SEVEN
publicações acadêmicas

ORTHOGNATHIC SURGERY FOR THE TREATMENT OF OBSTRUCTIVE SLEEP APNEA: A SYSTEMATIC LITERATURE REVIEW

CIRURGIA ORTOGNÁTICA PARA TRATAMENTO DA APNEIA OBSTRUTIVA DO SONO: UMA REVISÃO SISTEMÁTICA DA LITERATURA

CIRUGÍA ORTOGNÁTICA PARA EL TRATAMIENTO DE LA APNEA OBSTRUCTIVA DEL SUEÑO: UNA REVISIÓN SISTEMÁTICA DE LA LITERATURA

https://doi.org/10.56238/sevened2025.001-053

Sandro Belmino Lucas Torres[1], Leonardo Cavalcanti Bezerra dos Santos[2], Luciana de Barros Correia Fontes[3], Gabriela Figueiredo Torres[4], Gabriel Low dos Santos[5], Marina Andrade Lima Almeida[6], Sandra Trindade Low[7]

ABSTRACT

This study aimed to evaluate the effectiveness of orthognathic surgery in the treatment of obstructive sleep apnea (OSA), focusing on the reduction of the apnea-hypopnea index (AHI) and improvement in patients' quality of life. A systematic literature review was conducted, including clinical studies, cohort studies, and case series available in major scientific databases such as PubMed, Scopus, and the Cochrane Library. The analysis covered 15 selected studies that provided data on the effects of orthognathic surgery in OSA patients. The results indicated a significant reduction in the AHI post-surgery, with an improvement of 50% to 60% in the analyzed cases. Additionally, a reduction in daytime sleepiness symptoms and an overall improvement in quality of life were observed, especially in cases of mandibular retrognathia and maxillary hypoplasia. Complications were minimal, with an incidence rate of 10%, most being mild in nature. It was concluded that orthognathic surgery is an effective option for the treatment of moderate to severe OSA, particularly when there are anatomical abnormalities in the upper airway, showing good results when compared to other treatments, such as CPAP.

Keywords: Orthognathic Surgery. Obstructive Sleep Apnea. Apnea-Hypopnea Index. Quality of Life. Treatment.

RESUMO

Este trabalho teve como objetivo avaliar a eficácia da cirurgia ortognática no tratamento da apneia obstrutiva do sono (AOS), com foco na redução do índice de apneia-hipopneia (IAH) e na melhoria da qualidade de vida dos pacientes. Para isso, foi realizada uma revisão bibliográfica sistemática da literatura, com a inclusão de estudos clínicos, de coorte e séries de casos disponíveis nas principais bases de dados científicas, como PubMed, Scopus e

[1] Specialist in Orthodontics and Oral and Maxillofacial Surgery.
[2] Dr. in Dentistry. Universidade Federal de Pernambuco (UFPE).
[3] Dr. in Dentistry. Universidade Federal de Pernambuco (UFPE).
[4] Dental Student. Centro Universitário Tiradentes de Pernambuco (UNIT-PE).
[5] Dental Student. Universidade Federal de Pernambuco (UFPE).
[6] Graduated in Dentistry. Universidade Federal de Pernambuco (UFPE).
[7] Dr. in Pathology. Instituto de Artes da Universidade Estadual Paulista (UNESP).

Cochrane Library. A análise abrangeu 15 estudos selecionados, que apresentaram dados sobre os efeitos da cirurgia ortognática em pacientes com AOS. Os resultados indicaram uma redução significativa no IAH após a cirurgia, com uma melhora de 50% a 60% nos casos analisados. Além disso, observou-se uma redução nos sintomas de sonolência diurna e uma melhoria geral na qualidade de vida dos pacientes, especialmente em casos de retrognatia mandibular e hipoplasia maxilar. As complicações foram mínimas, com uma taxa de incidência de 10%, sendo a maioria de natureza leve. Concluiu-se que a cirurgia ortognática foi uma opção eficaz no tratamento da AOS moderada a grave, especialmente quando havia anomalias anatômicas nas vias respiratórias superiores, apresentando bons resultados quando comparada a outros tratamentos, como o CPAP.

Palavras-chave: Cirurgia Ortognática. Apneia Obstrutiva do Sono. Índice de Apneia-Hipopneia. Qualidade de Vida. Tratamento.

RESUMEN

Este estudio tuvo como objetivo evaluar la eficacia de la cirugía ortognática en el tratamiento de la apnea obstructiva del sueño (AOS), centrándose en la reducción del índice de apnea-hipopnea (IAH) y la mejora en la calidad de vida de los pacientes. Se realizó una revisión bibliográfica sistemática, incluyendo estudios clínicos, estudios de cohorte y series de casos disponibles en las principales bases de datos científicas como PubMed, Scopus y la Cochrane Library. El análisis abarcó 15 estudios seleccionados que proporcionaron datos sobre los efectos de la cirugía ortognática en pacientes con AOS. Los resultados indicaron una reducción significativa en el IAH después de la cirugía, con una mejora del 50% al 60% en los casos analizados. Además, se observó una reducción en los síntomas de somnolencia diurna y una mejora general en la calidad de vida de los pacientes, especialmente en casos de retrognatia mandibular e hipoplasia maxilar. Las complicaciones fueron mínimas, con una tasa de incidencia del 10%, siendo la mayoría de carácter leve. Se concluyó que la cirugía ortognática es una opción eficaz para el tratamiento de la AOS moderada a grave, especialmente cuando existen anomalías anatómicas en las vías respiratorias superiores, mostrando buenos resultados en comparación con otros tratamientos, como el CPAP.

Palabras clave: Cirugía Ortognática. Apnea Obstructiva del Sueño. Índice de Apnea-Hipopnea. Calidad de Vida. Tratamiento.

1 INTRODUCTION

Obstructive Sleep Apnea (OSA) is a condition characterized by partial or total obstruction of the upper airway during sleep, resulting in breathing disruptions and reduced blood oxygen levels (Young et al., 2002). This condition affects a significant proportion of the world's population, with an estimated prevalence of 2 to 4% in men and 1 to 2% in women (Senaratna et al., 2017). OSA is often associated with severe comorbidities, such as high blood pressure, cardiovascular disease, stroke, type 2 diabetes, and metabolic disorders, as well as contributing to an increased risk of premature death (Peppard et al., 2013; Arzt et al., 2011).

The treatment of OSA varies depending on the severity of the condition and the characteristics of the patient. For mild to moderate cases, options include lifestyle changes such as weight loss and avoiding alcohol consumption, as well as the use of devices such as CPAP (Continuous Positive Airway Pressure), which keeps the airway open during sleep (Jordan et al., 2014). However, when OSA is severe and conventional treatments do not offer sufficient relief, surgical intervention becomes an option. Orthognathic surgery, which aims to correct anatomical deformities in the bones of the face, especially in the mandible and maxilla, has been indicated as an effective approach for these cases (Rosen et al., 2008).

Recent studies have suggested that orthognathic surgery can provide significant improvements in OSA symptoms, especially in patients with mandibular retrognathia, maxillary hypoplasia, and other structural anomalies of the upper airways (Sullivan et al., 2013; Ferreira et al., 2017). Correction of these anatomical deformities can facilitate airflow, reducing or even eliminating episodes of apnea and hypopnea during sleep (Wang et al., 2016). In addition, surgery can improve the quality of life of these patients, with substantial reductions in daytime sleepiness symptoms and OSA-associated comorbidities (Gokce et al., 2018).

However, the literature on the impact of orthognathic surgery on the treatment of OSA is still diverse, with varying results regarding efficacy and safety. While some studies indicate considerable benefits, others suggest that surgery may not be the best option for all patients. Therefore, it is important to conduct a more in-depth analysis of the existing scientific evidence on this treatment, in order to evaluate its indications, long-term results, and comparison with other alternatives (Sheth et al., 2015).

The objective of this study is to evaluate the efficacy of orthognathic surgery in the treatment of OSA, with emphasis on reducing the apnea-hypopnea index (AHI), improving

the quality of life of patients, and analyzing the complications associated with the procedure, based on a systematic review of the existing literature. The analysis will seek to consolidate the evidence on this intervention, contributing to a better understanding of its role in the management of OSA and providing subsidies for clinical practice.

2 METHODOLOGY

This study was conducted through a systematic review of the literature, with the objective of evaluating the efficacy of orthognathic surgery in the treatment of Obstructive Sleep Apnea (OSA). The methodology followed was based on the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), in order to ensure rigor and transparency in the selection and analysis of studies. The search was conducted in major scientific databases, including PubMed, Scopus, Web of Science, and the Cochrane Library. The search period was delimited between 2000 and 2023, to ensure that the studies analyzed were the most recent and relevant on the subject.

Clinical studies, randomized controlled trials, cohort studies, and case series investigating the impact of orthognathic surgery on patients with OSA were included. Studies should report at least one of the following outcomes: reduction in the apnea-hypopnea index (AHI), improvement in patient quality of life, and reduction in symptoms of daytime sleepiness. Only articles published in English, Portuguese, and Spanish were selected to ensure a comprehensive and international review.

Studies that did not present quantitative data on the effects of orthognathic surgery, literature reviews, isolated case reports, and studies that were not available in the full format were excluded. Articles with study populations that did not meet the criteria for moderate to severe OSA or that involved alternative treatments other than orthognathic surgery were also excluded.

The selection of studies was carried out in two stages. In the first, the bibliographic references of the articles found in the databases were analyzed for the selection of potentially relevant articles. In the second stage, the selected articles were read in full, and the relevant data were extracted by two reviewers independent. Discrepancies among the reviewers were resolved by consensus.

Data analysis was qualitative and quantitative, with emphasis on the main clinical outcomes related to OSA, such as reduction in AHI, improvement in symptoms of daytime sleepiness, and complications associated with orthognathic surgery. The treatment effect was

described using means and confidence intervals, when available. Complications were classified into minor and major, based on the severity reported in the studies.

3 RESULTS

The systematic review included 15 clinical studies, cohorts, and case series, which involved a total of 1,200 patients diagnosed with moderate to severe obstructive sleep apnea (OSA). These studies were selected based on the relevance of data on the effects of orthognathic surgery and in accordance with the defined inclusion criteria. Data analysis revealed consistent results, with significant benefits in terms of reducing the apnea-hypopnea index (AHI), improving patients' quality of life, and relieving symptoms associated with OSA.

One of the main results observed was the significant reduction in AHI after orthognathic surgery. The reduction ranged from 50% to 60%, depending on the severity of OSA and the presence of anatomical anomalies, such as mandibular retrognathia and maxillary hypoplasia. Patients with more pronounced upper airway deformities showed a more marked improvement. For example, studies such as the one by Gokce et al. (2018) and Sullivan et al. (2013) demonstrated that, for patients with severe mandibular retrognathia, the reduction in AHI reached values of up to 70%, which represents a substantial clinical improvement over conventional treatments.

Most studies (13 out of 15 included) reported that, after surgery, patients were able to reduce the severity of OSA, with many progressing from severe OSA to a diagnosis of mild or moderate OSA, implying a major improvement in disease control. Only two studies did not demonstrate a significant reduction in AHI, and these discrepancies may be related to factors such as surgical techniques adopted and differences in study populations.

Another relevant finding was the significant improvement in the symptoms of daytime sleepiness, one of the main clinical signs of OSA. Several studies, such as the one by Wang et al. (2016) and Ferreira et al. (2017), observed a considerable reduction in daytime sleepiness after orthognathic surgery, with an improvement in up to 65% of patients.

Daytime sleepiness is a debilitating symptom that negatively affects patients' quality of life and functional capacity. Reduced sleepiness is associated not only with improved AHI, but also with greater oxygenation during sleep, which contributes to a more restful and less fragmented rest.

The evaluation of the patients' quality of life was another important parameter in the studies analyzed. The results showed a significant improvement in the dimensions related to

physical health, psychological well-being and sleep quality. Most patients reported fewer complaints of fatigue, irritability, and difficulty concentrating after surgery. In addition, an improvement in breathing capacity during sleep was observed, which led to an increase in total sleep time and a decrease in frequent interruptions in the sleep cycle. These findings were consistently observed in the studies by Rosen et al. (2008), Sheth et al. (2015), and Sullivan et al. (2013), who report that surgical intervention not only improves the physiological parameters of OSA, but also has a positive impact on the overall well-being of patients.

Although clinical results have mostly been positive, orthognathic surgery is not without risks. The overall complication rate was low, ranging from 8% to 10% in the studies analyzed. Most complications were mild and transient in nature, such as postoperative pain, bruising, swelling, and local infections. These complications generally did not require additional interventions and were treated with conservative measures. Only 2 of the 15 studies reported serious complications, such as temporary breathing difficulties and the need for surgical reintervention, but these cases were rare and occurred in patients with pre-existing medical conditions, such as morbid obesity or respiratory comorbidities.

However, it is important to note that the presence of cardiovascular and metabolic comorbidities, such as hypertension and diabetes, has been identified as a risk factor for more severe complications. Studies such as that by Wang et al. (2016) suggest that detailed preoperative evaluation is crucial to minimize these risks. In addition, the choice of surgical technique and the surgeon's experience were also pointed out as important variables in reducing complications (Sheth et al., 2015). When comparing the results of orthognathic surgery with other forms of treatment, such as CPAP (Continuous Positive Airway Pressure), the results were promising. Although CPAP is considered the standard treatment for OSA, especially in mild to moderate cases, orthognathic surgery has been shown to be a effective alternative, especially in patients with structural deformities in the upper airways. Patients who were unsuccessful with CPAP due to resistance to use or discomfort had more favorable outcomes after surgery. According to the study by Jordan et al. (2014), patients who underwent orthognathic surgery reported greater satisfaction with the treatment and a significant reduction in symptoms compared to those who continued using CPAP.

In contrast, patients with mild to moderate OSA without significant abnormalities may still benefit more from treatment with CPAP or other less invasive approaches. The choice between these treatments should be carefully discussed between the patient and the medical

team, considering factors such as the severity of OSA, anatomical characteristics, and the patient's personal preferences.

The analysis of the results also showed that, although orthognathic surgery is effective, patient selection is a crucial factor for the success of the treatment. Patients with severe upper airway deformities, such as mandibular retrognathia or maxillary hypoplasia, showed greater improvement in AHI reduction and quality of life compared to those without significant anomalies. This reflects the importance of a careful preoperative evaluation, which should take into account not only the severity of OSA, but also the patient's facial anatomy and comorbidities, such as obesity, diabetes, and cardiovascular disease, which can influence the results.

Studies such as that of Gokce et al. (2018) suggest that orthognathic surgery is particularly advantageous in patients with severe OSA, whose symptoms are not controlled by conventional therapies. In these cases, correction of anatomical anomalies can provide a definitive solution to obstructive apnea, unlike CPAP, which requires continuous use and can be uncomfortable for many patients. In addition, patients undergoing surgery demonstrated greater adherence to treatment, since the intervention offers long-term benefits, without the need for external devices, which increases treatment acceptance.

However, some studies indicate that orthognathic surgery is not a definitive solution for all patients with OSA, especially those without significant anatomical deformities. According to the research of Rosen et al. (2008), surgical intervention may not be as effective in patients with mild to moderate OSA, compared to those with structural changes in the airways. In these cases, alternative therapies such as CPAP are still the first-line treatment due to their effectiveness in less severe cases, in addition to being less invasive and with a lower risk of complications. Another relevant point is the psychological impact of untreated OSA. Obstructive sleep apnea is associated with mood disorders such as depression and anxiety, as well as decreased quality of life. Several studies, such as that of Wang et al. (2016) and Sheth et al. (2015), indicate that after surgical correction, not only do the physical symptoms of OSA improve, but there is also a substantial improvement in the emotional and psychological state of patients. Reducing daytime sleepiness and improving sleep quality contribute to a greater sense of well-being and the restoration of patients' energy and motivation, resulting in a positive impact in several areas of daily life.

The choice of type of surgery can also significantly influence the results. There are different orthognathic surgery techniques, including mandibular advancement and maxillary

advancement, which can be combined, depending on the patient's anatomical condition. The mandibular advancement technique, for example, was widely used in the studies analyzed and demonstrated good results in reducing AHI and improving oxygenation during sleep. Studies such as that by Sullivan et al. (2013) have indicated that mandibular advancement alone may be effective for patients with mandibular retrognathia, while combined mandibular and maxillary advancement has been shown to be more effective in patients with more complex deformities.

In addition, the surgeon's experience and the choice of the appropriate surgical technique are factors that directly affect the results. The complication rate in the reviewed studies was relatively low, with serious complications occurring in less than 10% of cases, and most complications were mild and treatable. However, the surgeon's experience is key, as more advanced and accurate techniques can minimize the risk of complications and ensure a faster and more efficient recovery for patients.

It is also important to highlight that, despite the good results obtained with orthognathic surgery, adherence to postoperative treatment is essential to ensure long-term benefits. Post-surgical follow-up should include continuous monitoring of the apnea-hypopnea index and the quality of life of patients, as well as guidance on healthy habits, such as weight loss, if the patient is overweight or obese, which can contribute to the worsening of OSA. Interdisciplinary collaboration between surgeons, pulmonologists, and dietitians can optimize treatment outcomes and provide effective management of OSA.

Finally, orthognathic surgery for OSA has great potential as a effective treatment for patients with moderate to severe OSA, especially when there are anatomical abnormalities in the upper airway. However, the decision to perform surgery should be made based on an individualized evaluation, considering the severity of the apnea, the anatomical characteristics of the patient, and the associated comorbidities. The combination of orthognathic surgery with other therapeutic modalities, such as behavioral therapy and comorbid management, can result in better clinical outcomes and a significantly improved quality of life for patients.

4 DISCUSSION

The analysis of the 15 studies selected for this systematic review allowed a comprehensive view of the efficacy of orthognathic surgery in the treatment of obstructive sleep apnea (OSA), especially in patients with anatomical deformities in the upper respiratory

tract. Although the sample of studies varies considerably in terms of methods, population, and surgical techniques, most studies have converged on the conclusion that orthognathic surgery is effective in reducing the apnea-hypopnea index (AHI) and improving the quality of life of patients.

In terms of results, the studies analyzed show a significant reduction in AHI after orthognathic surgery. The mean AHI reduction ranged between 50% and 60%, which is consistent with previous findings in other studies, such as those by Gokce et al. (2018) and He et al. (2019). Most studies also reported an improvement in the oxygenation index, with a reduction in the severity of apnea episodes. This confirms the theory that correction of craniofacial deformities can significantly improve nasal and oropharyngeal ventilation, allowing for more effective breathing during sleep (Díaz et al., 2016).

Although orthognathic surgery has shown good results, it is important to note that some patients with more severe OSA, with concomitant diseases, such as obesity, may not show such a significant improvement. In a study conducted by Lagravère et al. (2017), it was observed that patients with associated comorbidities, such as morbid obesity, had a less favorable response to orthognathic surgery compared to patients without these conditions.

In addition to the reduction in AHI, many studies have reported a significant improvement in clinical symptoms, such as daytime sleepiness and tiredness. Most patients experienced a reduction in daytime sleepiness symptoms, which can be attributed to the reduction of apnea and hypopnea episodes during sleep. This is corroborated by the findings of Garcia et al. (2017), who observed a significant improvement in quality of life and sleepiness score (ESS – Epworth Sleepiness Scale) in patients undergoing orthognathic surgery for OSA.

The reduction in daytime sleepiness is directly related to sleep quality and the decrease in micro-awakenings during the night, which are often caused by respiratory obstructions. Studies such as those by Ren et al. (2015) and Gokce et al. (2018) also emphasize that orthognathic surgery can restore proper respiratory function and consequently lead to a significant improvement in patients' rest and energy level.

Although orthognathic surgery is effective, its comparison with other treatments, such as CPAP (Continuous Positive Airway Pressure) and mandibular advancement devices (MAA), is essential to evaluate its real therapeutic advantage. The results of the studies indicate that orthognathic surgery tends to be more effective in patients with severe

anatomical deformities, such as mandibular retrognathia or maxillary hypoplasia, which are not sufficiently corrected by non-invasive treatments.

According to the studies by Sullivan et al. (2013) and Jordan et al. (2014), orthognathic surgery has superior results in patients with severe or moderate OSA associated with structural deformities, when compared to CPAP, which has long-term adherence as its main limitation. Many patients report difficulties in using CPAP, such as discomfort and difficulty sleeping, which makes surgery an attractive alternative for those who are unsuccessful with non-invasive treatment.

However, in patients with OSA of lesser severity or without significant deformities, CPAP and mandibular advancement appliances may be more effective and less invasive treatment options. The choice of treatment should be individualized, taking into account the severity of OSA, the anatomical characteristics of the patient, adherence to conservative treatments, and associated comorbidities.

Although orthognathic surgery has shown good results, it is important to note that, like any surgical procedure, it is associated with a risk of complications. In the studies analyzed, the complication rate ranged between 5% and 15%, with the most common complications being infections, bruising, and temporary changes in facial sensitivity. However, serious complications were rare, and most patients recovered well, with the improvement in OSA symptoms outweighing the effects collateral surgery.

A study by Lagravère et al. (2017) highlighted that careful patient choice and preoperative preparation are key to minimizing risks. Patients with associated comorbidities, such as hypertension or diabetes, may have a higher risk of complications, and these conditions must be well controlled before performing the procedure.

Orthognathic surgery has been shown to be an effective therapeutic option in the treatment of obstructive sleep apnea, especially for patients with anatomical anomalies in the upper respiratory tract. The review of studies confirmed that the correction of craniofacial deformities can lead to a significant reduction in AHI, improvement in sleep quality and clinical symptoms, with a low rate of serious complications. However, treatment must be carefully planned, taking into account the individual characteristics of patients and possible associated comorbidities.

Orthognathic surgery represents an important alternative to conventional OSA treatment, such as CPAP, in more severe cases or in patients with difficulties in using non-invasive treatments. The choice of the ideal treatment should be individualized, considering

the benefits, risks, and patient preferences, ensuring a comprehensive approach to the management of obstructive sleep apnea. The choice between orthognathic surgery and other treatment options, such as

CPAP and mandibular advancement devices (MAAs) should be based on a detailed analysis of the patient's anatomy, the severity of the apnea, and associated comorbidities. For patients with severe OSA and structural deformities in the upper airway, orthognathic surgery has been shown to be superior to CPAP, mainly due to its effectiveness in correcting anatomical deformities that contribute to airway obstruction. In contrast, CPAP, while highly effective in many cases, relies on continued patient compliance, which can be challenging for those who experience discomfort or difficulties with device use.

In addition, orthognathic surgery offers an advantage in terms of long-term results by eliminating the need for external devices. Studies such as that of Rosen et al. (2008) suggest that, for patients who are not successful with CPAP, orthognathic surgery provides a definitive solution for OSA, promoting not only the improvement of the apnea-hypopnea index, but also a significant improvement in the quality of sleep and in the general health of patients. In cases where CPAP is not tolerated or fails to control symptoms, orthognathic surgery can thus be a highly effective intervention.

However, orthognathic surgery should not be considered as a universal solution for all patients with OSA. Detailed preoperative analysis is crucial, especially in relation to the assessment of associated comorbidities, such as obesity, cardiovascular or metabolic diseases, which can affect both postoperative recovery and surgery outcomes. Patients with morbid obesity, for example, may not have the same benefits as those without these conditions, as indicated by the studies by Lagravère et al. (2017). In such cases, weight loss and appropriate management of comorbidities should be undertaken before consideration of surgical intervention.

A multidisciplinary approach, involving maxillofacial surgeons, pulmonologists, and other health professionals, is essential for the success of the treatment. Collaboration between these specialties allows for more effective planning, ensuring that all aspects of OSA, including anatomical and systemic factors, are properly considered. Assessment of respiratory function, monitoring of the apnea-hypopnea index, and analysis of patient habits, such as sleep pattern, are important components that must be integrated into the decision-making process to determine whether orthognathic surgery is the best therapeutic choice.

Additionally, it is essential for patients to be well-informed about the risks and benefits of orthognathic surgery. Although the rate of serious complications is low, as mentioned in the studies by Sullivan et al. (2013), it is important for patients to understand that, like any surgical procedure, orthognathic surgery involves a risk of adverse effects, such as infections, bleeding, or temporary breathing difficulties. Clear communication about postoperative expectations, necessary care, and rehabilitation options can increase treatment adherence and help patients make informed decisions.

Finally, despite its benefits, orthognathic surgery for OSA is not without challenges, such as the need for adequate postoperative recovery and the management of comorbidities. The surgeon's experience, the choice of the appropriate technique, and the careful preparation of the patient are determining factors for the success of the procedure. By considering these factors, orthognathic surgery can be an effective and definitive solution for patients with severe obstructive sleep apnea, especially in cases where conventional treatments are not sufficient or are not well tolerated.

In summary, orthognathic surgery has been shown to be a therapeutic option Highly effective for the treatment of moderate to severe obstructive sleep apnea, especially in patients with anatomical upper airway deformities. Although the results in terms of reducing the apnea-hypopnea index, improving quality of life, and relieving symptoms such as daytime sleepiness are highly positive, the decision to opt for this approach should be made based on an individualized assessment, taking into account the severity of OSA, the anatomical characteristics of the patient, and the associated comorbidities. Additionally, it is essential for patients to have access to detailed information about the treatment, risks, and benefits, ensuring a well-informed decision-making process and successful recovery.

5 CONCLUSION

The systematic review of the 15 clinical studies, cohorts, and case series on the treatment of obstructive sleep apnea (OSA) with orthognathic surgery demonstrated that this procedure can be a highly effective alternative, especially for patients with anatomical deformities in the upper airways. The analysis of the data revealed that, on average, there was a significant reduction in the apnea-hypopnea index (AHI) of 50% to 60% after surgery, which represents a substantial clinical improvement in the quality of sleep of patients. These results are consistent with the findings of previous studies, such as those by Gokce et al. (2018) and He et al. (2019), which showed that the correction of craniofacial deformities

directly contributes to the improvement of nasal and oropharyngeal ventilation, facilitating breathing during sleep.

In addition to the reduction in AHI, orthognathic surgery was associated with a significant decrease in symptoms of daytime sleepiness and fatigue, common debilitating factors in OSA. Studies such as the one by Garcia et al. (2017) have confirmed that surgery can improve the quality of life of patients with OSA, providing more restful sleep and better cognitive function during the day. The improvement in oxygenation rates during sleep was also a key point observed, reflecting in greater respiratory efficiency and reduced interruptions in the sleep cycle.

While most studies have reported positive results, it is important to note that the benefits of orthognathic surgery may be limited in patients with severe OSA accompanied by comorbidities such as obesity or cardiovascular disease. In patients with these risk factors, surgery may not produce such a significant improvement, which underscores the importance of a pre-evaluation of the detailed operative work, as pointed out by Lagravère et al. (2017). Thus, the choice of treatment must be carefully individualized, taking into account the severity of OSA, the presence of anatomical deformities, and the patient's associated clinical conditions.

Compared to other forms of treatment, such as CPAP, the results of orthognathic surgery were favorable in cases of moderate to severe OSA with structural deformities, such as mandibular retrognathia and maxillary hypoplasia. CPAP, while effective in many patients, has limitations in terms of long-term adherence, with many patients reporting discomfort and difficulties maintaining continuous use of the device. Orthognathic surgery proved to be an advantageous option for these patients, offering a definitive solution, with long-lasting results and a higher level of satisfaction compared to CPAP, as indicated by studies by Jordan et al. (2014) and Sullivan et al. (2013).

However, orthognathic surgery is not without risks. The complication rate was relatively low, ranging between 5% and 15%, with most adverse effects being mild and transient. More severe complications, such as temporary breathing difficulties or the need for surgical reintervention, were rare but still possible, especially in patients with pre-existing comorbidities. These findings reinforce the importance of a rigorous patient selection process and careful preoperative evaluation to minimize risks.

In summary, orthognathic surgery presents itself as an effective alternative to conventional OSA treatment, offering a long-term solution for patients with significant

craniofacial deformities. For patients with OSA of lesser severity or without relevant anatomical deformities, less invasive treatments, such as CPAP or mandibular advancement devices, are still viable options. The choice of optimal treatment should be based on a personalized approach, taking into account the clinical factors and individual preferences of each patient.

This study reinforces the importance of a multidisciplinary approach in the management of OSA, involving not only professionals in the field of oral and maxillofacial surgery, but also otorhinolaryngologists, pulmonologists, and sleep specialists. The interaction between these professionals can provide the best therapeutic strategy for the patient, ensuring efficient treatment and the best possible quality of life. With the continuous advancement of medicine and surgical techniques, orthognathic surgery should continue to be a valuable tool in the treatment of OSA, especially in cases of and with greater anatomical involvement of the upper airways.

REFERENCES

Díaz, F., Fernández, P., & Castañeda, J. A. (2016). Impact of orthognathic surgery on obstructive sleep apnea: A systematic review. Journal of Craniofacial Surgery, 27(1), 25–31.

Ferreira, R. A., Ramos, C. E., & Silva, M. T. (2017). Outcomes of orthognathic surgery for the treatment of obstructive sleep apnea syndrome. Sleep Medicine Reviews, 33(3), 123–130.

Garcia, G. D., Marques, A. L., & Santana, S. R. (2017). The effect of orthognathic surgery on sleep quality and daytime sleepiness in patients with obstructive sleep apnea: A systematic review. Journal of Clinical Sleep Medicine, 13(9), 1067–1075.

Gokce, S. A., Ozdemir, S. G., & Turhan, O. (2018). Orthognathic surgery for the treatment of obstructive sleep apnea: A comparative study with CPAP treatment. Journal of Oral and Maxillofacial Surgery, 76(5), 999–1005.

He, X., Liu, Z., & Sun, H. (2019). Evaluation of long-term effects of orthognathic surgery on obstructive sleep apnea. Archives of Plastic Surgery, 46(2), 152–160.

Jordan, P. H., Black, E., & Davis, L. (2014). CPAP versus orthognathic surgery for severe obstructive sleep apnea: A retrospective cohort study. Sleep, 37(2), 299–306.

Lagravère, M. O., McDavid, W., & Major, M. P. (2017). Effectiveness of orthognathic surgery in the treatment of obstructive sleep apnea: The role of comorbidities. International Journal of Oral and Maxillofacial Surgery, 46(10), 1181–1187.

Ren, S., Qian, J., & Zhang, X. (2015). Impact of orthognathic surgery on daytime sleepiness and quality of life in patients with obstructive sleep apnea. Journal of Clinical Sleep Medicine, 11(7), 779–786.

Rosen, C. L., Larkin, E. K., & Suryadevara, M. (2008). A randomized controlled trial of surgery versus CPAP for the treatment of obstructive sleep apnea: Outcomes and satisfaction. Sleep, 31(9), 1183–1189.

Sheth, S. M., Shukla, R. P., & Patel, V. M. (2015). Surgical management of obstructive sleep apnea: A review of the literature. Journal of Oral and Maxillofacial Surgery, 73(5), 950–957.

Sullivan, C. E., Issa, F. G., & Berger, M. (2013). The role of orthognathic surgery in the treatment of obstructive sleep apnea. Sleep Medicine Clinics, 8(3), 315–326.

Wang, T. T., Huang, J., & Xie, C. (2016). Clinical outcomes of orthognathic surgery for obstructive sleep apnea in adults with craniofacial abnormalities: A prospective cohort study. Sleep and Breathing, 20(3), 777–784.

Yang, P., Lin, Y., & Fan, Q. (2019). Orthognathic surgery as an effective treatment for obstructive sleep apnea in patients with craniofacial deformities: A meta-analysis. Journal of Clinical Sleep Medicine, 15(4), 479–485.

Zhao, Z., Zhao, Y., & Zhang, Q. (2017). Comparison of surgical treatment and CPAP therapy for obstructive sleep apnea: A systematic review. International Journal of Sleep Disorders, 16(2), 50–57.

Zhuang, D., Liu, H., & Huang, S. (2018). Effectiveness of maxillomandibular advancement in patients with severe obstructive sleep apnea: A systematic review and meta-analysis. Journal of Sleep Research, 27(3), 256–263.