International Journal of Paediatric Dentistry 2006; **16:** 227–229

Mandibular first and second molar tooth transposition: a case report

J. E. R. GRANT[1], N. ABU MEZIER[2] & A. T. DIBIASE[2]

[1]*Department of Orthodontics, Eastman Dental Institute, London, UK and* [2]*Department of Orthodontics, Kent and Canterbury Hospital, Canterbury, Kent, UK*

Summary. A case is reported of what appears to be a transposition affecting the mandibular first, second, and third molars. The possible aetiology is discussed in relation to previously published studies. In the case described the primary actilogical factor appears to intraosseous migration of the developing tooth germ.

Introduction

Tooth transposition has been described as an interchange in the position of two permanent teeth within the same quadrant of the dental arch [1]. In 1849, Harris, in his first edition of *A Dictionary of Dental Science, Biography, Bibliography, and Medical Terminology*, described transposition of teeth: 'it sometimes happens that a central incisor is situated between the lateral of the side to which it belongs and the cuspidatus, or that a right central is situated in the place of the left and the left in the place of the right; or that a lateral incisor is situated between the cuspidatus and first cuspid, and at other times a cuspidatus is found between the first and second bicuspids' [2]. Tooth transposition is far more common in the maxillary arch. Five different variations of maxillary tooth transpositions have been described [3]. These are classified as:

1 Canine – first premolar (Mx.C.P1)
2 Canine – lateral incisor (Mx.C.I2)
3 Canine to first molar site (Mx.C to M1)
4 Lateral incisor – central incisor (Mx.I2.I1)
5 Canine to central incisor site (Mx.C to I1)

Peck *et al*. [4] have suggested, based on associations found in their study, transcription factors such as MSX1 and PAX9 might be components in the genetic control of mandibular lateral incisor and canine transposition, palatally placed canines and tooth malpositions connected with the specific expression of posterior-field (M3) hypodontia.

Correspondence: A. DiBiase, Maxillofacial Unit, Kent and Canterbury Hospital, Ethelbert Road, Canterbury, Kent CT1 3NG, UK. E-mail: andrew.dibiase@ekht.nhs.uk

Ferrazzini [5] has suggested a sixth type of transposition. In his article he describes the maxillary molar transposition (MxM3M2 and MxM4M3, respectively). Three cases of this anomaly were presented. The occurrence is extremely rare, about 0·04% in a sample of 7000 orthodontic patients. Investigation of other family members, especially parents and siblings, could not substantiate a hypothesis of inheritance of this anomaly. Other possible causes (trauma, caries, tooth agenesis) were also absent in these cases.

The maxillary canine, first premolar transposition has been recorded as having a prevalence of 0·25 to 0·5% [6]. By comparison, mandibular transposition is much rarer. Two variations of mandibular tooth transposition have been described previously in the literature [6]. These are:

1 Mandibular lateral incisor, canine transposition (Mn.I2.C)
2 Mandibular canine transmigrated/erupted (Mn.C.transerupted)

The prevalence of mandibular transpositions has been reported as 0·02 [6] and 0·03% [7], respectively, for the examples previously described.

The rarity of reported mandibular transpositions and the fact that mandibular molar transposition has not previously been described in the literature has led us to report this case.

Case report

A 12-year-old boy was referred by his general dental practitioner to the department of orthodontics of East Kent NHS Trust for an orthodontic assessment regarding failure of eruption of the posterior teeth in the lower left quadrant. The patient presented

with a class II division 1 malocclusion on a mild skeletal II base with a slightly increased overjet of 5 mm and crowding of the labial segments.

Clinical examination showed the presence of: 11,12,13,14,15,16,21,22,23,24,25,26,31,32,33,34,3E, 36,41,42,44,4E. 13 and 23 were partially erupted.

6	5	4	3	2	1/1	2	3	4	5	6
E	4	3	2	1/1	2	3	4	E		

The lower left first permanent molar was not present. The dental history gave no indication of previous extraction of the lower left first permanent molar.

Radiographic examination revealed the presence of what appeared to be a tooth transposition of the first mandibular and second molar teeth (Fig. 1). This was evident because of the complete root formation of the terminal molar tooth and the formation of interradicular tooth tissue of the mesial molar. In normal root development at age 12, the lower first molar roots are complete, second molars begin to erupt while the interradicular tooth tissues are still forming, as seen in the other three quadrants. The failure of eruption of the first molar was attributed to primary failure of eruption, as there appeared to be no mechanical impediment or underlying systemic cause [8]. At that time, possible treatment options were discussed but the patient was resistant to any treatment.

The patient was reviewed approximately 12 months later when a further radiograph was taken. This showed the presence of what appears to be the left mandibular third molar follicle, forming between the lower left first and second molar teeth (Fig. 2). The lower left first molar has remained in the same position with forward movement of the lower second molar possibly because of mandibular growth and intraosseous migration of the tooth, allowing space for the development of the third molar. There was little evidence radiographically, however, that what was believed to be the lower left third molar has any eruptive potential and was therefore affected by the primary failure of eruption. The aim of treatment was therefore to address the increased overbite and overjet initially starting with a functional appliance. Unfortunately, this proved unsuccessful because of lack of compliance and the patient's continued resistance to any treatment. Therefore, treatment was discontinued and the patient was kept under review.

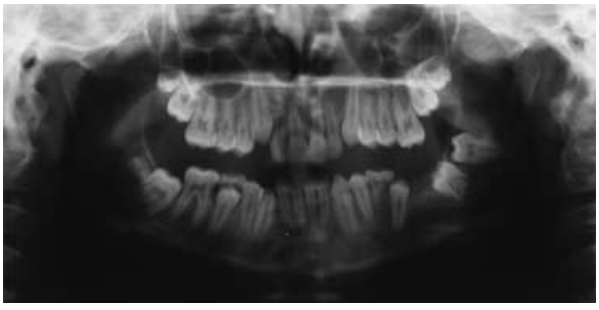

Fig. 1. Dental pantomogram of patient aged 12 years.

Fig. 2. Dental pantomogram of patient aged 14 years.

Discussion

The causes of all transpositions have not yet been fully explained; however, many theories as to the possible aetiology of tooth transposition have been implicated such as tooth trauma, retained primary teeth, ectopic formation of the dental follicle, ectopic eruption pathways, and a genetic predisposition [9–11].

Peck *et al*. [4] suggested a polygenic, multifactorial inheritance for transposition of teeth and supported the concept of field influence in the process of odontogenesis.

Nelson [12] suggested that transposition originates during cellular migration following induction of cell groups. He further states that at this time, moving epithelial cells 'test' the positional information put out by the mesodermal cells over which they move by matching protein chains. When they contact cells at the site for which they are programmed, they stop. The mutation, which causes the anomaly, may lie within the mesodermal organizer genes in that the cells producing canine and premolar placement proteins arise in reverse order along the developing maxilla, resulting in the canine and premolar epithelial cells attaching in a transposed position.

Peck *et al*. [4] stated, 'One significant failing of previous articles has been the mistaken search for a single unifying aetiology to fit all the apparent cases of transposition, maxillary, and mandibular'. In the

case described, it seems that the lower left first permanent molar migrated to a more distal position than usual, suggesting a very rare natural condition of horizontal tooth movement which has been reported only in the mandible and affecting second premolars and canines [13–15]. This migration appears to have led to the lower left first permanent molar being transposed with the lower left second permanent molar.

Further studies into tooth transposition have found a relationship between tooth transposition and other dental anomalies. In one recent study by Peck *et al*., the maxillary canine-first premolar transposition was associated with tooth agenesis and peg-shaped lateral incisors in 49% of cases; this was up to 10 times the normal rate of occurrence [6]. This was strongly suggestive of a multifactorial genetic inheritance model in the aetiology of tooth transposition. They did concede, however, that because of the low prevalence rate (0·03%) the anomaly discourages the prospects for easy collection of other cases.

What this case report adds

- The rarity of mandibular transpositions and the fact that mandibular molar transposition has not been previously described in the literature has led us to report this case.

Why this case report is important for paediatric dentists

- It adds another classification to tooth transposition as well as possible aetiological factors.

Conclusion

A true transposition affecting mandibular permanent molar as far as the authors are aware has not previously been reported. It is hoped that this case also serves to illustrate some of the possible aetiological factors involved in tooth transpositions. The aetiology may be considered as having a multifactorial basis, involving local factors such as ankylosis, ectopic tooth germ formation, and intraosseous migration, as well as general factors such as genetics.

References

1 Shapira Y, Kuftinec M. Tooth transpositions – a review of the literature and treatment considerations 1989; *The Angle Orthodontist* **59**, 271–276.

2 Harris CA. *A Dictionary of Dental Sciences, Biography, Bibliography and Medical Terminology*, 1st edn. Philadelphia: Lindsay and Blakiston, 1849: 725.

3 Peck S, Peck L. Classification of maxillary tooth transpositions. *American Journal of Orthodontics and Dentofacial Orthopedics* 1995; **107**: 505–517.

4 Peck L, Peck S, Attia Y. Maxillary canine-first premolar transposition, associated dental anomalies and genetic basis. *The Angle Orthodontist* 1993; **63**: 99–109.

5 Ferrazzini G. Maxillary molar transposition. *Journal of Dentistry for Children* 2002 **69**: 73–6, 13.

6 Peck S, Peck L, Kataja M. Mandibular lateral incisor–canine transposition, concomitant dental anomalies, and genetic control. *The Angle Orthodontist* 1998; **68**: 455–465.

7 Jarvinen S. Mandibular incisor–cuspid transposition: a survey. *Journal of Pedodontics* 1982; **6**: 159–163.

8 Proffit WR, Vig KW. Primary failure of eruption: a possible cause of posterior open-bite. *American Journal of Orthodontics* 1981; **80**: 173–190.

9 Dayal PK, Shodhan KH, Dave CJ. Transposition of canine with traumatic etiology. *Journal of Indian Dentistry Association* 1983; **55**: 283–285.

10 Joshi MR, Bhatt NA. Canine transposition. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontics* 1971; **31**: 49–54.

11 Shapira Y. Transposition of canines. *Journal of the American Dentistry Association* 1980; **100**: 710–712.

12 Nelson CC. Maxillary canine/third premolar transposition in a prehistoric population from Santa Cruz Island, California. *American Journal of Physical Anthropology* 1992; **88**: 134–144.

13 Sutton PRN. Migrating nonerupted mandibular premolars: a case of migration into the coronoid process. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontics* 1968; **25**: 87–98.

14 Stafne EC. Malposed mandibular premolar. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontics* 1964; **17**: 43.

15 Bluestone LI. The impacted mandibular bicuspid and canine: indications for removal and surgical considerations. *Dentistry Items of Interest* 1951; **73**: 341–355.