

CLINICIAN'S CORNER

Tooth Transposition: The Clinical Features and Management

A Case Report

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Abstract

Tooth transposition is a rare developmental dental anomaly of unknown etiology. It exhibits a clinical challenge due to the presence of 2 teeth in a narrow buccolingual thickness of bone that had interchanged in position; care should be taken to avoid root proximity during movement of the transposed teeth during orthodontic treatment. The acceptance of tooth transposition could be considered the safest method of treatment on the root structure and the surrounding periodontium of the transposed teeth. Correction of tooth transposition could be tried in cases of maxillary lateral incisor canine transposition to avoid adverse effects on esthetics.

Key words: Tooth transposition, Features, Clinical management

Etiology, Prevalence and Clinical features

Tooth transposition is the interchange in the normal position of 2 adjacent teeth within the same quadrant of the dental arch; it is a unique ectopic eruption of teeth (Shapira et al.1989). The prevalence of transposition ranges between 0.13% to 0.5 %, although this unusual ectopic eruption is rare, it is considered to be the most difficult to manage clinically (Ciarlantini et al2007 ; Nishimura et al. 2012; Yilmaz et al. 2005 ; Lieberman et al.1983).

In the maxilla, tooth transposition results usually from a displacement and migration of the maxillary canine, while tooth transposition in the mandible is usually a result of distal migration of the mandibular lateral incisor (Shapira et al. 2001). Tooth transposition occurs more often in the maxilla than in the mandible, and it almost always involves the canine (Shapira et al.2001 ; Peck S et al. 1995; Peck L et al 1993). The maxillary canine transposes most often with the first premolar and less frequently with the lateral incisor. In the mandible, transposition occurs between the canine and lateral incisor (Shapira et al. 2001; Peck S et al., 1995). When transposition occurs, it is often accompanied by other developmental dental anomalies like missing teeth; peg shaped lateral incisors and retained deciduous teeth, impacted teeth and rotated maxillary canine and premolar (Fig. 1) (Shapira et al.1989 ; Peck S et al.1993 ; Peck L et al 1995; Shapira et al.2001).

Unilateral transposition is more common than bilateral with an approximate ratio of 12:1, and the left side is more frequently involved than the right side a ratio of 2:1 in the upper jaw (Shapira et al.2001), while Peck and Peck (Peck S et al.1993 ; Peck L et al 1995) found slightly more predominance on the right side for the lateral incisor canine transposition in the mandible. Transposition was found to affect females more than males (Peck S et al.1995 ; Peck L et al 1993; Shapira et al.2001).

The etiology of transposition is still unknown, but it is presumed to be due to a multifactorial genetic factor (Peck S et al 1993). Transposition appears “often” in persons with clefts (Shapira et al. 2001). It seems that genetic or local factors could be responsible for dental anomalies. That is why, transposition or other dental anomalies e.g. missing teeth appear often in persons with clefts (Shapira et al. 2001; Lieberman et al.1983).

Crowding may lead to an interchange in the position of the developing dental lamina of the involved teeth, especially in the upper arch, peck found that transposition in the mandible was unrelated to crowding (Peck S et al. ; Peck L et al.). In some cases, migration of the erupting canine and retained deciduous canines may lead to this developmental dental anomaly (Shapira et al. 2001; Shapira et al. 1989 ; Platzer et al. 19681979; Mader et al.). Trauma may lead to dilacerations of the permanent incisors, and bone cysts in the maxilla, and may also lead to maxillary canine ectopic eruption and hence transposition (Yelmaz H et al. 2005)

Tooth transposition could be classified as complete or incomplete, in the complete transposition the crown and the entire root of the transposed teeth are in a state of interchange in position (Fig. 1), while in the incomplete transposition, the crowns are transposed while the roots are in their physiologic position (Shapira et al.1983). (Fig. 2 and Fig. 3).



Figure 1: transposition associated with missing lateral incisor



Figure 2: Complete transposition of the canine lateral incisor, the erupting maxillary right permanent canine was observed between the roots of the central and lateral incisors



Figure 3: Incomplete canine lateral incisor transposition

The Clinical Management

The clinical management of tooth transposition can be either alignment of the involved teeth into their transposed position and the acceptance of the transposition, or the orthodontic correction by moving each tooth to its physiologic position in the arch (Ciarlantini et al. 2007; Shapira et al.2001; Rabie AB and Wong RW 1999). In some cases of crowding, extraction of one of the transposed teeth could be a treatment option (Ciarlantini et al. 2007; Shapira et al.2001).

Which option **should we** undertake or follow? Ciarlantini and Melsen set the guidelines of which option to undertake (Ciarlantini et al.2007). These guidelines involve the following: **Dental morphology and**

whether the crown of the transposed tooth can be reshaped to mask the anomaly , dental occlusion and if it will be affected adversely by accepting the transposition due to occlusal interferences, and the possibility of obtaining a symmetrical canine-guided group function which will influence the choice of treatment, and thirdly the stage of development and the position of the root apices. It should be noted that the correction of the transposition is easier and safer if it is carried out during root formation and before full eruption of the transposed teeth because the buccolingual width of the alveolar bone is usually not sufficient to support 2 adjacent teeth moving in different directions. If this point is not taken into consideration, then root proximity during correction can lead to root resorption and periodontal compromise. If the orthodontic situation requires extraction due to dentoalveolar protrusion or severe crowding, then extracting one of the transposed teeth at that quadrant could be preferred (Ciarlantini et al.2007).

Case 1

This is a 13-year old girl, presented with the main complaint of blocked out upper right canine, she has a skeletal and dental class I relationship, overbite of 50 %, and an average overjet, with a 1 mm midline shift (Fig.4 A, B, and C).



Figure 4. A, Case 1



Figure 4. B, Case 1



Figure 4. C, Case 1

From an occlusal intraoral view, **the** patient exhibited ovoid upper and lower arch forms. **The** upper arch was asymmetric due to upper right canine premolar transposition, blocked out upper right canine and rotations of upper right and left first premolars. The upper right second premolar was unerupted and its successor was still there. The upper and lower arches had no problem with crowding (Fig. 5, A and Fig.5 B).



Figure 5. A, Case 1



Figure 5. B, Case 1

The radiographic findings revealed a complete transposition of the upper right canine and first premolar; all wisdom teeth are missing **without** any other developmental dental anomaly.



Figure 6, Case 1: Panoramic x-ray for case 1

Treatment options **were** either to accept or to correct the tooth transposition through placing the canine to its physiologic position in order to restore good esthetics and normal masticatory function.

Treatment started first by placing a band around the upper right first premolar and constructing a transpalatal arch with a helix to attach an elastic thread in order to pull the premolar further palatally **to** clear the way for the movement of transposed canine, **prevent** bony loss at the cortical plate of the labially positioned canine, and **avoid** root proximity between the canine and premolar , **and** thus avoiding root resorption and periodontal compromise (Fig.7).



Figure 7, Case 1: Palatal traction of transposed premolar while leveling the maxillary teeth

After initial palatal movement of the premolar, full bonding of the upper arch was carried out and leveling the entire upper teeth except the transposed premolar was commenced. Palatal movement the upper right premolar was **???** bodily to avoid root proximity with the canine, and took several visits.

After clearing the pathway for canine movement and complete leveling and alignment, a coil spring was used on a stainless steel wire to push the canine to physiologic position while opening a space for the transposed premolar. After achieving contact between the canine and the lateral incisor, space was enough for correcting the position of the premolar. The labial traction of the premolar was started, by an elastic thread with a labial line of traction to bring the premolar to its physiologic place in the arch (Fig. 8).



Figure 8, Case 1: A coil spring was used to push the canine mesially

Rotation of the transposed premolar was evident in this case; derotation of this premolar was carried out during labial traction of the premolar by creating a moment on that tooth (Fig. 9).



Figure 9, Case 1: Derotating the premolar while tracking it to the arch

Active treatment took 24 months, **after which the** canine and premolar transposition was corrected, Class I molar and canine relationship was achieved with average overbite and overjet, a Hawley retainer in the upper arch and a fixed retainer in the lower arch were used for retention. (Fig 10, A- D).



Figure 10. A, Case 1



Figure 10. B, Case 1



Figure 10. C, Case 1



Figure 10. D, Case 1

Case 2

This is a 14-year old girl presented with transposition of lower right canine and lateral incisor, with no other dental anomaly was revealed by a panoramic radiograph (Fig. 11). The treatment plan was to accept the transposition because of the labial position of the lower canine in the buccal cortical bone which may not allow safe distal movement without creating cortical bone resorption with gingival recession and possible root resorption (Fig. 12), beside the fact that accepting the transposition will not adversely affect esthetics.

Aligning the transposed teeth to their transposed locations was achieved, a slight trimming of the lower canine was done, and a lower fixed retainer was bonded (Fig. 13, A-E).

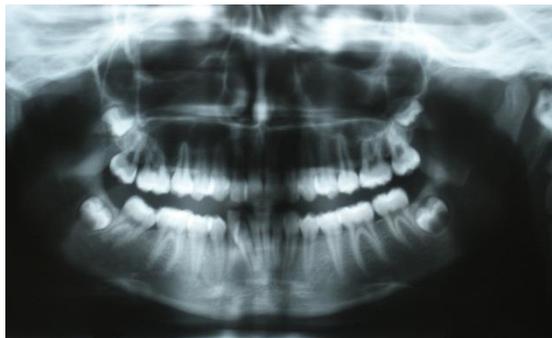


Figure 11, Case 2: Panoramic radiograph showing transposition between lower right canine and lateral incisor



Figure 12, Case 2: lower right canine with labial position during alignment



Figure13. A, Case 2



Figure 13.B, Case 2



Figure 13.C, Case 2



Figure 13. D, Case 2



Figure 13.E, Case 2

Case 3

The third case is a 13 year old girl presented with upper left canine first premolar transposition, with relatively small upper lateral incisors and retained upper deciduous canine on the affected side; this patient had a Class I molar and canine relationship and a spaced upper arch due to the small lateral incisors (Fig. 14, A-E).

Here we attempted to correct the tooth transposition, but progress radiographic evaluation by a panoramic x-ray revealed a possibility of root crossover and root proximity between the transposed canine and premolar (Fig. 15). **Therefore**, an acceptance of the transposition was the final treatment of choice for this case. Space was opened for the canine by bringing the premolar first lingually then mesially (Fig. 16, A-D). Reshaping the premolar by trimming the palatal cusp and periodontal management of this tooth is required in order to restore the proper facial esthetic and allow functional occlusion (Fig. 17 A-E).



Figure 14. A, Case 3



Figure 14. B, Case 3



Figure 14. C, Case 3



Figure 14. D, Case 3



Figure 14. E, Case 3



Figure 15, Case 3



Figure 16. A, Case 3

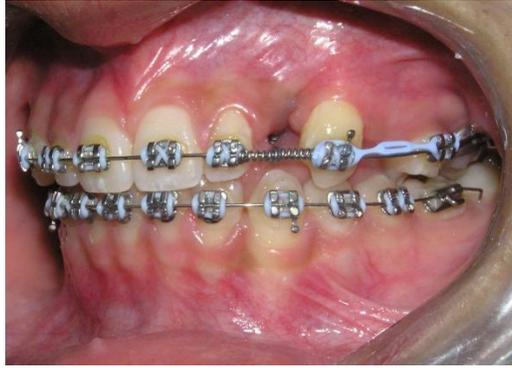


Figure 16. B, Case 3

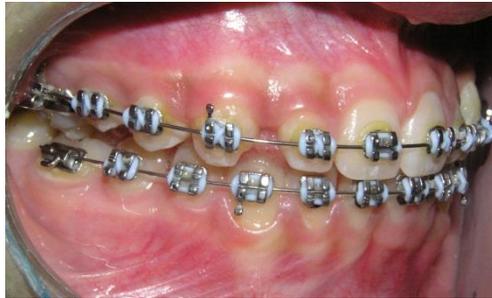


Figure 16. C, Case 3



Figure 16. D, Case 3



Figure 17. A, Case 3



Figure 17. B, Case 3



Figure 17. C, Case 3



Figure 17. D, Case 3



Figure 17. E, Case 3

Conclusions

Although tooth transposition is considered a rare developmental dental anomaly, it exhibits a clinical challenge due to the narrow buccolingual thickness of bone. **In addition , care** should be taken to avoid root proximity during movement of the transposed teeth during orthodontic treatment. **Also , the acceptance** of tooth transposition could be considered the safest method of treatment on the root structure and the periodontium of the transposed teeth. **Moreover , the correction** of tooth transposition could be tried in cases of maxillary lateral incisor canine transposition to avoid adverse effects on esthetics.

References

- 1- Ciarlantini R, Melsen B. (2007). Maxillary tooth transposition: correct or accept? American Journal of Orthodontics and Dentofacial Orthopedics; 132: PP 385-394.
- 2- Lieberman MA, Gazit E. (1983). Cuspid transposition and treatment timing. Case report. The Angle Orthodontist; 53: PP143-145.
- 3- Mader C, Konzelman JL. (1979). Transposition of teeth; American Journal of Orthodontics and Dentofacial Orthopedics 98: PP 412-413.
- 4- Nishimura K, Nakao K, Aoki T, Fuyamada M, Saito K, and Nagoya S. (2012). Orthodontic correction of a transposed maxillary canine and first premolar in the permanent dentition. American Journal of Orthodontics and Dentofacial Orthopedics;142: PP 524-533
- 5- Peck L, Peck S. (1993). Maxillary canine-first premolar transposition, associated dental anomalies and genetic basis. The Angle Orthodontist; 63: PP 99-109.
- 6- Peck S, Peck L. (1995). Classification of maxillary tooth transpositions. American Journal of Orthodontics and Dentofacial Orthopedics; 107: PP 505-517.
- 7- Platzer KM. (1968). Mandibular incisor-canine transposition. American Journal of Orthodontics and Dentofacial Orthopedics.; 76: PP 778-784.
- 8- Rabie AB, Wong RW. (1999). Bilateral transposition of maxillary canines to the incisor region. Journal of Clinical Orthodontics; 33: PP 651-655.

- 9- Shapira Y, Kufinec MM. (1989) Tooth transpositions—a review of the literature and treatment considerations. *The Angle Orthodontist*; 59: PP 271-276.
- 10- Shapira Y, Kufinec MM. (2001). A unique treatment approach for maxillary canine-lateral incisor transposition. *American Journal of Orthodontics and Dentofacial Orthopedics*; 119: PP 540-545.
- 11- Shapira Y, Kufinec MM. (2001). Maxillary tooth transpositions: characteristic features and accompanying dental anomalies. *American Journal of Orthodontics and Dentofacial Orthopedics*; 199: PP 127-134.
- 12- Yilmaz H, Turkkahraman H, Sayin M. (2005). Prevalence of tooth transpositions and associated dental anomalies in a Turkish population. *Dento Maxillo Facial Radiology*; 34: PP 32-35.

تبادل الأسنان: المظاهر السريرية والعلاج

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ملخص

تبادل الأسنان هو نادر جداً في تطور الأسنان، لأسباب غير معروفة، وهو بمثابة تحدٍ؛ نتيجة وجود سنين في سماكة عظم دهليزيه لسانية ضيقة، التي قد تؤدي لتبديل موقع الأسنان الصحيح، ولذلك يجب أخذ الحيطة أثناء تحريك الأسنان المنقولة خلال المعالجة التقويمية؛ لتجنب تقارب جذور الأسنان. إن القبول بتبادل الأسنان أثناء العلاج قد يعتبر الوسيلة الآمنة على بنية الجذر والعظم السنخي المحيط بالأسنان المنقولة، في حين أن تصحيح تبادل الأسنان يمكن تجربته في حالات تبادل الرباعية العلوية والنايب العلوي؛ لتجنب الآثار السلبية على الناحية الجمالية .

الكلمات المفتاحية: تبادل الأسنان، المظاهر السريرية، العلاج