THE INFLUENCE OF PREMATURE LOSS OF TEMPORARY UPPER MOLARS ON PERMANENT MOLARS

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THE INFLUENCE OF PREMATURE LOSS OF TEMPORARY UPPER MOLARS ON PERMANENT MOLARS (Abstract): **Aim:** Premature loss of primary molars due to dental caries and their complications has been associated with space loss and eruptive difficulties, especially when the loss occurs early. The aim of our study was to determine the impact of premature loss of temporary upper molars upon the longitudinal axis of the first and second upper permanent molar. **Material and Methods:** The study group included 64 patients 6-9 years old with premature loss of primary molars and a control group of 48 patients with intact temporary teeth. It was evaluated the angle between longitudinal axis of first and second upper permanent molars and occlusal plane. The software used is *Easy Dent 4 Viewer®*. The data were analyzed by using the Statistical Package for the Social Sciences (version 20.0; SPSS, Chicago, III). **Results:** It was observed that premature loss of upper second deciduous molars modifies greater the vertical axis of the permanent molars than the premature loss of first upper primary molar. First upper primary molar loss cause an acceleration eruption of first premolar, which will produce a distal inclination of the both permanent molars. **Conclusions:** The use of space maintainers after premature loss of the second upper temporary molar is a last solution in preventing tridimensional lesions in the dental arch and occlusion. **Keywords:** PREMATURE LOSS, AXIAL MODIFICATION, PERMANENT UPPER MOLARS, DENTAL CARIES, TEMPORARY TEETH.

Premature loss of temporary teeth, as a consequence of untreated dental cavity of temporary teeth, may determine serious tridimensional dental, dento-dental, dento-alveolar, occlusive and variably skeletal disorders. We thus witness a migration of permanent teeth, during intra-maxillary or oral eruption, leading to a dento-alveolar incongruence. Over-eruptions of opposite teeth, narrowed arch formation, reversed toofthing, premature contacts and occlusal interferences may also occur (1).

Studies have shown that premature loss of temporary first molars (m1t) mainly determines the distal migration of temporary canines. In this case, the mesial displacement of permanent molars or their mesio version doesn’t occur (2). Greater effects appear at the moment of premature loss of temporary second molars, as they serve as a guide for the eruption of the permanent molars (3). The premature loss of temporary secondary molars (m2t) – mainly maxillary – determines a shortening of the arch length due to the mesial migration of permanent molars, thus compromis-
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ing the „lee-way space” by affecting the posterior support area (4). The radiologic examination (orthopantomography) is a must in case of these patients, allowing the quantification of the leaning degree of permanent molars.

The main purpose of this study is to assess the impact of the premature loss of temporary upper molars on the longitudinal axis of the permanent molars. Another objective is to see whether there appear significant changes in the eruption sequence of the successor in these conditions.

MATERIAL AND METHODS

The study included 112 orthopantomographies of subjects aged between 6 and 9 who reported to the Pediatric Dental Clinic Iaşi. Out of these, 64 patients showed premature loss of a temporary upper molar and 48 had intact dentition. The condition of the subject selection was that the incisive teeth and permanent molars be intact. All the patients were given specialty treatment and their mandated, informed and motivated assent was obtained.

All orthopantomographies were conducted at a single radiologic center using the PaX-Uni3D (Vatech)® radiologic unit. The measurements were made by a single examiner using the Easy Dent 4 Viewer® software.

The processing of orthopantomographies included the identification of the following structures (fig. 1):

- *the right/left occlusion plane* – the tangent line to vestibular cuspids of the temporary molars/pre-molars or of lower temporary molars right/left (in case of loss of both temporary upper molars from the same quadrant);

- *the axis of the upper primary first permanent molar (M1)*-line passing through the center of the crown and the center of the radicular bifurcation;

- *the axis of eruption of upper permanent secondary molars (M2)*-the line passing through the middle of the crown and the center of the beginning of radicular bifurcation.

By tracing the following benchmarks, we shall evaluate the angle formed by the longitudinal axis of the primary, namely secondary permanent molar and the occlusal plane in the two upper quadrants.

The software used for the data analysis was SPSS 20.0. The error margins used in the statistic interpretation are of 5% and the
confidence interval was of 95%. We calculated the frequency parameters and descriptive parameters (average, standard deviation, minimum and maximum value) for each group. We used the t-student test to compare the group with premature loss with the control group. We used the t-pairs test to evaluate the correlation of the M1 upper axis with the M2 upper axis (right/left).

RESULTS
Of the 112 orthopantomographies conducted, 61 (54%) patients were males and 51 (46%) patients female (fig. 2). Concerning the subjects’ age distribution, there is a prevalence of patients aged 7 and 8, with a mean age of 7.29 (tab. I).

![Fig. 2. Group structure on age](image)

<p>| TABLE I |</p>
<table>
<thead>
<tr>
<th>Correlative dispersion of patients depending on age and gender</th>
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<tbody>
<tr>
<td>Sex/group</td>
</tr>
<tr>
<td>male</td>
</tr>
<tr>
<td>premature loss group</td>
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<tr>
<td>control group</td>
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<tr>
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<td>premature loss group</td>
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<td>control group</td>
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<td>Total</td>
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</tbody>
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![Fig. 3. Losses of m1t, m2t – comparative statistics](image)
The influence of premature loss of temporary upper molars on permanent molars

In our study, a total of 88 temporary upper molars were prematurely lost due to untreated dental cavity. The cumulated frequency of temporary primary molars is higher (61.36%), as compared to the secondary temporary molars (38.64%). At the same time, the frequency of the bilateral primary temporary molars is rather high, namely of 8.9% of the total cases studied (fig. 3).

From the point of view of angulations, average mesio version of the primary upper permanent molar for the control group is of 92.5° (79-110°), while for the secondary permanent upper molar of 116.5° (90-140°).

The premature unilateral loss of temporary upper molars determines a slight disto version of the primary permanent molar most likely due to the eruption spurt of first premolar (with an angular mean value of 93.9° (variation between 89.3° and 108°) compared to the mean value of the witness group of 92.26° as a compensatory phenomenon. In turn, the loss of temporary second molars has a negative influence through a mesial inclination of permanent molars (mean angular value of 90.18° for M1 and 111.86° for M2) (Fig. 4).

Bilateral loss of upper first temporary molars determines a distal compensation of the permanent molars axis (mean angular values of 95.13° for M1 and of 121° for M2). The greatest effect is caused by the bilateral loss of m1t and m2t which determines a strong mesio version of the primary permanent molars (mean angular values of 74.375° compared to the mean value of the witness group, of 92.26°). At the same time, one can notice a reduced influence on the eruption axis of the secondary permanent molar (fig. 5).

<table>
<thead>
<tr>
<th></th>
<th>control group</th>
<th>m1t</th>
<th>m2t</th>
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<tbody>
<tr>
<td>Ax M1</td>
<td>92,26</td>
<td>93,97</td>
<td>90,18</td>
</tr>
<tr>
<td>Ax M2</td>
<td>116,68</td>
<td>114,49</td>
<td>111,87</td>
</tr>
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</table>

Fig. 4. Influence of unilateral premature loss of temporary upper molars on the inclination of permanent molars
Fig. 5. Influence of bilateral premature loss of temporary upper molars on the inclination of the permanent molars

DISCUSSION

The concept of premature loss was defined as the exfoliation of deciduous teeth on the arch more than 12 months prior to the normal period of permanent teeth eruption (3,4), exceeding the normal variability limits of the exfoliation sequences of temporary teeth.

For both arches the highest space amount lost is due mainly to the mesial inclination of permanent molars. This inclination depends mainly on the dental age during extraction but also on the sequence/periodicity of eruption (5,6).

The results obtained from the point of view of the frequency of premature loss of temporary molars due to dental cavities are similar to those obtained in other studies (7,8). For the maxillary arch the premature losses are most frequent and are met in case of the primary temporary molar, namely in 61.3% of the total cases under analysis.

Based on the software analysis we could determine with higher accuracy the angle formed by the longitudinal axis of the permanent molars with the occlusion plane. These aspects are relevant under the aspect of the interrelation between the moment of premature loss of temporary molars and the moment of eruption of the primary permanent molar. The context of the premature loss of secondary temporary molar occurred after the initiation of clinical eruption of the primary permanent molar.

In the case of the loss of the primary maxillary temporary molar there are numerous contradicting studies. Some authors argue that there occurs a decrease of the postextractional space “within 6 months”, especially through the displacement of the temporary canine, but also through a palato version of the permanent incisive teeth (9). Park et al using a tridimensional scanning laser method of models conclude that “the
premature loss of the primary temporary maxillary molar, in a 1 class molar, has a limited influence on the existing space for permanent dentition”(10). Lin in a more recent study from 2011, states that after 12 months from the premature extraction of the primary temporary maxillary molar, the space reduction is due only to the distal displacement of the temporary canine. The same author even states that there is an increase of the arch parameter, of the inter-canine length and width (2). A Brazilian study conducted by Macena B. et al in 2011 confirms the latest results (5).

The most interesting study was published by Northway in 2000, in which he proves schematically that “at the moment of the premature loss of the primary temporary maxillary molar, the primary premolar start to erupt in a mesio position, as a consequence of the mesial inclination of the temporary secondary molar and thus will consume the space for the permanent canine, which will remain included or will erupt vestibular” (11). Our results are in correlation with the study conducted by Northway, since the loss of maxillary first primary molar would determine a spurt of eruption of the first premolar which will influence the axis of the primary permanent molar by distorting it in compensation, fact proven by the increase of the mean angular value of 93.9° as compared to the mean angular value of the control group, 92.26°.

Numerous studies showed that the premature loss of secondary temporary molars determines a higher loss of leeway-space than in case of the loss of primary temporary molar, both due to the greater difference of the mesio distal diameter and to the fact that the permanent primary molar and the secondary one losses its contact point and follows the tendency of all teeth to displace mesially or to incline mesially (12, 13). This is also proven by our study through the much lower mean angular values for the permanent maxillary molars in case of premature loss of secondary temporary maxillary molar as compared to the mean angular values of the witness group. Nonetheless, no statistically significant situation was found in any group to influence the axis of the upper molars.

A study carried out by Leroy R. et al (14) in 2009 showed that at the moment of cavity affection (cavity, filling, extraction) of both maxillary temporary molars on the same half-quadrant the classic eruption sequence “4-5-3-7” will change to “3-4-5-7” or “4-3-5-7”, with an accelerated canine eruption. In our study, the bilateral loss of first temporary molar and second temporary molar only determined an accentuated mesio version of primary permanent molars. The main reason for thus incongruence is the fact that the four patients who lost prematurely the upper temporary molars had a very young age (<5), and the orthopantomography was made at 6 years old. However, one can notice the low influence on the eruption axis of the secondary permanent molar.

**CONCLUSIONS**

This study highlights one again that the premature loss of temporary molars determines mainly a reduction of the arch length in the molar region. The space shrinking mostly appears through mesial migration and inclination of the molars, through the modification of the inclination of their axis of bone implantation and, to a smaller degree, through the distal migration of the canine.

In addition, the change of the eruption sequence following the premature loss of temporary molars is a phenomenon which
should be considered, especially when an interceptive treatment is adopted, with the preservation within normal limits of the morpho-functional occlusal complex.

ACKNOWLEDGMENTS
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