Battery Life and Predictors of Depletion in Hypoglossal Nerve Stimulation for Obstructive Sleep Apnea: A Preliminary Analysis

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Introduction

Obstructive sleep apnea (OSA) affects nearly 1 billion people worldwide and is associated with significant cardiovascular and metabolic morbidity[1]

Hypoglossal nerve stimulation (HGNS) is an effective surgical therapy for obstructive sleep apnea (OSA) but limited data exists regarding real-world battery longevity[2,3]

This study aims to characterize HGNS battery longevity and explore patient, sleep, and device related factors associated with depletion

Methods

COHORT SNAPSHOT (n=11)

58 y	31.0	29.9	80%
mean age	mean BMI	mean AHI	male

- Retrospective cohort at a single academic center of devices implanted August 2014- November 2025
- 813 implants were screened, 11 patients underwent revision
- Battery life was measured as time from implantation to documented IPG depletion requiring replacement
- Recorded predictors: age, sex, BMI, AHI, O_2 nadir, utilization, amplitude, titration amplitude, and Sher response (>50% AHI reduction and postoperative AHI < 20)[5]
- Battery life was analyzed using Mann-Whitney U tests and Spearman correlation coefficients

Results

DEMOGRAPHICS

- Battery life showed a weak-to-moderate **positive trend with pre-implant age** and **moderate negative trends with pre-implant BMI and AHI**

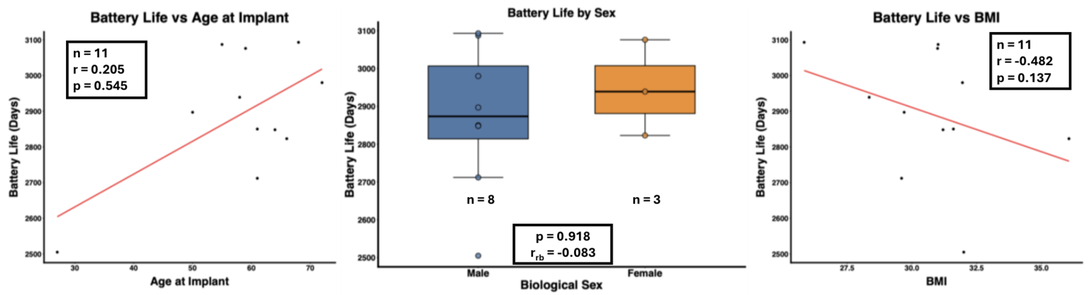


FIGURE 1. Demographic correlates with battery life

DEVICE USAGE & PROGRAMMING

- Battery life **trended negatively with average utilization, set amplitude, and titration study optimal voltage**
- Battery life **did not differ significantly** between Sher responders and non-responders

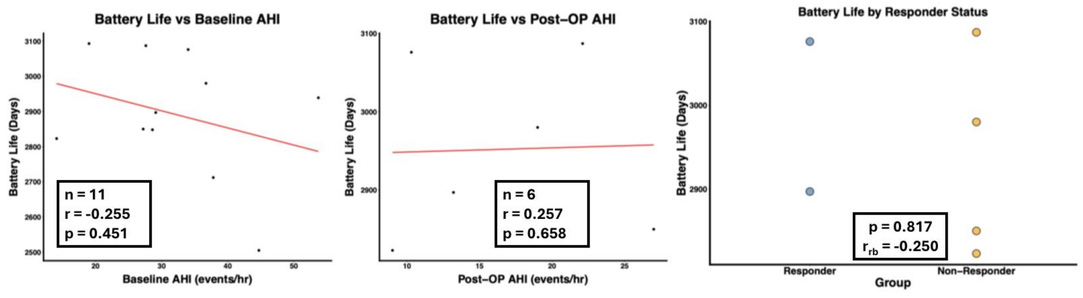


FIGURE 2. Sleep study correlates with battery life

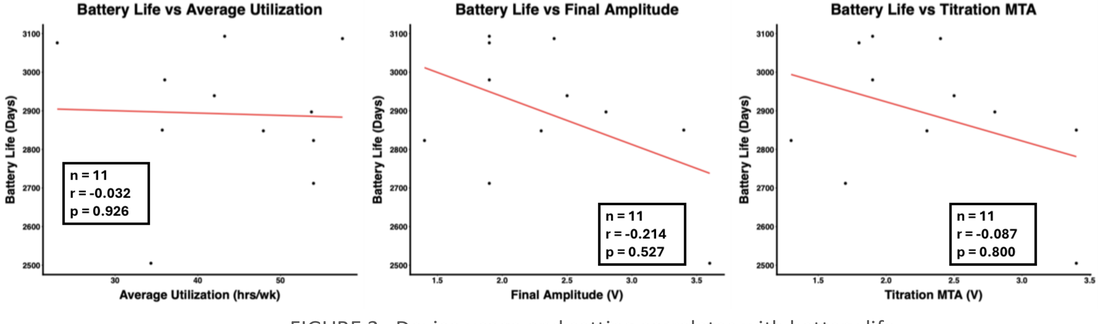


FIGURE 3. Device usage and setting correlates with battery life

MEAN BATTERY LIFE

7.91 years ± 0.51 years
2887.1 ± 185.72 days

MEDIAN TIME TO REPLACEMENT THERAPY

8.21 years (IQR 7.90 - 8.42 years)

Discussion

Trends suggest shorter longevity with

- **Younger patients**
- **Greater disease severity**
- **Higher stimulation requirements**

BATTERY LIFE

8 years Institutional battery longevity closely matched prior long-term HGNS data[4]

Real world longevity estimates can improve counseling and replacement planning. Standardized longitudinal capture of device settings may clarify which factors drive depletion.

References

1. Benjafield AV, Ayas NT, Eastwood PR, et al. Estimation of the global prevalence and burden of obstructive sleep apnea: a literature-based analysis. *Lancet Respir Med*. 2019;7(8):687-698. doi:10.1016/S2213-2600(19)30198-5
2. Urban MJ, Calder A, Jhaveri M, LoSavio P. Computed tomography scanning of implanted hypoglossal nerve stimulators and approach to device malfunction: case series. *J Laryngol Otol*. 2023;137(2):231-236. doi:10.1017/S0022215121003996
3. Munawar DA, Mahajan R, Linz D, et al. Predicted longevity of contemporary cardiac implantable electronic devices: A call for industry-wide "standardized" reporting. *Heart Rhythm*. 2018;15(12):1756-1763. doi:10.1016/j.hrthm.2018.07.029
4. Magaña LC, Strollo PJ, Steffen A, et al. Long-Term Generator Replacement Experience in Hypoglossal Nerve Stimulator Therapy Recipients With CPAP-Intolerant Obstructive Sleep Apnea. *Otolaryngol Neck Surg*. 2023;169(4):1064-1069. doi:10.1002/ohn.340
5. Sher AE, Schechtman KB, Piccirillo JF. The efficacy of surgical modifications of the upper airway in adults with obstructive sleep apnea syndrome. Sleep. 1996;19(2):156–177.