Periauricular Percutaneous Electrical Nerve Field Stimulation for Treatment of Opioid Withdrawal

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INTRODUCTION

- Opioid withdrawal syndrome is a ubiquitous challenge faced by patients with opioid use disorder seeking opioid cessation.
- There are no clinically supported recommendations for non-pharmacological options for the treatment of acute opioid withdrawal.
- Percutaneous electrical nerve field stimulation is a safe and new treatment option for patients interested in non-pharmacological treatments.
- Stimulation of the auricular nerve fields is proposed to activate the central nervous system afferent autonomic nerve fibers with the intent of mitigating sympathetic activity.
- BRIDGE™ is the first FDA-cleared, drug-free, non-surgical device to use neuromodulation to reduce opioid withdrawal symptoms.

CASE DESCRIPTION

- 36-year-old woman with multiple sclerosis and moderate opioid use disorder presents for diaphoresis, anxiety, muscle pain, muscle twitching, and mild nausea after voluntary heroin cessation for 24 hours.
- She had been using intravenous heroin daily over the past 6 months, for both recreation and analgesia of neuropathic pain.
- Multiple sclerosis was managed with was annual rituximab infusions.
- She denied any other substance use, including fentanyl and benzodiazepines.
- She drinks socially, but denied any recent alcohol use and did not meet any criteria for alcohol use disorder.

CASE DESCRIPTION

- After a discussion about treatment for her withdrawal symptoms, the patient decided that she would like to try a percutaneous nerve field stimulator designed for the treatment of opioid withdrawal symptoms, called "BRIDGE".
- We informed her that there is currently limited evidence for use in withdrawal symptom management or treatment of opioid use disorder.
- We informed her that the experimental device has never been used in the setting of multiple sclerosis after literature review.
- She decided she would proceed with trial of the nerve stimulator with standing orders for Suboxone and other comfort medications if needed.
- She had a subjective opioid withdrawal scale (SOWS) score of 27 prior to the implementation of the Bridge device.
- The application of the Bridge device was performed following the instructions from the device manager.
- After 15 minutes, she had mild improvement of her SOWS score to 23, with her main symptom improvement being the cessation of rhinorrhea.
- Four hours after the implementation of the nerve stimulator, her withdrawal symptoms continued unchanged, and she utilized Suboxone with good improvement.
- During a following clinic visit 2 days after the initial visit, the device was removed by the clinician.
- She maintained sobriety, adequate craving control, and neuropathic pain control with Suboxone and regular attendance of clinic-sponsored recovery group.

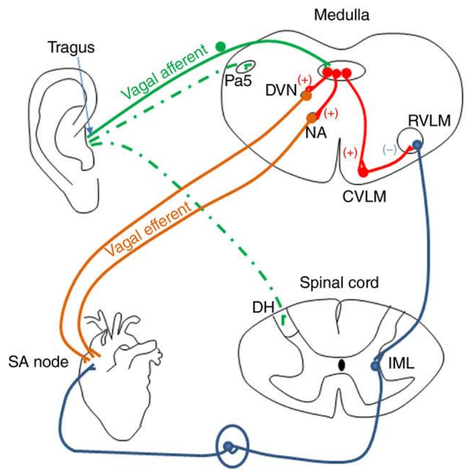

Figure A: The pathways in **green** represent the potential afferent inputs to the CNS, with the dotted lines being those under investigation. **Red** pathways are interneurons involved in the autonomic modulation, while vagal efferent pathways are in **orange** and the sympathetic components of the pathways are in **blue**.

Abbreviations: **Pa5**, paratrigeminal nucleus; **DVN**, dorsal vagal motor nucleus; **NA**, nucleus ambiguus; **RVLM**, rostral ventrolateral medulla; **CVLM**, caudal ventrolateral medulla; **DH**, dorsal horn; **IML**, intermediolateral cell column; **SA Node**, sinoatrial node.

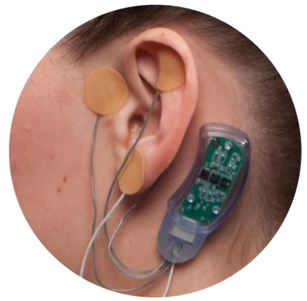

Figure B: The **NSS-2 Bridge device** placed on the ear. The body of the device is placed behind the ear. The stimulating electrodes are connected via wires and placed at key points on the ear. Each electrode contains a short penetrating needle which is used to provide percutaneous electrical stimulation.

DISCUSSION

- There is currently limited data on the use of percutaneous nerve field stimulators in the stabilization of opioid withdrawal symptoms.
- It is rare to find an opioid use disorder patient without confounding medical, psychiatric, or social issues that will potentially complicate treatments.
- Further studies should be done to ascertain which patients may be suitable and receive benefits from the new treatment.
- **Clinicians should provide standard-of-care withdrawal treatment medications in conjunction with any patient receiving a percutaneous nerve field stimulator to manage any potential withdrawal symptoms and help optimize chances of sobriety.**

ACKNOWLEDGEMENTS

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