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Impact of sleep apnea on orthodontic treatment outcomes

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Abstract

The impact of sleep apnea on orthodontic treatment outcomes is an increasingly recognized area of concern in dental and sleep medicine. Sleep apnea, particularly obstructive sleep apnea (OSA), is a sleep disorder characterized by repeated interruptions in breathing during sleep due to airway obstruction. This condition may influence orthodontic treatment results due to its effects on craniofacial structure, airway dynamics, and patient comfort. This paper explores how sleep apnea interacts with various orthodontic treatments, including traditional braces, clear aligners, and functional appliances. Furthermore, it examines how the severity of sleep apnea can alter treatment protocols, lead to delayed progress, or even compromise the long-term stability of orthodontic results. Understanding the relationship between sleep apnea and orthodontic treatment outcomes is crucial for improving treatment efficacy and enhancing patient care. The paper also highlights potential strategies for managing sleep apnea during orthodontic care, such as referral to sleep specialists, monitoring airway health, and incorporating devices like mandibular advancement appliances. Ultimately, addressing sleep apnea in orthodontics will lead to more holistic and successful outcomes for patients with both dental and sleep-related concerns.

Keywords: Sleep Apnea, orthodontic treatment, Obstructive Sleep Apnea (OSA), craniofacial structure, airway dynamics

Introduction

Sleep apnea, particularly obstructive sleep apnea (OSA), is a common and often underdiagnosed condition that significantly affects the quality of life of those who suffer from it. OSA is characterized by intermittent and repetitive obstructions in the upper airway during sleep, leading to brief episodes of breathing cessation and disrupted sleep patterns. Recent research has begun to explore the far-reaching implications of sleep apnea on overall health, particularly its influence on dental and orthodontic outcomes. Orthodontic treatments, including traditional braces, clear aligners, and functional appliances, aim to correct misalignments in teeth and jaws to improve both aesthetic and functional aspects of the dentition. However, the presence of sleep apnea can complicate these treatments, as the condition may alter craniofacial anatomy, airway function, and skeletal growth patterns. For instance, patients with OSA often exhibit certain craniofacial features, such as retrognathia or a narrow palate, which are common in individuals with compromised airways. The interaction between sleep apnea and orthodontic treatment outcomes can result in delayed or suboptimal results, posing a challenge for orthodontists. Additionally, the ongoing management of sleep apnea during treatment is essential to ensure both the success of orthodontic interventions and the overall well-being of the patient. This paper aims to review the impact of sleep apnea on orthodontic treatment outcomes, explore the potential complications, and offer recommendations for managing sleep apnea in orthodontic practice. By better understanding these interactions, dental professionals can optimize treatment plans for patients who present with sleep apnea, ultimately improving both their oral and sleep health.

Literature review

The intersection between sleep apnea and orthodontic treatment outcomes has garnered increasing attention in recent years, as clinicians recognize the potential for sleep-disordered

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breathing to influence orthodontic success. The literature highlights various aspects of how obstructive sleep apnea (OSA) can affect orthodontic treatment, ranging from its impact on craniofacial structure to its effects on treatment stability and patient compliance.

1. **Craniofacial Anatomy and Airway Obstruction:**

Several studies have established a relationship between craniofacial anomalies and sleep apnea. Research indicates that individuals with OSA often present with specific features such as a retrognathic mandible, a narrow maxillary arch, and a high palatal vault (Yuan *et al.*, 2017) ^[1]. These anatomical features may exacerbate airway obstruction and contribute to the development or worsening of sleep apnea. Orthodontic treatments, particularly those aimed at correcting malocclusions, may have to account for these anatomical considerations to avoid compromising the airway further.

2. **Effect of Sleep Apnea on Orthodontic Treatment:** The presence of sleep apnea can influence the progress and outcomes of orthodontic treatment. A study by Guilleminault *et al.* (2015) ^[2] demonstrated that orthodontic appliances may alter airway dynamics, potentially improving or worsening sleep-disordered breathing depending on the type of appliance used. For example, fixed appliances like braces can restrict the airway if the craniofacial structures are not appropriately aligned, while functional appliances designed to reposition the jaw may help improve airway patency and reduce symptoms of sleep apnea.

3. **Treatment Stability and Long-term Outcomes:** Research suggests that orthodontic treatment outcomes may be less stable in patients with untreated sleep apnea. Apnea episodes during sleep can disrupt the natural craniofacial development and remodeling that occurs during orthodontic treatment. This instability can lead to relapse or an incomplete resolution of malocclusions, particularly in growing patients (Proffit *et al.*, 2019) ^[5]. Addressing sleep apnea through adjunctive therapy or modifying orthodontic treatment protocols is vital for ensuring long-term success.

4. **Mandibular Advancement Appliances (MAAs) and Orthodontics:** One of the promising interventions in treating OSA alongside orthodontics is the use of mandibular advancement appliances (MAAs). Several studies have shown that these devices, which reposition the lower jaw to prevent airway collapse, can serve as a complementary treatment alongside orthodontic care. A review by Riley and Guilleminault (2017) ^[3] highlighted the effectiveness of MAAs in alleviating OSA symptoms and improving the airway, which could potentially enhance orthodontic outcomes for patients with OSA.

5. **Patient Management and Multidisciplinary Care:** The importance of a multidisciplinary approach in managing patients with both orthodontic needs and sleep apnea is emphasized in the literature. Collaborating with sleep specialists, pulmonologists, or otolaryngologists (ENT) is critical for optimizing treatment outcomes. Studies show that orthodontists who work in tandem with sleep medicine professionals are better equipped to monitor and address the effects of sleep apnea during orthodontic therapy (Lavigne *et al.*, 2016) ^[6]. Such collaboration ensures that both the orthodontic and sleep-related aspects of the patient's health are managed comprehensively.

6. **Influence of Age and Growth Patterns:** Age and

growth patterns also play a role in how sleep apnea affects orthodontic treatment. In growing patients, the alignment of teeth and jaws may alter craniofacial development, influencing the severity of sleep apnea. Early intervention, particularly with functional appliances that modify jaw growth, may improve both orthodontic and airway outcomes (Cistulli *et al.*, 2015). However, in adult patients, managing sleep apnea during orthodontic treatment requires more careful planning, often involving CPAP therapy or surgical interventions.

In summary, the literature suggests a complex interplay between sleep apnea and orthodontics, where the presence of sleep-disordered breathing can alter treatment outcomes, potentially complicating both the effectiveness and stability of orthodontic care. Clinicians must consider the severity of sleep apnea, its effects on craniofacial structures, and the potential for using adjunctive therapies like MAAs or CPAP devices to optimize treatment outcomes. Future research should continue to explore innovative ways to integrate sleep apnea management into orthodontic care to improve patient outcomes.

Theoretical framework

The theoretical framework for understanding the impact of sleep apnea on orthodontic treatment outcomes draws from several interrelated concepts in orthodontics, sleep medicine, and craniofacial biology. These concepts include airway physiology, craniofacial development, the biomechanics of orthodontic appliances, and the pathophysiology of obstructive sleep apnea (OSA). By integrating theories from these fields, we can better comprehend the influence of sleep apnea on orthodontic treatment and inform clinical practice. Below, we outline the key theoretical constructs that form the foundation of this research.

1. **Airway Physiology and Craniofacial Development:**

The relationship between airway function and craniofacial development is central to understanding how sleep apnea affects orthodontic outcomes. The concept of craniofacial growth and remodeling emphasizes that airway obstructions in early development or adulthood can alter the normal growth patterns of the maxilla, mandible, and associated structures (Proffit *et al.*, 2019) ^[5]. Sleep apnea, particularly when untreated, can lead to adaptive changes in craniofacial anatomy, such as retrognathia (a receded lower jaw) and narrowed maxillary arches, which may predispose individuals to further airway obstruction and complicate orthodontic treatment.

2. **Biomechanics of Orthodontic Appliances:** The biomechanics involved in orthodontic treatment are based on the principle of applying controlled forces to teeth and jaws, resulting in tooth movement and bone remodeling. The application of these forces can alter craniofacial anatomy, which is particularly relevant in patients with sleep apnea. The Biologic Response Theory in orthodontics postulates that mechanical forces exerted by appliances can influence bone resorption and apposition, which are crucial for effective treatment outcomes. In patients with sleep apnea, the presence of airway obstruction or structural changes may interfere with the desired effects of orthodontic appliances, requiring special consideration when planning treatment (Yuan *et al.*, 2017) ^[1].

3. **Pathophysiology of Obstructive Sleep Apnea (OSA):**

Obstructive sleep apnea is characterized by intermittent obstruction of the upper airway during sleep, resulting in reduced airflow and fragmented sleep. The Upper Airway Resistance Syndrome (UARS) model suggests that structural abnormalities in the upper airway, including soft tissue collapse, diminished muscle tone, and skeletal malformations, are primary contributors to OSA. In orthodontic patients, these factors may interact with treatment forces, influencing both the effectiveness and the stability of the results. The Multifactorial Model of OSA posits that genetic, developmental, and environmental factors all play a role in the severity and persistence of OSA. These factors must be considered in orthodontic treatment plans to ensure that orthodontic goals align with the overall management of the airway and sleep disorder.

4. **Mandibular Advancement and Airway Patency:** The use of mandibular advancement appliances (MAAs) is a widely studied approach in treating OSA and is grounded in the theory of airway patency. This concept posits that repositioning the lower jaw forward can help open the airway, improving airflow and reducing apneas. The application of this theory within orthodontics suggests that functional appliances or even braces with mandibular advancement components can potentially alleviate symptoms of sleep apnea while concurrently addressing malocclusions. The Functional Appliance Theory in orthodontics supports this approach, asserting that the repositioning of the jaw and soft tissues can modify airway dimensions and improve overall sleep quality, thus enhancing orthodontic treatment outcomes in patients with OSA (Riley & Guilleminault, 2017)^[3].
5. **Multidisciplinary Care and Collaborative Models:** The Multidisciplinary Approach Theory highlights the importance of collaboration between orthodontists, sleep specialists, and other healthcare professionals in managing patients with both orthodontic needs and sleep apnea. By integrating the expertise of sleep medicine professionals, such as pulmonologists or otolaryngologists, orthodontists can better address the underlying causes of OSA while simultaneously pursuing orthodontic treatment goals. This approach recognizes that sleep apnea management and orthodontic care are interdependent, and the success of one depends on the effective management of the other (Lavigne *et al.*, 2016)^[6].
6. **Growth and Remodeling Theory:** In growing patients, craniofacial development is influenced by genetic and environmental factors. The Growth and Remodeling Theory posits that craniofacial structures are capable of remodeling in response to orthodontic forces, but these changes may be altered in patients with sleep apnea. Early intervention with functional appliances designed to modify jaw growth and improve airway patency can optimize both craniofacial development and sleep quality. In contrast, in adults, where growth has ceased, orthodontic treatments must consider the static nature of the craniofacial skeleton and focus more on managing airway resistance and improving sleep apnea symptoms (Cistulli *et al.*, 2015)^[4].

Influence of sleep apnea on orthodontic treatment outcomes

The results and analysis section aims to evaluate the influence of sleep apnea on orthodontic treatment outcomes based on

existing clinical data, studies, and observed trends in orthodontic practice. Various factors, including airway dynamics, craniofacial development, treatment approaches, and long-term outcomes, contribute to the analysis of how obstructive sleep apnea (OSA) affects orthodontic treatment.

1. **Impact of Sleep Apnea on Craniofacial Structures:** Studies examining the craniofacial features of individuals with sleep apnea show a consistent pattern of anatomical traits that predispose patients to airway obstruction. Notably, patients with OSA often present with a retrognathic mandible (receded lower jaw), high palatal vault, and narrow maxillary arches, which may further compromise airway space (Yuan *et al.*, 2017)^[1]. This anatomical predisposition presents significant challenges for orthodontists in treating these patients, as orthodontic forces that aim to reposition the jaw or align the teeth could worsen the airway obstruction if not carefully monitored.

Analysis: Patients with significant craniofacial abnormalities should undergo thorough assessments to determine the extent to which these features contribute to their sleep apnea. In these cases, orthodontic treatment may need to be modified to address airway concerns alongside dental corrections. For example, using functional appliances that reposition the mandible forward or incorporating modifications to expand the maxillary arch may help improve airway patency while aligning the teeth.

2. **Effect of Sleep Apnea on Orthodontic Treatment Progress:** Research on the impact of sleep apnea on orthodontic treatment progress is limited but suggests that OSA can negatively affect the pace and outcome of treatment. A study by Guilleminault *et al.* (2015)^[2] observed that patients with untreated sleep apnea experienced slower progress in orthodontic treatment, particularly when fixed appliances like braces were used. This was attributed to the fact that OSA can interfere with normal craniofacial growth and development, potentially disrupting the efficacy of orthodontic forces and prolonging treatment times.

Analysis: The presence of OSA could affect the patient's ability to tolerate orthodontic appliances, especially if the condition leads to daytime fatigue or poor sleep quality. In severe cases, the treatment process may need to be adjusted by incorporating more frequent monitoring, reducing force levels, or integrating additional therapies such as CPAP (Continuous Positive Airway Pressure) for better management of the airway.

3. **Mandibular Advancement Appliances (MAAs) and Their Role in Treatment:** Mandibular advancement appliances (MAAs) have been shown to significantly benefit patients with sleep apnea by improving airway patency and reducing the frequency of apneic episodes. The simultaneous use of MAAs and orthodontic appliances could be an effective strategy for treating both OSA and dental malocclusions. In a study by Riley and Guilleminault (2017)^[3], the combination of MAAs and orthodontic treatment led to improvements in both the patient's airway and alignment of teeth, with many patients reporting better sleep quality.

Analysis: The use of MAAs in orthodontics, particularly in

patients with mild to moderate OSA, can provide dual benefits: repositioning the jaw to enhance airway function while also correcting dental misalignments. This dual-purpose approach can lead to more favorable orthodontic outcomes by addressing the root cause of the airway obstruction and allowing orthodontic forces to work more effectively. However, more research is needed to determine the long-term stability and effectiveness of using MAAs in conjunction with traditional orthodontic appliances.

4. Influence of Age and Growth on Treatment

Outcomes: Age has a significant role in determining how sleep apnea affects orthodontic treatment outcomes. In growing children and adolescents, early intervention with orthodontic appliances can correct craniofacial anomalies and prevent the worsening of sleep apnea symptoms. A study by Cistulli *et al.* (2015) [4] showed that early functional appliance therapy in children with OSA led to both improved airway size and favorable dental outcomes.

Analysis: For growing patients, orthodontic treatment that incorporates functional appliances aimed at expanding the upper jaw or advancing the mandible can yield positive results in both dental and airway management. Early diagnosis of sleep apnea and early orthodontic intervention can lead to better long-term outcomes. In contrast, in adults, whose craniofacial growth has stabilized, treatment may be more complex, requiring a combination of orthodontic therapy and CPAP or surgical interventions to manage the airway effectively.

5. Long-term Stability and Relapse: One of the key challenges in orthodontics is ensuring long-term stability of treatment results. Studies indicate that sleep apnea may impact the stability of orthodontic outcomes, particularly when airway issues remain unaddressed. Proffit *et al.* (2019) [5] highlighted that patients with untreated OSA

are at a higher risk of relapse after orthodontic treatment due to ongoing airway obstruction that affects craniofacial structure stability.

Analysis: For patients with persistent OSA, achieving long-term orthodontic stability may require a more comprehensive approach, including the use of retention devices, continued airway management, and possibly the integration of mandibular advancement devices post-treatment. Additionally, regular follow-ups with sleep specialists are necessary to monitor the progression of sleep apnea and adjust treatment protocols as needed.

6. Patient Compliance and Quality of Life: Patient compliance plays a significant role in the success of orthodontic treatment, particularly in those with sleep apnea. Poor sleep quality, daytime fatigue, and discomfort from OSA symptoms can negatively impact a patient’s ability to adhere to orthodontic regimens. Studies show that patients with sleep apnea may experience more difficulties in maintaining their orthodontic appliances, leading to disruptions in treatment (Lavigne *et al.*, 2016) [6].

Analysis: Addressing the symptoms of sleep apnea before or during orthodontic treatment is essential for ensuring patient compliance. Therapies like CPAP, lifestyle modifications, and the use of MAAs may improve sleep quality and overall patient well-being, which, in turn, can enhance the patient’s ability to adhere to orthodontic treatment. Multidisciplinary collaboration between orthodontists and sleep specialists is crucial for improving both compliance and treatment outcomes.

Comparative analysis

Here is a comparative analysis in tabular form summarizing the key factors related to the impact of sleep apnea on orthodontic treatment outcomes:

Factor	Impact on Orthodontic Treatment	Analysis
Craniofacial Anatomy	Patients with sleep apnea often have craniofacial traits like retrognathia, narrow palates, and high palatal vaults that exacerbate airway obstruction.	These anatomical features complicate orthodontic treatment, requiring modifications to treatment plans to avoid worsening airway obstruction.
Orthodontic Treatment Progress	Sleep apnea can slow down the progress of orthodontic treatment, particularly with fixed appliances.	OSA can interfere with craniofacial growth, resulting in slower tooth movement and treatment times. Treatment may need adjustment in force application or appliance types.
Mandibular Advancement Appliances (MAAs)	MAAs improve airway patency by repositioning the mandible, which may help alleviate sleep apnea symptoms and enhance orthodontic outcomes.	MAAs can have dual benefits: improving the airway while correcting dental misalignments. Effective in mild to moderate OSA but requires more research on long-term stability.
Age and Growth Patterns	Early intervention in growing patients can lead to improved airway dimensions and craniofacial development, enhancing orthodontic outcomes.	In children, functional appliances may prevent the worsening of sleep apnea and promote better orthodontic results. In adults, treatment may involve more complex strategies.
Long-term Stability and Relapse	Untreated sleep apnea may contribute to relapse or instability in orthodontic results due to ongoing airway issues.	Ongoing airway management is necessary to maintain stability, including the use of retention devices and adjunctive therapies.
Patient Compliance	Sleep apnea can lead to poor sleep quality and daytime fatigue, affecting patient compliance with orthodontic treatment.	Addressing sleep apnea symptoms may improve patient adherence to orthodontic care, improving treatment outcomes. Collaboration with sleep specialists is essential.
Multidisciplinary Care	Orthodontists working with sleep specialists ensure comprehensive management of both dental and airway concerns.	Collaborative care between orthodontists, sleep specialists, and other healthcare providers ensures optimal management of sleep apnea during orthodontic treatment.

This table provides a comparative overview of the major factors influencing orthodontic treatment in patients with sleep apnea and highlights the need for tailored treatment approaches to improve both dental and airway health

outcomes.

Positive impacts of sleep apnea on orthodontic treatment outcomes

The significance of examining the impact of sleep apnea on orthodontic treatment outcomes lies in the growing recognition of the interconnectedness between oral health and sleep health. Obstructive sleep apnea (OSA) is a common and often undiagnosed condition that not only affects the quality of sleep but also has far-reaching implications for craniofacial development, airway function, and overall health. As orthodontic treatments become more widespread, understanding how sleep apnea can alter or complicate treatment outcomes is crucial for improving patient care and treatment efficacy.

1. **Improved Patient Outcomes:** By understanding the effects of sleep apnea on orthodontic treatment, clinicians can provide more comprehensive care, addressing both dental misalignments and airway health. This integrated approach can lead to improved long-term outcomes, as patients who undergo orthodontic treatment with a focus on managing sleep apnea may experience better overall health, including enhanced sleep quality and reduced symptoms of sleep apnea. Effective management of both conditions can also prevent treatment relapse and ensure lasting improvements in both dental and sleep-related concerns.
2. **Tailored Treatment Plans:** Patients with sleep apnea often require personalized orthodontic treatment plans that consider the severity of their condition, their craniofacial anatomy, and their airway dynamics. Recognizing the interaction between orthodontics and sleep apnea allows for more precise interventions, such as the use of mandibular advancement appliances (MAAs) or incorporating CPAP therapy when necessary. This level of customization helps optimize treatment efficiency, improves patient comfort, and reduces the risk of complications.
3. **Multidisciplinary Collaboration:** The topic emphasizes the importance of a multidisciplinary approach, bringing together orthodontists, sleep specialists, and other healthcare providers to offer holistic care. Collaboration between these specialists is crucial for developing effective treatment plans that manage both sleep apnea and orthodontic needs simultaneously. This approach not only enhances patient outcomes but also strengthens the relationship between dental and medical professionals, leading to a more integrated healthcare system.
4. **Prevention and Early Intervention:** Sleep apnea, if left untreated, can lead to long-term health issues such as cardiovascular disease, hypertension, and cognitive impairments. Orthodontic care presents an opportunity to identify sleep apnea early, especially in children and adolescents, where early intervention can prevent the worsening of both dental and airway-related issues. By integrating sleep apnea screening into routine orthodontic evaluations, orthodontists can help detect the condition early and refer patients for appropriate treatment, potentially preventing more serious complications down the line.
5. **Patient Quality of Life:** Addressing sleep apnea in conjunction with orthodontic treatment can significantly improve a patient's overall quality of life. Sleep apnea is associated with poor sleep, fatigue, and difficulty concentrating, which can affect a patient's daily activities and well-being. When orthodontists and sleep specialists work together to address these concerns, they can help improve not just the patient's dental appearance but also their general health and day-to-day functioning. This

comprehensive care model enhances the patient's overall satisfaction with their treatment and contributes to a more positive healthcare experience.

6. **Relevance to Growing Populations:** As the prevalence of sleep apnea continues to rise globally, particularly with the increasing rates of obesity and other risk factors, the significance of this research becomes even more pressing. A greater number of individuals will seek orthodontic care, many of whom may have undiagnosed or poorly managed sleep apnea. Understanding how to adapt orthodontic treatments to accommodate this growing patient population is essential for the future of orthodontics.

Challenges of sleep apnea on orthodontic treatment outcomes

While the study of the impact of sleep apnea on orthodontic treatment outcomes is crucial for improving patient care, several limitations and challenges must be acknowledged. These limitations can affect the interpretation of findings, the generalization of results, and the practical application of treatment strategies.

1. **Lack of Longitudinal Studies:** One of the primary limitations is the lack of long-term, large-scale longitudinal studies that track the combined effects of sleep apnea and orthodontic treatment over several years. Most studies are short-term and fail to capture the long-term stability of orthodontic outcomes in patients with sleep apnea. The complexity of both conditions makes it challenging to predict how they will evolve over time, making it difficult to establish concrete evidence for sustained treatment success.

Impact: Without long-term data, it is difficult to predict the long-term efficacy of combined treatments (e.g., orthodontics and CPAP therapy) or to identify any potential relapse or complications that may arise years after treatment.

2. **Variability in Sleep Apnea Severity:** Sleep apnea varies significantly in severity among individuals, from mild to severe cases, and this variability complicates the ability to generalize findings. Different treatment protocols and interventions may be required depending on the severity of sleep apnea, but there is a lack of standardized treatment protocols across orthodontic and sleep medicine fields. Furthermore, mild cases of OSA may go undiagnosed or unaddressed, leading to discrepancies in treatment outcomes.

Impact: The wide range in severity makes it difficult to standardize treatment recommendations, leading to variability in outcomes. It also poses a challenge for clinicians to accurately assess the relationship between sleep apnea and orthodontic progress in each individual case.

3. **Difficulty in Diagnosing Sleep Apnea in Orthodontic Patients:** Sleep apnea is often underdiagnosed, especially in individuals who are undergoing orthodontic treatment for non-sleep-related reasons. Many patients do not display overt symptoms of sleep apnea, such as loud snoring or excessive daytime sleepiness, which can lead to missed diagnoses. Orthodontists may not routinely screen for sleep apnea unless there are overt signs, potentially overlooking the impact of the condition on treatment outcomes.

Impact: If sleep apnea is not identified early, orthodontic treatment may proceed without consideration of its effects, potentially leading to suboptimal treatment results or exacerbating airway issues. This also highlights the need for routine screening for sleep apnea in orthodontic practice.

4. Limited Research on Combined Therapies: While there is emerging research on the benefits of combining orthodontic treatment with sleep apnea therapies like CPAP or mandibular advancement appliances (MAAs), there is still a lack of comprehensive studies that analyze the effectiveness of these combined therapies. Many studies focus on either orthodontics or sleep apnea treatment in isolation, which may not reflect the complex realities of managing both conditions simultaneously.

Impact: The absence of studies examining combined therapies limits the ability to develop evidence-based protocols for managing orthodontic treatment in patients with sleep apnea. This lack of guidance may lead to inconsistent treatment approaches or missed opportunities to optimize patient care.

5. Challenges in Treatment Compliance: Patients with sleep apnea often experience fatigue, poor sleep quality, and discomfort, which can reduce their compliance with both sleep apnea therapies (e.g., CPAP use) and orthodontic treatment. Non-compliance is particularly problematic in patients who require both continuous use of CPAP machines and orthodontic appliances. This dual burden can lead to inconsistent results and prolonged treatment times.

Impact: Reduced patient compliance can compromise both the success of sleep apnea treatment and the effectiveness of orthodontic care, leading to suboptimal treatment outcomes and potentially increasing the duration of treatment. Managing patient adherence to both treatment regimens requires significant effort and support.

6. Interdisciplinary Collaboration Challenges: While a multidisciplinary approach between orthodontists, sleep specialists, and other healthcare providers is essential, there are often challenges in communication, coordination, and collaboration between these professionals. Differences in medical and dental approaches, timelines, and priorities can create barriers to effectively managing both conditions. Additionally, not all orthodontists have the necessary knowledge or resources to address sleep apnea or collaborate closely with sleep specialists.

Impact: Lack of coordinated care can result in fragmented treatment, where orthodontic treatment is conducted without full consideration of the patient's sleep apnea status, or sleep apnea is inadequately addressed while undergoing orthodontic treatment. This can ultimately compromise the effectiveness of both treatments.

7. Ethical and Practical Considerations: Implementing sleep apnea treatment alongside orthodontic care raises ethical and practical considerations, particularly in terms of patient costs, accessibility to specialized care, and the invasiveness of certain treatments (e.g., surgical options

or CPAP machines). In some cases, patients may not be able to afford or access both orthodontic and sleep apnea treatments, leading to limitations in comprehensive care.

Impact: Accessibility and affordability issues may prevent patients from receiving integrated care, limiting the potential benefits of treating both orthodontic and sleep apnea concerns simultaneously. Furthermore, invasive or uncomfortable treatments may impact patient adherence to both therapies.

Conclusion

The intersection of sleep apnea and orthodontic treatment outcomes presents a significant challenge in modern orthodontics. As sleep apnea continues to rise in prevalence, especially in patients with craniofacial anomalies or those undergoing orthodontic care, understanding the impact of this condition on orthodontic treatment is essential for ensuring optimal patient outcomes. Sleep apnea can complicate orthodontic treatment by affecting craniofacial development, hindering treatment progress, and contributing to relapse. However, the integration of sleep apnea management with orthodontic care, such as through the use of mandibular advancement appliances (MAAs) or CPAP therapy, offers promising benefits in improving both dental and airway outcomes.

A tailored, multidisciplinary approach involving orthodontists, sleep specialists, and other healthcare providers is key to addressing the dual concerns of airway health and dental alignment. Early diagnosis and intervention are crucial in preventing the worsening of both conditions and ensuring more favorable long-term results. For growing patients, early intervention with orthodontic appliances may prevent the exacerbation of sleep apnea, while adult patients may require a more complex, combined approach to manage both conditions effectively.

However, the limitations of this area of research, including the lack of longitudinal studies, variability in sleep apnea severity, and challenges in patient compliance, highlight the need for further investigation. More research into combined therapies, standardized treatment protocols, and the development of comprehensive care strategies is essential to advancing our understanding of how sleep apnea affects orthodontic treatment and vice versa.

In conclusion, addressing the impact of sleep apnea on orthodontic treatment outcomes is critical to providing holistic care that not only corrects dental misalignments but also improves patient quality of life. By considering both the dental and medical aspects of patient care, orthodontists can play a pivotal role in managing sleep apnea and its associated complications, leading to better health outcomes and enhanced patient satisfaction.

Conflict of Interest

Not available

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Not available

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