

Neuromodulation for Parkinson's Disease

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MD)

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Presenter:

Ashwin G. Ramayya, MD, PhD

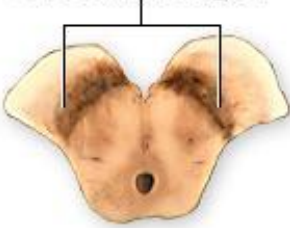
- Assistant Professor in the Department of Neurosurgery at Stanford University
- Area of focus is chronic pain, movement disorders, epilepsy, and traumatic brain injury.
- Specializes in neuromodulation, including deep brain stimulation (DBS), spinal cord stimulation, MRI-guided laser therapy, and focused ultrasound.
- Obtained his MD and PhD from the University of Pennsylvania, where he also completed his neurosurgery residency and a fellowship in stereotactic and functional neurosurgery.
- Disclosures:
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 - Other: None



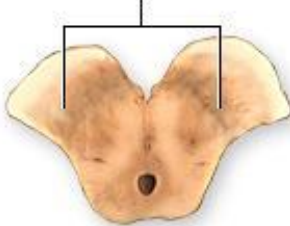
Cut section of the midbrain where a portion of the substantia nigra is visible



Substantia nigra



Diminished substantia nigra as seen in Parkinson's disease



ADAM

Parkinson's Disease Symptoms



Motor impairments

Non-motor impairments



Bradikinesia



Hypersalivation



Postural imbalance



Tremor



Muscular rigidity



Walking difficulties



Freezing of movements

Cognitive impairment



Sleeping disorders



Mood disturbances



Gastrointestinal issues



Sweat and olfactory disorders



Anxiety and depression



Pain



Parkinson's Prevalence by State*



*Click/Tap any state for more information.

What is it?
Parkinson's Foundation study to determine Parkinson's disease (PD) prevalence in North America.

930,000
people in the
U.S. with PD
by **2020**

1.2 million
people in the
U.S. with PD
by **2030**

Personalized Precision Therapy: Our wholistic approach

Exercise

Wellness

Medications



Personalized Precision Therapy: Next steps

Anatomy

Targeting

Delivery

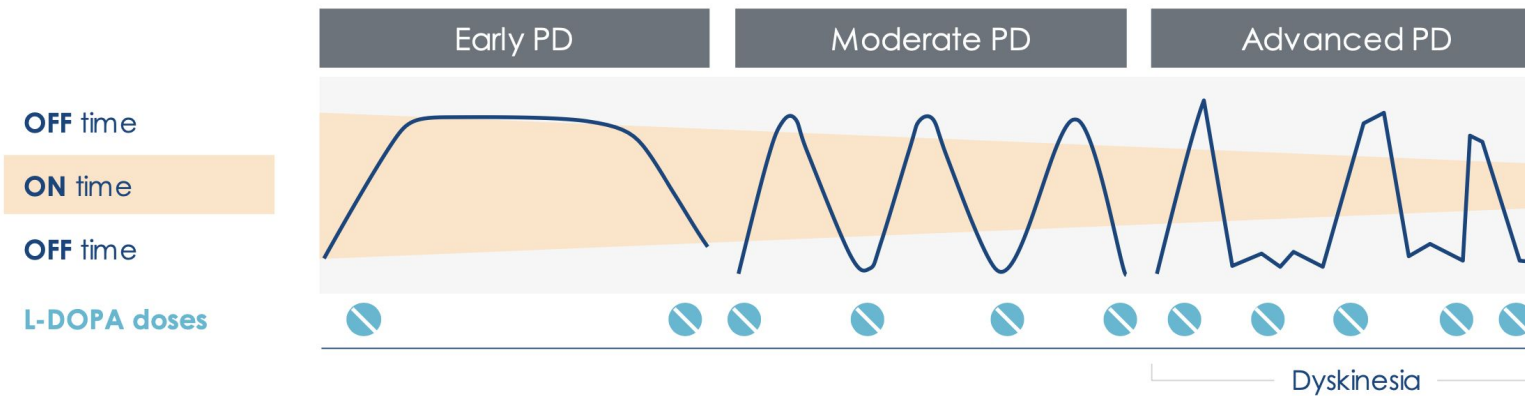


Becoming a surgical candidate

LONG-TERM MEDICATION USE AND INCREASED SIDE EFFECTS

Boston
Scientific

ON/OFF Fluctuations with levodopa treatment

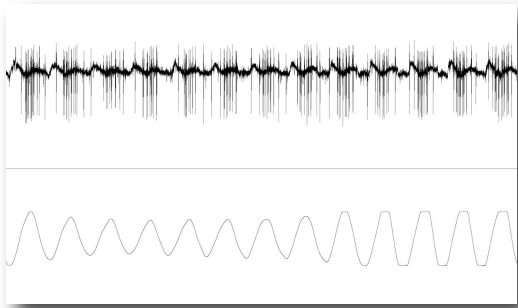


Long term use of L-DOPA may cause unintended side effects such as **dyskinesia**—rapid, uncontrolled movements

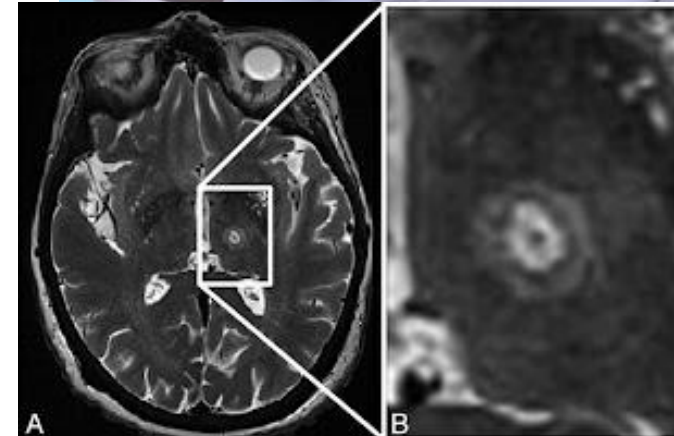
ON/OFF fluctuations are often a catalyst for a switch to another medication

Surgical Options

- Deep Brain Stimulation



- MRI guided Focused Ultrasound



Personalized Precision Surgery

#1 Personalized Brain Anatomy



Brain
anatomy is
unique



The use of coordinates in deep brain stimulation surgery

Coordinate-based lead location does not predict Parkinson's disease deep brain stimulation outcome

Kelsey A Nestor ¹, Jacob D Jones ², Christopher R Butson ³, Takashi Morishita ⁴,
Charles E Jacobson 4th ⁵, David A Peace ⁴, Dennis Chen ¹, Kelly D Foote ⁴, Michael S Okun ¹



Personalized Precision Surgical Therapy

#2 Personalized Surgical Targeting



Parkinson's
Disease
affects
entire
brain
networks

Motor

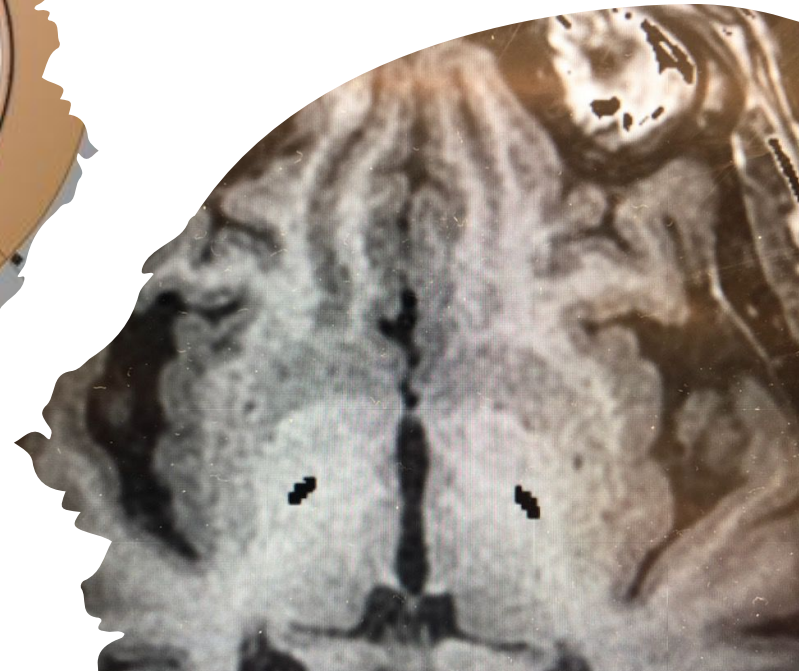
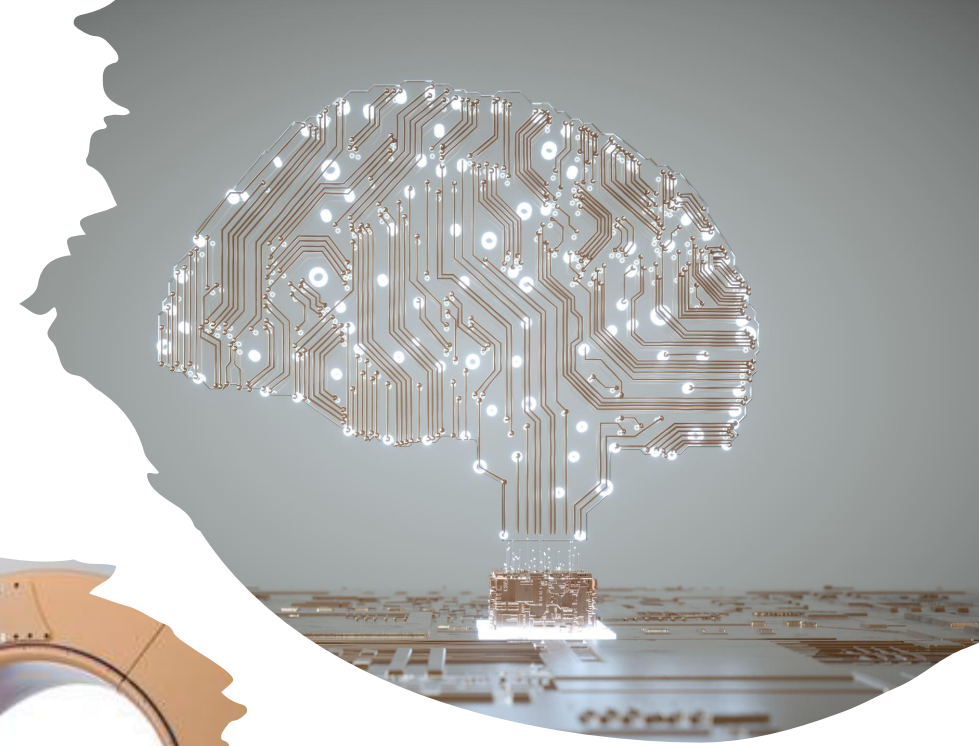
Cognitive

Limbic



Personalized network-based targeting

Goal	Goal = Motor improvement
AVOID	AVOID negative effects on non-motor networks
Brain	Deep brain structures are involved in many functions
Identify	Identify specific subregion that is connected to the motor network



Personalized Precision Surgical Therapy

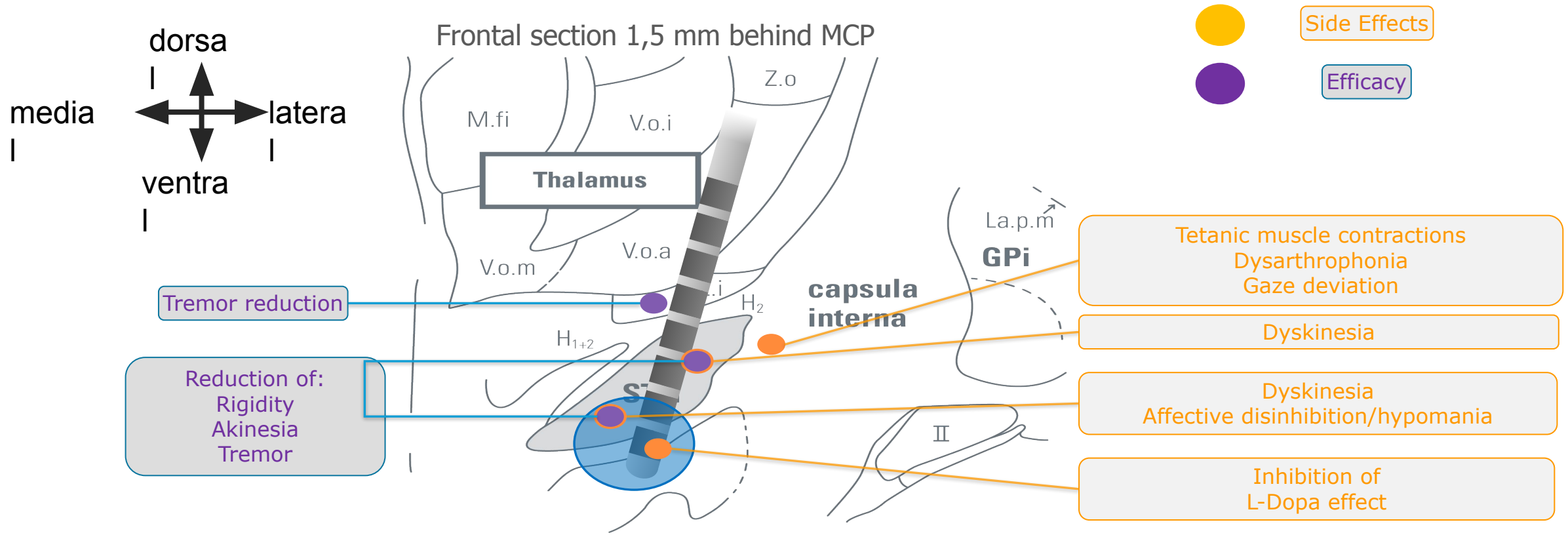
#3 Personalized Delivery



A Challenge in Deep Brain Stimulation

The STN "neighborhood"

Goal: Accurately target therapy and avoid unwanted effects



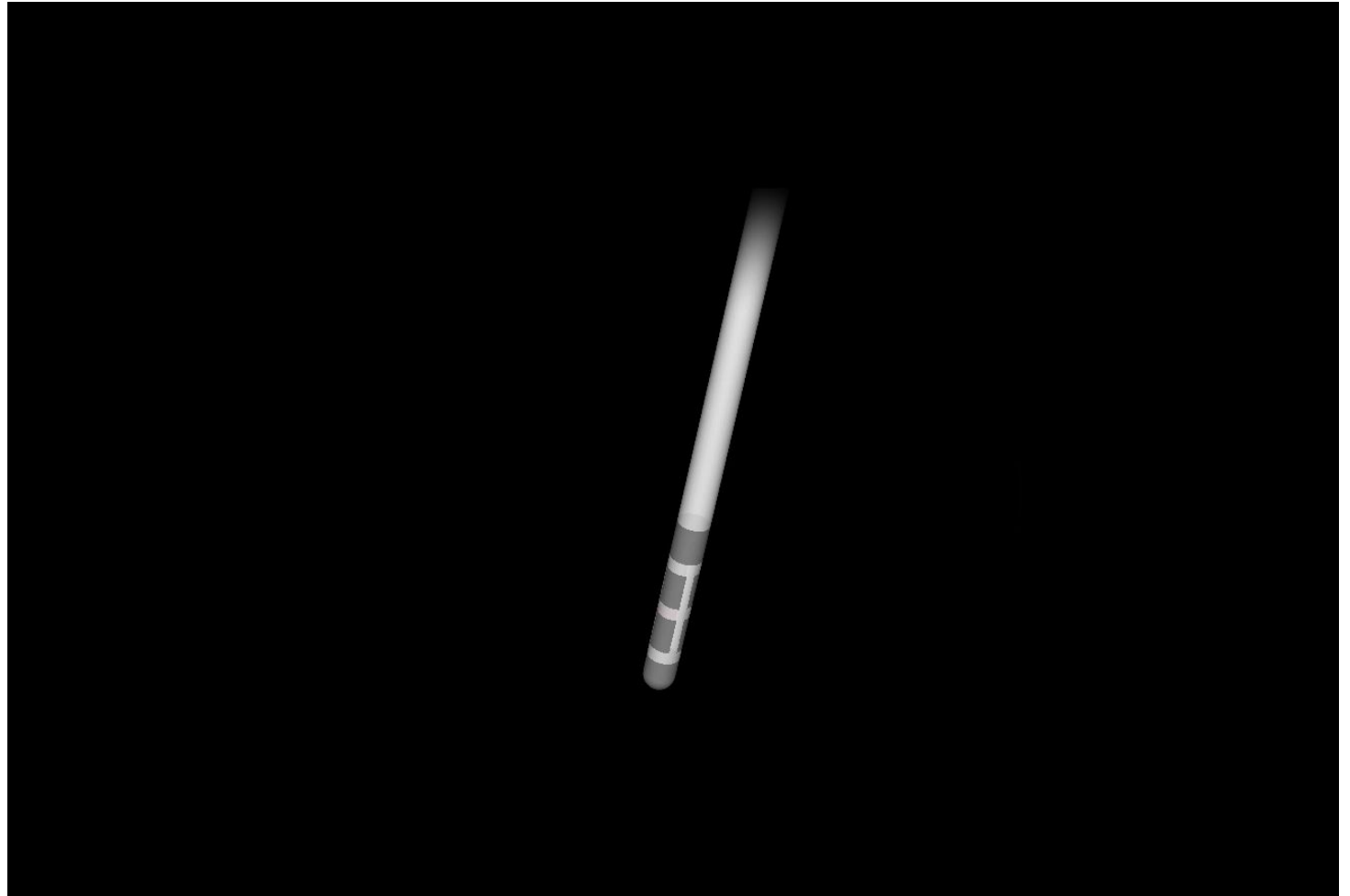
Reshaping Stimulation

Powered by **Multiple Independent Current Control (MICC)** technology

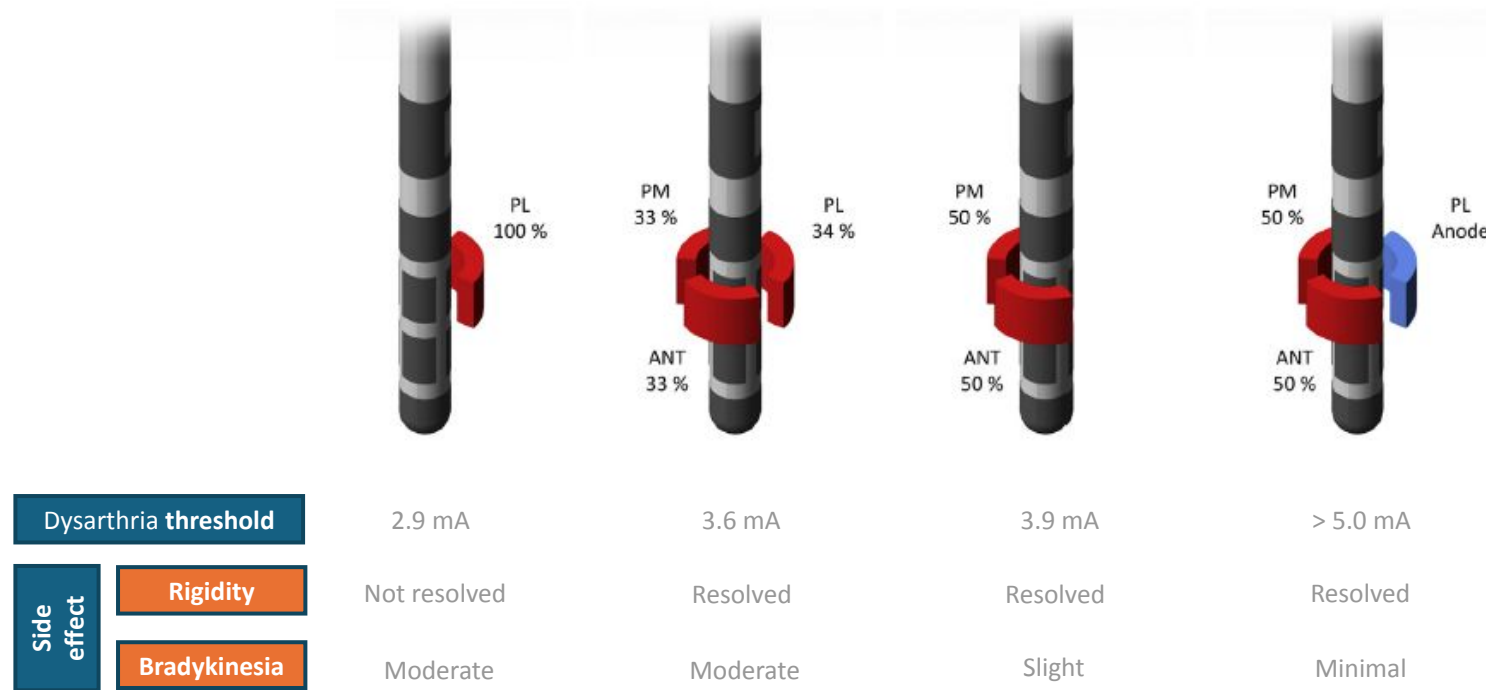
Vercise™ DBS Systems are
Designed to define the

- ✓ Size
- ✓ Shape
- ✓ Position
- ✓ Direction

of stimulation to **accurately target therapy** and **avoid unwanted side effects**, even in the presence of impedance variability.



Directional Case Study – Cologne, Germany



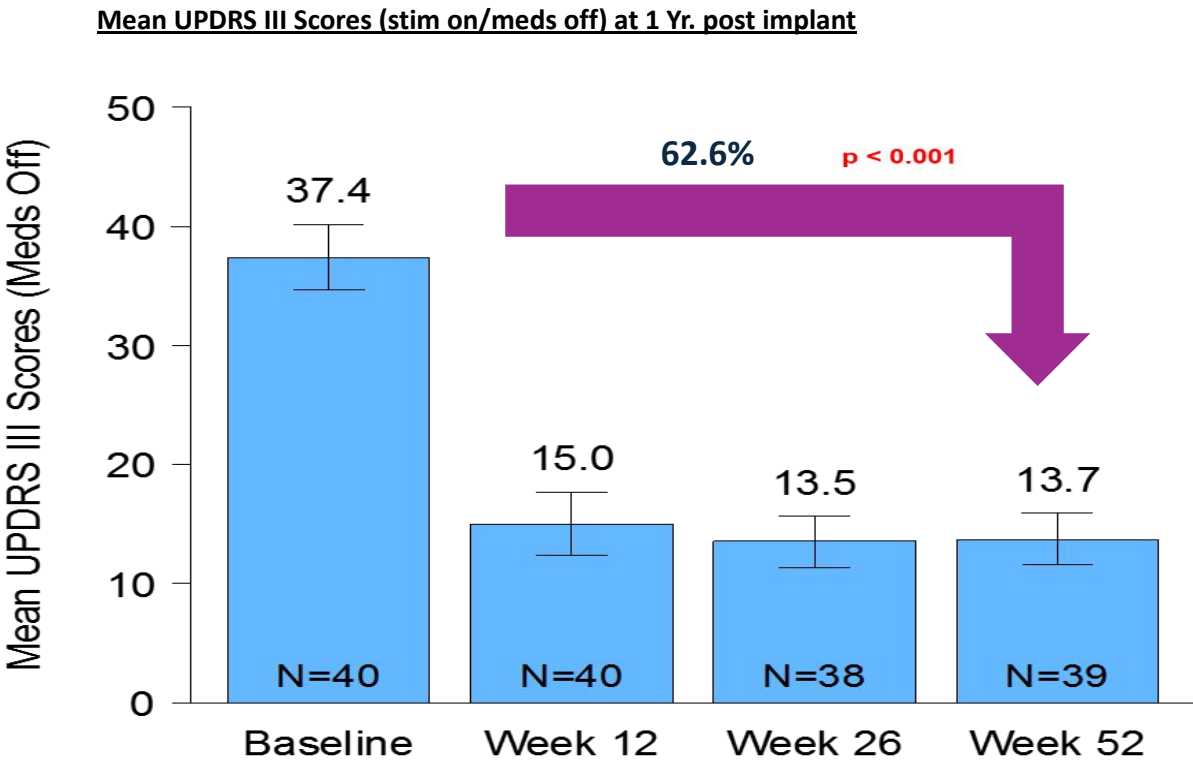
Combination of directional stimulation with bipolar programming is designed to allow physicians to fully optimize therapy

Reker et al. Directional Deep Brain Stimulation: A case of avoiding dysarthria with bipolar directional current steering. Related Disorders. 2016. NM-450106-AB

Results from case studies are not necessarily predictive of results in other cases. Results in other cases may vary.

Study	Principal Investigators	Description	Design	Status
Vantage (EU)	<ul style="list-style-type: none">Lars TimmermannFrancois Alesch	Document patient outcomes including effectiveness and safety with Vercise DBS System for PD	Prospective, Multi-center, open label, single-arm study	Complete

The study successfully passed primary endpoint ($p < 0.0001$) at 1 yr. post implant (UPDRS III scores in meds off condition)*



* Published in Lancet Neurology

Reshaping IPG Design: Smaller, Thinner, Contoured Shape¹

Vercise™ PC

Smaller:
33 cc Size



Thinner
11 mm Thin



Contoured
Shape



Vercise Gevia™

Smaller:
33 cc Size



Thinner
11 mm Thin



Contoured
Shape



Designed for minimal erosion and optimal cosmesis

15 YEAR BATTERY LIFE & Simple Recharging

Charging is as Easy as 1 – 2 – 3



1. Charge the Charger

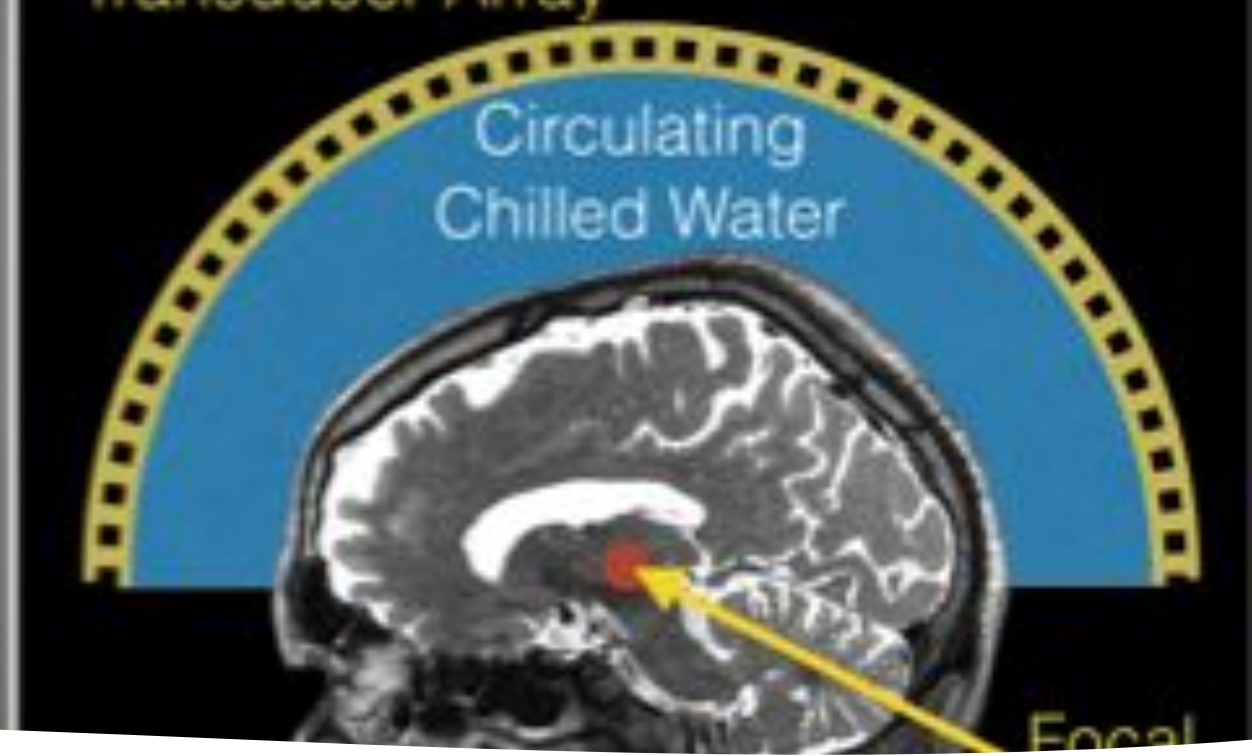


2. Place the Charger Within the Charging Collar



3. Position the Collar to Align the Charger

*This instruction is not meant to replace the charging instructions provided with the system



MRgFUS Therapy for PD at Stanford

- FUS thalamotomy for tremor-dominant PD (approved therapy, though not yet covered by all insurance)
- Clinical Trials (PI: Vivek Buch, MD)
 - FUS pallidotomy for PD (closed)
 - FUS ablation of the pallidothalamic tract for PD (OPEN)



TABLE 3 | One year post PTT off-medication vs. preoperative on-medication.

	Percentage reduction of the mean at 1 year <i>off-</i> vs. preoperative <i>on-</i> medication	<i>n</i>	<i>p</i>
Tremor (/12)*	84% (0.8 ± 1.2 vs. 5.2 ± 4.0), 83.3% improved, 8.3% stable and 8.3% increased	24	<0.001
Rigidity (/8) [†]	70% (0.9 ± 1.3 vs. 2.9 ± 2.0), 88% improved and 12% unchanged	24	<0.001
Distal hypobradycinesia (/16) [§]	73% (2.0 ± 2.0 vs. 7.3 ± 3.9), 96% improved and 4% unchanged	24	<0.001
Axial items (/32) [¶]	24% (6.0 ± 4.1 vs. 7.8 ± 4.0), 67% improved, 12% stable, 21% worsened	24	0.13
Speech (/4) (UPDRS III item 18)	38% (0.5 ± 0.7 vs. 0.8 ± 0.7), 46% improved, 42% stable, 13% worsened	24	0.17

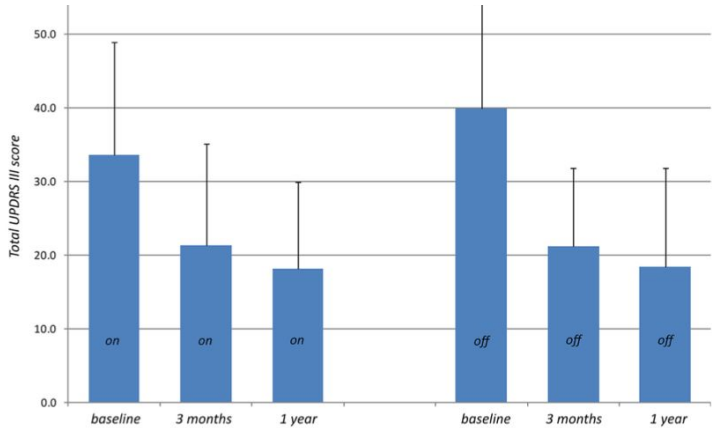
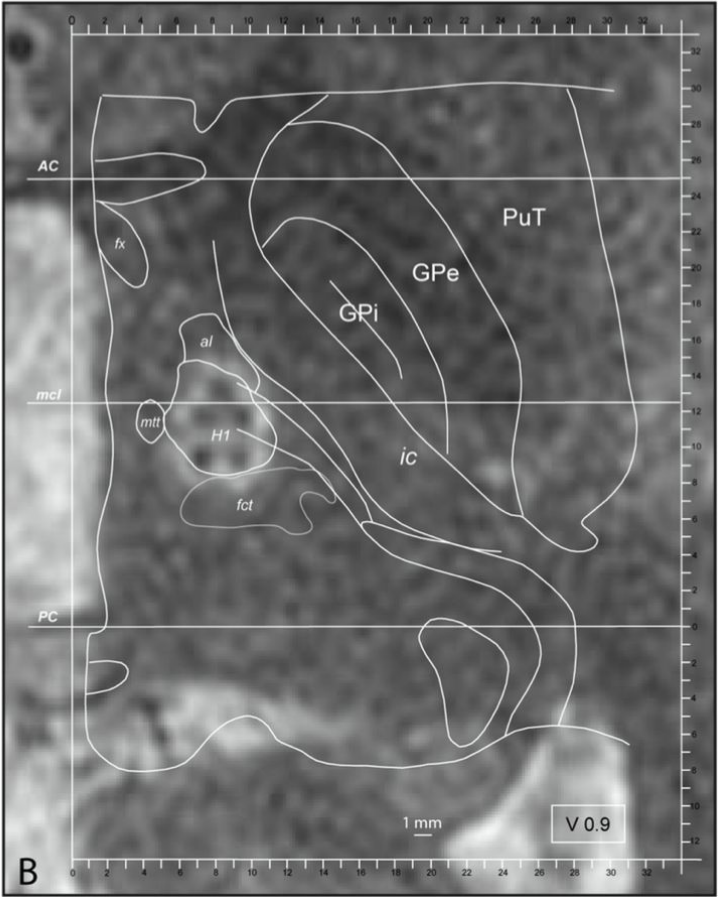


FIGURE 3 | Total UPDRS III scores (higher values indicate stronger impairments) measured preoperatively (baseline) on-medication and 3 months and 1 year after PTT off-medication.



Personalized surgical decision-making



Discuss all options

(Non-surgical management vs.
DBS vs. MRgFUS)



Utilize a team
approach

Patient, Family, Neurologist,
Clinic Team, Surgeon, Industry



Decide together
what is best for you



THANK YOU!



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