



Association Between Oral Breathing and Maxillary Compression: A Narrative Review

Elizabeth Paucar Toribio¹ , Gonzalo Bustamante Zamora² , Maricel Bravo Rojas² ,
Aurora Guerra Alfaro² , Germán Hempel Souper² .

Abstract: Introduction: Oral breathing is defined as the habit of breathing predominantly through the mouth rather than the nose, bypassing the natural filtering function of the nasal cavity and resulting in an altered tongue posture due to structural abnormalities, nasal obstructions, or respiratory syndromes. This habit leads to insufficient stimulation for transverse maxillary development, causing a deep, narrow palate that lacks muscular resistance against the centripetal forces of the perioral musculature as a result of an abnormal tongue position. **Objective:** To determine the association between oral breathing and maxillary compression, and to evaluate whether the diagnostic methods used meet standardized criteria. **Methods:** An electronic search was conducted in the following databases: PubMed, Elsevier, Epistemonikos, and Tripdatabase. The search included articles published between 2014 and 2025. **Results:** After analyzing publications that met the proposed objectives, six articles were selected for data extraction and interpretation. **Conclusions:** Oral breathing and maxillary compression are directly associated as a consequence of musculoskeletal imbalance between the tongue and the hard palate due to a lowered tongue posture. However, there is no unified criterion for measuring maxillary compression, which prevents comparisons of diagnoses across different clinical studies.

Key words: Mouth Breathing; Hard Palate; Tongue; Maxillofacial Development.

Asociación entre Respiración Oral y Compresión Maxilar, una Revisión Narrativa

Resumen: Introducción: La respiración oral se define como el hábito de respirar predominantemente por la boca en comparación con la nariz, evitando el filtro natural de la cavidad nasal y posicionando la lengua de forma alterada, a consecuencia de alteraciones estructurales, obstrucciones nasales o síndromes respiratorios. Este hábito conlleva a una falta de estimulación para el desarrollo transversal del maxilar, provocando un paladar hendido, profundo y que no posee una resistencia muscular contraria a las fuerzas centrípetas de la musculatura peri oral, debido a una posición lingual anómala. **Objetivo:** Determinar la asociación entre la respiración oral y la compresión maxilar, y evaluar si los métodos diagnósticos empleados cumplen criterios estandarizados. **Métodos:** Se realizó una búsqueda electrónica en las siguientes bases de datos: PubMed, Elsevier, Epistemonikos y Tripdatabase. La búsqueda incluyó artículos publicados entre 2014 y 2025. **Resultados:** Después de analizar las publicaciones que cumplían los objetivos propuestos, se seleccionaron seis artículos para la extracción e interpretación de los datos. **Conclusiones:** La respiración oral y la compresión maxilar están directamente asociadas, como consecuencia del desequilibrio musculoesquelético entre la lengua y el paladar duro debido a una posición lingual descendida. Sin embargo, no se dispone de un criterio unificado para su medición, lo que impide comparar diagnósticos de compresión maxilar entre distintos estudios clínicos.

Palabras clave: Respiración Bucal; Paladar Duro; Lengua; Desarrollo Maxilofacial.

¹Universidad San Sebastián, Santiago de Chile, Chile.

²Pontificia Universidad Católica de Chile, Santiago de Chile, Chile.

Associação entre Respiração Oral e Compressão Maxilar: Uma Revisão Narrativa

Resumo: **Introdução:** A respiração oral é definida como o hábito de respirar predominantemente pela boca em comparação ao nariz, evitando o filtro natural da cavidade nasal e posicionando a língua de forma alterada, em decorrência de alterações estruturais, obstruções nasais ou síndromes respiratórias. Esse hábito leva à falta de estímulo para o desenvolvimento transversal do maxilar, ocasionando um palato profundo e estreito, que não apresenta resistência muscular às forças centrípetas da musculatura perioral, devido a uma posição lingual anômala. **Objetivo:** Determinar a associação entre a respiração oral e a compressão maxilar, bem como avaliar se os métodos diagnósticos empregados atendem a critérios padronizados. **Métodos:** Foi realizada uma busca eletrônica nas seguintes bases de dados: PubMed, Elsevier, Epistemonikos e Tripdatabase. A busca incluiu artigos publicados entre 2014 e 2025. **Resultados:** Após a análise das publicações que atenderam aos objetivos propostos, seis artigos foram selecionados para extração e interpretação dos dados. **Conclusões:** A respiração oral e a compressão maxilar estão diretamente associadas como consequência do desequilíbrio musculoesquelético entre a língua e o palato duro, decorrente de uma posição lingual rebaixada. Entretanto, não há um critério unificado para a mensuração da compressão maxilar, o que impede a comparação dos diagnósticos entre diferentes estudos clínicos.

Palavras-chave: ARespiração Bucal; Palato Duro; Língua; Desenvolvimento Maxilofacial.

Introduction

Continuous assessment by healthcare teams of facial growth and development from childhood through adolescence is essential to prevent craniofacial developmental alterations and to avoid the physical, emotional, and social consequences of resulting anomalies. In this context, the establishment of deleterious oral habits—such as thumb sucking, prolonged pacifier use, lip interposition, infantile swallowing, and oral breathing—is directly related to the development of dentomaxillary anomalies. If not addressed in a timely manner, these habits not only affect the oral cavity but may also alter facial development, posture, sleep quality, among other factors¹⁻².

One of these deleterious oral habits is oral breathing, defined as the habit of breathing predominantly through the mouth rather than the nose, bypassing the

natural nasal filter and resulting in altered tongue positioning. Furthermore, as air does not pass through the nasal cavities, it fails to reach the maxillary sinuses, leading to their atresia and producing a characteristic long-face appearance or adenoid facies, characterized by upper lip incompetence and increased anterior facial height³.

Oral breathing has been observed as a consequence of various structural alterations, such as adenotonsillar hypertrophy, nasal obstructions including deviated septum, or respiratory syndromes such as obstructive sleep apnea-hypopnea syndrome (OSAHS), which is present, for example, in patients with obesity, where airway collapse occurs during sleep⁴. One of the key findings in patients with this condition is a significant reduction in maxillary transverse width, specifically associated with oral breathing⁵.

The consequence of this altered breathing pattern is a lowered tongue posture, with contact against the lingual surfaces of the lower incisors rather than the appropriate resting position, which should place the tongue tip on the palate behind the upper incisors and the lateral borders in contact with the palatal surfaces of the maxillary teeth ⁶. This leads to insufficient stimulation of palatal development, resulting in a narrow, deep palate with reduced transverse growth due to centripetal forces of the perioral musculature, which are not counterbalanced because of the abnormal tongue position ⁷.

The objective of this narrative review is to determine, through the analysis of recent clinical studies, the association between oral breathing and the establishment of maxillary compression, as well as to identify the diagnostic methods used and assess whether they meet standardized criteria.

Materials and Methods

A bibliographic search was conducted regarding oral breathing and maxillary compression, collecting information from January 2025 to May 2025. The search was performed in the PubMed, Elsevier, Epistemonikos, and Tripdatabase databases, using MeSH terms combined with Boolean operators AND and OR. Keywords were limited to the English language, such as: *Mouth breathing OR Oral breathing AND Maxillofacial development*. Inclusion and exclusion criteria were established for the electronic search, as described in Table 1.

Results

The search of PubMed, Elsevier, Epistemonikos, and Tripdatabase databases retrieved 414 records, with one additional record identified from other sources, yielding a total of 415

Table 1. Summary of the selection criteria.

Inclusion Criteria	Exclusion Criteria
Studies evaluating the relationship between oral breathing and maxillary compression	Printed or digital press articles, editorials, commentaries, blogs, peer-reviewed or non-peer-reviewed conference abstracts
Articles published in English or Spanish	
Randomized controlled clinical trials and observational studies	
Articles published between 2014 and 2025	
Articles with full text	

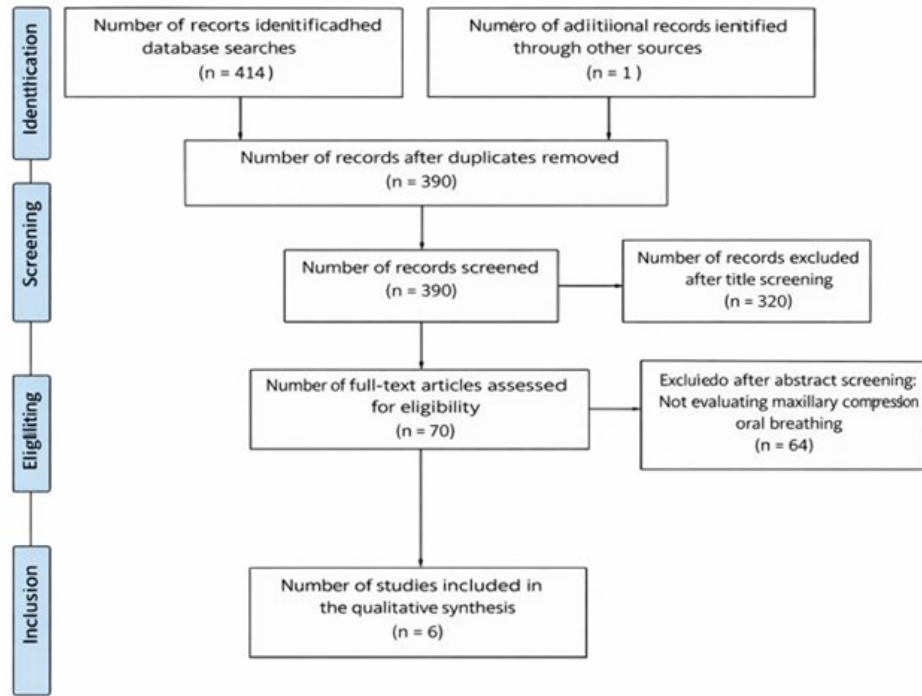


Figure 1. Flowchart of the bibliographic search process carried out in the study.

records. After removing 25 duplicates, 390 unique articles remained. Following title screening, 320 articles were excluded for not aligning with the review objectives, leaving 70 studies for abstract evaluation. At this stage, 64 articles were excluded for not specifically assessing

the relationship between oral breathing and maxillary compression. Ultimately, six studies met all inclusion criteria and were included in the qualitative synthesis (Figure 1). Extracted data from these studies are presented in Tables 2 and 3.

Table 2. Summary of data extracted from the publications included in the review.

Author (Year)	Country	Sample size	Age and gender	Conclusion
12. Huang et al. (2019)	Taiwan, Portugal, USA	244 preterm infants and 30 full-term infants	0–24 months (57% male preterm infants)	Narrow palate in preterm infants associated with sleep-disordered breathing and neurological delays
13. Markkanen et al. (2019)	Finland	52 children (9 with OSAHS, 18 non-snorers with PSG)	2.5 years (gender not specified)	OSAS associated with reduced intercanine width and increased adenoid size

Table 2. Summary of data extracted from the publications included in the review (cont.).

Author (Year)	Country	Sample size	Age and gender	Conclusion
10. Müller & Piñeiro (2014)	Chile	2 children	3 and 6 years	Oral breathing linked to maxillary compression, crossbite, and facial alterations
9. Rossi et al. (2015)	Brazil	1596 patients (groups: 5–12, 13–18, 19–57 yeras)	5–57 years	Dental and skeletal factors associated with oral breathing in children and adolescents
8. Li et al. (2023)	China	3433 children (1788 boys, 1645 girls)	6–11 years (mean: 8.53 years)	SRI associated with mandibular retrusion; no relationship with maxillary compression
11. Grippaudo et al. (2016)	Italy	3017 children	7–13 years (45.6% males, 54.4% females)	Oral breathing associated with overjet, crossbite, and dental displacement, indicating maxillary hypodevelopment

Abbreviations: SRI (Sleep-Related Breathing Disorders); OSAS (Obstructive Sleep Apnea Syndrome); PSG (Polysomnography)

Table 3. Summary of extracted data on diagnostic methods.

Author (Year)	Evaluation method	Measured parameters	Maxillary compression criteria	Relationship
12. Huang et al. (2019)	Visual clinical assessment	Mid-palatal width < 20 mm	(NHP)	NHP present in 65.2% of premature infants at 6 months, associated with persistent TRS and reduced sleep efficiency.
13. Markkanen et al. (2019)	Direct measurement with digital caliper	Upper intercanine width, upper intermolar width	Statistical differences reported	Smaller intercanine width in children with OSAS; mouth breathing and larger adenoid size associated with early maxillary compression.
10. Müller et al. (2014)	Visual clinical assessment	Triangular shape of the maxilla, unilateral or bilateral crossbite, highly arched palate, upper protrusion.	Triangular shape of the maxilla, posterior crossbite	Chronic mouth breathing associated with narrow palate, maxillary retrusion and upper maxillary compression, affecting craniofacial development.
9. Rossi et al. (2015)	Plaster models and measurement with a digital caliper	Maxillary intercanine and intermolar width	Comparison between OB and NB	No significant differences were found in children, adolescents, or adults. Greater mandibular width in OB in adults, associated with crossbite.

Table 3. Summary of extracted data on diagnostic methods (cont.).

Author (Year)	Evaluation method	Measured parameters	Maxillary compression criteria	Relationship
8. Li et al. (2023)	Visual clinical assessment	Maxillary arch form	Visual classification (normal/constricted)	No correlation was found between arch form and SRI. Only mandibular retrusion showed a significant association with SRI.
11. Grippaudo et al. (2016)	ROMA Index	Standardized clinical observation	Maxillary hypodevelopment (overjet \leq 0 mm)	Associated with increased or reduced overjet, crossbite and tooth displacements, indicating alterations in maxillary development.

Abbreviations: ROMA (Risk of Malocclusion Assessment); NHP (Narrow Hard Palate); SRI (Sleep-Related Breathing Disorders); OSAS (Obstructive Sleep Apnea Syndrome); OB (Oral Breathing); NB (Nasal Breathing)

Discussion

In four of the six included studies, oral breathing and maxillary compression were directly associated, as results demonstrated a causal relationship between these variables. However, two studies reported no statistically significant association, as shown in Table 2. The first, by Li et al.⁸, indicates that multiple studies upon which they based their work do report such an association, acknowledging at least a trend⁹. The second, by Rossi et al.⁹, did not establish a statistically significant association when comparing intramaxillary groups.

Analysis of the diagnostic methods used in both studies reveals that Li et al.⁸ did not objectively or quantitatively measure maxillary constriction, relying solely on direct observation. Rossi et al.⁹ compared intramaxillary models without employing a validated compression assessment method for each arch. Given that the

diagnosis of transverse compression requires quantitative and comparative intra- and intermaxillary techniques, an exclusively intramaxillary approach prevents definitive conclusions regarding the presence of this condition.

Regarding the studies by Huang et al.¹² and Muller et al.¹⁰, although an association was identified, diagnostic methodology remained limited to visual inspection of palatal shape and width, as shown in Table 3. Grippaudo et al.¹¹ was the only study that, in addition to identifying an association, employed an objective index to assess multiple clinical signs of malocclusion, including transverse maxillary width.

Concerning the etiology of maxillary compression, studies converge on abnormal tongue posture associated with altered breathing patterns, which prevents stimulation of transverse maxillary development and fails to

counteract centripetal forces of the perioral musculature ¹⁰. Oral breathing was also associated with other inter- or intramaxillary disharmonies, such as protruded maxillary incisors, increased or decreased overjet, anterior or posterior crossbite, open bite, and displacement of contact points ^{10,11}, including anatomical reduction of the upper airway ⁷.

Extraoral changes were also reported, including alterations in head, neck, and hyoid bone posture, short and hypotonic upper lip, open-mouth posture, and a more obtuse gonial angle, favoring a vertical growth pattern ¹⁰.

Regarding resolution, maxillary compression was observed to resolve spontaneously in almost none of the cases ¹², reinforcing the importance of professional intervention for treatment.

Among the included studies, one of the most frequently reported causes of oral breathing in the pediatric population was OSAHS, associated with allergic rhinitis, tonsillar hypertrophy, and parental snoring ⁸. Therefore, authors agree that early prevention and detection of respiratory disorders and deleterious tongue habits are crucial to prevent increasing severity of malocclusions over time.

Finally, it was observed that no unified criterion exists for measuring maxillary compression, hindering direct comparison across studies. Huang et al. ¹², Li et al. ⁸, and Müller et al. ¹⁰ used direct visual clinical methods based on intraoral inspection. Rossi et al. ⁹ measured intercanine width using digital calipers

on study models, while Markkanen et al. ¹³ employed transverse measurements on digital models. This methodological heterogeneity reflects a lack of diagnostic standardization, affecting objectivity and reproducibility. Direct observation is highly dependent on examiner criteria and may fail to detect dentoalveolar compensations. For example, arches appearing occlusally stable may mask excessive lingual inclination of lower teeth as an adaptive mechanism to transverse deficiency, which may go unnoticed without precise instrumental evaluation. In this regard, diagnostic tools such as posteroanterior Ricketts cephalometric analysis, Andrews' Element III analysis, or cone-beam computed tomography (CBCT) represent more objective and scientifically validated methods ¹⁴.

This lack of standardized diagnosis may explain why not all studies found a statistically significant relationship between oral breathing and maxillary compression, as diagnostic limitations may influence statistical outcomes.

Conclusions

Oral breathing and maxillary compression are directly associated as a result of the loss of musculoskeletal balance between the tongue and the hard palate due to a lowered tongue posture.

Failure to treat oral breathing may lead to malocclusions, characteristic facial patterns, postural alterations, and occlusal disharmonies that increase in severity over

time and do not resolve spontaneously, requiring early diagnosis and treatment. Therefore, a multidisciplinary approach is essential, including etiological correction of the habit, therapeutic management of intraoral consequences, and tongue muscle reeducation toward proper resting posture, fostering teamwork among dentists, speech therapists, pediatricians, otolaryngologists, physical therapists, and other healthcare professionals.

Future research should aim to unify criteria for transverse maxillary measurement to enable comparison of diagnostic methods across clinical studies, promoting a standardized global parameter and

improving data objectivity in research related to dentomaxillary anomalies.

Conflicts of Interest

The authors declare no conflicts of interest related to the publication of this article.

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Correspondencia: Elizabeth Paucar Toribio, correo: elizabethpt156@gmail.com