

Understanding Mental Health Treatment Options: From Traditional Therapies to Advanced Brain-Based Care

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Why Are We Here Today?

Neuromodulation Psychiatry: An Overview of Principles and Practice

Objectives:

- Define "treatment resistance" in the context of mental illness.
- Identify various neuromodulation treatment options in psychiatry.
- Describe the indications, key elements, risks, and benefits of each neuromodulation treatment option presented.

Introduction

- Many patients with psychiatric disorders do not adequately respond to “traditional” treatment options (ie. psychotherapy, medication).
- In this subset of patients, it is reasonable to pursue alternative treatment options.
- Neural circuit paradigm – psychiatric dysfunction results from abnormal communication within a network of brain regions.
- Neuromodulation
 - Stimulation of neurons through mechanisms that differ from traditional medication management
 - “Procedural” or “interventional” psychiatry
 - Neuroplasticity
 - Neurons grow in size and function more effectively after repeated stimulation.
 - Neural pathways that are not functioning adequately get reinforced through stronger synaptic connections.

Treatment Resistance

- Episodes of psychiatric decompensation that have not adequately responded to at least two trials of medication of adequate dose and duration, or psychotherapy. Medications should be from different classes.
 - Examples: SSRIs, SNRIs, tricyclic antidepressants, monoamine oxidase inhibitors, antipsychotic augmenting agents
 - Medications may not have been effective to treat acute symptoms or patient could not tolerate medication side effects
- Most of the literature pertains to treatment resistant unipolar depression. However, many patients with other psychiatric disorders also meet the criteria for treatment resistance.
- Not all psychiatric disorders are FDA approved for neuromodulation treatment.
- Impact: medical costs, hospitalization rate, suicide rate, quality of life

Goals of Treatment

- Response vs remission
 - Response: 50% reduction in symptom intensity, can be measured by rating scales
 - Remission: patient may still have residual symptoms but the severity is very low/borderline normal
 - Goal is always to achieve remission!
- Improved quality of life
- Improved functional status
- Improved subjective report of symptom severity
 - Sometimes the rating scales and subjective report do not match perfectly.

Available Treatment Options - HMM Neuromodulation Psychiatry

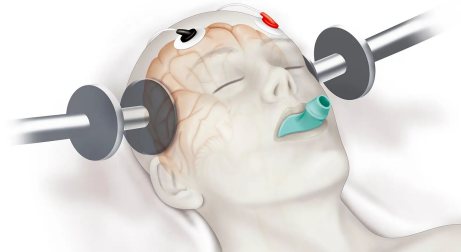
- Electroconvulsive therapy (ECT)
- Transcranial magnetic stimulation (TMS)
- Esketamine (Spravato®)
- Vagus nerve stimulation (VNS)
- Stereotactic radiosurgery (SRS)

Electroconvulsive Therapy (ECT)

- Application of electrodes to patient's scalp to stimulate the brain and subsequently induce a seizure *under general anesthesia*
 - Increases neurotransmitter output, hormones, and neural trophic factors
 - Increases brain volume and synaptic density at various locations
- Safe and non-invasive
- Many inaccurate cultural misconceptions
 - NOT "One Flew Over the Cuckoo's Nest"
- One of the most effective treatments in psychiatry!
 - Response rate: 70-80%
 - Remission rate: 40-50%

Electroconvulsive Therapy (ECT)

- Many indications
 - Major depressive disorder (most common)
 - Bipolar disorder (mania or depression)
 - Psychotic disorders
 - Catatonia
- Possible side effects
 - Immediately following procedure: headache, muscle ache, disorientation
 - Anesthesia-related: sedation, nausea/vomiting, very low baseline risk of fatality
 - Longer term: retrograde and anterograde amnesia
- Can be logistically challenging
 - 3x/week treatment then gradually tapered
 - Need transportation for outpatient treatment and medical or subspecialist clearance



Prognostic Factors in ECT

Factors favoring the use of ECT in depressed patients

1. Presence of psychotic or catatonic features
2. Debilitating ruminative thinking
3. Depression-related cognitive dysfunction (i.e., pseudodementia)
4. Profound psychomotor retardation or agitation
5. Refusal to eat
6. Suicidal drive secondary to the depression
7. Severe functional decline

Factors weighing against using ECT for depressed patients

1. Borderline personality disorder that accounts for the depressive features
2. Recent active substance abuse
3. Strong psychiatric comorbidity that represents the primary disorder

How is ECT Administered?

- Pre-op: RN checklist, IV insertion, fluids, Tylenol, procedural consent, depression screening
- Intra-op
 - Monitors/vitals
 - Time out
 - Bite block
 - Anesthesia induction and brief muscle paralysis
 - Stimulus delivery to induce seizure
 - Monitor seizure length and termination
 - Goal: 25-120 seconds
 - Post-seizure monitoring
 - Vital sign stability
 - Spontaneous breathing with adequate volumes
 - Agitation monitoring
- Recovery: maintaining stable vitals, returning to baseline mental status, ambulation, discharge
- Total time ~2 hours

Electrode Placement

Right unilateral (RUL)

Good efficacy but
not as good as BL

Less chance of
memory issues (but
can still happen)

Better
tolerated/more likely
to stay in treatment

Bifrontal (BF)

Slightly greater
efficacy than RUL

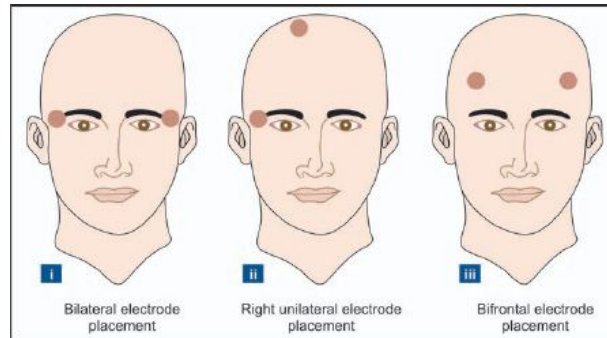
Higher chance of
memory issues
than RUL

Bitemporal/bilateral (BL)

Best efficacy

Highest chance of
memory issues

Generally most
difficult to tolerate



Transcranial Magnetic Stimulation (TMS)

- Generation of alternating magnetic fields which induce small electrical currents that depolarize neurons and stimulate the brain
- Targets dorsolateral prefrontal cortex (hypofunctioning in depression)
- Stimulation results in neuroplasticity (as in ECT), increased monoamine transmission, and increased cerebral blood flow
- Very safe, noninvasive, generally well tolerated, no anesthesia



Transcranial Magnetic Stimulation (TMS)

- Indications
 - Major depressive disorder
 - Obsessive compulsive disorder
 - Smoking cessation
- Possible side effects (generally mild): headache, scalp irritation, jaw movement, facial twitching, very low risk of seizure
- Response rate ~50%
- Treatment course
 - 36 treatments in one series but only ~25 minutes each tx
 - Patients can drive to and from treatment

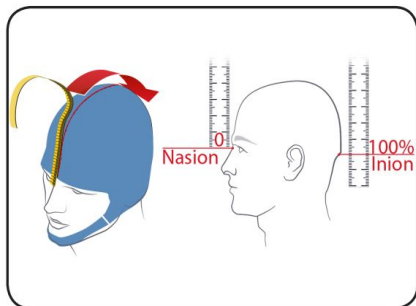


TMS Mapping

Measure → Motor Threshold → Optimal Treatment Position

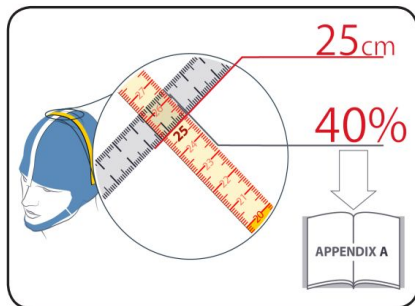
Preparing the Patient and the Device

6. USING THE BLACK RULER



Attach the midline flexible ruler (black ruler) along the midline of the cap (on the right side of the patient), with the zero mark on the patient's nasion. Measure the distance from nasion to inion.

7. USING THE RED RULER



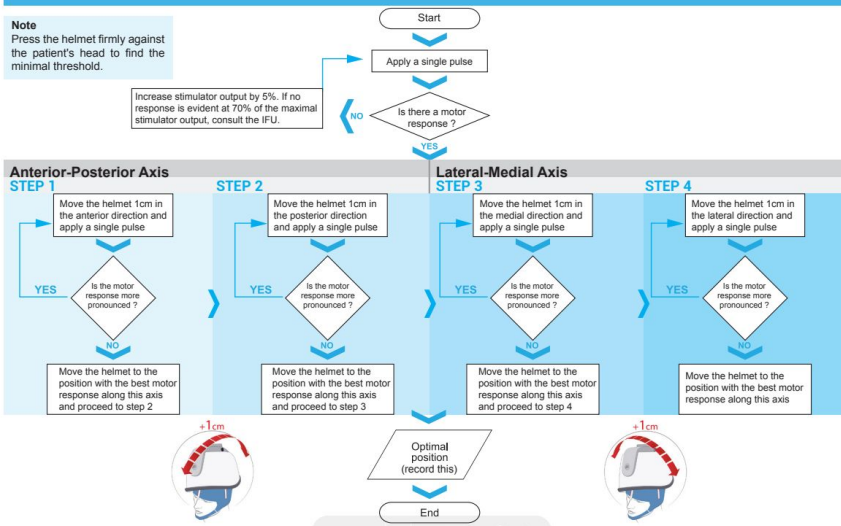
Place the lateral-medial flexible ruler (red ruler), so that the 25cm scale mark of this ruler lines up with the point along the black midline ruler (black ruler), whose distance from the nasion is 40% of the nasion-inion distance (Appendix A: nasion-inion distance). The zero mark needs to be on the left side. For example: in the case that the nasion-inion distance is 35cm, the red ruler should cross the black ruler at 14cm.

Note: All references to "left" and "right" in this document refer to the patient's left and right sides.

Determining the Motor Threshold (MT)

10. FINDING THE OPTIMAL POSITION

Note
Press the helmet firmly against the patient's head to find the minimal threshold.



Esketamine - Spravato®

- Medication administration (nasal spray) and monitoring for two hours post-treatment
- Novel mechanism of action which differs from standard antidepressants
 - NMDA antagonism (glutamate activate) and AMPA activation
 - Activation of anterior cingulate cortex
- Indication: major depressive disorder
- Common side effects: sedation, nausea, mild elevations in blood pressure, dissociation, dizziness
- Response rate: 50-70%
- Treatment schedule: 2x/week for four weeks, then 1x/week for four weeks, then maintenance treatment if required
- Need transportation home from treatment

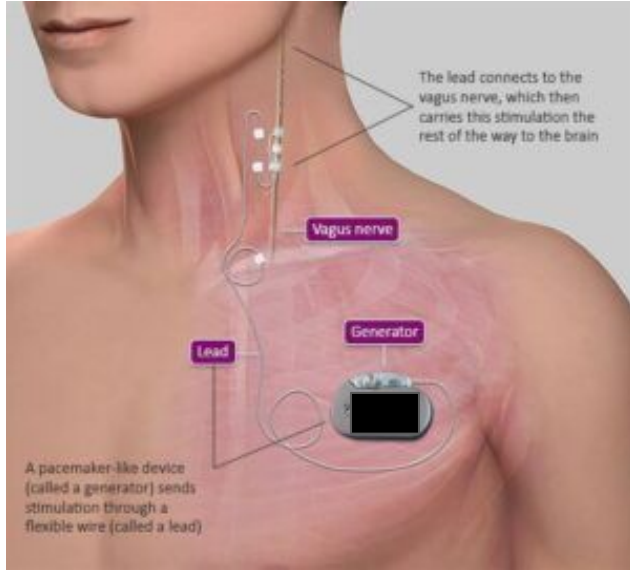


Vagus Nerve Stimulation (VNS)

- Neurosurgical procedure which involves attaching an electrode around the left vagus nerve in the carotid sheath
- Vagus nerve connects to the brainstem and helps to regulate mood through several brainstem nuclei
- Electrode is connected to a pulse generator implanted subcutaneously in the chest wall
- “Pacemaker for the brain”
- Stimulation is pulsatile; 30 second stimulation every 5 minutes
- Stimulus parameters are adjusted by a psychiatrist using a handheld transmitter
- Indications: major depressive disorder, bipolar depression, epilepsy
- Generally takes a few months to start seeing benefit
 - Good treatment for *relapse prevention*
- Stimulation side effects: voice alteration (most common), dizziness, cough, dyspepsia, shortness of breath
- Can use a magnet to stop stimulation

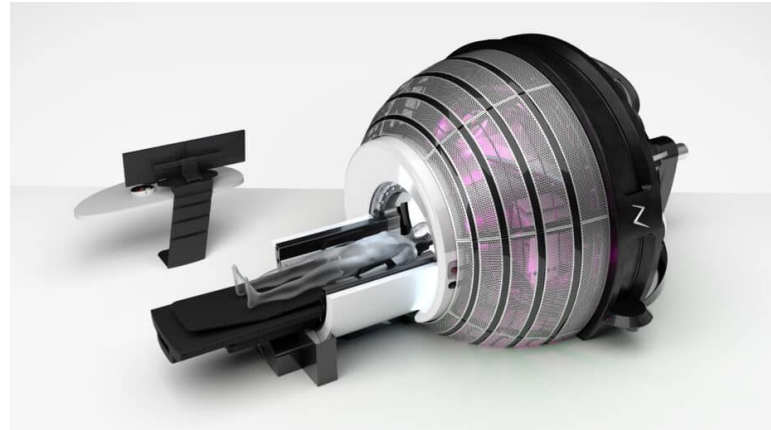


Vagus Nerve Stimulation (VNS)



Stereotactic Radiosurgery (SRS)

- Modulating areas of synaptic dysfunction with low doses of radiation
- Submillimeter precision and brief treatment durations (less than 30 minutes)
- Involves pre-treatment MRI
- In research phase now but available trial at JSUMC



Wrap Up

- Many patients with psychiatric conditions do not adequately respond to “traditional” treatments (medication, psychotherapy).
- Neuromodulation psychiatry is a much needed option for this subset of patients.
- Always important to discuss risks and benefits of each available treatment option.
- Most treatment options are indicated for mood disorders. ECT has the broadest indications.
- We are very lucky to have these options available in our health care system!

Summary: Neuromodulation for Mood Disorders

	ECT	TMS	Esketamine	VNS
Efficacy 3 = great 2 = good 1 = poor	3	2	2.5	1.5
Side effects 3 = lots 2 = some 1 = few	2.5	1	2	2
Logistics 3 = more challenging 2 = some challenge 1 = less challenging	3	1.5	1.5	2
Comments	Works well for many dx but with possible side effects/logistical barriers	Well tolerated, outpatient, works pretty well, multiple tx per series	Works well, no anesthesia, some logistical barriers	Not great data for acute treatment, good for relapse prevention, permanent implant

Questions & Answers

Resources:

- **VISIT:** HackensackMeridianHealth.org/HealthyMind



- **CALL:** 1-844-HMH-WELL

- **Neuromodulation Services:**

- Raritan Bay Medical Center – Dr. Abbas – 732-324-5339
- Carrier Clinic – Dr. Mehta – 908-281-1440
- Jersey Shore University Medical Center – Dr. Shuler – 848-332-0119



Thank you for joining us!

Tune in next Wednesday at 5:30 PM for our webinar session:

Recovery in Action: Evidence-Based Approaches to Addiction Treatment