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Early Dental Identification and Multidisciplinary Management of Severe Pediatric Obstructive Sleep Apnea: A Case Report

Selsebil Laajimi, Rihab Mabrouk, Yamina Elelmi, Fatma Masmoudi, Ahlem Baaziz

Faculty of Dental Medicine of Monastir, University of Monastir, Monastir, Tunisia

Corresponding author: drlaajimiselsebil@gmail.com

ABSTRACT Pediatric obstructive sleep apnea (OSA) represents a significant yet often underdiagnosed respiratory disorder associated with adverse neurocognitive, cardiovascular, and developmental outcomes. Despite its clinical importance, early detection remains challenging, particularly in cases where symptoms overlap with common pediatric conditions. This study aims to highlight the critical role of pediatric dental assessment in the early identification and multidisciplinary management of severe OSA through a detailed case report. An 8-year-old male patient was referred for dental malpositions and molar-incisor hypomineralization. Comprehensive clinical, radiographic, and functional evaluations revealed craniofacial abnormalities indicative of airway obstruction. Screening using a validated pediatric questionnaire suggested OSA, which was subsequently confirmed by ventilatory polygraphy, demonstrating a severe apnea–hypopnea index (AHI) of 34.5 events/hour. A multidisciplinary treatment approach was implemented, including rapid maxillary expansion, mandibular advancement orthosis, nasal dilation, and myofunctional therapy. Due to limited access to polysomnography, follow-up relied on clinical observations and caregiver-reported outcomes. After six months, the patient exhibited notable improvements in respiratory function, sleep quality, and daytime alertness, along with enhanced facial aesthetics and oral function. These findings are consistent with existing evidence supporting orthodontic and functional interventions in managing pediatric OSA, particularly in cases associated with craniofacial abnormalities. In conclusion, this case underscores the pivotal role of pediatric dentists as frontline healthcare providers in recognizing early signs of OSA and initiating timely referrals. Integrating dental assessments into routine screening protocols can facilitate early diagnosis and coordinated multidisciplinary care, ultimately improving patient outcomes and preventing long-term complications.

INDEX TERMS Pediatric Obstructive Sleep Apnea, Early Diagnosis, Multidisciplinary Management, Rapid Maxillary Expansion, Mandibular Advancement Orthosis

I. INTRODUCTION

Pediatric obstructive sleep apnea (OSA) is a common yet frequently underdiagnosed sleep-related breathing disorder characterized by recurrent episodes of partial or complete upper airway obstruction during sleep. These events lead to intermittent hypoxia, sleep fragmentation, and impaired physiological regulation, which may result in significant neurocognitive, behavioral, cardiovascular, and growth disturbances in children. Despite its clinical importance, early identification remains a major challenge because symptoms such as snoring, mouth breathing, and daytime fatigue are often nonspecific and frequently overlooked in routine clinical assessments. Consequently, many pediatric OSA cases are diagnosed only after complications emerge, highlighting a critical gap in early detection strategies [1]–[4].

From a state-of-the-art perspective, nocturnal polysomnography (PSG) is widely recognized as the gold standard for diagnosing pediatric OSA and determining its severity. However, PSG is costly, time-consuming, and requires specialized facilities, limiting its accessibility in many clinical settings, particularly in low- and middle-income regions. To address these limitations, alternative diagnostic approaches such as ventilatory polygraphy, validated screening questionnaires, and artificial intelligence-based detection systems have been increasingly explored to enhance early detection and accessibility [5]–[9]. In terms of treatment, contemporary management emphasizes a multidisciplinary approach involving medical, surgical, and orthodontic interventions. Rapid maxillary expansion (RME) and mandibular advancement orthoses (MAO) have shown promising outcomes in improving airway patency, reducing apnea–hypopnea index (AHI), and enhancing quality of life, especially in children with craniofacial abnormalities [10]–[15].

Despite these advances, several important research gaps remain. First, most existing studies primarily focus on therapeutic outcomes rather than early detection, particularly within dental settings where craniofacial indicators of OSA

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may first be observed. Second, the integration of pediatric dental evaluation into routine OSA screening protocols remains limited, despite strong evidence linking malocclusion, maxillary constriction, and airway obstruction. Third, there is a lack of evidence addressing practical multidisciplinary management strategies in resource-constrained settings, especially where access to PSG is restricted. These gaps underscore the need for clinically oriented studies that emphasize early identification and feasible management approaches [16]–[18].

Therefore, this study aims to demonstrate the role of pediatric dental assessment in the early identification and multidisciplinary management of severe pediatric OSA through a detailed case report. Specifically, this study illustrates how clinical, radiographic, and functional evaluations can contribute to diagnosis and guide intervention, even in the absence of comprehensive sleep laboratory resources.

This study offers several key contributions. First, it highlights the critical role of pediatric dentists as frontline healthcare providers in identifying early craniofacial and functional indicators of OSA. Second, it presents a structured multidisciplinary management strategy integrating orthodontic, medical, and behavioral interventions tailored to the patient's condition. Third, it provides practical insights into managing severe pediatric OSA in resource-limited settings, thereby contributing to more accessible and adaptable care models [19], [20].

The remainder of this article is structured as follows. The Introduction outlines the background, research gaps, and study objectives. The Case Presentation section describes the patient's clinical findings and diagnostic pathway. The Management and Results sections detail the interventions and outcomes. The Discussion section interprets the findings in relation to existing literature, including limitations and implications. Finally, the Conclusion summarizes the key findings and suggests directions for future research.

II. METHOD

A. STUDY DESIGN AND REPORTING STANDARD

This study employed a descriptive case report design to illustrate the early dental identification and multidisciplinary management of severe pediatric obstructive sleep apnea (OSA). The report was developed in accordance with the CARE (CAse REport) guidelines, which provide a standardized framework to ensure transparency, completeness, and reproducibility in clinical case reporting [21], [22]. The methodological approach emphasized detailed documentation of clinical findings, diagnostic procedures, therapeutic interventions, and follow-up outcomes to facilitate replication in similar clinical contexts.

B. STUDY SETTING AND SUBJECT

The study was conducted at the Department of Pediatric Dentistry and Prevention at a university-affiliated dental clinic. The subject was an 8-year-old male patient presenting for his first dental consultation with chief complaints of dental malposition and enamel defects consistent with molar-incisor hypomineralization (MIH). The patient had no prior orthodontic treatment history. Medical history revealed previous adenotonsillectomy at the age of five, without documented follow-up of respiratory function.

This study is classified as a retrospective observational case report, as it analyzes clinical data obtained during routine patient care without experimental manipulation or randomization. Case reports remain valuable in identifying clinical patterns, generating hypotheses, and documenting rare or complex presentations in pediatric OSA [23].

C. CLINICAL AND FUNCTIONAL

A comprehensive clinical examination was performed, including extraoral, intraoral, and functional evaluations. Extraoral assessment focused on facial morphology, lip competence, and breathing patterns. Intraoral examination evaluated dental occlusion, arch form, and presence of malocclusion, including crowding, ectopic eruption, and palatal constriction. Functional assessment included observation of oral breathing, swallowing patterns, and orofacial muscle tone.

Parental interviews were conducted to obtain information regarding sleep-related symptoms, including snoring, witnessed apnea, restless sleep, and daytime somnolence. A validated pediatric OSA screening questionnaire recommended by the American Academy of Pediatric Dentistry (AAPD) was utilized to support clinical suspicion [24]. Such screening tools are widely recognized for improving early detection in non-specialized settings [25].

D. RADIOGRAPHIC EVALUATION

Radiographic investigations included a panoramic radiograph and a lateral cephalometric radiograph. The panoramic radiograph was used to assess dental development, eruption patterns, and structural anomalies. The lateral cephalometric analysis evaluated skeletal relationships and airway dimensions, including parameters such as ANB angle, SNB angle, and posterior airway space. Cephalometric assessment is considered a reliable adjunct for identifying craniofacial risk factors associated with airway obstruction in pediatric OSA [26].

E. SLEEP ASSESMENT AND DIAGNOSIS

Following clinical suspicion of OSA, the patient was referred for ventilatory polygraphy, which served as an alternative to polysomnography (PSG) due to limited availability. Polygraphy recorded respiratory parameters including airflow, oxygen saturation, respiratory effort, and heart rate. The apnea–hypopnea index (AHI) was calculated to determine disease severity. An AHI value of 34.5 events/hour confirmed severe pediatric OSA, based on established diagnostic criteria [27]. Although PSG remains the gold standard, polygraphy is increasingly accepted as a practical diagnostic tool in resource-limited environments [28].

F. MULTIDISCIPLINARY INTERVENTION PROTOCOL

A multidisciplinary treatment approach was implemented, involving collaboration between pediatric dentists, orthodontists, and otolaryngologists. The intervention consisted of:

1. **ENT Evaluation:** The patient was referred to an otolaryngologist to assess potential residual airway

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obstruction. Medical management included nasal corticosteroid therapy to reduce inflammation and improve nasal airflow.

2. Orthodontic Treatment:

a. Rapid Maxillary Expansion (RME): A palatal expander was used to widen the maxillary arch and increase nasal cavity volume. Activation followed a standardized protocol (0.25 mm per turn, twice daily) until adequate expansion was achieved.

b. Mandibular Advancement Orthosis (MAO): A custom appliance was fabricated to reposition the mandible anteriorly, thereby enlarging the upper airway space.

3. Adjunctive Therapy:

a. Nasal Dilator: Applied during sleep to enhance nasal breathing.

b. Myofunctional Therapy: Included structured exercises targeting lip closure, tongue posture, and nasal breathing to improve orofacial muscle function.

This combined protocol reflects current evidence supporting integrated orthodontic and functional approaches in pediatric OSA management.

G. FOLLOW UP AND OUTCOME EVALUATION

Follow-up evaluation was conducted at six months post-intervention. Outcome measures included clinical examination, functional assessment, and caregiver-reported improvements in sleep quality, snoring frequency, and daytime alertness. Due to resource limitations, repeat polygraphy or PSG was not performed. However, clinical indicators and parental observations were systematically documented to assess treatment effectiveness.

III. RESULTS

This case report adheres to the CARE (CAse REport) guidelines to ensure clarity and completeness. Patient History: An 8-year-old boy was referred to the Pediatric Dentistry and Prevention Department at Monastir Dental Clinic for evaluation of dental malpositions and molar-incisor hypomineralization (MIH). This was his first dental consultation, with no prior interventions during the primary dentition phase.

FIGURE 1. Frontal Extraoral Photo Revealed an Elongated, Pale Face and Dry Lips

A. CLINICAL EXAMINATION

1. Extraoral findings: The patient presented with a pale, elongated facial profile, pinched nasal base, persistent open-mouth posture, and dry lips FIGURE 1.
2. Intraoral findings: Examination revealed a high, narrow palate and multiple dental malpositions, including palatal displacement of the permanent lateral incisors and ectopic eruption of the permanent canines FIGURE 2a. The mandibular arch showed incisor crowding and palatal inclination of the molars FIGURE 2b.
3. Functional assessment: Clinical observation and parental reporting confirmed chronic oral breathing and swallowing dysfunction, consistent with orofacial hypotonia.

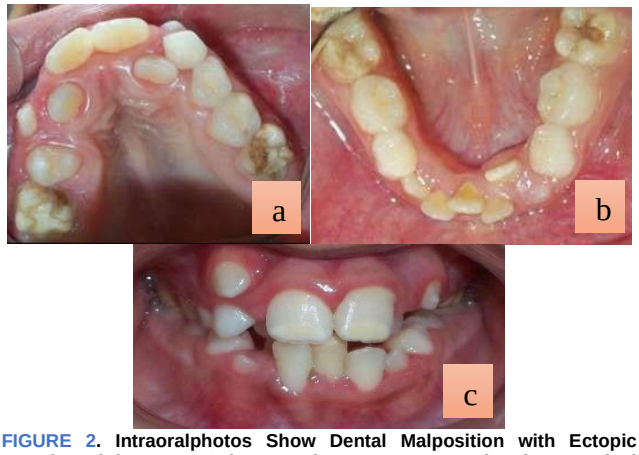

FIGURE 2. Intraoralphotos Show Dental Malposition with Ectopic Eruption of the Upper Cainnes and Permanent Lateral Incisors, Ovigal and Deep Palate
(a) Maxila Arch
(b) Mandibular Arch
(c) Arches in Occlusion

FIGURE 3. Panoramic Radiograph Showed a Significant Sign of Dento-Maxillary Disharmony, an Obstruction in the Right Upper Airway

FIGURE 4. Profile Radiograph Shows a Skeletal Class II (ANB=6°). Mandibular (SNB=74°), a Reduced Aerodigestive Crossroads

B. RADIOGRAPHIC ASSESMENT

1. Panoramic radiograph: Demonstrated dento-maxillary disharmony and partial obstruction of the upper right airway FIGURE 3.

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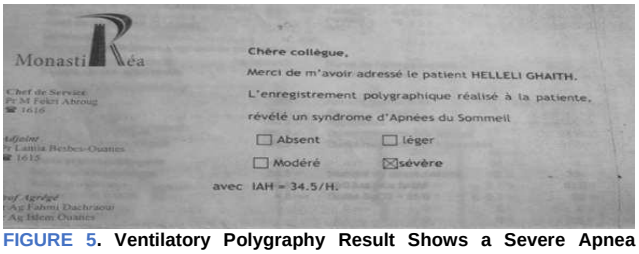
2. Lateral cephalometric radiograph: Revealed a skeletal Class II malocclusion (ANB = 6°) due to mandibular retrusion (SNB = 74°), along with a reduced aerodigestive airway space FIGURE 4.

Medical History The patient had undergone adenotonsillectomy and amygdalotomy at age five, with no documented follow-up regarding respiratory function.


Monasti Réa

Chère collègue,

Merci de m'avoir adressé le patient HELLELI GHAITH.

L'enregistrement polygraphique réalisé à la patiente,

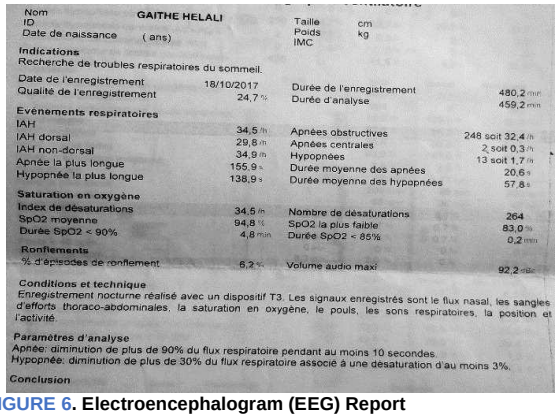
révélé un syndrome d'Apnées du Sommeil

☐ Absent ☐ léger

☐ Modéré ☒sévère

avec IAH = 34.5/H.

FIGURE 5. Ventilatory Polygraphy Result Shows a Severe Apnea Syndrome with AHI=34.5H≥10


Nom GAITHE HELALI
ID
Date de naissance (ans)
Taille cm
Poids kg
IMC

Indications
Recherche de troubles respiratoires du sommeil.

Date de l'enregistrement	18/10/2017	Durée de l'enregistrement	480,2 mn
Qualité de l'enregistrement	24,7 %	Durée d'analyse	459,2 mn

Evènements respiratoires

IAH	34,5 /h	Apnées obstructives	248 soit 32,4 /h
IAH dorsal	29,8 /h	Apnées centrales	2 soit 0,3 /h
IAH non-dorsal	34,9 /h	Hypopnées	13 soit 1,7 /h
Apnée la plus longue	155,9 s	Durée moyenne des apnées	20,6 s
Hypopnée la plus longue	138,9 s	Durée moyenne des hypopnées	57,8 s

Saturation en oxygène

Index de désaturations	34,5 /h	Nombre de désaturations	264
SpO2 moyenne	94,8 %	SpO2 la plus faible	83,0 %
Durée SpO2 < 90%	4,8 mn	Durée SpO2 < 85%	0,2 mn

Ronflements

% d'épisodes de ronflement	8,2 %	Volume audio maxi	92,2 dBc

Conditions et technique
Enregistrement nocturne réalisé avec un dispositif T3. Les signaux enregistrés sont le flux nasal, les sangles d'efforts thoraco-abdominales, la saturation en oxygène, le pouls, les sons respiratoires, la position et l'activité.

Paramètres d'analyse
Apnée: diminution de plus de 90% du flux respiratoire pendant au moins 10 secondes.
Hypopnée: diminution de plus de 30% du flux respiratoire associé à une désaturation d'au moins 3%.

Conclusion

FIGURE 6. Electroencephalogram (EEG) Report

FIGURE 7. Rapid Maxillary Expansion (RME) Using a Palatal Expander to Open the Midpatal Suture, Thereby Increasing Nasal Cavity Volume and Reducing Airway Resistance to Improve Respiratory Function

C. RESEARCH AND MANAGEMENT

During treatment, the child's fatigue and daytime drowsiness prompted further evaluation for obstructive sleep apnea syndrome (OSAS). Screening using a validated questionnaire (AAPD)[5] , indicated possible OSAS, leading to referral for ventilatory polygraphy. The test confirmed severe OSAS (AHI = 34.5) FIGURE 5-6. Treatment steps consisted at:

1. ENT Evaluation by referring the patient to an otolaryngologist to rule out post-surgical recurrence. Medical therapy with nasal corticosteroids was prescribed.

FIGURE 8. Custom-Made Monobloc Mandibular Advancement Orthosis (MAO) Designed to Correct Skeletal Class II and Enhance Upper Airway Patency, Particularly in the Oropharyngeal Region, During Pediatric Growth

FIGURE 9. Patient Wears a Nostril Dilatator to Improve The Quality of Breathing During Sleep

2. Orthodontic Phase using Rapid Maxillary Expansion (RME) with a palatal expander to widen the nasal cavity base and improve airflow FIGURE 7 and a Mandibular Advancement Orthosis (MAO) fabricated to correct mandibular retrusion and enlarge the upper airway dimensions FIGURE 8.
3. Adjunctive Therapy with a Nasal dilator used during sleep to enhance nasal breathing FIGURE 9. Myofunctional therapy was implemented, including lip toning, tongue posture correction, and nasal breathing exercises.

D. FOLLOW UP AND OUTCOMES

At six months, clinical evaluation revealed notable improvements, including enhanced facial aesthetics and lip competence FIGURE 10. According to parental reporting, snoring and breathing pauses had diminished, with better sleep quality and increased daytime alertness. Although objective follow-up via sleep study was not feasible due to resource limitations, clinical indicators suggested meaningful progress. The patient was subsequently referred for long-term orthodontic management.

IV. DISCUSSION

A. INTERPRETATION OF CLINICAL AND DIAGNOSTIG APPROACH

The present case demonstrates that pediatric obstructive sleep apnea (OSA) may initially manifest through

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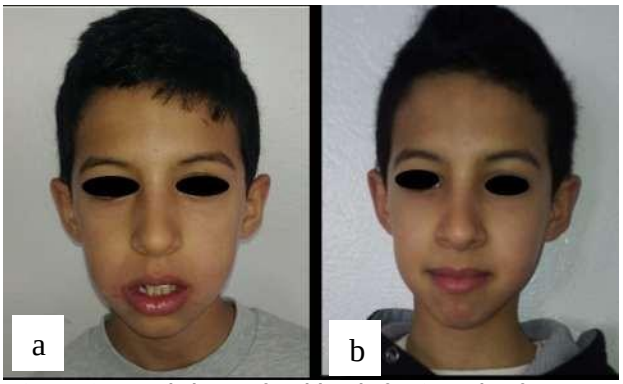

FIGURE 10. Frontal Photo Before (a) and After 6 Months of Treatment (b) a Clear Improvement of Facial Features was Noted

craniofacial and functional abnormalities that are detectable during routine dental examinations. In this patient, clinical indicators such as a narrow maxilla, mandibular retrusion, oral breathing, and atypical swallowing patterns were strongly suggestive of compromised airway function. These findings are consistent with the current understanding that craniofacial morphology plays a central role in the pathophysiology of pediatric OSA, particularly in non-obese children [29].

The confirmation of severe OSA through ventilatory polygraphy, with an apnea–hypopnea index (AHI) of 34.5 events/hour, underscores the clinical relevance of early suspicion based on dental and functional signs. Although polysomnography (PSG) remains the gold standard for diagnosis, its limited availability necessitates the use of alternative tools such as polygraphy, especially in resource-constrained settings. Recent studies indicate that polygraphy, when interpreted by trained professionals, can provide sufficiently reliable diagnostic information for clinical decision-making in pediatric populations [30].

The integration of clinical examination, caregiver-reported symptoms, and radiographic analysis in this case highlights a pragmatic and accessible diagnostic pathway. This approach aligns with recent recommendations advocating for multidisciplinary screening strategies to improve early detection rates of pediatric OSA [31]. The findings suggest that pediatric dentists can play a critical role as primary identifiers of OSA risk, particularly in settings where access to specialized sleep laboratories is limited.

B. COMPARISON WITH EXISTING LITERATURE AND THERAPEUTIC OUTCOMES

The multidisciplinary management strategy employed in this case combining rapid maxillary expansion (RME), mandibular advancement orthosis (MAO), and adjunctive therapies demonstrated clinically meaningful improvements in respiratory function and sleep-related symptoms. These outcomes are consistent with a growing body of evidence supporting the effectiveness of orthodontic interventions in pediatric OSA, particularly in patients with craniofacial abnormalities.

Several recent systematic reviews have reported that RME significantly increases nasal cavity volume, reduces airway resistance, and contributes to reductions in AHI values in children with maxillary constriction [32], [33]. Similarly, mandibular advancement devices have been shown to improve upper airway patency by repositioning the mandible anteriorly, thereby reducing airway collapsibility during sleep [34]. The improvements observed in this case, including reduced snoring, absence of observed apnea, and enhanced daytime alertness, are in line with these findings.

However, it is important to note that the absence of post-treatment polysomnographic data limits the ability to quantitatively compare outcomes with those reported in controlled clinical studies. While caregiver-reported improvements provide valuable insights, objective measurements remain essential for accurately assessing treatment efficacy. Previous studies have emphasized that subjective improvements may not always correlate directly with reductions in AHI, highlighting the importance of objective follow-up whenever feasible [35].

In contrast to studies conducted in high-resource settings, this case illustrates a practical approach to managing pediatric OSA in environments with limited access to advanced diagnostic tools. The reliance on clinical indicators and functional outcomes reflects a real-world scenario, where ideal diagnostic protocols may not always be feasible. This underscores the importance of adaptable and context-specific management strategies.

C. LIMITATION, CLINICAL IMPLICATIONS, AND FUTURE DIRECTIONS

Several limitations should be acknowledged in the present case. First, the absence of post-treatment polysomnography or repeat polygraphy represents a significant constraint, as it prevents objective evaluation of changes in AHI and sleep architecture. Second, the relatively short follow-up period (six months) limits the ability to assess the long-term stability of treatment outcomes. Third, the patient was not followed beyond one year, restricting the evaluation of sustained therapeutic effects and adherence to orthodontic and functional interventions.

Despite these limitations, the case provides important clinical insights. It highlights the feasibility and effectiveness of a multidisciplinary approach integrating dental, orthodontic, and medical interventions in the management of pediatric OSA. The observed improvements in breathing patterns, sleep quality, and daytime functioning suggest that early intervention targeting craniofacial abnormalities can contribute to meaningful clinical benefits.

From a clinical perspective, this case reinforces the need to incorporate OSA screening into routine pediatric dental practice. Early recognition of craniofacial risk factors such as maxillary constriction, mandibular retrusion, and oral breathing can facilitate timely referral and intervention, potentially preventing the progression of OSA and its associated complications. This is particularly relevant given the increasing recognition of the long-term systemic impacts of untreated pediatric OSA, including metabolic and cardiovascular consequences [36].

Future research should focus on longitudinal studies with standardized outcome measures, including pre- and post-treatment polysomnographic evaluation, to better quantify the effectiveness of multidisciplinary interventions. Additionally, the development of accessible and cost-effective screening tools suitable for use in dental settings may further enhance early detection and management.

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V. CONCLUSION

This study aimed to demonstrate the critical role of pediatric dental assessment in the early identification and multidisciplinary management of severe pediatric obstructive sleep apnea (OSA) through a detailed case report. The findings highlight that clinical and radiographic indicators—such as maxillary constriction, mandibular retrusion (SNB = 74°), skeletal Class II relationship (ANB = 6°), and functional abnormalities including oral breathing—can serve as early markers of airway compromise. The diagnosis of severe OSA was confirmed using ventilatory polygraphy, which revealed an apnea–hypopnea index (AHI) of 34.5 events/hour. Following a multidisciplinary intervention combining rapid maxillary expansion, mandibular advancement orthosis, nasal dilation, and myofunctional therapy, notable clinical improvements were observed within six months. These included restoration of lip competence, improved nasal breathing, reduction in snoring and breathing pauses, enhanced sleep quality, and increased daytime alertness based on caregiver reports. Although objective post-treatment sleep data were not available, the consistent clinical and functional improvements indicate a positive therapeutic response. These findings reinforce the importance of early screening by pediatric dentists and the effectiveness of integrated management strategies in improving patient outcomes. Future studies should focus on longitudinal designs with larger sample sizes and incorporate objective assessments such as pre- and post-treatment polysomnography to validate clinical outcomes. Additionally, the development of standardized screening protocols within dental settings may further enhance early detection and intervention in pediatric OSA.

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FUNDING

No.

DATA AVAILABILITY

not applicable.

AUTHOR CONTRIBUTION

All authors contributed significantly to the development of this study. Conceptualization and study design were performed by the primary author. Data collection and clinical management of the patient were carried out by the clinical team. Data analysis and interpretation were conducted collaboratively by all authors. The manuscript was drafted by the primary author and critically reviewed, revised, and approved by all co-authors. All authors have read and agreed to the published version of the manuscript.

DECLARATIONS

ETHICAL APPROVAL

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board (IRB) or Ethics Committee of the affiliated institution prior to the preparation of this case report. Written informed consent was obtained from the patient's legal guardian for participation and publication of clinical data and images. All efforts were made to ensure patient confidentiality and anonymity throughout the study.

CONSENT FOR PUBLICATION PARTICIPANTS

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

COMPETING INTERESTS

None of the authors have a conflict of interest.

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