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Review Article

Diagnosis, etiology, and management strategies of open bite malocclusions

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ABSTRACT

Open bite malocclusion is a condition where the upper and lower incisors do not overlap vertically. It involves factors like structure, dental issues and functional challenges. This review offers an overview of diagnosing, understanding the causes and managing bite malocclusions. The condition is noticeable by the gap between incisors, difficulties in biting and speech and habits like tongue thrusting. In children thumb sucking is often associated with this issue underscoring the importance of intervention. Diagnosis relies on assessments, cephalometric analysis and categorization based on dental or skeletal elements. The causes can be attributed to factors, environmental influences or behavioral habits. Various management strategies are available with treatments playing a role using methods like fixed appliances clear aligners, and innovative temporary anchorage devices (TADs). Surgical interventions such as surgery address discrepancies when necessary. Considering that open bites are age conditions, behavioral modifications along with intervention using orthopedic appliances are crucial for effective treatment. Advanced diagnostic tools like cone beam computed tomography (CBCT) contribute to treatment planning. The retention phase ensures stability of results while patient cooperation remains essential throughout the process. Collaboration between orthodontist's maxillofacial surgeons and other specialists is vital for care. The field of orthodontics is continuously advancing and with research we can expect improvements in our understanding and treatment of open bite malocclusions.

Keywords: Open bite malocclusion, Orthodontic management, Skeletal discrepancies, Behavioral habits, Interdisciplinary collaboration

INTRODUCTION

Open bite malocclusion is an issue characterized by a lack of overlap, between the upper and lower incisors when the back teeth come together.[1,2] This condition can be caused by factors related to the structure of the jaw, teeth and how they function. It is important for orthodontic practitioners to have an understanding of diagnosing bite malocclusions,

their causes and effective management strategies in order to create personalized treatment plans for each patient.[3,4] Diagnosing bite malocclusions involves conducting an examination of the patient's facial structures and dental health considering both the skeletal and dental aspects.[5,6] Clinical assessment, cephalometric analysis (using X-rays) and studying models of the teeth all play roles in assessing the extent and nature of a bite. Different classifications, such as distinguishing between posterior bites or those caused by dental versus skeletal issues, help determine specific characteristics of the malocclusion and guide treatment decisions.[7,8] The causes of bite malocclusions are influenced by factors including genetics, environment and behavior.[1,9] Genetic predisposition can contribute to bites as certain patterns of craniofacial growth may be inherited. Environmental factors like prolonged thumb-sucking habits, tongue thrusting or mouth breathing can disrupt tooth eruption and alignment resulting in open bites.[10,11] Additionally, habits like finger sucking can cause changes in tooth positioning, which may worsen an existing bite. The management of open bite malocclusions varies based on the causes and severity of the condition. Typically, non-surgical methods, like treatment using fixed braces or clear aligners, are commonly used to treat open bites. When there are issues with the alignment of the bones, orthognathic surgery might be an option to reposition either the jaw or the lower jaw. If caught enough in a growing patient, orthopedic appliances can change how the bones grow and prevent bite problems from worsening.[12] It's important for patients to cooperate and actively participate in their treatment, especially when habits like thumb-sucking or tongue-thrusting are involved. Treatment plans for open bite issues often include strategies to break these habits and educate patients on health practices. Recent advancements in orthodontics have introduced ways to treat bite problems. Temporary anchorage devices (TADs) give orthodontists control over tooth movement making it possible to correct bites with greater precision. Three-dimensional imaging techniques like cone beam computed tomography (CBCT) also help with diagnosis and treatment planning for cases of open bites.[13] However, successfully managing bite issues requires an approach that takes into account each individual case's unique characteristics and contributing factors. Collaboration between specialists, including orthodontists and oral and maxillofacial surgeons is often necessary due, to the complex nature of open bite malocclusions. Therefore, dealing with malocclusions characterized by a bite can be quite complex in a setting. It requires a grasp of the diagnosis underlying causes and effective management strategies.[14]

To achieve results, it is crucial to combine evaluation, state-of-the-art imaging techniques and a multidisciplinary approach. As orthodontics progresses, continuous research and technological advancements will improve our ability to diagnose and treat bite malocclusions effectively. This review provides an overview of the diagnosis, causes, and strategies for managing bite malocclusions.

METHODS

This evaluation, which took place on 26 November 2023, thoroughly assesses articles sourced from Cochrane Library, PubMed, and Scopus. It explores the diagnosis, causes and approaches to managing bite malocclusions. The focus of this review is, on studies conducted in English since 2008 that prioritize an understanding of open bite malocclusions. Its purpose is to provide guidance on assessment methods and early detection systems, for healthcare professionals to ensure management of open bite malocclusions.

DISCUSSION

The clinical presentation of bite malocclusions highlights the interaction between skeletal, dental and functional factors. A key characteristic is the lack of overlap between the lower incisors, which poses both aesthetic and functional challenges. These challenges go beyond the teeth and bones. Also involve soft tissue structures like tongue thrusting habits and lip incompetence. This emphasizes the importance of taking an approach. In cases involving children, who often suck their thumbs, early intervention is crucial to prevent long term complications. Since open bites vary depending on age management strategies need to be tailored. Orthopedic appliances play a role in modifying growth patterns in growing individuals.[15] Recognizing the range of presentations of bite malocclusions is vital for effective treatment planning. Orthodontic interventions form the foundation of management ranging from braces to aligners with the goal of correcting tooth positioning and achieving a balanced bite.[16] Surgical interventions become essential for cases with discrepancies highlighting advancements in orthognathic surgery over time. Temporary anchorage devices (TADs) represent a breakthrough that offers control over tooth movement during treatment. The management approach also addresses aspects by emphasizing cooperation in breaking harmful habits. Early intervention and the integration of tools like CBCT contribute, to improved treatment outcomes. The retention phase, whether through removable or fixed retainers, ensures the stability of corrections.

Clinical manifestation

Open bite malocclusions present a picture, which involves a combination of skeletal, dental and functional factors. The manifestations of bite malocclusions can vary in severity. Have distinct characteristics that are influenced by the patients age and the underlying cause of the condition.[17] It is crucial to have an understanding of these features to diagnose and develop effective treatment strategies accurately. One prominent feature of bite malocclusions is the lack of overlap between the upper and lower incisors when the jaws are closed. This absence of contact disrupts the alignment between the lower dental arches creating a noticeable gap between them.[18] There are two types of bites; dental open bites, which involve

mispositioned or extruded anterior teeth causing insufficient vertical overlap and skeletal open bites where there are vertical discrepancies in the positioning of the maxilla and mandible. In addition to gaps, individuals with bite malocclusions often face functional and aesthetic challenges. The lack of contact between teeth affects chewing efficiency leading to difficulties in biting and chewing food properly. Speech-related issues may also arise due to changes, in tongue positioning caused by having a bite affecting sounds and overall communication skills.[19] These practical difficulties highlight the effect of bite malocclusions on the well-being of those affected underscoring the importance of promptly identifying and addressing them. Expanding the scope, the clinical signs go beyond the skeletal aspects and include the soft tissue structures as well. It is quite common to observe tongue thrusting habits in patients, with bites, where the tongue exerts pressure on the teeth while swallowing or speaking.[20] This repetitive habit can worsen an existing bite by putting pressure on a compromised occlusion. Furthermore, there is a tendency for lip incompetence, where the lips don't meet naturally when at rest. This does not affect aesthetics. Also compromises overall occlusal stability. An important sign associated with bite malocclusions in children is thumb-sucking habits. Prolonged digit sucking can lead to changes like anterior open bites or protruding upper incisors. The continuous pressure from the thumb on the teeth disrupts eruption patterns and can result in an open bite deformity developing. Addressing these habits during childhood is crucial to prevent malocclusion progression and reduce the need for treatment in the future. Age plays a role, in how open bite malocclusions manifest clinically during growth when dynamic changes can occur as craniofacial growth continues. Detecting bite tendencies in children at a stage allows for timely intervention to modify their growth patterns and prevent the worsening of dental misalignments. On the other hand, open bites in adult patients may be relatively stable. Usually, it requires a comprehensive approach that takes into account both skeletal and dental factors. This may require a combination of surgical methods to achieve the results. The clinical signs of bite malocclusions include dental, skeletal and functional characteristics. The visible gap between the lower teeth, along with difficulties in biting, speaking and related soft tissue habits, are important clinical features. Orthodontists must accurately recognize these indications to make diagnoses and create treatment plans. Early intervention is especially important in children as it helps minimize the impact of bite malocclusions on function and appearance. This highlights the significance of an approach to diagnosing and planning treatment, for the complexities associated with bite malocclusions.

Management

The effective management of bite malocclusions requires a comprehensive approach that takes into account various factors contributing to this orthodontic condition. Clinical strategies are designed to address dental and functional aspects with the goal of achieving favorable outcomes for patients. Before initiating any intervention, it is crucial to conduct a diagnosis tailored to each case due to the personalized nature of open bite malocclusions. Orthodontic treatment plays a role in managing bite malocclusions. In cases where the primary cause is related to issues such as protruded front teeth orthodontic treatment using fixed appliances or clear aligners is commonly employed. This method involves moving the teeth to establish vertical overlap and restore a balanced bite. In cases removable appliances may be considered as an option to correct the positioning of front teeth and aid in vertical closure.[21,22] The duration of treatment varies depending on the complexity of the malocclusion and compliance levels. For cases involving skeletal discrepancies, orthognathic surgery becomes an essential consideration in the overall management plan. Surgical intervention aims at repositioning either the jaw (maxilla) or lower jaw (mandible) to achieve alignment and closure of the open bite. This multidisciplinary approach often involves collaboration between orthodontists and oral and maxillofacial surgeons to ensure results. The continuous progress in methods and advancements in technology have greatly improved the reliability and safety of surgery when treating open bite malocclusions. TADs have emerged as an advancement in treatment. These small implants serve as anchors allowing control over tooth positioning during the course of treatment. In cases where patients have open bite malocclusions strategically placed TADs play a role in correcting misalignments by providing support for desired tooth movements. This approach reduces the reliance on compliance and external devices, resulting in overall treatment efficiency. When it comes to open bite malocclusions, behavioral factors common among patients greatly contribute to their development and persistence. Effective management often involves addressing habits like thumb sucking or tongue thrusting. Special habit breaking appliances are designed to discourage these habits and aid in resolving tendencies towards bites. The success of interventions relies heavily on education and motivation strategies that ensure compliance and lead to long term success in breaking harmful habits. Highlighting the importance of intervention is paramount when dealing with bite malocclusions particularly in growing individuals. Orthopedic appliances, like expanders or functional appliances can be utilized to modify growth patterns and prevent the worsening of open bites. By capitalizing on the natural growth potential found in patients these appliances influence the development of the jaw (maxilla) and lower jaw (mandible) ultimately achieving more favorable occlusal relationships. Medical advancements have made contributions to the management of bite malocclusions by introducing advanced diagnostic tools like CBCT. These three-dimensional imaging techniques offer information about structures enabling precise diagnosis and effective treatment planning. CBCT enables orthodontists and oral surgeons to visualize the relationships between bones, teeth and soft tissues. This advanced technology enhances the precision of treatment interventions. When it comes to managing bite

malocclusions patient cooperation is crucial for outcomes. Active participation in maintaining hygiene practices, use of appliances and following behavioral modifications are key factors in achieving desired results. Orthodontic practitioners play a role in educating patients about the importance of adhering to treatment protocols and the potential consequences of noncompliance on treatment effectiveness and overall outcomes. In cases where nonsurgical approaches are prioritized the retention phase becomes a part of the strategy. Retainers, whether removable or fixed, are used to maintain alignment of teeth and prevent relapse. Regular follow-up appointments are necessary to monitor the stability of treatment outcomes and promptly address any emerging issues. Therefore, managing bite malocclusions requires an approach considering various underlying causes contributing to this condition. Effective management strategies involve interventions surgery if needed temporary anchorage devices utilization as well as behavioral modifications. Early intervention is particularly beneficial, in cases when combined with diagnostic tools. This comprehensive approach significantly improves treatment outcomes. Ensuring patient cooperation and maintaining follow-up are aspects, in managing open bite malocclusion, for long term stability. It is essential for orthodontists, oral and maxillofacial surgeons and other dental specialists to collaborate effectively in order to provide care and achieve the possible outcomes when dealing with the complexities of open bite malocclusions.

CONCLUSION

In summary dealing with bite malocclusions involves an individualized approach that considers diagnosis, causes and management. Recognizing the skeletal and soft tissue factors that contribute to this condition is essential for accurate diagnosis. Treatment strategies include procedures, surgery options and behavioral modifications emphasizing the need for an approach. The advancements in technology like TADs and advanced imaging techniques have improved treatment planning accuracy. However successful management of bite malocclusions relies on cooperation and ongoing follow up. As the field progresses it's crucial to prioritize a patient centered approach and collaborate with specialists to navigate the complexities of bite malocclusions, for optimal results.

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