

Complications in the course of surgical-orthodontic treatment of impacted maxillary canines

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Abstract

Purpose: The purpose of the study was to assess the effect of gender and age of patients with impacted permanent maxillary canines on complications in the course of tooth transposition.

Material and methods: The study material included files of 82 patients with a diagnosis of unilateral or bilateral impaction of 102 permanent maxillary canines. The study group consisted of 65 female and 17 male subjects, aged 8.5-39 years (mean 14.5 years) divided into four age groups: group I – patients under 12, group II – 12.0-13.9 years, group III – 14.0-15.9 years and group IV – patients at the age of 16 and older.

Results: In the study population, the impacted teeth showed the following locations: palatal (67.64%), vestibular (19.60%) and alveolar (12.74%). Spontaneous resorption caused by abnormal tooth position was observed in 5 (4.9%) permanent maxillary lateral incisors. In 4 cases, the resorption was bilateral and all the five cases were recorded in group III. In group IV, one patient had alveolar process atrophy and severe resorption, while another one showed ankylosis of a permanent canine. Extraction of palatally impacted canines was done in 3.92% of cases. Complications were noted in girls and referred to 5.58% of the study cases.

Conclusions: Orthodontic movement of the impacted teeth to the dental arch may result in complications. However, because of the major significance of the upper canine which is responsible for the behaviour of the frontal triad, surgical-orthodontic treatment should be undertaken to improve occlusion and the aesthetic look of patients. Thus,

any case of the ectopic canine requires observation and proper choice of radiological diagnostics.

Key words: impacted permanent upper canines, root resorption, ankylosis, therapeutic methods.

Introduction

According to literature data, the incidence of maxillary canine impaction ranges between 1% and 3% of the population [1-4]. Palatal impaction is the most frequent (85%) [5]. As stated by Shafer [6], leaving the retained canines untreated may result in serious sequels: displacement of the adjacent teeth and shortening of the dental arch, internal resorption, formation of follicular cysts, external resorption of the canine and the adjacent teeth, recurrent infections especially when the tooth is partially erupted, recurrent pain, or combinations of the above. Transposition of the impacted teeth may be accompanied by a number of negative events, including periodontal ailments that manifest themselves in the loss of bone retention, inflammation of the marginal gingiva, deepening of periodontal pockets, resorption of the canine and/or the adjacent teeth, root shortening, internal resorption, ankylosis and even tooth loss [7-11].

The aim of the study was to evaluate the effect of gender and age of patients with impacted permanent maxillary canines on complications in the course of orthodontic movement to the occlusal plane.

Material and methods

The study material included documentation files of 82 patients with a diagnosis of unilateral or bilateral impaction of 102 permanent maxillary canines. The study group consisted of 65 female and 17 male subjects, aged 8.5-39 years (mean 14.5 years) divided into four age groups: group I – patients under 12,

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Table 1. Study population with regard to gender and age

Sex	Age (years)				Total
	I	II	III	IV	
	< 12	12 ≥ 13.9	14 ≥ 15.9	≥ 16	
	n	n	n	n	n
Female	9	14	17	25	65
Male	3	4	5	5	17
Total	12	18	22	30	82

Table 2. Distribution of locations of the impacted canines with regard to age

Age groups	Canines n (%)	Canines locations				
		Palatal	Vestibular	In the process	Right-side	Left-side
		n (%)	n (%)	n (%)	n (%)	n (%)
I	19 (18.26%)	4 (3.92%)	6 (5.88%)	9 (8.82%)	10 (9.80%)	9 (8.82%)
II	20 (19.60%)	15 (14.70%)	5 (4.90%)	-	11 (10.78%)	9 (8.82%)
III	28 (27.45%)	20 (19.60%)	4 (3.92%)	4 (3.92%)	10 (9.80%)	18 (17.64%)
IV	35 (34.31%)	30 (29.41%)	5 (4.90%)	-	14 (13.72%)	21 (20.58%)
Total	102 (100.00%)	69 (67.64%)	20 (19.60%)	13 (12.74%)	45 (44.11%)	57 (55.88%)

n – number of the canines; data are number %

Table 3. Complications caused by transposition of the impacted canines with regard to age

Groups	Age	Patients n (%)	Complications			
			Lateral incisors roots resorption	Root canine resorption	Ankylosis of the permanent canine	
			n (%)	n (%)	n (%)	n (%)
I	<12	12 (14.63%)	-	-	-	-
II	12 ≥ 13.9	18 (21.95%)	-	-	-	-
III	14 ≥ 15.9	22 (26.82%)	5 (4.9%)	-	-	-
IV	≥ 16	30 (36.58%)	-	1 (0.98%)	1 (0.98%)	1 (0.98%)
Total		82 (100.00%)	5 (4.9%)	1 (0.98%)	1 (0.98%)	1 (0.98%)

n – number of the patients; data are number %

group II – 12.0-13.9 years, group III – 14.0-15.9 years and group IV – patients at the age of 16 and older (Tab. 1).

Statistical analysis

Results were subjected to statistical analysis, using t-Student test, non-parametric Wilcoxon test and Pearson correlation coefficient for paired variables.

Ethics

The Ethics Committee of Medical University of Białystok accepted the study.

Results and discussion

In the study population, the impacted teeth had the following locations: palatal (67.64%), vestibular (19.60%) and in the process (12.74%). The position of the retained teeth was age-dependent – in the youngest patients most teeth (9) were impacted in the process, while in patients over 12 most teeth showed palatal position. Right-side location was noted in 44.11% and left in 55.88% of the impacted canines. Right-

side retention was predominant in patients from groups I and II, while left-side retention was found to prevail in groups III and IV (Tab. 2). Complications caused by the impaction of permanent maxillary canines have been described in Tab. 3. Spontaneous resorption due to abnormal tooth position was observed in 4.9% of the permanent maxillary lateral incisors. In 4 cases of group III, the resorption was bilateral (Fig. 1A-C). In group IV, one patient had atrophy of the alveolar process and severe resorption (Fig. 2) and another one showed ankylosis of the permanent canine. Extraction of palatally impacted canines was done in 3.92% of cases. Complications were noted in girls and referred to 5.58% of the study cases.

Retention of permanent maxillary canines incurs the risk of complications, among which resorption of permanent incisors is quite frequent. Early diagnosis of resorption is difficult as in most cases it occurs posteriorly or anteriorly in the mid-root of the lateral incisor. Studies conducted by Ericson and Kuroi [3,12-14] have demonstrated the necessity to take X-ray pictures not later than at the age of 10 to supplement the clinical examination whenever resorption is suspected. If in the oral cavity examination, lateral incisors exhibit atypical position, i.e. the crowns are distally protruding and deviated, and canine ridge is

Figure 1A-C. Panoramic radiograms and radiogram of a 14.5-year-old girl with distinct advanced tooth resorption 12, 22

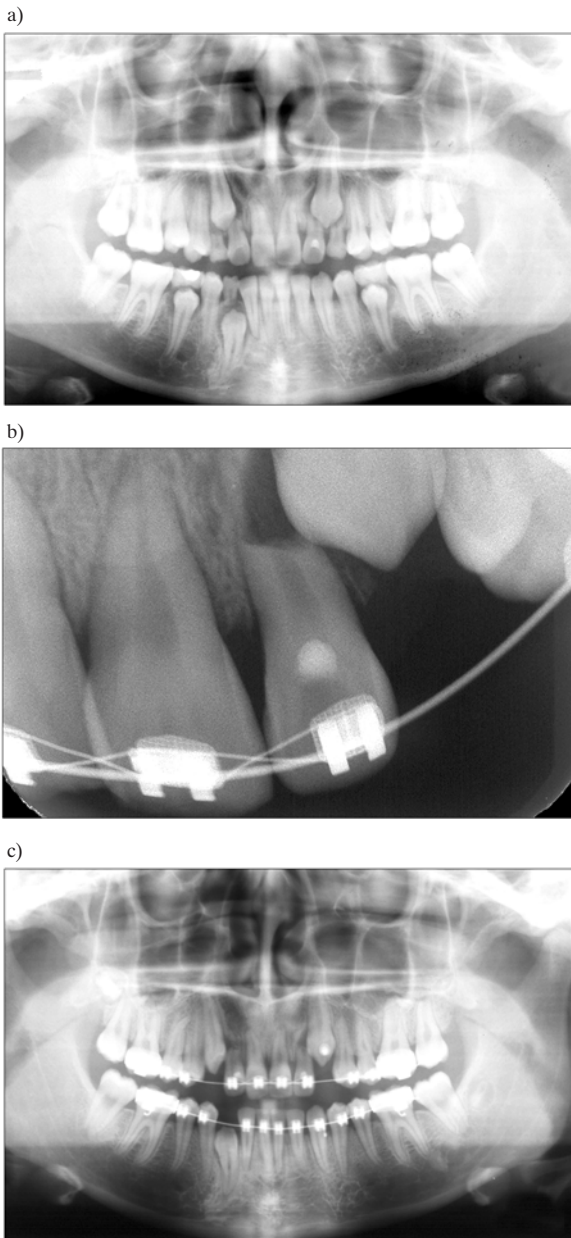
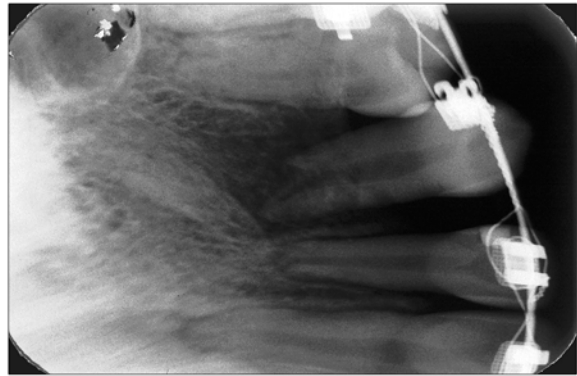


Figure 2. Contiguous radiogram of the left maxillary canine with the loss of bone retention and root resorption 23



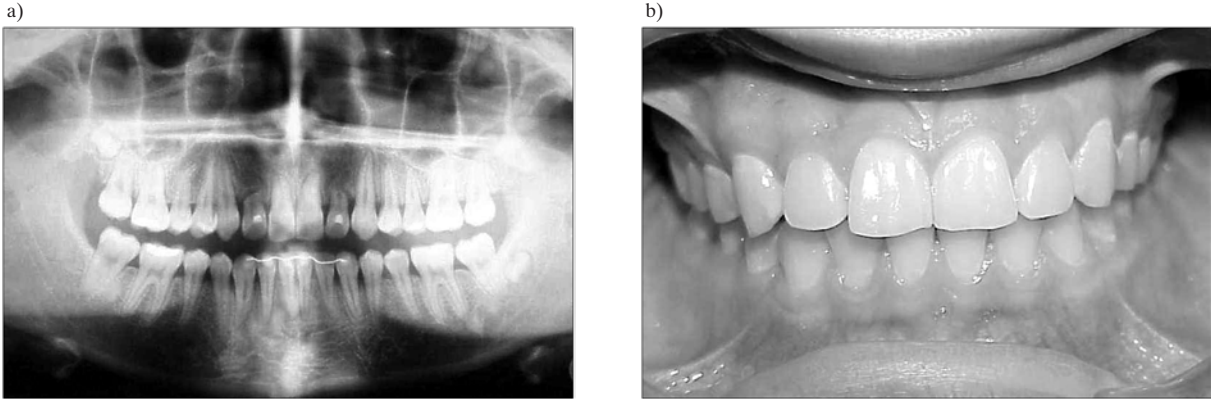
the risk of resorption. Other predisposing factors that may induce this process include: mesial position of canine crown, advanced development of canine, increased mesial ectopic eruption pathway above 25 degrees as compared to the median osseous line and age of 11-12 years. Resorption occurs mainly in girls [6,12,16]. Thanks to the availability of computerized tomography a larger number of resorption cases can be recognized than through clinical examinations [17,18]. In their latest study on a group of 80 patients with 113 impacted canines and marked resorption of 39 incisors, Bjerklin and Ericson [7] changed the treatment plans in 35 patients, extracting damaged incisors in cases which needed extraction due to space deficiency. The decision to change the treatment was made after a year, following additional computerized tomography examination.

We found resorption of 5 incisor roots in 3 female patients in the age range of 14-15.9 years. In four cases, resorption was revealed by the first radiogram, in the fifth case this process, which was caused by the impacted canine, was seen only when the tooth was shifted to the arch and did not blur the resorption image any longer. In all the cases of resorption, the lateral incisors had abnormal position, showing labial protrusion and distal inclination. In two female patients, linear values indicated deep location of the impacted canines. In the third patient, with advanced absorption, the canines were close to the occlusal plane and there was bilateral space deficiency in the arch and total left-side crossbite occlusion. Having in mind that the direction of canine eruption pathway changes with personal development it is difficult to indicate the moment at which the location of the erupting tooth is likely to initiate the process of lateral canine resorption. The increased risk of resorption in girls [12] has been confirmed by our study and should be always considered. The diagnosis of the impacted canine accompanied by resorption of lateral incisor roots requires immediate separation of both teeth in order to stop resorption progression. Examinations of 5 resorbed lateral incisors confirmed their vitality and resorption arrest. These observations are consistent with the data reported by Becker and Chaushu [19], who performed a comparative study in order to evaluate resorption progression in the incisors in which severe resorption was related to maxillary canine retention. Fig. 3A-B shows a panoramic radiogram

palpable, resorption can be recognised. The incidence of resorption amounts to 12.5%, and thus total percentage of cases in the age range of 10-12 years is 0.7% [3].

Resorption of lateral incisor roots is progressing rapidly and is unpredictable. The canines remaining in the process have a close contact with lateral incisors and cause loss of cortical plate, which is visible in radiograms. Heins and Wieder [15] have found that the spongy bone disappears when the interval between the roots is smaller than 0.5 mm and then teeth get in a direct contact. Shafer et al. [6] observed permanent incisor root resorption caused by ectopic eruption of maxillary canines in 0.71% of children aged 10-13 years. This complication has irreversible sequels, including tooth loss. Ericson and Kuroi [12], who analysed cases of lateral incisor root resorption, have demonstrated that the ectopic eruption itself does not increase

Figure 3A-B. Intraoral radiogram and panoramic radiogram of a female patient after completion of surgical-orthodontic treatment



and intraoral picture of a patient with lateral incisor resorption caused by a 2-year retention of the maxillary canine. The teeth have not undergone endodontic treatment, are vital and in proper colour.

Surgical-orthodontic treatment of the impacted teeth may also have an undesired effect on the alveolar bone and on the root of the transpositioned teeth. Serious resorption of a permanent canine in a 19-year-old patient coexisting with radiologically diagnosed atrophy of the alveolar process was due to the reaction against orthodontic force involved in a 180° tooth rotation in the alveolar process. In the study material, 4 out of the 102 impacted teeth had to be chiseled out. In one case, this procedure was necessary due to abnormal tooth position and advanced age of the patient (39 years), in another patient tooth transposition failed and the revision of the site of retention revealed ankylosis, in the other two cases extraction was indicated to improve occlusion, i.e. the contact between tooth four and two ensured both functional and esthetic occlusion. In such cases, canine extraction, according to Masztalerz [20], is the best option. However, as revealed by Suri et al. [21], extraction is not recommended in the case of vestibular retention of the canines, since surgical intervention can damage soft tissues and bones, causing scar formation on the alveolar process and thus worsening aesthetic appearance of the frontal segment of the dental arch.

Conclusions

Alignment of the impacted teeth may result in complications. However, considering major significance of the maxillary canine responsible for the behaviour of the frontal triad, it seems necessary to undertake surgical-orthodontic treatment in order to ensure proper occlusion and improve aesthetic appearance. Any case of ectopic eruption of the canine requires observation and proper choice of radiological diagnostic techniques.

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