

**RATE AND CHARACTERISTICS
OF DENTAL TRANSPOSITION**

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Abstract

The aim of this study is to review the frequency and the characteristics of the dental transpositions and to assess the associated dental disorders in treated patients with orthodontic deformations.

1457 adolescent patients were diagnosed with orthodontic problems. They were treated in our clinic and they were included in the study below.

14 of them have a true type of tooth transposition. This by itself presents 0.96% frequency of this abnormality. These 14 patients have 17 transposing teeth in general. The ratio of females/males is 71.4% to 28.6%. The problem manifests basically in the maxilla. It was present in 11 of the patients (78.6%) – 8 with unilateral and 3 with bilateral manifested type. Three of the patients (21.4%) had exchanged positions of the teeth in the mandibulla.

Early diagnosis and knowledge of the frequency and etiology of the problem influence the prognosis and success of orthodontic treatment of the patients.

Key words: tooth transposition, tooth disorder, canine, first premolar, lateral

Introduction. Dental transposition is a severe disorder of the position of the permanent teeth or their normal eruption in the dental arch. Its manifestation includes ectopic changed position of two adjacent teeth in a particular area. The transposition is complete when the root and the crown are in a different ectopic position and they are parallel to the other teeth. The dental transposition is incomplete (pseudo-transposition) when the crowns are in exchanged positions but the roots are not. In this case, the teeth are overlapped. Dental transposition can be bilateral and unilateral and the latter is most frequent. PECK and PECK [1] classify the dental transposition and report cases of dental transposition of

teeth which are not adjacent. These rare cases of dental transposition are most frequently combined with hypodontia of adjacent teeth. General changes in the genesis of teeth often lead to this abnormal position. According to PECK and PECK [2, 3] and CHATTOPADHYAY [4] the dental transposition between the canine and the first premolar is a genetic abnormality. It is multifactorial inherited from a polygene type. It is often manifested unilaterally and there is a difference between the prevalence among male and female patients. BURKI et al. [5] report that transposition is more often observed in combination with peg-shaped lateral, hypodontia, ankylosis of primary teeth, or severe rotation of permanent teeth. SHAPIRA [6] reports that 18.5% of patients with transposition have one or more missing teeth. Because of its genetic nature CIARLANTINI and MELSEN [7] ask the question “Do we have to treat the dental transposition or do we have to accept it?”. Authors like BABACAN [8], DEMIR [9], FILHO [10] offer their own techniques of attempts to treat this rare dental abnormality.

Frequency. Burki and Munawwar [5] report that dental transposition is observed in 1 of 300 orthodontic patients. According to MATTOS [11] the dental transposition frequency is 0.4%. That includes both unilateral and bilateral in ratio of 1:4 and the left sided transpositions are more frequent than the right sided ones. GEBERT'S [12] research on the problem reveals that the most frequent transposition is between canine and first premolar – it can reach up to 80%, compared to the transposition between lateral incisor and canine, which reaches up to 20%. ROMAN [13] studies 700 orthodontically treated patients and finds out that the rate of dental transposition is 0.83%. It is more often observed in male than in female patients. CELIKOGLU [14] studies dental transposition among the Turkish nation and discovers a rate of 0.27% and ratio of female/male 2.2/1. In his research from 2011 SYNODINOS [15] reports that the frequency of dental transposition is from 0.13% to 0.4%. He quotes Thilander (1968) with data from the Swiss nation with rate of 0.30%, Ruprech's survey is on Arabic patients in Europe – 0.13% and Burnett (1999) – 0.51%. ELY'S [16] research is made among 75 patients diagnosed with dental transposition. They had a total of 85 transpositioned teeth. A significant research in the orthodontic literature is made by PAPADOPOULOS et al. [17] in 2010. They found out that the prevalence of dental transposition was approximately 0.33%. The most commonly observed is unilateral.

The aim of this study is to reveal the epidemiologic prevalence of dental transposition among Bulgarian adolescents with orthodontic problems. Our main objective was to research the frequency and characteristics of dental transposition and to discover the related orthodontic abnormalities.

Material and methods. This study is based on 1457 patients, who were orthodontically treated at our clinic from 2004 to 2014. We analyzed every clinical case, which includes: X-ray (orthopantomography-OPG, Cone Beam Computer Tomography-CBCT), photos and model casts of the patient. All of the patients

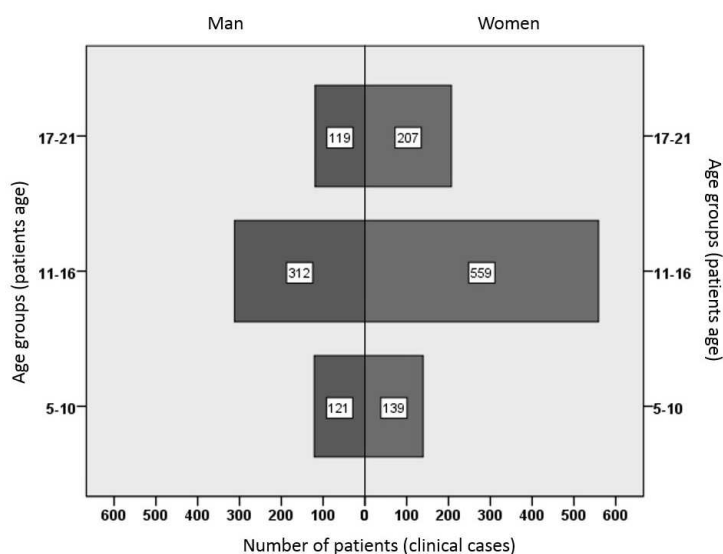


Fig. 1. Division of patients by gender and age groups

are between the age of 5 and 21, which means that they are in their growing period. The average age of the patients we studied was 13.85 ± 3.58 . Male patients are 552 (37.9%) and female patients are 905 (62.1%), respectively. All of the patients had dento-alveolar abnormalities. Most of the patients among the males are between the age of 11–16 years old (312 cases), followed by 5–10 years (121 cases). Most of the female patients are between 11–16 years old (559 cases), followed by 17–21 years old patients (207 cases) (Fig. 1).

We made a division of the patients by the following factors: presence of teeth that are in exchanged position. Type of transposition: unilateral or bilateral; in maxilla or in mandibulla; left or right sided; if the transposition is between canine and first premolar or lateral incisor. We reported the relative orthodontic deformations that are most commonly seen among patients diagnosed with dental transposition. Our survey includes rare cases of pseudo-transposition of teeth, transposition due to multiple congenital missing teeth (hypodontia), atypical transpositions. The last type of transposition is not included in this report.

Results. The patients diagnosed with transposition are 14 (0.96%). Eleven of them are with unilateral transposition and 3 are with bilateral. These 14 patients have a total of 17 teeth that are in transposition. The ratio among female and male who are diagnosed with dental transposition is 71.4% to 28.6%.

The problem is most commonly manifested in the upper jaw, 11 patients are diagnosed with transposition in the maxilla (78.6%). Eight of them are with unilateral type and 3 with bilateral. Three of the patients have transposition in the mandibulla.

Two of the clinical cases are with bilateral transposition between the upper canines and first premolars. These patients present 14.3% of all the patients with transposition. One of the cases is with bilateral transposition between the upper canines and lateral incisors – 7.14%. Bilateral transposition is observed in 3 of the female patients. One of them is diagnosed at the early age of 9. The diagnosis was based on X-ray, made before orthodontic treatment concerning another abnormality.

The unilateral type of dental transposition was observed in 4 cases (36.4%) between upper canine and first premolar, in 4 cases upper canine – lateral incisor (36.4%), 2 cases with exchange between lower canine and lateral incisor (18.2%) and 1 case with dental transposition of the lower canine and first premolar (9%) (Fig. 2).

Exchanged upper right first premolar with canine is presented in 6 cases (35.3%) out of 17. This is the most common type of dental transposition. From these cases two are with bilateral manifestation and four with unilateral. They are followed by transposition between upper left canine with lateral incisor – 4 cases (23.5%). From these cases 3 are with unilateral manifestation and one with bilateral. We report 2 cases of transposition between upper right canine with lateral (11.80%) and 2 cases of transposition between upper left first premolar with canine (11.80%) (Fig. 2).

There is an absence of cases with transposition between lower right premolar and canine in our survey. We report single cases of transposition between lower right canine and lateral incisor, as well as lower left canine and first premolar and canine and lateral.

A total of 9 transpositioned teeth were reported on the right side (8 in the upper jaw and 1 in the lower jaw). On the left side there were 8 cases in total

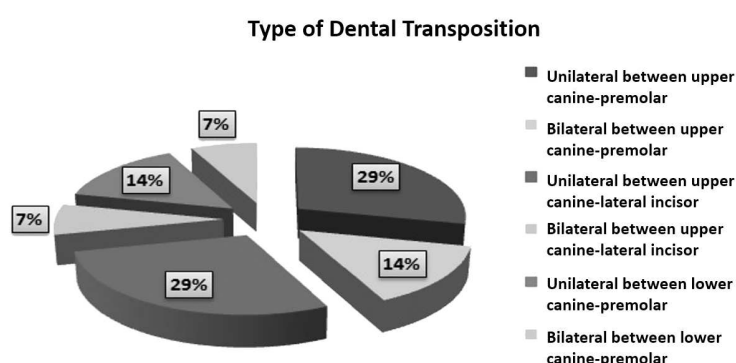


Fig. 2. Prevalence of the different types of transposition

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Abnormalities related to dental transposition

Indicator	Dental Transposition				P
	Number of patients with this indicator		Patients with diagnosed dental transposition		
	Cases	%	Cases	%	
Hypodontia	131	8.99%	2	0.90%	1.000
Hyperodontia	20	1.37%	2	10%	0.015
Microdontia	30	2.06%	2	6.67%	0,045
Impacted teeth	156	10.71%	4	2.60%	0.054
Treatment with extraction of teeth	178	12.22%	1	0.60%	1.000
Treatment with gaining space in the dental arch without extraction	212	14.55%	2	0.94%	0.600

(6 in upper jaw and 2 in lower jaw). According to this factor we do not find a significant difference between the prevalence of transposition on the two sides of the face.

From Test χ^2 and Fisher's exact test in search of the correlation between the categorical variable (Table 1), we found that 131 (8.99%) of all of the patients are diagnosed with hypodontia (without including the third molars). Two of the patients diagnosed with hypodontia are also diagnosed with transposition. From all of the patients 20 (1.37%) are diagnosed with hyperodontia, 2 of them are observed with transposition. These 10% of the patients with hyperodontia and transposition form a significant relation between these two conditions. It can be concluded, that the hyperodontia is related with higher percentage of prevalence of dental transposition.

Discussion. Dental transposition is an abnormality, which is observed among Bulgarian orthodontic patients with prevalence of 0.96%. This rate is normal, compared to the one reported in the other European countries (0.2–1.5%). The higher rate among the females, is due to their huge interest in their appearance, which is regarded to be a main reason for an orthodontic treatment. Bearing this in mind, the multifactorial type of inheritance and the majority of accompanying local factors, it is reasonable that the most common type of transposition to be from unilateral type.

On the basis of our clinical experience we made a review of the related orthodontic problems that accompany transposition: Four of the cases with exchanged position of the upper canine and lateral incisor are related to impacted canine. In one of these cases besides the impacted canine there was also an impacted central incisor with reverse direction of the crown-root (in situ – in verso) and persistent primary canine. The second case was related to odontoma col-

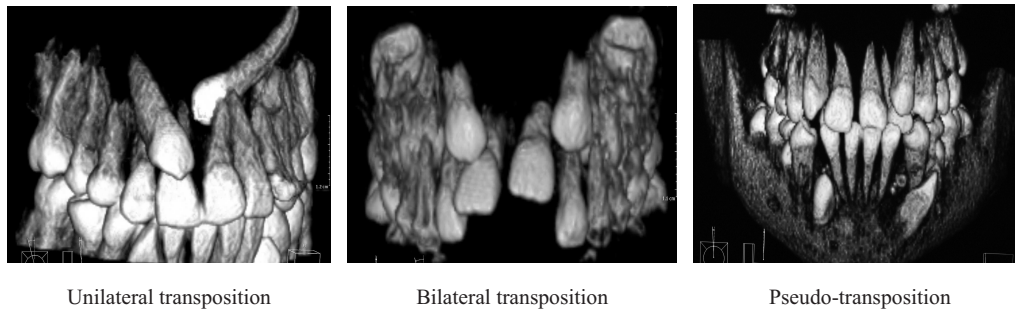


Fig. 3. Types of dental transposition

lection and impacted canine, central and lateral incisor. We observed that in the third case vestibular impacted canine was almost at the level of the central incisor and canine palatally impacted on the controversial side. In the fourth clinical case we found impacted canine with exchanged position and a peg-shaped lateral incisor and persistent primary canine. The two cases with bilateral transposition were clinically related: one of them with hyperodontia and the other with hypodontia, combined with persistent primary teeth. A female patient with hypodontia of the upper lateral incisors and bilateral transposition of the upper first premolars with canines, was early diagnosed with this problem and treated at our clinic and a nice esthetic and functional outcome was achieved (Fig. 3).

Summarizing the historical data, clinical and X-rays, we can conclude that dental transposition among our patients is due to genetic determination (1 female patient with bilateral dental transposition and hypodontia of upper lateral incisors, whose mother had also multiple hypodontia). Another reason is the local factors and disturbance: impacted canine in exchanged position (4 cases); impaction of a tooth that is adjacent to the problem teeth germ or odontoma collection (1 case), which means that the patient is prone to dental abnormalities; hypodontia (2 cases) and/or microdontia (peg-shaped teeth – 2 cases); persistent primary teeth in the area of dental transposition (6 patients).

Genetic factors with multifactorial expression, related to disturbance of the dentinogenesis and abnormal bone development. These are mainly patients with clefts, who we treat, but they are not mentioned in the current survey because they are a special group of patients. There is a high rate of dental transposition, tooth shape, number and position variety among the patients with cleft lip or/and palate, especially to the teeth adjacent to the cleft of the alveolar bone. Most often these teeth are the lateral incisor, the canine and the first premolar. These cases are examined in a different survey of ours.

Another reason for the dental transposition is the long canine migration during eruption. This is influenced by the morphology of bone in this area and the growth at this period. The upper canine takes relatively high position during the period of its foetal development close to Apertura Piriformis and above the

germs of the premolars. This determines high risk of its ectopic eruption or impaction. The eruption path of the canine, which follows the distal surface of the root of the lateral incisor as its guidance, can be influenced by other changes of the maxillary spaces, mechanical obstacles and differences in the speed of growth. This problem was found among 28.6% of the patients with transposition in our survey.

Hypodontia is a genetically determined condition, which is inherited by autosomal-dominant mechanism with incomplete penetrance and variable expression. This phenomenon most often leads to arrangement of the canine to the central incisor, and in some cases to the first molar – hypodontia of the first and second premolar. 14.2% of the group of the studied patients have upper lateral incisor hypodontia.

Long-time persisting primary teeth, especially the ones with more than one root (most often second molars) are one of the leading reasons for a change of the germ's eruption direction. The root resorption is an undesired effect in orthodontics, but its absence in the moments of teeth change can lead to severe disorders.

The aforementioned two factors are often combined with ankylosis of primary teeth which postpones the development of the alveolar bone in this area. The bone tissue at the ankylosed region does not allow any natural germ movements and the tooth migrates to an adjacent, which is free from ankylosis bone. This is a major reason for dental transposition.

The dilacerations of the tooth roots that are adjacent to the eruption teeth can change their direction. This phenomenon can be observed after early and incompetent orthodontic treatment.

Other mechanical obstacles, that can change the normal eruption of the teeth are bone changes and bone formations. The odontoma collection is the most often observed problem, and we found it among two of the patients.

The traumatic injuries of primary teeth, intervention in facial bone development and bone diseases as cysts can cause displacement of the primary teeth. This leads to atypical path of eruption. Changes of the shape of the dental arch as a consequence of problems, surgical or orthodontic treatment can also be a possible factor.

Conclusion. Dental transposition has a variety of etiological prerequisites, inheritance conditioning of the dental genesis, size of the adjacent teeth, bone changes and other local factors. We found a frequency of prevalence 0.96% which more often is a result of unilateral maxillary dental transposition than bilateral. We reported three cases with problems in the lower jaw. The frequency of dental transposition between upper canine and first premolar is higher, as compared to the frequency of prevalence of the upper canine and lateral incisor. Dental transposition leads to severe aesthetic and functional abnormalities during the eruption of teeth. For this reason, it is important to be familiar with the char-

acteristics related to the etiology and the rate of prevalence in order to have an optimal success in the orthodontic treatments.

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