

A multidisciplinary treatment approach of complete transposition of impacted maxillary left canine with maxillary first premolar in presence of bilateral congenital absence of maxillary lateral incisors

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Abstract

The maxillary permanent canine is the tooth most frequently involved, which is often transposed with the first premolar followed by transposition between the maxillary permanent canine and maxillary lateral incisor. This study describes the correction of complete transposition of the maxillary left first premolar with impacted permanent maxillary left canine and congenital missing maxillary lateral incisor. The current case report describes a multidisciplinary approach for the alignment of impacted and transposed teeth with surgical exposure of impacted maxillary canine and restorative treatment of transposed maxillary left first premolar. The satisfactory results were achieved with maximum three-dimensional control of tooth movement and without any iatrogenic damage.

Key words: Congenital missing incisors, impacted canine, transposition

INTRODUCTION

The transposition of the teeth has been observed and reported since early 19th century. Transposition has been described as an interchange in the position of two permanent teeth within the same quadrant of dental arch.^[1] Transposition may be accompanied with other dental anomalies such as peg-shaped lateral incisors, over-retained deciduous canine, malposed adjacent teeth, or rotation of the teeth. In literature, six types of transposition were clearly identified.^[2] These were:

1. Maxillary canine-first premolar
2. Maxillary canine-lateral incisor
3. Maxillary canine to first molar
4. Maxillary lateral incisor-central incisor
5. Maxillary canine to central incisor
6. Mandibular lateral incisor-canine.

Congenitally missing incisors and transposition of teeth presents challenging treatment planning for the dentist as they are usually associated with other malocclusions and abnormalities. Selecting the appropriate treatment option depends on the malocclusion, the anterior relationship, specific space requirements, and conditions of adjacent

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| Quick Response Code: | Website: www.apospublications.com |
|  | DOI: 10.4103/2321-1407.173722 |

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How to cite this article: Tekale PD, Vakil KK, Vakil JK, Agarwal CO. A multidisciplinary treatment approach of complete transposition of impacted maxillary left canine with maxillary first premolar in presence of bilateral congenital absence of maxillary lateral incisors. APOS Trends Orthod 2016;6:39-44.

teeth. To obtain best esthetic and functional result, a multidisciplinary team approach involving the orthodontist, implantologist, and prosthodontist is required.^[3]

The purpose of this study is to present a case of complete transposition of the maxillary left first premolar with impacted permanent maxillary left canine and congenital missing maxillary lateral incisor and to describe the unusual approach and procedure used in the orthodontic treatment of this challenging anomaly.

DIAGNOSIS

A 17-year-old male patient was diagnosed with complete transposition of the permanent maxillary left canine and the left first premolar, over-retained deciduous maxillary left lateral incisor and canine. The transposed canine was impacted with dilacerated root. There was bilateral congenitally missing maxillary lateral incisors, Ellis Class II fracture of permanent maxillary right first premolar, crowding in the mandibular anterior region, crossbite with left mandibular canine and end on molar relationship [Figure 1]. Radiographic examination revealed complete transposition of the maxillary left canine and maxillary first premolar [Figures 2 and 3] and transposed canine had dilacerated root [Figure 3].

TREATMENT OBJECTIVES

Based on the diagnostic records, the treatment objectives were:

1. Establish a functional Class I occlusion
2. Surgical exposure and alignment of impacted permanent maxillary left canine
3. Extraction of over-retained deciduous teeth
4. Correct the transposed left maxillary canine and maxillary first premolar
5. Restoration of permanent maxillary right first premolar
6. Establish normal ideal overjet, overbite, and correct the crossbite
7. Align in mandibular anterior teeth.

TREATMENT ALTERNATIVE

First treatment option for this case includes the extraction of over-retained deciduous teeth and impacted canine and implant-supported prosthesis in place of missing maxillary left lateral incisor and cosmetically reshaping maxillary right canine to appear as (the implanted) maxillary left lateral incisor.

Second treatment option includes the extraction of over-retained deciduous teeth, surgical exposure of impacted

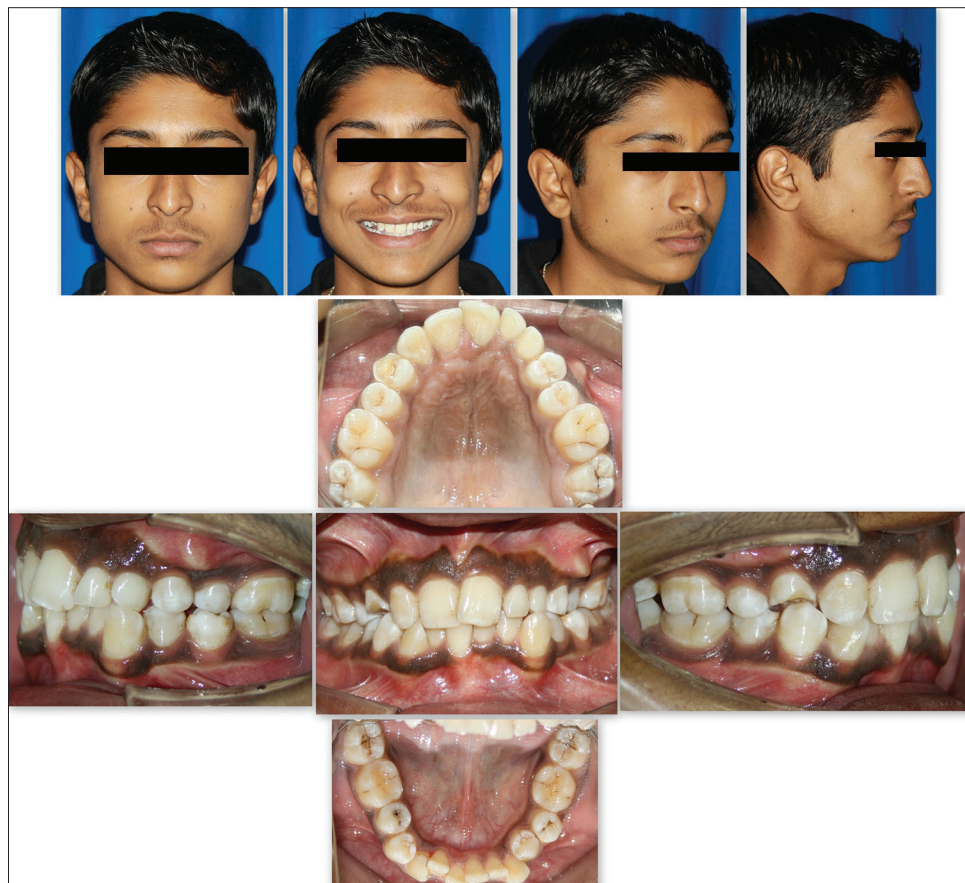


Figure 1: Pretreatment extraoral and intraoral photographs

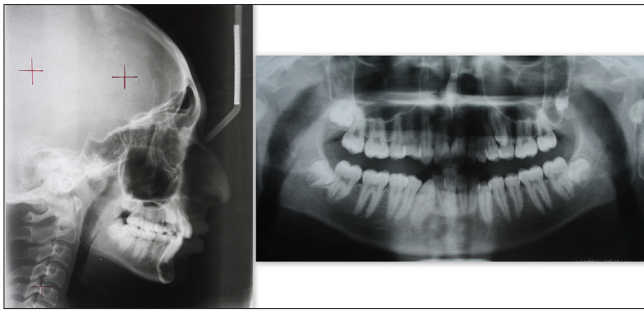


Figure 2: Pretreatment lateral cephalograph and orthopantomogram

maxillary left canine and alignment of maxillary left canine and first premolar as in transposed position, as there is a complete transposition and bodily movement is not possible for maxillary permanent canine with dilacerated root.

In the lower arch, extraction of first premolars on the both sides for the correction of crowding of the anterior segment.

TREATMENT PROGRESS

The second treatment option was selected by the patient after thorough discussion of the two options. The 0.018 × 0.025" MBT Prescription (3M Unitek, USA) was placed with 0.014" Nickel titanium (NiTi) wire for initial leveling and alignment of the teeth with passive laceback in the mandibular arch. Bracket placement was specified for tip and torque expression; maxillary left and right lateral incisor brackets were placed on maxillary left first premolar and maxillary right canine, respectively. The canine bracket on the right side is placed on the maxillary right first premolar.

As treatment progress, 0.016" stainless steel (SS) wire is placed in the maxillary arch with NiTi open-coil spring between maxillary left first and second premolar for mesialization of maxillary first premolar and creating space for alignment of the permanent maxillary left canine.

Periodontal phase started; once the required mesiodistal space was opened up between maxillary left first and second premolar, apically displaced flap and surgical exposure of impacted maxillary left canine were done. Traction started after 2 weeks, once initial epithelialization completed [Figure 3].

Initially, Beggs bracket is bonded on the maxillary left canine and 0.014" NiTi wire placed with piggy back 0.018" SS wire [Figure 3]. Once maxillary left canine is aligned in Arch, the Beggs bracket was replaced with MBT canine bracket. After 8 months, the maxillary left first premolar was moved forward with an open-coil spring. Thus, in order to be positioned beside or adjacent to the maxillary left central incisor and the maxillary left canine is aligned

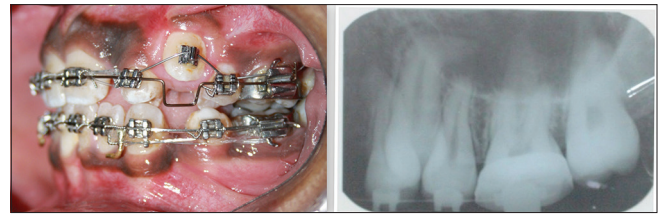


Figure 3: Intraoral radiograph showing transposition and surgical exposure of impacted left maxillary canine

between the maxillary left first and second premolar in completely transposed position [Figure 4].

The patient was seen at 3–5 weeks intervals during active treatment. After 4 months, 0.017 × 0.025" SS wire was placed in the mandibular arch, and en-masse retraction of the mandibular anterior teeth was carried out [Figure 4].

Prior to removal of the orthodontic appliance, the endodontic phase was completed. Endodontic phase involved the intentional root canal treatment of maxillary left first premolar, and it is reshaped to look like maxillary left lateral incisor. This was done for esthetic needs when viewed from the front. Further, the palatal cusp was modified to avoid any interference with opposing teeth. Reshaping and restorative treatment were also carried out for the maxillary right canine to look like maxillary lateral incisor [Figure 5]. The orthodontic appliances were removed, and retainers were placed in both the mandible and maxilla, to maintain treatment results.

TREATMENT RESULTS

Posttreatment records show that the treatment objectives were achieved. Facial photographs show an improved profile and an attractive smile [Figure 5]. Class I canine and Angles class I molar relationship was established. Ideal overjet and overbite were achieved with correction of the crossbite. Posttreatment panoramic and periapical radiographs show good parallelism of roots and normal structure of the periodontium, roots, and surrounding tissues. No sign of root resorption or other damage to the teeth were seen [Figure 6]. Cephalometric analysis is shown in Table 1. The superimposition is shown in Figure 7.

DISCUSSION

Approximately 2–10% of the population exhibit missing teeth. Excluding the third molars, the most commonly missing teeth are the maxillary lateral incisors and second premolars. Patients who exhibit congenital absence of teeth also experience increased ectopic dental eruption and other dental anomalies.^[4] Patients with congenitally



Figure 4: Midtreatment intraoral photographs

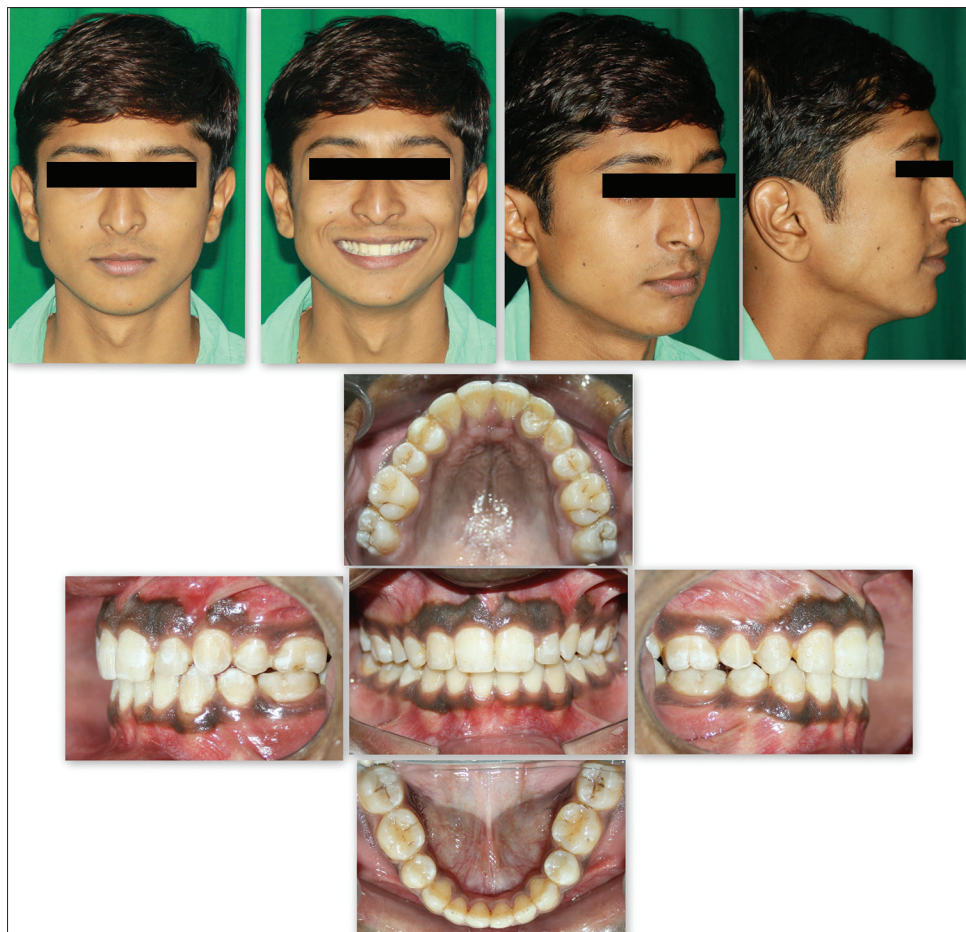


Figure 5: Posttreatment extraoral and intraoral photographs

absent maxillary lateral incisors often exhibit palatal ectopic eruption of the adjacent maxillary permanent canines.^[1]

The prevalence of transposition is more common in the maxilla than in the mandible, especially on left side. The

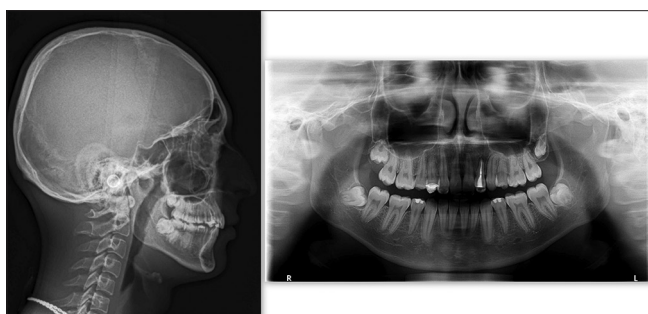


Figure 6: Posttreatment lateral cephalogram and orthopantomogram

Table 1: The cephalometric parameters pre- and post-treatment values

| Parameter | Pretreatment | Posttreatment |
|-----------------------------|--------------|---------------|
| Maxilla to cranium | | |
| SAN | 79° | 81° |
| N-Point A | -9 mm | 2 mm |
| Mandible to cranium | | |
| SBN | 77° | 79° |
| N-Pog | -17 mm | -5 mm |
| Go-Gn to SN | 37° | 34° |
| Maxillary teeth to cranium | | |
| NA to U1 | 27° | 24° |
| | 6 mm | 4 mm |
| U1 to SN | 112° | 99° |
| U1 to ANS-PNS | 69° | 70° |
| Mandibular teeth to cranium | | |
| NB to L1 | 20° | 18° |
| | 4 mm | 3 mm |
| L1 to Pog | 1.5 mm | 1 mm |
| IMPA | 87° | 89° |
| L1 to MP | 47 mm | 36 mm |
| L6 to MP | 35 mm | 30 mm |
| Maxilla to mandible | | |
| Interincisal angle | 132.5° | 135° |
| ANB | 1° | 2° |
| Wits appraisal | -1 mm | 1 mm |
| Vertical relation | | |
| Y-axis | 72° | 77° |
| Facial axis angle | -5 | -3 |
| J angle | 87° | 86° |
| Basal plane angle | 30° | 27° |
| Gonial angle | 127° | 121° |
| Soft tissue | | |
| S line to upper lip | +2 mm | +1 mm |
| S line to lower lip | +3 mm | +2 mm |
| Nasolabial angle | 96° | 110° |

canine is most frequently involved and transposed with either the first premolar (71%) or the lateral incisor (20%).^[5,6] This is because, the maxillary canine develops in a high position in the maxilla and has longest eruption path. In addition to this, if there was absence, malformation, or malposition of the lateral incisor root, this may result in a lack of guidance for canine to erupt in its normal position.

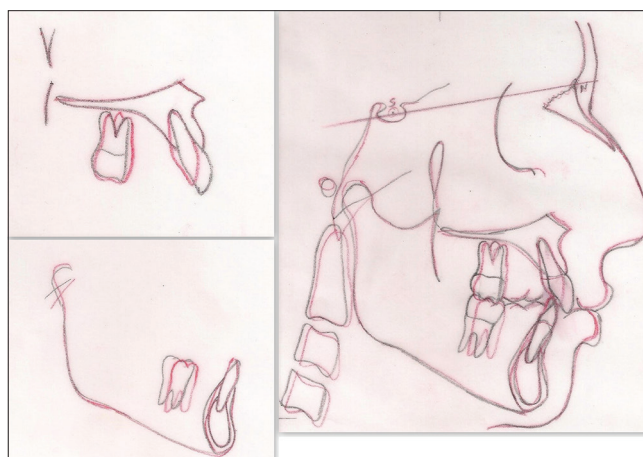


Figure 7: Superimposition

In such canine transposition, the treatment options may include alignment of the teeth in their transposed positions, extraction of one or both transposed teeth, and orthodontic movement into the correct positions in the arch.^[7]

The treatment options of missing permanent maxillary lateral incisor include a single tooth dental implant, tooth-supported fixed prosthesis or canine substitution. Autotransplantation and removable partial dentures are considered less common options.

The treatment option was decided with careful consideration of the multiple clinical variables. The advantage of using dental implants to replace maxillary lateral incisors lies in excellent success and survival rates and also the lack of need to involve adjacent teeth in a fixed restoration. The available bone space and density were evaluated with the help of cone beam computed tomogram technique. Canine substitution is a better option for patients who already committed to undergo fixed orthodontic treatment. It also holds back the patient from having additional surgeries or restorative procedures, making it not only a safer but also a more cost-effective option.

The maxillary left first premolar was endodontically treated and cosmetically reshaped to look like the maxillary left lateral incisor from buccal view, and the maxillary right canine also was reshaped and restored to look like the maxillary right lateral incisor. Such good finishing result will not be achieved unless there was a good cooperative team including the periodontist and endodontist. This team should be involved during the diagnosis and treatment planning session before starting the treatment. Each discipline will introduce his role with the other disciplines.^[4]

In the current case, the maxillary left canine was in complete transposition with the first premolar; hence, it is acceptable compromise treatment to guide both teeth into transposed position. Although this procedure requires significantly long

treatment duration, it is probably justified by an excellent result for the esthetic and long-term functional stability.

Simultaneous impaction of maxillary canine in a complete transposition and bilateral congenital missing maxillary lateral incisors is considered a rare clinical condition with diverse therapeutic approaches. The current multidisciplinary approach could be one of the best choices for alignment of impacted and transposed teeth with maximum three-dimensional control of tooth movement and without any iatrogenic damage.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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