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Review Article

Mouth Breathing Across the Lifespan: Interdisciplinary Perspectives in Prosthodontics and Digital Dentistry A Narrative Review

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Abstract

Mouth breathing is a frequent functional disorder in children and adolescents and is commonly associated with upper-airway obstruction, altered orofacial muscle balance, and abnormal dentofacial growth. Although the topic is usually discussed in pedodontics, orthodontics, and otolaryngology, its long-term consequences are also relevant to prosthodontics, because untreated cases may reach adulthood with constricted arches, an altered vertical facial pattern, malocclusion, oral dryness, and functional instability that complicate rehabilitation. Contemporary meta-analyses confirm that mouth breathers differ from nasal breathers in measurable craniofacial parameters, including reduced SNA and SNB angles and increased vertical facial dimensions. At the same time, digital dentistry has improved the documentation and planning of such patients through intraoral scanning, selective cone-beam computed tomography (CBCT), CAD/CAM workflows, and three-dimensional data integration. This narrative review presents a concise interdisciplinary overview of the causes of mouth breathing, the craniofacial and prosthodontic implications of persistent childhood cases, and the role of digital dentistry—including emerging artificial-intelligence and additive-manufacturing applications—in diagnosis and treatment planning.

Keywords: Mouth Breathing; Prosthodontics; Digital Dentistry; Interdisciplinary Care; CBCT; Intraoral Scanning; Craniofacial Development

Abbreviations

CBCT: Cone-beam Computed Tomography; CAD/CAM: Computer-aided Design/Computer-Aided Manufacturing; IOS: Intraoral Scanner; TMD: Temporomandibular Disorder; OSA: Obstructive Sleep Apnea; VDO: Vertical Dimension of Occlusion; SNA/SNB: Cephalometric Skeletal Angles; MD: Mean Difference; CI: Confidence Interval.

Introduction

Mouth breathing is more than a habit. It is often a clinical sign of impaired nasal function, altered airway physiology, or a persistent dysfunctional breathing pattern [1,2,7]. During growth, this shift from nasal to oral breathing can modify lip posture, tongue position, mandibular posture, and muscle balance, which in turn influences dentofacial development [2,5,12].

The subject is highly relevant to prosthodontic practice. Adult patients may present not with the original childhood diagnosis, but with its sequelae: a narrow maxillary arch, increased lower facial height, occlusal imbalance, tooth wear, dry mouth, esthetic disharmony, and sometimes temporomandibular symptoms [3-5]. This makes mouth breathing an interdisciplinary topic that deserves a clearer place in prosthodontic diagnosis and treatment planning [1,16].

Materials and Methods

This article is a narrative review. Relevant English-language literature was identified through PubMed/MEDLINE, Scopus, and Google Scholar using combinations of the terms "mouth breathing," "oral breathing," "craniofacial development," "malocclusion," "prosthodontics," "digital dentistry," "intraoral scanning," and "CBCT," supplemented by hand-searching of reference lists. Priority was given to systematic reviews, meta-analyses, and recent primary studies. Because direct evidence linking mouth breathing to adult prosthodontic outcomes is limited, some clinical inferences are necessarily extrapolated from pediatric, orthodontic, and prosthodontic sources and are presented as such.

Why this topic matters to prosthodontists

The clinical value of this topic becomes clear when it is viewed across the patient's life course.

- Childhood mouth breathing may influence maxillary width, palatal form, overjet, overbite, posterior crossbite, and facial growth direction [2,5,6].
- These changes may persist into adulthood and affect restorative space, occlusal design, esthetics, and adaptation to prosthetic treatment [3,4,11].
- Mouth breathing may also contribute to oral dryness, reduced comfort, and soft-tissue problems that are relevant to fixed, removable, and implant prosthodontics [7,12,13].
- Prosthodontists are often the first to see the adult consequences, even when the airway problem was never fully addressed in childhood [3,4].

Etiology of mouth breathing

Mouth breathing is usually multifactorial rather than purely behavioral [1,7]. Common etiologic factors include adenoidal hypertrophy, tonsillar enlargement, allergic rhinitis, turbinate hypertrophy, septal deviation, chronic nasal inflammation, and other causes of nasal obstruction [1,2,7]. In a cross-sectional study of 401 mouth-breathing children, obstruction was attributable to adenotonsillar hypertrophy in 71.8%, to allergic rhinitis in 18.7%, and was non-obstructive (habitual) in 9.5% of cases [22]. Some patients continue to breathe orally even after the initial obstruction decreases, because the dysfunctional neuromuscular pattern becomes habitual [2,8].

This is why diagnosis should not be reduced to a dental observation alone. A child with chronic open-lip posture, snoring, dry lips, gingival inflammation, a narrow maxilla, or a high-vaulted palate may need airway evaluation rather than only dentofacial correction [1,2,8]. An interdisciplinary model is therefore essential [1].

Dentofacial changes linked to mouth breathing

The literature consistently reports a recognizable dentofacial pattern in chronic mouth breathers, even though the strength of the association varies across studies [2,9,12].

Common findings

- Increased lower anterior facial height [2,6,10].
- Backward and downward rotation of the mandible [5].
- High palatal vault and maxillary constriction [2,4,10].
- Increased overjet and a greater prevalence of posterior crossbite [5,6].
- Lip incompetence and an altered anterior oral seal [5,9].

A retrospective orthodontic study found that mouth breathers had significantly more posterior crossbite and a more abnormal oral seal than nasal breathers, along with narrower arches and clockwise mandibular rotation [5]. More recent cephalometric research in children has reported an increased mandibular plane angle and increased vertical facial dimensions in mouth-breathing groups [6]. Reviews published in recent years continue to support the association between mouth breathing and altered craniofacial growth, especially maxillary narrowing and a vertical growth tendency [2,9,10].

Study (design)	Sample	Key quantitative findings
Zheng., *et al.* 2020 — systematic review and meta-analysis [20]	19 studies (18 pooled)	MB vs NB: ↓SNA (MD −1.33°, 95% CI −2.03 to −0.63) and ↓SNB (MD −1.33°, −2.18 to −0.49); ANB not significantly different; ↑mandibular plane angle and ↑total/lower anterior facial height; ↓posterior facial height — a retrognathic, backward-rotated vertical pattern
Zhao., *et al.* 2021 — systematic review and meta-analysis [21]	10 studies; 1,358 children (643 MB/715 NB)	↓SNA (MD −1.63°) and ↓SNB (MD −1.96°); ↑ANB (+0.90°); ↑vertical measures (PP-MP +4.92°, SN-GoGn +4.10°); ↓upper airway (SPAS −3.48 mm, PAS −2.11 mm).
Harari., *et al.* 2010 — retrospective cephalometric [5]	Orthodontic patients (MB vs NB)	Posterior crossbite in 49% of MB vs 26% of NB; narrower arches; clockwise (backward-downward) mandibular rotation; more frequent abnormal oral seal.
Souki., *et al.* 2009 — cross-sectional [22]	401 mouth-breathing children	Posterior crossbite in 30% (mixed dentition), rising to 48% (permanent dentition); wide variability in malocclusion — not all mouth breathers show the "classic" pattern.
Chowdhary., *et al.* 2024 — cephalometric [6]	Children aged 6–14 y	Increased mandibular plane angle and vertical facial dimensions in MB versus controls.
Kandasamy 2025 — critical appraisal [26]	Narrative/critical review	Highlights that the evidence is largely associative and cross-sectional and questions a direct causal link, underscoring the need for prospective controlled data.

Table 1: Representative evidence on the craniofacial and dentofacial effects of mouth breathing (MB) versus nasal breathing (NB).

MD = mean difference; CI = confidence interval.

Prosthodontic implications in adulthood

The adult consequences are especially relevant and clinically engaging for a prosthodontic readership [3,4].

Chairside concerns

- A constricted arch form may complicate tooth arrangement, occlusal reconstruction, and esthetic planning [3,4].
- An altered vertical facial pattern may affect decisions regarding vertical dimension and full-mouth rehabilitation [3,5].
- Oral dryness may reduce comfort and compromise mucosal tolerance in removable prosthodontics [7,12,13].
- Coexisting parafunction or temporomandibular symptoms may require staged and cautious treatment planning [3,16].

In practical terms, the prosthodontist should not only ask what prosthesis the patient needs, but also whether airway-related dysfunction has shaped the existing dentofacial condition [4,16]. This broader view can influence referral timing, provisionalization, occlusal reorganization, and the long-term stability of treatment [3,16].

Table 2 maps commonly reported childhood dentofacial changes to their plausible adult prosthodontic consequences and management considerations. Because direct longitudinal evidence remains limited, these links are best regarded as clinically reasoned extrapolations from the pediatric, orthodontic, and prosthodontic literature rather than established outcomes [3,4,26].

Interdisciplinary diagnostic approach

No single specialist can fully manage these cases; an interdisciplinary team is essential [1,8].

Reported childhood/developmental change	Plausible adult prosthodontic consequence	Management consideration
Maxillary transverse constriction/high palatal vault	Narrow arch and crossbite tendency; limited space for ideal tooth arrangement	Consider (surgically assisted) expansion or prosthetic compensation before definitive restoration
Increased lower anterior face height/backward mandibular rotation	Skeletal open-bite tendency; uncertainty in occlusal vertical dimension	Careful VDO assessment; multidisciplinary/orthognathic input in full-mouth rehabilitation
Increased overjet/Class II tendency	Anterior esthetic and functional compromise	Guidance-of-occlusion and esthetic planning; provisionalization to test function
Lip incompetence, poor oral seal, oral dryness	Reduced mucosal tolerance and denture retention; higher caries/periodontal risk	Saliva management, material selection, hygiene-friendly design, reinforced maintenance
Coexisting sleep-disordered breathing/parafunction/TMD	Instability of occlusal schemes; bruxism-related restoration failures	Airway/sleep referral first; staged, reversible, splint-protected treatment

Table 2: From childhood dentofacial change to adult prosthodontic implication: a clinical synthesis.

VDO = vertical dimension of occlusion; TMD = temporomandibular disorder.

Key team members

- **Pedodontist:** Early recognition of oral signs, growth disturbance, and developing malocclusion [1,8].
- **ENT surgeon:** Identification of adenoids, tonsils, septal deviation, turbinate hypertrophy, and other sources of airway obstruction [1,8].
- **Orthodontist:** Evaluation of arch constriction, occlusal development, and interceptive correction [4,9].
- **Sleep physician:** Assessment when snoring, sleep disturbance, or sleep-disordered breathing is suspected [16].
- **Prosthodontist:** Recognition of adult sequelae and planning of rehabilitation within a function-first framework [3,16].

Diagnostic roadmap

- **Identify clinical signs:** Open-mouth posture, lip incompetence, snoring, narrow maxilla, posterior crossbite, high-vaulted palate, and facial elongation [1,2,8].
- Determine whether the case is obstructive, habitual, or mixed [1,8].
- Record dentofacial and functional findings with appropriate clinical and digital tools [15,16].
- Stabilize airway and functional issues before irreversible rehabilitation whenever possible [3,16].

Role of digital dentistry

Digital dentistry adds major value because it captures morphology, occlusion, and skeletal relationships with better reproducibility and communication potential [16,18].

Key digital tools

- **Intraoral scanning**: Captures arch form, palatal contour, occlusion, and wear patterns with high efficiency [13-15].
- **CBCT:** Supports selective assessment of skeletal pattern, airway anatomy, arch-width discrepancy, and temporomandibular joint osseous structures [16].
- **CAD/CAM workflows**: Assist in digital wax-up, occlusal splints, provisionals, guides, and prosthesis fabrication [13,17].
- **3D data integration**: Improves interdisciplinary communication by combining intraoral, facial, and radiographic records [15,16].

Digital impressions have shown accuracy comparable to conventional impressions in many prosthodontic applications, although indication, span length, and operator skill still matter [14,15]. A 2024 systematic review and meta-analysis of full-arch scanning [9 studies] reported a pooled digital-versus-conventional discrepancy of approximately 152 μm and concluded that intraoral-scan accuracy falls within clinically acceptable thresholds for many indications [23]; a further systematic review likewise found no statistically significant accuracy difference between digital and conventional impressions [15]. In removable prosthodontics, intraoral scanning has been described for complete dentures, partial dentures, overdentures, maxillofacial prostheses, and splints, but standardized protocols are still evolving [13]. This is particularly useful in airway-linked patients, in whom altered anatomy, dryness, and occlusal instability may make conventional workflows less efficient [13,19]. Table 3 contrasts the current evidence and the emerging possibilities for each tool.

Technology	Current evidence/status	Emerging and future possibilities
Intraoral scanning (IOS)		Chairside capture of palatal morphology and arch width for longitudinal growth/airway monitoring; automated arch-width and palatal-volume analytics; feed into a 3D “virtual patient.”
CBCT (upper airway)	Enables selective airway and skeletal assessment; must be used judiciously (radiation) and interpreted with clinical and sleep data [16].	AI-assisted automatic 3D airway segmentation and volumetric analysis reduces analysis time and observer variability [24]; machine-learning OSA-risk stratification.
CAD/CAM and 3D printing	Established for wax-ups, provisionals, splints, guides, and prostheses [13,17].	Digital design and 3D-printed/CAD–CAM mandibular advancement and oral appliances for snoring and mild-to-moderate OSA [25]; in-office additive manufacturing of airway appliances.
Facial scanning + data fusion	Increasingly combined with intraoral and radiographic records [15,16].	Fusion into a 3D/4D “virtual patient”/digital twin integrating face, occlusion, and airway; dynamic (functional) airway simulation.
Teledentistry/AI analytics	Emerging; not yet standardized [18].	AI triage of dentofacial/airway risk, remote monitoring of appliance therapy, and predictive treatment-planning support [18].

Table 3: Digital tools in airway-focused prosthodontics: current evidence and emerging directions.

Future directions in digital and airway-focused prosthodontics

Several developments are likely to reshape how airway-linked patients are documented and treated. First, artificial intelligence is moving CBCT airway analysis from a manual, operator-dependent task toward automated three-dimensional segmentation and volumetric quantification; systematic reviews report that AI tools can reproduce expert airway measurements while substantially reducing analysis time and inter-observer variability, and machine-learning models are being explored to stratify obstructive sleep apnea (OSA) risk [24]. Second, the fusion of intraoral scans, extraoral facial scans, and CBCT into a single three-dimensional “virtual patient” (or digital twin) allows airway, skeletal, occlusal, and esthetic information to be planned together, with dynamic four-dimensional simulation on the horizon [16]. Third, digital design and additive manufacturing now enable CAD/CAM and 3D-printed mandibular advancement and oral appliances for snoring and mild-to-moderate OSA, bringing airway therapy directly into the prosthodontic–digital workflow [25]. Finally, teledentistry and AI-assisted analytics may support remote screening, triage, monitoring of appliance therapy, and predictive treatment planning [18]. These tools remain investigational for mouth-breathing-specific prosthodontic care and require prospective validation, but together they define a concrete research-and-development agenda for the field.

CBCT: Useful but not universal

CBCT warrants a balanced and judicious discussion [16]. It can improve evaluation of upper-airway morphology, craniofacial asymmetry, skeletal discrepancy, and temporomandibular osseous changes [16]. However, it should be used selectively and ethically, not as a routine screening method for all mouth-breathing patients [16].

Static imaging cannot, by itself, diagnose the functional behavior of the airway during sleep [16]. For this reason, CBCT findings must always be interpreted together with symptoms, history, clinical examination, and interdisciplinary referral [16]. Artificial-intelligence-assisted segmentation may improve the consistency of airway measurement, but it does not remove the need for clinical and sleep correlation [24]. This nuanced approach strengthens both the scientific quality and the clinical credibility of the diagnostic assessment [16].

A practical clinical sequence

If detected in childhood

- Screen for oral and facial signs [1,2,8].
- Refer for ENT assessment when nasal obstruction is suspected [1,8].
- Correct the underlying airway problem when possible [1].
- Combine with habit correction, myofunctional support, and orthodontic guidance where indicated [1,8,9].

If first recognized in adulthood

- Document facial pattern, occlusion, wear, oral dryness, airway symptoms, and TMJ status [3,16].
- Use digital records for baseline documentation and multidisciplinary discussion [15,16].
- Refer active airway or sleep concerns before definitive rehabilitation [16].
- Plan prosthodontic treatment in phases, especially in full-mouth rehabilitation and parafunctional cases [3,16].

Limitations in the available literature

The current evidence is informative but not ideal [2,9]. Many studies are cross-sectional, retrospective, or cephalometric, and diagnostic definitions of mouth breathing are not always uniform [2,9,12]. There is also a clear imbalance in the literature: pediatric orthodontic consequences are well discussed, while direct evidence on adult prosthodontic outcomes remains limited [3,9,11].

Similarly, the digital dentistry literature is robust for workflow applications but still sparse for mouth-breathing-specific prosthodontic outcomes [13,15,16]. The causal direction between mouth breathing and dentofacial change is also still debated, and the prosthodontic links proposed here, summarized in Tables 1 and 2 , should be tested in prospective, controlled studies [26]. This gap offers a useful direction for future interdisciplinary research [3,16].

Conclusion

Mouth breathing should be understood as a life-course functional disorder with airway, dentofacial, and restorative implications [1,2]. What begins as a pediatric airway or habit problem may later appear in prosthodontic practice as occlusal disharmony, an altered facial growth pattern, restorative instability, and treatment complexity [3-5]. The strongest clinical approach is interdisciplinary, with pedodontists, ENT surgeons, orthodontists, sleep specialists, and prosthodontists contributing at different stages of care [1,8,16]. Digital dentistry supports this model by making diagnosis, communication, and rehabilitation more precise through intraoral scanning, selective CBCT, CAD/CAM planning, and integrated digital records [13,15,16], and artificial intelligence, virtual-patient integration, and 3D-printed airway appliances are poised to extend these capabilities further [24,25].

The authors declare no conflict of interest.

Conflict of Interest

None.

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