

Orofacial profile of mouth breathing children previous to adenoidectomy and/or tonsillectomy

Perfil orofacial de crianças respiradoras orais pré adenoidectomia e/ou amigdalectomia

Perfil orofacial en niños con respiración oral antes de una adenoidectomía y/o amigdalectomía

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Abstract

The obstruction of the upper airways, such as hypertrophic tonsils, is the main cause of mouth breathing. Objective: to trace the orofacial myofunctional profile of mouth-breathing children previous to adenoidectomy and/or tonsillectomy. This is a descriptive quantitative study for data collection. Evaluations of orofacial motor function were based on the MBGR protocol. Results: 32 children with an age average of 8.9 years were evaluated; 34.4% of them were female and 65.6% male; breastfeeding and oral habits prevailed. The main complaints were oral breathing and snoring. Most were referred for adenotonsillectomy. The body posture was normal in 68.8% of the cases. There was a prevalence of parted lips and tongue in the mouth floor, Angle Class II malocclusion, besides hypertrophic tonsils. Snoring was described in 100% of the sample. Atypical swallowing was present in 77.4% of the sample. The

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articulation was predominantly normal, and articular changes were observed in males. Parted lips were related to atypical swallowing. Conclusion: the collected data did not differ from the literature regarding obstructive oral breathing. There is an open space for new research that embraces both pre- and post-operative moments, providing a longitudinal monitoring of children.

Keywords: Orofacial motricity; Mouth breathing; Adenoidectomy; Tonsillectomy; Speech Language and Hearing Sciences.

Resumo

As obstruções das vias aéreas superiores, como tonsilas hipertrofiadas, são causas da respiração oral. Objetivo: traçar o perfil miofuncional orofacial de crianças respiradoras orais pré-adenoidectomia e/ou amigdalectomia. Trata-se de um estudo descritivo de caráter quantitativo de levantamento de dados. As avaliações de motricidade orofacial basearam-se no protocolo MBGR. Resultados: foram avaliadas 32 crianças, com média de idade de 8,9 anos. Destas, 34,4% eram do sexo feminino e 65,6%, do sexo masculino; prevaleceram o aleitamento natural e o hábito oral. As principais queixas foram de respiração oral e ronco. A maioria foi encaminhada para a realização de adenoamigdalectomia. A postura corporal esteve normal. Prevaleceram lábios entreabertos e língua no assoalho bucal, má oclusão Classe II de Angle, presença de tonsilas hipertrofiadas. O ronco foi descrito em 100% da amostra. A deglutição atípica prevaleceu em 77,4%. A articulação apresentou-se predominantemente normal, as alterações articulatorias presentes foram observadas no sexo masculino. A postura de lábios entreabertos apresentou relação com a deglutição atípica. Conclusão: os dados levantados não diferem da literatura com relação à respiração oral obstrutiva. Abre-se espaço para pesquisas que abranjam o pré e pós-operatório, e que propiciem um acompanhamento longitudinal das crianças.

Palavras-chave: Motricidade orofacial; Respiração oral; Adenoidectomia; Amigdalectomia; Fonoaudiologia.

Resumen

Las obstrucciones de las vías respiratorias superiores, tales como las amígdalas hipertrofiadas, son la causa de la respiración oral. Objetivo: Trazar el perfil miofuncional orofacial de niños antes de la adenoidectomía y/o amigdalectomía. Se trata de un estudio descriptivo y cuantitativo para la recopilación de datos. Las evaluaciones de la función motora orofacial se basaron en el protocolo MBGR. Resultados: Se evaluaron 32 niños con un promedio de edad de 8,9 años. De estos, el 34,4% eran mujeres y 65,6%, hombres; han prevalecido la lactancia materna y el hábito oral. Las principales quejas eran la respiración oral y ronquidos. La mayoría fue remitida para la realización de adenoamigdalectomía. La postura del cuerpo ha prevalecido normal. Hubo prevalencia de labios entreabiertos y de lengua en el piso de la boca, maloclusión Clase II de Angle y la presencia de amígdalas hipertrofiadas. El ronquido fue descrito en el 100% de los casos. La función masticatoria era normal. La deglución atípica estaba presente en 77,4%. La articulación se presentó predominantemente normal, las alteraciones articulatorias presentes fueron observadas en el sexo masculino. Los labios entreabiertos presentaron relación con la deglución atípica. Conclusión: los datos levantados no difieren de la literatura acerca de la respiración oral de etiología obstrutiva. Se abre espacio para investigaciones que cubran los períodos pre y postoperatorio y propicien un seguimiento longitudinal de los niños.

Palabras clave: Motricidad orofacial; Respiración oral; Adenoidectomía; Amigdalectomía; Fonoaudiología.

Introduction

Breathing is considered a vital function and inherent to human beings. However, it needs to be accomplished in the right way to protect upper airways and to allow the craniofacial complex to grow. Only nasal cavities possess the conditions to filter the air and, therefore, protect and provide good conditions to facial growth¹.

It is observed that nasal breathing provides the right muscular action, suitable facial growth and bones development. For this, its functionality needs to be preserved. Oral breathing, a common condition in childhood is considered a functional change distinguished by the lack of use of the nasal cavity during breathing. This long-lasting condition may cause a number of structural and functional changes in the stomatognathic system, with results in the physical, psychological and social contexts^{2,3}.

Hypertrophy of palatine and pharyngeal tonsils is one of the causes of obstruction which lead to oral breathing, especially in childhood, and to solve this and other oral and nasal obstructions, surgical procedures are required⁴. However, in many occasions after the surgery, nasal breathing is not usually restored, for this can be revealed as a habit which duration may have influenced structural changes and which make breathing difficult, even after the cause of obstruction has been removed⁵.

Thus, a variety of changes found in mouth-breathing children, brings the importance of the early diagnosis in a multidisciplinary team consisting of an otolaryngologist, an orthodontist, a speech therapist and a physiotherapist. This joint action prevents and minimizes a number of anatomical-functional and social harms resulting from this condition⁵.

Understanding the stomatognathic functions and how its performance is modified by a nasal obstruction caused by the hypertrophy of the tonsils is indispensable for the speech therapist to identify persistent changes, plan a myofunctional treatment and to refer the patient to other treatments, previous to the surgery and after it. This will assure the efficiency of the early assistance and the preventive actions and avoid pathologic offsets to remain in the adult age^{1,4,5}.

This way, this paper is justified by its importance of understanding the myofunctional changes shown by oral-breathing children as a consequence of tonsils and adenoids hypertrophy, that is, con-

stant and continuous. Understanding this population is necessary to think of early intervention just after the discharge from the otolaryngologist, in order to restore nasal breathing and achieve functional and structural adjustments.

This study aimed to trace the orofacial myofunctional profile of oral-breathing children diagnosed with palatine and pharyngeal tonsils hypertrophy, previous to adenoidectomy and/or tonsillectomy, looking for the main complaints from the children and from their parents; describing the structures of the oral motor sensory system regarding their habitual posture, functionality and Myology; evaluating functions of the stomatognathic system like breathing, chewing, swallowing and enunciation, as well as describing sleep disorders.

Methodology

This is a descriptive study which data survey has a quantitative character, carried out with mouth-breathing children ageing up to 12 years old. The present research has respected all the rules set by Resolution 466/2012, from the National Health Council, about the ethical aspects of research with human beings and has been approved by the Ethics and Research Committee of the Center-West State University, opinion number 1.309.747.

The inclusion criteria for the research were: age up to 12 years old, have been diagnosed with oral breathing, tonsils hypertrophy and have been referred to adenoidectomy or tonsillectomy by the otolaryngologist. Those who didn't fit the criteria were excluded, as well as those who had previously been under speech therapy treatment, and those who could not be evaluated by the protocol.

Only those subjects whose parents or legal guardians signed the Free Informed Consent Form (TCLE) and those who signed the Nod Form, in favor of the research accomplishment, took part in the survey.

For the study accomplishment, a protocol for anamnesis and evaluation based on protocol MBGR⁶ was used. The participants' evaluation was carried out in the first-aid rooms of 'Santa Casa de Irati', between five days and one week before the surgery date. It was not possible to use the MBGR⁶ protocol in full with all the participants because of their ages.

During the anamnesis procedures, data from medical history were taken from parents or legal

guardians. Orofacial Myology evaluation and the Language Infant Test - ABFW⁷ were carried out related to the phonological-phonetic aspect and the use of Mallampati's ⁸ score.

The evaluations were performed by the researcher, speech therapy graduate, together with two leading professors, both specialized in Orofacial Myology. Every evaluation procedure lasted forty-five minutes each.

To accomplish the evaluations, personal protective equipment was worn as well as proper sanitation, sterile and disposable material, which were properly managed and disposed afterwards. The possibility of allergic reactions to the material and food was ruled out. The subjects' individuality and privacy was respected.

After the evaluations a feedback interview with the parents was performed in order to explain the necessity or non-necessity of referring the child to a speech therapy treatment after the adenoidectomy and/or tonsillectomy.

Collected data were periodically tabulated and quantitatively analyzed in a statistical analysis. The following software was used: SPSS V17, Minit-

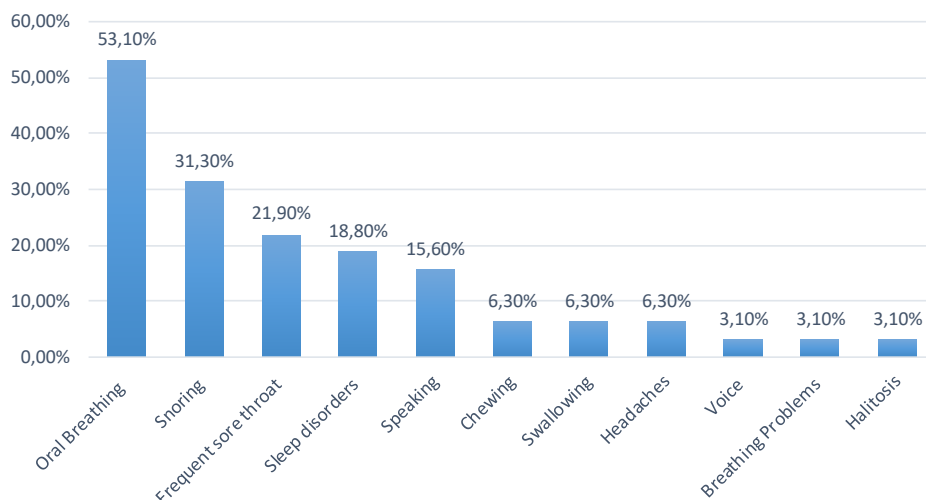
ab 16 e Excel Office 2010. The statistical tests for the results analysis were the Kolmogorov-Smirnov test, the Chi-Squared test, P-value test and the Confidence Interval for Mean technique. The significance level established was 0,05 (5%) and the confidence interval adopted was 95%.

Results

The research counted on 32 subjects, with average age 8-9 years old (107.7 months), standard deviation of 27.1 months, at the minimum age of 6. As to gender, 34.4% were female and 65.6% were male.

According to anamnesis data, 26 children had been breastfed, with a significant difference from those who had not ($p=0.001$). It was observed significant difference related to the presence of deleterious oral habits in 29 of the cases ($P=0.001$).

The main complaints are described in Figure 1, being that each child may have presented more than one of them. It was observed a significant prevalence of complaints related to mouth breathing compared to others ($p=0.001$).



Kolmogorov-Smirnov Test.

Figure 1. Reported complaints during anamnesis

The different types of surgical referrals are displayed on table 1. There was significant difference from those of tonsillectomy and adenoidectomy together ($p=0.001$).

In the orofacial myofunctional evaluation it was observed a normal body posture in 22 of the cases, with significant difference of $p=0.003$.

Table 1. Type of surgical referral

Type of surgery	N	%	P-value
Tonsillectomy	5	15,6%	<0,001*
Adenoidectomy	6	18,8%	<0,001*
Tonsillectomy and Adenoidectomy	21	65,6%	Ref.

Kolmogorov-Smirnov Test; *Significant Values ($p<0,05$)

Table 2 describes posture, functionality and lips mobility. About the evaluation of lips in their rest position, it was observed a significant difference between closed lips, open lips, and lips closed with tension related to half-open lips ($p=0.001$). It is also possible to observe a significant difference

between the adequate functionality and the normal mobility considering these aspects ($p=0.001$). The findings indicate then that the significant majority of this population features half-open lips without affecting the functionality and mobility.

Table 2. Lips posture, functionality and mobility

	N	%	P-value
Lips Posture			
Closed	3	9,4%	<0,001*
Open	1	3,1%	<0,001*
Half-open	26	81,3%	Ref.
Closed with tension	2	6,3%	<0,001*
Lips Functionality			
Adequate	24	75,0%	<0,001*
Hipofunctional	8	25,0%	<0,001*
Lips Mobility			
Normal	28	87,5%	<0,001*
Changed	4	12,5%	<0,001*

Kolmogorov-Smirnov Test; *Significant values ($p<0,05$)

Posture, functionality and mobility aspects of the tongue are exposed on table 3. It is possible to observe a significant number of children with the tongue lain on the floor of the mouth ($p=0.001$). Data related to mobility and functionality show

significant difference in normality ($p=0.001$) proving that the mobility and functionality of the tongue were not affected by the posture on the floor of the mouth. .

Table 3. Tongue posture, functionality and mobility

	N	%	P-value
Tongue Posture	N	%	
Floor of the mouth	24	75,0%	<0,001*
Unobsevable	8	25,0%	
Tongue Functionality	N	%	
Adequate	30	93,8%	<0,001*
Hypofuncional	2	6,3%	<0,001
Tongue Mobility	N	%	
Normal	31	96,9%	<0,001*
Changed	1	3,1%	<0,001*

Kolmogorov-Smirnov Test; *Significant values ($p < 0,05$)

Cheeks were observed to be symmetrical in 22 of the cases with significant difference ($p=0.003$). Adequate functionality was found in 28 of the cases with significant difference ($p=0.001$).

Lower jawbone was normal in 27 of the cases, with some deviation in 5 of them and significant difference ($p=0.001$). Concerning soft palate, it was observed normal and symmetrical in all the subjects of the sample ($p=0.001$).

Dentition and dentures were observed mixed in 26 of the children with significant difference ($p=0.001$). About occlusion, according to Angle's classification, the prevalence was for Class II, with significant difference ($p=0.001$) related to Classes I and III. Occlusion showed significant difference modified in 23 of the cases ($p=0.001$). Table 4 displays the types of bite found. This item showed significant difference in open bite and deep bite types related to the other types of bite ($p=0.004$ and $p=0.001$, respectively)..

Table 4. Types of bite found on evaluation

Type of bite	N	%	P-value
Normal	13	40,6%	Ref.
Open	3	9,4%	0,004*
Cross	6	18,8%	0,055*
Level bite	8	25,0%	0,183
Deep	2	6,3%	0,001*

Kolmogorov-Smirnov Test; *Significant values ($p < 0,05$)

As described on table 5 it was observed a prevalence of hypertrophy in palatine tonsils, with significant difference ($p=0.001$).

About stomatognathic functions, it was observed that the oral respiratory mode was predominant in 32 of the cases ($p=0.001$). The prevalent respiratory type was medium/upper in the whole sample ($p=0.001$).

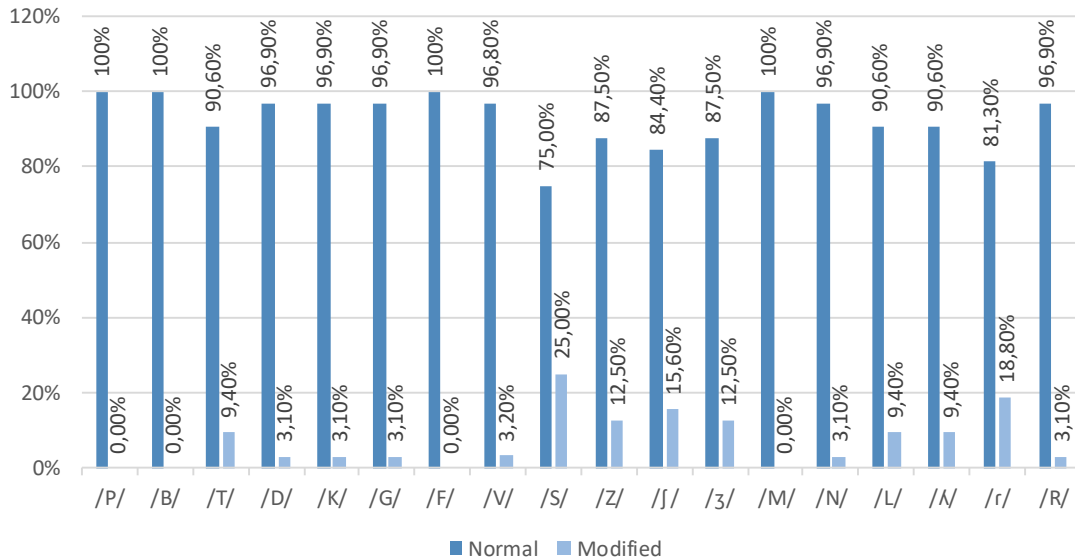
Table 5. Distribution of findings on palatine tonsils

Palatine tonsils	N	%	P-value
Normal	4	12,5%	<0,001*
Hypertrophic	27	84,4%	Ref.
Absent	1	3,1%	<0,001*

Kolmogorov-Smirnov Test; *Significant values (p<0,05)

Swallowing was found atypical in 24 of the subjects, showing significant difference (p=0.001). Speech articulation was found modified in 14 subjects, which was not a change with statistical

differences Data resulting from the speech evaluation are distributed on Figure 2 and show a major percentage for normality, being statistically significant when compared to the percentage of changes..



Kolmogorov-Smirnov Test.

Figure 2. Speaking evaluation

Table 6 shows the relation between gender and stomatognathic functions, on which it is possible to observe significant difference on the articulatory function related to the difference in percentage of modifications in males and females, being present mostly in boys.

On table 7, data on the relation between lips posture and stomatognathic functions are represented. There was significant difference related to the percentage of atypical swallowing in those cases were lips were found half-open.

Table 6. Relation between gender and stomatognathic functions

	Sexo	Female		Male		Total		p-value
		N	%	N	%	N	%	
Chewing	Normal	9	82%	12	57%	21	66%	0,163
	Changed	2	18%	9	43%	11	34%	
Swallowing	Adequada	3	27%	4	20%	7	23%	0,643
	Atypical	8	73%	16	80%	24	77%	
Articulation	Normal	9	*82%	9	43%	18	56%	0,035*
	Changed	2	18%	12	*57%	14	44%	

Chi-squared Test; *Significant values (p<0,05)

Table 7. Relation between lips posture and stomatognathic functions

Lips posture		Closed		Open		Half-open		Closed with tension		Total		p-value
		N	%	N	%	N	%	N	%	N	%	
Chewing	Normal	3	100%	0	0%	17	65%	1	50%	21	66%	0,296
	Changed	0	0%	1	100%	9	35%	1	50%	11	34%	
Swallowing	Adequada	0	0%	0	0%	5	20%	2	*100%	7	23%	0,044*
	Atypical	3	100%	1	100%	20	*80%	0	0%	24	77%	
Articulation	Normal	1	33%	1	100%	14	54%	2	100%	18	56%	0,386
	Changed	2	67%	0	0%	12	46%	0	0%	14	44%	

Chi-Squared Test; *Significant Values (p<0,05)

On Figure 3, the children’s sleep features are displayed. There was significant difference in aspects like restless sleep, open mouth during sleep, dry mouth upon waking time and snoring (p=0.001). Related to Malampati’s scale, there was significant difference regarding the prevalence of Class II and Class I (p=0.001).

Discussion

This study with oral-breathing children as a result of tonsils hypertrophy enabled us to know the stomatognathic system characteristics and the adjustments resulting from this condition. Besides, it was possible to know about the main complaints and the main aspects on the quality of sleep in those children.

It is important to highlight the fact that the clinical evaluations of the structures and functions are ordinarily used in a subjective way.

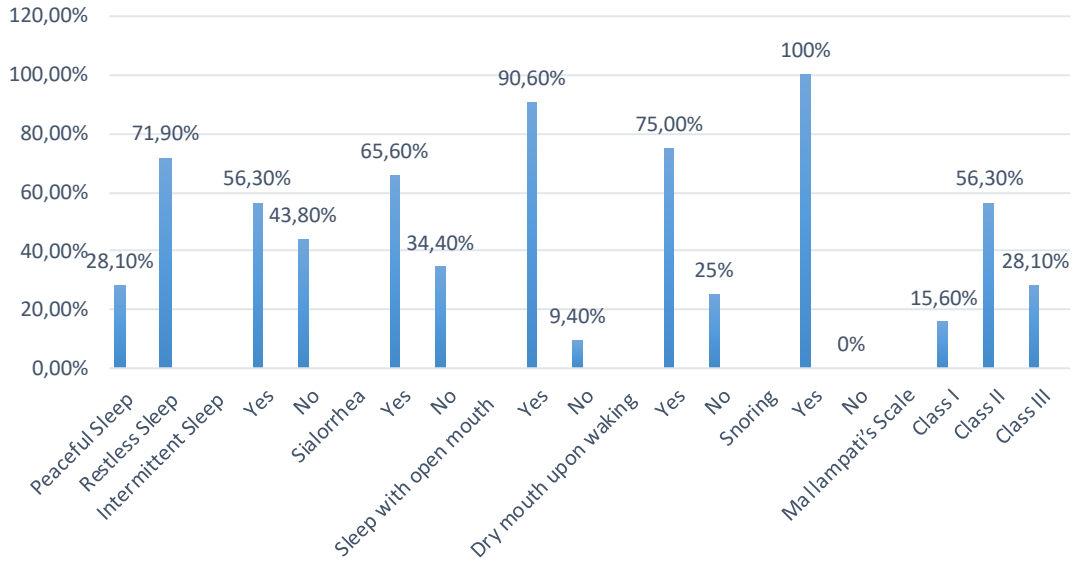
Among the studied population there was the prevalence of males and this way, this research likens two other studies^{9,10}. However, a third study which described the profile of children who had undergone an adenotonsillectomy described

a prevalence of females, proving a non-distinct frequency of one of the genders in the population of children with tonsils hypertrophy.

In this research there was the prevalence of complaints related to oral breathing, described in Figure 1, resulting from the disuse of the nasal pathway, obstructed with hypertrophic tonsils, which should be considered in the clinical and surgical decision-making and assuming that oral breathing leads to relevant changes in the quality of life.

Oral breathing, snoring and sleep disorders, prevalent in this study, are in accordance with the main complaints raised from the literature^{12,13} which also discusses the fact that a minor percentage of parents did not mention mouth breathing as a complaint, even when the children had a diagnosis of oral breathing. This can be observed in this study as well and can be considered a lack of attention from parents to important changes in this condition, even in a low percentage.

As it can be observed on table 1, most of the participants from the studied sample were referred for adenoidectomy and tonsillectomy. These data are in accordance with findings from a research¹² in which 75% of the studied population underwent



Kolmogorov-Smirnov Test.

Figure 3. Sleep characteristics in oral breathing children with tonsils hypertrophy.

an adenotonsillectomy, also demonstrating that the adenoids affect the process more than the tonsils, solely, and revealing that oral breathing is a recurrent surgical referral in those cases.

In the orofacial myofunctional evaluation of the children, posture changes were present in 10 of the cases, for oral-breathing people may adopt an adjusted postural pattern for head and neck, which aims to facilitate the air to enter through the mouth. This way, there is hyperextension of the head. Besides, thoracic deformities, flaccid and distended abdominal muscles and head badly positioned, with spine adaptations and shoulders rotated forward¹⁴ may be present.

On table 2 data about mobility, functionality and lips positioning are displayed. Half-open lips position was prevalent related to other lips positions. It is assumed that, in order to compensate nasal obstruction, it is necessary to allow the air to enter through the mouth.

Regarding the tongue evaluation, table 3 shows results for mobility, functionality and habitual positioning. The prevalent habitual position was on the floor of the mouth, followed by a non-perceptible positioning. In oral-breathing people there is a tongue and lower jawbone repositioning to allow the air to enter through the mouth. Thus, tongue is, habitually, resting on the floor of the mouth.

Evaluating the habitual positioning of the tongue is not easy task, once it is not frequently possible to observe its position inside the oral cavity¹⁵.

In the literature it is possible to observe a connection between breathing, facial morphology and dental occlusion as a result of a discrepancy in the soft tissues, which causes changes in the cranio-facial morphology, leading to malocclusion^{16,17}.

Regarding the findings in the evaluation of the cheeks, jawbone and soft palate, it was possible to observe that these changes are in accordance with literature discussions, directly connected to changes as a result of breathing through the oral path^{13, 18, 19, 20}.

About dental aspects and occlusion, it was observed that most of the dentition was mixed with dental occlusion adjustments and bite Angle Class II, which are in accordance with the literature. Besides being concerning these data indicate the importance of the early intervention, once these adjustments may persist in the adult years, with a repercussion in the adequate operation of the temporomandibular joint^{19,20,21}.

Palatine tonsils evaluation showed that the majority of the subjects in the sample had hypertrophic tonsils, which could be related to data on the type of surgery referred. One of the subjects had already

undergone a tonsillectomy and was referred to have pharyngeal tonsils removed.

Both adenoids and tonsils hypertrophy can narrow the oral-nasal space for air passage, as well as can be, ordinarily, focus of infections, being the cause for respiratory obstruction and oral breathing among children²². When this occurs, oral breathing is prevalent to supply the obstruction, which justifies the 100% of oral breathing subjects in the studied sample.

There is a prevalence of a standard swallowing in the sample, although it is adjusted in 34.4% of the cases as a result of the direct relation with the inadequate tongue posture, mostly described as adjusted, once it is necessary the elevation of the tongue against the hard palate during chewing, which also keeps the jawbone in its physiological position²³.

Hypertrophic tonsils occasionally interfere on the pharyngeal phase of swallowing, so that there may be some difficulty in swallowing, worse for solids than for liquids. There are, also, some difficulties resulting from a non-coordination between breathing and swallowing²⁵.

On table 6 it is possible to see that, related to stomatognathic functions and the prevalence of genders, adjusted articulation was statistically significant for males, showing prevalent adjustments for this gender. This is in accordance with the literature²⁶ and aimed at interrelating oral breathing and speech disorders in children.

In this study there was a prevalence of swallowing disorders and statistical significance between half-open lips positioning and atypical swallowing, as shown on table 7.

In this context it is stated²³ that it is necessary a lip interposition for sealing the back part of the mouth and causing a negative pressure, which is indispensable for swallowing and which can be harmed in the oral-breathing subject, if we consider lips sealing disorders and tongue resting on the floor of the mouth.

Speech showed disorders in 14 of the subjects. For the adequate performance of this function, mobility of the orofacial structures like tongue, lips and cheeks is considered necessary, as well as the position of the teeth, tongue and jawbones. Thus, as formerly described, in this study the mentioned structures showed mobility and positioning disorders, once the habit of keeping the mouth open changes the adequate position of the tongue, chang-

ing its tonus and function, leading to changes in the remaining structures directly related to them²⁵.

There was, as described in Figure 2, a prevalence of normality for phonemes in the sample. However, phonetic disorders were observed in 14 children, which is in accordance with the literature, concerning the disorder in the emission of /s/, /z/, /ʃ/ and /ʒ/, related to frontal and lateral tongue interposition, and in /t/, /d/, /n/, /r/ e /l/, related to dental disorders²⁵.

It was possible to observe that sleep disorders were present for the majority of the subjects, with complaints about restless sleep, intermittent sleep, ptyalism, sleep with mouth open, dry mouth upon waking and snoring, as described in Figure 3. It was also possible to observe a prevalence of Angle class II, in which it is possible to see the hard palate, the soft palate and the upper part of the tonsils and the uvula, through the Mallampati's scale.

A study²⁷ with nasal-breathing and oral-breathing children highlighted the presence of hypertrophic palatine and Mallampati's scale obstructive class III and IV, different from data collected in this research.

Data concerning quality of sleep revealed that these children have had important sleep changes which require intervention, considering the importance of sleep during this growth period and once snoring, mentioned by all the subjects is frequently related to sleep apnea²⁸. These disorders require speech therapists actions, which show to be effective in restoring the quality of sleep and in the quality of life of oral-breathing children²⁹.

It is important to highlight that, because it is a study with children between 6 and 12 year old, a considerable difficulty related to cooperation of younger children was observed, which has limited the observation of some myofunctional parameters.

Conclusion

This study aimed to trace the orofacial myofunctional profile of children diagnosed with pharyngeal and palatine tonsils hypertrophy. It was observed that the collected data are in accordance with the literature which points at oral breathing as a consequence of the obstruction caused by the tonsils.

Important disorders which require treatment to oral-breathing children for obstructive reasons are highlighted, especially those related to the quality

of sleep. This makes room for future researches and interventions in which a huge and significant number of children are included, either before or after surgery, providing a long-term follow-up of the changes and disorders resulting from this condition on the stomatognathic system, in order to make the effect of therapeutic interventions stronger, as well as to improve the quality of life of these children and their families.

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