

Transposition of teeth: A forensic perspective

Supriya Nambiar,
Subraya Mogra,
Surendra Shetty

*Department of Orthodontics and
Dentofacial Orthopedics, Manipal
College of Dental Sciences
affiliated to Manipal University,
Mangalore, Karnataka, India*

Address for correspondence:

*Dr. Supriya Nambiar,
Department of Orthodontics and
Dentofacial Orthopedics, Manipal
College of Dental Sciences,
Mangalore, Karnataka, India.
E-mail:
nambiar.supriya@gmail.com*

Abstract

Dental identification plays a key role in mass casualties and is usually based on disturbances of tooth eruption, malocclusions and/or previous dental treatments, changes brought about by age, pathological conditions and developmental disturbances. Tooth transposition is a disturbance of tooth eruption and is defined as change in the position of two adjacent teeth within the same quadrant. This review aims to discuss the prevalence and the etiology of transposition through a literature survey and to discuss its importance and implications as pertaining to the field of forensics. In summary, transposition is a rare and severe positional anomaly that represents a challenge for a dentist. It requires a keen eye on the part of the forensic pathologist to identify the condition.

Key words: Identification, mass disaster, maxillary canine, tooth transposition

Introduction

Dental identification can be used for identifying the deceased or the assailant in a crime scene or for identification of victims of a mass disaster. In the Asia Pacific region, because of its wide range of variations in topography and climatic conditions, India is a disaster prone country with an average of eight major natural calamities a year. While floods, cyclones, droughts, earthquakes and epidemics are frequent from time to time, major accidents occur in railways, mines and factories causing extensive damage to human life and property. In recent times, forensic odontology has evolved as a new ray of hope in assisting forensic medicine. This is relatively a young science of dentistry and still in its infancy state in India whereas in other developed countries it has acquired a recognized branch of dentistry in medical forensicology. In India, qualified forensic odontologists are very few. So, an attempt should be made to reinforce dental awareness among forensic personnel not only

about the role of dentists in person identification also to awaken the social responsibility of maintaining dental records of all patients. One such condition that can be noted in the dental records is transposition, which is one of the most difficult of clinical situations to treat and is a condition that has been observed and studied since the early 19th century. In his first edition titled "A dictionary of dental sciences, biography, bibliography and medical terminology" Harris in 1849 gave a description of transposition as an aberration in the position of teeth^[1]. It is in fact a unique and extreme form of ectopic eruption wherein a permanent tooth develops and erupts in a position normally occupied by another permanent tooth. Transposition is used to refer to an interchange in the position of two adjacent teeth within the same quadrant of the dental arch.^[2] Whereas, ectopic eruption refers to an abnormal eruption path taken by a tooth.

During identification of this condition, a distinction should be made between a complete and an incomplete transposition.^[2] A complete transposition is a condition wherein both crowns and the entire root structures of the involved teeth are found in their transposed positions. Whereas incomplete transposition is also called "pseudo" or "partial" transposition the crowns may be transposed while the root apices remain in their normal positions or the crowns may be in the correct order while the root apices are transposed. The involved teeth overlap and their long axes cross each other. In

Access this article online

<p>Website: www.jfds.org</p>	<p>Quick Response Code</p>
<p>DOI: 10.4103/0975-1475.137041</p>	

addition, the crowns and roots of the involved teeth may completely superimpose each other on normally projected radiographs.

Displacement and migration of teeth is a common phenomenon and literature evidence point to the fact that maxillary canine is probably the most frequently displaced tooth.^[2] When displaced in the palatal or labial plane, it may become palatally or labially impacted [Figure 1]. When displaced distally or mesially, an ectopically erupting canine can become transposed with one of the adjacent teeth. The objective of this review is to intimate medical and dental practitioners of the crucial role of dentist in the victim's identification and to further update the trainee dental specialist about this unique condition.

Epidemiology

Sandham and Harvie^[3] conducted a study on Scottish school children and concluded that 0.38% was seen to have transposition out of a sample of 800, which was corroborated by a study in India where the occurrence was seen to be 0.4%. Thilander and Jakobsson^[4] reported prevalence of 0.26% in Swedish school children. According to Peck and Peck^[5] and Feichtinger *et al.*,^[6] transposition affect both sexes equally, but some authors reported more frequency in females^[7,8] and others have found a higher prevalence in males.^[9]

Unilateral transposition has been reported more often than bilateral transposition, with the left side being somewhat more frequently involved than the right.^[6,9,10] Transpositions have a more female preponderance than males^[7,9] and more often in the maxilla with the maxillary canine as the tooth most frequently involved in transposition, usually with the first premolar and less often with the lateral incisor. Transposition of teeth without involvement of the maxillary canine is extremely rare.

Classification

A classification system with six classes grouped according to the teeth involved in the transposition has been suggested for the maxillary arch. Two of these classifications cannot truly be defined as transpositions. Canine-first molar and canine-central incisor site "transpositions" represent extreme displacements and should instead be called ectopic eruptions.

In the literature,^[6,9] six types of transpositions were clearly identified. These are:

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

Etiology

According to Kuttapa *et al.*,^[11] etiological possibilities include genetics, retained primary teeth, deviation of eruptive path of permanent teeth and abnormality in the sequence of eruption of permanent teeth. The maxillary



Figure 1: Unilateral transposition (occlusal view)



Figure 2: Unilateral transposition (right lateral view)



Figure 3: Bilateral transposition

canine-to-first premolar transposition was determined to be an anomaly resulting from genetic influences within a multifactorial inheritance model.^[6] In a study conducted by Peck *et al.*,^[8] evidence was found to suggest that the maxillary canine-to-first premolar transposition is genetically influenced, which has been proven by observations such as moderate rate of bilateral occurrence, sex-associated frequency differences, increased prevalence of additional dental anomalies and occurrence along family lines. In some cases, the canine-to-first premolar transposition occurs simultaneously with developmentally absent lateral incisors^[6,9] and is the most frequently appearing maxillary transposition type, comprising 71% of the cases.^[5] Transposition has never been reported in the deciduous dentition. The etiology of tooth transposition has been the subject of much controversy and is still not completely understood. Several theories have been proposed to explain the phenomenon. Multifactorial genetic factors,^[9] an interchange in the position of the developing dental lamina of the involved teeth and even trauma to the deciduous teeth in which dilacerations of the permanent incisor root was found have all been suggested as causes for transposition of teeth.

Another theory suggests that retained deciduous canines, observed in a large number of canine transpositions, might be the primary cause for the displacement and migration of the permanent canine from its normal path of eruption. Although not a true transposition, this migration theory may help to explain those extreme cases in which the canine erupted in the position of the incisor, second premolar or first molar.

Transposition is often accompanied by other congenital dental anomalies such as hypodontia [Figure 3], peg-shaped or small maxillary lateral incisors, retained deciduous teeth, severe rotations and malposition, dilacerations or malformation of the adjacent teeth.^[9] When transposition occurs, the involved teeth show a characteristic malposition and appearance.

Conclusion

Forensic odontology is a vital and integral part of forensic science that is most widely utilized for identification of the living and deceased persons. In India, qualified forensic odontologists are very few. So, an attempt should be made to reinforce awareness in dental practitioners about the role of dentists in person identification and to awaken the social responsibility of maintaining dental records of all patients. This is very essential for identification of individuals in the event of any disaster. Transposition is a rare and severe positional anomaly that represents a challenge for a dentist. It requires a keen eye on the part of the forensic pathologist to identify the condition. In this

article, a literature review of transposition was performed. Transposition of teeth is a condition that is recorded and managed during the dental treatment. This recording of transposition at dental clinical examination can be used to aid identification of mass disaster victims. The presence or absence of dental treatment (which gives information on the attitude and dental awareness of an individual) as well as the quality and quantity of dental treatment (type of restoration, type of prostheses or appliance) may give some clues on the socio-economic status of the individual. In short, we can say, in post mortem dental profiling, a forensic dentist looks for all possible methods to narrow down the identity of the deceased so as to enable search for the ante mortem records. This as a method of forensic dental identification is used when comparative and other methods of identification are not sufficient to establish the identity of the individual. Forensic dental identification depends largely on the availability of ante-mortem records. Hence, it is the social responsibility of each and every dentist to maintain the dental records of their patients for the noble cause of identification in the event of mass disaster.

References

1. Shapira Y, Kufninec MM. Tooth transpositions – A review of the literature and treatment considerations. *Angle Orthod* 1989;59:271-6.
2. Chattopadhyay A, Srinivas K. Transposition of teeth and genetic etiology. *Angle Orthod* 1996;66:147-52.
3. Sandham A, Harvie H. Ectopic eruption of the maxillary canine resulting in transposition with adjacent teeth. *Tandlaegebladet* 1985;89:9-11.
4. Thilander B, Jakobsson SO. Local factors in impaction of maxillary canines. *Acta Odontol Scand* 1968;26:145-68.
5. Peck S, Peck L. Classification of maxillary tooth transpositions. *Am J Orthod Dentofacial Orthop* 1995;107:505-17.
6. Feichtinger C, Rosswall B, Wunderer H. Canine transposition as autosomal recessive trait in an inbred kindred. *J Dent Res* 1977;56:1449-52.
7. Dayal PK, Shodhan KH, Dave CJ. Transposition of canine with traumatic etiology. *J Indian Dent Assoc* 1983;55:283-5.
8. Peck L, Peck S, Attia Y. Maxillary canine-first premolar transposition, associated dental anomalies and genetic basis. *Angle Orthod* 1993;63:99-109.
9. Ciarlantini R, Melsen B. Maxillary tooth transposition: Correct or accept? *Am J Orthod Dentofacial Orthop* 2007;132:385-94.
10. Weeks EC, Power SM. The presentations and management of transposed teeth. *Br Dent J* 1996;181:421-4.
11. Kuttapa N, Nayak US, Shetty A, Murali PS. Bilateral maxillary canine-premolar transposition. *J Indian Orthod Soc* 2011;45:193-7.

How to cite this article: Nambiar S, Mogra S, Shetty S. Transposition of teeth: A forensic perspective. *J Forensic Dent Sci* 2014;6:151-3.

Source of Support: Nil, **Conflict of Interest:** None declared