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AGE AS FACTOR IN THE CHANGE OF THE POSITION IN IMPACTED MAXILLARY CANINE

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Abstract

Many studies have shown that mesiodistal position of impacted maxillary canine gives the best prediction values for orthodontic treatment, or, the closer the impacted canine lies to midline, the poorer is the prognosis for orthodontic alignment.

The aim of the present study is to classify impacted maxillary canine according to canine crown horizontal overlap with lateral or central incisor root; to find their correlation with the age of patients with impacted maxillary canine.

A cross-sectional survey was carried out in 104 patients with impacted maxillary canine who attended several polyclinics and dental ordinations in north-east part of North Macedonia. Patients' dental records as well as their panoramic radiographs were examined. We used a sector classification by Alesandri et al. Dominant position of the impacted canines cusps in younger group (from 10-15 years of age), is when it is overlapping with half and a whole width of lateral incisor's root 9 (28.13%) and 17 (53.13%), consequently. Dominant position in older group (from 15-69 years of age), is when it is overlapping a half and the whole width of central incisor's root 10 (20.41%) and 20 (40.82%), consequently (p=0,00025 sig.). Early detection of impacted canines and timely start of orthodontic treatment is crucial for successful treatment.

Key words: maxillary canine, impaction, orthodontic treatment

Introduction

Malocclusion is a condition when the teeth are not correctly aligned in the dental row and deviate of the normal manner one to another in the same arch as well as to the teeth in the other dental arch. This definition was firstly used by White and al. in 1967. Most of the malocclusions are not pathologic conditions. Impacted maxillary canines (IMC) are rated as malocclusions that cause explicitly aesthetic disorder of the face [1]. The term impacted teeth in stomatology means half erupted or non-erupted tooth that is not in functional level in the occlusal plate and is not in standard, inter-cuspidation correlation with the other teeth in the mouth [2]. The most prevalent dental anomaly in the population today according to Fardi and co. is impaction, especially on the canines with prevalence of 8.8% [3]. The etiopathology of IMC is multicausal. Peck (1994) introduced the theory of polygenic-multifactorial inheritance of maxillary palatal canine impaction [3]. It is certain that the responsibility goes to group of genes. These genes are also responsible for the onset of other dental anomalies, which are known as associated dental anomalies. This explains the fact why in certain ethnic regions there is increased prevalence of this anomaly [4, 5, 6, 7]. If there is clinical doubt for IMC, the most frequently used radiography examination for its confirmation is ortopantomographic image [8, 9]. The possible mesiodistal position of the tip of IMC crown on pantomographic image was classified in 5 sectors by Alesandri and co. In sector 1 overlapping is lacking, in sector 2 it is with distal half of the root of the adjacent lateral incisor. Sector 3 is when IMC shadow is covered by the whole width of the shadow of the lateral incisor root. Sectors 4 and 5 relate to distal half of the width of the central incisor root and the

whole width of central incisor by the side of impactation. Localization into sectors can be used in several aims [10].

The aim of the investigation is to perform classification in relation to the size of horizontal overlap of IMC with the adjacent lateral and central incisor root; to present the way of the overlap in the division of the patients in age groups and to find out their mutual dependence/relationship.

Materials and methods

The investigation represents transversal cross sectional study for the prevalence of impacted maxillary canines and it was realized in the period from 1.12.2017 to 28.02.2018. The population that was subject of the research was individuals at the age ranging from 10 to 69 years who came to have oral check-up and who underwent radiographic orthopantogramic examination in representative dental polyclinics and ordinations on the territory of Skopje, Kumanovo and Kriva Palanka. Inclusion criteria for the investigation - patients at the age from 10 to 69 years with un-erupted maxillary canine who voluntarily agreed to participate in the study and to undergo orthopantomogramic radiography. Exclusion criteria were patients younger than 10 and older than 69 years with bad quality of panoramic images and incomplete data from the medical records of family and private health institution (PZU), as well as patients with syndromes and craniofacial anomalies.

Two investigation instruments were used in the study, radiographic orthopantomogramic (OPG) radiographs from patients, which were made in selected dental ordinations and polyclinics as well as data obtained from stomatologic diaries where the patients were registered. Statistical processing of the data obtained in the course of the research was realized by creating database in the statistical program Statistica for Windows 8.0. Computer analysis included adequate statistical methodologies such as distribution of frequencies (absolute and relative incidence) for demonstration of qualitative signs, that is, parameters, as well as descriptive methods (central tendency measures – mean, median and mode) for presenting medium and typical data values.

Determination of the association, that is, the correlation of certain variables and the onset of impacted maxillary canines as well as quantification of this correlation, was performed by usage of non-parametric methods (Chi-square test of homogeneity with C – contingency coefficient) and parametric methods (Linear correlation – Pearson's coefficient). In order to test the importance of the difference among certain analyzed parameters, depending on the type and distribution of the data, parametric (t-test for independent examples) and nonparametric tests for independent specimen were used (Mann-Whitney U test, Kolmogorov-Smirnov test for two samples, Fisher-exact test); the value $p<0,05$ was taken as a level of significance, while for the high significant value $p<0,01$ was taken.

Results

Overlapping with lateral and central incisor root was detected in 81 (77.88%) examinees. In 12 patients (11.54%) overlapping with ½ of lateral incisor root was registered, in 15 (14.42%) overlapping with ½ of central incisor root, in 33 (31.73%) overlapping occupied the whole width of lateral incisor while in 21 (20.19%), the whole width of central incisor root (figure 1).

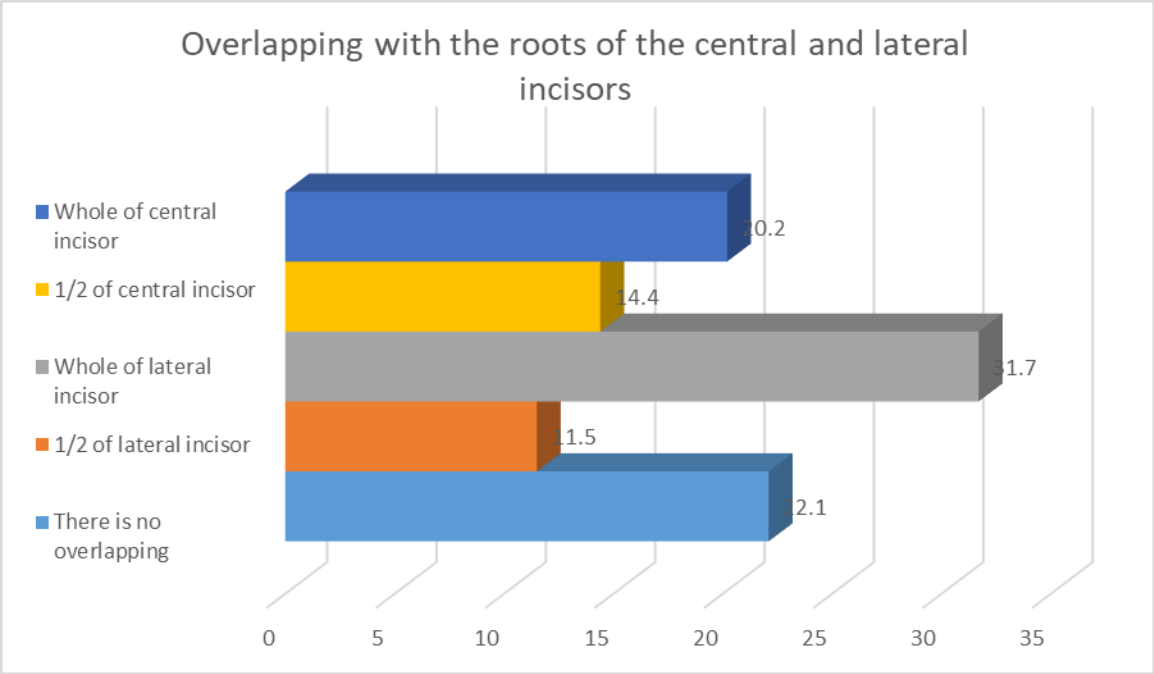

Figure 1. Examiner's graphical view of degree of IMC's crown overlapping with central and lateral incisor root

Overlapping with lateral and central incisor root was detected in 45 patients (71.43%) at the age between 10 and 19 years, in 15 (83.33%) at the age between 20 and 29 and in 9 (81.82%) patients aged between 30 and 39 years. The same condition was detected also in all 5 patients who were between 40 and 49 years, the two patients between 50 and 59 years and all 5 patients belonging to the oldest age group ranging from 60 to 69 years. The patients of these age groups had non-significantly different incidence of overlapping with lateral and central incisor root. (p=0.58%).

Overlapping with central and lateral incisor's root	**Groups of age**					
	10 – 19	**20 – 29**	**30 – 39**	**40 – 49**	**50 – 59**	**60 – 69**
Absence of overlapping	18 (28.57)	3 (16.67)	2 (18.18)	0	0	0
Presence of overlapping	45 (71.43)	15 (83.3)	9 (81.82)	5 (100)	2 (100)	5 (100)
Total	63	18	11	5	2	5

Table 1. Distribution of patients with and without overlapping depending on age

Statistically significant difference in the registered overlapping condition with lateral and central incisor root depending on age was registered when the age was analyzed in two age groups, younger and older than 15 years (p=0,01). Overlapping was significantly more frequently detected in 32 (66.67%) patients, younger than 15 years, and in 49 (87.5%) patients older than 15 years, which means it was significantly more frequently in older patients.

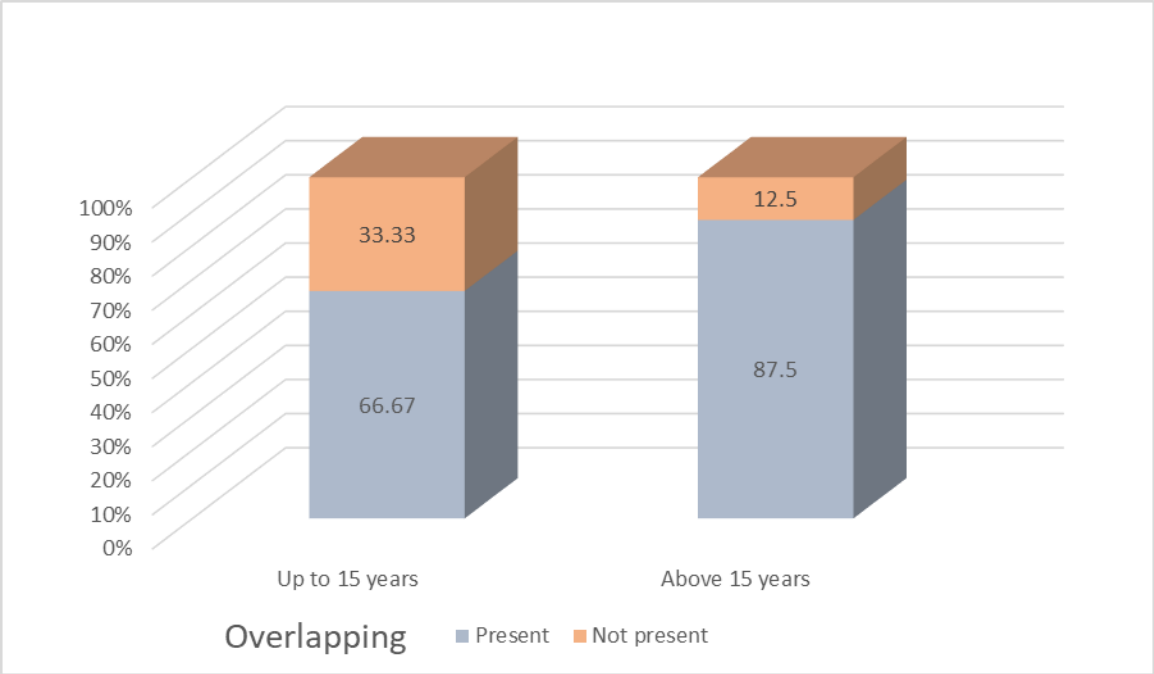

Figure 2. Graphical presentation of overlapping incidence in patients younger and older than 15 years p (Chi-square test) p-value=0.011 sig.

Both age groups of patients, below and over 15 years, with registered overlapping condition, differ significantly in association to the manner of overlapping by lateral and central incisor root (p=0,00025).

Overlapping condition with ½ of lateral incisor root and with whole width of lateral incisor root, was registered in the younger age group more often than in the older one – 9 (28.13%) vs 3 (6.12%), and 17 (53.13%) vs 16 (32.65%), consequently.

Overlapping condition with one half of central incisor root and with whole width of central incisor root, was registered in the age group older than 15 years more frequently than in the group of patients younger than 15 years - 10 (20.41%) vs 5 (15.63%), and 20 (40.82%) vs 1 (3.13%), consequently.

Degree of overlapping	**Age**		**p-value**
	< 15 years	**> 15 years**	
½ of the width of lateral incisor's root	9 (28.13)	3 (6.12)	0,00025 sig
Whole width of lateral incisor's root	17 (53.13)	16 (32.65)	
½ of width of central incisor's root	5 (15.63)	10 (20.41)	
Whole width of central incisor's root	1 (3.13)	20 (40.82)	
Total	32	49	

Table 2. Overlapping with lateral and central incisor in age groups to and over 15 years.

Discussion

The division in two age groups of patients with IMC was made having in mind the fact that maxillary canines are erupted until 13 years while their root is completely formed up to 15 years of age [11].

For the assessment of the difficulties which orthodontists would encounter in their attempts to bring IMC in their normal position in the alveolar arch, the so called Subjective degree of difficulties (SDD) and Treatment Difficulty Index were performed. The most important factor in these parameters was the size of the horizontal overlap that is, overlapping with lateral and central incisor and the age of the child [12, 13]. Four aspects of the position of impacted canines are recommended for the prognosis of IMC therapy result. The first and most significant is the size of horizontal overlap of radiographic image of canine crown with the root of lateral incisor. The prognosis can be good, moderate and bad if there is no overlap; the overlap is half of the root or on the whole width of the root [14]. Depending on how much the shadows of lateral and central incisor's roots are overlapped by the IMC, division in five sectors is made. The absence of overlapping is in sector number 1, a half of mesio-distal width of the lateral incisor root is in sector number 2, whole width of mesio-distal width of lateral incisor root is sector 3, sector 4 relates to the zone where the tip of IMC occupies one half of mesio-distal length of central incisor root and zone 5 is when the tip of IMC overlaps the whole width of the central incisor root [11].

This sector classification was applied by Pacifici at al., and compared with the results of our study in the sector 3 it was concluded 60% vs. 31.7%, in sector 2, 24%, vs. 11.5%, sector 1, where without overlapping, the results were 16% vs. 22.1% [15].

It is necessary to start surgical-orthodontic treatment earlier since the number of visits during the treatment is in correlation with the age, or with the growth of the overlap zone, that is, as much as the tip is located mesially, more often the visits should be made [16]. In addition, this zone classification has its great application in the planning of the treatment. Thus, Olive estimated that canines in zones 4 and 5, that is, those which overlap with central incisor, need 21 months to be included in the tooth arch in orthodontic treatment. Canines from sectors 2 and 3, that is, those that overlap with lateral incisor, need only 8 months [17]. The results from this same study opposite to the results from our study showed IMC

incidence in zones 3, 4 and 5 of 54.8% vs. 71.9% in the age group to 15 years and incidence of the same zones of 80% vs. 93.9% in the older age group. IMC treatment involves time, substantial financial cost, and the psychic trauma from the surgical treatment should not be forgotten. Also, there are not only the duration of the expensive orthodontic treatment and the number of visits we should think of, but there are the travelling costs and the absence from work which the patients and their families will have to undertake [19, 20].

Conclusion

Overlapping is significantly more frequently detected in 32 (66.67%), patients younger than 15 years and 49 (87.5%) patients older than 15 years, which is, significantly more often in older patients.

Overlapping condition with one half of lateral incisor and with whole width of lateral incisor's root – 9 (28.13%) vs 3 (6.12%) and 17 (53.13%) vs 16 (32.65%) consequently was registered more frequently in the younger age group than in the older one. In the adult group, older than 15 years, more often than in the group of patients younger than 15 years, overlapping condition with one half of central incisor's root, and with whole width of central incisor's root was registered - 10 (20.41%) vs 5 (15.63%), и 20 (40.82%) vs. 1 (3.13%), consequently.

According to the given findings, it can be concluded that it is necessary to work on the program with family dentists for early recognition of IMC and timely referring of the patients to orthodontic specialist. Further researches are also needed that would allow recommendations for early interceptive treatment of IMC consisting of early extraction of milk canines, that is until 9 years of age at the latest.

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