Maximum interincisal distance in mouth breathing children

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Abstract

Introduction: The maximum interincisal distance is a very important aspect during myofunctional orofacial evaluation, because myofunctional orofacial disorders can limit mouth opening. **Purpose:** To describe the maximum interincisal distance of mouth breathing children, according to age, and to compare maximum interincisal distance means of mouth breathing children to those of children with no history of speech-language pathology disorders. **Methods:** Ninety-nine mouth breathing children, of both genders, with ages ranging from 7 to 11 years and 11 months, leukoderms, in the mixed dentition took part in this study. The control group was composed of 253 children, with ages ranging from 7 to 11 years and 11 months, leukoderms, in the mixed dentition period, with no history of speech-language pathology disorders. **Results:** The results show that the maximum interincisal distance mean of mouth breathing children was, considering the total sample, 43,55 millimeters, and did not show statistically significant difference according to age. There is no statistically significant difference between maximum interincisal distance means of mouth breathing children and of the control group children. **Conclusions:** The maximum interincisal distance is a measure that did not modify in mouth breathing children, during the mixed dentition period, according to age, and seems not to be altered in this population. The importance of the use of the caliper in objective evaluation of the maximum interincisal distance was also observed.

Keywords: Face. Measurements. Mouth. Child. Mouth breathing.

INTRODUCTION

Mouth breathing is one of the most frequent orofacial myofunctional disorders in the speech-language pathology clinic, and has a high prevalence in the population, in all ages[10]. Evaluation and early detection of mouth breathing individuals is extremely important. This disorder compromises the nasomaxillary process development, due to the disruption of the physiologic balance of the dentomaxillofacial architecture. The effects of mouth breathing have been discussed in the literature. It describes disorders in the normal development of the face, bones and occlusion, due to the unbalance caused to the relationship between

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muscle, bone and dental tissues. In this way, the alterations of the skeletal and muscular patterns of mouth breathing individuals have been demonstrated[4,9,10,17,18,19,22,26,29].

During speech-language pathology evaluation, Bianchini[3] proposes the use of the caliper to measure the maximum interincisal distance, that is, the distance between the upper and lower incisors, in the maximum possible mouth opening. This instrument is also used to measure the maximum mouth opening which is considered as the distance between the upper and lower incisors, adding the amount of overbite or subtracting the anterior open bite distance.

Others authors[20,21,23,24,27] also proposes the use of the caliper to measure, among other orofacial measurements, maximum mouth opening.

The use of the caliper, an anthropometric instrument, offers many advantages in the objective evaluation of the craniofacial complex, once it is a simple non-invasive technique that poses no risk to subjects and has low costs[30].

In reference to the norms of maximum mouth opening, Bianchini[4] describes that an opening under 35 millimeters (mm) in a child is an alert to muscular and/or joint problems. Hamazaki et al. [16] found, in their study with children from 6 to 12 years old, that the mean for maximum mouth opening was 48.33mm, and this measure increased according to age. Ríspoli and Bacha[23] indicated that maximum mouth opening is about 40 to 45mm, and they did not differentiate between genders or ages. Rodrigues [25] considers, in adults, that 40mm is a reference value for maximum mouth opening.

In a study, with the purpose of describing the maximum interincisal distance in leukoderm children with no speech-language pathology complaints, in the mixed dentition, the veryfied mean for this distance in the sample was 44.75mm, and a significant statistical difference was only observed in males from 7 to 11 years and from 8 to 11 years old. Females showed lower means than males, except in 8-year-old children[6].

The interest of the present study has grown as a lack of norms for maximum interincisal distance in mouth breathing children was observed, as well as, no description for this characteristic according to age.

The purposes of this study were: (1) to describe the maximum interincisal distance of mouth breathing children and to verify if there is a statistically significant difference between the means of this measurement, according to age; and (2) to compare the maximum interincisal distance means of mouth breathing children to those of children with no history of speech-language or swallowing disorders and to verify if there is statistically significant difference between the means of these two populations, according to age.

MATERIAL AND METHODS

Subjects

Participants were 99 mouth breathing children with ages ranging from 7 to 11 years and 11 months, being 50 (50.5%) males and 49 (49.5%) females. The mean age was 8 years and 5 months and the median was 8 years. The children were divided according to age: 31 children (31%) from 7 years to 7 years and 11 months; 21 children (22%) from 8 years to 8 years and 11 months; 21 children (21%) from 9 years to 9 years and 11 months; 12 children (12%) from 10 years to 10 years and 11 months; 14 children (14%) from 11 years to 11 years and 11 months.

The inclusion criteria were: (a) diagnosis of mouth breathing by an otorhinolaryngologist; (b) functional alteration of breathing; (c) leukoderm; and (d) being in the mixed dentition period with the four permanent first molars completely erupted.

The exclusion criteria were: (a) history of speech-language pathology, with present and/or previous treatment, in any area (voice, language, orofacial myology and/or audiology); (b) history of facial and/or pharyngeal surgery; (c) history of

syndrome and/or neurological disease and/or bifid uvula; (d) history of craniofacial malformations; and (e) history present and/or previous orthodontics and/or facial orthopedics and/or craniomandibular treatments and/or temporomandibular joint dysfunction (TMD).

The control group was composed by 253 (same sample from Cattoni's[5] study, 2003), with ages between 7 years and 11 years and 11 months, being 137 boys (54%) and 117 girls (46%), leukoderms, in the mixed dentition period with the four permanent first molars completely erupted, with no history of speech-language pathology with no present and/or previous treatment, in any area (voice, language, orofacial myology and/or audiology), with no speech-language pathology complaints and attending private schools in the city of Sao Paulo. The mean age was 8 years and 5 months and the median was 8 years.

The children were divided according to age: 48 (19%) children between 7 years and 7 years and 11 months; 51 (20.1%) children between 8 years and 8 years and 11 months; 50 (19.7%) children between 9 years and 9 years and 11 months; 54 (21.5%) children between 10 years and 10 years and 11 months and 50 (19.7%) children between 11 years and 11 years and 11months.

Material

The instrument used to obtain the maximum interincisal distance was the electronic digital sliding caliper Starrett Series 727, made in Brazil, made of stainless steel, containing LCD display with an active unit system in millimeters with 0.01 mm of resolution and repeatability. Data protocols, cotton and ethyl alcohol were also used.

Procedure

On the first phase, the otorhinolaryngologist carried out the diagnostic evaluation, composed by physical and radiologic exams. The physical exam was composed by oroscopy to evaluate the size of palatine tonsils and anterior rhinoscopy to evaluate the turbinal bones, septum and nasal mucosa. Complementary exams were asked, such as cavum radiography, to determine the extention of nasopharyngeal obstruction by the pharyngeal tonsil. The children that, after the otorhinolaryngologic evaluation and results of the exams, received mouth breathing diagnosis were referred to evaluation of the maximum interincisal distance. When all criteria for participation in this study were respected, parents or legal guardians of the children were asked to fill in the informed consent form (ICF). The research and the ICF were approved by the Ethics Committee of Hospital das Clinicas (CAPPesq) and of the Medical School of the University of São Paulo (protocol number 096/04).

On the second phase, the maximum interincisal distance was measured, and it corresponded to the distance between the incisal edge of the central upper incisor and the incisal edge of the central lower incisor, after maximum mouth opening. If the right central upper and/or lower incisors were in eruption process or absent, the distance between the correspondent teeth on the left side was measured. If the central upper and/or lower incisors, on the right and left sides, were in eruption process or absent, the distance between the incisal edge of the lateral upper incisor, on the right side and the incisal edge of the lateral lower incisor on the right side was measured. When it was impossible to obtain this last measurement, as result of the incomplete eruption process or absence of the central and lateral incisors on the right side, the distance between the incisal edge of the lateral upper incisor on the left side and the edge of the lateral lower incisor on the left side was measured. In the absence of the central and lateral lower and upper incisors or if they were in eruption process, this measurement was not obtained.

The child was asked to remain seated, with both feet on the ground, with the head in resting position. The maximum interincisal distance

was measured, in frontal vision, with the jaws for internal measurement of the sliding caliper, and it was written in millimeters in the data protocol. The measurement was taken twice and, afterwards, the average was calculated. At the end of the evaluation of each child, the caliper jaws were washed and disinfected with ethyl alcohol, rubbed with cotton.

Finally, the analysis that compared the results for the maximum interincisal distance between the mouth breathing children and the control group was carried out, verifying if there was statistically significant difference among the means of these two populations, according to age. The procedures were similar with the control group.

Statistical analysis

The studied population was characterized by descriptive statistics (mean, standard deviation, median, minimum and maximum values). The adherence to Normal curve was evaluated by Komolgorov-Smirnov test.

In the data analysis regarding maximal interincisal distance, means were compared according to age, by the analysis of variance (ANOVA). The confidence interval was calculated at 95%.

The comparison of the maximum interincisal distance means between the mouth breathing children and the control group was performed by the Student's t test, according to age.

All analysis were processed with SPSS for Windows version 12.0 and the level of significance was considered at 5%.

RESULTS

Descriptive statistics for the maximal interincisal distance, considering the total number of mouth breathing children, demonstrates that the mean was 43.55mm and the median was 43.75mm. The minimum value obtained was 31.12mm and the maximum value was 55.83mm The maximum interincisal distance mean in the sample showed a close value to the median and it presented adherence to the Normal distribution (p>0,663 by Komolgorov-Smirnov test).

The descriptive statistics for the maximal interincisal distance, considering the total number of children from the control group, demonstrated that the mean was 44.75mm and the median was 44.65mm. The minimum value obtained was 32.34mm and the maximum value was 58.01mm.

Regarding the characterization of the study population according to the main otorhinolaryngologic diagnosis, in accordance to age, the most frequent was hypertrophy of the pharyngeal and palatine tonsils (48%), which was followed by the hypertrophy of pharyngeal tonsils (32%). Enlarged palatine tonsils, as well as rhinitis, were observed in 15% of the study population. No significant statistical difference among the percentages of the otorhinolaryngologic diagnosis according to age was found (p>0.005).

In Table 1, it can be observed that there was no significant statistical difference among the maximal interincisal distance means, according to age (p=0.950). The minimum value found in the sample was 31.12mm, in a 7-year-old child, and the maximum value was 55.83mm, in a 10-year-old child.

Table 2 shows the comparison of the maximum interincisal distance means. Significant statistical difference among the means of this measurement in the two studied populations was not verified. The mean values in the control group children were close to the ones obtained in the mouth breathing children, for all ages (p>0.005).

DISCUSSION

Although the literature does not describe disorders in the maximal interincisal distance in mouth breathing children, this measurement was collected in order to describe this population. It is important to emphasize that, during the data gathering process, the procedures proposed by Bianchini[3], Cattoni and Fernandes[6] were respected.

Regarding selection criteria of the children,

TABLE 1 - Descriptive statistics of the maximum interincisal distance, according to age.

AGE (years)	MEAN (mm)	ERRO PADRÃO	CI 95% (mean)	MÍN. – MÁX. (mm)
7	43,29	0,92	41,39 – 45,19	31,12 – 51,05
8	43,85	1,07	41,61 – 46,09	31,55 – 51,67
9	42,99	0,98	40,94 – 45,04	35,24 – 52,20
10	43,86	1,77	39,94 – 47,77	36,07 – 55,83
11	44,20	1,18	41,63 – 46,77	35,40 – 53,04

CI=confidence interval (ANOVA) p = 0,950.

TABLE 2 - Comparisons among means of the maximal interincisal distance in the different groups according to age.

AGE	n	CONTROL GROUP mean (mm)	n	MOUTH BREATHING CHILDREN mean (mm)	p
7	48	43,90	31	43,29	p > 0,05
8	51	43,70	21	43,85	p > 0,05
9	50	45,67	21	42,99	p > 0,05
10	54	44,96	12	43,86	p > 0,05
11	50	45,46	14	44,20	p > 0,05

n=number of patients; p= t-Student test.

only mouth breathing children confirmed by otorhinolaryngologic diagnosis participated in this study, reducing the subjectivity in determining this condition. Moreover, the children should not present history of present and/or previous speech-language pathology and/or treatment, because alterations in the orofacial muscles can be verified after myofunctional therapy [17].

Also, the participants in this study could not have present and/or previous history of facial and/or pharyngeal surgery; syndrome, neurological disease and/or bifid uvula; craniofacial malformations; orthodontics and/or facial orthopedics and/or craniomandibular treatments; or TMD, because these clinic and surgical treatments, such as the cited alterations, can damage the craniofacial complex[2,3,8,11-15,20,28]. If these exclusion criteria were not respected the obtained data would not present the desired validity.

The mixed dentition was the chosen period, because some other investigations[5,6,7] have also focused on this dentition phase as inclusion criteria. It is determined by the presence of four completely erupted first permanent molars since important transformations occur in the oral cavity, between 5 and 6 years old, as a result of the eruption of these teeth. Hence, it was possible to obtain an homogeneous sample in regard to the dentition development.

Among the mouth breathing children, significant statistical differences were not verified between the maximum interincisal distance means, according to age, and the mean value for this sample was 43.55mm. It was noted that the obtained results are according to data described by Bianchini[4], which describes that mouth opening under 35mm in a child is one of the aspects that indicate possible muscular and/or joint disorders. However, it is emphasized that there is a difference between the maximal interincisal distance and maximal mouth opening, once there are different procedures to obtain them.

The results regarding maximal interincisal distance in mouth breathing children are close to previously published data about children with no speech-language pathology complaints (43.55mm and 44.75mm, respectively)[6]. These researches respected the same assessment procedures, which allows data comparison.

When the two studied populations are compared, no significant statistical difference between the means according to age was observed, this indicates that in mouth breathing children this measurement seems not to be altered.

It is emphasized, finally, that the mouth breathing children who participated in this study are attending a highly specialized hospital –due to other conditions - and the generalization of the

obtained data in this research can, therefore, have some limitations. In this way, it would be interesting to repeat this kind of study in other health care services, with different populations, in other dentition periods.

As a final consideration, the use of the caliper was shown to be useful during speech-language pathology evaluation, adding to the visual assessment with quantitative measures. It is relevant to indicate that its use needs procedure standardization, in order to obtain an accurate analysis of the maximum interincisal distance.

CONCLUSIONS

There was no significant statistical difference between the maximum interincisal distance means in mouth breathing children, according to age.

There was no significant statistical difference between the maximum interincisal distance means in mouth breathing children and in the control group, according to age.

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