Vagus Nerve Stimulation in Treatment-Resistant Depression: Long-term Clinical Outcomes

S. Rosson^{1,2}, MD, N. Bresolin³, MD, D. d'Avella³, MD, L. Denaro³, MD, PhD, A. Landi³, MD, PhD, S. Caiolo¹, MD, M. Lussignoli¹, MD, T. Toffanin¹, MD, PhD, G. Pigato¹, MD

¹Azienda Ospedaliera di Padova, Psychiatric Clinic, Padova, Italy ²Azienda AULSS3 Serenissima, Venezia, Italy ³U.O.C. di Neurochirurgia Pediatrica, Neuroscienze, Padova, Italy

Introduction

- Vagus nerve stimulation (VNS) is a neuromodulation technique approved for Treatment-Resistant Depression (TRD). [1]
- The treatment requires the surgical implant of a pacemaker-like device that delivers intermittent pulses to the left Vagus Nerve (Fig.1).
- The impact of VNS on TRD has been investigated in clinical trials with a median observation time of 12 months. [2]
- Evidence regarding its long-term efficacy and safety is still scarce.

Fig 1. VNS system representation

Objectives

- To report on a case series of 3 patients undergoing adjunctive VNS for TRD over a 10-year period from implantation.

Fig 2. Relapses under VNS for each study subject

Methods

- We investigated efficacy and safety outcomes in patients with ongoing VNS for at least 10 years.
- They were diagnosed with TRD and had participated in a larger single-arm interventional study conducted at the University Hospital of Padua. [3]
- Our 3 cases had an average 14-year history of psychiatric disease before surgery.
- Patients were assessed with the Hamilton Depression Rating Scale (HDRS) for the initial two years, and with regular clinical interviews thereafter.

Results

- A summary of the efficacy and safety outcomes is presented in table 1.
- All subjects achieved remission within the first year of stimulation.
- For 2/3 patients, relapses were concentrated in the first years after surgery (Fig. 2).
- Psychiatric admissions decreased.
- 2 individuals improved their working situation and the other was able to maintain theirs.
- Few changes were made in the prescriptions after surgery.
- Common adverse events were voice alteration, neck pain, and cough.

Conclusions

- Very few cases of 10-year VNS for TRD have been reported so far.
- For our subjects, it appears that VNS had a positive impact on the clinical course of the disease.
- This treatment could be a safe and effective adjunctive intervention for some patients with TRD.

Clinical outcomes	Frequency	Specifics
Remission	3/3	All patients achieved remission within 1 year.
Psychiatric Unit Admissions	1/3	1 patient once during the first 2 years of VNS. Before surgery, the subjects' psychiatric hospitalizations amounted to 7.
Suicide Attempts	0/3	1/3 before VNS
AE: Hoarseness	3/3	Events happening during the "ON" time of the generator.
AE: Neck pain	2/3	
AE: Cough	2/3	
AE: Hypomanic episode	1/3	1 patient after 10 years of VNS.

Table 1. Efficacy and safety outcomes. AE: adverse event. Remission was defined as HDRS≤7.

Bibliography

- Nemeroff CB, Mayberg HS, Kahl SE, McNamara J, Frazer A, Henry TR, et al. VNS Therapy in Treatment-Resistant Depression: Clinical Evidence and Putative Neurobiological Mechanisms. *Neuropsychopharmacology*. 2006;31(7):1345-55.
- Bottomley JM, LeRune C, Diamantopoulos A, Mitchell S, Gaynes BN. Vagus nerve stimulation (VNS) therapy in patients with treatment resistant depression: A systematic review and meta-analysis. *Compr Psychiatry*. 2019;98:152156.
- Perini GI, Toffanin T, Pigato G, Ferri G, Follador H, Zonta F, et al. Hippocampal Gray Volumes Increase in Treatment-Resistant Depression Responding to Vagus Nerve Stimulation. *J ect*. 2017;33(3):160-6.