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Maxillary Canine Transposition to Central Incisor Site: A Rare Case and Treatment Considerations

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Maxillary Canine Transposition to Central Incisor Site: Report of a Rare Case and Treatment Considerations

Abstract

The transposition of a maxillary canine to the central incisor position is the rarest finding in cases of transposition. The orthodontist can envision a dilemma in treatment planning for these cases. There are many treatment options for such cases, considering different factors like the age of the patient, economic status, esthetic concerns, desire of the patient, etc. This case report discusses the myriad of treatment options and the different restorative and tissue considerations for a case of transposed maxillary canine to the central incisor site.

Introduction

The transposition of a tooth can be defined as the interchanged position of an erupted tooth with another tooth in the same quadrant.^{1,2} It leads to a change in the natural sequence of the permanent teeth. It can be of 2 types viz. complete and incomplete. 1 Complete transposition means the crown and the root of the transposed tooth is completely shifted in the new location i.e. the tooth bodily shifts into its new location. Incomplete transposition means only that a tipping has occurred i.e. the crown shifts while the root remains in its original position. The incidence has been reported as 0.4 % only³, while others report 1 in 300 cases.⁴ It may occur unilaterally or bilaterally. It tends to occur at specific sites and is more common in the maxilla than in the mandible. It is more common on the left side and in females.^{5,6} Other dental anomalies like peg shaped lateral incisors, missing lateral incisors, retention of deciduous canines and/or lateral incisors, malpositioned adjacent teeth and rotations are also seen with transposition.^{5,6}

Several factors like genetics^{2,3,7}; interchange in the position of tooth buds^{8,9}; trauma in the affected area^{10,11,12}, mechanical interferences^{2,5,6,8}; and early loss of incisors^{2,13,14} have been cited as the etiological factors for the transpositions. The guidance theory for canine eruption and long path of eruption of the canine has also been discussed as a possibility, since the canine develops high in the maxilla with a long path of eruption.^{1,5,6} The absence, malformation or malpositioning of the lateral incisor root is most often described as the reason for a lack of guidance for canine eruption, although some studies contradict this conclusion.³ Transpositions can be divided into 6 main types according to literature, as related to their distribution as given below:^{10,15}

- * Canine–first premolar 71%;
- * Canine–lateral incisor 20%;
- * Canine to first molar site 4%;
- * Lateral incisor–central incisor 3%;
- * Canine to central incisor site 2%.

* Mandibular lateral incisor to canine sites.

From this data, it is evident that the transposition of maxillary canines to the central incisor region is the rarest, while to the lateral incisor region is common. Among the numerous reports in the literature regarding transpositions, the reports depicting transposition of a maxillary canine to the central incisor region is very rare.¹⁶ This transposition has been hypothesised as due to a very early loss of central incisors with the loss of guidance to canine eruption, and thus the migration of the canine into that area during eruption.^{1,2,5,6} In this article, we present a rare case of canine transposition in central incisor area, with associated partial anodontia. The treatment considerations have also been discussed in detail.

Case Report: A 16 year old female patient reported in the Dept. of Oral Surgery with the chief complaint of small teeth in the upper jaw and esthetic concerns. She presented for the removal of her retained primary teeth. On examination, it was found that her teeth # 11, 12 and 22 were congenitally missing with no history of any extraction and trauma. There was no family history. She had # 52 and #53 retained in the arch. The #13 has perfectly and completely been transposed to the # 11 position, with a midline diastema of 1.5 mm. Her # 23 was completely transposed to the # 22 position, (Figs. 1,2,3). The resulting molar relations on the right side was Angle's class I and on the left side was an Angle Class II (1/2 cusp). She had 1 mm of overjet and overbite. No other associated anomalies were found. However, she was not aware of her present condition. She was referred to the orthodontist for further advice.



Figure 1: Showing transposed maxillary canines at central and lateral incisor sites.



Figure 2: Showing retained primary lateral incisor and canine on right side.

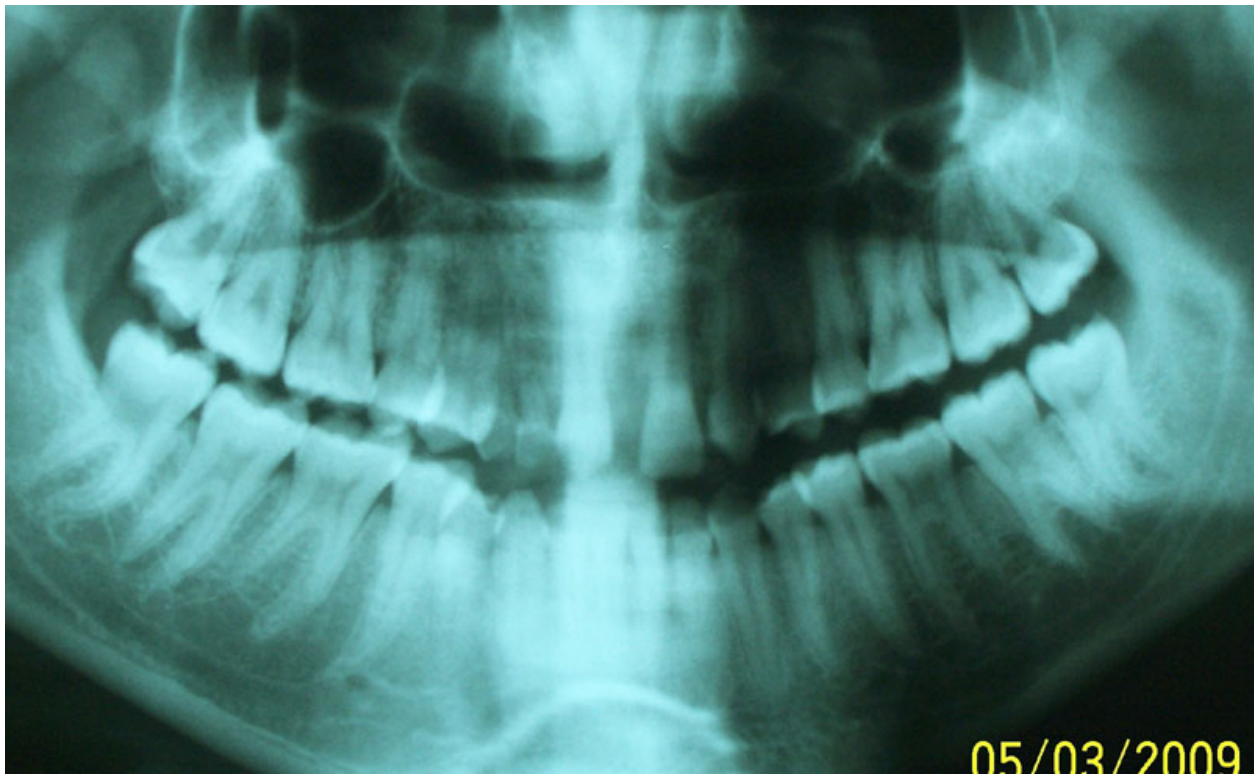


Figure 3: OPG showing transposed canines and retained milk teeth.

Two treatment plans were recommended:

1. Orthodontic treatment plan: Extraction of retained primary teeth; movement of canine to its normal position, followed by fixed or removable partial denture or implant supported bridge. Reshaping of the canine to the lateral incisor and reshape on the other side and closure of the diastema.

2. Non-orthodontic treatment plan: Removal of primary teeth, maintaining the canine in its transposed position; an RPD/FPD or implant supported tooth, reshaping the canines to central and lateral incisor shapes and closure of the diastema by composite build up.

However, due to financial concerns and the time required for fixed orthodontic treatment, the patient chose the removal of the primary teeth, followed by RPD and reshaping of the canines.

Discussion and Treatment considerations:

The maxillary canine is the most frequently involved tooth in transpositions. Many factors¹⁻¹⁵ like genetics, missing incisors, localized pathologic processes, trauma, supernumerary teeth, early loss of incisors, and mechanical interferences, etc. have been reported to cause transposition. Retained deciduous canines have also been suggested to cause ectopic eruption of maxillary canines into the incisor, second premolar, or first molar area.⁵ Peck and Peck¹⁰ reported that only 2 % of cases had canine to central incisor site transposition, making this type of transposition a rare condition.

A greater frequency of left-side occurrence in unilateral transposition cases has been reported.^{2,3,5,6,8} But in the case reported here, the transposition has occurred on right side, thus making it even rarer. Cases of transposition have been associated with congenital absence of the lateral incisor, but in our case, there was congenital absence of one permanent central incisor also, making it more unique.

Shapira and Kufnec¹ described this high incidence associated with canine's longest period of development and longest path of eruption. Guidance to eruption theory^{1-6,10,11} has been suggested to lead to transposition. In this case, the lateral incisors on both sides and the central incisor on the right side were congenitally absent, thus guidance to canine eruption was lost. Since the canine erupts in a mesial and incisal direction, it must have moved to the central incisor site due to non – guidance by the lateral and central incisors. There was no family history reported by the patient.

Gholston and Williams¹³ reported bilateral transposition of the maxillary canines to the central incisor area, with a history of avulsion of upper central incisors, suggesting the loss of guidance to the canines. Peck and Peck² suggested that canine transposition to central incisor site is primarily due to opportunistic canine migration as a by-product of adventitious tooth loss. The incisors might also get lost due to abnormal root resorption induced by the mesially impacted maxillary canine, leading to the opportunistic canine migration.² Turkkahraman¹⁶ reported a longitudinally followed – up case, in which the canine began to change its path of eruption after removal of central incisor and completely transposed to the incisor site. It provides strong evidence for opportunistic canine migration. So periodic radiographic monitoring of maxillary canine after early loss of central incisor is essential to avoid transposition.^{16,17} Interceptive extraction of the deciduous canine at proper dental age allows the permanent canine to erupt in its normal position. ²¹ Even, in some cases without loss of incisor/s, a

transposed canine may be present during mixed dentition as can be found during a routine OPG examination (Fig. 4). These cases should be closely monitored during eruption and may require extractions for eruption guidance i.e. by extracting C, D & 4 on that side, depending on space discrepancy. It will help the canine to erupt into proper position and thus improve the prognosis of orthodontic treatment later on.

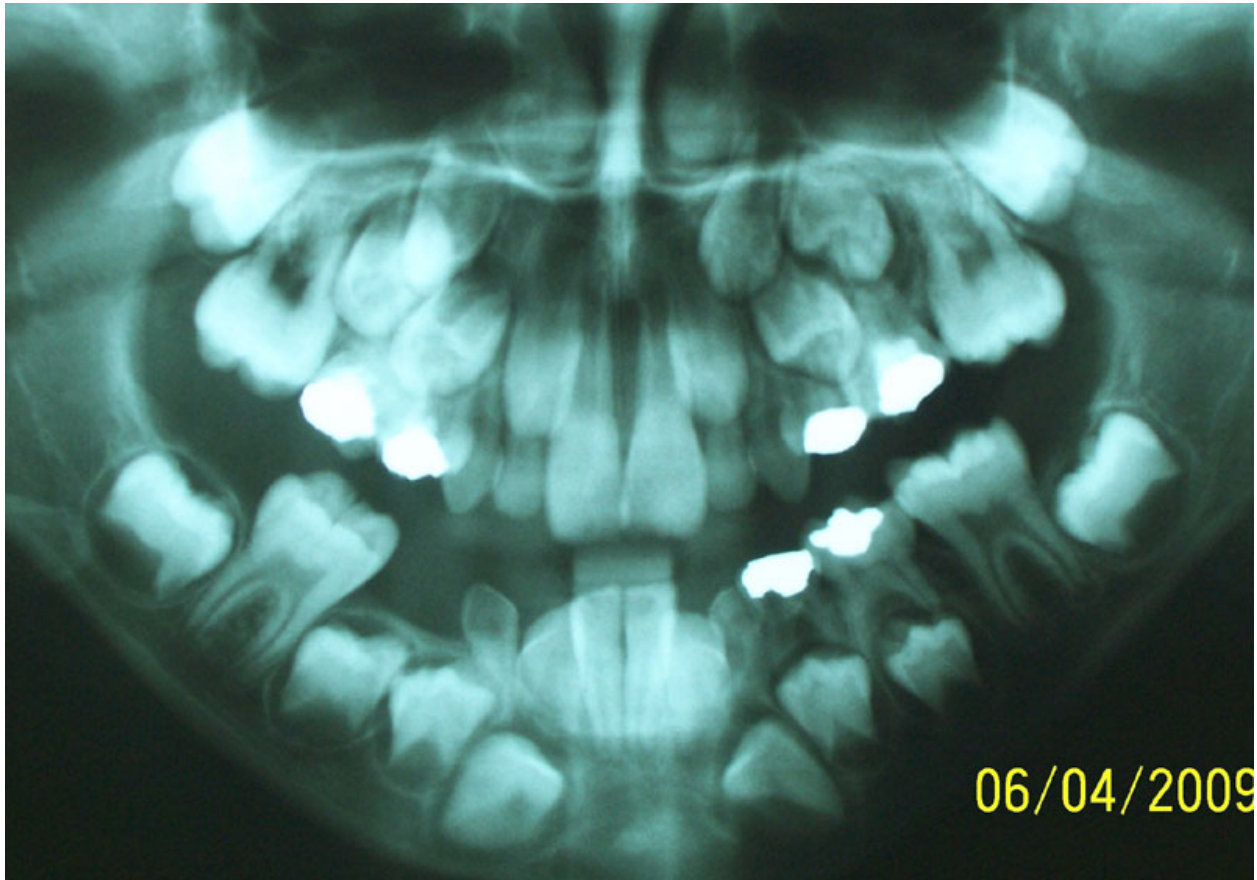


Figure 4: OPG showing transposed maxillary unerupted canine shifted between the bicuspids in early mixed dentition.

Treatment considerations: A thorough evaluation and treatment plan is required for best prognosis of such cases with following considerations.

- * Surgical exposure

- * Orthodontic considerations^{4,18}

* Restorative consideration: composite build up / reshaping / veneers / FPD/ RPD/ Implants supported tooth/ pink color gingival collars.4,19,20

* Endodontic consideration: intentional RCT of some teeth may be required.

* Periodontal considerations: gingival contouring; gingival grafting; gingivoplasty.4,20,21

* Esthetic considerations: pink gingival collar, reshaping; restorative build up etc to attain proportionality in the sizes of adjacent teeth.4

Surgical exposure in some cases may be required for bonding orthodontic attachments & / or to remove any eruption hindrances.

Orthodontic management: Best treatment for such cases involves the movement of the canine to the ideal position by orthodontics and then providing the restoration of choice, taking care of the canine guidance and excursive movements. However, if the canine is to be retained in its transposed site, still its position in all the 3 planes of space should be corrected depending on the restoration to be chosen. Care should be taken in selecting the appropriate bracket.

First order: As the canine is buccolingually thicker than the incisor, and gets further compromised by the veneer, the overbite of canine and whole labial segment should be properly evaluated. To position the labial aspect of canine slightly inset to the arch, but to also accommodate it to occlusal function, the overbite must be fully reduced. Considering the labial contour of canine, a traditional canine bracket is most appropriate to provide overbite reduction. A small first order offset bend will detail the canine, bringing it in the same plane of the central incisor. Lingual surface of canine may require some enameloplasty to flatten it to correlate with the lower incisors.

Second order: The prescription of canine brackets in most pre-adjusted edgewise brackets are the most variable in the maxillary canine value. The maxillary canine is approximately as wide as the central incisor, but the second order prescription of central incisor brackets is approximately 5°. Bracket for a canine replacing a central incisor should be selected carefully, as the most common second order prescriptions for maxillary canines bracket in SWA systems is 10–13°. This excess tip leads to a greater mesiodistal crown width of the canine and may inhibit proper reproduction of embrasures in the labial segment. A canine bracket with low second order value is recommended eg MBT (8°). If a standard edgewise bracket is used, then some degree of second order bends or loops may be required in the arch wire to give a transposed canine proper inclinations.

Third order: The prescription of torque in central incisor brackets of pre-adjusted appliances is 7–12° of palatal root torque, while canine brackets have buccal root torque. As the canine will be simulating a central incisor, the torque prescription of the brackets should be considered. Also the root form of canine is worth consideration. Since the canine root is round while that of the central incisor has a somewhat flat labial surface, the canine may show root prominence in the labial plate. So palatal root torque is required for the canine. One useful solution is to select a canine bracket of second order & third order values similar to the adjacent incisor and then invert the bracket to retain the first and second order values, but reversing the third order value. With a standard edgewise bracket, individual palatal root torque in arch wire for the canine may be given.

Periodontal, gingival and esthetic considerations: The inciso-gingival height of the canine crown is longer than the central incisor, affecting the gingival margin heights of the canine and the central incisor, which is quite unaesthetic. It is sometimes advisable to place the canine bracket slightly (1 mm) more gingival than normal to level the gingival heights & then reduce the incisal edge of the canine. Another option is to contour the gingival margin of the central incisor to the level of the canine, but it may introduce gingival recession later on. Pink color composite may be bonded in the cervical region of the canine to provide a shortening effect to the crown of the canine.

Restorative Considerations: The ultimate positioning of the canine for restorative rehabilitation should be considered at the treatment planning stage. Restorative treatment options include composite build-ups, composite or porcelain veneers, and partial and full porcelain crowns, RPD, FPD or implant etc. A porcelain veneer is often the restorative treatment of choice due to its esthetic, durable and conservative nature. There are factors to be considered when deciding to camouflage a canine to resemble a central incisor. These include:

* The mesio-distal width of the canine: If this is similar or smaller than the central incisor, then any restorative options are possible. However, if the canine is considerably larger than the central incisor, there will be a noticeable discrepancy in regards to the emergence appearance. Then a crown is the only option left to make the tooth smaller. Intentional RCT may be required, in some cases, before crown preparation depending on the age of the patient.

* Protrusive guidance: The bucco-palatal width of the canine is greater than central incisor which causes difficulties in protrusive excursion with all guidance being taken by the canine. So the adjustments should be made to the canine's palatal aspect.

* Color characteristics: The hue, chroma and value of canine may be similar to a central incisor in many cases, but if there are marked differences, with the canine generally being darker, the recontouring by direct addition of composite or by using a veneer on canine would not be sufficient due to the 'shine through' of the natural tooth. The porcelain jacket crown will be the treatment of choice.

- * The buccal curvature of the canine: Since the buccal curvature of the canine is greater compared to the central incisor, an increased bucco-palatal width of the final restoration on the mesial and distal incisal aspects of a canine is required to mimic the central incisor. It results in a broad incisal edge thus making incising through food difficult.
- * The incisal tip of the canine: This can be quite long and pointed, thus it is beneficial to reduce it before completion of the orthodontic phase to reduce the extent of the incisal build-up required on the canine.
- * Root anatomy: Cross section of root of the canine is round as compared to the somewhat flat labial aspect of the root of the central incisor. This may give a root prominence in the labial alveolar region. So a palatal root torque is required for a canine.
- * The gingival margin: Problems can exist with regard to the gingival position due to difference of crown heights, which may necessitate alterations in the position of the orthodontic bracket combined with a gingivoplasty in the central incisor region.

CONCLUSIONS

Common factors like trauma, congenital absence of incisor/s and early loss of incisors can induce ectopic migration of a canine to a central incisor site. The clinician should be aware of the possibility of canine transposition. Timing of intervention is important in such cases. When early loss of the central incisor occurs before sufficient root development of the canine, this may be the optimum time to consider the opportunities for rehabilitation of the occlusion. Proper guidance of eruption with appropriate appliances, & extraction of the deciduous canine at a proper dental age can be helpful in preventing the transposition and further complicated treatment in future.²¹ Therefore, the maxillary canines should be carefully monitored after early loss of a maxillary central incisor.

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