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Management of Anterior Crossbite Using Orthodontic Fixed Appliance Therapy

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Abstract

A case report on a twenty-two-year-old male patient who presented at the orthodontic clinic of Lagos State University Teaching Hospital with a chief complaint of inability to bite properly with his front teeth. Clinical examination revealed a concave facial profile, anterior crossbite, reversed overjet of -1mm, mild upper anterior segment crowding, mild lower anterior segment spacing, class III incisor relationship, and Angle's class 1 molar relationship. Treatment objectives were to correct the crossbite, unravel crowding, close spaces and maintain buccal interdigitation in the class I position. Non-extraction orthodontic treatment using pre-adjusted edgewise fixed appliance therapy with Roth 0.022" prescription was carried out over a period of 26 months and retention was attained with upper and lower Hawley's retainer. This case report demonstrates the successful camouflage orthodontic treatment of a patient with anterior crossbite with skeletal 3 malocclusion.

Keywords: Anterior Crossbite, Camouflage, Skeletal 3 Malocclusion

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ORIGINAL ARTICLE

Introduction

Anterior crossbite is the lingual placement of maxillary incisors in relation to the opposing mandibular teeth when both arches are in centric occlusion.[1] This is found to be a common clinical finding in skeletal class 3 malocclusions.[2] Class III skeletal relationships may result from a normal maxilla with prognathic mandible or a retrognathic maxilla with a normal mandible, or a combination of both.[3] The management of class III relationship may be a challenging one for the orthodontist, which may include three treatment options namely growth modification, orthodontic camouflage and orthognathic surgery.[4] Orthodontic camouflage is a treatment process that includes extraction or non-extraction as a dentoalveolar compensation to mask skeletal discrepancies[5] through tooth movements to correct the dental occlusion while maintaining the skeletal discrepancy.[6]

Indications for orthodontic camouflage in class III patients in whom growth cessation has occurred include a mild to moderate skeletal class III; reasonably well-aligned teeth; and good vertical

facial proportions.[4,5] This report demonstrates the successful orthodontic camouflage treatment of anterior crossbite in a patient with class 3 skeletal malocclusion.

CASE REPORT

Presenting Complaint

A twenty-two-year-old male patient presented at the Orthodontic clinic of the Lagos State University Teaching Hospital, with the chief complaint of inability to bite properly with his front teeth.

Medical and Dental History

There was no significant medical history, but past dental history revealed previous visits for the management of recurrent minor aphthous ulcerations and surgical extractions of the third molars which were without complications.

Diagnosis

Extraoral findings: Extra-oral examination revealed no facial asymmetry, a concave profile, and competent lips (Figure 1).

Intraoral findings: Examination showed full complement of teeth in all quadrants except the third molars, anterior crossbite extending from tooth 12 to 22, upper anterior crowding, lower anterior spacing, retroclined maxillary incisors, disto labial rotation of 11, 21, mesiopalatal rotations of 12,31,41, lower midline shift to the left, Angle's class I molar relationship, and class III incisor relationship with a reversed overjet of 1 mm as shown in Figure 1.

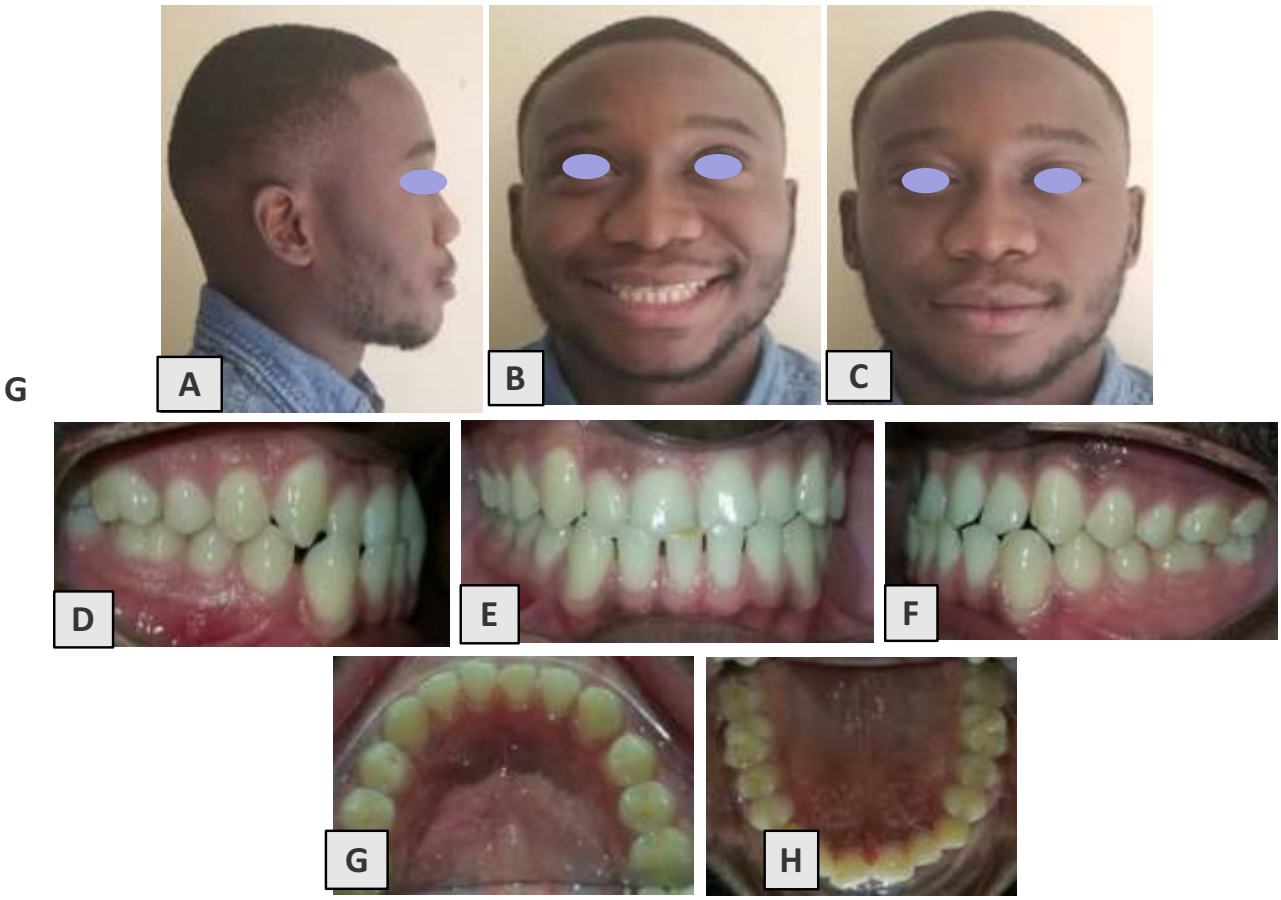

Figure 1: (A-H) Pretreatment facial and intra-oral photographs

Radiographic Assessment

Panoramic findings: This revealed a full complement of teeth except for the third molar teeth in all quadrants with no sign of caries, root resorption or periapical lesion (Figure 2).

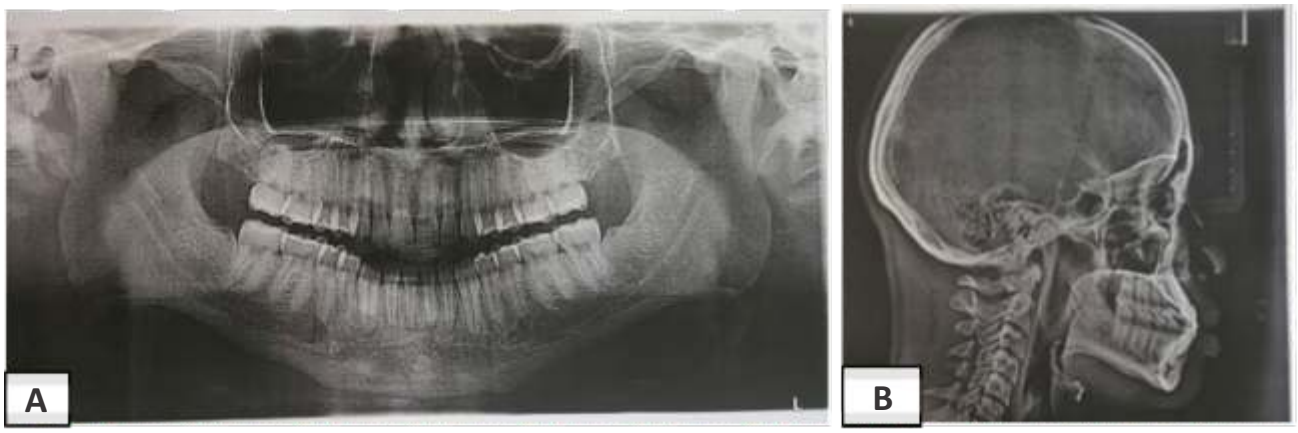

Figure 2: (A) Pretreatment panoramic radiograph, and (B) Pretreatment lateral cephalograph

Table 1: Cephalometric data

Measurement	Normal	Pre-treatment	Post-treatment	Difference
SNA (°)	85.5° ± 3.5°	75	77	2
SNB (°)	82.7° ± 3.0°	81	82	1
ANB (°)	2 – 4	-6	-5	1
U1 to FP (°)	119 - 127°	122	126	4
L1 to MP (°)	96 - 104°	110	102	-8
Interincisal Angle (°)	108 - 116°	113	111	-2
FMA (°)	24-26°	25	24	-1
LFH	55%	53.4%	57.4%	4
UL to S Line (mm)	-5.89 SD 2.23mm	-3.5mm	-6.5mm	3
LL to S Line (mm)	-8.19 SD 2.60mm	-6.5mm	-8mm	1.5
UL to E Line (mm)	-3.21 SD 2.69mm	-3.21 SD 2.69mm	-4.5mm	2
LL to E line (mm)	-6.76 SD 2.83mm	-6.76 SD 2.83mm	-7.5mm	2.5
Nasolabial angle (mm)	84.35° SD 13.71°	84.35° SD 13.71°	84°	3

Treatment Objectives

The treatment objectives were to correct the anterior crossbite, achieve normal overbite and overjet, correct rotations, relieve the crowding in the upper arch, close the spaces in the lower arch and maintain buccal interdigitation in class I position.

Treatment Alternatives

Three alternatives were presented to the patient.

1. Use of pre-adjusted edgewise fixed appliance, 0.022" Roth prescription in the upper and lower arches, non-extraction to enable correction of crossbite, achieve normal overbite, normal overjet and improve facial aesthetics.

2. Use of pre-adjusted edgewise fixed appliance, 0.022" Roth prescription in the upper and lower arches, with 4-unit extraction to enable correction of crossbite and to achieve normal overbite and overjet.
3. Use of fixed appliance using self-ligating bracket prescription in the upper and lower arches, non-extraction with class III elastics to enable correction of crossbite and to achieve normal overbite and overjet. This would require prolonged use of elastics as well as patient compliance.

After a review of the risks and benefits of the three options, the patient chose the more conservative option which was the first alternative because of the advantages of being non-extraction and cost-beneficial.

Treatment Progress

Orthodontic treatment began with pre-adjusted edgewise 0.022-inch brackets, Roth prescription bonded on the upper and lower arches, utilising bite raisers on teeth 14,15,24,25 to clear the bite anteriorly (Fig. 3). Levelling and alignment started with 0.014-inch nickel-titanium (NiTi) with progression up to 0.019 × 0.025-inch stainless steel archwires. With the rectangular 0.019 × 0.025-inch stainless steel archwire, an elastomeric chain was used to close anterior spaces in the mandibular arch followed by an active tie back for retraction. Settling of occlusion was done with 0.018-inch stainless steel wire in upper and lower arches and class III intermaxillary elastics for better interdigitation. Retention was achieved with a removable Hawley's retainer in both arches. The total active treatment time was 26 months.

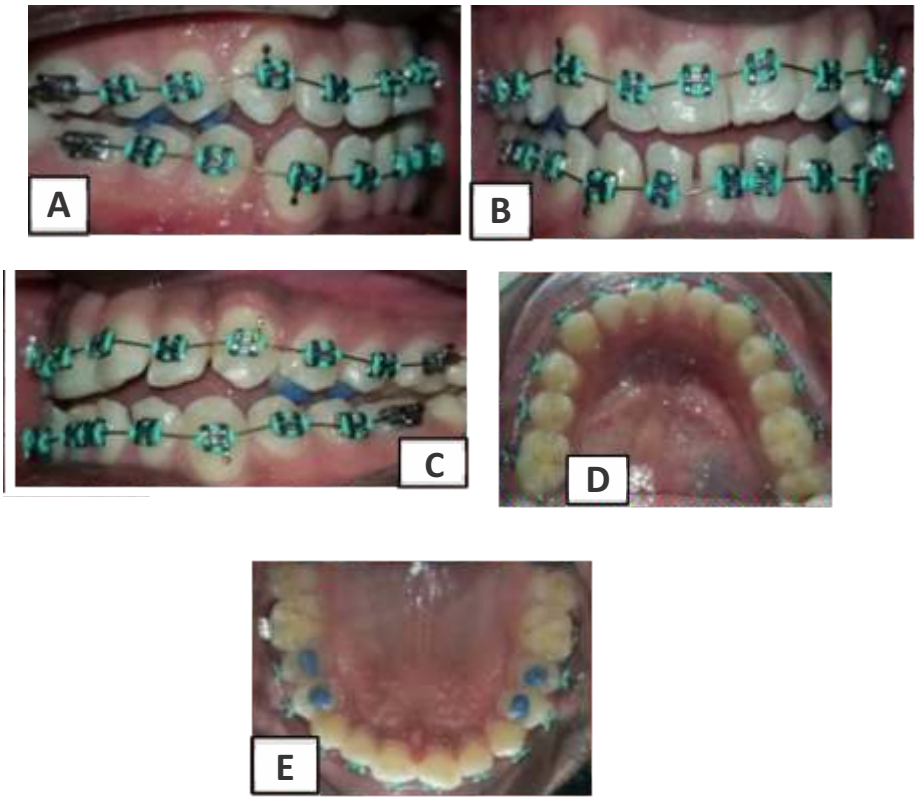

Figure 3 (A-E): Treatment progress intraoral photographs

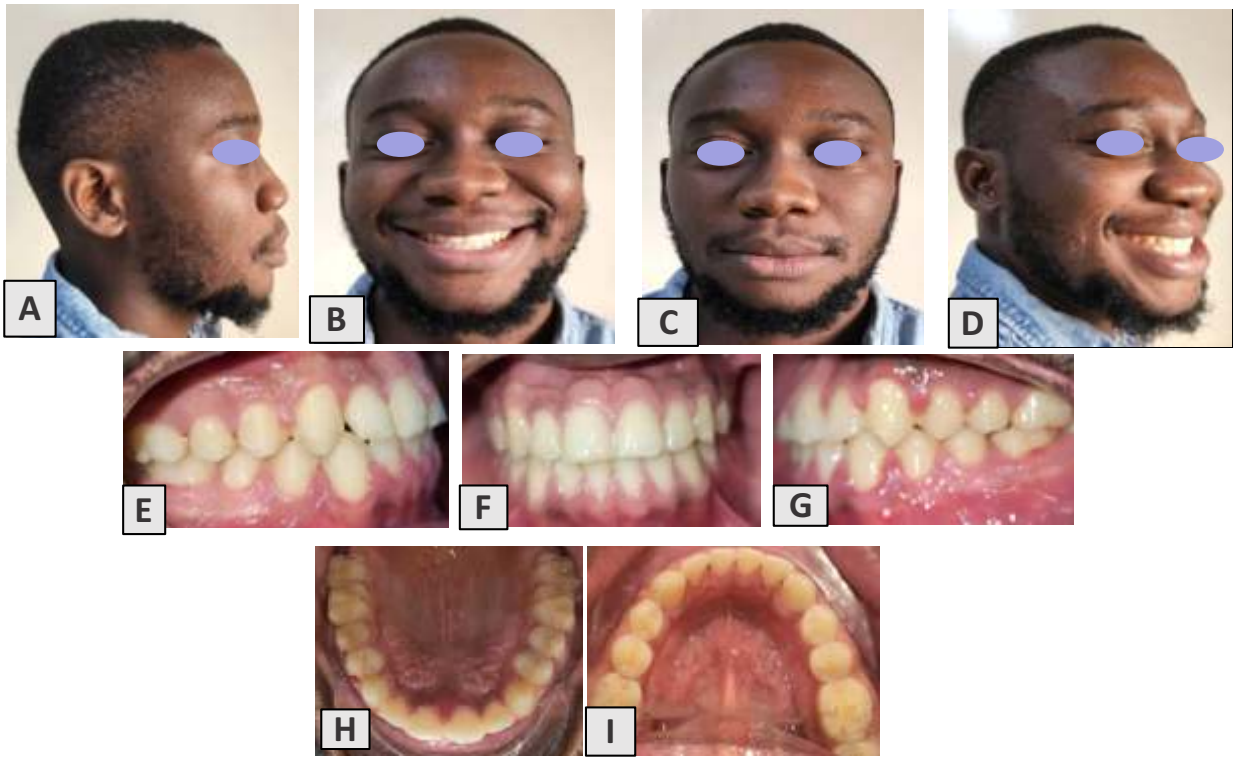

Figure 4 (A-I): Post-treatment facial and intra-oral photographs

The post-treatment dental casts demonstrated Class I canine with Class I molar relationships, normal overbite, and overjet (Figure 5).

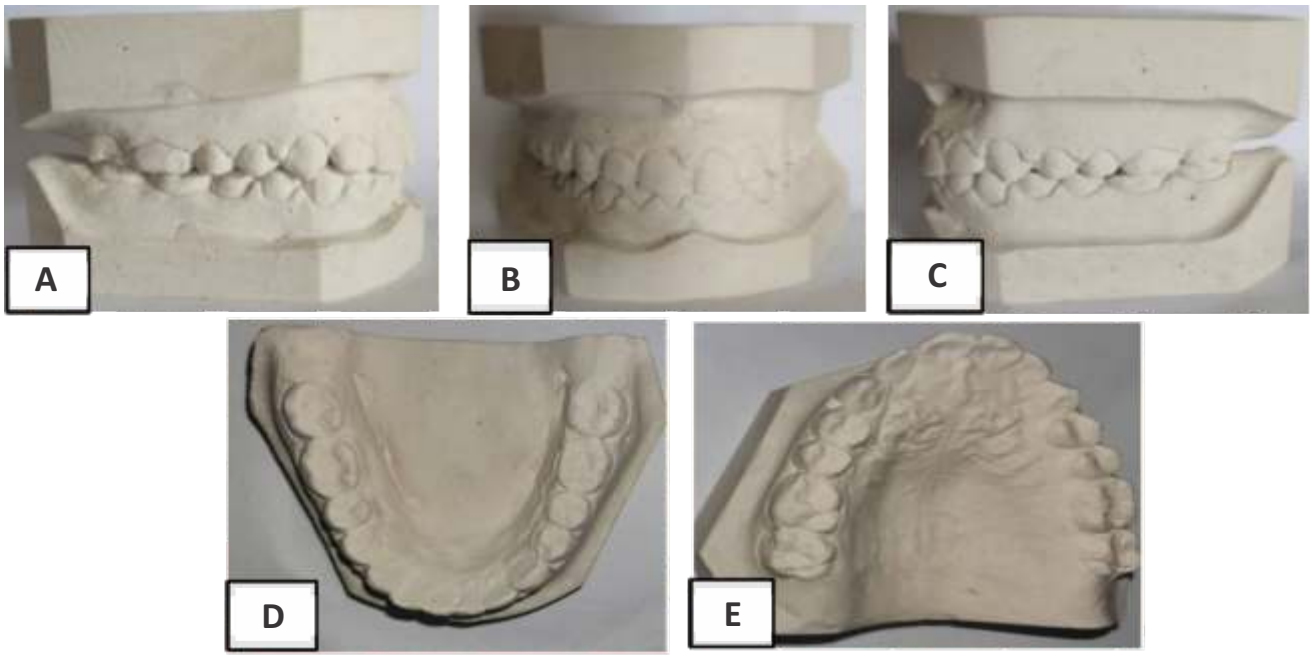

Figure 5: (A-E) Post-treatment study casts

The post-treatment cephalogram and panoramic radiograph are shown in Figure 6. A comparison between the pretreatment and post-treatment cephalometric analysis revealed an improvement in the anteroposterior skeletal discrepancy with 1º increase in ANB value from -6º to -5º, a reduction in the lower incisal angle and the upper lip was no longer retrusive. The comparison of the pretreatment and posttreatment panoramic radiographs revealed mild resorption of the roots of teeth 31,41,42 within acceptable limits of the extent of movement.

Figure 6: (A) Posttreatment panoramic radiograph, and (B) Post Treatment lateral cephalograph

After 26 months of active treatment, a stable occlusal relationship and a harmonious face were achieved and maintained (Figure 7).

Figure 7: (A-C) Retention with Hawley's retainers

Discussion

Skeletal Class III malocclusion could develop as a result of either a retrognathic maxilla, prognathic mandible, or a combination of both conditions.[5,7] In this case report, the skeletal class III relationship was a result of the maxilla being retrognathic, with an SNA value of 75º (Table 1). Treatment of skeletal malocclusion in adults is performed either by a combination of orthodontics and orthognathic surgery or by orthodontic camouflage alone depending on the severity of the skeletal problem, patient's age, facial profile as well as patient requirements. Orthodontic treatments aim to achieve normal overbite and overjet relationships as well as normal buccal interdigitation.[7–9] Orthodontic camouflage treatment is sometimes a preferred treatment option in the management of mild Class III skeletal malocclusion because of avoidance of surgical risks and improvement in oral function.[3,10] Although orthodontic camouflage has its limitations, since it involves solving a dento-skeletal problem with tooth movements while the underlying skeletal

problem persists, the success is dependent on the severity of the malocclusion.[3,10] In this present case, orthodontic camouflage was used and at the end of treatment, correction of the incisal relationship, normal buccal interdigitation and harmonious facial profile were achieved.

Orthodontic camouflage treatment of skeletal class III malocclusion involves maxillary incisors proclination and mandibular incisors retroclination.[5,11] In this present case, retroclination of the mandibular incisors by 8º from 110º to 102º (Table 1) coupled with space closure in the anterior segment by anterior segment retraction contributed to the correction of anterior crossbite. In the maxillary arch, proclination of the incisors from 122º to 126º (Table 1) created space to relieve crowding as well as correct the anterior crossbite. The occlusal bite was raised by placing bite turbos on posterior teeth, to eliminate anterior interference and allow for correction of anterior crossbite.

Several factors may have contributed to the success of this present case, including patient cooperation, proper diagnosis, and a treatment plan suitable for the patient's pretreatment parameters.[5,10]

Conclusion

Orthodontic camouflage can be considered an effective therapy in the management of skeletal class III malocclusion, however, success depends on the severity of Class III malocclusion. This report demonstrates the successful treatment of an adult patient presenting with skeletal class III malocclusion using orthodontic camouflage. At the end of treatment, treatment objectives were achieved, the patient's expectations were met and the patient was satisfied.

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Conflict of Interest: None to declare

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