JAW DIMENSIONS AND INTER ARCHES RELATION IN MOUTH BREARHING CHILDREN

ABSTRACT

AIM: This research evaluates the dimension characteristics of jaw and the inter arches relation in children with reduction of nasopharynx space by hypertrophy of the pharyngeal tonsils in the mixed dentition stage. **MATERIAL AND METHODS:** the sample was composed by initial orthodontic documents of 25 patients of both genders, from 6 to 10 years old, diagnosed with nasopharynx obstruction by two specialists (one orthodontist and one otorhinolaryngologist) based on anamnesis, medical history, clinical tests, face photos and evaluation of the respiratory airways through lateral telereadiography. In this early moment, occlusal characteristics were not considered during the diagnosis. The sample was composed by only the cases in which both professionals considered presenting significant obstruction of airways (isthmus ≤ 4mm), able to provide changes on growth and occlusion and that presented the inclusion criteria. The cases selected had their initial plaster models evaluated by means of a digital caliper (brand Vonder) previously calibrated. The intra arches and inter arches included in this study were: intercanine and intermolar distance; anterior and total length of dental arch, depth of the dental arch overjet, overbite and terminal plan/molar and canine relation. **RESULTS:** It was not found correlation among the isthmus values and variable analyzed. Intra arches measurements presented similar behavior among them, showing their severity. **CONCLUSION:** Intra arches and inter arches analyzed showed values similar to them reported in the literature, evidencing the influence of nasopharynx space reduction on the morphology of arcade and on occlusion.

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KEYWORDS

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INTRODUCTION

During the process of occlusion development, the transition from deciduous dentition to the permanent one occurs, and several hereditary and environmental factors act direct or indirectly on the final occlusion resulting[1-4]. A change in the functional order, represented by a nasal airway obstruction promotes a number of harmful influences to the dynamic of the growth process and dentofacial development. It may generate malocclusion in early age[5].

Among these different etiological factors of nasal obstruction, the hypertrophy of the pharyngeal tonsil deserves detach by its high prevalence and its aggressiveness on the growth process and dentofacial development. The pharyngeal tonsil, commonly known as adenoid, is a lymphoid tissue structure localized on the nasopharynx posterior wall, and plays an important role as the first line on defense of body during the early ages of living, until other structures, like the spleen, thyme and the bone marrow, linked to the formation and maintenance of the immune system can be developed[6].

In normal conditions, the growth of the pharyngeal tonsil occurs in balance with the growth of the cranial base and with the anteroposterior displacement of the nasomaxillary complex, maintaining the appropriate nasopharyngeal space for the respiratory function. However, in the period from the birth to the puberty, the pharyngeal tonsil exhibits a volumetric increase, and it can achieve 200% of its final size; and after this stage, an atrophy process starts, probably due to the sexual hormones[7-8].

Depending on the volume acquired during its development, the adenoid can provoke compensatory postural changes on the face, promoting changes on the lip relation, tonicity and on the tongue posture, as well as on the jaw in order to establish an alternative via for the airflow, using the mouth cavity for this[5,8,-9,12]. This set of changes on the postural and facial muscle are characteristics of mouth breathing and can generate, in long term, a specific facial type, also known as adenoidean face[13], which presents classical characteristics: nose with small alar base and little developed, vague and inert facial expression, further the facial growth predominantly vertical.

One of the preconized ways for diagnosis of nasal obstruction is through the telereadiography in standardized lateral rule[14], which represents high precision degree, low cost and easy access for population. According to Holmberg, Linder-Aronson[15] , radiographic image of nasopharyngeal space, resulted of relation between the pharyngeal tonsil and the nasopharyngeal portion of the soft palate at rest, in its narrower portion known as isthmus, has a high correlation degree with clinical characteristics observed directly on the nasopharynx.

To evaluate dimensional changes on the arches promoted by the mouth breathing[16,17], traditionally is used the caliper rule as a measure method for plaster models in study. An example is the study performed by Paul, Nanda[18], in which they analyzed 100 plaster models of young patients (15-20 years), equally divided in mouth and nasal breathing. In mouth breathing patients, it was observed a transverse shrinkage and an increase on the length of the dental arch, and also a pronounced overjet, deep bite, deep palate due to the lateral shrinkage of arch and high percentage of malocclusion Class II, 1st division. Gross[19] still considers as bigger the nasal obstruction, as higher the possibilities of deviation from the normal standard of facial growth.

The aim of this study was evaluating the dimensional characteristics of jaw and the inter arches and intra arches relation in children during the mixed dentition with reduction of nasopharynx space by hypertrophy of the pharyngeal tonsils.

MATERIAL AND METHODS

SAMPLE SELECTION:

This retrospective study with transversal and quantitative base was composed by 25 patients pf both genders from 6 to 10 years old, independently on the type of malocclusion, obtained from the files of the Orthodontic Clinic of the Graduation and post-graduation courses in Dentistry of University Center of Araraquara – UNIARA.

The inclusion criteria used were: (1) being in the intermediate period of the mixed dentition; (2) nasopharynx space with isthmus smaller or equal to 4mm by the radiographic exam (teleradiography in lateral rule); (3) initial plaster models in good conditions for analysis; (4) absence of tooth loss (physiological or not); (5) absence of anomaly on dental shape, number or size, crown fracture or caries or restorations which compromise the dental anatomy; (6) absence of other craniofacial deformities, syndromes or lip-palate cleft; (7) absence of orthodontic treatment and /or facial orthopedic previously the study; (8) presence of all the first permanent molars totally erupted or in occlusion; (9) possessing initial teleradiography in lateral rule with adequate clarity.

Exclusion criteria: (1) history of nonnutritive sucking habits (finger or pacifier) in a period inferior to 6 months from performing the initial orthodontic documentation.

BREATHING PATTERN EVALUATION:

Initially, it was performed a survey of the number of children with mixed denture, who passed by orthodontic attendance at University Center of Araraquara, in the period from 2006 to 2013, and who possess complete initial orthodontic documents in the University files. From the initial group of 157 children, the patients selected were those who were in the transitory period of mixed denture when the documentation was performed, and attend the other inclusion criteria previously mentioned.

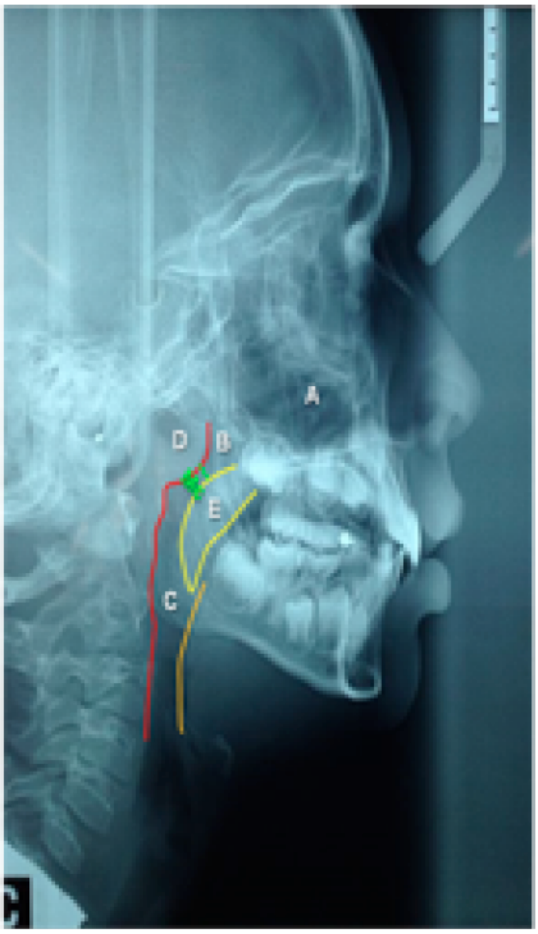
The patients were classified according to the breathing pattern (nasal or mouth) based on radiographic exam, clinical exam, photos of face, medical history and anamnesis carried out by two professionals, one orthodontist and one otorhinolaringologist, previously calibrated for this study.

In the anamnesis, it was evaluated the parents report about the presence of allergic or respiratory problems of the child, if the child was submitted to evaluation or treatment with otorhinolaringologist, presence of nightly snore or slobber, daytime sleepiness, difficulty concentrating, frequent cold and difficulty breathing.

For the radiographic evaluation, it was measured the distance of isthmus on the lateral teleradiography, represented by the shortest space between the dorsal surface of the soft palate and the posterior wall of the nasopharynx or adenoid, according to the method described by McNamara[14] (Figure 1). It was considered as cutoff for classification of mouth breathing the presence of isthmus equal or inferior to 4mm.

In the clinical trial were observed some aspects to classify the patient as mouth breathing: narrow face, nose with small alar base or little developed, vague facial expression, tired looking, absence of lip seal liability and standard long face. Both evaluations were performed separately by two experts (an orthodontist and an otorhinolaringologist), with no contact during the evaluations. It was considered mouth breathing the patients which both professional considered with significant reduction of nasopharynx space and with facial characteristics and other exams indicated presence of nasal obstruction.

Figure 1. Teleradiography in lateral rule: (A) nasal breathing space; (B) nasopharingeal space; (C) oropharyngeal space; (D) contour of the posterior wall of the nasopharynx; (E) back of the soft palate; (Mc) McNamara Line (isthmus).



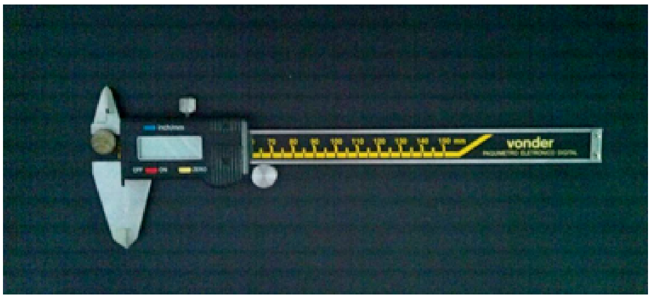
EVALUATION OF ARCADES:

For evaluation of changes promoted on the patients' arcades of classified as mouth breathing was used a digital caliper rule brand Vonder with resolution of 0,01mm and precision of ± 0,02mm (Figure 2), previously calibrated for this purpose. All the measures were carried out by the same researcher previously calibrated by the repetition process until the values obtained could be considered consistent by a second examiner. The wrong of method was evaluated using the intraclass correlation coefficient obtaining value always superior to 0.9. Thereunto, 3 pairs of models were measured in three different moments with interval of one week. It was still performed a pilot study in order to test the method to be applied.

During the measured were observed the following inter arches relations: terminal plan and molar and canine relation, overjet and overbite; and intra arches: inter canine distance, inter molar distance, depth arcade and total and anterior length arcade. In the intra arches measures were used only the plaster models of superior arcades.

In each measure, the caliper was placed in the initial position (zero) in order to avoid *addicted* reading. The caliper was placed on the referential points using the measuring rod tips, carefully keeping it parallel to the occlusal plan during each measure to ensure the register only on the horizontal sense.

Figure 2. Digital caliper rule brand Vonder used for the research.



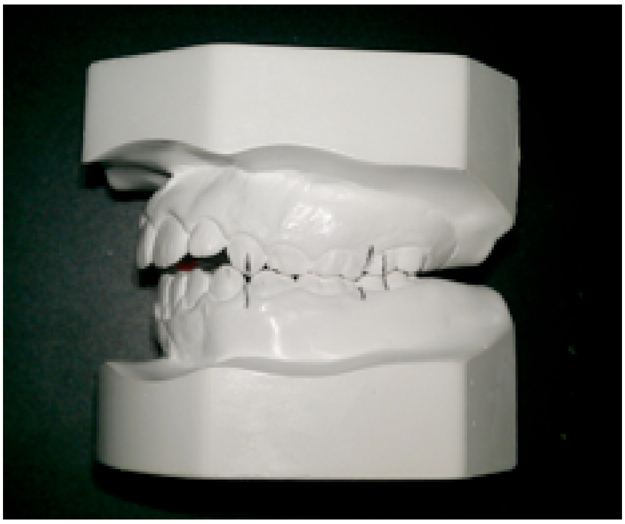
INTER ARCHES MEASURES:

To measure between the superior and inferior arcades, the models were maintained in occlusal contact according to the occlusion obtained by the register in wax. It was carried out marking with pencil (0,5mm) on the plaster models (Figure 3), in order to obtain the following measures: terminal plan, molar relation, canine relation, overjet and overbite, using the digital caliper rule.

The molar relation was bilaterally measured, with horizontal distance in millimeters, from the mesiobuccal cusp of the 1st superior permanent molar to the mesiobuccal groove, which divide the mesial and median cusps from 1st inferior permanent molar. According to the relation observed between the cusp and the groove described, the patient was classified in Class I, Class II or Class III of Angle, still considering their possible divisions and subdivisions.

As this relation between molars is not completely defined in the mixed denture stage, it was still evaluated the canine relation and the relation between the distal faces of the second deciduous molars, which were classified in straight terminal plan, distal step or mesial step.

Figure 3. Marks to obtain the molar relation, the canine relation and the terminal plan.



To measure the overbite, a line was traced (with pencil), tangent to the incisor edge of superior incisors in order to mark the vestibular surface of inferior incisors (Figure 4). Then the models were separated and the distance (in millimeters) between the line marked and the incisor edge of inferior incisors was registered. In the cases where the incisors were not completely erupted, this measure was not considered.

In the overjet case, the measure was obtained using a drypoint compass positioned in order to achieve the greater distance between the vestibular face of inferior incisors and the incisor edge of superior incisors on the horizontal plan (Figure 5). In this case, the digital caliper rule was replaced by the drypoint compass, once the active point thickness of the caliper rule did not allow an appropriate measure for this variable. Even as the *overbite*, the measures with non-completely erupted incisors were not considered.

Figure 4. Overbite measure.

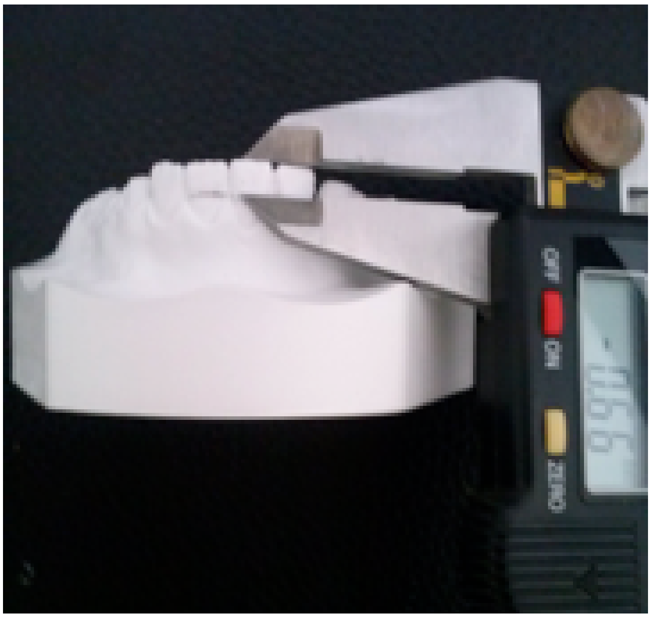
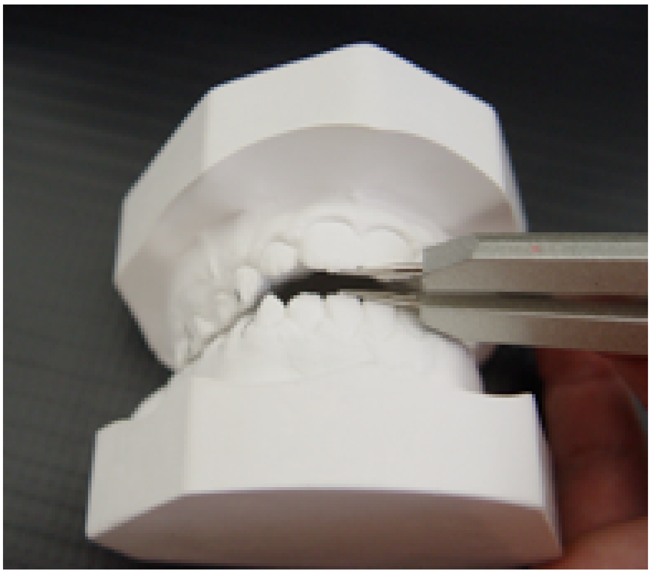


Figure 5. Overjet measure with drypoint compass.



INTRA ARCHES MEASURES:

To obtain the superior arcade dimensions, the points were marked with a pencil (0.5mm) on the plaster models (Figure 6). They were references to obtain the transversal measures (width) and vertical ones (depth) of hard palate, as well as to obtain the arcade anteroposterior length.

Figure 6. Points marked on the plaster model.

On canines, the marks were carried out on the point of greatest convexity on the gingival edge of the lingual surface of each tooth [20]. In the region of first molars, the point corresponded to the gingival edge union with palatal groove[21]. The foremost point of hard palate marked on the sagittal line between the central superior incisors[20]. From the reference points described, it was performed measures from the anterior length arcade (from the point between incisors and a perpendicular passing by the points of canines), total length arcade (from the point between incisors passing by the points of molars), inter canine distance (distance in millimeters from the canine gingival edge) and the inter molar distance (distance in millimeters – points of permanent first molars), according to the Figures 7-10.

Figure 7. Inter canines distance measure.

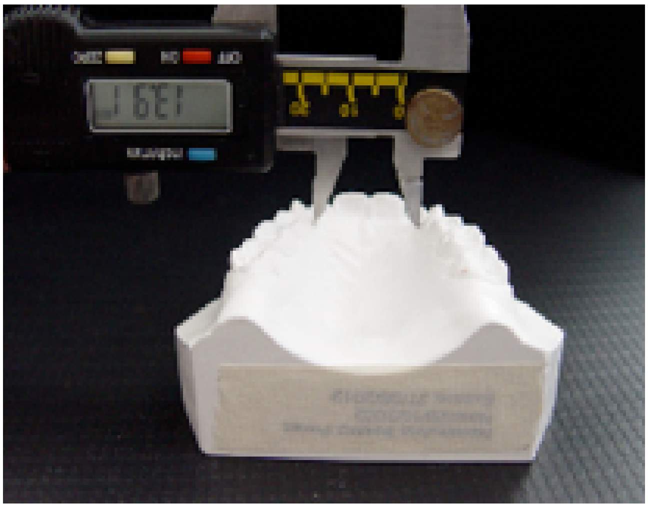
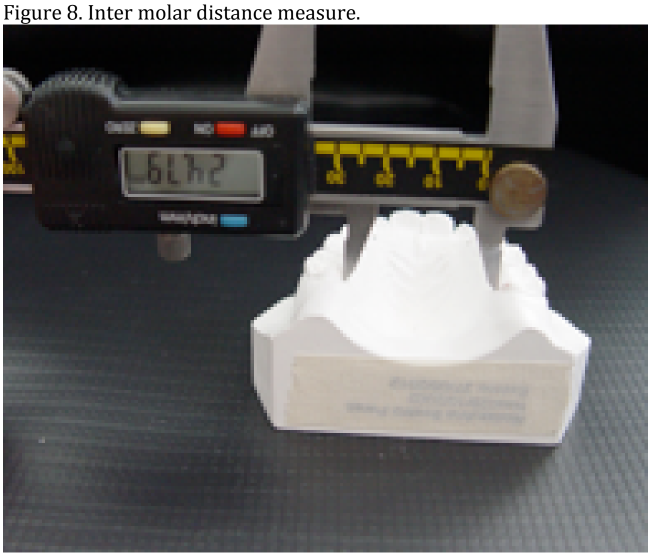


Figure 8. Inter molar distance measure.



For transversal and anteroposterior measures of superior arcade were used the point of the instrument for internal measurement. To carry out the vertical measures, a stainless steel wire of 0.05mm was cut on the correspondent length to the transversal measure obtained and fixed wax between the points at the level of teeth considered[22]. After fixing the wire, the depth was measured with the Depth gauge of caliper, which corresponds to the measure of perpendicular line traced from the palate midline to the stainless steel wire that links the region of each tooth considered; in this case, the wire thickness was discounted (0.05mm) used for this measurement (Figure 11).

Figure 9. Orthodontic wires adapted on the measure points of arcade anterior length.

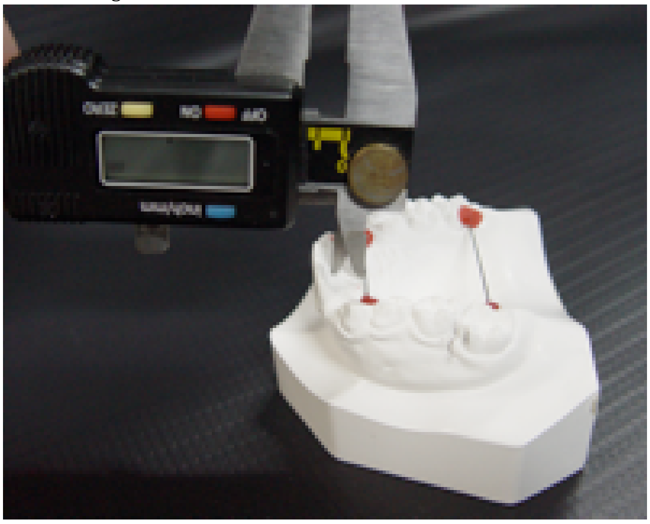
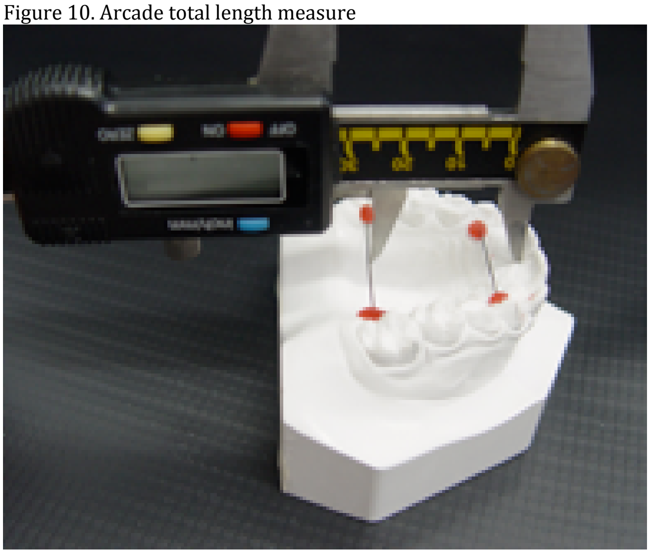
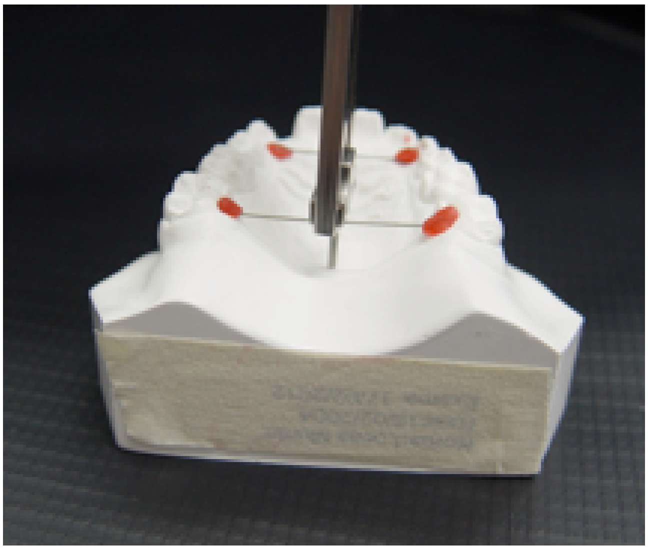


Figure 10. Arcade total length measure



Before performing each measure, the caliper rule was reset, and when the measure was carried out, the value of digital scale considered in this study was checked with an analog scale. Whether they were different, the measure was performed again and the first value obtained was not considered.

Figure 11. Depth arcade measure.



STATISTICAL ANALYSIS:

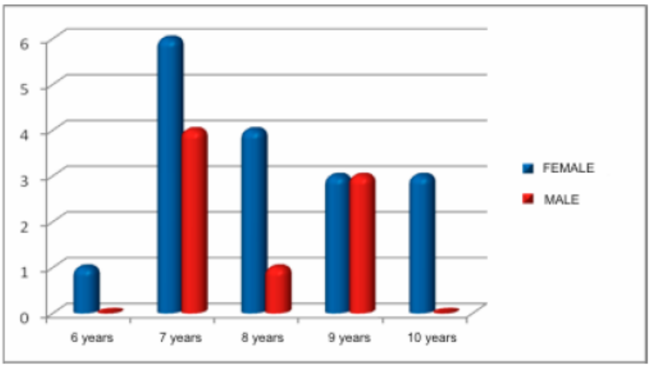
After measuring, the data were tabulated with the software Excel 2010™ and the descriptive and statistical analyses of results were performed.

For the statistical analysis, the linear regression test was applied, and to evaluate the relation among the variable studied, the Pearson correlation test was used.

RESULTS

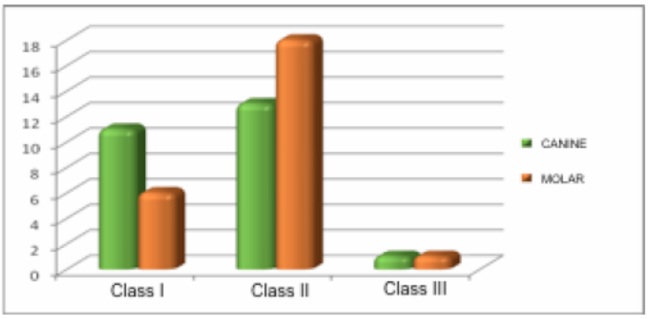
The sample in this study was composed by 25 pairs of models of children from 6 years and 1 month and 10 years and 11 months (average of 8 years and 4 months); 17 female and 8 male genders (Graph 1).

Graph 1. Distribution of sample according to age and gender.



The patients were still classified according to the molar canine relation, according to Angle. The results showed predominance of Class II over the others (Classes I and III), both for molar relation and canine relation. Eighteen children presented molar relation Class II; six presented Class I and just one presented Class III. When compared the molar relation with canine one, there was higher number of patients with canine Class I (11) than considering the molar relation (6). On the other hand, the number of patients with molars Class II (18) was higher than the number found for the canine relation (13). There was no difference on the number of children with Class III when compared the molar and canine relations. All the children presented isthmus ≤ 4mm; the minimum value was 1.46mm and the maximum one was 4.00mm (average 2.89mm), characterizing these children as mouth breathing (Graph 2).

Graph 2. Distribution of sample according to the Angle classification by regions canine and molar.



The values obtained for the variables inter arches: overjet and overbite; and the variables intra arches: inter canine and inter molar distances, anterior and total length of arcade and depth arcade were also exposed on the Table 1.

The value of isthmus of each patient was compared with values obtained for each intra arches variable in order to verify the presence of any kind of correlation statistically significant between the nasophariynx obsturction degree and the severity of changes on dimensions of jaw. However, the Pearson correlation test showed that no correlation was found between them. Similarly, the linear regression test also did not find statistically significant values between the variables. The Table 2 shows the findings for the intra arches measures for each patient.

When analyzed the individual values of intra arches measures obtained for each patient is possible observe similar behavior between them; for example, when there there is a reduction on the length arcade, other variable also tend to reduce their values.

DISCUSSION

The transition from deciduous denture to the permanent one provides several changes on the shape and dimensions of the arcades. In normal conditions, these changes occur within a musculoskeletal balance which favors the normal occlusal development. From 3 to 13 years old, stage that represents the transition from deciduous denture to the permanent one, the intracranial width increase the average 6mm, while the intermolar width presents a less significant increase, around 4.2 mm. On the sagittal sense, there is a slight reduction on the arc length with age due to the verticalization of incisors[2].

Table 1. Average values, standard deviation (SD), minimum and maximum variables measured in the study.

VARIABLES	AVERAGE (mm)	SD	MINIMUM	MAXIMUM
Isthmus	2.89	0.9	1.46	4.00
Overjet	3.88	2.64	0.38	9.69
Overbite	1.89	2.42	-4.18	4.77
Inter canine distance	24.65	2.43	18.00	29.44
Inter molar distance	34.97	2.64	29.54	39.47
Anterior length arcade	10.14	1.96	6.29	14.22
Total length arcade	34.99	2.64	30.20	40.94
Depth arcade	10.59	1.96	6.89	14.73

Table 2. Individual values of isthmus measure and intra arches variables.

PATIENT	ISTHMUS	INTER CANINE DISTANCE	INTER MOLAR DISTANCE	TOTAL LENGTH ARCADE	DEPTH ARCADE
1	1.46	28.94	38.88	35.74	10.39
2	1.8	26.72	33.49	38.36	12.82
3	1.6	20.19	29.54	32.83	12.67
4	2.9	23.7	34.46	34.42	13.56
5	3.73	22.48	36.93	30.2	12.01
6	1.67	23.77	30.24	33.08	9.62
7	2.78	25.14	35.01	36.67	13.21
8	1.9	26.88	32.45	37.8	10.09
9	3.37	26.42	36.88	35.48	7.15
10	4	24.4	32.93	32.34	11.7
11	3	18	35.49	38.13	10.64
12	2.94	24.93	35.26	37.18	7.63
13	2.34	25.57	34.67	37.2	10.77
14	4	29.44	37.91	36.04	10
15	3.71	23.48	35.3	34.1	10.9
16	3.67	24.68	31.06	33.16	6.89
17	3.04	24.41	34.08	32.48	9.9
18	4	23.81	35.25	32.58	9.35
19	1.58	22.78	34.31	32.77	7.89
20	3.5	25.43	39.47	40.94	14.73
21	3.45	26.87	36.47	33.19	12.65
22	3.71	22.83	38.93	33.87	10.88
23	2.24	25.42	38	36.26	10.93
24	1.9	24.27	32.5	31.51	9.47
25	3.96	25.72	34.84	38.32	8.82

Dimensions achieved by the arcades when the growth finishes will depend on the several factors, genetic and environmental, which will influence this process, directly or indirectly[1,3,4]. For the most patients, the difference between genetic and environmental local factors plays an important role on determination of diagnosis and prognosis of malocclusion. Preventing genetic causes for malocclusion is not possible, for a while. On the other hand, preventing environmental causes is promising[2].

In general way, occlusal parameters and of arches are little influenced by genetic factors and experiment a growing influence of environmental factors during all the post-natal growth. Harris and Johnson[4] showed that average estimate of genetic influence over 11 occlusal parameters, including the inter-incisal angle, vertical trespass, crowding, irregularity on the incisors, posterior cross bite and dental rotations 43% at 4 years old and 24% at 20 ones. Similarly, Cassidy et al.[3] studied the genetic influence over the dental arch shape.

Twelve different variables on the width of the arc presented 57% average heredity, what indicates that width is under strong genetic influence. The average heredity estimates were: 45% for nine different variables of depth of the arch, 56% for anteroposterior relation of first molars (classification by Angle), and 23% for horizontal trespass. These results showed the important etiological factor for malocclusion which originates in the environment, among them the chronic nasopharynx obstruction, provoking mouth breathing.

One of the preconized diagnosis nasal obstruction is by the standardized telerediography in lateral rule that presents high precision degree, low cost and easy access for population. According to Holmberg, Linder-Aronson[15] the radiographic image of nasopharynx space, resulting from the relation between the pharyngeal tonsil and the nasopharyngeal portion of soft palate at rest, in its narrower portion known as isthmus, has a high correlation degree with clinical characteristics observed directly on the nasopharynx. Authors like McNamara[14], Santos-Pinto et al.[23] and Santos-Pinto et al.[24] consider the isthmus value equal or inferior than 4mm able to promote a significant respiratory obstruction, then allowing classify the patient as mouth breathing.

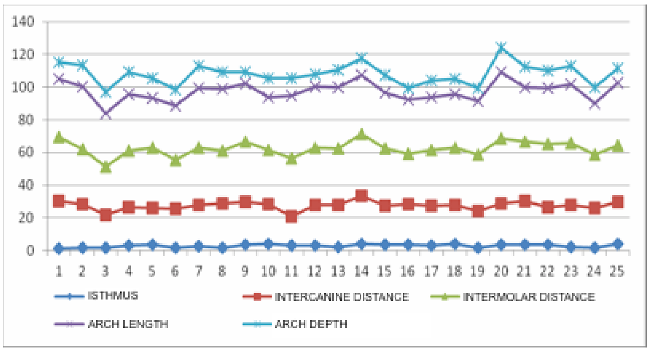
Based on this scientific data, we composed a sample with 25 children of isthmus ≤ 4mm, in order to cover only mouth breathing children with reduction of the airway provoked by nasopharyngeal tonsil hypertrophy. Further the radiographic evaluation, the diagnosis was also based on the anamnesis, medical history and evaluation of occlusal and facial characteristics performed by two professional of the health area (an orthodontist and an otorhinolaringologist).

The aim of use the sample with this profile was verify whether inside a mouth breathing group there is a value in which the isthmus width exercises significant influence on the morphology pf the maxillary arch. The results showed that there was no statistically correlation between the isthmus value and the variables maxillary depth, anterior and total arcade length and inter canine and inter molar distances. It demonstrates that, for values equal or inferior than 4 mm there is no difference on the occlusal severity; in other words, nasopharyngeal obstruction does not necessarily implicate on the worsening of constriction and depth arcade. Possibly this difference would be significant only when compared mouth breathing group and a control group (nasal breathing), as demonstrated by some authors[22,23,25].

When compared the variables anterior and total arcade length, inter canine and inter molar distances and depth arcade as illustrated in the Graph 3, it is possible observe that these variables presented a similar behavior among them; in other words, in patients with increase of inter canine distances, this increase also happened on the others variable in a proportional way.

Due to the influence of several factors along the growth and development of the occlusion, it is difficult determine an absolute value for normality of arches dimensions. According to Staley, Stuntz and Peterson[16] the average values of superior inter canine distance for Caucasian adult male is 36.2mm (±2.3mm), and superior inter molars is 54.7mm (±2.3mm). For mixed denture, these dimensions vary from 28.50 to 36,45mm for inter molar distance; and from 24.03 to 26.92mm for inter canine distance, inside a nasal respiratory pattern[22,25].

Graph 3. Distribution of individual values of isthmus measure and intra arch variables.



On the other hand, functional changes like mouth breathing are able to promote significant changes on the dental arches morphology. According to Santos-Pinto et al.[23], there is the trend of superior inter canine and inter molar distance reduction when the nasopharyngeal space is reduced. For these authors, transversal dimensions of superior dental arch present significantly reduction in patients with nasopharyngeal space from 0 to 2mm, when compared with patients with space of 6.1mm or bigger. Therefore, a nasopharyngeal space smaller or equal to 4mm results in important dento-skeletal changes which compromise the children's morphofunctional development.

It is known that dimensions of arches in the patients changes depending on the dental stage, then we search composing a standardized sample, covering only children in the mixed denture stage (6-10 years), specifically in the transitory period. Then, with all the patients presenting the same composition of arcades, the comparison or conclusion would be reliable on these characteristics of arches.

The results in this study showed average values for inter canine distance of 24.65mm and of 34.97mm for inter molar distance. These values were near to the findings by Berwig[22] and Feres et al.[25], who used samples with similar age and method, but comparing 2 different groups (mouth breathing and nasal breathing). However, the sample composed by a unique group in this study precluded conclusions about presence or not of maxillary atresia, once a control group is indispensable to allow any kind of comparison. Portanto, os resultados de nosso estudo nos permitem apenas caracterizar a amostra de respiradores bucais, sem traçar um perfil comparativo da mesma.

Berwig[22] and Feres et al.[25], when compared nasal breathing children with mouth breathing ones about occlusal characteristics and palate dimensions, observed significant statistically difference on the inter molar distance between the groups, proving the trend of maxillary narrowing dur to the breathing pattern changed. On the other hand, Trask, Shapiro and Shapiro[26], in evaluation of superior inter canine and inter molar distances did not observe significant statistically difference on the comparison between allergic mouth breathing patients and non-allergic nasal breathing ones. This conclusion was also observed by Freitas et al[27].

Tomes (1882) apud Bushey[10] affirm that children with large adenoid usually present superior arch in "V" shape. This characteristic of superior arch narrowing would result from a muscular unbalance due to a more anterior position of the tongue, an excessive compression of external muscles over posterior segments and atrophic development of superior lip. The dental arch contraction results in a muscular unbalance caused by nasal respiratory obstruction. Bushey[10] still mention the "theory of disuse atrophy", in which the nasal respiratory obstruction caused by the adenoid would provoke a disuse atrophy of nasal cavity.

The depth of the palate was another variable studied in this research. The average value found for arcade depth measured from the first permanent superior molars was 10.59mm, with minimum of 6.89mm and maximum of 14.73mm. These values were near to the averages found for mouth breathing by authors like Feres et al.[25], with 10.80mm; and

Berwig[22], with 10,68mm. On these two researches, the average values for depth arcade in nasal breathing patients were significant lower (9.83mm and 10.19mm, respectively) when compared with the average of the mouth breathing group. Both studies presented samples with age similar to our study, allowing trace comparisons among the results.

Nieto et al.[28] evaluated the influence of mouth breathing associated to the palate depth and observed that, on the mouth breathing group, the average value of palate depth at the level of molars was 17.38mm, and at canine level was 6.72mm. In the control group, the palate depth was 16.81mm and 7.83mm, respectively. Despite the different method for palate measure, it was also possible find an association between mouth breathing and depth arcade at the molar level. Corroborating these findings, Freitas et al.[27] also found higher values for the arcade depth on the mouth breathing group when compared to the nasal one.

The sagittal evaluation in our study was performed by the anterior length (from incisor to canine) and total length of the arcade (from incisors to the first molars). The average values found were 10.14mm (anterior length) and 34.99mm (total length), this last one near to the value 34.89mm found by Berwig[22] in the mouth breathing group. In the mentioned study, the author did not find significant statistically difference on the anteroposterior length of arcade on the different respiratory patterns.

About variables on molar and canine relations and terminal plan, the results showed prevalence of the Class II by Angle (18 children), followed by Class I with 6 children. Only one case of the sample presented molar relation Class III. When compared the molar relation with canine one, we verified greater number of patients with canines Class I (13) than when the molar relation was considered (6). It is because on the mixed denture stage, the molar relation is not definitive, many times changing after the change of deciduous molars by pre-molars; it means, after the use of the "Leeway Space". In this stage, the kind of terminal plan can be decisive on determination of molar relation that the patient will present when defined the permanent denture.

According to Bishara[2], a little more than half of cases with straight terminal plan progress for a normal molar Class I, while 44% progress for Class II or occlusion top to top. Some dental relations, as midline diastema or molar relation top to top are considered normal occurrences on the mixed denture stage, but no for permanent one. Our results showed that 7 children presented straight terminal plan on the right side and 9 on the left. These data would justify the difference between the number of cases with molar relation and canine relation Class I, once the most of cases of terminal plan trend to evolve for a future Class I. The higher prevalence of Class II in the sample seems to be related to the respiratory pattern, once studies as that performed by Paul and Nanda[18] also found great percentage of malocclusion Class II div 1 on mouth breathing patients.

Changes on the position of superior and inferior incisors due to the muscle unbalance caused by the respiratory way are also frequently reported in the literature[9,17,18]. The retroinclination of inferior incisors, protrusion of the superior incisors, frequent in mouth breathing patients, interferes directly on the overjet and overbite these patients. In this work, the average value for overjet was 3.88mm with maximum value of 9.69mm. Regarding to the overbite, the average value was 1.89mm with minimum of -4,18mm (open bite) and maximum of 4.77mm. As the cases of patients with nonnutritive sucking habits were excluded, we observed low prevalence of open mouth in the sample (4 cases). The non-exclusion of these cases would interfere on the values of overjet and overbite, because one of the main etiologic factors for open bite is the sucking habits. In general way, the literature[9,17,18] corroborates when describes that in mouth breathing patients there is significant increase on the overjet. However, there is certain controversial regarding to the overbite, in which Behlfelt[9] reports reduced values, while Paul and Nanda[18] report augmented values for this variable. Probably this divergence is due to a lack of standardization among the samples, in which variables like pacifier or finger sucking habits and their non-complete eruption of incisors were not considered during the selection of sample.

Some authors still tried relation the respiratory way, facial type and the morphology of arcade. Differences were found on the arcade depth for different facial patterns[26]. However, authors like Berwig[22], Bianchini et al[29], and Pedreira et al[30] could not prove the existence of relation between these variables.

The presence of a significant nasal respiratory obstruction promotes not only changes on the shape of arches, but a series of occlusal and functional changes due to the muscular unbalance[9]. The pronounced reduction of the nasopharyngeal space by proximity of the adenoid tissue to the posterior wall of the soft palate promotes a mandibular rotation on the contrary sense during the early growth stage[1]. An increased anterior facial height with greater divergence on the mandibular plan regarding to the occlusal plan, to the palate plan and the saddle-nasion line, associated to the retro inclination of inferior incisors in their bone base correspond to the changes due to the rotation presented by the jaw[9]; as bigger the nasal obstruction as greater deviation possibilities from the normal standard of facial growth.

Based on the reports of the literature and on the findings in this research, it was possible observe that the reduction of nasopharyngeal space provoked by the pharyngeal tonsil hypertrophy causes damages on the facial growth process, occlusion, morphology of arcades and muscle balance. Wherefore, there is the need of an early diagnosis in order to devolve to these patients a pattern of growth and development inside the normal standards.

CONCLUSION

We concluded that isthmus lower values or equal to 4mm do not influence significantly on the severity of morphological changes of jaw. The intra arches measures presented similar behavior between them. The values obtained for intra arches and inter arches variables analyzed showed compatibility with the literature, presenting influence on the nasopharynx space reduction on the morphology of arcade and on the occlusion. Therefore, the importance of an early and correct diagnosis of obstruction by hypertrophy of nasopharyngeal tonsils is evident in order to provide the appropriate growth pattern and dentofacial development.

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