Obstructive sleep apnea (OSA) syndrome is a respiratory sleep disorder characterized by partial or complete recurrent episodes of upper airway collapse that occur during the night. The OSA manifests with a reduction (hypopnea) or complete cessation (apnea) of airflow in the upper airways, associated with breathing effort. OSA is a frequent and often underestimated pathology affecting between 2 and 5% of the middle-aged population. Typical nocturnal symptoms are the persistent snoring and awakenings with dyspnea sensation. On the other hand, diurnal symptoms could be sleepiness, headaches, asthenia, neurological disorders, and impaired personal relationships. Surgery of the velo-pharyngeal region had a huge evolution going from ablative techniques (UP3 and LAUP) to remodeling techniques of the pharyngeal lateral walls.

**Abstract:** Obstructive sleep apnea (OSA) syndrome is a respiratory sleep disorder characterized by partial or complete recurrent episodes of upper airway collapse that occur during the night. The OSA manifests with a reduction (hypopnea) or complete cessation (apnea) of airflow in the upper airways, associated with breathing effort. OSA is a frequent and often underestimated pathology affecting between 2 and 5% of the middle-aged population. Typical nocturnal symptoms are the persistent snoring and awakenings with dyspnea sensation. On the other hand, diurnal symptoms could be sleepiness, headaches, asthenia, neurological disorders, and impaired personal relationships.

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During the hypopnea/apnea events, poor alveolar ventilation reduces the oxygen saturation in the arterial blood (SaO2) with a gradual increase in carbon dioxide (PaCO2) [1,5,10,11]. The direct consequence of the intermittent hypoxia could be an oxidative imbalance, with reactive oxygen species production and an inflammatory cascade activation with pro-inflammatory cytokines growth (IL2, IL4, TNF, PCR). Furthermore, an endothelial dysfunction, as indicated by increased serum levels of ET-1 and LOX-112-14, could occur. As a result of the nocturnal hypoxia and the systemic inflammations, the risks of the cardiovascular and cerebrovascular morbidities increase [1–10].

The phenotypes of OSA patients are variable depending upon the different anatomy, the collapsibility of the upper airway, the neuromuscular tone and the function sleep–wake, as well as the ventilatory control instability and the arousal threshold. Bosi et al. [5] developed a qualitative pathophysiological classification (PALM grades) by means of clinical PSG, grade of OSA severity, and therapeutic level of continuous positive airway pressure.
pressure (CPAP). All of these data are a solid base for the pre-operative surgical assessment, the therapeutic recommendations, and their potential outcomes and side effects [10–15]. Drug-induced sleep endoscopy (DISE) represents another method for evaluating sites and patterns of collapse in OSA patient candidates to surgical treatment. It consists in an upper airway evaluation during a pharmacologically simulated sleep. Yu Lin et al. [15] and other literature evidence [10–17] has stated that DISE is superior to the wake-up endoscopy in identifying obstructions sites and types of collapses in the hypopharyngeal base of the tongue regions. Recently, the use of a middle latency auditory evoked potentials (MLAEp) has been proposed as a good methodology to evaluate the correct level of sedation for patients during DISE procedures [16,17].

There are many surgical procedures proposed for the treatment of OSA. Surgery of the velo-pharyngeal region had a huge evolution going from ablative techniques (UP3 and LAUP) to remodeling techniques of the pharyngeal lateral walls [18–21]. In this scenario, barbed reposition pharyngoplasty (BRP), devised by Vicini et al. [22], showed excellent outcomes at short- and long-term follow-up [23,24]. Another surgical option, which gave optimal anatomical and functional results [25,26], is the transoral robotic surgery utilized for the base of tongue resection.

The recent introduction of hypoglossal nerve stimulation is another novel therapy for treating OSA. In a literature review, Mashaqi et al. [27] reported that it is a very effective therapy for moderate and severe OSA in patients who are intolerant to CPAP therapy.

Finally, the myofunctional therapy (MFT) with its active training of the oropharyngeal muscles has been introduced as an OSA treatment modality. The current studies demonstrate a positive effect in reducing sleep apnea, as shown by the post-therapy improvement of polysomnography values and clinical symptoms [18–30].

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References

1. De Vito, A.; Woodson, B.T.; Koka, V.; Cammaroto, G.; Iannella, G.; Bosi, M.; Pelucchi, S.; Filograna-Pignatelli, G.R.; El Chater, P.; Vicini, C. OSA Upper Airways Surgery: A Targeted Approach. *Medicina* 2021, 57, 690. [CrossRef] [PubMed]

2. Iannella, G.; Magliulo, G.; Maniaci, A.; Meccariello, G.; Ciofalo, A.; Cammaroto, G.; Gobbi, R.; Sgarzani, R.; Firinu, E.; Corso, R.M.; et al. Olfactory function in patients with obstructive sleep apnea: A meta-analysis study. *Eur. Arch. Otorhinolaryngol.* 2021, 278, 883–891. [CrossRef] [PubMed]

3. Magliulo, G.; Iannella, G.; Polimeni, A.; De Vincentiis, M.; Meccariello, G.; Gulotta, G.; Pasquariello, B.; Monteverci, F.; De Vito, A.; D’Agostino, G.; et al. Laryngopharyngeal reflux in obstructive sleep apnoea patients: Literature review and meta-analysis. *Ann. J. Otolaryngol.* 2018, 39, 776–780. [CrossRef] [PubMed]

4. Iannella, G.; Magliulo, G.; Lo Iacono, C.A.M.; Bianchi, G.; Polimeni, A.; Greco, A.; De Vito, A.; Meccariello, G.; Cammaroto, G.; Gobbi, R.; et al. Positional Obstructive Sleep Apnea Syndrome in Elderly Patients. *Int. J. Environ. Res. Public Health* 2020, 17, 1120. [CrossRef]

5. Bosi, M.; De Vito, A.; Eckert, D.; Steier, J.; Kotecha, B.; Vicini, C.; Poletti, V. Qualitative Phenotyping of Obstructive Sleep Apnea and Its Clinical Usefulness for the Sleep Specialist. *Int. J. Environ. Res. Public Health* 2020, 17, 2058. [CrossRef]

6. Iannella, G.; Vicini, C.; Colizza, A.; Meccariello, G.; Polimeni, A.; Greco, A.; de Vincentiis, M.; De Vito, A.; Cammaroto, G.; Gobbi, R.; et al. Aging effect on sleepiness and apneas severity in patients with obstructive sleep apnea syndrome: A meta-analysis study. *Eur. Arch. Otorhinolaryngol.* 2019, 276, 3549–3556. [CrossRef]

7. Pace, A.; Iannella, G.; Rossetti, V.; Visconti, I.C.; Gulotta, G.; Cavaliere, C.; De Vito, A.; Maniaci, A.; Cocuzza, S.; Magliulo, G.; et al. Diagnosis of Obstructive Sleep Apnea in Patients with Allergic and Non-Allergic Rhinitis. *Medicina* 2020, 56, 454. [CrossRef] [PubMed]

8. Magliulo, G.; Iannella, G.; Ciofalo, A.; Polimeni, A.; De Vincentiis, M.; Pasquariello, B.; Monteverci, F.; Vicini, C. Nasal pathologies in patients with obstructive sleep apnoea. *Acta Otorhinolaryngol. Ital.* 2019, 39, 250–256. [CrossRef]

9. Magliulo, G.; De Vincentiis, M.; Iannella, G.; Ciofalo, A.; Pasquariello, B.; Manno, A.; Angeletti, D.; Polimeni, A. Olfactory evaluation in obstructive sleep apnoea patients. *Acta Otorhinolaryngol. Ital.* 2018, 38, 338–345. [CrossRef] [PubMed]

10. Iannella, G.; Maniaci, A.; Magliulo, G.; Cocuzza, S.; La Mantia, I.; Cammaroto, G.; Greco, A.; Vicini, C. Current challenges in the diagnosis and treatment of obstructive sleep apnea syndrome in the elderly. *Pol. Arch. Intern. Med.* 2020, 130, 649–654. [CrossRef]

11. Iannella, G.; Vicini, C.; Polimeni, A.; Greco, A.; Gobbi, R.; Monteverci, F.; De Vito, A.; Meccariello, G.; Cammaroto, G.; D’Agostino, G.; et al. Laryngopharyngeal Reflux Diagnosis in Obstructive Sleep Apnea Patients Using the Pepsin Salivary Test. *Int. J. Environ. Res. Public Health* 2019, 16, 2056. [CrossRef] [PubMed]
12. Kosacka, M.; Brzeczka, A. Endothelin-1 and LOX-1 as Markers of Endothelial Dysfunction in Obstructive Sleep Apnea Patients. *Int. J. Environ. Res. Public Health* **2021**, *18*, 1319. [CrossRef]

13. Maniaci, A.; Iannella, G.; Cocuzza, S.; Vicini, C.; Magliulo, G.; Ferlito, S.; Cammaroto, G.; Meccariello, G.; De Vito, A.; Nicolai, A.; et al. Oxidative Stress and Inflammation Biomarker Expression in Obstructive Sleep Apnea Patients. *J. Clin. Med.* **2021**, *10*, 277. [CrossRef] [PubMed]

14. Wu, M.F.; Chen, Y.H.; Chen, H.C.; Huang, W.C. Interactions among Obstructive Sleep Apnea Syndrome Severity, Sex, and Obesity on Circulatory Inflammatory Biomarkers in Patients with Suspected Obstructive Sleep Apnea Syndrome: A Retrospective, Cross-Sectional Study. *Int. J. Environ. Res. Public Health* **2017**, *14*, 4701. [CrossRef] [PubMed]

15. Lin, H.Y.; Lin, Y.C.; Hsu, Y.S.; Shih, L.C.; Nelson, T.; Chang, W.D.; Tsou, Y.A. Comparison of Findings between Clinical Examinations and Drug-Induced Sleep Endoscopy in Patients with Obstructive Sleep Apnea Syndrome. *Int. J. Environ. Res. Public Health* **2020**, *17*, 6041. [CrossRef] [PubMed]

16. Arigliani, M.; Toraldo, D.M.; Ciavolino, E.; Lattante, C.; Conte, L.; Arima, S.; Arigliani, C.; Palumbo, A.; De Benedetto, M. The Use of Middle Latency Auditory Evoked Potentials (MLAEP) as Methodology for Evaluating Sedation Level in Propofol-Drug Induced Sleep Endoscopy (DISE) Procedure. *Int. J. Environ. Res. Public Health* **2021**, *18*, 2070. [CrossRef]

17. Arigliani, M.; Toraldo, D.M.; Montevecchi, F.; Conte, L.; Galasso, L.; De Rosa, F.; Lattante, C.; Ciavolino, E.; Arigliani, C.; Palumbo, A.; et al. A New Technological Advancement of the Drug-Induced Sleep Endoscopy (DISE) Procedure: The “All in One Glance” Strategy. *Int. J. Environ. Res. Public Health* **2020**, *17*, 4261. [CrossRef] [PubMed]

18. Cammaroto, G.; Stringa, L.M.; Iannella, G.; Meccariello, G.; Zhang, H.; Bahgat, A.Y.; Calvo-Henriquez, C.; Chiesa-Estomba, C.; Lechien, J.R.; Barillari, M.R.; et al. Manipulation of Lateral Pharyngeal Wall Muscles in Surgery: A Review of the Literature. *Int. J. Environ. Res. Public Health* **2020**, *15*, 5315. [CrossRef] [PubMed]

19. Cammaroto, G.; Bianchi, G.; Zhang, H.; Veer, V.; Kotecha, B.; Jacobowitz, O.; Llatas, M.C.; de Apodaca, P.M.R.; Lugo, R.; Meccariello, G.; et al. Sleep medicine in otolaryngology units: An international survey. *Sleep Breath*. **2021**, *25*, 2141–2152. [CrossRef] [PubMed]

20. Iannella, G.; Magliulo, G.; Di Luca, M.; De Vito, A.; Meccariello, G.; Cammaroto, G.; Pelucchi, S.; Bonsembiante, A.; Maniaci, A.; Vicini, C. Lateral pharyngoplasty techniques for obstructive sleep apnea syndrome: A comparative experimental stress test of two different techniques. *Eur. Otorhinolaryngol.* **2020**, *277*, 1793–1800. [CrossRef]

21. Cammaroto, G.; Stringa, L.M.; Cerritelli, L.; Bianchi, G.; Meccariello, G.; Gobbi, R.; Iannella, G.; Magliulo, G.; Zhang, H.; Baghat, A.Y.; et al. Acquired Nasophasyngaleal Stenosis Correction Using a Modified Palatal Flaps Technique in Obstructive Sleep Apnea (OSA) Patients. *Int. J. Environ. Res. Public Health* **2020**, *17*, 2048. [CrossRef] [PubMed]

22. Vicini, C.; Meccariello, G.; Montevecchi, F.; De Vito, A.; Frassineti, S.; Gobbi, R.; Pelucchi, S.; Iannella, G.; Magliulo, G.; Cammaroto, G. Effectiveness of barbed repositioning pharyngoplasty for the treatment of obstructive sleep apnea (OSA): A prospective randomized trial. *Sleep Breath*. **2020**, *24*, 687–694. [CrossRef] [PubMed]

23. Iannella, G.; Lechien, J.R.; Perrone, T.; Meccariello, G.; Cammaroto, G.; Cannavici, A.; Burgio, L.; Maniaci, A.; Cocuzza, S.; Di Luca, M.; et al. Barbed reposition pharyngoplasty (BRP) in obstructive sleep apnea treatment: State of the art. *Am. J. Otolaryngol.* **2022**, *43*, 103197. [CrossRef] [PubMed]

24. Iannella, G.; Vallicelli, B.; Magliulo, G.; Cammaroto, G.; Meccariello, G.; De Vito, A.; Greco, A.; Pelucchi, S.; Sgarzani, R.; Conso, R.M.; et al. Long-Term Subjective Outcomes of Barbed Repositioning Pharyngoplasty for Obstructive Sleep Apnea Syndrome Treatment. *Int. J. Environ. Res. Public Health* **2020**, *17*, 1542. [CrossRef] [PubMed]

25. Di Luca, M.; Iannella, G.; Montevecchi, F.; Magliulo, G.; De Vito, A.; Cocuzza, S.; Maniaci, A.; Meccariello, G.; Cammaroto, G.; Sgarzani, R.; et al. Use of the transoral robotic surgery to treat patients with recurrent lingual tonsillitis. *Int. J. Med. Robot.* **2020**, *16*, e2106. [CrossRef] [PubMed]

26. Iannella, G.; Magliulo, G.; Montevecchi, F.; De Vito, A.; Polimeni, A.; De Vincentiis, M.; Meccariello, G.; D’Agostino, G.; Gobbi, R.; Cammaroto, G.; et al. Lingual tonsil lymphatic tissue regrowth in patients undergoing transoral robotic surgery. *Laryngoscope* **2019**, *129*, 2652–2657. [CrossRef] [PubMed]

27. Mashaqi, S.; Patel, S.I.; Combs, D.; Estep, L.; Helmick, S.; Machamer, J.; Parthasarathy, S. The Hypoglossal Nerve Stimulation as a Novel Therapy for Treating Obstructive Sleep Apnea: A Literature Review. *Int. J. Environ. Res. Public Health* **2021**, *18*, 1642. [CrossRef]

28. Pascoe, M.; Wang, L.; Aylor, J.; Mehra, R.; Kominsky, A.; Foldvary-Schaefer, N.; Shah, V.; Waters, T.; Walia, H.K. Association of Hypoglossal Nerve Stimulation With Improvements in Long-term, Patient-Reported Outcomes and Comparison With Positive Airway Pressure for Patients With Obstructive Sleep Apnea. *JAMA Otolaryngol. Head Neck Surg.* **2022**, *148*, 61–69. [CrossRef] [PubMed]

29. Carrasco-Llatas, M.; O’Connor-Reina, C.; Calvo-Henriquez, C. The Role of Myofunctional Therapy in Treating Sleep-Disordered Breathing: A State-of-the-Art Review. *Int. J. Environ. Res. Public Health* **2021**, *18*, 7291. [CrossRef]

30. O’Connor-Reina, C.; Ignacio Garcia, J.M.; Rodriguez Alcala, L.; Rodriguez Ruiz, E.; Garcia Iriarte, M.T.; Casado Morente, J.C.; Baptista, P.; Plaza, G. Improving Adherence to Myofunctional Therapy in the Treatment of Sleep-Disordered Breathing. *J. Clin. Med.* **2021**, *10*, 5772. [CrossRef]