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Prevalence and Factors Associated with Crossbites and Openbites



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Orthodontic Treatment of Severe Anterior Crowding and Crossbite



Anterior Open Bite correction using Passive Self Ligating System: A Case Report



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Orthodontic Treatment of Aesthetically Unpleasing Severe Crowding and Anterior Crossbite

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Abstract

This case report describes the treatment of a 25-year-old lady with severe crowding in the maxillary and mandibular anterior segments and anterior crossbite of the maxillary incisors. Treatment consisted of 4-unit extraction of the first premolars and use of open coil springs to open up spaces for the palatally excluded maxillary lateral incisors during fixed orthodontic appliance therapy. The result of the treatment showed improved facial profile, correction of overjet, and overbite. Therefore, extractions are still helpful in improving treatment outcomes in cases of severe crowding.

Keywords: severe crowding, anterior crossbite, fixed orthodontic appliance

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Crowding is one of the most common presentations of malocclusion[1, 2] Crowding is diagnosed when there is a negative arch length discrepancy i.e. when the available space on the dental arch is less than the required space for proper teeth alignment.[3] Crowding is considered unattractive[4, 5] and is the main reason many patients seek orthodontic treatment.[6,7]

Crowding has a significant negative impact on the quality of life in affected individuals with regards to physical, social and Orthodontic Treatment of Crowding and Crossbite psychological functions,[8-11] especially in the younger age group, patients' parents, and among those with university education.[12] Children with pleasing dental appearance are judged to be more intelligent and less likely to be bullied, while children with obvious malocclusions such as anterior crowding, are considered unattractive, and can be discriminated against by teachers and other students.[13] Onyeaso[14] in an epidemiological survey of 636 secondary school students of Yoruba descent in Ibadan, Nigeria, observed crowding in 20% of the population. Anterior labial segment crowding was reported as 21.6% in the upper arch and 36.3% in the lower arch in another epidemiological survey of 1,028 children aged 11-18 years carried out in Kaduna, Nigeria by daCosta.[15] Also, a study carried out in Benin, Nigeria by Ajayi to assess the prevalence of malocclusion in 441 school children revealed crowding of 11.1% in the upper anterior segment and 12% in the lower anterior segment.[16]

Dental crowding can be treated with fixed orthodontic appliance therapy with or without orthodontic extractions, depending on the severity of the crowding and other factors.[17] This clinical case was treated with 4-unit extraction of the first premolars.

Diagnosis and aetiology

A 25-year-old adult female presented with complaints of dissatisfaction with her aesthetics due to poorly arranged and overlapping teeth. Extra-oral examination revealed a concave facial profile, a symmetric face, and competent lips (Fig 1). Intraorally, she had the full complement of teeth with generalized intrinsic staining. In the lower arch, there was severe labial segment crowding evidenced by mesiolingual rotation of her right central incisor and both lateral incisors. The left canine was distolabially rotated while the right canine was lingually displaced and distolingually rotated. The left first premolar was distolingually rotated.

In the upper arch, there was also severe anterior crowding evidenced by palatally excluded lateral incisors resulting in anterior crossbite of all the incisors. The canines were distobuccally rotated, so also was the left first premolar which was 90 degrees rotated and in scissors bite. The first molars were in Class I relationship bilaterally while the incisors were in class III relationship. The overjet was minus 1mm

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and overbite 2mm. This was also obviously depicted in the pre-treatment study models (Fig 2).

Cephalometric radiography findings revealed a class 1 skeletal pattern, reduced upper incisor to Frankfort plane and lower incisor to mandibular plane angles. Soft tissue analysis confirmed a slightly retrusive upper lip while the lower lip was normal since the upper lip to aesthetic line of Ricketts (UL-E line) gave a value of zero and the lower lip to the aesthetic line (LL-E line) was 6mm (Fig 3 and Table 1). The panoramic radiograph showed presence of the full complement of teeth and absence of intrabony anomalies (Fig 3). Following proper clinical examination and radiographic investigation, an orthodontic diagnosis of Angle's Class I malocclusion on a Class 1 skeletal base complicated by severe upper and lower labial segment crowding, anterior crossbite, and scissors bite of upper left first premolar was made.

Treatment Objectives

The treatment objectives for this patient were as follows:

1. Correction of the crowding in the maxillary and mandibular anterior segments.
2. Correction of the overjet and overbite and thus the anterior crossbite.
3. Maintenance of class I molar relationship and correction of canine relationships.
4. Improvement in the patient's facial profile.

Treatment Alternatives

Based on treatment objectives, the following treatment options were suggested: 1. Four-unit extraction of all first premolars to create space for crowded teeth while treating with preadjusted edgewise MBT prescription appliance. 2. Fixed appliance (MBT prescription) with extraction of maxillary first premolars and mandibular expansion. 3. Fixed appliance (MBT prescription) with extraction of maxillary first premolars and mandibular second premolars. 4. Fixed appliance (MBT prescription) with four-unit extraction of all second premolars.

The first option was chosen as it would help resolve the maxillary and mandibular crowding fastest. The second option could further tip towards a concave profile while the third and fourth treatment options would not help resolve the lower anterior crowding as fast as the first.

Treatment Progress

Following the extraction of the four first premolars, fixed 0.022 x 0.028" MBT brackets were bonded in both arches excluding the palatally displaced maxillary lateral incisors. Alignment was initiated with 0.016" NiTi archwire. Following 3 months, 0.018" SS was inserted in the maxillary arch, with incorporation of open coil springs to distalize both maxillary canines to create adequate space for the palatally excluded maxillary lateral incisors (Fig 4). An 0.018 x 0.025 NiTi was however inserted in the mandibular arch.

Following 4 months, bite raisers were placed on the lower first molars while engaging the newly bonded maxillary lateral incisors after adequate space had opened for them (Fig 4). Three months later, 0.016 x 0.022NiTi was inserted in the maxillary arch and 0.019 x 0.025" SS posted stainless steel wires in the mandibular arch. Patient was also asked to wear class III elastics. Closure of residual space was commenced in both arches 2 months later after inserting 0.019 x 0.025" SS posted stainless steel in the maxillary arch also. At the subsequent appointment, after closure of residual spaces, she was asked to wear asymmetric elastics for midline correction. The fixed orthodontic appliance was removed after 22 months of active treatment and vacuum-formed retainers were delivered for full-time wear after debonding.

Treatment Results

The posttreatment intraoral photographs (Fig 5) indicate properly aligned teeth and corrected overjet and overbite i.e. the initial severe anterior maxillary and mandibular crowding had been relieved and the anterior crossbite corrected. The canine positions in the four quadrants were also corrected. All residual extraction spaces, especially in the mandibular arch following alleviation of crowding were successfully closed. Bilateral class I molar relationship, buccal occlusion and coincident centre-line were preserved.The post-treatment study model analysis confirms this (Fig 6). The post-treatment cephalometric analysis and measurements (Fig 7 and Table 2) showed some proclination of the upper

incisors considering an increase in the upper incisor to the Frankfort plane angle, it also shows some retroclination of the mandibular incisors considering the slight reduction in the mandibular incisor to the mandibular plane angle. The soft tissue analysis also shows about 2mm retrusion of the lower lip in comparison with the pre-treatment value. These are responsible for improvement in the patient's facial profile from the slightly concave profile to a straight profile. The patient had generalized intrinsic staining which was considered not too obvious to require conservative intervention. She also had minimal attritive injury to the maxillary central incisors as a result of the initial anterior crossbite, these were also not restored as they were considered unnoticeable by the patient. Vacuum formed retainers for full-time wear in both maxillary and mandibular arches were delivered to the patient after debonding the fixed appliance (Fig 8).



Fig 1. Pre-treatment facial and intraoral photographs



Fig 2. Pre-treatment study models

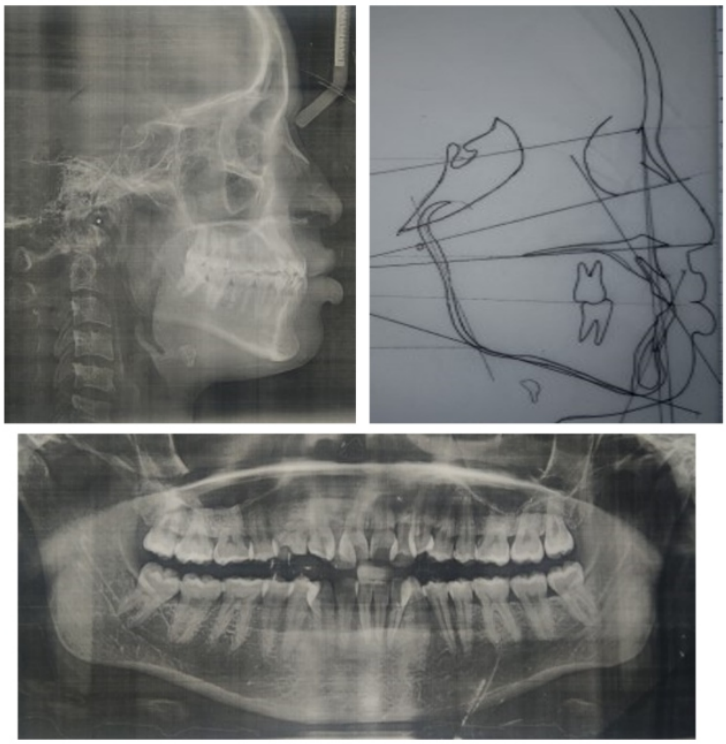


Fig 3. Pre-treatment radiographs and cephalometric tracing

Table I. Cephalometric measurements

	Pre-treatment Values	Normal Values
SNA (°)	85	85±3.5
SNB (°)	83	82.7±3.0
ANB (°)	2	2-4
Ui-FP (°)	97	119-127
Li-MP (°)	85	96-104
Ui-Li (°)	137	108-116
FMA (°)	32	20-26
UL-E-line (mm)	0	3.21±2.69
LL-E-line (mm)	6	6.76±2.83



Fig 4. Treatment progress photographs showing the bite raisers and open coil springs in place.



Fig 5. Post-treatment facial and intraoral photographs.



Fig 6. Post-treatment study models

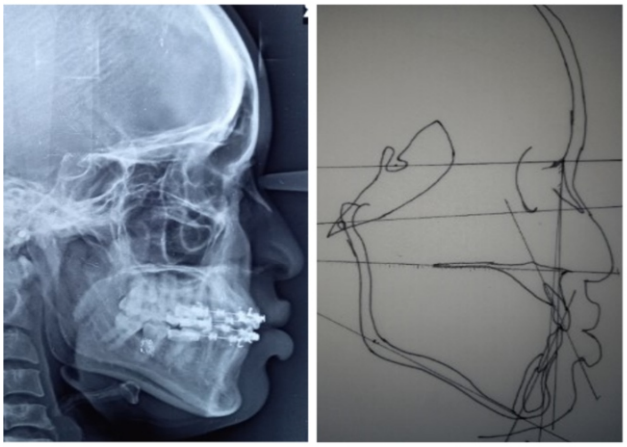


Fig 7. Post-treatment lateral cephalogram and tracing

Table II. Post-treatment cephalometric measurements

	Pre-treatment Values	Post-treatment Values	Normal Values
SNA (°)	85	87	85±3.5
SNB (°)	83	85	82.7±3.0
ANB (°)	2	2	2-4
Ui-FP (°)	97	109	119-127
Li-MP (°)	85	83	96-104
Ui-Li (°)	137	135	108-116
FMA (°)	32	33	20-26
UL-E-line (mm)	0	0	3.21±2.69
LL-E-line (mm)	6	4	6.76±2.83



Fig 8. Post-treatment retention photographs showing vacuum formed retainers in place

Discussion

Crowding is one of the most common malocclusion traits patients present with,[7] and though orthodontic extractions have been on the decline, it is still advocated in a number of cases. It is indicated in severe crowding, as was the case in our 25-year-old patient in this case report. Other indications for extraction include decreased overbite, increased overjet, and skeletal class 2 malocclusions.[18,19] The premolars are the commonly extracted teeth for this purpose[23], the choice of whether to extract the first premolars or the second premolars, two premolars or four premolars and symmetric or asymmetric extractions is largely dependent on the clinical presentation.[20, 21] In this case report, the four first premolars were extracted as they were nearest to the anterior crowding to aid quick resolution of the labial segment crowding and anterior crossbite.

Open coil springs were used as accessories to open up adequate space for the palatally excluded maxillary lateral incisors, After opening up adequate spaces, bite raisers were placed temporarily on the mandibular first molars with our adhesive system to encourage effective unobstructed movement of the teeth in crossbite. Bite raisers could either be fixed or removable.[22] Removable plates require full patient cooperation when used as bite raiser and restorative materials such as glass ionomer cement and composite do not always withstand masticatory forces when bonded to occlusal surfaces of posterior teeth to serve as bite raisers.[23] The use of restorative materials bonded on the occlusal aspect of posterior teeth was however chosen because it is easy to place and requires no laboratory assistance. It also does not require patients' cooperation and it does not interfere with patients' oral hygiene.[23] Bite raisers are however best used on a short- term basis as long term use could predispose to molar intrusion, though this could be counteracted by some wire bending.[23] The case was well finished and the patient was satisfied with the outcome as patient's profile and smile were greatly improved.

Conclusions

Premolar extractions are still very useful adjunctive modalities in fixed appliance therapy for the treatment of moderate to severe crowding, following proper patient assessment. Extractions can be helpful in improving the facial profile.

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