

Targeted ansa cervicalis nerve stimulation acutely restores airflow

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Introduction: Hypoglossal nerve stimulation (HNS) is an efficacious therapy for a third of people with obstructive sleep apnea (OSA). However, it is a costly, invasive and complex surgical procedure. Targeted ansa cervicalis nerve stimulation has been shown to improve airflow in animals and humans. We aimed to compare airflow responses to acute, percutaneous, targeted neurostimulation of the ansa cervicalis.

Methods: Participants were administered propofol sedation and equipped with an epiglottic pressure catheter, nasal mask connected to CPAP tubing and a modified CPAP device and pneumotachograph to measure airflow. Ultrasound was used to identify and guide percutaneous insertion of a temporary 6-electrode array. Therapeutic CPAP was reduced to cause sustained flow limitation and targeted stimulation at varying stimulus amplitude was applied to the ansa cervicalis nerve. Changes to peak inspiratory airflow (PIF) were quantified comparing airflow 1) on therapeutic CPAP, 2) pre-stimulation and 3) during stimulation.

Results: 13 (3 female) people with severe OSA (AHI= 38 ± 16 events/h), aged 51 ± 14 years and non-obese (BMI= 28 ± 4 Kg/m²) were studied (mean \pm SD). To date, preliminary findings in 10 participants show 9/10 had an increase to airflow with 3.2 ± 1.2 mA stimulation. Therapeutic CPAP PIF was 0.37 ± 0.13 L/s. PIF was reduced to an average of 0.18 ± 0.13 L/s ($p < 0.01$ vs. therapeutic CPAP) during sustained flow limitation. Following ansa stimulation, airflow was restored to equivalent levels therapeutic CPAP (0.39 ± 0.19 L/s, $p = 0.14$) and with the removal of stimulation, airflow returned to 0.20 ± 0.12 L/s ($p = 0.65$).

Conclusion: Using a less invasive, percutaneous stimulation approach to target a novel neurostimulation target, ansa cervicalis, improved airflow. This approach is safe, feasible and effective for people with OSA.