



**ΣΥΛΛΟΓΟΣ ΠΑΡΚΙΝΣΟΝΙΚΩΝ
ΑΣΘΕΝΩΝ ΚΑΙ ΦΙΛΩΝ
ΒΟΡΕΙΟΥ ΕΛΛΑΔΟΣ**

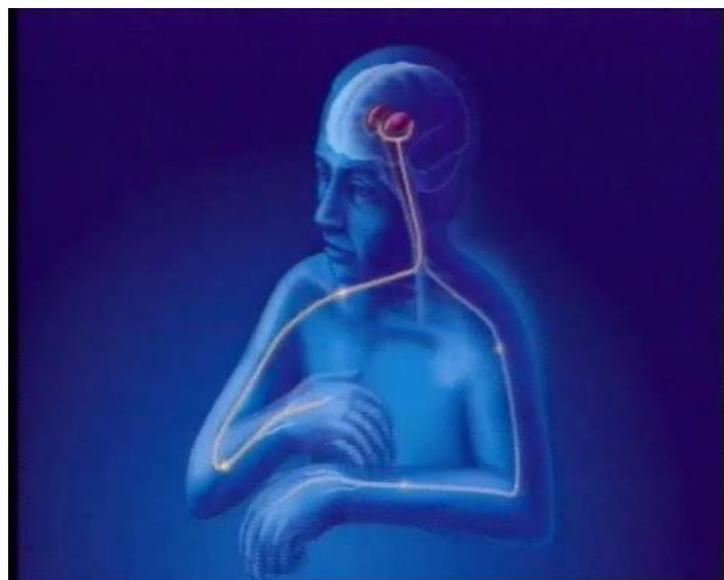
Deep Brain Stimulation for Parkinson's Disease

Introduction

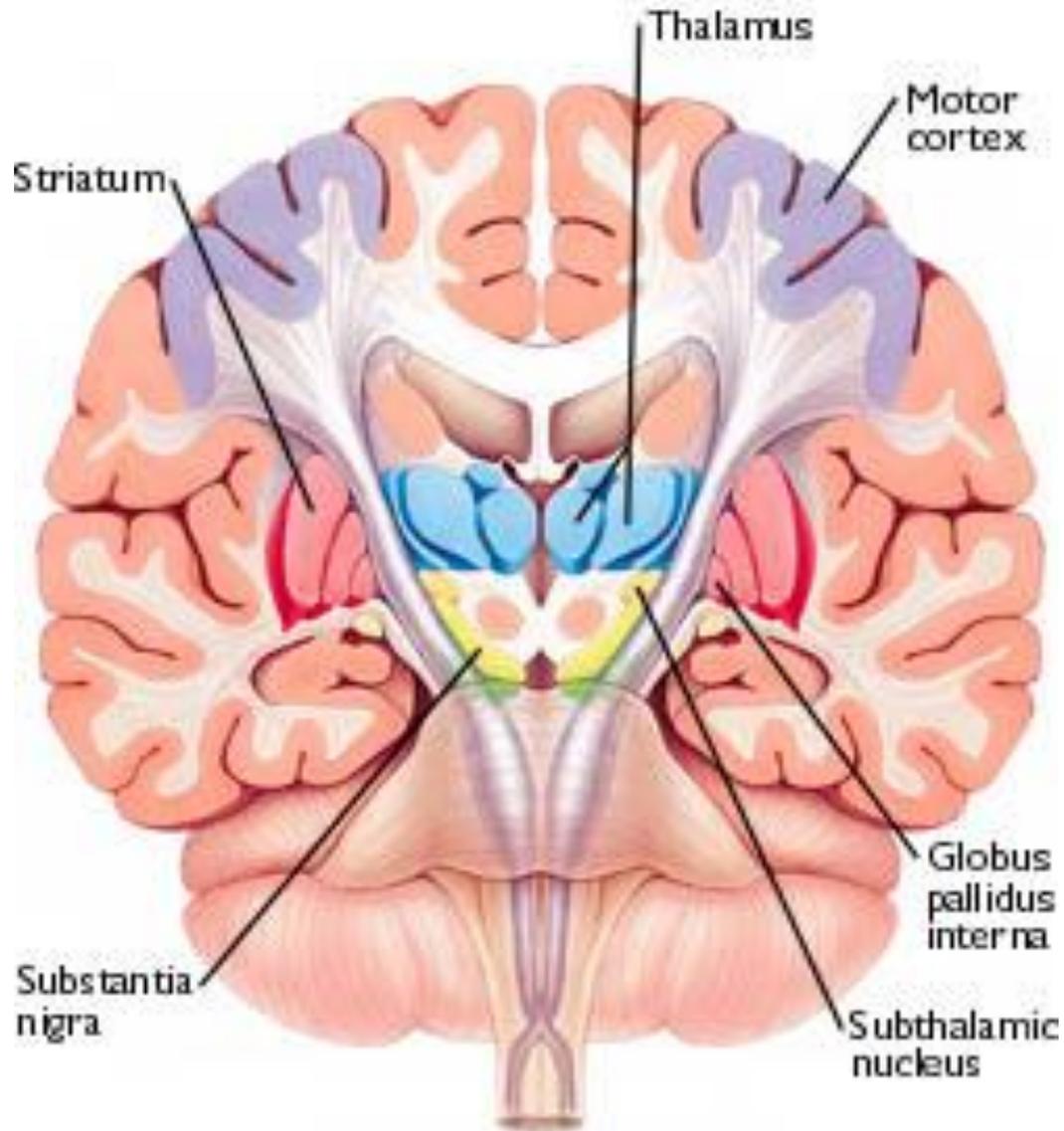
- Surgical interventions for Parkinson's Disease started many years ago, with procedures that were destroying part of the basal ganglia in the brain (thalamus or subthalamic nucleus), and which procedure were non reversible and had a permanent effect.
- Those techniques are not being used any more, as Deep Brain Stimulation-also known as DBS- has totally replaced them.
- The application of DBS for the treatment of the movement disorders started in 1989 by the French neurosurgeon Professor A. Benabid.
- Since then, DBS has been performed to more than 100.000 patients world wide.
- In Greece the main centers where DBS is performed are: General hospital Evaggelismos and Hygeia private hospital in Athens, General Hospital of Patras and University hospital AHEPA in Thessaloniki.

What DBS is...

- It is the transmission of electric impulses in targeted structures deeply in the brain, responsible for controlling the movement.
- In patients with parkinson's disease the neural function within those structures is not normal.
- This electrical stimulation overrides abnormal neuronal activity within these brain regions to bring motor controlling circuits into a more normal state of function, thereby reducing movement disorder symptoms
- Other indications where DBS is applied are:
 - Essential Tremor
 - Dystonia
 - Obsessive Compulsive Disorder
 - Epilepsy



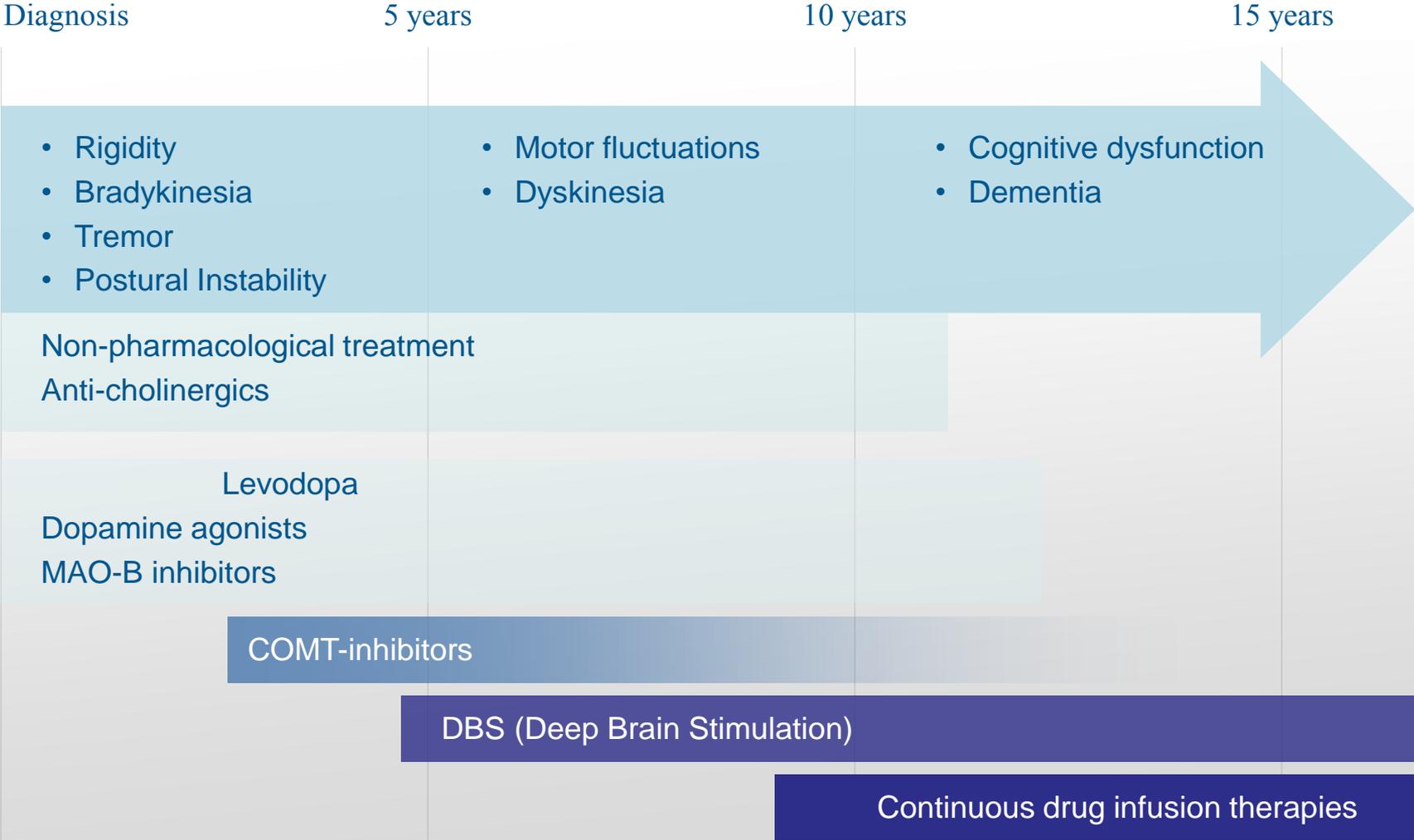
Brain structures-DBS targets



DBS

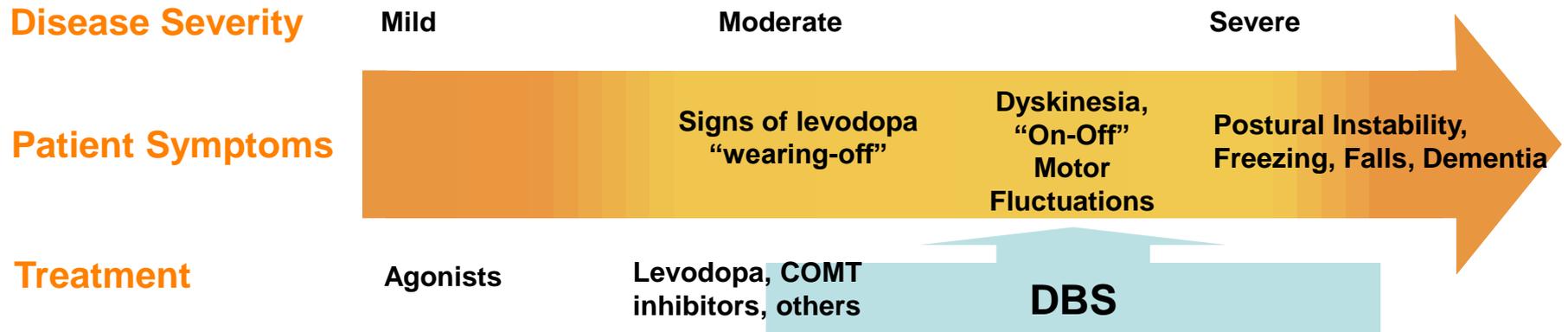
- A big number of clinical trials and publications reflects the great development of DBS.
- According to these publications, the target structure in the brain is subthalamic nucleus. High frequency stimulation of this structure results in improvement of the symptoms in patients with Parkinson's Disease.
- DBS is a reversible method, which can be modified or stopped at anytime. It also allows for adjustments in the stimulation parameters according to the special needs of each patient, in a way that the best results are obtained, having the minimal side effects at the same time.

Parkinson's Disease : Typical Symptoms and Treatment



Indications

Parkinson's Disease Treatment: when DBS should be considered



DBS: When Pharmacotherapy isn't Enough

- As Parkinson's disease progresses, medications may fail to provide consistent and adequate symptom control
- Medications used at levels required for symptom control may produce adverse effects
 - Motor complications, such as dyskinesia
 - Cognitive and psychiatric problems
 - Nausea, hypotension, and other systemic effects

When Should DBS be Considered?

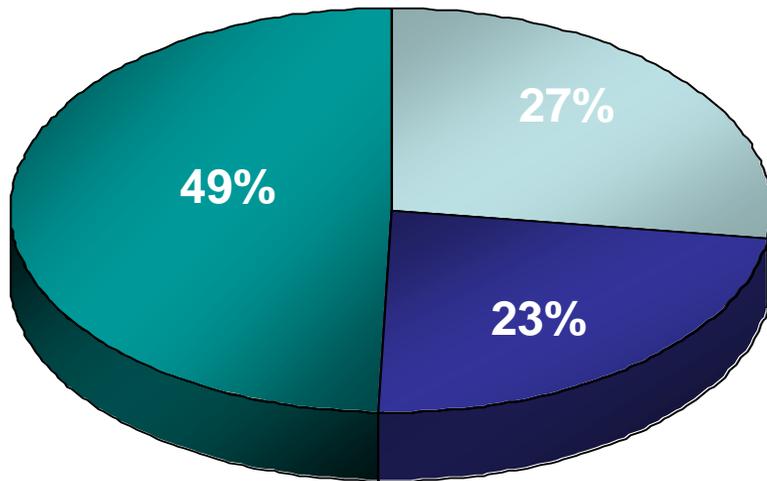
- When, despite optimized pharmacotherapy, your patient experiences troubling motor symptoms, which may include:
 - Wearing off – Off periods that contain troubling bradykinesia, rigidity, tremor, and/or gait difficulty
 - Troubling dyskinesia
 - Motor fluctuations
 - Refractory tremor

Exclusion Criteria for DBS

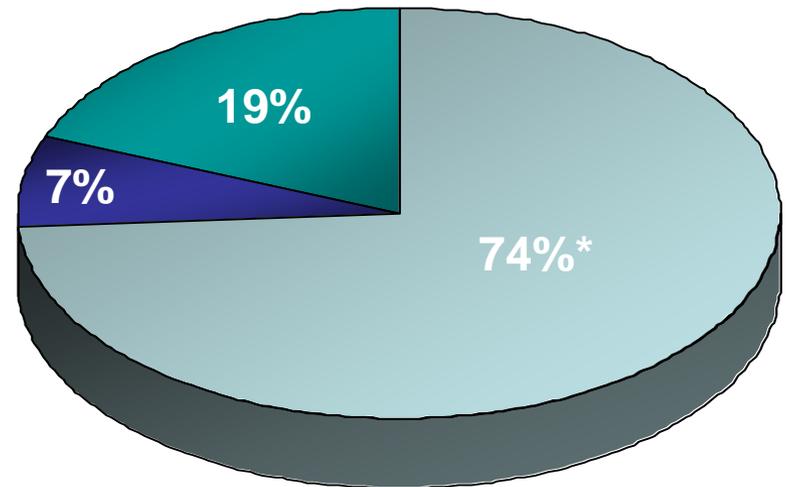
- Atypical (non-idiopathic) parkinsonism
- Lack of sustained response to levodopa
- Frank dementia, moderate to severe dementia

Most DBS Implanting Centers will review patient medical history to identify other potential exclusion criteria & verify patient candidacy for DBS.

“ON” Time Without Dyskinesias Improves from 27% to 74% of a Patient’s Waking Day*



Before Surgery
(n=96)

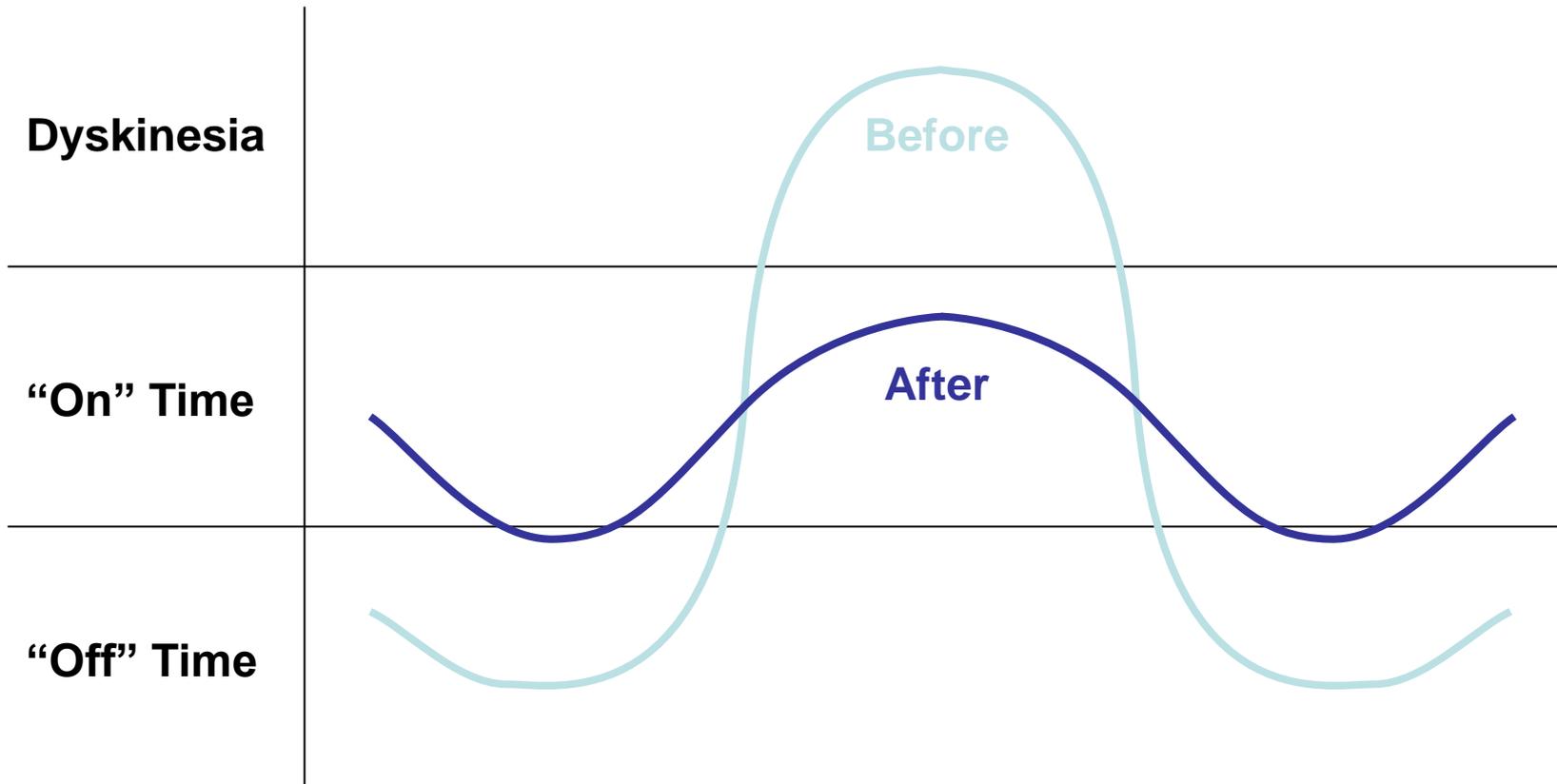


6 Months After Surgery
Bilateral STN DBS Implant
(n=91)

■ 'ON' with Dyskinesia ■ 'ON' without Dyskinesia ■ 'OFF'

* The Deep-Brain Stimulation for Parkinson's Disease Study Group. Deep-brain stimulation of the subthalamic nucleus for the pars interna of the globus pallidus in Parkinson's disease. *N Eng J Med.* 2001;345:956-63.

Efficacy: Benefits of DBS Therapy Impact on Mobility



This graph is only for illustrative purposes and does not represent actual “on” and “off” time.

Efficacy: Benefits of DBS Therapy for PD Patient Population



87% of patients
demonstrated improved
motor scores in the OFF
medication state at the 12-
month evaluation .*

* Results were for a subset of patients whose data were verified against medical records. Data on file at Medtronic, Inc.

Motor Symptoms Improvements Maintained After 5 Years

- In a 5-year study, DBS significantly improved OFF-medication assessments of tremor, rigidity, and akinesia/bradykinesia

	OFF-Medication Motor Score Improvements*			
	6-month	1-year	3 years	5 years
Tremor	79%	75%	83%	75%
Rigidity	58%	73%	74%	71%
Akinesia	42%	63%	52%	49%

**Results for STN*

Additional Benefits of DBS

- Bilateral, reversible, and adjustable
- Non-destructive versus ablative procedures
- Can be non-invasively fine-tuned to each patient's individual needs

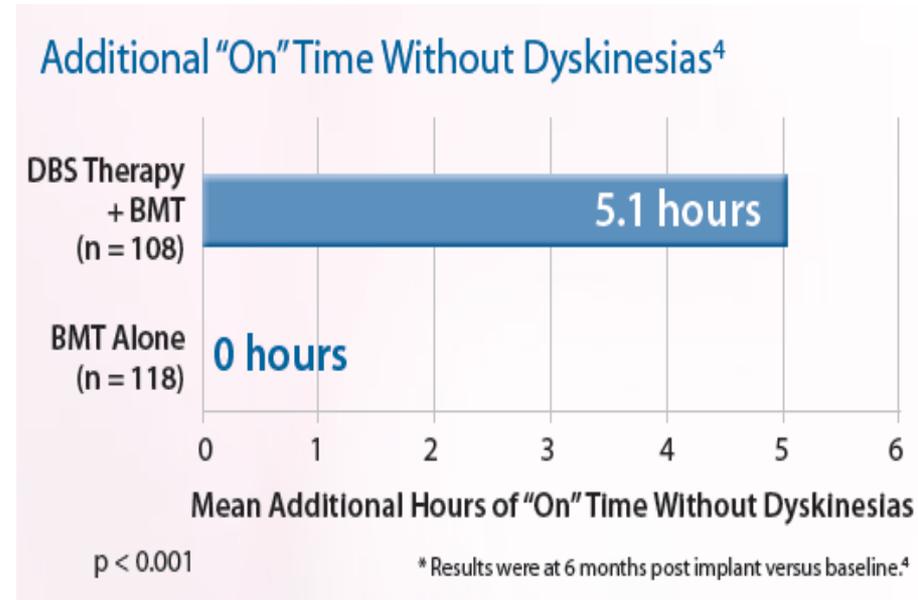
Parkinson's Disease : Goals of DBS Treatment

To improve:

- Motor disabilities
- Quality of life
 - By potentially treating at or just prior to onset of personal, social, or professional decline
 - By treating when L-dopa-related complications begin to have a negative impact on quality of life
- DBS should not be used at this time to prevent motor complications in patients who have not yet developed them

Parkinson's Disease : The Role of DBS

- DBS is a solution for PD patients with troublesome motor symptoms and impaired quality of life despite optimized pharmaceutical treatment
 - Improves and maintains motor function for at least 5 years
 - Increases ON time without dyskinesia from 27% to 74% of the waking day (more than 5 additional hours per day)
 - Reduces significantly the duration and severity of dyskinesia compared to best medical treatment
 - Enables long-term reductions in levodopa dose (>50%) when in the STN hence potential reductions in drug side effects
 - Improves quality of life (>15-25% in the PDQ39) compared to best medical treatment



Patient selection for DBS

- 10 to 20% of people with PD may be eligible for DBS¹
- Identifying the most appropriate candidates is crucial for the optimum outcome of DBS
 - Achieves best clinical results
 - Ensures that patients who are most likely to benefit receive the treatment
 - Ensures that patients who are unlikely to benefit do not receive the treatment

Appropriate patient selection – key for therapeutic success

1. American Academy of Neurology Guideline Summary for Patients and their Families. Medical and surgical treatment for motor fluctuations and dyskinesias in Parkinson's disease. April 2006. www.aan.com

Italian Neurol Soc and Italian Soc Clin Neurophysiol. *Neurol Sci* 2003
Lang AE, *et al. Mov Disord* 2006
Defer GL. *Rev Neurol* 2000
Lang AE and Widner H. *Mov Disord* 2002
Machado A, *et al. Mov Disord* 2006

DBS Inclusion Criteria

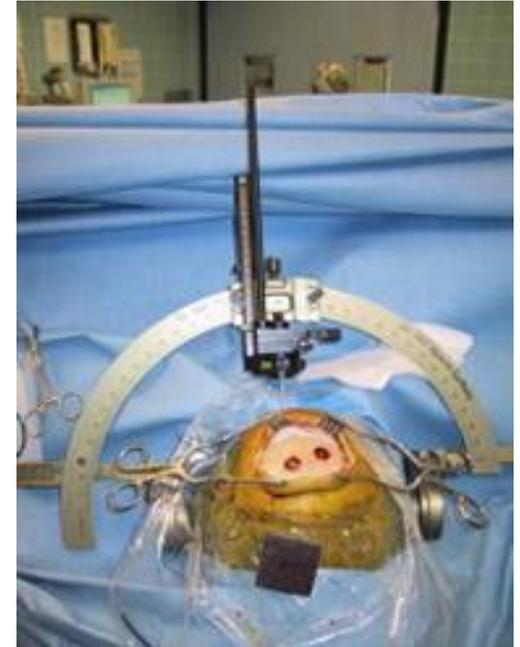
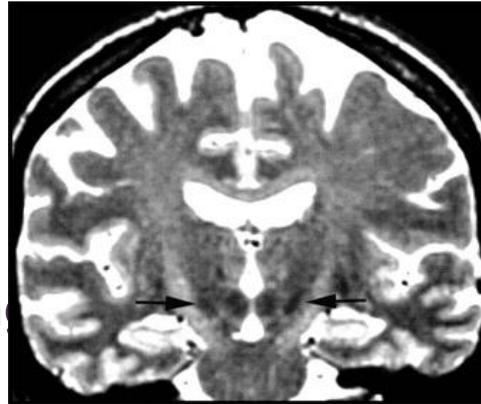
PD Patient Selection Inclusion Criteria

- 1. Idiopathic Advanced PD**
- 2. Levodopa responsive, with good “on” period function**
- 3. Troublesome symptoms, despite optimized pharmacotherapy**
 - Off periods with troublesome bradykinesia, rigidity, tremor, and/or gait difficulty and/or
 - Unpredictable on-off phenomena and/or
 - Motor fluctuations and/or
 - Bothersome dyskinesia and/or
 - Refractory tremor
- 4. Response to Dopaminergic Therapy Predicts response to DBS**
- 5. No dementia or significant untreated depression**
- 6. Realistic expectations**

If any uncertainty, consult or refer to the DBS centre for full assessment

Surgical Technique

- Stereotactic frame placement or frameless stereotaxy
- Targeting
 - Imaging
 - Stereotactic targeting
 - Physiologic targeting (microelectrode recording and stimulation)
- Electrode placement
- Pulse generator implantation



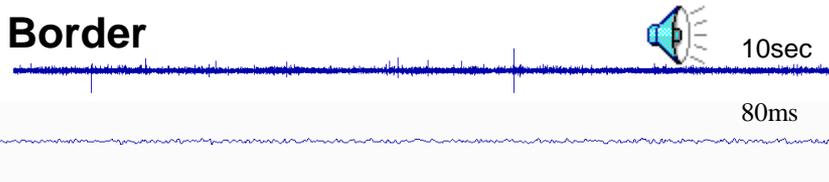
Surgical Technique: Targeting

- Sophisticated imaging and software enables precise targeting for optimal outcomes and minimal risk
- Microelectrode recording (MER) offers additional levels of verification of lead location

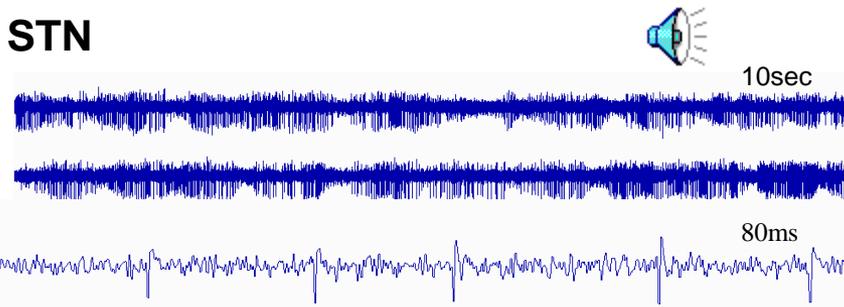


Surgical Technique: Microelectrode Recording

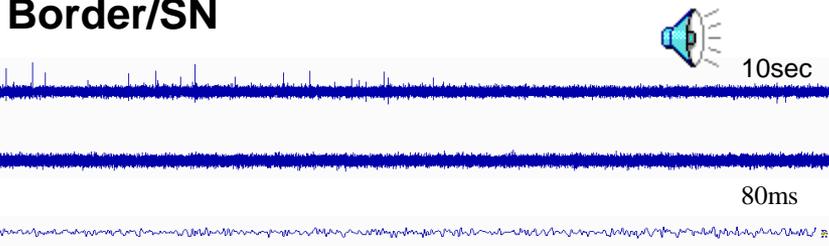
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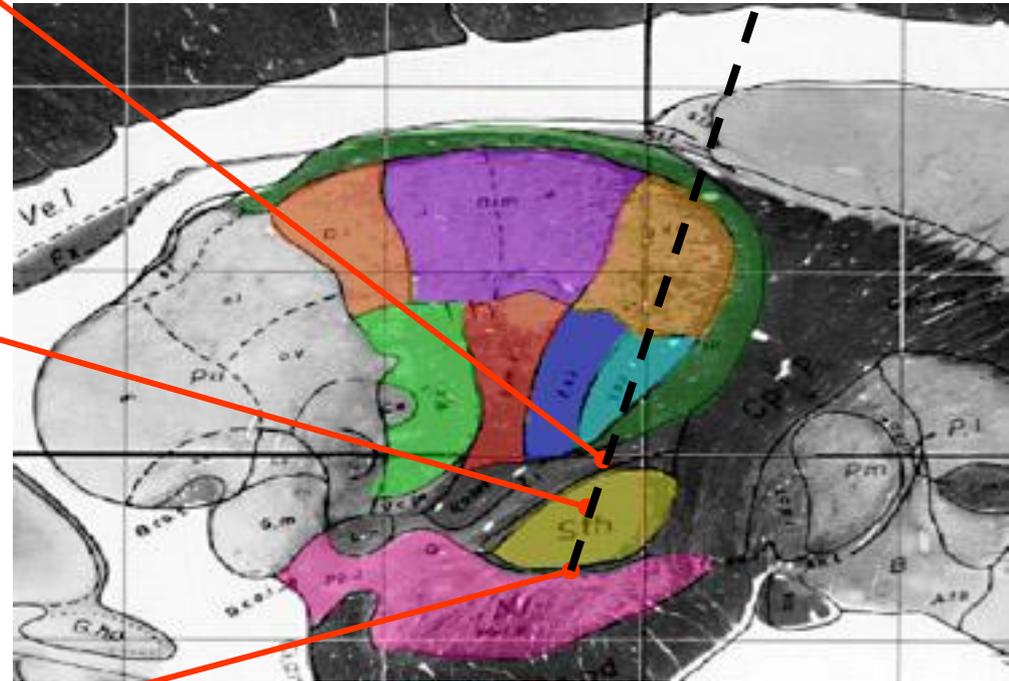
STN



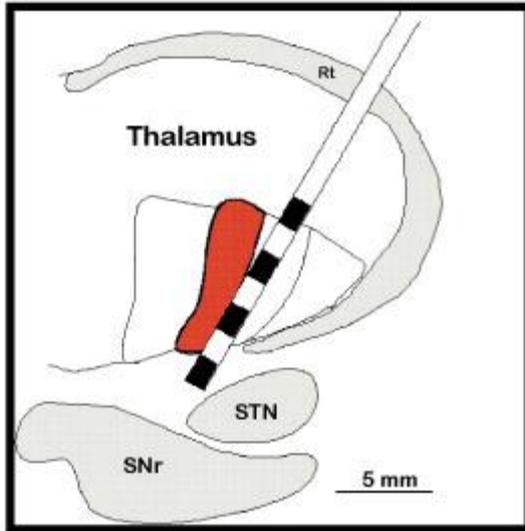
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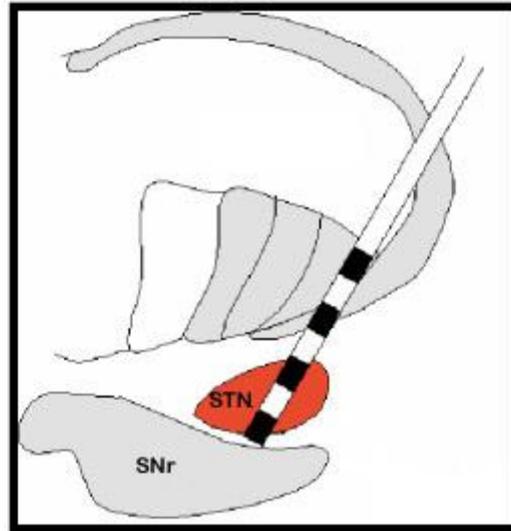
Sagittal Section Through the Thalamus



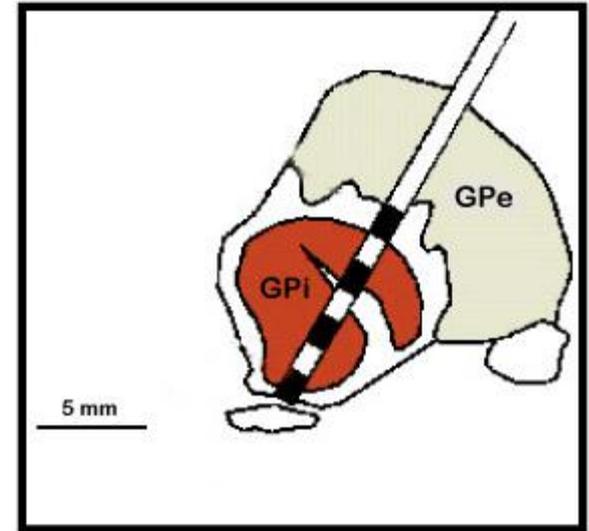
Target Sites for **DBS** Therapy



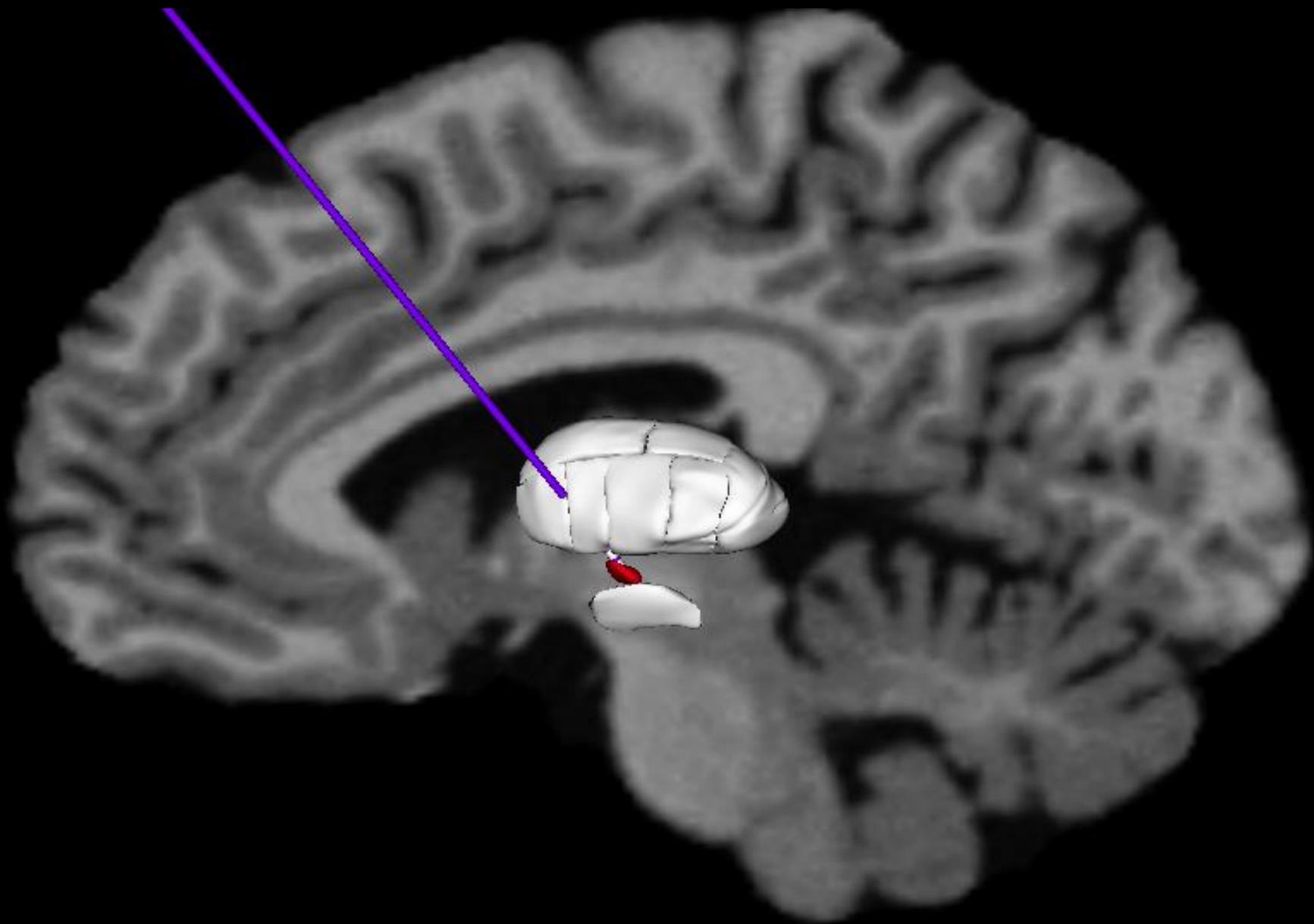
Vim Thalamus:
Essential Tremor

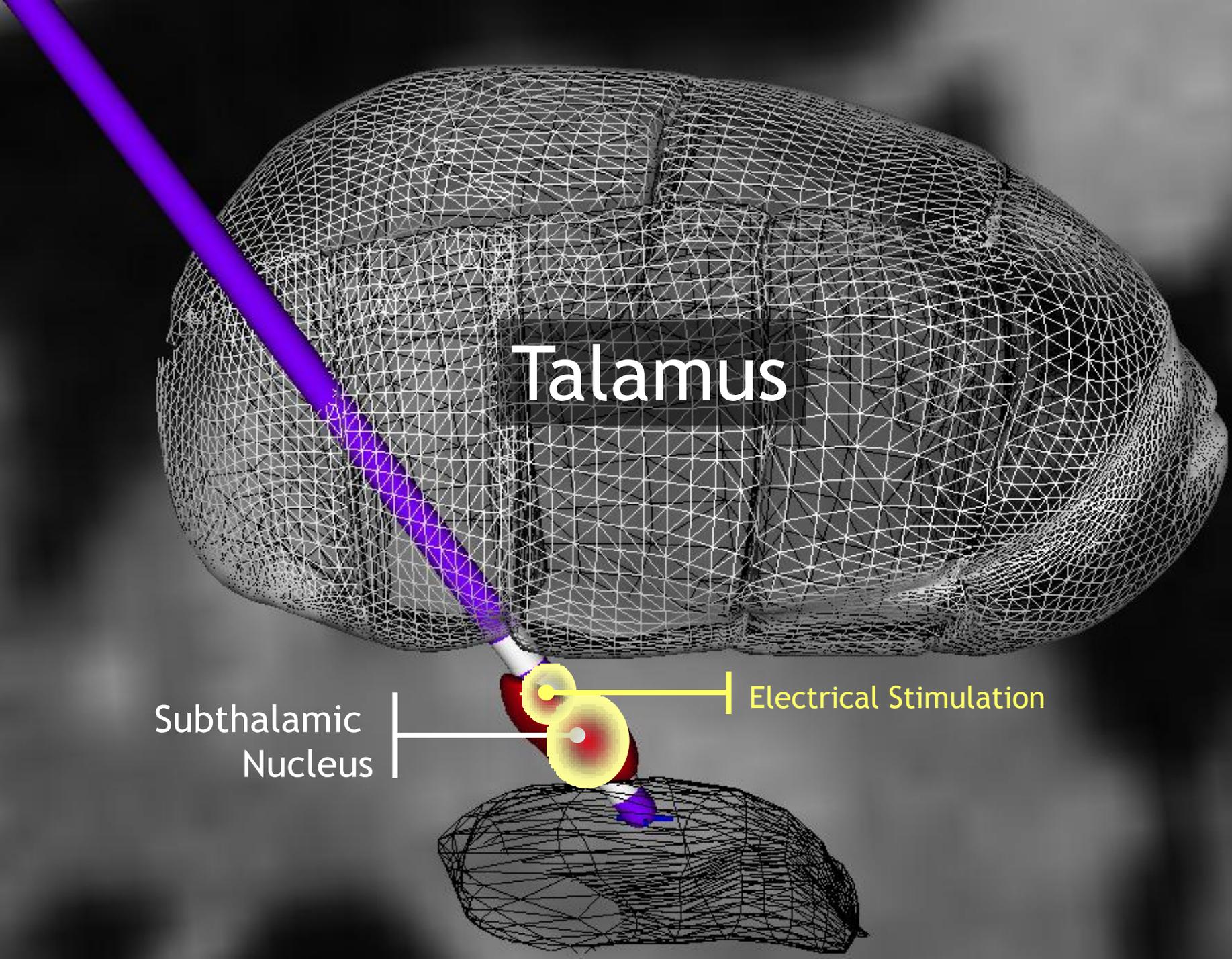


Subthalamic Nucleus:
Parkinson's disease
and Dystonia



Globus Pallidus:
Parkinson's disease
and Dystonia





Talamus

Subthalamic
Nucleus

Electrical Stimulation

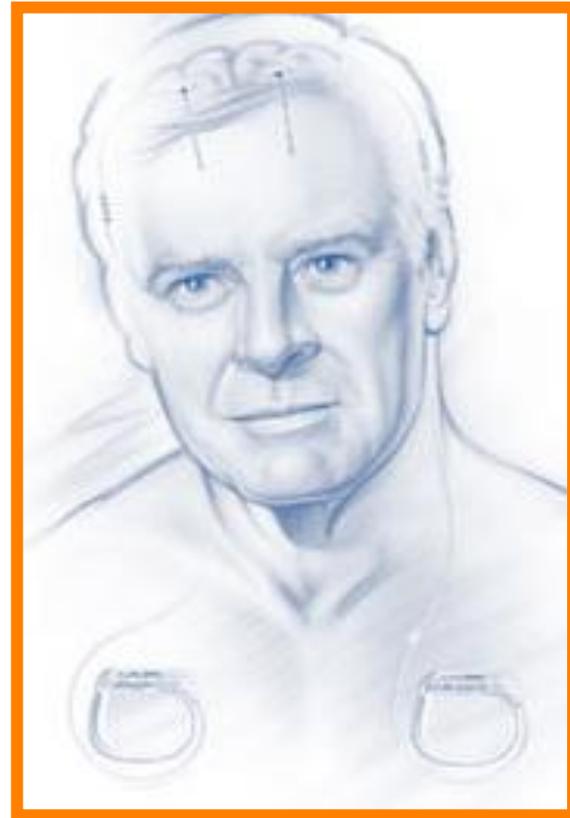
Surgical Technique: DBS Lead Placement

- Leads placed in motor territory of nucleus
- Leads have four electrodes
- Multiple electrode configurations possible during post-operative programming



Surgical Technique: Neurostimulator Placement

- Can be done immediately or days/weeks later
- Typically placed below clavicle
- Connected to lead using extension



DBS Therapy: Potential Complications and Risks

- Surgery related
 - Hemorrhage (inherent in any stereotactic procedure);
may be silent or symptomatic
 - Transient confusion
 - Infection (typically occurs at neurostimulator site in chest when it does occur)
- Stimulation related
 - Usually can be minimized or eliminated by adjusting stimulation settings
 - Reversible paresthesia, dysarthria, muscle contraction

Adjustability of DBS Therapy

- Non-invasive adjustment of parameters to maximize benefit and minimize adverse effects
- Selection of electrodes allows adjustment of the site of stimulation
- Adjustment of parameters allows control over amount of therapy
- Adjustments generally are few once optimal parameters are achieved

