

Comprehensive Orthodontic Treatment of Bilateral Ectopically Positioned Maxillary Canines: Techniques, Retention and Follow Up. Part 1

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Abstract

Bilateral ectopic eruption of canine teeth can be displaced from their normal position. Any permanent tooth may be ectopic, and the cause may be genetic or environmental or even combined. Orthodontic treatment is justified because ectopic canine teeth can move in the jaw bone in unpredicted directions and may cause damage and resorption to the adjacent teeth roots and bone. Orthodontic treatment is also justifiable for aesthetic reasons. Diagnosis and treatment of ectopically erupting permanent maxillary canines requires timely management by the orthodontist. Internal or external root resorption of teeth adjacent to the ectopic canine is the most common consequence [1]. Malocclusion with severe crowding is complicated and challenging to treat without extraction. Non-extraction treatment of ectopic canines can compromise the patient's profile specially if he or she possess a class III jaw relation. In this article we will present a case in which the extraction treatment approach will be utilized for ectopic or bilaterally displaced canines (BDC) in a patient with distinguished maxillary crowding and prognathic maxilla and mildly hyperdivergent growth pattern.

Keywords: *Ectopic Eruption; Maxillary Canines; Orthodontic Treatment*

Introduction

Ectopic buccally erupted maxillary canines are one of the most frequent conditions specialists may face in orthodontic practice. Palatally displaced canines (PDC) occur twice as frequently as buccally displaced ones [2].

However, buccally displaced canines are commonly seen in practice. The prevalence of permanent maxillary canine impaction or ectopic eruption in the general population is approximately 1 - 2% [3].

The main difference between the buccally displaced and the lingually displaced canine, erupted or failed to erupt, is an altered tooth size-arch length relationship.

Multiple etiological factors, local or systemic, play the rule of ectopic canines. No single etiology has been shown to explain the main cause of a majority of unusual eruptions or to show explanation of why it erupts labially or palatally. Environmental factors may take part in this anomaly during the long, complicated eruption path of a canine. Another possible elucidation is that a disturbance in the follicle of the unerupted tooth may enhance the direction of eruption and contribute to the ectopic occlusion of the canines [4].

Impactions of upper canines mostly occur in families with a genetic or familial pattern of inheritance. Peck and Peck suggested a multifactorial genetic pattern of inheritance for the anomaly [5].

Main etiologies include early loss of a primary tooth, lack of space, ankylosis, dilacerations of the root, neoplastic development and an awkward upper lateral root position in relation to the unerupted canine [6]. Canine ectopic eruption has been related to a genetic basis. This sometimes explains a recurring occurrence in families [7]. Since the normal eruption path of the permanent canine is slightly buccal to the line of the arch, reduced space in the canine area together with the close proximity of the adjacent teeth will prevent the canine from taking up its normal position in the arch and it will remain buccally displaced [8]. Diagnosis of eruption irregularities begins with clinical observations of the patient and on the regular visit to the primary health care general dentist. The first sign of ectopic eruption is seeing unerupted permanent canines when a patient's dental development appears average relative to the chronologic age. The amount of space in the arch for the unerupted and erupted ectopic canine, the morphology and position of the anterior teeth, the position and the amount of bone, the mobility of teeth [1] and the CBCT pictures and radiographic evaluation help to confirm the position of the canine, its apex, crown, and direction of longitudinal axis [9].

Clinical Case

16 year and 1 month old SJ. Chief Complaint: "I would like to fix my canines that stick out". Ethnicity is African American. Medical history is non-contributory. Last dental visit to the local dentist was 6 months ago. No habits recorded. Attitude towards treatment is excellent.

Facial records

Frontal view records: Facial Form are mesocephalic with mild scleral display, mild excessive lower third balanced. Balance fifth. Lips Size is full and mildly incompetent.



Figure 1

Profile view records: Soft tissue profile is convex. Nose is within the normal limit. Acute nasolabial angle. Deep mentolabial angle. Everted lower lip. Lip Position according to Ricketts Esthetic Plane. Upper lip and lower lip are mildly retruded 1.3 mm, 4.5 mm respectively. Mandibular plane is mildly hyperdivergent. The throat angle and neck drape are within the normal limits.

Smiling view records: Incisor display 70%. Non-consonant smile. The buccal corridors are full. Maxillary midline in relation to the face is shifting to the right by 1 mm. Mandibular midline in relation to the maxilla is shifting 1 mm to the right. Chin position to the face is on.



Figure 2



Figure 3

Dental records



Figure 4: Photographic picture.

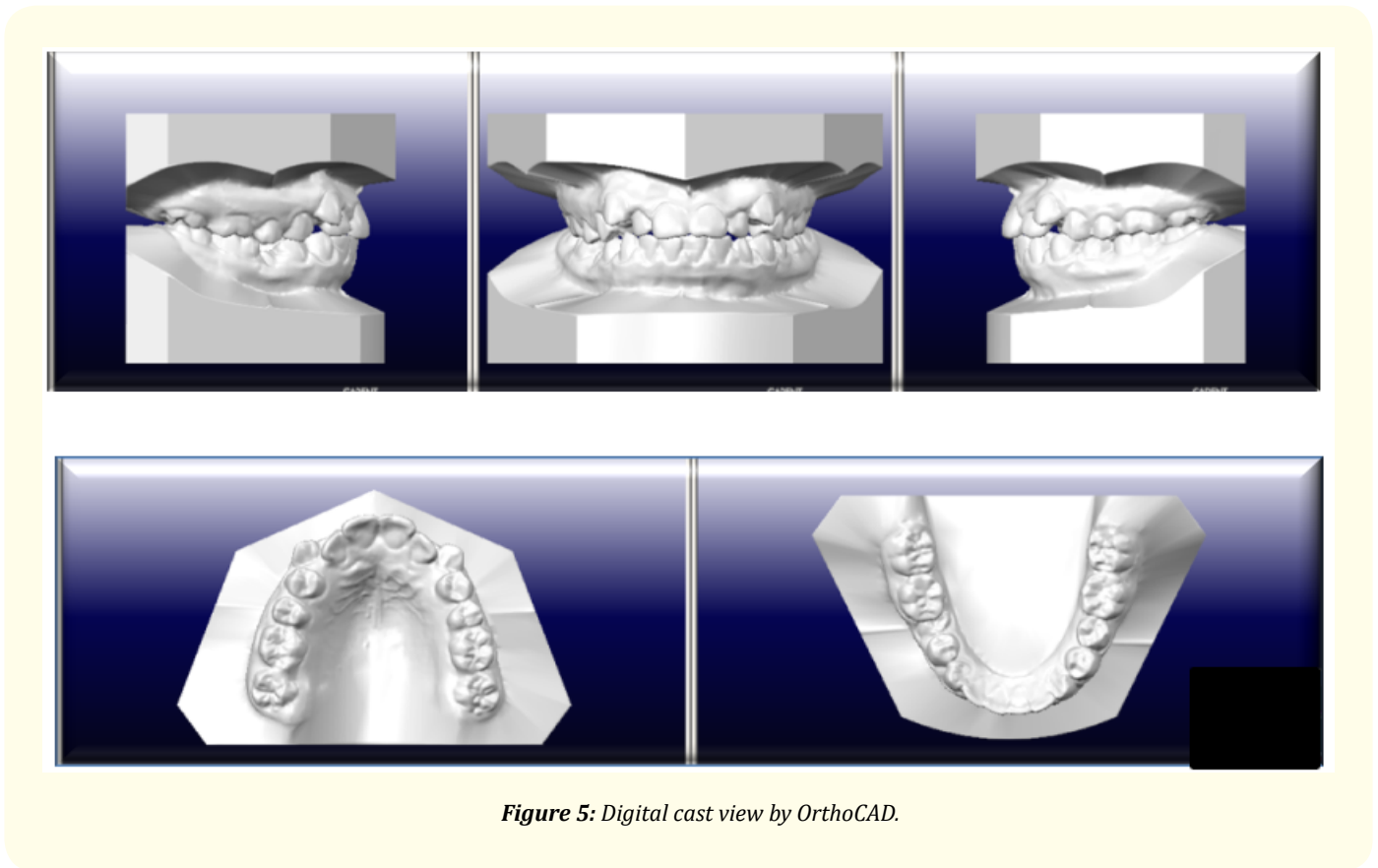


Figure 5: Digital cast view by OrthoCAD.

Frontal view: Angle Class III End-on. Crossbite noted on upper right lateral incisor with the lower right lateral incisor and lower right canine. Buccally positioned upper canines and fracture in upper left central incisor. Moderate oral hygiene.

Right view: Angle Class III End-on. Class II (2 mm) in canine relationship. Overjet and overbite measurements are both 0 mm. Curve of Spee is moderate.

Left view: Angle Class III End-on. Class III (2 mm) in canine relationship. Overjet and overbite measurements are both 0 mm. Curve of Spee is moderate.

Maxillary occlusion: All permanent teeth are present including two wisdom teeth. Crowding discrepancy is 7 mm. The arch is u-shaped with no restorations or active caries present.

Mandible occlusion: All permanent teeth are present including the third molars. The mandibular right premolar is crowded out with 5 mm crowding and a mild curve of Wilson. The arch is u-shaped. No restorations or active caries are present.

Bolton Analysis

Bolton index analysis was calculated on the digital cast which is accepted by the ABO model examiners [10].

Results shows 0.2 mm Anterior Excess and 3.5 mm Total Excess.

X-ray records

Panoramic X-ray

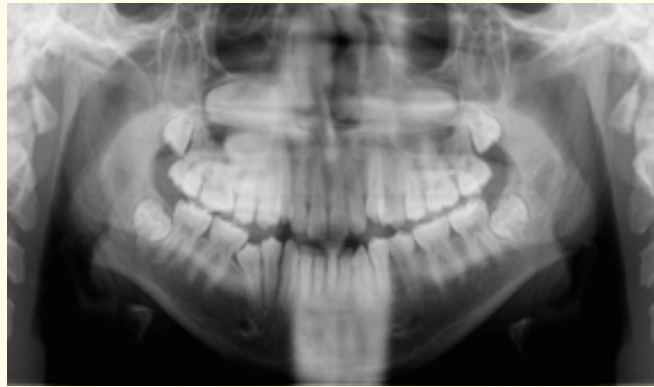


Figure 7: Mild flattening of right condylar head. Impacted Lower Right Second premolar.
Developing maxillary and mandibular 3rd molars.

Cephalic X-ray

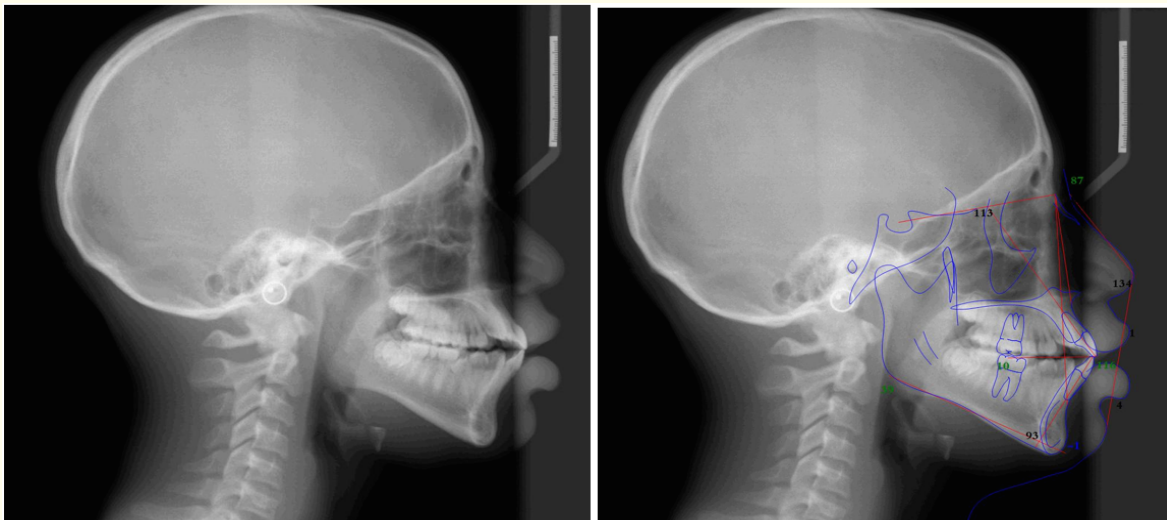


Figure 8: COGS Analysis (Cephalometric for Orthognathic surgery) [11].

ABO Analysis

The values and numbers in the tables above give off multi stars sign, as red flags, as it goes further away from standard deviation data. Dolphin Imaging & Management Solutions specialized Orthodontic software were utilized.

Cranial base				
Ar-PTM (HP) (mm)	28.9	37.1	2.8	-2.9 *
PTM-N (HP) (mm)	48.6	52.8	4.1	-1.0 *
Horizontal (skeletal)				
N-A-Pg (°)	9.7	3.9	6.4	0.9
N-A (HP) (mm)	3.5	0.0	3.7	0.9
N-B (HP) (mm)	-1.2	-5.3	6.7	0.6
N-Pg (HP) (mm)	-2.4	-4.3	8.5	0.2
Vertical (skeletal, dental)				
N-ANS (perp HP) (mm)	44.8	54.7	3.2	-3.1 *
ANS-Me (perp HP) (mm)	71.8	64.3	3.5	2.1 *
PNS-N (perp HP) (mm)	48.2	53.9	1.7	-3.3 *
Mand Plane - HP (°)	31.7	23.0	5.9	1.5 *
U1 - NF (perp NF) (mm)	29.5	30.5	2.1	-0.5
L1 - MP (perp MP) (mm)	44.3	45.0	2.1	-0.3
U6 - NF (perp NF) (mm)	24.5	26.2	2.0	-0.8
L6 - MP (perp MP) (mm)	31.3	35.8	2.6	-1.7 *
Maxilla, mandible				
PNS-ANS (HP) (mm)	54.3	57.7	2.5	-1.3 *
Ar - Go (mm)	37.1	52.0	4.2	-3.5 *
Go - Pg (mm)	81.6	83.7	4.6	-0.4
B-Pg (MP) (mm)	5.7	8.9	1.7	-1.9 *
Ar-Go-Gn (°)	126.1	119.1	6.5	1.1 *
Dental				
OP - HP (°)	3.0	6.2	5.1	-0.6
A-B (OP) (mm)	-2.3	1.1	2.0	-1.7 *
U1 - NF (°)	116.3	111.0	4.7	1.1 *
L1 - GoGn (°)	95.2	95.0	5.2	0.0

Figure 9: According to this analysis there is a decreased anterior maxillary height, decreased posterior maxillary height and a decreased ramus height.

Maxilla to Cranial Base				
SNA (°)	87.0	82.0	3.5	1.4 *
Mandible to Cranial Base				
SNB (°)	82.3	80.9	3.4	0.4
SN - MP (°)	36.0	32.9	5.2	0.6
FMA (MP-FH) (°)	30.4	26.9	4.5	0.8
Maxillo-Mandibular				
ANB (°)	4.7	1.6	1.5	2.1 **
Maxillary Dentition				
U1 - NA (mm)	6.8	4.3	2.7	0.9
U1 - SN (°)	112.9	108.4	5.5	0.8
Mandibular Dentition				
L1 - NB (mm)	11.8	4.0	1.8	4.3 ****
L1 - MP (°)	93.0	95.0	7.0	-0.3
Soft Tissue				
Lower Lip to E-Plane (mm)	4.5	5.0	2.0	-0.3
Upper Lip to E-Plane (mm)	1.3	3.0	2.0	-0.8

Figure 10: This analysis shows a prognathic maxilla, mildly hyperdivergent, Class II according to Wits, proclined and protruded maxillary incisors and protruded mandibular incisors.

Problem List

Soft tissue

- Convex facial profile.
- Incompetent lips.

Hard tissue

- Prognathic Maxilla.
- Mildly Hyperdivergent growth pattern.

Dental

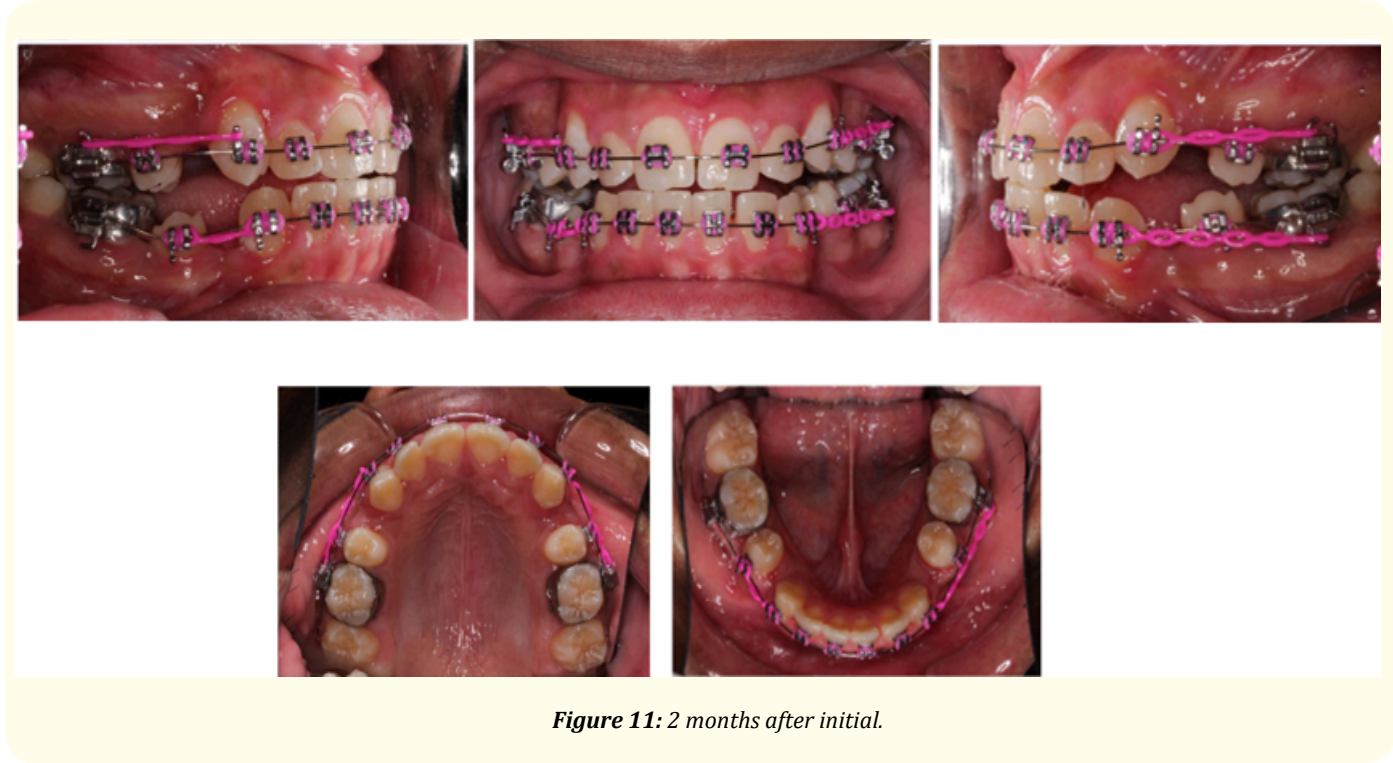
- Poor oral hygiene.
- Bilateral Class III-Molar End on.
- 2 mm Class II Canine on right.
- 2 mm Class III Canine on left.
- Non-coincident Midlines.
- Buccally positioned maxillary canines.
- Partial anterior crossbite LR2/3 with UR2.
- Crowded out right mandibular second premolar.
- Edge to edge anterior bite.
- Severe bilateral Curve of Spee.
- Moderate maxillary and mandibular crowding.
- Chipped maxillary left central incisor.

Treatment objectives and goals

- Improve lip incompetence.
- Bring buccally positioned maxillary canines into arch.
- Establish proper overbite and overjet.
- Obtain Class I Molar and obtain Class I canine relationship bilaterally.
- Coordinate midlines.
- Long-term stability.

Treatment objectives and goals

Band the upper and lower first molars. Bond the upper and lower second premolars, excluding the upper and lower first molars that should be referred for extraction. Utilization of upper and lower archwire NiTi 0.014 then 0.016 for leveling and aligning, vs. sectional SS mechanics or modified TMA wire, or vertical close loop or T loop to bring maxillary canines into arch level. Elastics and closing NiTi coil aids for canine retraction and closing the space. Space closure on stainless-steel SS using sliding mechanics and closing loops. Obtain class I molar and canine relationships using elastics. Then coordinate the midlines. Obtain upper and lower root correction 0.017 x 0.025 NiTi and finishing with suitable torqueing with 0.019 x 0.025 ss. Then the labially placed canines will be corrected and a good occlusal relationship will be achieved. Detailing and finishing will be undertaken with MTA archwire. Upper and lower removable Hawley prostheses will be fabricated for retention.



Progress of using modification with stainless steel wire by excluding the upper anterior incisors after the first phase of leveling and aligning, and holding them together with continuous steel tie in order to bring the maxillary canine to the arch and avoiding excessive overbite and lateral openbite. [Systemized orthodontic treatment mechanics].

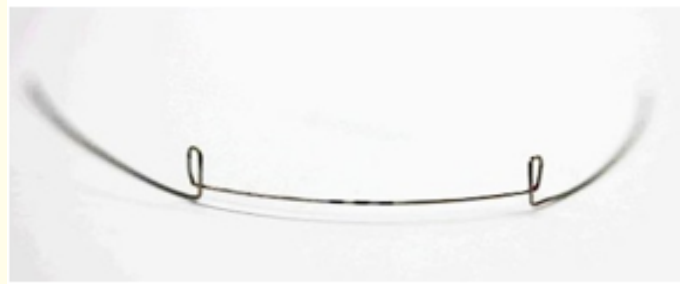


Figure 13: Modified wire vertical closed loop.

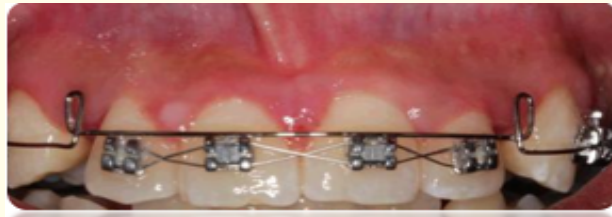


Figure 14: 6 months after.



Figure 15: 7 months after bonding



Figure 16: 9 months on braces.

Discussion

In the above case report, adequate progress was accomplished by the extraction decision approach. If the four premolars were not extracted, it might have resulted in proclination of the maxillary and mandibular anterior teeth with unwanted outcomes on the patient's profile and even speech. Utilization of the extraction treatment approach made it much easier to correct the crowding by having reasonable space.

Crowding is found in a few palatally displaced canine cases, and a greater percentage of the PDC occurs when excess space is available in the dental arch [12].

In opposition to PDC of the maxillary canines has been firmly associated affiliated with crowding [6].

Jacoby, *et al.* reported that almost 17% of buccally displaced canine subjects presented adequate space for eruption in the mouth.

Conclusion

An accomplishment of a perfect result for a patient with ectopic canines and severe crowding is a challenging task for an orthodontist and if not planned well may take extra unnecessary time. Proper treatment of such a patient requires rigorous treatment planning by the specialist. The decision to extract the premolars was made to avoid a fuller mouth with a bimaxillary, ethnically expected protrusion and a convex face profile. Extraction of the premolars was acceptable aesthetically, functionally, and had more stable results in this case. In light of the attention lately being paid to aesthetics as a primary treatment goal for the patient, today's treatment plans for patients with ectopic canine must consider the functional and aesthetic importance in orthodontic outcomes.

PART II of this case report will include correction of molars relationship and canines' relationships to obtain a class I relation. It will include finishing and detailing and the improvement of the profile based on the cephalometric analysis as well as the retention means and how to avoid relapses and finally patient instructions to keep their perfect smile.

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