

Age Related Prevalence of Pre-Eruptive Intracoronary Radiolucent Defects in the Permanent Dentition

Marina Umansky*/Nili Tickotsky **/Silvina Friedlander-Barenboim ***/Sarit Faibis ****/ Moti Moskovitz *****

Objective: The present study aimed to determine if the prevalence of pre-eruptive intracoronary radiolucent defects is higher for young age groups, in which there are more unerupted teeth. **Study design:** A retrospective study of panoramic and bitewing radiographs was conducted. An inclusion criterion was the presence of un-erupted permanent teeth with a formed and clearly visible crown. Age groups were: young (6-8 years), intermediate (9-12 years) and adults (13-53 years). Significance level was set at $p \leq 0.05$. **Results:** Thirteen (3.9%) pre-eruptive lesions were detected in 335 records. No lesions were found in the young group (7.4%), in the intermediate and adult age groups six and seven lesions were found, respectively. In most cases the pre-eruptive lesion was found in a third molar. **Conclusion:** The prevalence of pre-eruptive intracoronary lesions was not higher for young age groups. The prevalence of pre-eruptive intra coronal radiolucent lesions is 3.9%, irrespective of age.

Key words: pre-eruptive dentin radiolucency, panoramic radiographs, bitewing radiographs

INTRODUCTION

Pre-eruptive intracoronary lesions are caries-like lesions appearing in un-erupted teeth, often located within the dentin, adjacent to the DEJ. Generally the lesion will be 2/3 of the dentinal width¹⁻⁶. The lesions are usually asymptomatic and appear as a secondary finding¹⁻⁸. The conventional theory of pre-eruptive lesions pathogenesis describes the lesions as an idiopathic external absorption of coronal dentin; resorptive cells originating from the surrounding connective tissue or bone penetrate the developing tooth through a breach in the reduced enamel epithelium and cause dentinal resorption^{4,6,9}. The etiology and factors that affect the resorptive cells is unknown^{4,6,9}. No clear linkage has been established between pre-eruptive lesions and age, gender, medical conditions or fluoride supplements.

Much of the data on pre-eruptive lesions is derived from case reports^{1,6,8,10,11}. As those do not depict the typical features (such as prevalence, size and location) of the lesions, information on these subjects should be derived from population studies.

The prevalence of pre-eruptive lesions in the general population has been evaluated by different radiographic methods: a prevalence of 1.55%-3% of pre-eruptive lesions was found in panoramic radiographs^{7,9}, and a prevalence of 6% was found in bitewings radiographs³. Previous studies' populations had wide age ranges up to a variability of 14 to 73 years⁹.

Studies that were conducted on younger populations found a considerable number of un-erupted teeth, and therefore a higher prevalence of lesions⁷. Studies with larger age range populations found fewer incidences of lesions as they focused on more diverse populations, with a higher median age⁹. In the later study's case the

*Marina Umansky DMD, Postgraduate student, Oral Medicine Department, the Hebrew University, Hadassah School of Dental Medicine.

** Nili Tickotsky DMD, Med, Private Practice

***Silvina Friedlander-Barenboim, DMD, Head Oral and Maxillofacial Radiology Unit, Oral Medicine Department, the Hebrew University, Hadassah School of Dental Medicine.

****Sarit Faibis, DMD, Department of Pediatric Dentistry, the Hebrew University, Hadassah School of Dental Medicine

***** Moti Moskovitz DMD PhD, Department of Pediatric Dentistry, the Hebrew University, Hadassah School of Dental Medicine.

Corresponding author:

Moti Moskovitz, Department of Pediatric Dentistry, Hadassah School of Dental Medicine, P.O.Box 12272, Jerusalem 91120, Israel.

Phone: 972-2-776122

Fax: 972-2-6431747

E-mail: motim@md.huji.ac.il

average number of un-erupted teeth was much lower than in studies that were conducted on younger populations. This may be the reason for the lower prevalence of pre-eruptive lesions found in that study.

The present study's hypothesis was that at younger age, when there are many un-erupted teeth, the prevalence of pre-eruptive lesions will be higher than for older age. As age may be a determinant of the presence of un-erupted teeth, the present study aimed to analyze the prevalence of pre-eruptive intra-coronal lesions in association with more specific age groups.

MATERIALS AND METHOD

A retrospective study using all dental records of patients treated at the department of Orthodontics of the Hebrew University, Hadassah School of Dental Medicine; Jerusalem, Israel between the years 2008-2010 was conducted.

The study protocol was approved by the Institutional Human Subjects Ethics Committee of the Hebrew University, Hadassah medical center; Jerusalem, Israel. Medical history, age, gender, dental age and any dental anomalies found in radiographs were recorded from patients' records. Three age groups were defined: Young: aged 4-8 years, intermediate: aged 9-12 years, adults: aged 13-53 years. The two younger groups were designed to include significantly small age ranges in order to enable a clearer distinction of the prevalence of pre-eruptive lesions according to age.

Excluded from the study were records of patients with medical conditions that are known to affect tooth development e.g. Down syndrome, Crouzon syndrome, chemotherapy and Ectodermal dysplasia.

Visual analysis of digital panoramic radiographs and bitewings was performed by an unbiased trained observer (MU). Questionable findings were subjected to further examination by a Maxillofacial Radiology expert and a specialist in Pediatric Dentistry.

Inclusion criteria for panoramic radiographs (analog film) were: 1. presence of at least one un-erupted permanent tooth in which the crown is fully formed and clearly visible, 2. no super positioning of teeth and 3. optimal radiographic contrast¹² (Figure 1).

Radiographs were examined for pre-eruptive lesions using a standard computer screen without magnification.

Posterior bite-wings radiographs were present for 221 (66.3%) of the patients in addition to panoramic radiographs. 64.2% had 2

sets of bitewings (i.e. a left side and a right side radiographs) and the rest had one (0.6%), three (0.3%) or four (1.2%) sets of bitewings.

Anomalies other than pre-eruptive lesions (e.g. cysts, odontomas, and impacted teeth) that were detected were also recorded.

Data was analyzed using SPSS software Chicago, Illinois, USA, version 20. Analysis consisted of basic descriptive statistical analysis, ANOVA test to compare the prevalence of pre-eruptive lesions between the three age groups and Pearson correlation to check for correlations between age, sex and number of radiographs and the prevalence of pre-eruptive lesions or dental anomalies. Significance level was set at $p \leq 0.05$.

RESULTS

Out of a total of 638 records of patients from the department of Orthodontics, 494 (77.4%) had panoramic radiographs matching the inclusion criteria. 413 (64.73%) patients had at least one un-erupted tooth, but only 86% of those (356) were sufficiently developed (i.e. with a completely formed crown) to enable diagnosis. Only 335 records matched all inclusion criteria, i.e. at least one un-erupted tooth sufficiently developed to enable diagnosis, optimal contrast of the panoramic radiograph with no super positioning of the teeth, and no underlying systemic disease.

Patients' age ranged from 4 years to 53 years, with an average of 13.46 (SD=4.6) and a median of 13. Of the study's population 49% were females, and 51% were males. Study population's age groups are described in table I.

Out of the 335 records thirteen patients with a pre-eruptive lesion were detected (3.9%). A pre-eruptive lesion was defined as a radiolucent area located in the dentin adjacent to the dentino-enamel junction that is clearly visible without any sort of magnification device. In all cases no more than one tooth with a pre-eruptive lesion was detected per patient. In most cases the lesion was detected in a third molar (Table II).

Most lesions were small (up to a third of the dentinal width) and located in the mesial or occlusal aspect of the crown of the developing tooth (Table III).

Gender and dental age were not found to be associated with presence of pre-eruptive lesions ($p=0.75$; $p=0.522$).

Presence of pre-eruptive lesions according to age groups: In the young patients group (4-8 years) no lesions were found. In the intermediate age group (9-12 years) six lesions (4.8%) were found. In the adult age group (13 years and up) seven lesions (3.7%) were found.

No pre-eruptive lesions were detected in bitewing radiographs.

Presence of other dental anomalies: Ten types of anomalies other than pre-eruptive lesions were detected in 37 records (Table IV). No associations were found between these anomalies and age ($p=0.073$) or gender ($p=0.75$). No association was found between presence of pre-eruptive lesions and presence of other dental anomalies ($p=0.69$).

DISCUSSION

The study's hypothesis that the prevalence of pre-eruptive lesions for younger ages is higher than for older ages was not supported. In the youngest age group (4-8 years) no lesions were found, and the intermediate and adult groups had a similar prevalence of lesions. This may be explained by the fact that at the young group's developmental stage the second and third molars are not yet

Fig. 1 Two pre-eruptive intracoronal radiolucent defects in the lower left and right third molars.



formed. In the intermediate group (9-12 years) the second molars are already developed, and can be detected in radiographs. In the third group (13- 53 years) the third molars developed and can be perceived in radiographs.

Another possible reason may be that the sample size in the stratified sampling was not large enough, although all patients treated at the department of Orthodontics were included. This is a limitation of the study, as a larger sample may have provided more data. Also, the fact that our inclusion criteria were very strict may have left out cases with an initial stage of resorption. As it appears, the entity of pre-eruptive lesion is not a common finding in premolars and first permanent molars. Therefore the prevalence in the present study is comparable to the literature and a larger sample size may not have affected the prevalence found in the population.

In the present study a prevalence of 3.9% was discovered. This prevalence is similar to that found in another study, which was conducted in a population of children and young adults patients (aged 3-25)⁷.

In contrary to other studies, where the highest prevalence of intracoronal lesions was detected in the second molars^{7,9,11}, in our study the lesion was mostly detected in a third molar (Table II).

Table I: Study population age groups.

	young	intermediate	adult
Age (years)	6-8	9-12	13-53
Number of group members	25	125	185
% of study population	7.4%	46%	55.6%

Table II: Teeth with a detected pre-eruptive lesion in panoramic radiographs.

Tooth Number	number of teeth in the sample	Percent of teeth in the sample
17 (2 nd right upper molar)	3	0.9
18 (3 rd right upper molar)	1	0.3
28 (3 rd left upper molar)	6	1.8
38 (3 rd left lower molar)	1	0.3
48 (3 rd right lower molar)	2	0.6
Total	13	3.9

Table III: Location and size of lesions in pre-erupted teeth.

		Frequency	Percent
Location	Occlusal	5	1.5
	Mesial	6	1.8
	Distal	2	0.6
	Total	13	3.9
Size	Small (up to 1/3 of dentinal width)	9	2.7
	Medium (up to 2/3 of dentinal width)	4	1.2
	Total	13	3.9

Also unlike the findings of other studies^{7,9}, in the present study most lesions were small (up to a third of the dentinal width).

Previous studies found association between ectopic positioning and pre-eruptive lesions^{7,9}. In the present study no such association was detected. Also, no association was found between presence of pre-eruptive lesions and presence of other dental anomalies.

Type of radiograph used for diagnosis: In the present study bitewing radiographs did not add information on the prevalence of pre-eruptive lesions. Bitewings provide limited data (as they do not include front teeth and usually do not include the third molars), yet the geometric distortion is generally lower because the beam is more perpendicular to the tooth¹². In younger populations up to the age of 12 years third molars are not yet developed and therefore bitewings may be the radiograph of choice for discovering the presence of pre-eruptive lesions in the young dentition. In older populations the panoramic radiograph will be more effective because it provides a better view of the third molars, which are most likely to be the un-erupted teeth in the dentition.

Large scale studies on the prevalence of pre-eruptive intra coronal lesions are needed in the young population group, where more un-erupted teeth exist.

Clinical implication: Pediatric Dentists and specialists in orthodontics are often the first to encounter radiographs of un-erupted permanent teeth¹³. They should be aware that pre-eruptive intra-coronal radiolucent lesions prevalence is 3.9%, irrespective of age and refer these patients for treatment before a decision is made regarding orthodontic treatment.

Table IV: Prevalence of dental anomalies other than pre-eruptive lesions.

	Frequency	Prevalence in study population
Hypodontia	15	4.5%
Cysts	2	0.6%
Impacted	8	2.4%
Microdontia	5	1.5%
Hyperdontia	2	0.6%
Ectopically positioned unerupted teeth	1	0.3%
Dense bone island	1	0.3%
Dens invaginatus	1	0.3%
Taurodontism	1	0.3%
Odontoma	1	0.3%
Total	33	11% of total

REFERENCES

1. Moskovitz M, Holan G. Pre-eruptive intracoronary radiolucent defect: A case of a nonprogressive lesion. *J Dent Child (Chic)*. 71:175-8, 2004.
2. Rankow H, Croll TP, Miller AS. Preeruptive idiopathic coronal resorption of permanent teeth in children. *J Endod* 12:36-9, 1986.
3. Seow WK, Wan A, McAllan LH. The prevalence of pre-eruptive dentin radiolucencies in the permanent dentition. *Pediatr Dent* 21:26-33, 1999.
4. Grundy GE, Pyle RJ, Adkins KF. Intra-coronal resorption of unerupted molars. *Aust Dent J* 29:175-9, 1984.
5. McNamara CM, Foley T, O'Sullivan VR, Crowley N, McConnell RJ. External resorption presenting as an intracoronary radiolucent lesion in a pre-eruptive tooth. *Oral Dis*. 3:199-201, 1997.
6. Singer S, Abbott PV, Booth DR. Idiopathic coronal radiolucencies in unerupted permanent teeth. Case reports. *Aust Dent J*. 36: 32-7, 2009.
7. Seow WK, Lu PC, McAllan LH.. Prevalence of pre-eruptive intracoronary dentin defects from panoramic radiographs. *Pediatr Dent* 21:332-9, 1999.
8. Davidovich E, Kreiner B, Peretz B. Treatment of severe pre-eruptive intracoronary resorption of a permanent second molar. *Pediatr Dent* 27:74-7, 2005.
9. Özden B, Acikgoz A. Prevalence and characteristics of intracoronary resorption in unerupted teeth in the permanent dentition: a retrospective study. *Oral Radiol* 25: 6-13, 2009.
10. Seow WK, Hackley D. Pre-eruptive resorption of dentin in the primary and permanent dentitions: case reports and literature review. *Pediatr Dent* 18: 67-71, 1996.
11. Kjær I, Steiniche K, Kortegaard U, et al. Preeruptive intracoronary resorption observed in 13 patients. *Am J Orthod Dentofacial Orthop* 142: 129-32, 2012.
12. White SC, Pharaoh MJ. In white & pharaoh 6th ed. *Oral radiology*. Elsevier Mosby, 2009 ch 5 pp 11.
13. Altug-Atac AT, Erdem D. Prevalence and distribution of dental anomalies in orthodontic patients. *Am J Orthod Dentofacial Orthop* 131:510-14, 2007.