

Obstruktif Uyku Apnesi'nde Üst Solunum Yolu Kaslarının Elektriksel Stimülasyonu

Ali ÖZTÜRK¹

Saliha KUŞOĞLU ATALAY²

Obstruktif uyku apnesi(OUA) uyku esnasında faringeal hava yolunda oluşan tekrarlayıcı kollapslarla karakterize oksijen desaturasyonu, apne, hipopne ve uykunun mikromimarisindeki bozulmaya bağlı çeşitli metabolik kardiyovasküler hastalıklara yatkınlık yapan multisistemik bir hastalıktır. Oua olan hastalar gün içi yorgunluk, uyku ihtiyacı, uyku esnasında horlama, solunumsal kesilme, uyanma atağı gibi farklı semptomlara sahiptir(1).

Orta ve şiddetli OUA, insülin direnci, dislipidemi, vasküler hastalık ve ölüm için bağımsız bir risk faktörüdür(2,3). CPAP(noninvaziv sürekli pozitif hava yolu basıncı) tedavisine uyum gösteren hastalarda bu riskler azalır. Ancak tedaviye uyum oranı %40 tır(4). Ağız içi araç tedavisi ve üst solunum yolu cerrahileri CPAP'a alternatif tedavilerdir. Araştırmalar orta ve ağır uyku apnesi tedavisinde mevcut tedavilerin bazen yetersiz olduğunu göstermiştir. Bu nedenle yeni tedavilere ihtiyaç vardır(5).

Apnenin başlamasında, üst hava yolu kaslarına yönelik uyarının uykuda azalması bir sebep olarak öngörülmüştür. Genioglossus kasının uyku sırasında aktive edilmesi üst hava yolu açıklığını sağlayarak OUA tedavisinde bir alternatif yöntem olarak karşımıza çıkar(6).Bu bölümde OUA hastalarında selektif nöromuskuler dil ve hipoglossal sinirin direkt uyarımını üst hava yolu hava akım mekanizmasına etkisi ve OUA tedavisindeki yeri ele alınacaktır.

¹ Dr., Ankara Yıldırım Beyazıt Üniversitesi Tıp Fakültesi KBB Hastalıkları, aliozturk21095239@gmail.com

² Dr., Ankara Beypazarı Devlet Hastanesi KBB Hastalıkları, skoatalay@gmail.com

KAYNAKLAR

1. Sateia MJ. International classification of sleep disorders-third edition: highlights and modifications. *Chest*. 2014 Nov;146(5):1387-94.
2. Durgan DJ, Bryan RMJ. Cerebrovascular consequences of obstructive sleep apnea. *J Am Heart Assoc*. 2012 Aug;1(4):e000091.
3. Punjabi NM, Shahar E, Redline S, Gottlieb DJ, Givelber R, Resnick HE. Sleep-disordered breathing, glucose intolerance, and insulin resistance: the Sleep Heart Health Study. *Am J Epidemiol*. 2004 Sep;160(6):521-30.
4. Loubé DI. Technologic advances in the treatment of obstructive sleep apnea syndrome. *Chest*. 1999 Nov;116(5):1426-33.
5. Strollo PJJ, Soose RJ, Maurer JT, de Vries N, Cornelius J, Froymovich O, et al. Upper-airway stimulation for obstructive sleep apnea. *N Engl J Med*. 2014 Jan;370(2):139-49.
6. Mwenge GB, Rombaux P, Dury M, Lengelé B, Rodenstein D. Targeted hypoglossal neurostimulation for obstructive sleep apnoea: a 1-year pilot study. *Eur Respir J*. 2013 Feb;41(2):360-7.
7. Hartwig WC. Muscle and connective tissues. In: Williams PC, Horvath K, Taylor C, eds. *Fundamental Anatomy*. Baltimore: Lippincott Williams & Wilkins; 2008. Chapter 7, p. 350-1.
8. Heiser C, Knopf A, Hofauer B. Surgical anatomy of the hypoglossal nerve: A new classification system for selective upper airway stimulation. *Head Neck*. 2017 Dec;39(12):2371-80.
9. Dempsey JA, Veasey SC, Morgan BJ, O'Donnell CP. Pathophysiology of sleep apnea. *Physiol Rev*. 2010 Jan;90(1):47-112.
10. Schwab RJ, Pasirstein M, Pierson R, Mackley A, Hachadoorian R, Arens R, et al. Identification of upper airway anatomic risk factors for obstructive sleep apnea with volumetric magnetic resonance imaging. *Am J Respir Crit Care Med*. 2003 Sep;168(5):522-30.
11. Cistulli PA. Craniofacial abnormalities in obstructive sleep apnoea: implications for treatment. *Respirology*. 1996 Sep;1(3):167-74.
12. Jordan AS, Whit DP, Lo YL, Wellman A, Eckert DJ, Yim-Yeh S, et al. Airway dilator muscle activity and lung volume during stable breathing in obstructive sleep apnea. *Sleep*. 2009;32(3):361-8.
13. Mann EA, Burnett T, Cornell S, Ludlow CL. The effect of neuromuscular stimulation of the genioglossus on the hypopharyngeal airway. *Laryngoscope*. 2002 Feb;112(2):351-6.
14. Cori JM, O'donoghue FJ, Jordan AS. Sleeping tongue: Current perspectives of genioglossus control in healthy individuals and patients with obstructive sleep apnea. *Nat Sci Sleep*. 2018;10:169-79.
15. Schwartz AR, Thut DC, Russ B, Seelagy M, Yuan X, Brower RG, et al. Effect of electrical stimulation of the hypoglossal nerve on airflow mechanics in the isolated upper airway. *Am Rev Respir Dis*. 1993 May;147(5):1144-50.
16. Oliven A, Odeh M, Schnall RP. Improved upper airway patency elicited by electrical stimulation of the hypoglossus nerves. *Respiration*. 1996;63(4):213-6.
17. Eisele DW, Schwartz AR, Hari A, Thut DC, Smith PL. The effects of selective nerve stimulation on upper airway airflow mechanics. *Arch Otolaryngol Head Neck Surg*. 1995 Dec;121(12):1361-4.
18. McWhorter AJ, Rowley JA, Eisele DW, Smith PL, Schwartz AR. The effect of tensor veli palatini stimulation on upper airway patency. *Arch Otolaryngol Head Neck Surg*. 1999 Sep;125(9):937-40.

19. Kezirian EJ, Goding G SJ, Malhotra A, O'Donoghue FJ, Zammit G, Wheatley JR, et al. Hypoglossal nerve stimulation improves obstructive sleep apnea: 12-month outcomes. *J Sleep Res.* 2014 Feb;23(1):77–83.
20. Mashaqi S, Patel SI, Combs D, Estep L, Helmick S, Machamer J, et al. The hypoglossal nerve stimulation as a novel therapy for treating obstructive sleep apnea—a literature review. *Int J Environ Res Public Health.* 2021;18(4):1–24.
21. Zhu Z, Hofauer B, Wirth M, Hasselbacher K, Frohnhofen H, Heiser C, et al. Selective upper airway stimulation in older patients. *Respir Med.* 2018 Jul;140:77–81.
22. Heiser C, Hofauer B, Lozier L, Woodson BT, Stark T. Nerve monitoring-guided selective hypoglossal nerve stimulation in obstructive sleep apnea patients. *Laryngoscope.* 2016 Dec;126(12):2852–8.
23. Whelan R, Soose RJ. Implantable Neurostimulation for Treatment of Sleep Apnea: Present and Future. *Otolaryngol Clin North Am.* 2020 Jun;53(3):445–57.
24. Baptista PM, Costantino A, Moffa A, Rinaldi V, Casale M. Hypoglossal Nerve Stimulation in the Treatment of Obstructive Sleep Apnea: Patient Selection and New Perspectives. *Nat Sci Sleep.* 2020;12:151–9.
25. Strohl MM, Yamauchi M, Peng Z, Strohl KP. Insights since FDA Approval of Hypoglossal Nerve Stimulation for the Treatment of Obstructive Sleep Apnea. *Curr sleep Med reports.* 2017 Sep;3(3):133–41.
26. Bestouros DE, Pasick LJ, Benito DA, Zapanta PE. Adverse events associated with the Inspire implantable hypoglossal nerve stimulator: A MAUDE database review. *Am J Otolaryngol.* 2020;41(6):102616.
27. Eastwood PR, Barnes M, MacKay SG, Wheatley JR, Hillman DR, Nguyễn X-L, et al. Bilateral hypoglossal nerve stimulation for treatment of adult obstructive sleep apnoea. *Eur Respir J.* 2020 Jan;55(1).
28. Friedman M, Jacobowitz O, Hwang MS, Bergler W, Fietze I, Rombaux P, et al. Targeted hypoglossal nerve stimulation for the treatment of obstructive sleep apnea: Six-month results. *Laryngoscope.* 2016 Nov;126(11):2618–23.
29. Heiser C, Maurer JT, Steffen A. Functional outcome of tongue motions with selective hypoglossal nerve stimulation in patients with obstructive sleep apnea. *Sleep Breath.* 2016 May;20(2):553–60.