Bilateral Maxillary Canine-First Premolar Transposition in Permanent Dentition

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ABSTRACT
Transposition is 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. Transposition of the maxillary canine and first premolar has a low prevalence in the population and it primarily affects maxillary canines and premolars. The aetiology of the transposition remains unclear, although it has been associated with genetic factors. It may also be related to a combination of localised factors such as malformation of adjacent teeth, tooth agenesis, retention of the deciduous canine and a history of local trauma. If uncorrected, the results are often both functionally and esthetically unsatisfactory. This case report presents treatment of a female patient with complete bilateral transposition of maxillary canine and premolar. The patient was treated orthodontically with non-extraction fixed mechanotherapy by simulation of maxillary first premolar as canine bilaterally.

Key Words: Bilateral maxillary canine-first premolar. Transposition. Permanent dentition.

INTRODUCTION
Transposition is defined as an interchange in the position of two teeth within the same quadrant of the dental arch. Maxillary canine-premolar transposition (MxC.P1) is the most frequent transposition and the incidence is reported to be 0.135 – 0.510%.

Transposition may affect both genders equally and shows higher maxillary prevalence. Although, the exact mechanism of canine transposition is unclear, a possible explanation for tooth transposition would be an exchange in position of developing tooth buds. However, the current data supports this disturbance to genetic influences within a multifactorial inheritance model. Treatment options for transposition include early diagnosis and guidance of eruption and orthodontic management either by non-extraction or extraction modalities.

The authors report this uncommon condition as a bilateral occurrence in a teen-aged girl.

CASE REPORT
A girl aged 13 years and 2 months reported to the Department of Orthodontics with the chief complaint of gap between teeth. She presented with good facial relationships, and a slightly prominent chin. The patient had permanent dentition, dental Class-I malocclusion, complete bilateral transposition of MxC.P1, mild upper and lower labial segment crowding, crossbite of upper right lateral incisor with right lower canine, overjet of 3 mm and overbite of 4 mm (Figure 1 and 2).

Cephalometric analysis showed a mild skeletal Class-III relationship (ANB angle = -1°) with low vertical proportions (FMA = 17°).

Treatment alternatives discussed with patient were correcting the order of transposed teeth, maintaining the order of transposed teeth and extraction of one of the transposed teeth.

As the patient’s facial profile was satisfactory, correction of crowding and management of transposition was the treatment objective. The treatment goals were to maintain Class-I molar relationship, achieve ideal overjet and overbite, maintain the order of transposed teeth by simulating maxillary first premolar as canine bilaterally and achieve good facial balance.

The treatment plan, after considering the complete nature of the transposition, facial profile, lip position, smile height, crowding and the cephalometric and dental cast analyses was to improve the facial esthetics along with the dental relations. Therefore, a non-extraction fixed mechanotherapy treatment was considered keeping the transposed order of the teeth (by simulation of MxC.P1 bilaterally), upper and lower pre-adjusted edgewise appliances (0.022“ x 0.028” slot) with Roth prescription.

Treatment was initiated by banding of permanent first molars, during the bonding procedures canine bracket was bonded onto first premolar crown to achieve the canine prominence and the palatal cusp of maxillary first premolars were grinded. Leveling and alignment was started with 0.012” NiTi wire and was carried upto 0.016” NiTi archwire and then 0.018” stainless steel was placed
with open coil spring bilaterally between maxillary lateral incisors and canines to create space for maxillary first premolars. The canine was bonded with first premolar bracket and aligned into arch. Upper and lower 0.017 x 0.025” stainless steel wire were inserted, buccal root torque and mesiopalatal rotation bends were given on simulated canines (first premolars). Finally, pre-debond OPG was evaluated for root paralleling bends and settling elastics were given.

Posttreatment facial photographs showed a pleasant smile. The favourable soft tissue drape facilitated orthodontic camouflage of the Class-III skeletal pattern, without detriment to dentofacial appearance. Lips were competent at the end of treatment, with the upper incisors under the control of the lower lip. However, the lower lip appeared full but it is normal in patients with skeletal Class-III malocclusion. The maxillary canines and first premolars were successfully aligned into arch maintaining the order of transposed teeth. The case was finished in Class-I molars on both sides (Figure 3 and 4).

The lower incisors were advanced marginally with treatment to relieve the crowding, risking their antero-posterior stability. However, overbite was minimal, interproximal reduction in the lower labial segment would have prevented this, and possibly increased the overbite further. However, fixed upper and lower bonded retainer was given to the patient in order to enhance stability.

**DISCUSSION**

The maxillary permanent canine tooth is the most frequently involved in transposition. The canine shows highest incidence of transposition with first premolar. Although transpositions are associated with increased frequency of other dental anomalies, supporting a genetic etiology, however, there are no other dental anomalies in the case presented here. Thus, etiology of transposition of present case is not clear.
Transposition of MxC.P1 allows three main options to be considered. When the sufficient space cannot be gained to align the transposed teeth, then only extraction of tooth should be considered. For this case, extraction treatment was not considered as there was no arch length deficiency. It was not advised to correct transposed teeth in the permanent dentition because attempts at restoring the natural tooth order usually leads to root resorption, labial bone dehiscence. While moving the teeth across each other, vitality of the tooth may be affected if its root is moved out of bone support while moving it across the transposed tooth and treatment time may be prolonged.5

In this case, a non-extraction treatment was considered. Therefore, keeping the transposed order of the teeth or recreating the natural tooth order was presented as the two treatment alternatives to the patient. In incomplete transpositions, where the crowns are transposed but the roots are in normal position, uprighting and rotating the involved teeth is the procedure undertaken to place them in normal alignment provided sufficient space is available in the arch.5,6 Furthermore, when the transposition is complete with tooth apices in transposed position, repositioning the teeth to the normal position in the arch is complex and may be damaging to the teeth and supporting structures. Alignment of teeth to the transposed order is the best option.8 Hence, in the present case of bilateral complete transpositions of MxC.P1, alignment of the teeth in their transposed positions with reshaping of their incisal surfaces gave an acceptable esthetic result. The patient and her parents were extremely satisfied with the results.

Deepti et al. reported a case of complete transposition of the maxillary canines with the permanent lateral incisor area in which they maintained the order of transposed teeth and then reshaped them for the purpose of esthetics purpose.9 Maia and Maia10 also reported the non-extraction management of a bilateral MxC.P1 transposition with congenitally missing lateral incisors. They showed a small degree of root resorption on the canines and central incisors, and a small loss of alveolar crest height. Although great effort was made to prevent root resorption, minor root contour irregularities occurred at the maxillary premolars at the end of treatment.

The prevalence of tooth transposition is low, but the management of transposed teeth especially MxC.P1, must be assessed on case-to-case basis. This type of dental anomaly causes many problems in orthodontic management, many factors that affect the treatment results must be considered, such as esthetics, occlusion, treatment period, patient comfort, patient cooperation, and periodontal support. However, it is possible to orthodontically treat this challenging anomaly in an efficient way and achieve promising results. This may also provide orthodontists with the best understanding of how to resolve similar malocclusions in the future.

REFERENCES