







Advancing Neurostimulation Therapy for Obstructive Sleep Apnea: Does the Hyoid Bone Hold the Answer?

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Introduction

What is obstructive sleep apnea (OSA)?

- OSA is a disorder characterized by repeated episodes of upper airway obstruction and breathing limitation during sleep.
- OSA results in serious health consequences and increases the risk of mortality.

What is hypoglossal nerve stimulation (HGNS)?

- HGNS is a therapy for OSA (Fig. 1).
- Electrical stimulation → forward tongue movement.
- Only effective in ~65% of patients → necessary to optimize HGNS.

OSA Burden

- Increased Mortality

Figure 1: HGNS Device and Mechanism of Action.

A) Implanted HGNS device. B) Obstructed airway with no stimulation vs C) open airway with stimulation. HGNS: hypoglossal nerve stimulation. (Gurek et al., 2018)

Aims

Aim 1: To assess the influence of hyoid bone repositioning on the effectiveness of HGNS in improving upper airway outcomes.

Aim 2: To assess the influence of HGNS stimulation amplitudes combined with hyoid bone repositioning on upper airway outcomes.

Subjects:

- Supine, New Zealand White rabbits
- Anaesthetized (ketamine/xylazine)

Protocol

- Outcomes were collected before (0 mm) and after anterior hyoid bone repositioning (2 mm) using HGNS at 800 and 1600 μ A.

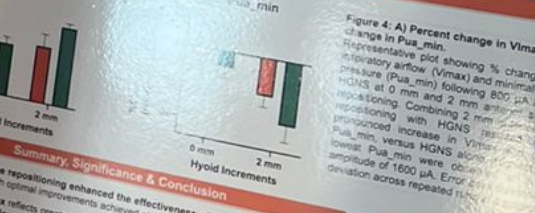
Outcomes

- Maximal inspiratory airflow (V_{imax})
- Minimal upper airway pressure (P_{ua_min})

Methods

Figure 2: Upper Airway Anatomy.

Figure 3: Experimental Setup.



Summary, Significance & Conclusion

- Anterior hyoid bone repositioning enhanced the effectiveness of HGNS in improving upper airway function, with optimal improvements achieved at the maximum current amplitude.
- An increase in V_{imax} reflects greater airflow and improved oxygen intake, while a decrease in P_{ua_min} indicates a lower risk of upper airway collapse, contributing to enhanced breathing.
- Findings can help guide and optimize surgical hyoid bone repositioning in HGNS effectiveness, improve OSA treatment outcomes and prevent its serious health consequences.

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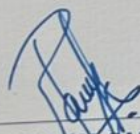
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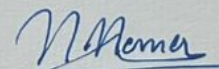
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