



# Forced eruption of a palatally impacted and transposed canine with a temporary skeletal anchorage device

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Treatment of palatally impacted and transposed canines is challenging for both orthodontists and oral surgeons. To treat a maxillary canine impaction without risking damage to adjacent teeth, it is necessary to use cone-beam computed tomography for proper localization and treatment planning. In this case report, a palatally impacted canine was initially retracted distally with a microimplant inserted in the palatal slope and then was moved buccally into its ideal position. The patient's occlusion and smile esthetics were significantly improved after orthodontic treatment. (*Am J Orthod Dentofacial Orthop* 2017;151:1148-58)

Maxillary canine impaction is a fairly common problem requiring surgical-orthodontic treatment; it is more common in female patients than in male patients and has a definite tendency toward being unilateral rather than bilateral.<sup>1-3</sup> Ranked after third molar impaction, the maxillary canine is the second most frequently impacted tooth with an incidence of 0.92% to 1.7%, most often with a palatal path of eruption. Although the cause of impacted maxillary canines is not exactly known,<sup>4</sup> it can be classified into 4 distinct groupings: local hard tissue obstruction, local pathology, departure from or disturbance of the normal development of the incisors, and hereditary or genetic factors.<sup>5</sup>

Tooth transposition is defined as a reversal of position with adjacent teeth in the same quadrant, particularly at the roots.<sup>6,7</sup> Transposition of maxillary anterior teeth is uncommon and is a special challenge diagnostically and therapeutically. Maxillary tooth transpositions can be classified into 5 types on the basis of anatomic factors.<sup>6</sup> Maxillary canines are the most commonly involved teeth,<sup>6,8,9</sup> and maxillary canine-lateral incisor transposition is the second most common type. The most frequent type of transposition is the reversal of a maxillary canine and a first premolar.<sup>10-12</sup> Although the etiology of transposition is still speculative, some factors such as trauma, heredity, transposition of the analog of the teeth during odontogenesis, mechanical interferences, migration of teeth away from their normal path of eruption, and early loss or prolonged retention of deciduous teeth have been related to tooth transposition.<sup>6,8-12</sup> The most common etiologic causes for maxillary canine-lateral incisor transposition are environmental factors such as dentofacial trauma in the deciduous dentition rather than genetic factors.<sup>6,11</sup>

There are several potential treatment options for impacted and transposed teeth: tooth extraction, surgical repositioning, a surgical-orthodontic approach, and dental implant replacement.<sup>4,10-20</sup> The standard procedure is surgical exposure and forced orthodontic eruption.<sup>21</sup> If a palatally impacted canine is transposed close to the incisor roots, a buccally directed orthodontic force should be changed to prevent root damage and move the canine away from the root obstacle.<sup>22</sup> Therefore, many techniques have been proposed to move the impacted tooth in the desired direction to prevent contact with other roots and then move it buccally into occlusion.<sup>16-20,23,24</sup>

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**Fig 1.** Pretreatment facial and intraoral photographs.

Assessing the actual position of an impacted canine is an important factor affecting the total treatment time and the final position of the canine in the oral cavity.<sup>25</sup> Cone-beam computed tomography (CBCT) is essential for determining the feasibility of and proper access for a surgical procedure, as well as the best direction in which to apply orthodontic forces.<sup>26-30</sup> We present a patient to demonstrate an impacted and transposed maxillary left canine. It was diagnosed with CBCT and treated with a temporary skeletal anchorage device to accomplish the desired correction.

#### **DIAGNOSIS AND ETIOLOGY**

An 11-year-old girl came to the clinic at Wonkwang University Daejeon Dental Hospital with the chief complaint of delayed eruption of her maxillary left canine. She was in good health with no history of dental trauma. She had a well-balanced and symmetrical face, but her appearance was degraded by spacing and malpositioned teeth upon smiling. Intraorally, she had a slight Class II molar relationship on the left side with spacing

issues in both arches. Her maxillary dental midline was shifted to the left of the facial midline. The maxillary left central incisor tilted to the left side, and the maxillary left lateral incisor showed evidence of gingival recession because of thin attached gingivae (Figs 1 and 2).

The panoramic and periapical radiographs showed transposition of the impacted maxillary left canine with the maxillary left lateral incisor. The canine tipped mesially, and the maxillary left central incisor tipped distally. The mesial and distal alveolar process, especially on the mesial side of the maxillary left lateral incisor region, had a deficiency in vertical development. The third molars were present in the maxillary arch (Fig 3).

A lateral cephalometric assessment showed a Class I hypodivergent skeletal pattern with normally inclined incisors. Further CBCT findings (3-dimensional image analysis software, Simplant; CEP Tech, Seoul, South Korea) showed that the maxillary left canine was impacted on the palatal side and transposed with the maxillary left lateral incisor. The canine was mesially inclined and located between the left central and lateral incisors (Figs 3 and 4; Table).

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