Anatomía Digital

ISSN: 2697-3391
Vol. 7 No. 3.2, pp. 24 – 41, September 2024

www.anatomiadigital.org

Relación entre el tamaño de las amígdalas con la forma de arcadas dentarias. Revisión de la literatura

Relationship between tonsil size and dental arch form. a literature review

[1] Erika Carolina Tapia Vasquez https://orcid.org/0009-0009-2255-9503
Student of Dentistry, Catholic University of Cuenca, Cuenca, Ecuador
erikatapia6913@gmail.com

[2] Maria Isabel Cabrera Padron https://orcid.org/0000-0002-4086-6082
Professor of Dentistry, Catholic University of Cuenca, Cuenca, Ecuador
mcabrerap@ecacue.edu.ec

Scientific and Technological Research Article
Sent: 06/16/2024
Revised: 12/07/2024
Accepted: 12/08/2024
Published:03/09/2024
DOI: **https://doi.org/10.33262/anatomiadigital.v7i3.2.3163**

Please quote: Tapia Vásquez, EC, & Cabrera Padrón, MI (2024). Relationship between tonsil size and dental arch shape. Literature review. Digital Anatomy, 7(3.2), 24-41.https://doi.org/10.33262/anatomiadigital.v7i3.2.3163

DIGITAL ANATOMY is an electronic, quarterly journal that will be published in electronic format and has the mission of contributing to the training of competent professionals with a humanistic and critical vision who are capable of presenting their investigative and scientific results to the same extent that positive changes in society are promoted through their intervention.https://anatomiadigital.org
The journal is published by Editorial Ciencia Digital (a prestigious publisher registered with the Ecuadorian Book Chamber with membership number 663).www.celibro.org.ec

ISSN: 2697-3391
Vol. 7 No. 3.2, pp. 24 – 41, September 2024

www.anatomiadigital.org

Palabras claves:
Amígdalas, Mal oclusión, arcada dental, Hipertrofia amigdalar, factor de riesgo.

Resumen

Introducción. El sistema estomatognático está formado por un conjunto de estructuras y cada una de ellas ejecuta un papel fundamental en el cumplimiento de funciones y estética de los individuos, razón por la que es vital que el personal del salud estén en conocimiento de la anatomía y función de cada estructura que conforma el sistema estomatognático así como la configuración, oclusión dental, la forma de las arcadas dentarias y como estas estructuras estomatognáticas están sometidas a grandes trasformaciones durante la vida, considerando que la oclusión dental está determinada por el crecimiento óseo, madurez neuromuscular y desarrollo dentario, lo cual representan un posible factor etiológico en la patología disfuncional. **Objetivo.** Identificar la relación entre el tamaño de las amígdalas con la forma de arcadas dentarias. **Métodos.** Se llevó a cabo un estudio descriptivo a través de una revisión bibliográfica en las bases de datos: *Google Academic*, *SciELO*, *PubMed*, *Elsevier y ScienceDirect.* Los criterios de inclusión fueron: Ensayos clínicos, revisiones sistemáticas, revisión literaria, artículos publicados en los últimos 5 años, en idioma inglés y español. Los criterios de exclusión fueron pacientes sindrómicos o tratados quirúrgicamente. **Resultados.** Se describe significativa relación entre el tamaño de las amígdalas y la forma de las arcadas, modificando así la oclusión de los pacientes. **Conclusión.** La forma de las arcadas dentarias es fundamental para comprender las alteraciones que afectan la oclusión y la respiración. Hábitos como la respiración bucal y condiciones como la obstrucción nasal, hiperplasia de las amígdalas influyen en estas alteraciones, causando dificultades respiratorias. Reconocer estas interrelaciones es esencial para tratar eficazmente los trastornos respiratorios y oclusales. **Área de estudio general:** Odontología. **Área de estudio específica:** Ortodoncia. **Tipo de estudio:** Revisión Bibliográfica.

ISSN: 2697-3391
Vol. 7 No. 3.2, pp. 24 – 41, September 2024

www.anatomiadigital.org

Keywords:
Tonsils, Malocclusion, Dental arch, Tonsillar hypertrophy, Risk factor.

Abstract

Introduction.A set of structures forms the stomatognathic system. Each of them plays a fundamental role in the fulfillment of functions and aesthetics of individuals. Thus, health personnel must be aware of the anatomy and function of each structure comprising the stomatognathic system, its configuration, dental occlusion, shape of the dental arches, and how these structures are subjected to significant transformations during life. It should be considered that dental occlusion is determined by bone growth, neuromuscular maturity, and dental development, which represents a possible etiological factor in dysfunctional pathology. objective. To identify the relationship between the size of the tonsils and the shape of the dental arches. Methods. A descriptive study was conducted through a literature review in Google Scholar, SciELO, PubMed, Elsevier, and ScienceDirect databases. The inclusion criteria were clinical trials, systematic reviews, literature reviews, and articles published in the last five years in English and Spanish. Exclusion criteria were syndromic or surgically treated patients. Results. A meaningful relationship is described between the size of the tonsils and the shape of the arches, thus modifying the patients' occlusion.**Conclusion.** The shape of the dental arches is fundamental to understand the alterations that affect occlusion and respiration. Habits such as mouth breathing and conditions such as nasal obstruction, hyperplasia of the tonsils influence these alterations, causing breathing difficulties. Recognizing these interrelationships is essential to effectively treat respiratory and occlusal disorders.

Introduction

The structures that make up the stomatognathic system are subject to changes in their morphology during life due to environmental influences that lead to morphological adaptations. For this reason, dental occlusion will be determined by bone growth, neuromuscular maturity and also by dental development, which will be subject to risk factors that may trigger a functional alteration of said stomatognathic system.(1).

The dental arches are delimited by 3 important segments, where the first segment is the central one, which is occupied by canines and incisors, and two lateral segments, which are considered from the first premolar to the third molar. These segments can form an ovoid, square, parabolic, round or hyperbolic arch. A disharmony in the dental arches will trigger a malocclusion, with the consequent aesthetic and functional problems. It is considered that these alterations can influence various parts of the stomatognathic system; said damage to the structures will depend on the presence of external stimuli that act as risk factors (1, 2, 3).

It is worth mentioning that the tonsils are anatomical structures located in the posterolateral part of the oropharynx, in the region called Waldeyer's lymphatic ring. They are an important component of the immune system, since they are part of the lymphoid tissue and contribute to the protection of the body against infections. It is worth mentioning that the size and shape of the dental arches can be affected by these structures. It is currently known that genetic factors, racial factors and the environment can lead to the development of an anomaly, acting in humans with different intensity, form and moments of development (3, 4).

However, under normal conditions, the size of the tonsils does not pose a risk of abnormality in the size of the arches, but if they are exaggerated in size, it could lead to a habit of mouth or mixed breathing, which will affect the size of the dental arches, the skeletal bases and therefore produce facial deformities..Therefore, the objective of the present study is the literature review to identify the relationship between the size of the tonsils with the shape of dental arches (1, 2, 3, 4).

Methodology

The main objective of this study is to identify the relationship between the size of the tonsils and the shape of the dental arches througha descriptive documentary study through theresearch in bibliographic databasessuch as Google Scholar, SciELO, PubMed, Elsevier and *ScienceDirect*.The keywords were obtained from the terminological vocabulary in MeSH and DeCS, which allowed the selection of the words which were:Tonsils, malocclusion, dental arch, tonsillar hypertrophy, risk factor.

Inclusion criteria were: clinical trials, systematic reviews, literature review, articles published in the last 5 years, in English and Spanish. Exclusion criteria were studies conducted in syndromic patients or those treated surgically.

In the bibliographic search, 23,252 articles were initially obtained, of which 39 belonged to PubMed, 18,700 to Google Academic, 1,134 to SciELO and 103 to Elsevier, 3,276 to ScienceDirect, data that are explained in the table below.

Strategies for the initial search process

After the initial search, language and temporality filters were applied, as well as the relevant research criteria, to finally obtain a total of 23,252, which correspond to the search in the different databases (Table 1).

Table 1.*Search Strategy*

Database	Search tree	Total
PubMed	(Tons) AND (dental arch)	39
Google Scholar	(Tonsillar hypertrophy) AND (dental arch)	18,700
SciELO	Tonsils) OR (malocclusion)	1134
Elsevier	Tonsils) OR (malocclusion)	103
ScienceDirect	(Tons) AND (dental arch)	3276
	Total	23,252

Inclusion Criteria

- Clinical trials
- Systematic reviews
- Literary review
- Articles published in the last 5 years, in English and Spanish.

Exclusion Criteria

- Studies carried out in syndromic or surgically treated patients.

Results

The present investigation on the relationship between tonsil size and dental arch shape involved an exhaustive digital search of scientific literature. Initially, 23,102 relevant articles were found. These articles were subjected to a pre-selection process based on the review of their titles and abstracts, which resulted in the selection of 150 articles.

Specific inclusion and exclusion criteria were then applied, designed to ensure that only the most relevant and high-quality studies were considered for the final analysis. As a result of this process, 23 articles were selected for further review.

ISSN: 2697-3391
Vol. 7 No. 3.2, pp. 24 – 41, September 2024

www.anatomiadigital.org

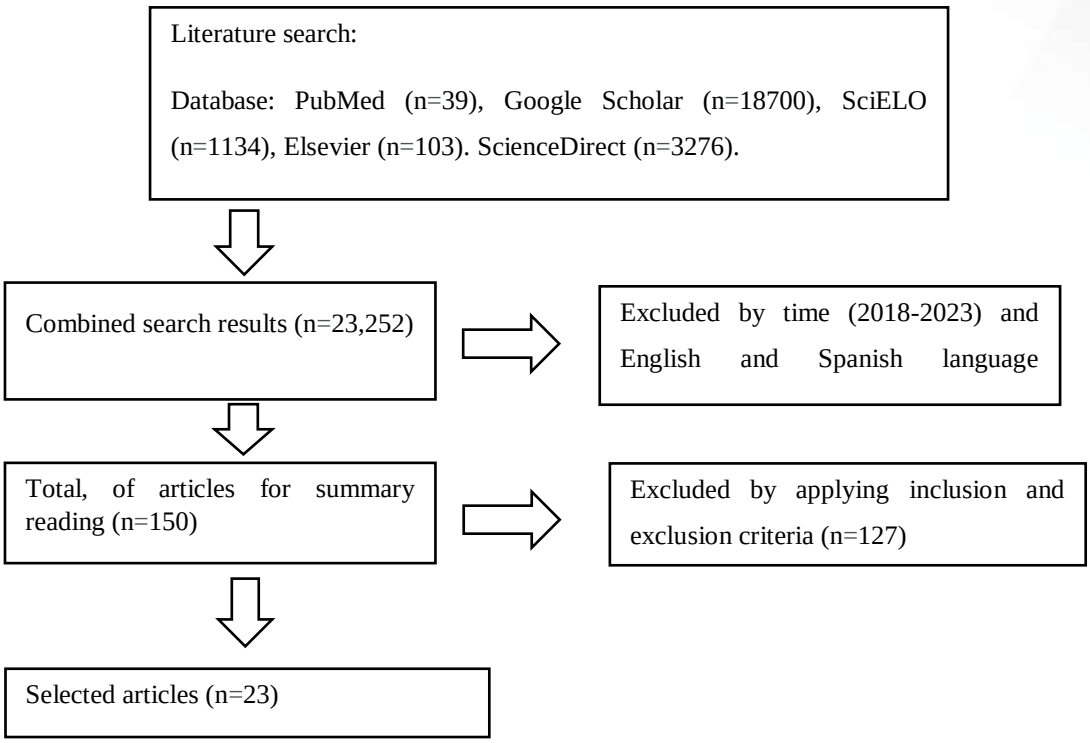

Figure 1. Literature Search Flowchart

The flowchart indicates the bibliographic results of the digital search that were selected and systematized according to the use of filters based on inclusion and exclusion criteria.

As previously stated, malocclusion is defined as an alteration in the relationship between the alveolar arches and dental occlusion, but it is not only about these structures, since it involves the soft tissues and the TMJ; in short, any alteration at the level of these structures can affect the occlusion. There are many factors that can cause anatomical alterations in these structures, but above all they have a close relationship with harmful habits that the patient may have (3, 5, 6).

Habits are considered routine behaviors that are performed consciously or unconsciously and that can cause deformities in dentofacial structures and arch shape depending on the intensity and duration of the same, generally observed in patientsduring the first years of life and in the initial stages of mixed dentition, causing disorders oflanguage skills, in physical and emotional progressof the individual; a clear example of these habits is mouth breathing, which in many patients is an adaptive form of breathing due to the blockage of the upper component corresponding to breathing, due to structural alterations such as: deviation of thenasal septum, enlarged tonsils, among others, which can cause nasal obstructive syndrome,sleep apnea disorderdeforming the dentomaxillofacial structures (2, 3).

Nasal obstruction is commonly caused by rhinopharyngitis, including allergic rhinitis, chronic and acute sinusitis; these long-term problems would cause a deviated nasal septum among other deformities since, by causing nasal obstruction, the patient will have to open the oral cavity to allow the entry of air flow, which in turn causes lip incompetence, altered posture, jaw rotation and protrusion of upper incisors (7, 8, 9). Mouth breathing has many causes, such as, for example, colds or flu, allergic processes, presence of nasal polyps, benign or malignant nasal tumors, etc. In this clinical picture, it is understandable that the patient breathes through the mouth, because it is a survival mechanism that humans develop to maintain an accessible airway. Therefore, it is very important to refer these patients to treating physicians (2, 4).

It is worth mentioning that tonsil hyperplasia can influence the development of malocclusion, such as advancement, depression and flattening of the tongue posture, since there is an imbalance in the tongue position, due to an increase in pharyngeal lymphoid tissue. When the tonsils are inflamed or enlarged, they can partially or completely obstruct the respiratory tract, which could lead to oral ventilation (1, 6, 10, 11).

Furthermore, mouth breathing has many consequences not only on occlusion but also at a systemic level, since when breathing through the mouth, dry, cold and dusty air enters, so that blood oxygenation is poor; causing anemia, hypoglobulinemia, leukocytosis, weight deficit, etc. (5). A mouth breathing patient frequently presents an adenoid facies where his nose is upturned, with a significant increase in the protrusion of the incisors, has hypertrophic gums, cross and open bite, deep palate, cracked lips, skeletal class II (4, 12, 13, 14).

It is worth mentioning that tonsil hyperplasia can influence the development of malocclusion, such as advancement, depression and flattening of the tongue posture, since there is an imbalance in the tongue position, due to an increase in pharyngeal lymphoid tissue. When the tonsils are inflamed or enlarged, they can partially or completely obstruct the respiratory tract, which could lead to oral ventilation (1, 6, 10, 11).

It is understood that when the obstruction of the airways is long-term, it causes sleep problems, causing the patient to snore, may have morbid behavioral alterations and neurocognitive dysfunction (12, 13, 15).

As for the position of the mandible, it rotates downwards and backwards, the lower third of the face increases, the palate is pushed upwards, producing a transverse upper micrognathism, the upper arch becomes narrow, the palate becomes ogival. Regarding obstructive sleep apnea, which frequently occurs in children, it is most common that in these patients a large tonsillar size is found (4, 5).

Anatomía Digital
ISSN: 2697-3391
Vol. 7 No. 3.2, pp. 24 – 41, September 2024
www.anatomiadigital.org

Table 2. *Relationship between tonsil size and arch shape*

Authors and year	Title of the article	Results
Hernandez 2021 (4)	Nasal obstructive syndrome	It does not specifically mention the relationship between tonsil size and dental arch shape. However, a possible indirect relationship can be inferred based on anatomical and functional principles that may cause airway obstruction, leading to chronic mouth breathing, which alters the posture of the tongue and facial muscles, which, in turn, may influence the development of the dental arches and the position of the teeth.
Markkanen et al. (2019) (5) Rivera et al. (2020) (15)	Craniofacial and occlusal development in 2.5-year-old children with obstructive sleep apnea syndrome.	Children withobstructive sleep apnea syndromehad a narrower intercanine width than children who did not snore (P = 0.032). In addition, children with OSA had larger adenoids relative to nasopharyngeal volume (P = 0.020) and a greater tendency to breathe through the mouth (P = 0.002).When performing the analysis, no statistically significant differences were identified. Despite the variations observed, these were not relevant enough to be considered statistically important when comparing the size of the palatine tonsil, occlusal characteristics, soft tissue profile measurements or BMI (Body Mass Index).
Tong et al. (2022) (6)	The association of tonsil hypertrophy with pediatric dentofacial development: evidence from a cross-sectional study of young children in Shanghai, China	In this study 715 members of which (334 boys and 381 girls) participated in the analyses. According to the calculation, about 45.6% of malocclusion was identified according to Angle's classification. No obvious relationship was found between OSA scores (Sleep Apnea Disorder)and dentofacial anomalies (P > 0.05). With tonsillar hypertrophy, the proportion of children with triangular dental arch shape (P < 0.05) and high palate (P < 0.001) was increasingly higher. More children with protruding and less upright profiles were observed as tonsil size increased, although there was no statistical difference (P = 0.103).
Fernandez et al. (2021) (8)	Cephalometric evaluation of the airways of pediatric patients with oral habits treated at a university institution in Barranquilla	Mouth breathing is associatedThe upper airways, which include the nose, mouth, pharynx, and larynx, are given lengths of 5 mm and 6 mm, possibly referring to specific segments within these areas. The lower airways, which comprise the trachea, bronchi, and lungs, are given lengths of 4 mm and 5 mm, denoting a narrow (triangular) lower arch or a retrognathous mandible.

Table 2. *Relationship between tonsil size and arch shape (continued)*

Authors and year	Title of the article	Results
Murrieta et al. (2019)(12)	Parafunctional oral habits and primary dentition characteristics in a group of preschool children from Tlaquepaque, Jalisco, Mexico.	In the children studied, 72.7% were found to have a narrow lower arch, 26.0% had the habit of breathing through the mouth, and 17.2% had the habit of biting their nails. These were the most common risk factors identified during the study.
Carrillo et al. (2019) (13)	Clinical differences between preschoolers and school children with obstructive sleep apnea	Arch shape may influence airway anatomy and therefore predisposition to obstruction during sleep. Dental arch shapes can vary widely between individuals and may influence anatomy. Some arch shapes, such as narrow or deep arches, may be associated with an increased risk of sleep apnea, which could contribute to OSA.
Abdalla et al. 2022 (9)	Sleep-disordered breathing in children and adolescents seeking pediatric dental care in Dubai, UAE. European archives of pediatric dentistry.	There is a relationship between tonsil size and arch shape, so the study found that tonsil size is significantly associated with the risk of sleep-disordered breathing. In addition, a positive association was observed between the risk of sleep-disordered breathing and class II molar relationship, suggesting a connection between tonsil size and dental malocclusion.

Research on the relationship between tonsil size and malocclusion showed that tonsillar hypertrophy, which can cause nasal airway obstruction and lead to mouth breathing, is significantly associated with various dentofacial abnormalities. These abnormalities are influenced by tonsillar size, which is detailed in the following table with various studies.

Table 3. *Relationship between tonsil size and malocclusion*

Author and year	Title of the article	Results
Gonzalez et al. 2020 (1)	Risk factors for malocclusion	Tonsillar hypertrophy, which may cause nasal airway obstruction and lead to mouth breathing, is associated with various malocclusions such as anterior open bite, clockwise mandibular rotation, increased lower vertical dimension, maxillary compression, high-arched palate, mandibular protrusion, and anterior crossbite.
Navarrete & Pita 2020 (2)	Factors related to malocclusions in Ecuadorian children aged 3-9 years.	The study found that 77% of malocclusion cases were linked to low socioeconomic status and breastfeeding for less than 1 year. An association was observed between crossbite and interferences with occlusion. However, no association was found between open bite malocclusion and the factors studied.
Lima et al. 2019 (3)	Dental malocclusions and their relationship	The pressure exerted by enlarged tonsils can affect craniofacial development, which in turn could have

	with harmful oral habits.	consequences on the position of the teeth and therefore their alignment, causing dental malocclusions.
Lin et al. 2021 (7)	Risk of dental malocclusion in children with upper respiratory tract disorders: A case-control study of a nationwide, population-based health claim database.	Respiratory problems, especially those related to chronic mouth breathing with enlarged tonsils and may present some common malocclusions such as open bite, deep bite and anterior and posterior reverse bite but the size of the tonsils, and malocclusion can be complex and vary between individuals, however, this study presented prevalence in deep and open bite.

In analyzing the relationship between tonsil size and malocclusion, different types of studies were reviewed to obtain a comprehensive understanding of the topic. These included studies that examine data at a specific point in time, those that follow subjects over time, studies that analyze case-control information, and research that deliberately manipulates one or more independent variables. Studies that provide an overview of health patterns in broad populations, as well as reviews that consolidate findings from previous research, were also considered.

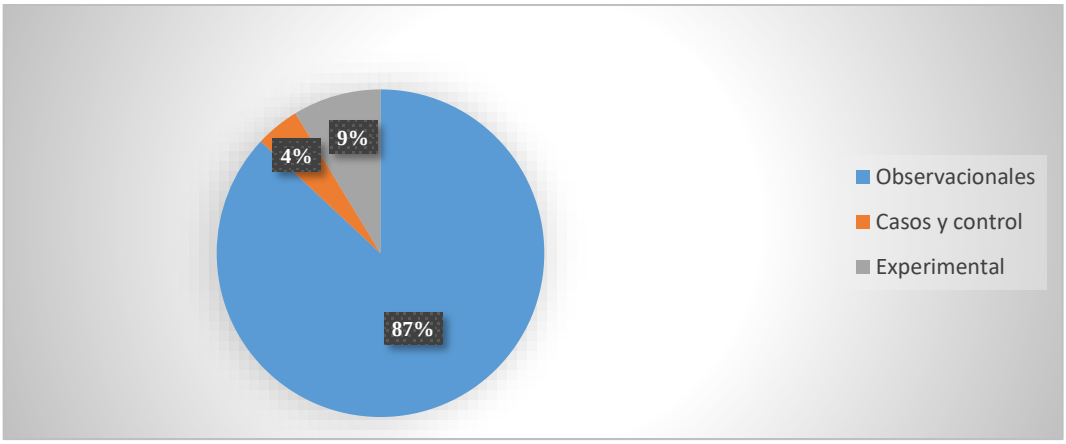

Figure 2.*Types of studies*

The 23 selected works are classified as: 12 cross-sectional studies, 2 longitudinal studies, 2 descriptive studies, 2 retrospective observational studies, 1 epidemiological study, 2 bibliographic reviews, 1 review and meta-analysis, and 1 descriptive cross-sectional observational study.

Discussion

In Latin America, oral health care focuses on disease promotion and prevention. It is essential that dentists provide timely care to children during the stages of temporary dentition (baby teeth) or mixed dentition (temporary and permanent teeth), in order to

identify any problems in the development of the structure of the upper and lower teeth and how they fit together when the mouth is closed., the shape of the arch and the face in order to reduce the prevalence and incidence of these alterations at early ages in order to be able to carry out a good preventive orthodontic and orthopedic treatment, with the purpose of providing a correct formation of the permanent dentition bite (1, 2, 3).

Authors such as González et al. (1) and Chih-Yu et al. (16)., report results of their research carried out on infants between 5 and 12 years old, said study reports oral habits such as digital labial suction or objects, lingual interpositions, onychophagia, among others are risk factors for developing malocclusion and breathing problems that occur when the dental arches are altered.

Likewise, Navarrete & Pita (2), after a series of investigations on children between 3 and 9 years old, yielded important results on malocclusion, in this phase of diagnosis, showing that craniofacial characteristics are inherited from parents to children, therefore, their occlusal conditions as well. In addition, it is important to consider that children who did not complete their period of breastfeeding have a higher prevalence in the group of malocclusions (2, 17, 18).

Markkanen et al. (5), in a study conducted on children aged 27 and 33 months, at a University Hospital in Tampere, Finland; in which their main objective was the occlusal and craniofacial development related to obstructive sleep apnea; they were able to show that snoring children had larger adenoids and a greater tendency to mouth breathing, which in the long term would generate occlusion problems such as anterior open bite. It should be noted that, for this analysis, the selection parameters were patients who snore while sleeping (5).

A study carried out by Behlfel in 1987 in children in Sweden showed that pediatric patients who are mouth breathers and have problems with their tonsils and adenoids have come to suffer from functional and morphological disorders such as short arches and crossbite, due to the narrowing of the airways (6).

In a study conducted at the Metropolitan Hospital of Colombia, it was shown that dysfunctional swallowing is the most prevalent oral habit in children between 6 and 12 years of age, followed by mouth breathing, digital sucking and onychophagia. It is worth mentioning that it is more common to observe children with class II malocclusion, since many of these practices modify the correct increase in size and development of the maxillary bones (8, 19, 20).

In descriptive retrospective observational studies by Pierlorenzo et al. (10), the association of tonsil size in relation to the dental arch will present a greater occurrence of crossbite or narrow palate among children in the development stage, however, in the

cross-sectional study byAbdallaet al. (9) states that the dimensions of the dental arches will depend on the size of the tonsils in patients with respiratory problems, such as sleep apnea (21, 22, 23).

Conclusions

- In conclusion, the shape of the dental arches plays a crucial role in understanding the structural alterations that affect occlusion and breathing. Pernicious habits, such as mouth breathing, and chronic conditions, such as nasal obstruction, can influence these alterations, while tonsil hyperplasia increases the likelihood or possibility of airway blockage, thus hindering normal breathing and obstructive sleep apnea. Recognizing these interrelations is essential for an effective and personalized approach to respiratory and occlusal disorders.
- Furthermore, the relationship that exists between skeletal and dental malocclusions with the capacity of the airways to allow free passage of air during normal breathing, because in many cases, the growth of the tonsils has a close connection with occlusal problems, for this reason the alterations in the size of the tonsils would modify the breathing and with it the correct dental development, commonly showing problems in the anterior sector, it should also be clarified that the hypertrophy of the tonsils does not directly affect the morphology of the dental arch, nor the palatal depth, however, the side effects, such as oral breathing and unusual swallowing and low position of the tongue would cause changes at the dentoskeletal level.
- It is also very important to consider that the size of the tonsils modifies the patient's occlusion, taking into account that the larger they are, the growing patient will develop crossbite and short dental arches, because the nasopharyngeal airways are narrow and the individual will develop the habit of mouth breathing. In short, tonsillar hypertrophy is a modifiable risk factor for malocclusion in pediatric patients.However, in some cases, an interdisciplinary approach involving orthodontists, otolaryngologists, and other health care professionals may be needed to comprehensively address dental occlusion and tonsil-related problems.
- It is worth mentioning that these findings underline the need for intervention where health professionals act at the right time to provide care, intervention or treatment as needed for the specific health situation. To identify and address these alterations at early ages, in order to reduce their prevalence and incidence and promote proper growth and evolution of the bite in permanent teeth, because enlarged tonsils can influence the development of dentition and the position of teeth. Proper evaluation and treatment of enlarged tonsils can be important to prevent dental and orthodontic problems in children and adults, this means that

the connection or association mentioned above may change or be different depending on other personal circumstances or factors specific to each individual.

Conflict of interest

There is no conflict of interest, since it is a bibliographic review, and does not require informed consent.

Authors' contribution statement

Author 1:A thorough review of the relevant scientific literature has been carried out, contextualizing and justifying the study appropriately, taking into account the most recent advances in the field, which has allowed the establishment of a solid theoretical basis.

Author 2:Review and correction of the manuscript, ensuring that the content is correct, as well as tables and figures have been carried out, guaranteeing the precision and clarity of the presentation of the results. He also supported the interpretation and writing of the conclusions.

In summary, the contribution of Erika Carolina Tapia Vásquez and María Isabel Cabrera Padrón in this scientific article has been fundamental for the development and successful completion of the study.

Bibliographic References

1. González L, Rodríguez A, Soto L. Risk factors for malocclusion. Villa Clara Scientific Journal [Internet]. 2020 [cited 30 May 2024]; 24(4): 753–66. Available at:http://scielo.sld.cu/pdf/mdc/v24n4/1029-3043-mdc-24-04-753.pdf

2. Navarrete N, Pita Sobral M. Factors related to malocclusions in Ecuadorian children aged 3-9 years. Cuban Journal of Stomatology [Internet]. 2020 [cited 30 May 2024]; 57(2): 2111. Available at:http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0034-75072020000200009

3. Lima Illescas MV, Rodríguez Soto A, García González B. Dental malocclusions and their relationship with harmful oral habits. Cuban Journal of Stomatology [Internet]. 2019 [cited 30 May 2024]; 56(2): 1395. Available at:http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0034-75072019000200009

4. Hernández Bridon N. Nasal obstructive syndrome: a mini-review. Revista Salud Ciencia Tecnología [Internet]. 2021 [cited 30 May 2024]; 1:12. Available at:https://www.medigraphic.com/pdfs/salcietec/sct-2021/sct211n.pdf

5. Markkanen S, Niemi P, Rautiainen M, Saarenpää-Heikkilä O, Himanen SL, Satomaa A, Peltom T. Craniofacial and occlusal development in 2.5-year-old children with obstructive sleep apnea syndrome. European Journal of Orthodontics[Internet].2019[cited May 30, 2024]; 41(3): 316–21. Available at:https://academic.oup.com/ejo/article/41/3/316/5423411

6. Tong China. Journal Nature and Science of Sleep[Internet]. 2022[cited May 30, 2024]; 14: 1867–75. Available from:https://www.dovepress.com/the-association-of-tonsil-hypertrophy-with-pediatric-dentofacial-devel-peer-reviewed-fulltext-article-NSS

7. Lin SW, Jheng CH, Wang CL, Hsu CW, Lu MC, Koo M. Risk of dental malocclusion in children with upper respiratory tract disorders: A case-control study of a nationwide, population-based health claim database. International Journal of Pediatric Otorhinolaryngology[Internet]. 2021 [cited 30 May 2024]; 143(110663): 110663. Available at:http://dx.doi.org/10.1016/j.ijporl.2021.110663

8. Fernández AA, Herrera AH, Barros MAA, Torres KB, Fontalvo KM, Grau MJP, et al. Cephalometric evaluation of the airways of pediatric patients with oral habits treated at a university institution in Barranquilla. Cuban Journal of Biomedical Research[Internet]. 2021 [cited 30 May 2024]; 40(4). Available at:https://revibiomedica.sld.cu/index.php/ibi/article/view/1362

9. Abdalla, M, Halabi, M, Kowash, M, Hussein, I, Khamis, A, Salami A. Sleep-disordered breathing in children and adolescents seeking pediatric dental care in Dubai, UAE. European archives of pediatric dentistry. Official Journal of the European Academy of Pediatric Dentistry [Internet]. 2022 [cited 30 May 2024]; 23(3): 485-494. Available at:https://pubmed.ncbi.nlm.nih.gov/35220544/

10. Pierlorenzo Vi,PozziF ,Tommaso A,CastelnuovoD. Endoscopic endonasal odontoidectomy preserving atlantoaxial stability: a pediatric case.Journal of Neurological Surgery Part B: Skull Base[Internet]. 2021[cited 30 May 2024]; 82(1): 2-3. Available at:https://pubmed.ncbi.nlm.nih.gov/33717798/

11. Can K,Lavinia B,Basilicata A , Stefani A.Correlation between malocclusions, tonsillar grading and mallampati modified scale: a retrospective observational study. JournalChildren (Basel)[Internet]. 2023 [cited 30 May 2024]; 10(6): 1061. Available at:https://pubmed.ncbi.nlm.nih.gov/37371292/

12. Murrieta J, Velazquez Y, Yanez M,Anaya M,Chieftain J. Parafunctional oral habits and primary dentition characteristics in a group of preschool children from Tlaquepaque, Jalisco, Mexico.Journal of Oral Research [Internet]. 2019 [cited 30

May 2024]; 8(1): 50-58. Available at:https://dialnet.unirioja.es/servlet/articulo?codigo=7018495

13. Carrillo A, Torres V, Garcia E, Baños M, Torres M, Brockmann V. Clinical differences between preschoolers and school children with obstructive sleep apnea. Pediatric Act of Mexico [Internet]. 2019 [cited 30 May 2024]; 40(6): 318-327. Available at:https://www.medigraphic.com/cgi-bin/new/resumenI.cgi?IDARTICULO=90670&idP=8633

14. Bravo M, Salinas E.Importance of articulator mounting as an auxiliary method for differential diagnosis between class III and pseudoclass III malocclusions. Mexican Journal of Orthodontics [Internet].2019[cited 30 May 2024]; 7(2): 73-87. Available at:https://www.medigraphic.com/cgi-bin/new/resumen.cgi?idarticulo=90458

15. Rivera E, Rangel J, Espinosa C. Phenomenical analysis of the functional neuromuscular technique as a treatment for OSA. Journal of Research and Innovation in Health Sciences [Internet]. 2020 [cited 30 May 2024]; 2(1): 56-81. Available at:http://portal.amelica.org/ameli/jatsRepo/267/2672223005/

16. Chih-Yu F, Jian-Hong Y, Chia-Chi C, Jui-Ting H, Yu-Chen L, Heng-Li H. Effects of short-term acupuncture treatment on occlusal force and mandibular movement in patients with deep-bite malocclusion .Journal of Dental Sciences [Internet]. 2019 [cited 30 May 2024]; 14(1): 81-86. Available at:https://www.sciencedirect.com/science/article/pii/S1991790218307955

17. Ji-Eun K, Pradhan P, Sungil J. Nasal, Ho K. Nasal obstruction promotes alveolar bone destruction in the juvenile rat model.Journal of Dental Sciences [Internet]. 2022 [cited 30 July 2024]; 17(1):176-183. Available at:https://www.sciencedirect.com/science/article/pii/S1991790221001069

18. Dae-Woo L, Jae-Gon K, Yeon-mi Y. Influence of mouth breathing on atopic dermatitis risk and oral health in children: A population-based cross-sectional study.Journal of Dental Sciences [Internet]. 2021 [cited 30 May 2024]; 16(1): 178-185.Available at:https://www.sciencedirect.com/science/article/pii/S1991790220301380

19. Samba D, Youssouf O, Ngoné S, Alpha B, Khady D, Ibrahima N, Ayoub Z, Falou D Comparison of dental arch measurements according to the grade and the obstructive character of adenoids. Journal International Orthodontics [Internet]. 2019 [cited 30 May 2024]; 17(2): 333-341.Available at:https://www.sciencedirect.com/science/article/abs/pii/S1761722719300543

20. Benlee Y,Kontos Y, James M, Declan K, Wayne S, Craig D. Differences in dentofacial morphology in children with sleep disordered breathing are detected with routine orthodontic records. Journal Sleep Medicine [Internet].2019 [cited 30 May 2024]; 55(1): 109-114. Available at:https://www.sciencedirect.com/science/article/abs/pii/S1389945719300061

21. Magalhães B, Souki S, Lione R, Silke A, Bigliazzi R, Oliveira P, Moro P, Cozza P. Three-dimensional airway changes after adenotonsillectomy in children with obstructive apnea: Do expectations meet reality?American Journal of Orthodontics and Dentofacial Orthopedics [Internet]. 2019 [cited 30 May 2024]; 155(6): 791-800.Available at:https://pubmed.ncbi.nlm.nih.gov/31153499/

22. MarkkanenYes,Rautiainen M,Pekka N,Helminths M,PeltomäkiT.Is securing normal dentofacial development an indication for tonsil surgery in children? A systematic review and meta-analysis. International Journal of Pediatric Otorhinolaryngology[Internet]. 2020 [cited 30 May 2024]; 133:110006. Available at:https://www.sciencedirect.com/science/article/abs/pii/S016558762030149X

23. Katarzyna P,White U,Katarzyna R,Morawska K, Katarzyna P,KręckiT. Craniofacial proportions in children with adenoid or adenotonsillar hypertrophy are related to disease duration and nasopharyngeal obstruction.International Journal of Pediatric Otorhinolaryngology [Internet]. 2020 [cited May 30, 2024]; 132. Available at: https://pubmed.ncbi.nlm.nih.gov/32032918/

Anatomía Digital

ISSN: 2697-3391
Vol. 7 No. 3.2, pp. 24 – 41, September 2024

www.anatomiadigital.org