IMPLICATIONS OF PREMATURE LOSS OF PRIMARY MOLARS

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Abstract

The pathology of premature loss of temporary molars is a complex issue with profound impact on dental and facial harmony, urging clinician’s interest for an optimal therapeutic approach. Identification of the predisposing factors, in full agreement with the anatomical particularities of the temporary teeth, corroborated with the incidence of premature loss of molars is a main condition for an optimal therapeutic management of these patients.

Keywords: temporary molars, premature loss, consequences.

The consequences of premature loss of temporary teeth are complex, of functional and morphological nature. Clinically, they depend on multiple factors, such as [1]:
1. The number and topography of extracted teeth, which also involves the edentulous clinical form, which may be frontal or lateral, symmetric or asymmetric, mono-maxillary or bi-maxillary, isolated or continuous.
2. Temporary tooth loss pace relatively to the sequence of permanent teeth eruption. Thus, premature loss of the second temporary molar, followed by premature eruption of the second premolar result in loss of available space necessary to align the canines and premolars.
3. The time elapsed from temporary tooth extraction to permanent tooth eruption.
4. Pre-existence of disfunctions, vicious habits or malocclusions may potentiate the negative effect of the thus created edentulous space, possibly leading to permanent and more severe manifestations among the existing anomalies.
5. Presence of factors that may cause spontaneous recovery of some of the existing clinical forms or - on the contrary - that may aggravate the observed cases.

EFFECTS OF PREMATURE LOSS OF TEMPORARY TEETH

a. Teeth migrations
   - Bordering - mesial-distally or buccal-orally
   - Antagonistic teeth - vertically
   - Primary
   - Permanent - successional - tipping, rotations, bodily movements
b. A deficit in local dental-alveolar or dental-alveolar-maxillary development
c. Disorders in the rhythm of permanent teeth eruption
d. Disorders in the inter-maxillary relationship and in dynamic occlusion
e. Functional disorders of the stomatognathic system
f. Possible impairment of - psychosomatic individual development
   - communication
   - acquiring individual autonomy
   - psychosocial insertion.

POTENTIAL CLINICAL VARIABLES

Premature loss of the second temporary molar can cause mesial tipping and rotation of the first permanent molar, distal tipping of the first primary molar, egression of antagonistic teeth (the first permanent molar and second primary molar), loss of space for the eruption of the second premolar, reduction of the “lee-way” space (which may lead to inclusion, entopic or
ectopic eruption of the second premolar and canine), secondary dental alveolar incongruence, retro-position of the front teeth, premature contacts and occlusal interferences, first permanent molar cross bite.

Premature loss of the first primary molar can cause mesial tipping of the second primary molar, distal tipping of the temporary canine, inclusion or ectopy of the first premolar, distal tipping and rotation of the permanent mandibular canine, mesial tipping of the first mandibular premolar, egression of antagonistic teeth, secondary dental alveolar incongruence.

Unilateral, uni-maxillary premature loss of primary molars can lead to the before mentioned changes, but also to:
- Egression of antagonistic teeth, causing a blockage in mandibular dynamics;
- Palatal tipping of the permanent maxillary incisors and anterior cross bite due to premature loss of primary maxillary molars;
- Lingual tipping and over positioning of the mandibular permanent incisors and functional mandibular prognathism, caused by conduction due to premature loss of primary mandibular molars;
- Poor alveolar local development with upper asymmetrical endo-alveolgia and unilateral cross-bite;
- Mandibular lateral deviation, which can lead to mandibular laterognathia;
- Collapsed deep bite.

Bimaxillary premature loss of temporary molars can lead to maxillary endo-retro-alveolodontia, collapsed deep bite and functional mandibular prognathism.

DATA ON THE EFFECT OF PREMATURE LOSS OF MOLARS

Accurate research of space modifications in dental-alveolar arches is difficult due to the multifactorial factors that influence the results. Most studies on this issue are based on cross-linked data, limited study groups and imprecise methodology, inducing misconceptions on the spatial changes in the two dental arches.

Among the factors influencing these assessments are: age at the moment of premature loss of primary molars occurrence, facial and dental growth potential, occlusion status, vicious habits and applied methodology. Another factor related to the patient is the time passed since premature loss. The highest quantity of space loss was observed in the first 6 months after tooth loss (Beierl & Hune, Stratford, Wright & Kennedy) [2].

Bayardo, Eckles & Shulman, Popovich & Thompson noted that the premature loss of molars may result in reducing the arch length, which will cause crowding and rotations [3].

On a group of 104 children, Ronnerman & Thilander have observed that patients with premature loss of molars have significantly less space in both arches [4]. After examining a series of three study casts on every child at ages of 9, 11 and 13 years, significant differences were noticed in terms of the relative space between groups - accordingly, children with loss of primary molars before 7½ years developed more intense crowding than children with all teeth present at that age, whereas teeth losses after 7½ years have relatively less impact on space.

Seipel compared 50 cases of loss of space on the extraction side with the contralateral side, where all temporary molars were present. The mean difference between the two sites was 1.9 ± 0.3 mm, in most of cases (about 70%) less than 3 mm. Kronfeld found out that 51% of the prematurely lost temporary first molars and 70% of the temporary second molars resulted in loss of space and consecutive tooth malposition in the respective hemiarch. Pedersen et al., who conducted a longitudinal study on 723 children, of whom 324 with early loss of temporary molars, found out a statistically significant increase in the frequency of malocclusion and the need for treatment [5].

Harvold (cited by Schapira) examined lateral cephalometric radiographs of 76 children, made at ages of 6, 9, 12, 14 and 16 years. The subjects were divided into two groups, one group (n = 27) consisting of individuals with premature loss of molars, and another group (n = 49) consisting of individuals without premature loss before the age of 9 years. A standard F-ratio test showed some significant differences in changes at the age of 6, 9, 12, 14, but none at 16 years. According to these analyzes, they have concluded that the
interceptive orthodontic treatment in order to maintain space after premature loss of molars is not always indicated [6]. On the other hand, Harvold et al. found significant differences in some asymmetries measured between extraction and non-extraction groups at 6, 12 and 14, but not at 16 years.

Northway et al. studied the effects of premature loss of temporary teeth in 107 children, followed from the age of 6 years, with an average of 5.9 years. The study demonstrated that, in the lower jaw, severe reduction of space, of 3.7 mm in the control, was observed, in association with the temporary loss of the second molar. At the maxilla, the premature loss of the first primary molar and/or second primary molar led to a similar reduction in space, of 3 mm to 4 mm, compared to the control group [7].

Ronnerman & Thilander, who investigated a group of 104 children, have observed that patients with early loss of molars showed significantly less space in both arches, compared to the control group. Seipel compared the loss of space on the extraction side of the 50 cases without extraction. The mean difference between the two sites was of 1.9 ± 0.3 mm in most of the cases, about 70% less than 3 mm. In his turn, Kronfeld found out that 51% of one temporary prematurely lost molar and 70% of two temporary prematurely lost molars resulted in loss of space and tooth malposition of the consecutive quadrant, respectively [4].

Other studies have revealed that the premature extraction of the second temporary molar causes a greater reduction in the lee-way space than the premature extraction of the first temporary molar, which supports the idea that premature loss of the second temporary molar has a more important effect on malocclusions in permanent dentition, because minor and medium crowding can no longer be solved on the basis on Nance’s space drift. Ngan reached the same conclusion, outlining that most problems of crowding with less than 4.5 mm space reduction can be solved by maintaining the lee-way space, by regaining space or by limited expansion in late mixed dentition. Most of the cases will require extraction of permanent teeth to preserve the integrity of facial aesthetics and of the supportive tissue. Serial extraction or guidance eruption is reserved for the treatment of major discrepancies between teeth size and dental arch diameter [8].

Space management requires consideration of patient’s skeletal pattern, growth pattern and the presence of any oral or facial abnormal muscles that would interfere with the establishment of a normal occlusion. Moore and Reed have revealed a length of the arch drops of 2 to 3 mm between 10 and 14 years of age, when temporary molars are replaced by premolars [9]. These authors also demonstrated a reduction in the circumference of the mandibular arch of about 3.5 mm in boys to 4.5 mm in girls, respectively, during mixed dentition. If crowding is evident at the age of 8, it will not improve by further development and growth.

In cases of premature loss of molars, A. K. Rao noted a reduction in the length of both maxillary and mandibular arches in the molar region and an increase in the length of the mandibular arch in the canine region. Reduction in arch length is due to mesial migration of the molar, while arches’ growth in length was caused by the distal migration of the canine. It has been found out that length reduction was higher in the maxilla, compared to the mandible, and also that the distal migration of the canine was observed only in the lower jaw [10].

Kitae Park, in a research including numerous cases with premature loss of deciduous molars, encountered a significant increase in the arch size along the observation period, which showed no clinical loss of space when a normal growth pattern occurred.

In the mandible, the premature loss of the first deciduous molar during active eruption of the first permanent molar can cause mesialization of both the second temporary molar and of the first permanent molar. Similarly, if the second temporary molar is prematurely exfoliated, the length of the mandibular arch is reduced to such an extent that the normal lee-way space will be reduced and crowding will appear. Normally, according to Moyers and Lo, the lee-way space is of 2.6 mm (1.3 mm on each side) in the maxilla, and of 6.2 mm (3.1 mm on each side) in the mandible, respectively. Other authors (Nance, Fisk) have estimated that the lee-way space could be of 1.8 mm in the maxilla and of 2.4 mm in the mandible. The difference in lee-way space between maxilla and mandible was of 1.3 mm in
IMPLICATIONS OF PREMATURE LOSS OF PRIMARY MOLARS

boys and of 1.1 mm in girls. Since the reported spaces vary widely, the lee-way space should be determined for each patient [11,12].

Data provided in the study of Padma Kumari and in that of Lin, in cases of loss of the temporary first mandibular molar, showed a statistically significant loss of space on the extraction side and insignificant reduction in the control [13]. The loss rate was higher in the first 4 months. This study certifies the use of space maintainers in the circumstances of premature loss of temporary mandibular molars in order to preserve space. Yet, the authors found no significant arch differences in width, length and perimeter between the initial and the final examination, so that they concluded that the change in space after premature loss of the first temporary molar in the mandible is caused mainly by a distal movement of the temporary canine during the first stage of the premature loss of the first temporary molars.

In the case of premature loss of the first temporary maxillary molar, Lin stated that the D + E space on the extraction side, 6 months after extraction, is of 15.62 mm ± 1.13 mm, being significantly lower than that in the control - 16.88 ± 1.12 mm. The authors observed a significant shortening of the arch length (25.47±1.58 mm) and an increase in the inter-canine distance (31.29±2.49 mm) after 6 months, compared to the initial length (25.66±1.64 mm) and the inter-canine width (30.42±2.64m). According to Cuoghi, if this condition is present, space reduction and dislocation of the permanent canine and incisors towards the extraction site occur, which calls for an immediate use of a space maintainer [14].

Northway believes that loss of the first temporary maxillary molar results in a mesial shift of the permanent canine during eruption. The first premolar erupts in more mesial direction than in cases without premature loss, as a result of the second temporary molars mesial tilt towards, and uses the space needed for the permanent canine, which is blocked in eruption. As to the clinical implications, rather than using a space maintainer after premature loss of the temporary first maxillary molar, clinicians can choose among a number of other options to prevent the mesial eruption of the first premolar [7].

Davey’s study showed that mesial inclination of the first permanent maxillary molar is related to cusp height. For every millimeter lower cusp height, an extra 2.367 mm mesial migration occurs. Availability of lee-way space is also related to the loss of space. Davey revealed that mesial migration of the first permanent molar occurs in arches with crowding potential, every millimeter loss of lee-way space resulting in an extra 0.305 mm mesial inclination [15].

The effect of the premature loss of temporary first molar on occlusion depends on the development stage of occlusion at the time of loss. If loss occurs during the active period of permanent first molar eruption, a powerful force towards the front zone is to be expected, that will be exerted on the second temporary molar, pushing it in the space designed for the first premolar. Similarly, canine distalization is also possible, if loss occurs during active eruption of the lateral incisor [16].

Choonara reported that many of the orthodontic cases involving crowding and lack of space in permanent dentition could have their problems prevented or their severity reduced if the intervention of the practitioner could maintain adequate space in mixed dentition. The decision to use space maintainers should be based on good knowledge principles of orofacial growth and development [17].

The impact of temporary molars pathology, especially of their premature loss upon the harmony of the stomatognathe system, is an eloquent plea for the development of well-conducted prophylactic methods, in conjunction with a targeted approach.

References


