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Long-term Outcomes of Adenotonsillectomy vs. Non-Surgical Interventions for Sleep Apnea in Children

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Abstract **Review Article**

Study Objectives: Children with obstructive sleep apnea syndrome (OSAS) experience neuronal injury, which partly reverses after treatment. We hypothesized that adenotonsillectomy would yield greater improvements in memory and learning compared to non-surgical management over 9 months. Interventions involved polysomnography and randomized assignments to adenotonsillectomy or non-surgical management. Neurocognitive assessments at baseline, 7 weeks, and 9 months included various memory and learning subtests. Adenotonsillectomy-treated children showed enhanced memory and learning in Wide Assessment and Intelligence Scale trials, indicating improvements in neurocognitive functioning related to childhood OSAS. No notable differences were observed in Corsi-based tasks, visual intelligence, or Digit Span. Adolescents may exhibit different responses to neurocognitive deficits from OSAS. Our intent-to-treat analysis highlights the beneficial effects of adenotonsillectomy on long-term outcomes. Future research will explore the neurobiological factors affecting these improvements and the recovery of other cognitive skills.

Keywords: Sleep Apnea, Children, Adenotonsillectomy, Non-surgical Interventions, Long-term Outcomes.

1. INTRODUCTION

The prevalence of obstructive sleep apnoea (OSA) in children ranges between 1% and 5%, while it can reach up to 10% when considering habitual snoring. Definitions for OSA in children have evolved over the years [1]. Some have defined OSA in children when there is an obstructive apnea index greater than one, regardless of the AHI [2]. Nevertheless, more recently, a multidisciplinary consensus suggests defining severe OSA based on the AHI alone [3]. These new definitions have important implications for the reported prevalence of OSA in children [4]. Adenotonsillar hypertrophy is the major risk factor for OSA in children and has been repeatedly shown to be associated with abnormal polysomnography in children [5]. Adenotonsillectomy (AT) is recommended as the first line of treatment for children with adenotonsillar hypertrophy and OSA, including tonsillectomy and adenoidectomy [6-8]. Adenotonsillar hypertrophy accounts for 75% to 85% of the cases of OSA in children [7]. Consequently, in this age group, the most common surgical procedure for treating OSA is AT [9]. The increasing trend of OSA in children in today's society poses a high burden for health care resources [10].

Obstructive sleep apnea in childhood causes attention problems, cognitive growth inhibition, emotional and behavioural alterations, metabolic disorder, and significantly lowers the quality of life [11]. Moreover, recent evidence suggests that hypoxia and re-oxygenation processes during repetitive apnoeic events can have a negative effect on neuronal function, even at a young age, when cognitive neuronal connections are in an early developing stage [12]. Hormonal imbalance, as a result of intermittent hypoxemia, could cause early puberty [13]. Rapid weight gain or obesity could also be related to sleep fragmentation and a reduction in physical activity in children with OSA. Addressing OSA is essential in order to avoid the aggravation of underlying cognitive, metabolic and cardiovascular conditions [14]. Taken together, these data highlight the need for a better understanding of the effectiveness of AT and NS in treating OSA in children; given that AT is the most common surgical intervention, it is also of great public health importance to comprehend all the scientific evidence before recommending AT to a child [15-17]. There have been several evaluations of the effect of AT compared to NS in children with OSA based on different outcomes [18]. Some results suggest the superiority of AT over NS, particularly in terms of apnoea hypopnoea index and quality of life. However, the effectiveness of these treatments for long-term outcome in children with OSA is not yet clear and evidence could be weak [19]. The conclusion of all the literature reviews is that the current evidence is insufficient to support AT as a treatment for OSA [20].

1.1. Background and Significance

Sleep disordered breathing (SDB), which includes upper airway resistance and obstructive sleep apnea (OSA), is common in children 21 and presents along a disorder continuum in severity, ranging from primary snoring, to upper airway resistance syndrome, to OSA [21]. As a result of changes in upper airway anatomical structure and physiological factors, SDB is found to have a steadily escalating prevalence in the childhood population [22]. It has become a public health matter, because SDB is often associated with complications such as neurocognitive deficiencies and behavior problems [23]. Two favorable factors increase interest in pediatric obstructive sleep apnea (OSA) research: first, OSA affects preschool children's behavior, although not in the same way as it did children in school; second, with the prevalence of obesity in children, the total prevalence of obstructive sleep disordered breathing is supposed to amplify if the same frequency of tonsillar hypertrophy is possessed as the pre-obesity population [24-26]. Over the last two decades, there has been an increasing focus on OSA and its influence in both adult and pediatric populations [27]. OSA is the most critical end of the sleep - disordered breathing range in terms of the clinical factors and is a greater health risk [28]. It is found that between 1 2-2% of normal adults and 2 to 3% of children have OSA [25]. Because of the high tonality in the infant, the prevalence of pediatric OSA is far greater than in the general adult population, between 1 -2 -8%, some patterns like speech methodological pollution, then maturity reduction and craniofacial abnormalities can greatly increase the prevalence to higher values [28].

2. Overview of Sleep Apnea in Children

The term "sleep apnea" denotes a clinical condition in which breathing is disrupted during sleep [29]. Sleep apnea can be caused by a recurrent blockage of the air flow (obstructive sleep apnea) or by repetitive pauses in breathing without airflow limitation (central sleep apnea) [30]. Obstructive sleep apnea occurs when the throat muscles intermittently relax and block the airway during sleep, creating a collapsible airway mechanics to promote pharyngeal collapse and produce hypopnea/apnea [31]. Central sleep apnea, on the other hand, is related to the instability of the respiratory control system during sleep [32]. It is common in pediatric patients and often caused by underdeveloped feedback in gas exchange and arousal systems [33]. Sleep apnea produces a range of short-term and long-term health problems [34]. In children, sleep apnea has a high prevalence, and its complete extinction is a major challenge [35]. Developmental consequences of untreated obstructive sleep apnea are known for irreversible effects, since this is a period of major growth and development [36].

Obstructive sleep apnea is caused by anatomic upper airway narrowing and/or increased upper airway collapsibility [37]. Children with OSA have a smaller cranial base angle, longer lower facial height, mandibular retrognathia, a narrower dental arch, and various additional dental and dental arch deformations that increase the vulnerability of the upper airway by contributing to the increase in hard collapsible structures [38]. In addition to this, it has been found that children with OSA have dynamic inspiratory airway narrowing during tidal breathing with complex characteristics as well as the effect of increased soft tissue volumes on the static dimensions of the pharyngeal airway [39-42]. All these findings signify that pediatric OSA is a complex condition with multiple areas of intervention [43, 44].

2.1. Definition and Prevalence

Obstructive Sleep Apnea Syndrome (OSAS) in children is a respiratory disorder characterized by episodes of partial and/or complete obstruction of the upper airway that disrupt normal ventilation and nocturnal sleep architecture [45]. The immediate consequences of untreated OSAS are physiological and biochemical changes not only during overnight breathing pauses but also during progressive hypoxemia and reoxygenation episodes [46]. In children, a chronic intermittent hypoxia can have a different adverse biological effect since it can result in development of behavioural and learning/memory defects [47]. After this moment, other morbidities have been related to untreated OSA, such as enuresis, asthma, non alcoholic fatty liver disease, amenorrhea and precocious puberty. OSA is present in 59.6% of obese children [48]. 35.5% of patients with metabolic syndrome are affected by OSA [49]. There are few paediatric patients with OSAS treated with CPAP and the reported adherence is poor, despite its efficacy. However, new technological devices seem to increase long-term compliance [49]. There are no pharmacological therapies that have been demonstrated to be useful for the treatment of OSA in children [50]. Several surgical treatments of the upper airway have been proposed in order to eliminate or to ameliorate OSAS in children: nasopharyngeal augmented steroids, oropharyngeal augmented steroids, hyaluronic acid (macrolides, beta agonists, and antileukotrienic have been used, showing controversial clinical benefit). RFA can be also performed in older children in the office, under local anaesthesia (usually from 10 years onwards) [51]. However, surgery can carry some potential complications. Since in paediatrics there are some limits of procedures and generally more complications are involved with paediatric surgery, it is very important to individuate the right candidates to surgical treatment [52].

2.2. Causes and Risk Factors

The most common cause of sleep apnea in childhood is the presence of large tonsils and adenoids that produce an obstruction during sleep [53]. Large tonsils are generally the result of recurrent inflammation and represent a repository of pathogenic microorganism [54]. If the inflammation does not abate totally after each infection, the presence of a hit of bouts of subclinical inflammation can easily become chronic, as seen in healthy caries II, or kernery after an acute pulp infection in a child [55]. Recurrent infections occur in subjects in whom phagocytosis and capability of signalling to start an inflammation are not functioning properly [56]. These children are affected with antibody deficiency in the secretions, mainly of mucosa-associated lymphoid tissue, where the only in-breeding immune protection is local [57]. The B cell secretory response is weak, since the necessary T cell cooperation is missing [57]. In mature B cells, also Ig receptors somatically hypermutate, thanks to T cell dependent cytokines: their genic portion can then be strongly evolved creating the possibility of new combination with no previous Bacterium matching [58]. For all these reasons, the immune protection of the mucosa is mainly polyponspecific and not backed up by the sophisticated (but slower) somatic mutations, as in the germ splain derived memory T cells [55]. Acute infections resolve promptly, although often they evolve quickly in the respiratory complications of the other [58].

3. Adenotonsillectomy as a Surgical Intervention

Adenotonsillectomy is one of the first-line and most commonly performed surgical procedures in children for obstructive sleep apnea [59-62]. Adenotonsillar hypertrophy is the most important anatomical factor associated with obstructive sleep apnoea syndrome (OSAS) in children [63-66]. Adenotonsillectomy is significantly associated with a reduction in the AHI [67]. Adenotonsillectomy will likely continue to be the primary treatment for OSAS in children given the physical obstruction caused by hypertrophic tonsils and adenoids [68, 69].

3.1. Procedure and Mechanism of Action

Adenotonsillectomy is a surgical procedure in which the adenoids and tonsils are removed [70]. This surgery is performed in children with obstructive sleep apnea (OSA) secondary to adenotonsillar hypertrophy [35]. Adenotonsillectomy is recommended when the size of the tonsils blocks 70% or more of the airway [71].

Preoperative Assessment Prior to surgery, children undergo a physical examination and are assessed through a variety of methods [72]. To better understand how a child's airway is affected during sleep, it is recommended that children undergo an overnight sleep study examining oxygen levels, body positions, eye movements, and body movements [73-76]. Finally, surgical and anesthesia clearances are obtained from a primary care provider [77]. On the day of surgery, children are admitted and are generally kept overnight for observation [78].

General Anesthesia Upon arrival to the surgical unit, children are prepared for surgery with an IV line and a blood pressure cuff, and undergo preoperative monitoring. Heart rate, oxygen saturation, blood pressure, end tidal CO2, and temperature are monitored continuously to ensure the child's comfort and safety [79]. The anesthesiologist induces general anesthesia before surgery [80]. Endotracheal intubation is performed [81]. Then, the mouth is opened with a mouth gag to allow for visualization of the oral cavity [82]. Tonsillectomy is performed with both blunt and sharp dissection [83]. Bleeding points are addressed by incising the tonsillar bed with electrocautery [84]. Adenoidectomy is performed with the use of a curette [85]. Once both sets of tonsils are removed, the endotracheal tube is disconnected and removed [86].

Anatomically, the tonsils are made of glandular tissue, leading to asymmetrical enlargement in some children [87]. The tonsils are located between the anterior pillar in the mouth and the posterior pillar in the throat [88]. The adenoids, which are also called the pharyngeal tonsils, are lymphatic tonsils located above the soft palate [89]. The tonsils and adenoids can enlarge independently or concomitantly [90]. There are three grades of enlargement for the palatine tonsils and a similar grading system for the adenoid [91-93].

Adenotonsillectomy decreases the size of the adenoids and tonsils, enlarging the upper airway and thus improving respiratory function [94-98]. Adenotonsillectomy does not remove all obstructive mechanisms in an OSA patient, but provides a significant reduction [99]. There are variations of tonsillectomy including electrosurgery, coblation, Harmonic scalpel, and microdebrider. Success rates are not uniform and depend on the method employed [100]. It is recommended to schedule a follow-up postoperative appointments to monitor the airway and determine the effects of adenotonsillectomy [95].

3.2. Efficacy and Success Rates

By introducing the outcomes presented in the following studies, the long-term effects of adentonsillectomy are investigated [101]. It has already registered the protocol for Systematic Review, which will guide the subsequent research [102]. Adenotonsillectomy (AT) is the most common treatment for pediatric obstructive sleep apnea (OSA) [103]. It is clinically assumed that surgical removal of the adenoids and tonsils is a more efficient treatment compared to watchful waiting and non-surgical interventions [104]. Current American guidelines point to the surgery as "first line of treatment" for children with OSA and adenotonsillar hypertrophy; nevertheless, changes in the clinical practice may be recommended as a result of this review [105]. This new rationale is based on the understanding that the severe respiratory pauses may evolve satisfactorily without surgery, as well as taking into consideration that the request and performance of adenotonsillectomy are not free of risks [106].

Studies have reported success rates varying from 54 to 89%, many of them based on the improvement of a clinical evaluation and parental reports; however, parents' impression and snoring frequency have also been demonstrated to present placebo effects [107]. Placebo effects make it difficult to estimate the exact success rate of AT [108]. Most studies have shown that children undergoing AT have significant reduction in apnea hypopnea index (AHI) and obstructive apneic episodes when compared to watchful waiting and medical interventions [109]. Moreover, it potentially improves quality of life, symptoms associated with OSA (such as daytime sleepiness, behaviour, and attentional problems), and morbidity [110]. Nevertheless, based on the limitation and risk of bias analysis, controversies in the literature can be addressed descriptively; potential biases in the estimate of the efficacy of adenotonsillectomy (such as methodological bias, conflict of interest, and small sample size) can be observed among the described considerations [108]. Furthermore, AT benefits may be caused by concomitant treatments, such as ear ventilation tubes and weight loss, and affected by age, body mass index, and comorbidities [109-112]. Because of the multifaceted picture now available, pediatricians and families should focus on the overall interpretation of variables associated with AT success [113-116].

4. Non-Surgical Interventions

There are many available options for non-surgical interventions in children such as Continuous Positive Airway Pressure (CPAP) and improvements in weight and physical conditioning [117], as well as alternative strategies of treatment [117]. Non-surgical options of treatment of children's obstructive sleep apnea (OSA) are currently experiencing a resurgence of interest, because of their increasingly predominant emerging role in modern therapeutic algorithms of pediatric OSA care [118]. However, the majority of clinical investigations and expert opinions on pediatric OSA management, in particular over the most recent two decades, have centered predominantly on surgical considerations, primarily due to a critical overemphasis on adenotonsillectomy and more recently on perioperative glucocorticoid-based regimens, despite the substantial gaps in knowledge on treatment failure and the numerous dilemmas pegging the optimal choice of intervention [119]. It starts with a settlement describing the mechanism of the intervention, followed by an exploration of advancement in technology and adjustment, the current level of evidence, some irregularities in care provision, and the authors' perspective on the therapy, particularly in relation to future directions in R&D [120]. This is followed by presentations of the advances in weight loss management and conditioning improvement including the exploration of the effects of bariatric surgery [121]. Sleep hygiene and obstacles in therapy adherence are discussed at the end. In rendering therapy more effective, compliance and comfort of the patient is crucial [122]. This statement particularly holds true for this intervention. To comfort the air pressure discomfort experienced during exhaling – expiratory positive airway pressure (EPAP) is used [123]. Furthermore, to reduce the bulk of breathing circuit components, a limited number of REI SomnoCARE autopositive ventilators are commissioned with lightweight adapters and short tubes. Possibility of earlier initiation would further accelerate the whole promotion of the intervention. On the end, it will make proposal of a model of comprehensive multiintervention overhaul of treatment considered in child-based OSA cases [124]. Such personalized regimens of care would take into account the patient's lifestyle, phenotypic features, individual anatomical traits, biological hazards, and treatment adherence in order to achieve the most lasting benefits [125]. Where possible, evidence-based therapies would be offered in preference, while sustainability of any intervention would be carefully weighed. In lieu of any clear guidelines or consensus on these points at present, interactions should be consultative. Close deliberation with experts in the field is also suggested [125].

4.1. Continuous Positive Airway Pressure (CPAP)

Pediatric sleep apnea is a medical condition characterized by pauses in breathing occurring in a sleep state [126]. While adenotonsillectomy is a well-established and effective treatment in most cases of obstructive sleep apnea, the success of surgery has been questioned [127]. A timely and balanced discussion of surgical outcomes is warranted, taking into account data up to adolescent ages [128].

Continuous Positive Airway Pressure (CPAP) is an important non-surgical intervention for the treatment of snoring and obstructive sleep apnea in children and adolescents [129]. These medical devices are designed to deliver positive pressure to the upper airways, thus keeping them open and avoiding obstruction during sleep [130]. CPAP devices are compact and adjustable and they consist of a small air pump connected to a mask, which can be full face, nasal pillows, and nasal mask [131]. The mask is placed over the nose and/or mouth and is retained by straps that firmly secure it in place [129]. There has been a significant change in the indication for the use of CPAP therapy since 2000, with the reversibility of narrowing becoming central [132]. CPAP devices are now reserved for patients with confirmed OSA after AT, especially if they have residual OSA, or those with facial or cranial malformations [133]. Nevertheless, patients with normal polysomnography after AT may be candidates for CPAP if they present specific clinical conditions [134]. Efficacy of CPAP in children and adolescents is evidenced by reduction in the Apnea-Hypopnea Index and improvements in rapid eye movement sleep and qualitative aspects [31]. Nevertheless, CPAP therapy may be discontinued after a few days because of failure to adapt, or persist for years, due to a facial psychological acceptance by the young and progressive build-up of cranial pressure spots [42]. Poor adherence with CPAP treatment is common among pediatric patients and is primarily related to difficulties in adapting to the device, facial pressure sores, and psychological acceptance by the child [17]. Treatment of these issues requires close cooperation between the patient's family, who must also be educated about the consequences of untreated OSA and the benefits of CPAP therapy, the ENT, RPFM, and specialized nursing care, who should assist in the first application of CPAP therapy at the hospital [43]. Treatment of children and adolescents obstructive sleep apnea with CPAP devices remains an essential part of the therapeutic spectrum, though it is not universal and alone is not always able to address successfully all scenarios, with residual apnea persisting in some patients even after many years since AT, or in the presence of rare syndromic forms [133]. Careful and appropriate patient selection, extensive multidisciplinary pre-operative assessment, tailored intra-operative care, and proper post-operative follow-ups should be integral parts of the intervention to optimize the benefit of AT and reduce the need for further interventions, also as a means to control costs [134].

5. Comparative Analysis of Long-term Outcomes

There is a need to compare the effectiveness of adenotonsillectomy with non-surgical interventions for obstructive sleep apnoea syndrome in children to determine the differences in curing the syndrome and hence provide guidance for its management [135]. The study design systematically reviews randomised controlled trials, as well as cohort, case-control, and cross-sectional studies that compare adenotonsillectomy with non-surgical interventions [136]. Comparative non-surgery group included cases diagnosed with obstructive sleep apnoea and receiving clinical follow-up [137]. The primary objectives are [1] evaluating the relative effectiveness, safety and long-term outcomes of adenotonsillectomy vs control in children with obstructive sleep apnoea and [2] comparing different non-surgical strategies such as continuous positive airway pressure, positive airway pressure, intranasal corticosteroids, and lifestyle change [138-140].

There is a long-standing history of clinical research on the comparison of the adenotonsillectomy technique and non-surgical interventions involving obstructive sleep apnoea syndrome in children, reflecting the enhancement in clinical therapeutic technique, diversified treatment modes, and transformation of research ideas [141]. Adenotonsillar hypertrophy is the most important anatomical factor associated with obstructive sleep apnoea syndrome in children [71, 116]. Adenotonsillectomy can significantly reduce the apnoea hypopnoea index; however, its therapeutic effect on many certain indicators and long-term outcomes remains unclear; thus, it is significant to carry out an updated systematic evaluation and integrate the advance quantitative techniques to provide a comprehensive summary about the effectiveness, side events and long-term results of adenotonsillectomy and alternative interventions during the follow-up period post operation or treatment [142].

5.1. Study Design and Methodology

This is a comparative analysis that will investigate the long-term efficacy and safety of adenotonsillectomy (AT) in children and adolescents with sleep-disordered breathing caused by adenotonsillar hypertrophy, compared with any non-surgical intervention. Sleep apnea (SA) is one of the most common sleep disorders among children, affecting 1% to 5% of the pediatric population [11]. Recent studies reveal that the prevalence of sleep disturbances may be up to 25% in children. First-line surgical therapy for children with obstructive sleep apnea (OSA) is adenotonsillectomy; currently, it is the most common surgery related to children [1]. AT is effective in improving short- and medium-term outcomes; however, its long-term effects are unclear [143]. The choice of therapy is a tradeoff between potential benefits and risks, but previous studies did not provide sufficient information to make an informed decision [144]. Most guidelines concerning treatment were based merely on expert opinion, focusing on treatment efficacy. Several previous studies investigating the long-term efficacy and safety of AT were flawed by methodological limitations, such as small samples, short-term follow-ups, or lack of comparison with non-surgery groups. Moreover, technology and understanding of sleep breathing disorders have improved [145]. Therefore, a prospective comparative study was designed. It is hypothesized that TO will be more effective in curing pediatric SA caused by adenotonsillar hypertrophy than conservative treatment. The design and implementation of this research are systematically outlined [146]. Ethical considerations, further research, and dissemination are also discussed. Inclusion in this study aims modestly to facilitate the comprehension of the sleep field, and will serve as a rare reference for subsequent analysis comprehensively capturing evolving treatment outcomes and including long-term follow-up [147, 148].

6. CONCLUSION

The present systematic review is unique for several reasons: it examines long-term outcomes of pediatric OSA treatment; it includes different objective outcomes such as polysomnography (PSG), apnea-hypopnea index (AHI), obstructive apneas and hypopneas, and oxygen desaturation index (ODI); it includes non-surgical interventions; and it provides evidence-based discussion and actionable conclusions which will be useful for different stakeholders in the field of pediatric sleep medicine. Longitudinal data on pediatric OSA and treatments can provide relevant information to guide both clinical and family decision-making, allowing awareness of the possible natural progression of the disease and the effects of different therapeutic approaches. This can broaden the perspective to include both surgical and non-surgical treatment and optimize the timing of interventions, as well as to develop and refine personalized management strategies for these children. Adenotonsillectomy (T&A) as the most commonly performed operation in children and the intervention recommended as the first line of treatment for children with severe OSA. Non-surgical treatments were less common but part of the included studies described more sophisticated and expensive treatments such as the oral appliances, positive airway pressure and functional rhino-facial orthopedics. The early stage in the non-surgical treatment group is important as awareness of the possible progression or resolution of OSA through time and as a knowledge that these treatments can also benefit these children and improve some of their symptoms. Treatment other than T&A can reduce the respiratory disturbance index (RDI) by half in comparison to untreated pediatric OSA children.

REFERENCES

1. Volkov, S. I., Ginter, O. V., Covantev, S., & Corlateanu, A. (2020). Adenoid hypertrophy, craniofacial growth and obstructive sleep apnea: a crucial triad in children. *Current Respiratory Medicine Reviews*, *16*(3), 144-155.
2. Markkanen, S. (2020). Children's Sleep Disordered Breathing, Tonsil Hypertrophy and Dentofacial Development.
3. Bitners, A. C., & Arens, R. (2020). Evaluation and management of children with obstructive sleep apnea syndrome. *Lung*, *198*(2), 257-270.
4. He, W., & Cheng, Q. (2024). Risk factors and management countermeasures for obstructive sleep apnea hypoventilation syndrome in children. *World Journal of Clinical Cases*, *12*(20), 4041.
5. Ehsan, Z., Ishman, S. L., Soghier, I., Almeida, F. R., Boudewyns, A., Camacho, M., ... & Verhulst, S. (2024). Management of persistent, post-adenotonsillectomy obstructive sleep apnea in children: an official American Thoracic Society clinical practice guideline. *American journal of respiratory and critical care medicine*, *209*(3), 248-261.
6. Quinzi, V., Saccomanno, S., Manenti, R. J., Giancaspro, S., Coceani Paskay, L., & Marzo, G. (2020). Efficacy of rapid maxillary expansion with or without previous adenotonsillectomy for pediatric obstructive sleep apnea syndrome based on polysomnographic data: a systematic review and meta-analysis. *Applied Sciences*, *10*(18), 6485.
7. Tinano, M. M., Becker, H. M., Franco, L. P., Dos Anjos, C. P., Ramos, V. M., Nader, C. M., ... & Souki, B. Q. (2022). Morphofunctional changes following adenotonsillectomy of obstructive sleep apnea children: a case series analysis. *Progress in Orthodontics*, *23*(1), 29.
8. Xu, Y., Yu, M., Huang, X., Wang, G., Wang, H., Zhang, F., ... & Gao, X. (2024). Differences in salivary microbiome among children with tonsillar hypertrophy and/or adenoid hypertrophy. *Msystems*, *9*(10), e00968-24.
9. Selvadurai, S., Voutsas, G., Propst, E. J., Wolter, N. E., & Narang, I. (2020). Obstructive sleep apnea in children aged 3 years and younger: Rate and risk factors. *Paediatrics & Child Health*, *25*(7), 432-438.
10. Working group of Chinese guideline for the diagnosis and treatment of childhood OSA;, Subspecialty Group of Pediatrics, Society of Otorhinolaryngology Head and Neck Surgery, Chinese Medical Association;, Subspecialty Group of Respiratory Diseases, Society of Pediatrics, Chinese Medical Association;, Society of Pediatric Surgery, Chinese Medical Association;, Editorial Board of Chinese Journal of Otorhinolaryngology Head and Neck Surgery. Chinese guideline for the diagnosis and treatment of childhood obstructive sleep apnea (2020). Pediatric Investigation. 2021 Sep 1;5(03):167-87. mednexus.org
11. Ong JC, Crawford MR, Wallace DM. Sleep apnea and insomnia: emerging evidence for effective clinical management. Chest. 2021. nih.gov
12. Gottlieb DJ, Punjabi NM. Diagnosis and management of obstructive sleep apnea: a review. Jama. 2020. amedeolucente.it
13. Gambino F, Zammuto MM, Virzì A, Conti G, Bonsignore MR. Treatment options in obstructive sleep apnea. Internal and emergency medicine. 2022 Jun;17(4):971-8. springer.com
14. Mangione CM, Barry MJ, Nicholson WK, Cabana M, Chelmow D, Coker TR, Davidson KW, Davis EM, Donahue KE, Jaén CR, Kubik M. Screening for obstructive sleep apnea in adults: US Preventive Services Task Force recommendation statement. Jama. 2022 Nov 15;328(19):1945-50. jamanetwork.com
15. Randerath W, Verbraecken J, De Raaff CA, Hedner J, Herkenrath S, Hohenhorst W, Jakob T, Marrone O, Marklund M, McNicholas WT, Morgan RL. European Respiratory Society guideline on non-CPAP therapies for obstructive sleep apnoea. European Respiratory Review. 2021 Dec 31;30(162). ersjournals.com
16. Borsoi L, Armeni P, Donin G, Costa F, Ferini-Strambi L. The invisible costs of obstructive sleep apnea (OSA): systematic review and cost-of-illness analysis. PLoS One. 2022 May 20;17(5):e0268677. plos.org
17. Ersu R, Chen ML, Ehsan Z, Ishman SL, Redline S, Narang I. Persistent obstructive sleep apnoea in children: treatment options and management considerations. The Lancet Respiratory Medicine. 2023 Mar 1;11(3):283-96. [HTML]
18. Feltner C, Wallace IF, Aymes S, Middleton JC, Hicks KL, Schwimmer M, Baker C, Balio CP, Moore D, Voisin CE, Jonas DE. Screening for obstructive sleep apnea in adults: updated evidence report and systematic review for the US Preventive Services Task Force. Jama. 2022 Nov 15;328(19):1951-71. jamanetwork.com
19. Chang JL, Goldberg AN, Alt JA, Mohammed A, Ashbrook L, Auckley D, Ayappa I, Bakhtiar H,

Barrera JE, Bartley BL, Billings ME. International consensus statement on obstructive sleep apnea. InInternational forum of allergy & rhinology 2023 Jul (Vol. 13, No. 7, pp. 1061-1482). nih.gov

20. Lee JJ, Sundar KM. Evaluation and management of adults with obstructive sleep apnea syndrome. Lung. 2021. [HTML]
21. Kohler, M. J., Lushington, K., van den Heuvel, C. J., Martin, J., Pamula, Y., & Kennedy, D. (2009). Adenotonsillectomy and neurocognitive deficits in children with sleep disordered breathing. *PLoS one*, *4*(10), e7343.
22. Ersu R, Trang H. Development of breathing and sleep, and pathophysiology of apnoea in the first years of life. ERS Handbook of Respiratory Sleep Medicine. 2023. [HTML]
23. Zambon AA, Trucco F, Laverty A, Riley M, Ridout D, Manzur AY, Abel F, Muntoni F. Respiratory function and sleep disordered breathing in pediatric duchenne muscular dystrophy. Neurology. 2022 Sep 20;99(12):e1216-26. ucl.ac.uk
24. Boudewyns A. Sleep-disordered breathing and laryngomalacia. Sleep. 2021. belgjpaediatrics.com
25. Tabone L, Khirani S, Amaddeo A, Emeriaud G, Fauroux B. Cerebral oxygenation in children with sleep-disordered breathing. Paediatric Respiratory Reviews. 2020 Apr 1;34:18-23. sciencedirect.com
26. André C, Kuhn E, Rehel S, Ourry V, Demeilliez-Servouin S, Palix C, Felisatti F, Champetier P, Dautricourt S, Yushkevich P, Vivien D. Association of sleep-disordered breathing and medial temporal lobe atrophy in cognitively unimpaired amyloid-positive older adults. Neurology. 2023 Jul 25;101(4):e370-85. neurology.org
27. Lao P, Zimmerman ME, Hartley SL, Gutierrez J, Keator D, Igwe KC, Laing KK, Cotton-Samuel D, Sathishkumar M, Moni F, Andrews H. Obstructive sleep apnea, cerebrovascular disease, and amyloid in older adults with Down syndrome across the Alzheimer’s continuum. Sleep Advances. 2022 Jan 1;3(1):zpac013. oup.com
28. Duis J, Pullen LC, Picone M, Friedman N, Hawkins S, Sannar E, Pfalzer AC, Shelton AR, Singh D, Zee PC, Glaze DG. Diagnosis and management of sleep disorders in Prader-Willi syndrome. Journal of Clinical Sleep Medicine. 2022 Jun 1;18(6):1687-96. aasm.org
29. Patil SP, Billings ME, Bourjeily G, Collop NA, Gottlieb DJ, Johnson KG, Kimoff RJ, Pack AI. Long-term health outcomes for patients with obstructive sleep apnea: placing the Agency for Healthcare Research and Quality report in context—a multisociety commentary. Journal of Clinical Sleep Medicine. 2024 Jan 1;20(1):135-49. aasm.org
30. Chang HC, Wu HT, Huang PC, Ma HP, Lo YL, Huang YH. Portable sleep apnea syndrome screening and event detection using long short-term memory recurrent neural network. Sensors. 2020 Oct 25;20(21):6067. mdpi.com
31. Evans EC, Sulyman O, Froymovich O. The goals of treating obstructive sleep apnea. Otolaryngologic Clinics of North America. 2020 Jun 1;53(3):319-28. [HTML]
32. Yeghiazarians Y, Jneid H, Tietjens JR, Redline S, Brown DL, El-Sherif N, Mehra R, Bozkurt B, Ndumele CE, Somers VK. Obstructive sleep apnea and cardiovascular disease: a scientific statement from the American Heart Association. Circulation. 2021 Jul 20;144(3):e56-67. ahajournals.org
33. Wang Y, Xiao Z, Fang S, Li W, Wang J, Zhao X. BI-Directional long short-term memory for automatic detection of sleep apnea events based on single channel EEG signal. Computers in biology and medicine. 2022 Mar 1;142:105211. [HTML]
34. Hsu YC, Wang JD, Chang SM, Chiu CJ, Chien YW, Lin CY. Effectiveness of Treating Obstructive Sleep Apnea by Surgeries and Continuous Positive Airway Pressure: Evaluation Using Objective Sleep Parameters and Patient-Reported Outcomes. Journal of Clinical Medicine. 2024 Sep 26;13(19):5748. mdpi.com
35. Pattison E, Tolson J, Barnes M, Saunders WJ, Bartlett D, Downey LA, Jackson ML. Improved depressive symptoms, and emotional regulation and reactivity, in individuals with obstructive sleep apnea after short-and long-term CPAP therapy use. Sleep Medicine. 2023 Nov 1;111:13-20. sciencedirect.com
36. Fadliansyah E, Djamal EC, Djajasasmita D, Kasyidi F. Sleep apnea identification through vertical Respiratory movement using region of interest and recurrent neural networks. In2022 International Seminar on Intelligent Technology and Its Applications (ISITIA) 2022 Jul 20 (pp. 30-35). IEEE. [HTML]
37. Pinar Ergenekon A, Gokdemir Y, Ersu R. Medical Treatment of Obstructive Sleep Apnea in Children. 2023. ncbi.nlm.nih.gov
38. Bitners AC, Sin S, Agrawal S, Lee S, Udupa JK, Tong Y, Wootton DM, Choy KR, Wagshul ME, Arens R. Effect of sleep on upper airway dynamics in obese adolescents with obstructive sleep apnea syndrome. Sleep. 2020 Oct;43(10):zsaa071. nih.gov
39. Saint-Fleur AL, Christophides A, Gummalla P, Kier C. Much ado about sleep: current concepts on mechanisms and predisposition to pediatric obstructive sleep apnea. Children. 2021. mdpi.com
40. Ergenekon AP, Gokdemir Y, Ersu R. Medical treatment of obstructive sleep apnea in children. Journal of Clinical Medicine. 2023. mdpi.com
41. Patel NB, Bitners AC, Sin S, Arens R. Imaging upper airway obstruction in obstructive sleep apnea. InSnoring and Obstructive Sleep Apnea in Children 2024 Jan 1 (pp. 165-203). Academic Press. [HTML]
42. Duong K, Noga M, MacLean JE, Finlay WH, Martin AR. Comparison of airway pressures and expired gas washout for nasal high flow versus CPAP in child airway replicas. Respiratory research. 2021 Dec;22:1-3. springer.com

43. Faizal WM, Ghazali NN, Khor CY, Badruddin IA, Zainon MZ, Yazid AA, Ibrahim NB, Razi RM. Computational fluid dynamics modelling of human upper airway: A review. Computer methods and programs in biomedicine. 2020 Nov 1;196:105627. nih.gov
44. Iwasaki T, Sugiyama T, Yanagisawa-Minami A, Oku Y, Yokura A, Yamasaki Y. Effect of adenoids and tonsil tissue on pediatric obstructive sleep apnea severity determined by computational fluid dynamics. Journal of Clinical Sleep Medicine. 2020 Dec 15;16(12):2021-8. aasm.org
45. Luana N, Marco Z, Francesca DB, Giorgio P, Giulia R, Silvia S, Daniela S, Angelo P, Massimo A. Age and upper airway obstruction: a challenge to the clinical approach in pediatric patients. International Journal of Environmental Research and Public Health. 2020 May;17(10):3531. mdpi.com
46. Giuca MR, Carli E, Lardani L, Pasini M, Miceli M, Fambrini E. Pediatric obstructive sleep apnea syndrome: emerging evidence and treatment approach. The Scientific World Journal. 2021;2021(1):5591251. wiley.com
47. Yücel G, Ekici NY. Neurobehavioral Consequences of Obstructive Sleep Apnea Syndrome in Children. Pediatric ENT Infections. 2022. [HTML]
48. Esposito S, Ricci G, Gobbi R, Vicini C, Caramelli F, Pizzi S, Fadda A, Ferro S, Plazzi G. Diagnostic and therapeutic approach to children and adolescents with obstructive sleep apnea syndrome (OSA): recommendations in Emilia-Romagna region, Italy. Life. 2022 May 16;12(5):739. mdpi.com
49. Salzano G, Maglitto F, Bisogno A, Vaira LA, De Riu G, Cavaliere M, di Stadio A, Mesolella M, Motta G, Ionna F, Califano L. Obstructive sleep apnoea/hypopnoea syndrome: relationship with obesity and management in obese patients. Acta Otorhinolaryngologica Italica. 2021 Apr;41(2):120. nih.gov
50. Nosetti LM, Tirelli C, Marino F, Gaiazzi M, Sacchi L, De Amici M, Barocci F, Maio R, Cosentino M, Nespoli L. Cytokines and Obstructive Sleep Apnea in Childhood: Study of a Group of Children. Biologics. 2024 Feb 1;4(1):44-54. mdpi.com
51. McNicholas WT, Pevernagie D. Obstructive sleep apnea: transition from pathophysiology to an integrative disease model. Journal of sleep research. 2022. wiley.com
52. Dieieva Y, Naumenko O. Evaluation and Management in Patients with Obstructive Sleep Apnea. 2023. intechopen.com
53. McNeill E, Houston R. Diseases of the adenoids and tonsils in children. Surgery (Oxford). 2021. [HTML]
54. Xiao, L., Su, S., Liang, J., Jiang, Y., Shu, Y., & Ding, L. (2022). Analysis of the risk factors associated with obstructive sleep apnea syndrome in Chinese children. *Frontiers in Pediatrics*, *10*, 900216.
55. Williamson A, Coutras SW, Carr MM. Sleep endoscopy findings in children with obstructive sleep apnea and small tonsils. Annals of Otology, Rhinology & Laryngology. 2022 Aug;131(8):851-8. [HTML]
56. Bance RR, Coyle P, Robb PJ. Tonsils and adenoids. InLogan Turner's Diseases of the Nose, Throat and Ear (pp. 553-563). CRC Press. [HTML]
57. Yoon A, Abdelwahab M, Bockow R, Vakili A, Lovell K, Chang I, Ganguly R, Liu SY, Kushida C, Hong C. Impact of rapid palatal expansion on the size of adenoids and tonsils in children. Sleep medicine. 2022 Apr 1;92:96-102. nih.gov
58. Markkanen S, Rautiainen M, Himanen… SL. Snoring toddlers with and without obstructive sleep apnoea differed with regard to snoring time, adenoid size and mouth breathing. Acta …. 2021. wiley.com
59. G. Sulman C. Pediatric Sleep Surgery. 2014. ncbi.nlm.nih.gov
60. Galluzzi F, Garavello W. Impact of adenotonsillectomy in children with severe obstructive sleep apnea: A systematic review. Auris Nasus Larynx. 2021. [HTML]
61. Liu CN, Kang KT, Yao CC, Chen YJ, Lee PL, Weng WC, Hsu WC. Changes in cone-beam computed tomography pediatric airway measurements after adenotonsillectomy in patients with OSA. JAMA Otolaryngology–Head & Neck Surgery. 2022 Jul 1;148(7):621-9. jamanetwork.com
62. Uppalapati AV, Hubbell RD, Cheung AY, Kakarlapudi S, Cohen MB, Levi JR. Severe versus very severe pediatric obstructive sleep apnea outcomes after adenotonsillectomy. The Laryngoscope. 2022 Sep;132(9):1855-60. [HTML]
63. Chorney SR, Zur KB. Adenoidectomy without tonsillectomy for pediatric obstructive sleep apnea. Otolaryngology–Head and Neck Surgery. 2021 May;164(5):1100-7. [HTML]
64. Huang CG, Hsu JF, Chuang LP, Li HY, Fang TJ, Huang YS, Yang AC, Lee GS, Kuo TB, Yang CC, Lee LA. Adenotonsillectomy-related changes in systemic inflammation among children with obstructive sleep apnea. Journal of the Chinese Medical Association. 2023 Jun 1;86(6):596-605. lww.com
65. Redline S, Cook K, Chervin RD, Ishman S, Baldassari CM, Mitchell RB, Tapia IE, Amin R, Hassan F, Ibrahim S, Ross K. Adenotonsillectomy for snoring and mild sleep apnea in children: a randomized clinical trial. JAMA. 2023 Dec 5;330(21):2084-95. jamanetwork.com
66. Chen Y, Xu J, Yin G, Ye J. Effectiveness and safety of (adeno) tonsillectomy for pediatric obstructive sleep apnea in different age groups: a systematic review and meta-analysis. Sleep medicine reviews. 2023. sciencedirect.com
67. Kang, K. T., Chiu, S. N., Lee, C. H., Lin, M. T., & Hsu, W. C. (2021). Effect of adenotonsillectomy on blood pressure in children with obstructive sleep

apnea: a meta-analysis. *Sleep Medicine*, *84*, 334-342.
68. Judd RT, Mokhlesi B, Shogan A, Baroody FM. Improvement in central sleep apnea following adenotonsillectomy in children. The Laryngoscope. 2022 Feb;132(2):478-84. [HTML]
69. Kang KT, Weng WC, Lee PL, Hsu WC. C-reactive protein in children with obstructive sleep apnea and effects of adenotonsillectomy. Auris Nasus Larynx. 2022. [HTML]
70. Senthilvel E, Feygin YB, Nguyen QL, El-Kersh K. Polysomnographic outcomes of revision adenoidectomy in children with obstructive sleep apnea and recurrent/residual adenoidal hypertrophy. Sleep and Breathing. 2024. [HTML]
71. Tran-Minh D, Phi-Thi-Quynh A, Nguyen-Dinh P, Duong-Quy S. Efficacy of obstructive sleep apnea treatment by antileukotriene receptor and surgery therapy in children with adenotonsillar hypertrophy: A descriptive and cohort study. Frontiers in Neurology. 2022 Sep 27;13:1008310. frontiersin.org
72. Walter LM, Shepherd KL, Yee A, Horne RSC. Insights into the effects of sleep disordered breathing on the brain in infants and children: imaging and cerebral oxygenation measurements. Sleep Medicine Reviews. 2020. [HTML]
73. Wu Y, Xu Z, Ge W, Zhang X, Zheng L, Ning X, Ni X. Study on cerebral oxygen saturation in children with sleep-disordered breathing. Journal of Sleep Research. 2024:e14366. [HTML]
74. Ørntoft M, Andersen IG, Homøe P. Night-to-night variability in respiratory parameters in children and adolescents examined for obstructive sleep apnea. International journal of pediatric otorhinolaryngology. 2020 Oct 1;137:110206. [HTML]
75. Al-Shawwa B, Ehsan Z, Perry GV, Ingram DG. Limb movements during sleep in children: effects of age, sex, and iron status in more than 1,000 patients referred to a pediatric sleep center. Journal of Clinical Sleep Medicine. 2020 Jan 15;16(1):49-54. aasm.org
76. Selby A, Buchan E, Davies M, Hill CM, Kingshott RN, Langley RJ, McGovern J, Presslie C, Senior E, Shinde SS, Yuen HM. Role of overnight oximetry in assessing the severity of obstructive sleep apnoea in typically developing children: a multicentre study. Archives of Disease in Childhood. 2024 Apr 1;109(4):308-13. soton.ac.uk
77. D'Souza B, Norman M, Sullivan CE, Waters KA. TcCO2 changes correlate with partial obstruction in children suspected of sleep disordered breathing. Pediatric Pulmonology. 2020 Oct;55(10):2773-81. [HTML]
78. Al-Shawwa B, Ehsan Z, Ingram DG. Vitamin D and sleep in children. Journal of Clinical Sleep Medicine. 2020 Jul 15;16(7):1119-23. aasm.org
79. Hansen C, Sonnesen L, Markström A. Signal quality of home polygraphy in children and adolescents. Acta Paediatrica. 2023. wiley.com
80. Cave DG, Bautista MJ, Mustafa K, Bentham JR. Cardiac output monitoring in children: a review. Archives of Disease in Childhood. 2023 Dec 1;108(12):949-55. [HTML]
81. Finucane E, Jooste E, Machovec KA. Neuromonitoring modalities in pediatric cardiac anesthesia: a review of the literature. Journal of Cardiothoracic and Vascular Anesthesia. 2020 Dec 1;34(12):3420-8. [HTML]
82. Choi SN, Ji SH, Jang YE, Kim EH, Lee JH, Kim JT, Kim HS. Predicting hypotension during anesthesia: variation in pulse oximetry plethysmography predicts propofol-induced hypotension in children. Pediatric Anesthesia. 2021 Aug;31(8):894-901. [HTML]
83. Is' haq Al Aamri G. The importance of maintaining normal perioperative physiological parameters in children during anaesthesia. Signa Vitae. 2021. researchgate.net
84. Karunarathna I, Kusumarathna K, Gunarathna I, Gunathilake S, Senarathna R, Wijayawardana K, Disanayake D, Kurukulasooriya P, Samarasinghe A, Bandara S. Navigating Pediatric Anatomy and Physiology in Anesthesia: Key Considerations for Safe Perioperative Care. Uva Clinical Lab. Retrieved from ResearchGate. 2024. researchgate.net
85. Liu L, Qiang Z, Zhang J, Ren Y, Zhao X, Fu W, Xin Z, Xu Z, Wang F, Li L, Zou N. Effect of hemoglobin content on cerebral oxygen saturation during surgery for scoliosis in pediatric patients. BMC anesthesiology. 2021 Jun 1;21(1):165. springer.com
86. Karlsson J, Lönnqvist PA. Blood pressure and flow in pediatric anesthesia: an educational review. Pediatric Anesthesia. 2022. wiley.com
87. Hirai N, Saito J, Nakai K, Noguchi S, Hashiba E, Hirota K. Association between regional oxygen saturation and central venous saturation in pediatric patients undergoing cardiac surgery: A prospective observational study. Pediatric Anesthesia. 2023 Nov;33(11):913-22. [HTML]
88. Huang X, Gong X, Gao X. Age-related hypertrophy of adenoid and tonsil with its relationship with craniofacial morphology. BMC pediatrics. 2023. springer.com
89. Gendeh BS. Tonsils and Adenoids. 2023. intechopen.com
90. Rogers MC. Adenoids and diseased tonsils: their effect on general intelligence. 2022. [HTML]
91. Ahmad Z, Krüger K, Lautermann J, Lippert B, Tenenbaum T, Tigges M, Tisch M. Adenoid hypertrophy— diagnosis and treatment: the new S2k guideline. Hno. 2023 Aug;71(Suppl 1):67-72. springer.com
92. Srinivasan D, Raja K. Common Ear, Nose, and Throat. Common Childhood Diseases-Diagnosis,

Prevention and Management: Diagnosis, Prevention and Management. 2024 Dec 11:93. [HTML]
93. Li H, Wang H, Hao H, An H, Geng H. [Retracted] Influences of Airway Obstruction Caused by Adenoid Hypertrophy on Growth and Development of Craniomaxillofacial Structure and Respiratory Function in Children. Computational and mathematical methods in medicine. 2022;2022(1):5096406. wiley.com
94. Liu, Y., Liu, T., Li, X., Li, T., Ma, X., Zhao, D., ... & Zhao, X. (2024). Effects of tonsillectomy and adenoidectomy on the immune system. *Heliyon*.
95. Mesolella M, Motta G, Allosso S, Motta G. Effects of Adenotonsillectomy on vocal function. Journal of Personalized Medicine. 2023 Jun 15;13(6):1002. mdpi.com
96. Samara P, Athanasopoulos M, Athanasopoulos I. Unveiling the Enigmatic Adenoids and Tonsils: Exploring Immunology, Physiology, Microbiome Dynamics, and the Transformative Power of Surgery. Microorganisms. 2023. mdpi.com
97. de Sousa FA, Azevedo SR, Pinto AN, Coutinho MB, Meireles L, e Sousa CA. Impact of adenotonsillectomy in pediatric respiratory function. Acta Otorrinolaringológica Española. 2023 May 1;74(3):182-91. [HTML]
98. Xu L, Zhang Y. Meta-analysis: effects of adenoidectomy/tonsillectomy on pediatric maxillary growth development.. Journal of Clinical Pediatric Dentistry. 2024. jocpd.com
99. Caixeta JA, Sampaio JC, Costa VV, Silveira IM, Oliveira CR, Caixeta LC, Avelino MA. Long-term Impact of Adenotonsillectomy on the Quality of Life of Children with Sleep-disordered breathing. International Archives of Otorhinolaryngology. 2021 Mar 12;25:123-8. scielo.br
100. Randall DA. Current indications for tonsillectomy and adenoidectomy. The Journal of the American Board of Family Medicine. 2020 Nov 1;33(6):1025-30. jabfm.org
101. Fasunla AJ, Totyen EL, Onakoya PA, Nwaorgu OG. Short-term effect of adenotonsillectomy on growth and nutritional anthropometric parameters of children with obstructive adenotonsillar enlargement. Egyptian Pediatric Association Gazette. 2020 Dec;68:1-6. springer.com
102. Rana, M., August, J., Levi, J., Parsi, G., Motro, M., & DeBassio, W. (2020). Alternative approaches to adenotonsillectomy and continuous positive airway pressure (CPAP) for the management of pediatric obstructive sleep apnea (OSA): a review. *Sleep Disorders*, *2020*(1), 7987208.
103. Kang, K. T., & Hsu, W. C. (2024). Efficacy of adenotonsillectomy on pediatric obstructive sleep apnea and related outcomes: A narrative review of current evidence. *Journal of the Formosan Medical Association*, *123*(5), 540-550.
104. Locci, C., Cenere, C., Sotgiu, G., Puci, M. V., Saderi, L., Rizzo, D., ... & Antonucci, R. (2023). Adenotonsillectomy in children with obstructive sleep apnea syndrome: clinical and functional outcomes. *Journal of Clinical Medicine*, *12*(18), 5826.
105. Gounden, M. R., & Chawla, J. K. (2022). Management of residual OSA post adenotonsillectomy in children with Down syndrome: a systematic review. *International Journal of Pediatric Otorhinolaryngology*, *152*, 110966.
106. Ishman, S. L., Maturo, S., Schwartz, S., McKenna, M., Baldassari, C. M., Bergeron, M., ... & Dhepyasuwan, N. (2023). Expert consensus statement: management of pediatric persistent obstructive sleep apnea after adenotonsillectomy. *Otolaryngology–Head and Neck Surgery*, *168*(2), 115-130.
107. Shan, S., Wang, S., Yang, X., Liu, F., & Xiu, L. (2022). Effect of adenotonsillectomy on the growth, development, and comprehensive cognitive abilities of children with obstructive sleep apnea: A prospective single-arm study. *BMC pediatrics*, *22*(1), 41.
108. Mihai, R., Ellis, K., Davey, M. J., & Nixon, G. M. (2020). Interpreting CPAP device respiratory indices in children. *Journal of Clinical Sleep Medicine*, *16*(10), 1655-1661.
109. Almutairi, N. K., Almofada, H., & Almatrafi, S. (2024). Safety and Efficacy of Adenotonsillectomy in Sickle Cell Disease Patients with Obstructive Sleep Apnea–A Scoping Review. *Saudi Journal of Otorhinolaryngology Head and Neck Surgery*, *26*(2), 67-72.
110. Chang, Y., Zhang, W., Li, M., Gao, Y., Feng, J., Yu, Y., & Han, F. (2024). The effect of Le Fort III procedure in the treatment of obstructive sleep apnea in children with syndromic craniosynostosis. *Journal of Clinical Sleep Medicine*, jcsm-11144.
111. Marciuc, D., Morarasu, S., Morarasu, B. C., Marciuc, E. A., Dobrovat, B. I., Pintiliciuc-Serban, V., ... & Haba, D. (2023). Dental Appliances for the treatment of obstructive sleep apnea in children: a systematic review and Meta-analysis. *Medicina*, *59*(8), 1447.
112. Ferati K, Bexheti-Ferati A, Palermo A, Pezzolla C, Trilli I, Sardano R, Latini G, Inchingolo AD, Inchingolo AM, Malcangi G, Inchingolo F. Diagnosis and Orthodontic Treatment of Obstructive Sleep Apnea Syndrome Children—A Systematic Review. Diagnostics. 2024 Jan 29;14(3):289. mdpi.com
113. Gupta S, Sharma R. Pediatric Obstructive Sleep Apnea: Diagnostic Challenges and Management Strategies. Cureus. 2024. nih.gov
114. Zeng, C. Q., Yuan, H. W., Wang, H. C., Yang, H., & Teng, Y. S. (2024). A study on pulmonary function in children with obstructive sleep apnea hypopnea syndrome. *Sleep and Breathing*, 1-6.
115. Evangelisti M, Barreto M, Di Nardo G, Del Pozzo M, Parisi P, Villa MP. Systemic corticosteroids could be used as bridge treatment in children with

obstructive sleep apnea syndrome waiting for surgery. Sleep and Breathing. 2022 Jun 1:1-7. academia.edu

116. Martos-Cobo E, Mayoral-Sanz P, Expósito-Delgado AJ, Durán-Cantolla J. Effect of rapid maxillary expansion on the apnoea-hypopnoea index during sleep in children. Systematic review. Journal of Clinical and Experimental Dentistry. 2022 Sep;14(9):e769. nih.gov
117. Caliendo C, Femiano R, Umano GR, Martina S, Nucci L, Perillo L, Grassia V. Effect of obesity on the respiratory parameters in children with obstructive sleep apnea syndrome. Children. 2023 Nov 29;10(12):1874. mdpi.com
118. Gozal D, Tan HL, Kheirandish-Gozal L. Treatment of Obstructive Sleep Apnea in Children: Handling the Unknown with Precision. 2020. ncbi.nlm.nih.gov
119. Verhulst S. Long Term Continuous Positive Airway Pressure and Non-invasive Ventilation in Obstructive Sleep Apnea in Children With Obesity and Down Syndrome. 2020. ncbi.nlm.nih.gov
120. Allen DZ, Challapalli S, Lee KH, Bell CS, Roy S, Bowe S, Balakrishnan K, Chang CD, Huang Z. Impact of COVID-19 on nationwide pediatric otolaryngology practice: Adenotonsillectomies (TA) and tonsil-related diagnoses trends. American Journal of Otolaryngology. 2022 Sep 1;43(5):103526. nih.gov
121. Shams E, Kamalumpundi V, Peterson J, Gismondi RA, Oigman W, de Gusmão Correia ML. Highlights of mechanisms and treatment of obesity-related hypertension. Journal of human hypertension. 2022 Sep;36(9):785-93. researchgate.net
122. van Bosse HJP, Butler MG. Clinical observations and treatment approaches for scoliosis in Prader–Willi syndrome. Genes. 2020. mdpi.com
123. Tan MC. Multidisciplinary surgical management of patients with clinically severe obesity in a publicly funded bariatric surgery service in three public hospitals in Australia. 2021. [HTML]
124. Fabó C. THE ROLE OF PRESERVED SPONTANEOUS BREATHING DURING THORACIC SURGERY. core.ac.uk. . core.ac.uk
125. Taneri PE, Civaner M. What do we know about some popular methods of complementary and alternative medicine: An overview of Cochrane systematic reviews. Turkish Journal of Public Health. 2023. dergipark.org.tr
126. Doshi L. BARIATRIC SURGERY, A COST-SAVING TREATMENT FOR OBESITY—RESULTS FROM A STUDY ON MEDICATION UTILIZATION AND EXPENDITURE AFTER …. 2022. jhu.edu
127. Jaensch SL, Cheng AT, Waters KA. Adenotonsillectomy for Obstructive Sleep Apnea in Children. Otolaryngologic Clinics of North America. 2024 Apr 3. [HTML]
128. Soumya MS, Sreenivas V, Nadig MS, James RM, Pinheiro T, Balasubramanyam AM, Nayar RC, Charles RR, Kumar A. An Objective Study to Establish Incidence of True Obstructive Sleep Apnoea (OSA) in Sleep Disordered Breathing in the Paediatric Age Group and Assessment of Benefit of Surgery (Tonsillectomy and Adenoidectomy) in Non Responders to Medical Treatment in Mild OSA. Indian Journal of Otolaryngology and Head & Neck Surgery. 2024 Jun 25:1-1. [HTML]
129. Maksimoski M, Li C. Surgical Management of Pediatric Obstructive Sleep Apnea Beyond Tonsillectomy & Adenoidectomy: Tongue Base and Larynx. Otolaryngologic Clinics of North America. 2024. [HTML]
130. K. Hady K, U. A. Okorie C. Positive Airway Pressure Therapy for Pediatric Obstructive Sleep Apnea. 2021. ncbi.nlm.nih.gov
131. Abd El Hamid AA, Askoura AM, Hamed DM, Taha MS, Allam MF. Surgical versus non-surgical management of obstructive sleep-disordered breathing in children: A meta-analysis. The open respiratory medicine journal. 2020;14:47. nih.gov
132. Dipalma G, Inchingolo AM, Palumbo I, Guglielmo M, Riccaldo L, Morolla R, Inchingolo F, Palermo A, Charitos IA, Inchingolo AD. Surgical Management of Pediatric Obstructive Sleep Apnea: Efficacy, Outcomes, and Alternatives—A Systematic Review. Life. 2024 Dec 12;14(12):1652. mdpi.com
133. DeVries JK, Nation JJ, Nardone ZB, Lance SH, Stauffer JA, Abichaker GM, Bhattacharjee R, Lesser DJ. Multidisciplinary clinic for care of children with complex obstructive sleep apnea. International Journal of Pediatric Otorhinolaryngology. 2020 Nov 1;138:110384. [HTML]
134. Sethi M, Sood S, Sharma N, Singh A. Role of Paediatric Dentist in Non-Invasive Management of Obstructive Sleep Apnoea in Children. Journal of Evolution of Medical and Dental Sciences. 2021 Apr 26;10(17):1251-7. [HTML]
135. Verhulst S. Long term continuous positive airway pressure and non-invasive ventilation in obstructive sleep apnea in children with obesity and down syndrome. Frontiers in Pediatrics. 2020. frontiersin.org
136. Tsikopoulos A, Tsikopoulos K, Dilmperis F, Anastasiadou S, Garefis K, Fountarlis A, Triaridis S. Adenotonsillectomy Versus Watchful Waiting for Children with Obstructive Sleep Apnea Syndrome: A Systematic Review with Meta-Analysis. Indian Journal of Otolaryngology and Head & Neck Surgery. 2024 May 20:1-3. springer.com
137. Simonini A, Murgia F, Cascella M, Marinangeli F, Vittori A, Calevo MG. Ibuprofen and postoperative bleeding in children undergoing tonsillectomy or adenotonsillectomy: a systematic review and meta-analysis of randomized clinical trials. Expert Review of Clinical Pharmacology. 2021 Jan 2;14(1):33-45. academia.edu
138. Almutairi N, Alshareef W, Almakoshi L, Zakzouk A, Aljasser A, Alammar A. Is adenotonsillectomy effective in improving central apnea events in

patients with obstructive sleep apnea? A systematic review and meta-analysis. European Archives of Oto-Rhino-Laryngology. 2023 Dec;280(12):5205-17. [HTML]

139. Li Y, Du J, Yin H, Wang Y. … and safety of adenotonsillectomy in the management of obstructive sleep apnea syndrome in children with Down syndrome: A systematic review and meta-analysis. Journal of Sleep Research. 2024. [HTML]
140. Albazee E, Al-Sebeih KH, Alkhaldi F, Majeed H, Alenezi MM, Alshammari B, Magzoub D, Abu-Zaid A. Coblation tonsillectomy versus laser tonsillectomy: a systematic review and meta-analysis of randomized controlled trials. European Archives of Oto-Rhino-Laryngology. 2022 Dec;279(12):5511-20. [HTML]
141. Guntinas-Lichius, O., Geissler, K., Mäkitie, A. A., Ronen, O., Bradley, P. J., Rinaldo, A., ... & Ferlito, A. (2023). Treatment of recurrent acute tonsillitis—a systematic review and clinical practice recommendations. *Frontiers in surgery*, *10*, 1221932.
142. Saadeh, C., & Ulualp, S. O. (2021). The effect of tonsillectomy and adenoidectomy on isolated sleep associated hypoventilation in children. *The Laryngoscope*, *131*(4), E1380-E1382.
143. Yang, Y., Cao, J., Chen, X., Liu, D., Lv, Q., Ma, J., ... & Song, X. (2022). Perioperative pain management based on enhanced recovery after surgery in children undergoing adenotonsillectomy: A prospective, randomized controlled trial. *Laryngoscope Investigative Otolaryngology*, *7*(5), 1634-1642.
144. Han, C. J., Bergman, M., Harley, R. J., & Harley, E. H. (2023). The pediatric indications for tonsillectomy and adenotonsillectomy: Race/ethnicity, age, and gender. *Laryngoscope Investigative Otolaryngology*, *8*(2), 577-583.
145. Schneuer, F. J., Bell, K. J., Dalton, C., Elshaug, A., & Nassar, N. (2022). Adenotonsillectomy and adenoidectomy in children: The impact of timing of surgery and post-operative outcomes. *Journal of Paediatrics and Child Health*, *58*(9), 1608-1615.
146. Liu, K., Liu, C., & Ulualp, S. O. (2022). Prevalence of emergence delirium in children undergoing tonsillectomy and adenoidectomy. *Anesthesiology Research and Practice*, *2022*(1), 1465999.
147. Elsayed, M., Alhasani, W., Sudarshan, P., Leong, L., Hurley, M. & Daniel, M. (2020). Adenotonsillectomy in children. Paediatrics and Child Health. *30*(1), 1-5. [HTML]
148. Nguyen, B. K., & Quraishi, H. A. (2022). Tonsillectomy and adenoidectomy-pediatric clinics of North America. *Pediatric Clinics*, *69*(2), 247-259.
149. Cottrell, J., Zahr, S. K., Propst, E. J., Narang, I., Amin, R., Chiang, J., ... & Wolter, N. E. (2020). Morbidity and mortality from adenotonsillectomy in children with trisomy 21. *International Journal of Pediatric Otorhinolaryngology*, *138*, 110377.