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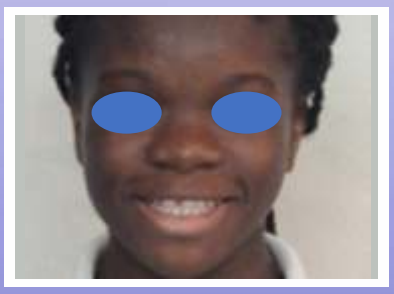

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Multidisciplinary Management of a Class III Malocclusion with Congenitally Missing Maxillary Lateral Incisor using a one-couple force system approach: A Case Report

Pobee RD[a,b], Amoah GK[a], Newman-Nartey M[a], Toledo Mayari Yabang G[a]

Abstract

A case of a 12 year old female who presented at the Orthodontics and Paedodontics Department of the University of Ghana Dental School. She was diagnosed with a Class III malocclusion on a Class 3 skeletal base with reduced vertical proportions and a congenitally missing upper right lateral incisor. Treatment involved the extractions of mandibular second molars and the use of a one-couple system to correct the malocclusion, followed by the prosthetic replacement of the upper lateral incisor.

Key words: class III malocclusion, one-couple force system, multidisciplinary orthodontic treatment.

Authors' Affiliations

[a]Department of Orthodontics & Paedodontics, Dental School, College of Health Sciences, University of Ghana.

[b]Dental department, LEKMA Hospital Teshie.

Correspondence

Dr Gyaami Kwabena Amoah Department of Orthodontics & Paedodontics, Dental School, College of Health Sciences, University of Ghana Contact: +233243301626, email: kgamoah@ug.edu.gh, gyaami@yahoo.co.uk

Introduction

The congenital absence of one or more permanent teeth is known as hypodontia. Congenitally missing teeth are common dental anomalies with multifactorial aetiology. Apart from third molars, the third most common congenitally missing teeth are the maxillary lateral incisors[2]. It may be unilateral or bilateral and is more frequently seen in females.

The management of congenitally missing lateral incisors usually requires a multidisciplinary approach[2]. Treatment aims to establish a functional and an esthetic occlusion[3]. Two main treatment options are generally employed: either space is opened up for the prosthetic replacement of the missing tooth, or by orthodontic space closure[4], together with extractions in the lower arch

The treatment choice is based on the anteroposterior occlusal relationship, the profile and the tooth size arch length discrepancy. In cases where canine substitution is considered, the morphology, size and colour of the canine are considered[5]. According to Paduano et al.[5], space opening and prosthetic replacement of the missing tooth/teeth are recommended in low-angle cases and patients with retruded profiles.

Class III malocclusion may be skeletal and due to mandibular prognathism, maxillary retrognathia or a combination of both[6]. Pseudo class III relationship may occur in normal skeletal jaw relationship with reverse overjet as a result of centric relation (CR)–centric occlusion (CO) discrepancy[6].

Dental Treatment modalities used in managing class III malocclusions include orthopaedic, orthodontic camouflage or orthognathic surgery methods. Treatment choice usually depends on the patient's age, skeletal pattern, the severity of the skeletal problem and patient preference[7,8].

The present case report describes the multidisciplinary management in a class III malocclusion patient complicated by unilateral congenitally missing right maxillary lateral incisor using a one-couple system mechanics approach.

Case Report

A 12-year-old female presented at the Orthodontics and Paedodontics department of the University of Ghana Dental School with a complaint of spacing in her upper anterior teeth and protruded lower jaw. She was in permanent dentition with all teeth present except 12,18,28,38, and 48. She had a prognathic profile with average lower anterior facial height.

An intra-oral assessment revealed a class III incisor,

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canine and molar relationship with about 12mm and 3mm spacing in the maxillary and mandibular arch, respectively. The overjet was -5mm, 20% overbite, and the mildly increased curve of spee with 11,21 and 22 in crossbite with the lower anterior teeth. The centrelines were non-coincident, with a 2mm maxillary midline shift to the right and a 2mm mandibular midline shift to the left of the maxilla. There was no abnormality with the temporomandibular joints, and the oral soft tissues were healthy.

The orthopantomogram showed no apparent bony pathology. However, tooth #12 was congenitally missing whilst the third molars were present and in the normal developing stage. The cephalometric analysis pointed to a class 3 skeletal base with an ANB of -3.87 and a Wits appraisal value of -7.2. The SNB was increased (89.05), confirming the cause of the class III malocclusion was due to mandibular prognathism. The upper incisors were proclined, and the inter-incisal angle and the vertical proportions were normal.

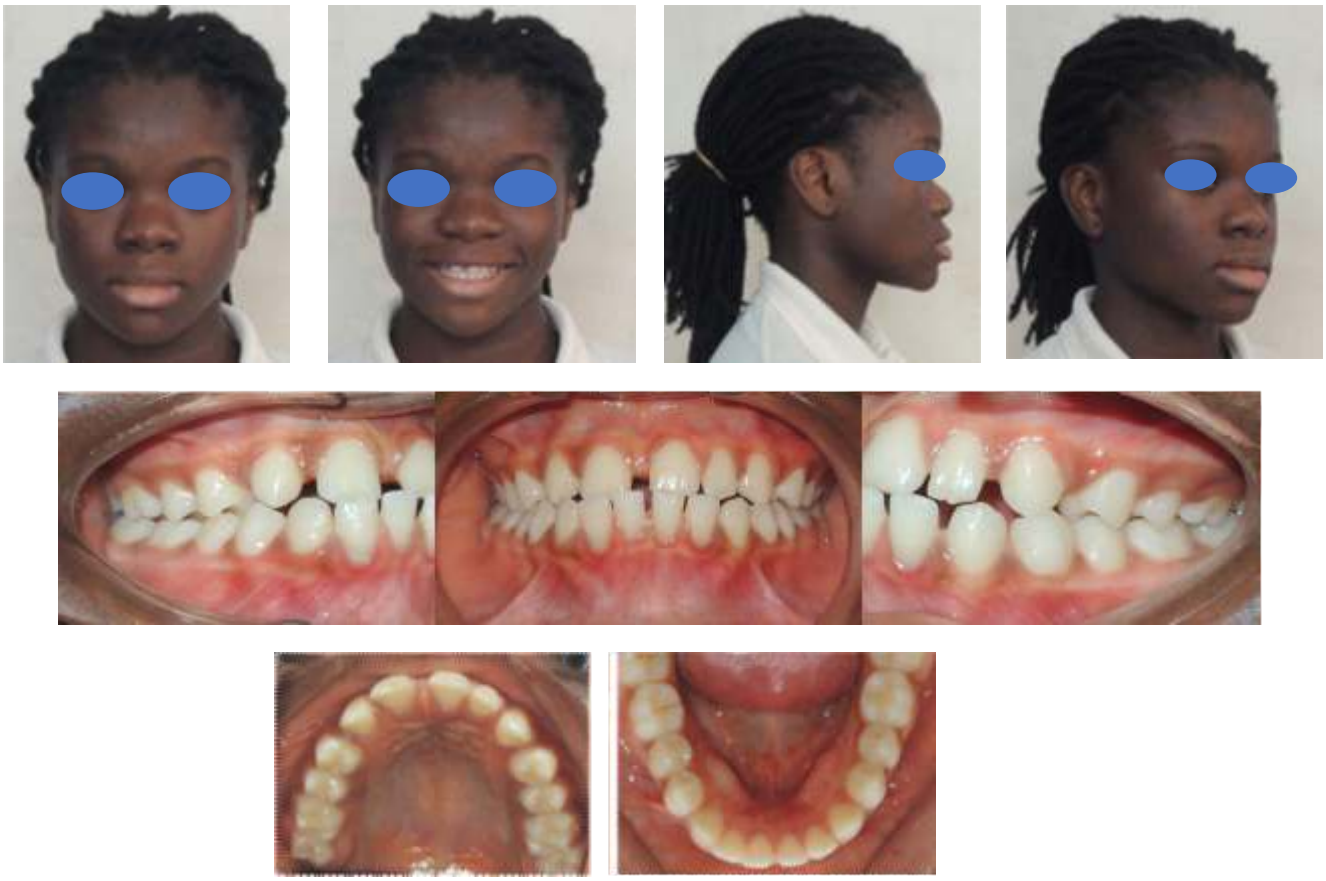

Figure 1: Pretreatment photographs of the patient

Figure 2: Pretreatment orthopantomogram, Lateral cephalometric radiograph and cephalometric tracing

Figure 3: Pretreatment study models

Table 1. Cephalometric summary of pretreatment and post-treatment results
Sources of normal values:(Fadeju et al., 2012)

	Parameters	Pre-treatment	Post-treatment	Change	Ref(Ghana)
SAGITTAL	SNA	85.18^0	85.18^0	+2.56	89^0 (+/-4)
	SNB	89.05^0	85.90^0	-3.15	83^0 (+/-4)
	ANB	-3.87^0	1.84^0	+5.41	5^0(+/-2)
DENTAL	UIMXP	135.24^0	123.01^0	-12.23	121^0(+/-8)
	LIMd	92.35^0	93.28^0	+ 0.93	99^0(+/-8)
	I-I Angle	111.69^0	117.96^0	+6.27	114^0(+/-6)
VERTICAL	MMPA	20.72^0	25.75^0	+5.03	28^0(+/-12)
	LAFH	55.73%	56.81%	+1.08	57% (+/-2)
	Wits	-7.23mm	0.95mm	+8.18	4mm (+/-3)

Treatment aims, Progress and Results

The patient's chief concern was the prognathic mandible; she wanted all the mandibular spaces closed but requested that a 1mm maxillary midline diastema be maintained. Treatment aimed to correct the class III incisal, canine and molar relationships to a class I relationship, consolidate the maxillary spaces for prosthetic replacement of tooth # 12, leave the 1mm diastema requested by the patient, correct the centre lines, close all the mandibular anterior spaces and improve the facial profile.

The case was managed by orthodontic camouflage using a fixed orthodontic appliance. The treatment involved the extraction of the mandibular 2nd molars, slight intrusion and retraction of the lower anterior segment and space regaining and prosthetic replacement of the maxillary lateral incisor.

Consent was obtained from the patient, and scaling and polishing was done. The maxillary and mandibular teeth were bonded with pre-adjusted edgewise Roth prescription brackets with 0.022 x0.028"inch slot size and molar bands cemented on the first molars. The mandibular canine brackets were swapped to change the inherent mesial crown tip to a distal crown tip to facilitate the distal tipping of the lower labial segment. After leveling and alignment with 0.014 and 0.018 nitinol wires, a Connecticut intrusion arch (CIA) with a 60g force was tied over a 0.017X0.025 stainless steel (SS)base archwire from teeth #42 and #32 in the mandibular arch to form the one couple force system. Lower second molars were extracted to provide more space for the mandibular molars to tip back and the lower labial segment to retract, thus correcting the anterior crossbite.

A 0.018 SS was placed in the maxillary arch, and a push coil was placed between teeth # 13 and #11 and secured with metal ligatures. This was done to consolidate the anterior maxillary space and create space for the congenitally missing tooth #12.

About six months into the treatment, the space for the congenitally missing #12 was regained, and an acrylic pontic was fabricated to replace the gap created.

Residual space closure in the mandible was completed using a 0.018SS archwire and power chain. About 26 months into the treatment, the mandibular third molars erupted and were protracted to replace the extracted mandibular 2nd molars. The maxillary third molars remained unerupted until the patient was debonded. The patient was, however, informed about the need to extract the maxillary third molars when they finally erupted. Per the patient's wishes, a 1mm midline diastema was left in the maxilla.

A resin-bonded bridge was fabricated to replace the congenitally missing #12, with the aim to provide an implant after the slowing down of craniofacial growth. Full alignment of the 3rd molars could not be attained because the patient relocated abroad for further studies, however the patient was pleased with the outcome.

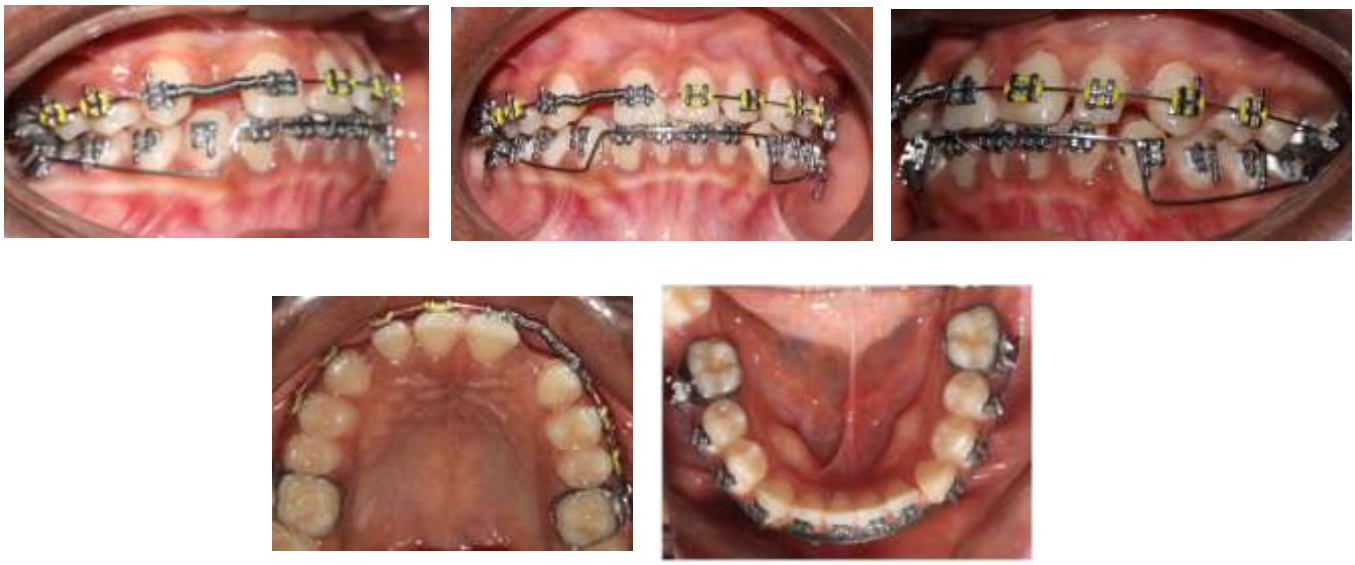

Figure 4: Mid-treatment photographs of the patient

Figure 5: Post-treatment photographs of the patient

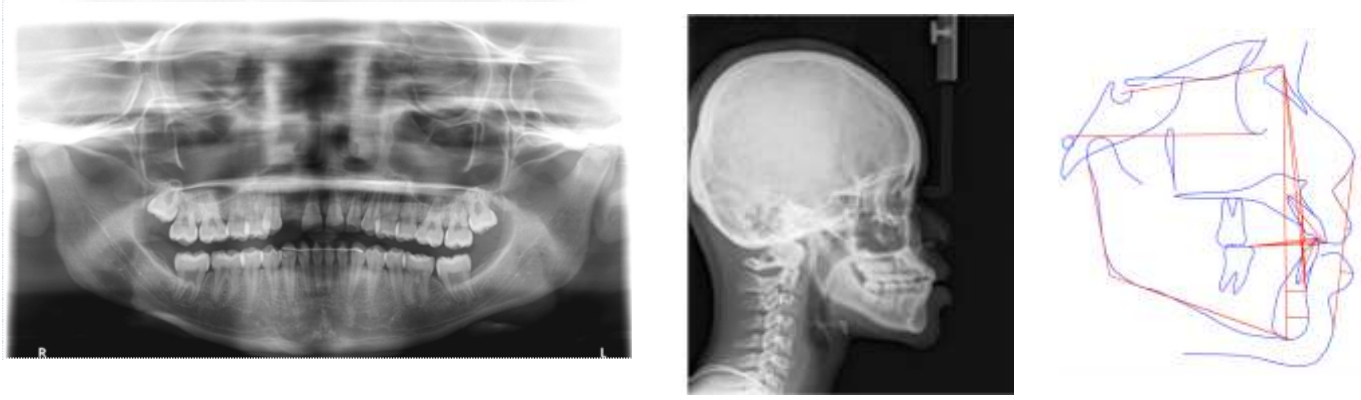

Figure 6: Post-treatment orthopantomogram, Lateral cephalometric radiograph and cephalometric tracing

Figure 7: Post-treatment study models

Discussion

The aims of the treatment were met at the end of treatment, and the patient was pleased with the result. Class I incisal, canine and molar relationships were achieved with a positive overjet and a good overbite. The occlusal and aesthetic effects were enhanced, and the facial profile significantly improved. As requested by the patient, a 1mm maxillary midline diastema was left. Although maxillary diastemas are a common aesthetic complaint in some races, in some African cultures, it is seen as a sign of beauty.[9,10]

Though many orthodontists are critical with 2nd molar extractions as they are noted to be poorly replaced by the 3rd molars, extraction of mandibular 2nd molars was employed in this case.[11] Comparing cases of lower second molar extraction to those of premolar or lower third molar extractions, Lin et al.[11,6] found that lower second molar extractions gave more space for the anterior teeth to move back to rectify anterior crossbites. This makes it easier for a class I molar relationship to be achieved and enables the eruption of the third molars into the extraction space to ensure that all eight premolars occlusally lock together, enhancing stability[11]. However, the timing is crucial when extraction of 2nd molars is being considered. Good third molar alignment is more likely if the second molars are extracted before the third molar roots are about one-third formed.[12] As in this case, the authors have come up with a novelle method for correcting mild skeletal class III malocclusions in patients with average to reduced lower anterior facial heights (LAFH) using the one couple system of forces. The intrusion arch (with a tip-back bend placed mesial to the molar) is ligated to a single point between the lower central incisors or between the lower central and lateral incisors. The posterior section of the intrusion arch is passed through the accessory tube on the molar bands and tightly cinched back. The one-couple system produces a pure intrusive force on the anterior segment and a distal tip back (anticlockwise) moment, and an extrusive force on the molars(posterior segment). The distal tipping of the posterior segment is enough to also tip the lower labial segment distally, thus correcting the crossbite. A resin-bonded bridge was fabricated by the restorative department to temporarily replace the congenitally missing # 12.

At the end of the treatment, anterior crossbite was corrected, Class I canine and molar relationship was obtained, and space for tooth #12 was regained and replaced by a prosthesis.

The orthopantomogram at the end of treatment showed good root parallelism and no iatrogenic root resorption. However, the alveolar bone was slightly

blunted in the lower molar region.

The patient's profile was noticeably improved with favourable treatment effects in cephalometric analysis. SNA and ANB increased while SNB decreased.

Interincisal angle, MMPA and LAFH increased slightly. A positive Wits appraisal value was obtained.

A fixed lingual retainer from 33-43 was bonded, and a mandibular thermoplastic retainer was given to maintain the achieved result. A maxillary Hawley retainer was given for the maxillary retention. The patient relocated abroad for further studies and thus was lost to recall.

Conclusion

This class III case was successfully managed with the one-couple system approach and extraction of lower second molars. Remarkable soft-tissue change and skeletal changes were achieved. The one-couple force system is often employed in the Department of Orthodontics and Paedodontics to treat mild to moderate class III patients with average to reduced facial proportions with reverse overjet. This has the advantage that premolars are left intact, and in cases where the third molars are erupted at the time of treatment, they are extracted instead of the second molars. The interdisciplinary approach in managing this patient ensured good occlusion, aesthetic smile, and long term stability.

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