# A Modified Palatal Appliance for Forced Eruption of Impacted Central Incisor

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*A 9-year-old female was referred by her general dentist for an evaluation of an impacted maxillary left central incisor. Her maxillary left primary incisors showed crossbites and her right central incisor showed an edge-to-edge bite which caused gingival recession on the mandibular right central incisor. After treatment, the impacted maxillary central incisor erupted successfully. An optimal overbite and overjet were also achieved, and her gingival recession was improved.*

***Keywords***: *Impacted central incisor, a modified palatal appliance, forced eruption*



## INTRODUCTION

Impaction is defined as the condition where a tooth fails to erupt into the dental arch and where it has no potential to erupt. While the incidence of permanent tooth impaction in the dental arch is relatively common, the prevalence of maxillary central incisor impaction is relatively rare, only from 0.06% to 0.2% in the general population.[1] The etiology of an impacted maxillary central incisor is multifactorial, involving both hereditary and environmental factors such as a lack of space, ankylosis, cysts, supernumerary teeth, cleft palate, and trauma.[2] Both missing and impacted maxillary incisors have a negative impact on dental esthetics and create the potential for speech difficulties and aberrant tongue posture. Moreover, the possibility for promoting psychological problems is present, not only for the patient but for the parents as well. Accordingly, early diagnosis and interceptive treatment is critical to addressing these issues with optimal esthetic and functional outcomes. The following case is of a young girl who had an impacted central incisor that was treated with a modified Nance appliance with an extended arm.

### Clinical Case

A 9-year-old female was referred by her general dentist for an evaluation of an impacted left central incisor. Medical history was not remarkable. An intraoral clinical examination exhibited that she was in the early mixed dentition stage with delayed eruption of her maxillary left central and lateral incisors. She presented a Class I molar relationship on both sides. Her maxillary left primary incisor exhibited a crossbite and her right central incisor presented an edge to edge bite which caused gingival recession on the mandibular right central incisor. Her maxillary dental midline was deviated by approximately 1 mm to the left (Fig. 1).

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**Fig. 1 Pre-treatment facial and intraoral photographs.**

A panoramic radiograph showed a supernumerary tooth located on the coronal portion of her maxillary left central incisor. The maxillary left lateral incisor overlapped the left canine. From a cone-beam computed tomography (CBCT) image, the supernumerary tooth was located on the lingual side of the impacted central incisor and the lateral incisor was located on the palatal side of the maxillary left canine. Cephalometric analysis revealed a skeletal Class I (ANB: 0.9°) with hypodivergent growth pattern (SN-MP: 26.5°). Her maxillary right incisor was slightly retroclined (U1 to SN: 102.2°) and mandibular incisors showed proclination (IMPA: 105.7°) (Fig. 2 and Table).

**Fig. 2 Pre-treatment radiographs.**

**Table.1 Cephalometric measurements**

| Measurement | Japanese norm | Pre-treatment | Post-treatment | 2y-Retention |
|---|---|---|---|---|
| SNA (°) | 82.0 | 79.7 | 79.2 | 77.9 |
| SNB (°) | 80.0 | 78.9 | 78.0 | 77.1 |
| ANB (°) | 2.0 | 0.9 | 1.2 | 0.9 |
| Wits (mm) | 1.1 | -4.2 | -2.8 | -1.7 |
| SN–MP (°) | 34.0 | 26.5 | 28.6 | 28.4 |
| FH–MP (°) | 28.2 | 22.0 | 22.7 | 21.9 |
| LFH(ANS-Me/N-Me)(%) | 55.0 | 58.2 | 55.0 | 53.8 |
| U1–SN (°) | 104.0 | 102.2 | 108.6 | 107.1 |
| U1–NA (°) | 22.0 | 22.5 | 29.4 | 29.2 |
| IMPA (°) | 90.0 | 105.7 | 97.8 | 99.9 |
| L1–NB (°) | 25.0 | 31.0 | 24.4 | 23.8 |
| U1/L1 (°) | 124.0 | 125.6 | 125.0 | 126.2 |
| Upper lip to E-plane (mm) | 1.2 | -3.0 | -3.1 | -4.5 |
| Lower lip to E-plane (mm) | 2.0 | -1.8 | -1.9 | -2.8 |

## Treatment Progress

Early diagnosis is crucial for scheduling the best time to start treatment to allow for normal eruption of permanent teeth by extraction with retained primary and supernumerary teeth.[3] The treatment objectives in this case were to monitor the eruption of the permanent teeth and extract the supernumerary tooth and remaining primary teeth in order to facilitate normal eruption of the permanent teeth to thus obtain optimal overbite and overjet.

The supernumerary tooth near the central incisor was extracted to clear a path for eruption. To bring the impacted central incisor to the occlusal plane, a modified Nance appliance with an extended arm was used for forced eruption (Fig. 3). Approximately one year later, the impacted tooth erupted and tip-edge brackets (TP Orthodontics, LaPorte, Ind) were bonded with 0.022 X 0.028-in preadjusted appliances with a 0.014-in nickel-titanium archwire. After leveling and aligning, an 0.018-in stainless wire with open coil spring was used to gain space for the lingually displaced maxillary left lateral incisor. To control the torque, the maxillary left lateral incisor was bonded upside down. To align the maxillary left central and lateral incisors and to control the torque of the teeth, an auxiliary wire was engaged to the vertical slots of the teeth (Figs. 4-7). After 3 months, the torque was controlled and the fixed orthodontic appliances were debonded. Fixed retainers were placed in the mandibular arch from canine to canine and in the maxillary arch from lateral incisor to lateral incisor after debonding. Wraparound removable retainers were delivered in both arches to achieve long-term stability of the successful tooth movement. Total treatment time for this patient was 19 months (Fig. 8).

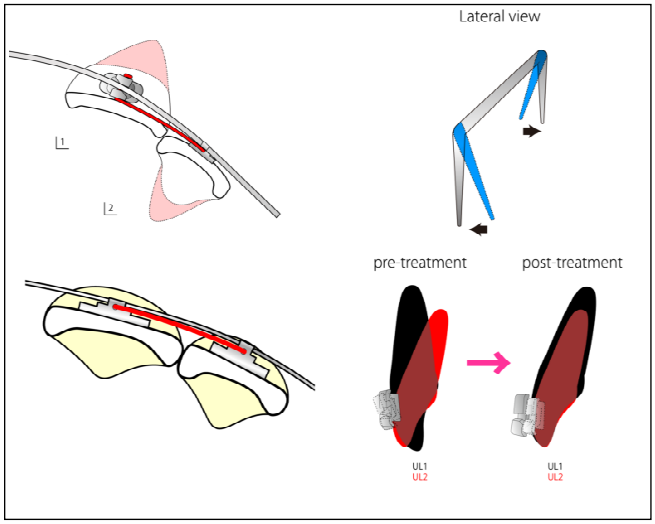
**Fig. 3 Progress intraoral photographs showing the modified Nance appliance with an extended arm.**

**Fig. 4 Progress intraoral photographs showing the lingually displaced maxillary left lateral incisor. The patient's fixed orthodontic treatment started when she was 10 years and 5 months old.**

**Fig. 5 Progress intraoral photographs after 6 months of treatment.**

**Fig. 6 Progress intraoral photographs after 16 months of treatment.**

**Fig. 7 Auxiliary torquing spring (0.016-in Australian wire) to control the root movements of central and lateral incisors.**




## Treatment Results

Post-treatment records revealed that the treatment objectives were achieved. Facial photographs showed improved smile esthetics. The Class I molar relationships were maintained and Class I canine relationship was accomplished. An optimal overbite and overjet were also achieved (Fig. 8).

A post-treatment panoramic radiograph showed acceptable root parallelism except for a dilacerated maxillary left lateral incisor. There were no significant signs of bone resorption and the anterior teeth demonstrated no signs of significant apical root resorption. The patient's third molars were developing except for the mandibular right third molar. Post-treatment lateral cephalometric analysis and superimposition revealed no significant skeletal changes (ANB: 1.2°) and her mandibular plane was slightly increased (SN-MP: 28.6°). Compared with pre-treatment, the maxillary incisors were proclined (U1-SN: 108.6°) and the mandibular incisors were retroclined (IMPA: 97.8°). (Figs. 9 and 10, and Table). At the 2-year follow-up, the patient had stable occlusion and the results of the orthodontic treatment were maintained (Figs. 11 and 12).

**Fig. 8 Post-treatment facial and intraoral photographs.**

**Fig. 9 Post-treatment radiographs.**

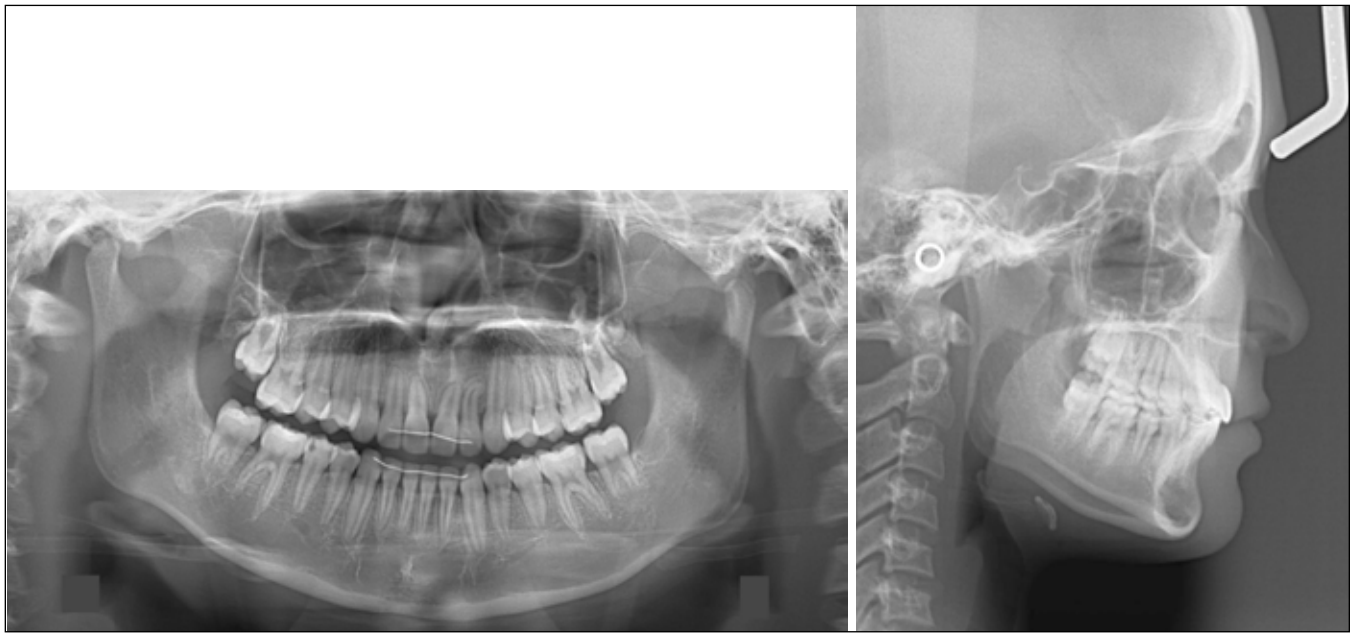
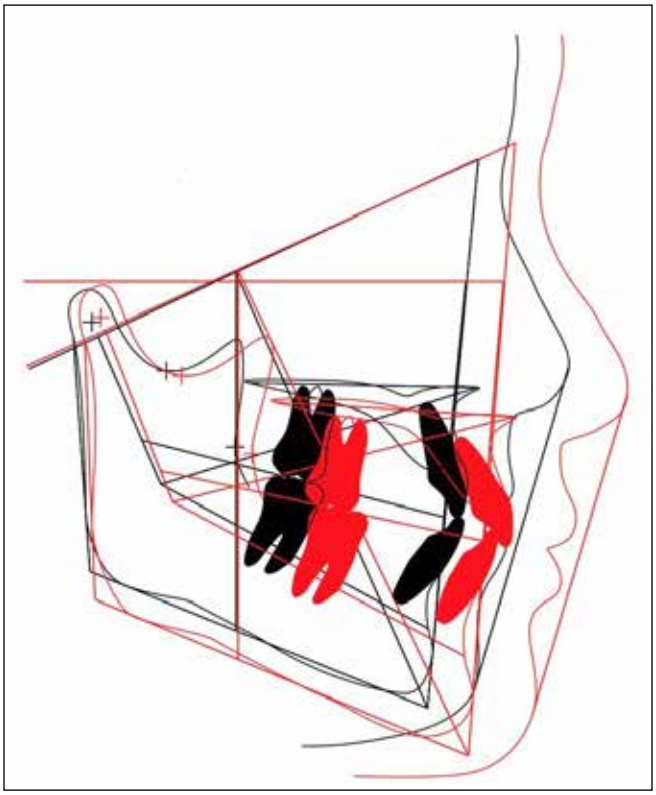


**Fig. 10 Cephalometric superimposition. Black, pre-treatment; red, post-treatment.**



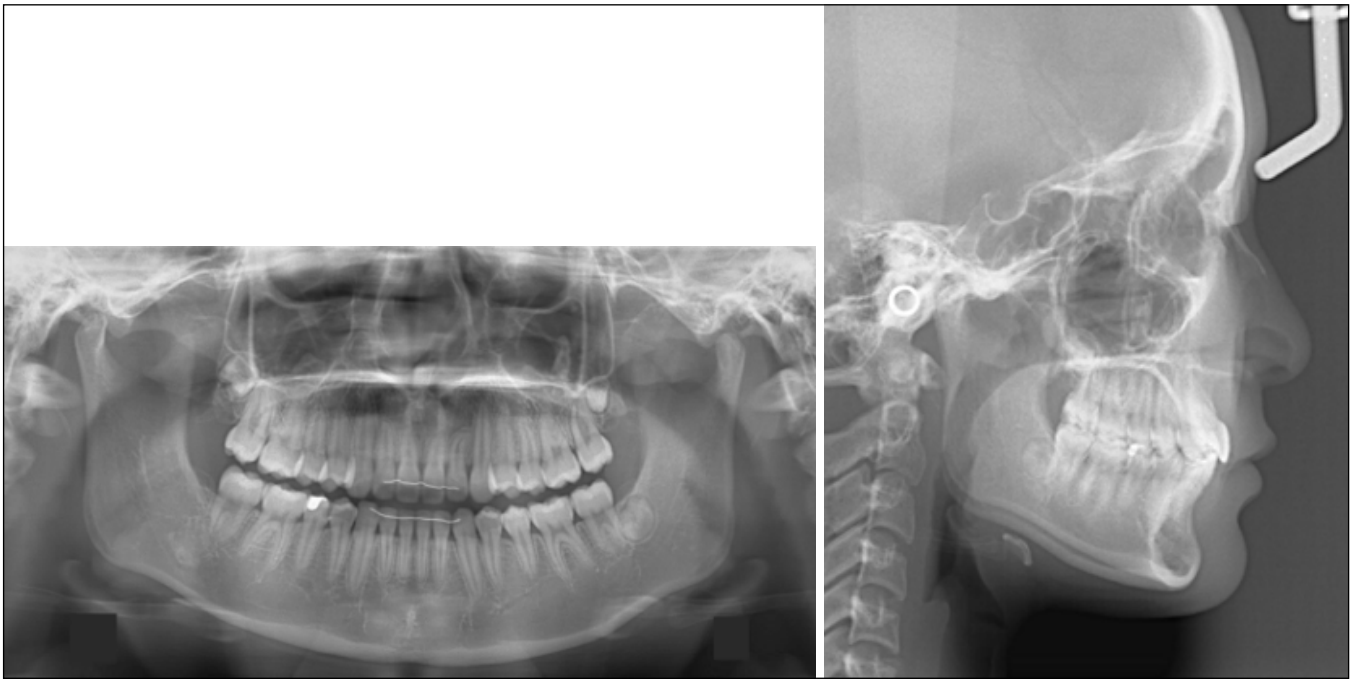
## DISCUSSION

A number of approaches have been reported to correctly position impacted maxillary incisors into the dental arch. Several authors[2,4,5] have suggested surgically exposing impacted incisors and using fixed expansion appliances including bracketing of both permanent and primary teeth to serve as anchorage for orthodontic extrusion. These approaches can prove to be challenging because placing fixed appliances at an early age can cause compliance and hygiene issues. In addition, in cases with patterns of generalized delayed eruption, it is often more prudent to limit the use of fixed appliances, and direct treatment application specifically to the impacted tooth/teeth to prevent further root resorption of the adjacent teeth. Therefore, the treatment of impacted maxillary permanent central incisors poses a significant clinical challenge and requires particularly skilled management when it involves very young and anxious parents.

The most commonly reported methods for establishing traction for extruding impacted maxillary incisors have involved the placement of fixed appliances to create anchorage. This is followed by the alignment and stabilization of the maxillary arch with fixed appliances and the subsequent surgical exposure of the impacted teeth with placement of a bonded attachment, secured to the archwire and adjusted over time.[4,6] In our case, the approach was to surgically expose the impacted maxillary left central incisor and use a modified Nance appliance with an extended arm to serve both as anchorage and to provide active forces to extrude the tooth and thus achieve the principal clinical objective without the need for additional fixed

**Fig 11 Post-retention facial and intraoral photographs 24 months after debonding.**

**Fig 12 Post-retention radiographs 24 months after debonding.**



auxiliary appliances. Following successful extrusion of the central incisor, a coil spring with reciprocal anchorage was placed to create adequate space for orthodontic positioning of the left lateral incisor that had erupted palatal to the maxillary left permanent canine. In the finishing stage, an auxiliary torquing wire was used to control the root movements of the central and lateral incisors.

For this patient, the approach demonstrated minimal use of appliances and permitted a delay in the start of comprehensive fixed appliance therapy. The final results of the treatment outcome illustrates optimal esthetic and functional objectives can be attained by treating impacted maxillary incisors with minimal appliances, specifically using a modified Nance appliance with an extended arm.

## CONCLUSION

The impacted maxillary central incisor has been successfully positioned with a modified palatal appliance. In this case, the patient's anterior coupling and gingival recession were significantly improved in 19 months of treatment.

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