Incidence and distribution of deciduous molar ankylosis, a longitudinal study

ABSTRACT

To study incidence and distribution of deciduous molar ankylosis.

Study design: longitudinal retrospective study. A total of 512 consecutive subjects (aged 5 to 15 years) were examined at the Orthodontics and Pediatric Dentistry Department of the Genoa University School of Dentistry; for each subject an ortopantomography x-ray was taken.

Results Thirty-four children were affected by deciduous molars ankylosis (6.6%). A statistically significant difference was revealed between the distributions: the lower deciduous molars were ankylosed more frequently than the upper ones (P<0.001); the second deciduous molars were ankylosed more frequently than the first molars (P<0.001). No statistical significance was found between sex and number of infraoccluded teeth (P=0.74).

Conclusion This study found an incidence of deciduous molar ankylosis of about 6.6%; the lower deciduous molars and second deciduous molars were ankylosed more frequently (P<0.001).

Keywords: Tooth ankylosis; Deciduous molars.

Introduction

Ankylosis has been described by Mc Call e Wald [Falconi et al.,1987] and is a dental anomaly of unknown aetiology that causes bone bridges between root cementum and alveolar bone; for this reason, ankylosis hampers the normal development of the tooth involved and, consequently, prevents tooth eruption and growth of the alveolar bone supporting it. Ankylosis seldomly affects the permanent dentition, while it has a frequency of 6-8% in deciduous molars, causing, in the most severe cases, local malocclusions, delayed and hook-shaped morphology of bicuspid roots, and a tendency to impaction of the tooth underneath the ankylosed molar (Fig. 1).

Diagnosis must necessarily be based on clinical and x-ray findings, because the histological examination, which is the proper diagnostic criterion, is not practicable in a longitudinal research.

Steigman [1973] had in view to check the earliest age at which ankylosis becomes clinically detectable, to determine the distribution frequency, and to investigate the most frequently affected arch. For this reason 1042 children aged 3 to 6 years were examined. Among the deciduous molars examined, 9.2% had ankylosis. At three years of age, it was found an incidence of about 8.4%. The incidence of ankylosis was greater in the lower dental arch (P<0.001). The first deciduous molars were affected more often than the second molars (P<0.001) both in the maxilla and in the mandible. In females the mandibular deciduous first molars and the maxillary deciduous second molars were affected more frequently (P<0.001); in males the maxillary deciduous first molars and the mandibular deciduous second molars were affected more frequently (P<0.5 and P<0.01 respectively). The reason for the disparity in frequency between first and second deciduous molars and between upper and lower dental arches is unknown.

Other authors report a great variation in ankylosis frequency in deciduous dentition; unfortunately in many researches the age of children examined is not mentioned. Among these, we mention [all reported in Mueller et al., 1983] an European research [Dechaume and Cauhepe, 1948], in which 40 cases of ankylosis were found among 60.000 children (0.07%); an english study [Andlaw, 1974] on 1.539 children (5 to 11 years) which found a 3.2% incidence of ankylosis; in other studies, done in the U.S.A., ankylosis was found to have a 3.2% incidence in 2.105 children (8-12 years) [Brearley and Mc Kibben, 1973]; 6.9% in 1.641 patients (2.5-14.5 years) [Lamb and Reed, 1968]; 3.7% in 2.234 children from 6 to 12 years [Krakowiak, 1978].

Mueller [Mueller et al., 1983] planned a research in order to investigate the incidence of ankylosis by means of bite-wing x-rays in 1.895 United States patients (aged from 7 to 12 years), of a very heterogeneous ethnic
population (78.3% Caucasian, 9.3% African Americans, 8.9% Hispanic, and 3.5% of mainly Asian American). This study examined the incidence of ankylosis related to sex, ethnic background and exposure to communal water fluoridation. Chi square analyses were used to determine the relationships between ankylosis and other characteristics of the patients. The incidence of ankylosis was 9.9%, with no significant differences between the different geographic areas; no significant differences were found between the fluoridated and non fluoridated areas in the incidence of ankylosis (P>0.05); the difference in the incidence of ankylosis between males and females was not significant (P>0.05); the highest incidence was found among Hispanic (11.5%) and Caucasian subjects (10.6%). African Americans and other ethnic groups were well below the overall average (5.5% and 3.2% respectively). There was a statistically significant relationship between the race of the child and the prevalence of ankylosis (P<0.05). The mandibular first molar showed the highest frequency of ankylosis (P<0.001), in a twice ratio versus second deciduous molar. Sixty-four children had at least one ankylosed tooth on each side. Of them, 87% were Caucasian and within this subgroup, 71.4% were females. In other ethnic groups the observations were so few to make it impossible a statistical comparison. These results revealed a higher incidence of ankylosis (9.9%) than that reported in previous studies, probably due to the higher age of the children examined or to the diagnostic method used, which was based on radiographic criteria.

In this paper we study the incidence and distribution of deciduous molar ankylosis.

Materials and methods

At the Orthodontic and Paediatric Dentistry Department in Genoa University School of Dentistry (Italy) were visited 512 consecutive Caucasians patients, aged 5 to 15 years. Diagnosis of ankylosis was made clinically, from radiographs and from study models. The amount of infraocclusion was measured in millimeters, to determine the difference in height between the affected tooth and the occlusal plane [Darling and Levers, 1973], using a gauge on cast models; minimum amount was considered 1 mm infraocclusion.

Statistical analysis

The Chi-square test was used to evaluate differences between sex and number of infraoccluded teeth, and the Wilcoxon signed-rank test was used to evaluate differences between the distributions of first and second deciduous molars and between the distributions of upper and lower molars. An independent samples t-test was used to compare the means of infraocclusion amounts in all first molars and in all second molars, while the paired samples t-test was used to compare the means of infraocclusion amount of first and second molars for patients who had both teeth involved. Lastly, the Mann-Whitney U-test was performed to assess differences in first, second, upper and lower molars and their distributions with respect to sex. The statistical difference was tested at P < 0.05. These analyses were carried out using SPSS Advanced Models 17.0 statistical analysis software for Windows and Macintosh, provided by the Department of Health Sciences, Section of Biostatistics, Genoa University, Italy.

The error of the method for the linear measurements was evaluated by repeating the measurements of 30 randomised teeth. The ICC was 0.71.

Results

Thirty-four patients had ankylosis of one or more deciduous teeth (6.6% among the examined group); the total ankylosed deciduous teeth found were 88. In Table 1, for each patient examined age, sex, number, type and position of ankylosed teeth are reported; distribution in dental arches are reported in Figures 2, 3 and 4.

As for sex, 17 males and 17 females had deciduous molar ankylosis, in a 1:1 ratio. The amount of infraocclusion was distributed as follows:

- from 1 to 2 mm: 53 molars;
- from 2.5 to 4 mm: 25 molars;
- from 4.5 to 9 mm: 6 molars.

Lower molars were more infraoccluded than the corresponding upper ones (15 subjects had at least one infraoccluded upper molar while 32 subjects had at least one infraoccluded lower molar) (Table 1).

A statistically significant difference was found between the distributions of upper and lower molars (P<0.001) (Table 2), also confirmed considering males and females separately (P=0.006 for males and P=0.002 for females).

A statistically significant difference was found between the distributions of first and second deciduous molar (P<0.001). In males and females respectively a total of 15
and 7 first molars and a total of 29 and 37 second molars were recorded, but no statistical significance was found between sex and number of infraoccluded teeth \( (P=0.74) \).

Regarding maxillary and mandibular first and second molar, no statistical significant difference was found between male and female subjects: males and females showed respectively 3 and 2 infraoccluded maxillary first molars \( (P=0.95) \), 6 and 9 maxillary second molars \( (P=0.45) \), 12 and 5 mandibular first molars \( (P=0.12) \), 23 and 28 mandibular second molars \( (P=0.34) \).

Regarding the amount of infraocclusion (Table 3) a statistically significant difference was found between first and second molars, considering all infraoccluded first molars versus all infraoccluded second molars \( (P=0.001) \), while when considering only the paired samples analysis for patients who presented both infraoccluded first and second deciduous molars the mean difference was not statistically significant \( (P=0.11) \).

The mean amount of infraocclusion was about \( -1.91 \pm 0.45 \) mm for the first deciduous molars and \( -2.59 \pm 1.45 \) mm for the second deciduous molars.

Concerning the age of patients and incidence of ankylosis, a greater number of ankylosed teeth was detected between 8 and 10 years with a peak at 9 years old in males and at 9 and 10 years old in females.

### Discussion

The incidence of ankylosis found in this study (6.6%) stands halfway between the results found by the above-mentioned authors. This research is based on x-rays examinations: this permitted to put in evidence even not severe ankylosis, measured on orthopantomograms in mm. About the greater incidence in the mandible, we found these data in agreement with those of Steigman et al. [1973] and M ueller et al. [1983]; on the contrary, we found a greater incidence of second deciduous molar ankylosis (73% between ankylosed molars resulting in this investigation), while several authors (but not all) found a greater incidence of first molar ankylosis.

The lower deciduous molars were ankylosed more frequently than the upper ones \( (P<0.001) \), in agreement with Biederman [1962]; the second deciduous molars were ankylosed more frequently than the first molars \( (P<0.001) \). No statistical significance was found between sex and number of infraoccluded teeth \( (P=0.74) \) as reported by M ueller.

With respect to other authors for maxillary and mandibular first and second molar no statistical significant difference was found between males and females; though between males mandibular first molars and mandibular second molars resulted more affected while between females mandibular second molars resulted much more involved. Steigman confirmed a higher incidence of ankylosed mandibular second molars in males. M esser and

<table>
<thead>
<tr>
<th>Sex</th>
<th>Ankylosed teeth in each patient</th>
<th>P</th>
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<tbody>
<tr>
<td>F</td>
<td>4 4 5 3 1</td>
<td>0.74</td>
</tr>
<tr>
<td>M</td>
<td>3 7 3 2 2</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>7 11 8 5 3</td>
<td></td>
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</tbody>
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**TABLE 1** - Distribution of number of ankylosed teeth in each patient for sex.

**TABLE 2** - Upper/Lower ankylosed teeth and first/second ankylosed molars.

**TABLE 3** - T-test to compare means of infraocclusion in first and second ankylosed deciduous molars.
Cline [1980] described the possibility of infrabony dental rotation, leading to a lack of space. Kurol and Koch [1985], in a longitudinal study about the effects of ankylosed molars extraction, in which they followed 15 children affected by not severe deciduous mandibular molar infraocclusion (2 to 4.5 mm), making extractions only in one side, pointed out that in the nonextraction side the degree of infraocclusion worsened, but all deciduous molars exfoliated normally and all successors erupted spontaneously.

Starnes [1998] indicated in 6 to 8 years the age of interception of any condition that can influence the growth pattern, tooth development, and eruption. Kurol [2002] underlined that progressive infraocclusion cause tipping of adjacent teeth, bone defects, and hindered or delayed eruption of permanent successors. Early removal was therefore recommended, especially when the permanent successor is in an incorrect position. Reopening or maintaining space must be considered before extractions are performed. Because of tipping of neighbouring teeth and roots thinness, surgical removal may present difficulties.

Kurol [2006] also stated that, if permanent successor is in a normal position, early extraction of the ankylosed deciduous molar is unnecessary. We agree, underlying that we always paid a special attention to the normal development of premolar roots: altered morphologies, such as root enlargements or apical hooks, have been noticed in our clinical experience (Fig. 1), that may definitively hinder the eruption of the tooth.

Loriato et al. [2009] pointed out that, since dentoalveolar ankylosis can cause negative effects on occlusal development, early diagnosis and an effective treatment plan are essential to prevent further eruption deviations and more severe malocclusion.

Conclusion

This longitudinal retrospective study showed an incidence of deciduous molar ankylosis of about 6.6%; the lower deciduous molars (mainly second deciduous molars) were those ankylosed more frequently (P<0.001). The amount of infraocclusion was distributed as follows:

- from 1 to 2 mm: 53 molars;
- from 2.5 to 4 mm: 25 molars;
- from 4.5 to 9 mm: 6 molars.

No statistical significant difference was found between sex and number of infraoccluded teeth (P=0.74).

References


