contraction of the lower dental arch, associated with the extraction of the left maxillary and mandibular third molars, left mandibular first premolar, and right second premolar. Space closure and replacement of the mandibular right third molar with the implant and dental prosthesis
2. Expansion of the upper dental arch, contraction of the lower dental arch, associated with Class III elastic compensation, extraction of left maxillary and mandibular third molars, left mandibular first premolar, and right second premolar closure of the remaining spaces, and mesialization of the mandibular right third molar in place of the second molar
3. Expansion and contraction of the maxillary and mandibular dental arch, respectively. Extraction of the following teeth: maxillary left third molar; and mandibular left first premolar, right second premolar, right second molar. Distalization of the right mandibular first molar for recovering the space of mandibular right second premolar, and mesialization of the right mandibular third molar in place of the second molar.

Treatment progress

The patient opted for the first option. The treatment began bonding 0.022 MBT ceramic brackets and tubes (3M Unitek) and soon extractions of mandibular left first, second right mandibular premolars, and right mandibular second molar. After 2 weeks, the devices were placed in the lower arch. Alignment and leveling was developed with the sequence 0.014-in, 0.016-in, and 0.019 × 0.025- in thermo-activated NiTi arches [Figure 3].

The space closure in the mandibular arch was performed with 0.019 × 0.025- stainless steel and sliding mechanics to retract the lower incisors. Once the spaces were closed, the anterior crossbite was corrected. During the treatment, the maxillary arch was expanded with the arches, and the mandibular arch was contracted to achieve bilateral posterior crossbite correction, also aided by Kris-Kros elastics [Figure 4].

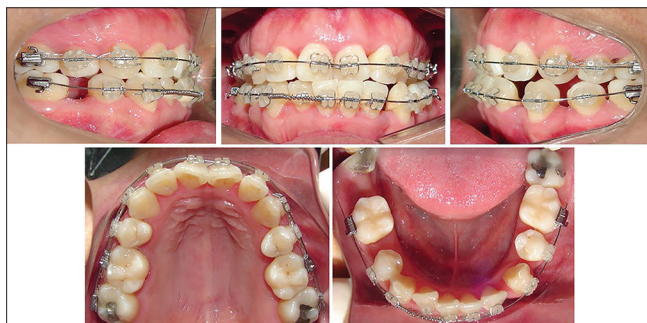


Figure 3: Progress intraoral photographs

Class III guidance on the right side and Class II on the left side were used to obtain adequate Class I occlusion of molars and canines. An implant-supported prosthesis was placed in substitution of the mandibular right second molar.

Treatment results

At the end of orthodontic treatment, the patient's dental aspects were remarkably improved, the anterior and bilateral posterior crossbites were corrected, and acceptable overjet and overbite were established [Figure 5].

The cephalometric analysis confirmed the clinical examinations. Sagittal skeletal pattern changes slightly, and the vertical patterns were maintained as shown by the GoGn-SN, SNA, SNB, ANB, and AO-BO measurements.

The panoramic radiograph shows that the level of interradicular bone remained relatively stable during orthodontic treatment. The treatment plan proposed to the patient was considered adequate, as well as the goals of the treatment were achieved, reestablishing function and dentofacial esthetic [Figure 6].

The maxillary and mandibular incisors had a considerable alteration of tooth position. The maxillary incisors were proclined and protruded, and the mandibular incisors were retruded and retroinclined in a favorable position as shown by 1.NA, 1-NA, 1.NB, and 1-NB, reducing the interincisal angle. Moreover, the facial profile and upper and lower lip position improved, which were confirmed by S-line lower lip, S-line upper lip, and nasolabial angle [Figure 6 and Table 1].

The 2 years' follow-up photography and panoramic radiograph show the maintenance of normal overjet and overbite and gingival and periodontal health, with adequate functions [Figures 7 and 8].

DISCUSSION

In dentistry, adults presenting for comprehensive orthodontic therapy often have dental and periodontal problems that require interdisciplinary treatment approaches. For these kinds of situations, the professional must pay attention to periodontal defects, missing teeth, and the presence of old atrophic extraction sites.^[6]

The etiologic factors of malocclusion in individual adult cases should be determined as clearly as possible at diagnosis, and



Figure 4: Progress finishing stage intraoral photographs



Figure 5: Posttreatment facial and intraoral photographs

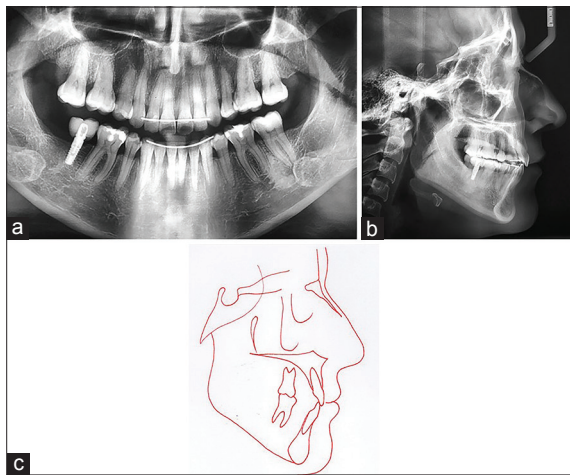


Figure 6: Posttreatment radiographs and tracing: (a) panoramic radiograph, (b) lateral cephalogram, (c) cephalometric tracing

tailored treatment mechanics should be chosen for efficient orthodontic treatment and long-term stability.^[7,8]

An early crossbite correction may prevent an abnormal transverse growth of the maxilla and the mandible, but if abnormal growth still happens, a late relapse may be expected mainly because of late mandibular growth.^[9] This kind of investigation is important because patients with bilateral posterior crossbite can have asymmetrical condyles and might be at risk for the development of future skeletal mandibular asymmetries.

A posterior crossbite accompanied by a narrow maxillary dental arch is considered one of the most problems in orthodontics because the relapse of the transverse maxillary

Table 1: Initial and final measurements

Measurements	Initial	Final
SNA angle (°)	82.5	81
SNB angle (°)	76	76
ANB angle (°)	6.5	5
Ao-Bo (mm)	-4	-3
Facial angle (°)	86	88
Convexity (°)	-11	-10
FMA (°)	32.5	31
GoGn-SN (°)	42	42
Y-axis (°)	65.5	63
1-NA (mm)	-0.5	0.5
1-NA (°)	4	14
1-NB (mm)	7.5	5.5
1-NB (°)	26	21
IMPA	87.5	88
Interincisal angle (°)	144.5	140
Z-angle (°)	79	81

dimension leads to the recurrence of posterior crossbite and an anterior open bite. For these cases, a surgically assisted RME would produce a better treatment result.^[4]

For this and other reasons that interdisciplinary treatment combining orthodontics, stripping technique, surgery, and prosthodontics may help to achieve good esthetic and functional results in an adult case with periodontal defects and multiple dental arch problems.^[6]

Moreover, regarding to periodontal health, the morphological characteristics of the symphysis, combined with the different



Figure 7: 2-year follow-up facial and intraoral photographs



Figure 8: 2-year follow-up panoramic radiograph

force vectors loaded to the lower incisors during the orthodontic treatment, such as in crossbite and Class III open bite, have not been fully evaluated.^[10]

Thus, a better understanding of the differences in the effects of dentoalveolar compensation in normal and negative overjet cases becomes necessary to establish an additional basis for planning the orthodontic treatment of skeletal cases since there must be limits in sagittal jaw relationships.^[11,12]

The width and height of the alveolar symphyseal region are usually lower in the adult Class III open bite if compared to Class III crossbite and normal occlusion patients, indicating that these periodontal changes are the major factors influencing the symphyseal morphology.^[10]

There is a significant association between lower incisor bony support and certain dentofacial traits; in other words, a combination of four dentofacial traits (vertical facial pattern, transverse jaw relationship, lower incisor cervical width, and mandibular symphyseal width) could explain 64.3% of the total variation in lower incisor bony support.^[13]

By the way, orthodontic treatment should be aimed primarily at limiting or correcting excessive dentoalveolar height in the upper and lower posterior regions, what is a common finding in these subjects.^[14] This was the main reason why the extraction of third molars was done in the present case report, avoiding extensive anteroposterior molar movements.

To replace the mandibular right second molar, after careful planning by an interdisciplinary team, a small unit restoration with a separate single-crown implant prosthesis was used. This procedure applied in this present case report maintained and achieved favorable conditions for oral function, hygiene maintenance, and esthetic results.

The second lower right premolar was removed, the lower left premolar was removed, and the right lower third molar was also extracted. The fixed appliance for alignment and leveling was installed, correction of the sagittal relation of the arches was done, canines and molars in Class I were obtained, and the spaces were closed. Fixed upper and lower containment with 0.032-in braided wire.

In general, orthodontic treatment and tooth loss increase the need for interdisciplinary treatment; when properly indicated

and planned, tooth extraction improves malocclusion correction. The final result was satisfactory with the correction of posterior and anterior crossbite.

CONCLUSION

The orthodontic movement through dental compensations and controlling of the reciprocal forces applied in this patient allowed a favorable occlusion, with Class I relationship of molars and canines, normal overjet and overbite, maintenance of gingival and periodontal health, and adequate functions, which made possible the dental rehabilitation of the patient with implant prosthesis, improving facial profile and esthetics.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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