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Frequency and causes of premature extractions of deciduous molar teeth – a retrospective study

Częstość i przyczyny przedwczesnych ekstrakcji zębów trzonowych mlecznych – badanie retrospektywne

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Key words

premature teeth loss, premature extractions of deciduous teeth, deciduous molar teeth, causes of extractions

Summary

Introduction. Premature loss of deciduous molar teeth is a common cause of dysfunction of the masticatory system. Analysis of the causes of premature extractions of these teeth will allow the appropriate targeting of preventive and therapeutic interventions.
Aim. To determine the frequency and causes of premature extraction of deciduous molar teeth.
Material and methods. Analysis of randomly selected 1880 medical records of the patients of the Department of Pediatric Dentistry (Medical University of Warsaw) concerned the necessity and causes of premature extractions of deciduous molar teeth in children under the age of 6 and the course of previous dental treatment. Data was analyzed statistically using the Mann-Whitney U-test, Spearman's rank correlation and a chi-square test; significance level – $p \leq 0.05$.
Results. 228 deciduous molar teeth were extracted in 139 children, most commonly due to inflammation of the pulp and its complications (abscesses, fistulas) – 84.7%, and carious destruction – 7.9%. The incidence of acute purulent inflammation decreased with age, whereas the occurrence of chronic pulpitis increased. 87.3% of the extracted teeth had not been previously treated, 7.5% had fillings and 5.2% had been pulpotomized. 54.7% of the patients had a single tooth removed and the rest – more than one. Maxillary first molars were most frequently extracted. There was no statistically significant difference in terms of gender. No relationship between age and the number of the removed tooth was found. There was a positive correlation between chronic inflammation of the pulp and age; negative correlation was found between age and acute inflammatory process of the pulp or periapical tissue as causes of extraction (Spearman's rank correlation, $p < 0.05$). A statistically significant difference in the average amount of premature extractions performed per one patient was found – more than one tooth was more often extracted in boys (Mann-Whitney U-test, $P = 0.034$).

Conclusions. Premature extractions of deciduous molar teeth are a significant clinical problem. The most common causes are complications of untreated caries – acute inflammation of the pulp in younger children and chronic pulpitis in older ones. Extractions are performed more often in boys. Most of the lost teeth were not previously treated.

Introduction

Premature loss of deciduous teeth occurs prior to the physiological period of teeth replacement. It is combined with incomplete resorption of the root and with insufficient mineralization of permanent teeth buds (1, 2). This phenomenon has very serious clinical implications as well as a negative effect on the development of the organ of mastication. Abundant data available in literature reports the serious consequences of premature loss of teeth in the form of stomatognathic system dysfunctions (1-4). The effects of premature teeth loss include rotations, positioning of teeth outside of the dental arch, supraposition of the antagonist, hindered eruption of permanent teeth and the formation of malocclusion caused by the loss of space in the dental arch as well as disorders in the development of the facial skull (5, 6). Mesialization of the first permanent molar tooth is one of the other observed consequences of premature loss of deciduous molar teeth (3, 7-9). Moreover, caries in deciduous teeth increases the risk of its development in permanent teeth (10).

Reasons for the premature loss of deciduous teeth include: caries, diseases of the pulp and periapical tissues; less frequently: traumas, paradontopathy, orthodontic indications, cancer (5, 11, 12).

Research shows that molar teeth are, of all deciduous teeth, most commonly affected by caries (13). It has been found that caries in posterior teeth affects 65% of Polish children in the preschool age (3). They are also the most often treated deciduous teeth. Tickle et al. have found that the first deciduous molars were subject to conservative treatment in 81.1% of the cases, second deciduous molars in 84.3%, while in the case of anterior teeth, fillings were made only in 40.5% of the cases (14). It has also been found that posterior teeth are more likely to be lost prematurely than anterior teeth (11).

Some of the authors point to the dubious justification of undertaking conservative treatment of deciduous teeth in the context of their keeping in the oral cavity until physiological exfoliation. No statistically significant differences have been found referring to the frequency of extraction of filled vs. untreated teeth (15-17). Moreover, fear may be another negative consequence following invasive treatment during the first visit (18, 19).

Aim

The aim of the study was to indicate the frequency and reasons for premature extractions of deciduous molars, taking into account the course of previous dental treatment.

Material and methods

Medical records of 1880 patients aged 1-19 years old, under the care of the Department of Pediatric Dentistry of the Medical University of Warsaw, were subject to retrospective analysis. 139 children, who had at least one deciduous molar tooth extracted before the age of 6 years old, were selected. The study accounted for the age at which the extraction took place, its reasons as well as the course of the previous dental treatment. The researched group was divided into four age categories: I – under 3 years old, II – 3-4 y/o, III – 4-5 y/o and IV – 5-<6 years old. The collected data was subject to statistical analysis (STATISTICA, Statsoft: Mann-Whitney U-test, Spearman's rank correlation, chi-square test; significance $p < 0.05$).

Results

228 deciduous molar teeth were extracted from 139 children below 6 years of age. The researched group included 79 boys and 60 girls aged 1.06 to 5.9 years old (average age 4.61 ± 1.06). 139 extractions were made in boys (61% of all extracted teeth) and 89 extractions were made in girls (39%). Maxillary first deciduous molar teeth were the ones most frequently extracted (38.6% of all extractions) and least frequently – maxillary second molars (9.65%) (tab. 1). In the youngest group of patients, the most frequently extracted tooth was the maxillary first right molar (46.15%). In a smaller percentage of cases, extraction was performed of the homonymous tooth on the left side (26.92%). However, they constituted the majority of teeth extracted in this age group. For comparison, the percentage of extracted mandibular first molars amounted to a total of 15.38%. Second molars were extracted much less frequently (total for the maxilla and mandible – 11.54%).

In the age group of 3-4 year olds, only maxillary first deciduous molars were extracted (45.46%) and in the

Table 1. Frequency of extraction of individual teeth among deciduous molar teeth.

	Maxilla			Mandible		
First molar tooth	54	19.3%	38.6%	74	14.47%	28.94%
	64	19.3%		84	14.47%	
Second molar tooth	55	4.39%	9.65%	75	12.28%	22.81%
	65	5.26%		85	10.53%	

mandible – both first and second teeth; with more frequent extractions on the left side (40.91%), followed by those on the right side (13.64%). In children aged 4-5, the most frequently extracted tooth was the mandibular first molar on the right side (23.68%), and the least frequently extracted one was the maxillary second molar on the same side (2.63%). In the oldest group of children, the percentage share of extractions of individual teeth was more uniform than in other groups. The dominating group of extractions related to maxillary first molars on the left side (19.23%). Maxillary second molars on the right side were the least frequently extracted teeth in this age group (6.73%). No statistically significant differences in the frequency of extractions in girls and boys were identified (tab. 2).

Pulp diseases were the most frequent reason for premature extractions. 84.7% of deciduous molars were extracted due to this reason, of which inflammations of the pulp accounted for 53.07% of the cases. The remaining 31.58% were extracted due to pulpopathy complications (abscess – 18.86%, fistulas – 12.72%). Carious destruction was a less frequent reason for extraction (7.9%), as were changes in radiological images (7.02%) or traumas (0.44%). In terms of gender, only in the youngest group there was a clear difference in the frequency of the occurrence of pulp inflammation. It was twice as common in boys as in girls. In the remaining age groups, both in boys and girls, the rate of extractions due to inflammation of the pulp was similar (tab. 3).

The frequency of acute purulent inflammation was most common in the age group of children below 3 years of age (38.36%) and it decreased with age. It was 14.42% in patients aged 5-6. In the case of chronic pulpitis, however, the tendency was reversed. In the group of the youngest children, its percentage share was 42.31%, while in the group of 5-6 year olds, it was 70.19% (fig. 1). A positive correlation was found between age and chronic pulpitis and a negative correlation between age and acute inflammatory state of pulp and periapical tissues as reasons for extraction (Spearman's rank correlation, $p < 0.05$). The predominance of acute purulent inflammatory conditions in the youngest group was particularly clear in girls. In the group of 3-4 year olds, however, it was more frequent in boys. In the remaining age categories, the ratios were similar for both genders. The frequency of the occurrence of chronic inflammatory states increased with age and it became comparable in boys and girls.

87.28% of the extracted teeth had not been previously treated; 7.46% had fillings and 5.26% had been pulpotomized (fig. 2). The percentage share of previous treatment, taking into account gender, is shown in figure 3.

54.68% of patients had one tooth extracted, 45.32% had more than one tooth extracted (tab. 4). The percentage share of girls who had more than one tooth extracted was 33.33%, in the case of boys it was 54.43%. A statistically significant difference in the average number of premature extractions performed in one patient, taking into account gender, has been established – boys had more than one tooth extracted more frequently than girls (Mann-Whitney U-test, $P = 0.034$). No relationship between the age and the tooth extracted has been found. No significant difference between the frequency of extractions of individual teeth has been found in boys vs. girls (chi-square test, $P = 0.178$). No statistically significant difference between genders has been identified in terms of the reasons for premature

Table 2. Frequency of extractions in individual age groups.

Age groups (year of life)	Tooth number							
	54	55	64	65	74	75	84	85
< 3	46.15%	3.85%	26.92%	0.00%	7.69%	7.69%	7.69%	0.00%
Girls	50.00%	0.00%	12.50%	0.00%	12.50%	12.50%	12.50%	0.00%
Boys	44.44%	5.56%	33.33%	0.00%	5.56%	5.56%	5.56%	0.00%
3-4	22.73%	0.00%	22.73%	0.00%	22.73%	18.18%	9.09%	4.55%
Girls	8.33%	0.00%	25.00%	0.00%	25.00%	25.00%	8.33%	8.33%
Boys	40.00%	0.00%	20.00%	0.00%	20.00%	10.00%	10.00%	0.00%
4-5	11.84%	2.63%	15.79%	5.26%	15.79%	11.84%	23.68%	13.16%
Girls	20.69%	3.45%	17.24%	6.90%	20.69%	10.34%	13.79%	6.90%
Boys	6.38%	2.13%	14.89%	4.26%	12.77%	12.77%	29.79%	17.02%
5-6	17.31%	6.73%	19.23%	7.69%	13.46%	12.50%	10.58%	12.50%
Girls	17.50%	2.50%	20.00%	7.50%	10.00%	15.00%	12.50%	15.00%
Boys	17.19%	9.38%	18.75%	7.81%	15.63%	10.94%	9.38%	10.94%
Total	19.30%	4.39%	19.30%	5.26%	14.47%	12.28%	14.47%	10.53%

Table 3. Reasons for extractions in individual age groups.

Age groups/ gender	Reason for extraction						
	Abscess	Carious destruction	Fistula	Residual root	Inflammation of the pulp	Changes in the radiological image	Trauma
< 3 years old	38.46%	7.69%	0.00%	3.85%	42.31%	3.85%	3.85%
Girls	50.00%	12.50%	0.00%	0.00%	25.00%	12.50%	0.00%
Boys	33.33%	5.56%	0.00%	5.56%	50.00%	0.00%	5.56%
3-4 y/o	22.73%	4.55%	4.55%	4.55%	50.00%	13.64%	0.00%
Girls	16.67%	8.33%	8.33%	0.00%	50.00%	16.67%	0.00%
Boys	30.00%	0.00%	0.00%	10.00%	50.00%	10.00%	0.00%
4-5 y/o	17.11%	0.00%	10.53%	2.63%	60.53%	9.21%	0.00%
Girls	17.24%	0.00%	6.90%	0.00%	72.41%	3.45%	0.00%
Boys	17.02%	0.00%	12.77%	4.26%	53.19%	12.77%	0.00%
5-6 y/o	14.42%	2.88%	19.23%	7.69%	50.96%	4.81%	0.00%
Girls	15.00%	5.00%	15.00%	5.00%	57.50%	2.50%	0.00%
Boys	14.06%	1.56%	21.88%	9.38%	46.88%	6.25%	0.00%
Total	18.86%	2.63%	12.72%	5.26%	53.07%	7.02%	0.44%

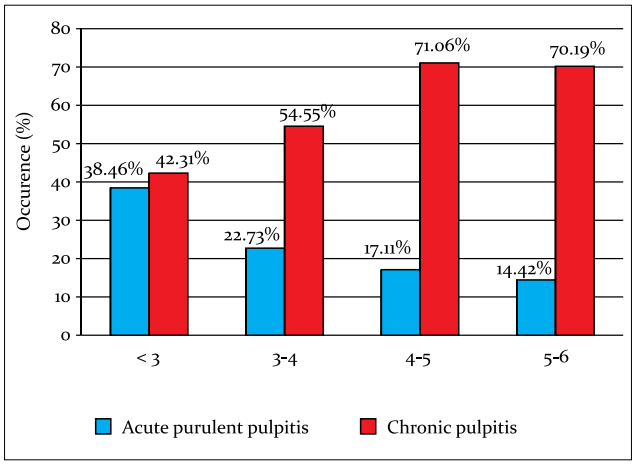

Fig. 1. The occurence of acute putulent inflamation and chronic pulpitis as the cause of extraction in the age groups.

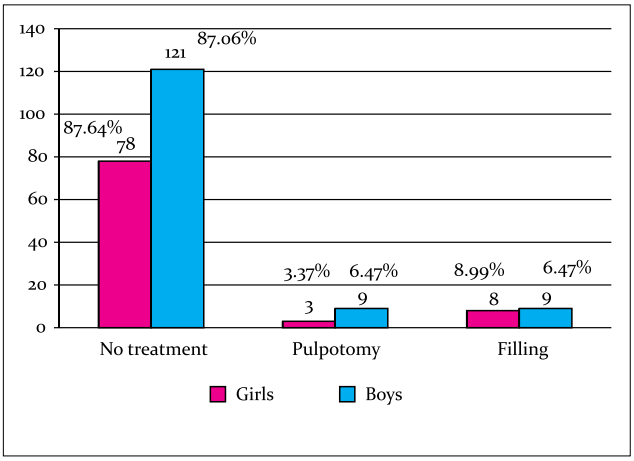

Fig. 3. Type of treatment performed previously on prematurely extracted deciduous teeth.

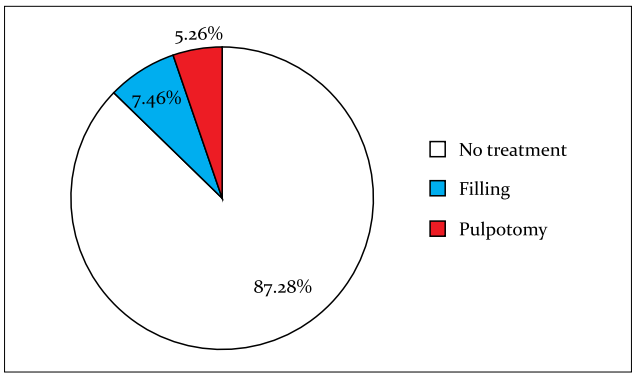

Fig. 2. Percentage share of previous treatment.

extractions of deciduous molar teeth and for taking up previous treatment (chi-square test, $p > 0.05$).

Discussion

In the conducted study, pulp diseases, as complications of caries, were the most frequent reasons for premature loss of deciduous molar teeth. This reflects the importance of untreated caries in this group of teeth. According to the findings of Wyne et al., in the group of children aged 3 to 5 years old, 28.8 and 38.9% of first and second maxillary deciduous molars, respectively, were affected by caries (20). In the mandible, this percentage share was 41.7 and 54.3%.

Table 4. The number of extracted deciduous molar teeth per one patient.

The number of extracted deciduous molar teeth per one patient	Boys n/%	Girls n/%	Total n
1	36/47.37%	40/52.63%	76
2	23/52.27%	11/47.37%	44
3	7/63.64%	4/36.36%	11
4	11/91.67%	1/8.33%	12
5	0/0%	3/100%	3
6	1/50%	1/50%	2
7	1/100%	0/0%	1
Total of children	79/56.83%	60/43.17%	139

Research by Matthews-Brzozowska et al., whose aim was to identify the frequency of occurrence of caries in deciduous molars, found that up to 65% of preschoolers were affected by this problem (on average, 2.3 deciduous molars were affected by caries) (3).

In our research, extensive carious cavities were the cause of extractions of 84.7% of the teeth. Extractions due to complete carious destruction of teeth crowns (roots present) took place in 7.9% of the cases. It may be inferred, then, that caries, and its consequences, were the reasons for as many as 92.6% of the premature extractions of deciduous molar teeth in children of less than 6 years old.

Mehdi et al. analyzed the factors responsible for premature extraction of deciduous molar teeth in children aged 3 to 9 years old and reported that caries was the reason in 96.1% of cases (21). In a retrospective research, Mansour Ockell and Bågesund found that caries accounted for 60.5% of extractions in children aged 3 to 8 years old (22). According to Olczak-Kowalczyk, in 96.6% of cases, premature extractions are performed due to caries and its complications (1). Such a high percentage share of caries, as a reason for extraction of deciduous molar teeth, indicates the need for education and prevention in the field of oral cavity health and the need for taking up treatment in the early stages of development of carious lesions, in order to avoid extensive loss of mineralized tissues, preventing conservative restoration.

A mechanical trauma, consisting in either fracture or luxation of the tooth, is a less frequent reason for premature extraction of deciduous molar teeth. The construction of deciduous teeth favours this, as do the low mineralization of the alveolar processes and the weaker setting of teeth in alveoli due to a lower resistance of the periodontium fibres. In our analysis of children below 6 years of age, mechanical traumas accounted for only 0.44% of the extractions. Mehdi et al. reached different conclusions, as in their research, deciduous molar teeth fractured as a consequence of traumas accounted for 2.3% of the extractions in patients aged 3 to 9 years old (21). The percentage differences were probably caused by the different age criteria established for the purposes of research. The above statement is confirmed by the analysis by Wochna-Sobańska et al., in which a larger percentage share of traumas to all teeth was found in the age group of 7 to 12 years old, where it comprised 65.5%. In the age group of 1 to 6 years old, traumas accounted for only 15.5% of all cases (23).

In the present paper, the most frequently extracted tooth was the maxillary first deciduous molar. Findings by other authors confirm that first deciduous molars are lost more frequently than second molars (21, 24). However, unlike in the case of these results, they were mandibular rather than maxillary teeth in those analyses. According to the research by Mehdi et al., focusing on patients aged 3-9 years old, the most frequently extracted tooth was the mandibular first deciduous molar on the left side (21). Ahamed et al., on the other hand, conducted research on a group of children aged 5-10 years old, where the most commonly extracted tooth was its equivalent on the right side (24). Both studies analysed the frequency of premature losses of deciduous teeth in general, not just of molar teeth. Despite this, the mandibular first deciduous molar on the right side was still the most frequently extracted. They did not find any statistically significant differences between genders in terms of frequency of premature extractions of deciduous teeth. The same results were achieved in the study presented by us – there are no differences between genders in the frequency of extractions of deciduous molar teeth. Similarily to Alsheneifi et al., we have not identified any relationships between the number of the extracted tooth and gender (25).

The present study indicates low incidence of taking up restorative or endodontic treatment prior to extraction (7.46% of teeth had fillings, while 5.26% had been pulpotomized). This data confirms the findings by Szatko et al., according to which only 15% of teeth in 5-year-olds were treated (26). At the same time, the authors indicate that four out of five diseased teeth are affected by primary

or secondary active caries. This percentage is radically different in Scandinavian countries. In the research by Mansour Ockell and Bågesund, dental interventions prior to extraction due to caries were observed in 51.0% of cases in children aged 3-8 years old (22). In 24.0% of cases, these interventions consisted in long-term glass ionomer cement or composite resin fillings. More frequent fillings in deciduous teeth, as compared to Poland, have also been observed in Great Britain, where 81.1% of first deciduous molars and 84.3% of second deciduous molars had been treated prior to extraction or exfoliation (12).

Tickle et al., over three years of prospective research with the participation of 739 children aged 3-6 years old, established that each year 1 out of 40 patients had a deciduous molar tooth extracted. In the case of patients with co-existing caries, however, tooth loss occurred in one out of 10 patients (27). The author also observed that teeth previously subjected to conservative treatment were also more frequently extracted. Milsom et al. and Tickle et al., on the other hand, indicate comparable numbers of extractions of teeth with both fillings and without any previous interventions (14-16). The decision to leave or extract a deciduous tooth until the period of physiological replacement is not an unequivocal one. It is important to evaluate whether the extraction decidedly improves the health condition of the child and whether it does not contribute to the formation of a negative attitude towards dental practitioners. A retrospective research which analyzed caries and extractions due to caries in children aged 1-12 years old showed that the majority of carious lesions developed prior to the age of 6 years old (28). Due to the particularly dynamic development of caries in deciduous teeth and the lack of hygienic discipline, in order to avoid premature teeth loss, patients below 6 years of age should be covered by special dental care.

Conclusions

1. Inflammation of the pulp and its complications are the most frequent reason for the extraction of deciduous molar teeth.
2. Acute inflammatory states of the pulp, as a reason for premature extractions, are more frequent in younger children, while chronic pulpitis is more common in older groups.
3. Most extracted teeth had not been previously treated.

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