

# Transposition of Mandibular Lateral Incisor–Canine (Mn.I2.C) Associated with Hypodontia: A Review and Rare Clinical Case

KARTHIK VENKATARAGHAVAN<sup>1</sup>, ANANTHARAJ ATHIMUTHU<sup>2</sup>, PRAVEEN PRASANNA<sup>3</sup>, RAMYA B JAGADEESH<sup>4</sup>

## ABSTRACT

Transposition is a unique and extreme form of ectopic eruption in which a permanent tooth develops and erupts in the position which is normally occupied by other permanent teeth. Tooth transpositions are rare and they can be complete or incomplete. The aetiology of transposition is still obscure. Various populations have been studied, to determine the prevalence of tooth transpositions. 20% of the transpositions which occur on the maxillary arch involve the canine and the lateral incisor. Although they are rare, transpositions may involve the maxillary lateral and central incisors. Among all transpositions, Mandibular Lateral Incisor-Canine (Mn.I2.C) is the rarest, with a prevalence rate of 0.03%. Although various reports have been published on tooth transpositions, very few have noted the agenesis of teeth, particularly Mn.I2.C and its management. We are reporting a rare clinical case with associated hypodontia.

**Keywords:** Tooth transposition, Canine, Lateral incisor, Hypodontia, Maxilla, Mandible

## INTRODUCTION

Transposition is a unique and an extreme form of ectopic eruption in which a permanent tooth develops and erupts in the position which is normally occupied by other permanent teeth (Shapira et al., 1989) [1]. To avoid confusion, it may be made clear that 'ectopic eruption' refers to any aberrant or abnormal eruption path which is taken by a tooth and that the term, 'transposition' refers to an interchange in the position of two adjacent teeth which are located within the same quadrant of the dental arch [2]. Tooth transpositions are rare and they can be complete or incomplete. The difference between the two types is that in a complete transposition case, crowns and roots of the involved teeth are in the transposed position, whereas in an incomplete transposition case, the crowns may be transposed, although the root apices remain in their normal positions [1,3].

The aetiology of a transposition is still obscure. Transposition of tooth buds at anlage stage, migration of a tooth during eruption, heredity, and trauma have been proposed as the possible aetiological factors [4,5].

Various populations have been studied to determine the prevalence of tooth transpositions and these include Indian Chattopadhyay et al., [6], African Burnette et al., [7], Swedish Thilander et al., [8], Saudi Arabian Ruprecht et al., [9], Turkish Yilmaz et al., [10] and Scottish Sandham et al., [11] populations.

Transpositions have been classified according to Peck and Peck [12] as:

1. Maxillary canine-first premolar (Mx.C.P1)
2. Maxillary canine-lateral incisor (Mx.C.I2)
3. Maxillary canine to first molar site (Mx.C to M1)
4. Maxillary lateral incisor-central incisor (Mx.I2.I1)
5. Maxillary canine to central incisor site (Mx.C to I1)
6. Mandibular lateral incisor-canine (Mn.I2.C)

Peck et al., [12] stated that 20% of the transpositions which occur on the maxillary arch involve the canine and the lateral incisor. Although they are rare, transpositions may involve the maxillary lateral and central incisors. Among all transpositions, Mn.I2.C is rare, with a prevalence rate of 0.03% [6,13].

Tooth transpositions can hinder aesthetic and functional aspects of dentition and accordingly, it is important to know the variables which are related to the aetiology and prevalence of this anomaly, in order to establish possible preventive measures [14]. Various other factors have also been proposed regarding the aetiology of transposition abnormalities, which include a genetic interchange in the position of the developing tooth buds, lack of root resorption of primary canine, mechanical interferences which come in way of erupting permanent teeth, early loss and /or prolonged retention of deciduous teeth [15].

Tooth transpositions often coexist and they are related to other pathological entities or anomalies of the dental arch, a fact which suggests the presence of a syndromic condition. In some patients, one may also observe peg-shaped maxillary lateral incisors, congenitally missing teeth other than third molars, persistence of primary teeth, severe rotations and poor alignment of heterotopic teeth or of their neighbouring teeth, supernumerary teeth, ectopic eruption of non-neighbouring teeth and root ankylosis. Their prevalences vary, according to different authors and they were found to occur in 0.38% patients in Turkey, 0.13% patients in Saudi Arabia, 0.43% patients in India and in 0.14% patients in Nigeria [16].

Although various reports have been published on tooth transpositions, very few have noted the agenesis of teeth other than third molars in the mandibular arch. There is considerable evidence which suggests that genes play a fundamental role in the aetiology of tooth agenesis. A study was conducted on children with tooth agenesis and it reported that siblings and relatives more than 50% of patients had presented with hypodontia, which was a high prevalence as compared to the expected prevalence which was seen in the general population [17].

Inheritance on an autosomal dominant basis, has also been proposed Pirinen et al., [18]. Hypodontia of teeth may be caused by one major gene mutation, but it is very often heterogenic Arte et al., [19].

Peck et al., analyzed the pattern of hypodontia which was associated with a palatally displaced canine (PDC), Mx.C.P1 and

other variations of canine transposition. The third molar (M.3) was found to be strongly associated with mandibular incisor-canine transposition (Mn.I1.C) and PDC. In view of this, the homeobox genes, MSX1 and PAX9, which are associated with posterior field hypodontia, have been suggested to be the candidate genes for the control of Mn.I2.C and PDC [20].

Peck et al., described the characteristics of early stage mandibular incisor canine (Mn.I2.C) transposition: distal tipping, coronal displacement, and severe mesiolingual rotation (from 60° to 120°) of the mandibular lateral incisor, which prompt the adjacent canine to become mesially transposed. In the later stages, eruption of the mandibular-canine and its transposition with the lateral incisor can be detected [21].

The main goal of treatment of all transposition abnormalities is to correct the positions of transposed teeth.

Shapira et al., proposed that the treatment of transposed teeth involved fixed orthodontic appliances and treatment modalities which depended on the types of the involved teeth and their eruption stages [22].

Canoglu et al., reported the management of a complete type of Mn.I2.C with use a removable appliance [15].

## CLINICAL CASE

A 11-year-old male child reported with chief complaint of decay in lower left back tooth region. The clinical examination showed that there was dental caries in relation to 75, with a mixed dentition which had an end-on molar relation with an increased over bite. [Table/Fig-1,2].

Further examination revealed 33 erupting buccally between 32 and retained 72 on the left quadrant. A mesio lingual rotation was noticed in 32 and 33. Ortho pantomographs (OPGs) [Table/Fig-3] and periapical [Table/Fig-4] and occlusal radiographs [Table/Fig-5] were advised. A radiographic examination confirmed the presence of an incomplete type of transposition, wherein there was superimposition of roots of both 32 and 33. OPG picture showed the agenesis of 35 and 45.

An orthodontic opinion was sought, following which it was decided to allow 33 to erupt in the transposed position. It was also decided to retain 75 and 85, as the second premolars were congenitally missing. Fixed appliance therapy was planned for the correction of the malocclusion, deep bite and teeth rotations. As a precursor to the planned treatment, 72 was extracted to aid in the eruption of the involved teeth, followed by restoration of 75 and a crown placement on 85. The patient was recalled after 6 months for commencement of orthodontic therapy.

## DISCUSSION

Several factors have been proposed regarding the aetiology of transposition abnormalities. In recent years, research has attempted to determine the aetiologic factors of different transposition abnormalities. Peck et al., (1993) [23], suggested a genetic influence of the maxillary canine and the first premolar transposition. They also found a strong relationship between Mn.I2.C, tooth agenesis and a peg-shaped maxillary lateral incisor and concluded that the Mn.I2.C anomaly was genetically determined [21]. It was also reported that the main cause of transposition in the maxilla was the displacement and migration of the canine, whereas in the mandible, it was caused by the distal migration of the lateral incisor [1].

Although the main goal of treatment of all transposition abnormalities is to correct the position of transposed teeth, several factors which include patient's age, occlusion, aesthetics and treatment length, should be taken into consideration, in order to prevent any damage which can be caused to the teeth and supporting structures. Mn.I2.C is reported to be seen less often in the mandible than in the maxilla [6].

Keeping in mind the above mentioned factors, two treatment approaches have been suggested for Mn.I2.C: [1,21,24-27].

If the transposition is in an early stage, the position of the teeth can be corrected with the aid of fixed orthodontic treatment. However, one primary anterior tooth can be extracted to facilitate an early correction.

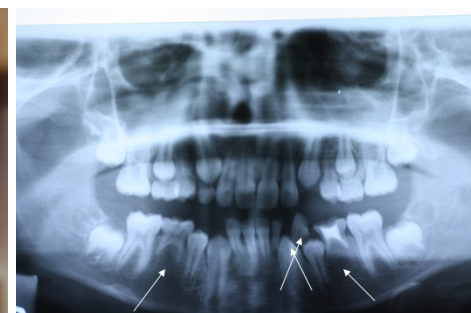
1. If the transposition is recognized after the transposed teeth have erupted in their transposed positions or where the roots of the



[Table/Fig-1]: Frontal view



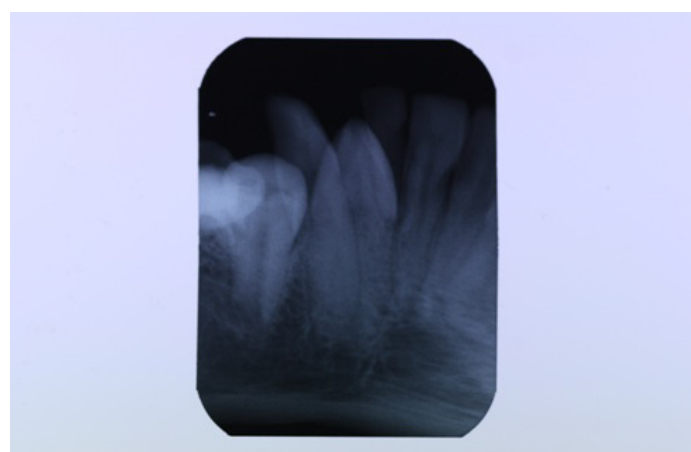
[Table/Fig-2]: Occlusal view



[Table/Fig-3]: OPG view



[Table/Fig-4]: Occlusal view



[Table/Fig-5]: Periapical radiograph

involved teeth are parallel, it is not preferred to correct the position of the involved teeth. Because of the dense compact bone of the mandible, the teeth should be aligned in their transposed forms.

In our case, 32 had already erupted and 33 was erupting labially in the former's position. The radiographic picture shows the roots of the transposed teeth to be almost parallel. In the present case, the start of the treatment differed mainly, owing to the following factors:

1. Age of the child
2. Hypodontia
3. Relatively intact roots of the mandibular second primary molars.

In the literature, all transposition cases were found to be treated with fixed orthodontic treatment, barring one, which was treated by using a removable appliance [15].

The present case was a case of transposition with associated hypodontia, which did not involve space problems during orthodontic treatment. Owing to these factors, it was decided to extract the retained 72, to allow 33 to erupt in its place and to retain the 75 and 85, owing to agenesis (hypodontia) of 35 and 45. The initiation of the fixed orthodontic therapy was planned after the exfoliation of other primary teeth present in the maxillary arch. The patient has been kept under regular observation.

## CONCLUSION

Within the limits of the present case, we can conclude that this was a rare combination of Mnd.I2.C with hypodontia (agenesis of 35 and 45), which had led to the retention of 75 and 85, owing to agenesis of their successors. 33 could be allowed to erupt into the transposed space, to facilitate orthodontic therapy for correcting the malocclusion, deep bite and teeth rotations.

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### PARTICULARS OF CONTRIBUTORS:

1. Professor & Head, Department of Pedodontics and Preventive dentistry, College of Dental Sciences & Research Centre, Ahmadabad, Gujarat, India.
2. Professor and Head, Department of Pedodontics and Preventive Dentistry, D.A.P.M.R.V Dental College, Bangalore, India.
3. Professor, Department of Pedodontics and Preventive Dentistry, D.A.P.M.R.V Dental College, Bangalore, India.
4. Post Graduate Student, Department of Pedodontics and Preventive Dentistry, D.A.P.M.R.V Dental College, Bangalore, India.

### NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Karthik Venkataraghavan,  
Professor & HOD, Department of Pedodontics and Preventive Dentistry, College of Dental Sciences & Research Centre,  
Opp. Pleasure Club, Bopal-Ghuma Road, Manipur, Ta. Sanand, Ahmadabad, Gujarat– 382115, India.  
Phone: 9845258974, E-mail: veekart@yahoo.co.in

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