

Orthodontic Treatment of A Patient With Bilateral Transposed Maxillary Canine

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SUMMARY

An 11-years old male patient whose maxillary canines were erupting between first and second premolars was referred to our clinic for treatment. In the evaluation of panoramic radiograph, it was determined that bilateral maxillary canines were completely transposed with first premolars. 3 dimensional (3D) cone-beam computerized tomography (CBCT) was taken to observe the positions of the roots and to detect whether it would be possible to place the canines to their correct positions (between lateral incisor and first premolar) with orthodontic treatment. In the 3D tomographic evaluation it was determined that the roots of the canines were placed between the roots of the premolars and they were in vestibule position, the roots of the first premolars were in palatal position. However, it was detected that the canines' roots would come into contact with the roots of the first premolars during canine mesialization so we planned to insert the canines between the premolars in order to prevent the risk of root resorption.

Key words: Tooth transposition, 3D cone-beam tomography

ÖZET

Çift taraflı transpoze maksiller kanin dişi olan bir hastanın ortodontik tedavisi

Maksiller kanin dişleri birinci ve ikinci premolar dişler arasından sürmekte olan 11 yaşındaki erkek hasta tedavi için kliniğimize başvurmuştur. Panoramik radyografinin değerlendirilmesinde, çift taraflı kanin dişlerin birinci premolarlar ile bütün olarak transpoze olduğu belirlenmiştir. Köklerin konumlarını belirlemek ve ortodontik tedavi ile kanin dişleri doğru yerlerinde (lateral kesici diş ve birinci premolar arası) konumlandırmanın mümkün olup olmadığını saptamak için üç boyutlu (3D) cone-beam bilgisayarlı tomografi (CBCT) alındı. 3D tomografik değerlendirmede; kaninlerin köklerinin premolarları kökleri arasında konumlandığı ve vestibül pozisyonunda olduğu, birinci premolarları köklerinin ise palatinal konumunda olduğu belirlendi. Ancak kanin mezyalizasyonu sırasında, kaninlerin köklerinin birinci premolarlar ile temas edebileceği saptandı, bu nedenle kök rezorpsiyon riskini engellemek için kaninlerin premolarların arasına yerleştirilmesi planlandı.

Anahtar kelimeler: Diş transpozisyonu, 3D cone-beam tomografi

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Introduction

Transposition is defined as an unusual type of ectopic eruption where a permanent tooth develops in the position normally occupied by another permanent tooth. A possible explanation for tooth transposition would be an exchange in position between developing tooth (1-4). A clear and objective definition of tooth transposition has been reported by Peck (5) as a dental anomaly characterized by the exchange of position between two adjacent teeth, especially in relation to their roots, or development and eruption of a tooth in a position normally occupied by a nonadjacent tooth. Dentofacial trauma in the deciduous dentition, with subsequent drifting of the developing permanent teeth has been reported to be the most common etiological factor (1,2).

Transposition is a relatively rare dental anomaly that affects less than 1% of the population. It affects the maxillary dentition more frequently than mandibular dentition (6,7). Orthodontic treatment of a transposition can be performed by different modalities: aligning the involved teeth, maintaining them in their transposed positions, extracting one or both transposed teeth, or moving them to their correct anatomic position in the arch (8,9). The difficulty of resolving the transposition is the risk of root interference as the canine passes around the transposed neighbor tooth. The interference could lead to significant root resorption and subsequent pathologic tooth mobility of the affected teeth. However, resolving the transposition is ideal for esthetics and function. The treatment decision depends on the age at which the transposition is discovered, as well as the severity and completeness of the anomaly (9,10).

In the presented case, patient's bilateral maxillary canines were transposed with the first premolars. The root inclination of



Figure1- Intraoral photographs of the patient before treatment



Figure2- Panoramic radiograph of the patient revealing the transposed canines



Figure3- 3D tomographic images of the transposed teeth

the transposed canines was evaluated by 3 dimensional (3D) cone-beam computerized tomography (CBCT). The aim of this case report was to describe the orthodontic treatment planning via 3D CBCT and to present the orthodontic treatment results.

Case report

A 12-years old male patient whose maxillary canines were erupting between first and second premolars was referred to our clinic (Fig. 1). In the panoramic radiographic examination, it was determined that bilateral maxillary canines were completely transposed with first premolars (Fig. 2). 3D tomography was taken to observe the positions of the roots and to detect whether it would be possible to place the canines to their original position (between lateral incisor and first premolar) with orthodontic treatment. 3D CBCT evaluation revealed complete transposition with the roots of the canines placed between the roots of the premolars. Canines' roots were in vestibule position, while the roots of the first premolars were in palatal position (Fig. 3). However, it was detected

that the canines' roots would come into contact with the roots of the first premolars during canine mesialization so it was decided to position the canines between the premolars in order to prevent the risk of root resorption.

0.18 inch brackets were bonded and after the leveling phase with 0.16 inch nitinol arch wire, 0.16x0.16 inch stainless steel arch wire was applied and open coil spring was inserted between right premolars so as to mesialize the first premolar and distalize the second premolar. On the left side, since the second premolar hadn't erupted yet, first premolar was mesialized by applying force via elastic chain. At the end of orthodontic treatment, first premolars were placed near lateral incisors and canines were positioned between first and second premolars (Fig. 4).

Discussion

Tooth transposition is a rare and severe positional anomaly that occurs more often in the maxilla (6,7). Although the etiology of the transposition is still unclear, genetic interchange



Figure 4- Intraoral photographs of the patient after treatment

in the position of the developing tooth buds, lack of deciduous canine root resorption, mechanical interferences to erupting permanent teeth, early loss of deciduous teeth, and prolonged retention of deciduous teeth have been reported as probable cause of the phenomenon. (1,2). Transposition may be complete or incomplete. Incomplete transposition is a condition describing an interchange in the positions of the crowns of two permanent teeth within the same quadrant of the dental arch, while the root apices remain in their relative positions. Complete transposition is a similar situation in which both the crowns and the entire root structure are transposed (8). In the presented case, there was bilateral maxillary first premolar and canine transposition. Literature review revealed that many transposition cases have been reported, and correction of transposed teeth in the maxilla has been described frequently (1,5,9). However, bilateral transposition of teeth is a rare condition (10).

Malocclusions related with transposed teeth can be treated with orthodontic disciplines and diagnosis of the transposition during the early stages is the key point in the success of the treatment. Achievement of optimal function and esthetics in cases with tooth transposition requires care in the design of the treatment. When the maxillary canine is transposed with the first premolar, the transposed order can be maintained with no esthetic or functional problems but when the maxillary lateral incisor is involved, transposition should generally be corrected for esthetic reasons (1,4,8,10). The repositioning of the transposed teeth to their normal anatomic sequence in the arch is challenging and extremely complex when transposition is complete. Multiple factors, such as the position of the root apices, dental and facial esthetics, acceptable occlusion, patient age, motivation, expected compliance, and the extra length of treatment time, should be carefully considered in making treatment decisions (9). In the presented case roots of the transposed canine and the premolars were carefully detected by 3D tomography and it was decided to position the canines between the premolars. Otherwise, trying to reposition these teeth to their normal anatomic places in the dental arch would be harmful since contact of the roots was inevitable.

There have been reports of successful use of CT in the localization of impacted canines (11). Ericson and Kurol (12) reported that when the clinicians were given additional information from a CT scan, they changed their treatment plan 43% of the time. Today we have the ability to gather undistorted, accurate 3-dimensional views of the jaws with CBCT at a radiation dose that is considerably less than of conventional CT. Panoramic radiographs provide only 2 dimensional images and have the disadvantage of distortion and magnification, whereas CBCT can provide buccolingual, axial, coronal, sagittal, and panoramic views. In the presented

case panoramic radiograph could not provide an accurate assessment of the roots of the transposed teeth and CBCT imaging was necessary to confidently execute a successful treatment plan. Similar to our report, Pair (13) also used CBCT during the treatment planning of a patient with transposed canine and lateral incisor.

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