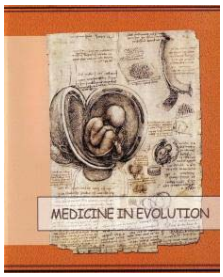
Apical pathological root resorption in primary teeth: retrospective study



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Abstract

Aim and objectives: to assess the changes in speed of the apical pathological root resorption and its causes in a group of Romanian children from Bucharest treated at the Paediatric Dentistry Department.

Material and methods: The retrospective study was carried out on the OPG of 94 Romanian children aged between 3.5 and 13.58 years, mean age 8.00±0.20 years and on 1137 primary teeth.

Results: The apical root resorption represented 93.1% from the teeth with external root resorption. Early root resorption was present in 15.4%, while the late root resorption in 6.5%, of the teeth. Pulpal and periapical infection were the most encountered (8%) causes of the accelerated root resorption.

Conclusions: Accelerated root resorption was the most common change in the rate of root consumption recorded in primary teeth and its main cause being the pulpal complications of the untreated caries and trauma.

Keywords: apical root resorption, primary teeth, early, late

INTRODUCTION

Pathological root resorption (PRR) represents the process of modified root consumption (pattern and speed) in both primary and permanent teeth (1-3).

The PRR classification according to Andreasen subdivides root resorption in two main groups: external and internal (2-7).

The external pathological root resorption, based on the location of the resorptive lesion, includes three types: apical, lateral and cervical (8,9)

The apical pathological root resorption (APRR) is the most common type of pathological root resorption (1).

Causes of APRR could include the following: complicated caries (10,11,12), trauma (13,14), vicinity pressure (3), systemic conditions (15-18).

The teeth with APRR are asymptomatic in the early stages (3,14). The clinical signs and symptoms are similar to those of the apical periodontitis in advanced stages (14). This is associated with a negative vitality test and a positive percussion test (13,14,18). The colour of the tooth can be altered to grey (19). Radiologically, shortening of the root can be observed (10) together with a radiolucency in the periapical area (13). Tooth mobility can be noticed as a consequence of APRR (3,20).

Aim and objectives

This paper aims to assess the changes in speed of the apical pathological root resorption and its causes in a group of Romanian children.

MATERIAL AND METHODS

The retrospective study was carried out over a period of 1 year (2016-2017), at the Paediatric Dentistry Department of the Medicine and Pharmacy University ''Carol Davila'', Bucharest, Romania.

The patients study sample (PSS) contained 94 Romanian children (46 girls and 48 boys, aged between 3.5 and 13.58 years, mean age 8.00±0.20 years).

The inclusion criteria of the participants were: healthy children with full medical records and primary or mixed dentition.

The study initial sample of primary teeth (IST) with and without root resorption (n=1137) was composed of 201 incisors (17.67%), 318 canines (27.96%) and 618 molars (54.35%).

The study sample of teeth with root resorption (n=835) was selected from the study initial sample of teeth and was composed of 165 incisors (19.76%), 225 canines (26.94%) and 445 molars (53.29%).

Data were collected from the patients' medical records and from theirs orthopantomograms (OPG). All radiographs were taken in the same radiographic facility according to a standardized technique.

The variables extracted from the patients' medical records were the following: age, gender, type of tooth, pulp diagnosis, presence and type of dental trauma.

The variables obtained (from OPGs and clinical records) were the following: type of root resorption (physiologic or pathologic), the location of external PRR, the possible causes of the external PRR (pulpal pathology, dental trauma, dental ankyloses, pressure on the dental root, multiple or idiopathic causes a.s.o.).

The speed of root resorption (physiological, early, late) was determined using the following data: the average length of root of the primary tooth (from standard tables) (21), the age range between which the physiological root resorption takes place for each dental group, the root length measured on the radiographs for each tooth. The age range during which root

resorption takes place was divided in equal parts of 1 year in order to observe the speed of the root resorption.

Table 1. The expected degree of APRR in primary incisors in accordance with patient`s age

Root resorption stages	Mx. CI	RAL (mm)	Mx. LI	RAL (mm)	Md. ci	RAL (mm)	Md. li	RAL (mm)
1.Initial stage	4 y	10	5 y	11.4	3 y	9	4 y	10
2. Intermed. stage 1	5 y	6.66	6 y	7.66	4 y	6	5 y	6.66
3. Intermed. stage 2	6 y	3	7 y	3.8	5y	3	6 y	3.33
4. Intermed. stage 3	7 y	3	8 y	3	6 y	3	7 y	3
5. Final stage	8 y	0	9 y	0	7y	0	8y	0

Legend: RAL – root average length; y-year; Mx. – maxillary; Md.- mandibular; CI, ci - central incisor; LI, li - lateral incisor.

Table 2. The expected degree of APRR in primary canines in accordance with patient`s age

Root resorption stages	Mx. C	RAL (mm)	Md. c	RAL (mm)
1. Initial stage	6 y	13.5	6 y	11.5
2. Intermediary stage 1	7 y	10.8	7 y	8.62
3. Intermediary stage 2	8 y	6.75	8 y	5.75
4. Intermediary stage 3	9 y	3.38	9 y	2.88
5. Final stage	10 y	0	10 y	0

Legend: RAL – root average length; y-year; Mx. – maxillary; Md.- mandibular; C, c- canine

Table 3. The expected degree of APRR in primary molars in accordance with patient`s age

Root resorption stages	Mx. CI	RAL (mm)	Mx. LI	RAL (mm)	Md. ci	RAL (mm)	Md. li	RAL (mm)
1.Initial stage	4 y	10	5 y	11.4	3 y	9	4 y	10
2. Intermed. stage 1	5 y	6.66	6 y	7.66	4 y	6	5 y	6.66
3. Intermed. stage 2	6 y	3	7 y	3.8	5y	3	6 y	3.33
4. Intermed. stage 3	7 y	3	8 y	3	6 y	3	7 y	3
5. Final stage	8 y	0	9 y	0	7y	0	8y	0

Legend: RAL – root average length; y-year; Mx. – maxillary; Md- mandibular; M1, m1 – first primary molar; M2, m2 – second primary molar.

Root length measurements were compared to the corresponding values in tables 1-3. Root resorption was assessed as early or late degree 1 if the measured length was in a resorption stage corresponding to an age one year older or younger, respectively in relation to the age of the patient. If the measured root length corresponded to an interval 2 or more years away from the length corresponding to the patient's age, it was included in the category of early or late resorption degree 2, respectively (Table 1-3).

The research team consisted of four examiners: a PhD student (AGG) which was previously trained in order to obtain an acceptable inter-examiner reliability score (Fleiss' kappa=0.82) and three experienced researchers.

Statistical analysis

Data analysis was performed using Stata® 11IC (StataCorp LP, Texas, USA) statistical software. A *p*-value of 0.05 was considered statistically significant.

RESULTS AND DISCUSSIONS

The study group was balanced in terms of children's gender (boys - 51.06%, n=48).

External root resorption was observed in 23.1% (n=263) of the initial study sample of teeth (IST), out of which the most frequently encountered (93.15%, n=245) was apical root resorption.

The alteration of the speed of the external apical root resorption was registered in 21.9% (n=250) of the initial study sample of teeth, including 5 teeth with delayed onset of root resorption.

The prevalence of APRR was not influenced by gender (p=0.970).

Table 4. The distribution of the root resorption according to the type of the tooth

	Normal speed	**Early RR**	**Late RR**
Incisors	70.1% (n=141)	1.67% (n=19)	3.6% (n=41)
Canines	87.1 % (n=277)	1.58% (n=18)	2.02% (n=23)
Molars	75.9% (n=469)	12.13% (n=138)	0.96% (n=11)

Early root resorption was present in 15.47% (n=176) of the teeth and was divided in two categories based on its severity: degree 1 (7.1%, n =81) and degree 2 (8.4%, n=95). The late root resorption registered a lower percentage (6.5%, n=74) and was also divided in the same two categories: degree 1 (2.9%, n=33) and degree 2 (3.6%, n=41). The prevalence of late root resorption was lower than reported by Taran and Ölmez (4.5%).

The distribution of the early root resorption according to the type of the tooth was the following: molars (12.13%, n=138), followed by incisors (1.67%, n=19) and canines (1.58%, n=18). The distribution of the late root resorption according to the type of the tooth was the following: incisors (3.6%, n=41), followed by canines (2.02%, n=23) and molars (0.96%, n=11).

Normal speed of the root resorption was observed in canines (87.1%, n=277) more frequently than in molars (75.9%, n=469) and incisors (70.1%, n=141). The accelerated degree 2 root resorption was observed more often in molars (13.6%, n=84) than in incisors and canines. The late degree 1 and 2 were more frequent encountered in incisors (20.4%, n=41) than in canines (7.2%, n=23) (p<0.001).

Molars represented 14.86% (n=11) of the teeth with late root resorption, which is similar than the results obtained by **Iraqi** et al, that showed a persistence on the arch in 15.2% of the primary molars (22) but lower than reported by Taran and Ölmez (30%) (23) who reported a high frequency of premolar agenesis.

The most common type of late root resorption was in incisors with 3.6% (n=41), followed by canines (2.02%, n=23) and molars (0.96%, n=11), which was in discordance with the Taran and Ölmez's results, that registered the highest percentage in canines (49.5%), followed by molars (30%) and incisors (20.6%) (23).

The pulpal diagnosis of teeth correlated with the alteration of the root's resorption speed was the following: necrosis or apical periodontitis has accelerated the root resorption in 8% (n=91) of the study initial sample of teeth, while irreversible pulpitis in 1.67% (n=19).

Dental trauma was recorded in 2.99% (n=34) of the study sample. About half of the teeth with severe trauma (0.79%, n=9) such as enamel-dentin-pulp fracture, root fracture and intrusion had pulpal complications compared to teeth with mild trauma (2.19%, n=25) like enamel-dentine fracture, subluxation and concussion in which only a third suffered consecutive pulpal diseases.

Early root resorption occurred in 66.7% of the teeth affected by luxation, which was higher than the results obtained by Costa et al. (46.7%) (24).

CONCLUSIONS

The external apical root resorption in primary teeth is a challenging pathology for the paediatric dentists due to the accelerated consumption of the roots which in time may lead to space loss on the dental arch and appearance of malocclusion.

The pathological alterations of the root resorption pattern were represented especially by external apical root resorption.

One of the most important causes of the accelerated speed of the root resorption was represented by necrosis and apical periodontitis and the periodontal trauma. Early diagnosis and treatment of the teeth with pulpal involvement and traumas may be helpful to clinicians in order to prevent premature loss of primary teeth and its consequences in the permanent dentition.

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