# Parkinson's Disease (PD)

## The Latest Advances in Treatment and Research

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# BIO AND DISCLOSURES

- Board-certified neurologist with subspecialty fellowship training in Movement Disorders.
- Education:
  - Medical school – Royal College of Surgeons in Ireland
  - Residency – Northwestern University
  - Fellowship - UCLA
- Director of Movement Disorders Clinic at PNI/Providence Little Company of Mary since 2019.
- Active clinical trials researcher in Parkinson's disease for more than 10 years.
- **No current relationships to disclose**

# LEARNING OBJECTIVES

- Provide an overview of the the clinical spectrum of Parkinson's disease, its stages of progression and its impact on morbidity and mortality.
- Discuss young onset Parkinson's disease and any variations in disease severity and progression.
- Provide an update on diagnostic trends including biomarkers (e.g., alpha-synuclein) and the use of genetic testing (e.g., LRRK2 and other genes).
- Discuss the use of newer therapies (subQ infusion, exercise, deep brain stimulation, focused ultrasound, etc. and their impact on morbidity and mortality.

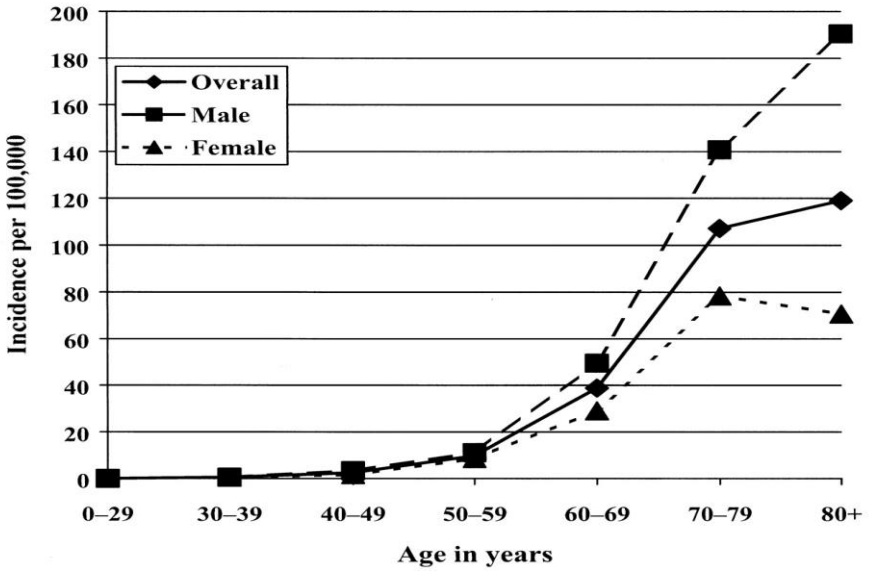
# OVERVIEW OF PARKINSON'S DISEASE (PD)

- A chronic and progressive degenerative disease of the central nervous system that spans decades with significant morbidity and healthcare burden.
- PD is the 2nd most common neurodegenerative disorder following Alzheimer's disease.
- Affects about 1.5 million Americans with 90,000 new cases diagnosed every year in the USA.
- Not a fatal condition but with an overall mortality ratio of 1.52 due to secondary complications.
- Number of people with PD is expected to more than double by year 2040*.

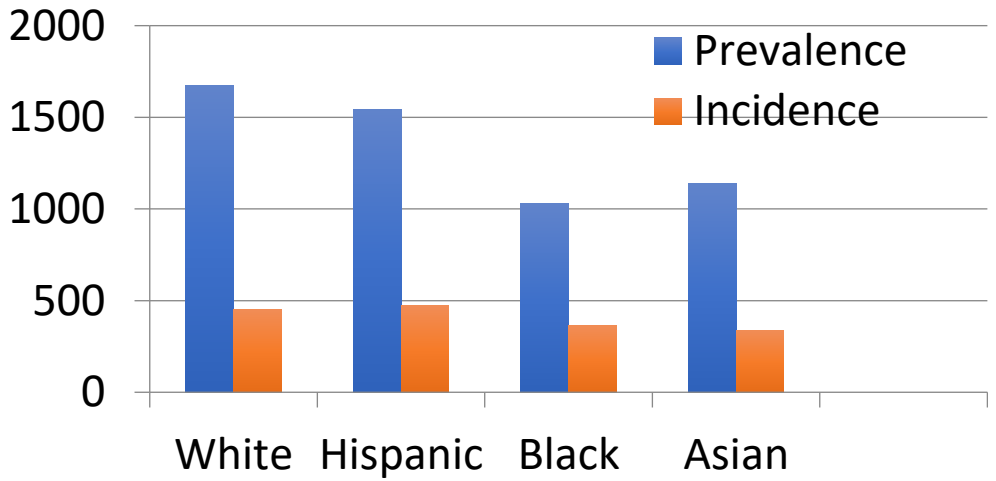
*Dorsey ER, Sherer T, Okun MS, Bloem BR. The Emerging Evidence of the Parkinson Pandemic. *J Parkinsons Dis*. 2018;8(s1):S3-S8.
*Su D, Cui Y et al. BMJ 2025;388:e080952 | doi: 10.1136/bmj-2024-080952

# WHO IS AT RISK FOR PARKINSON'S DISEASE

- Mean age of onset 60,  10% patients with onset before the age of 50.
- Incidence increases with age.
- More common in males (2:1)
- Caucasian and Hispanic populations highest at risk




Van den Eeden SK et al. Amer J of Epidemil 2003

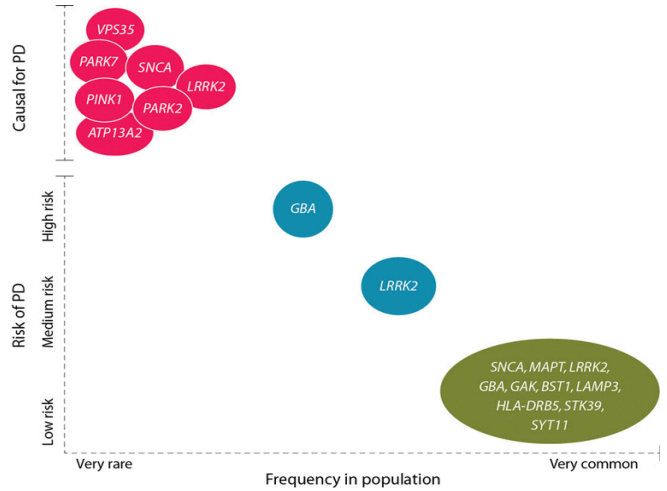



Age-adjusted Parkinson disease prevalence and annual incidence (per 100,000) by ethnic group. Taken from Neuroepidemiology, 2010;34:143-151

# WHAT HAVE WE LEARNED IN THE LAST 25 YEARS

## Genetics

### Monogenic genes vs risk variants



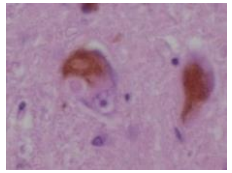

Marcel P. van der Brug *et al..Sci. Transl. Med. 2015;.***7**,305ps20-305ps20.

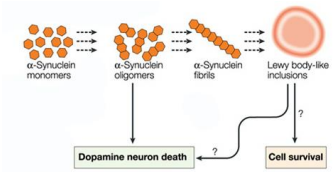
### Genotype–clinical correlations

- Early vs late age onset
- Rate of progression
- Response to medication and DBS
- Cognitive and psychiatric decline

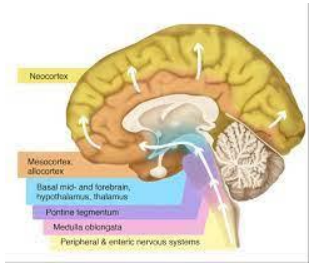
## Pathology

### -synuclein pathology

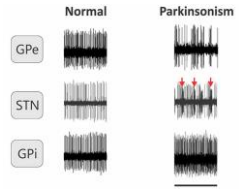





### Braak Staging

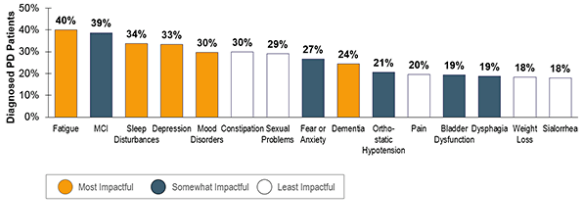



### Changes in motor circuits and B-oscillations




## Clinical

### Nonmotor spectrum of PD




PD gives rise to a spectrum of cognitive/neurobehavioral and other non-motor symptoms that highly impact quality of life of patients

*Health Advances, based on ~200 physicians*

The Michael J. Fox Foundation for Parkinson's Research

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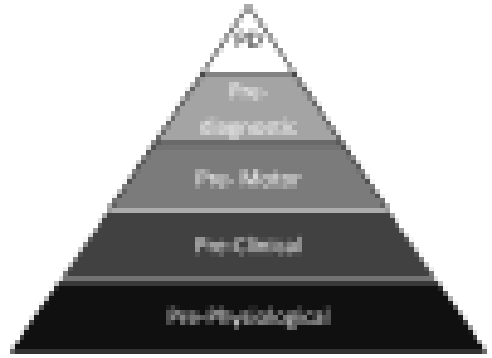
### Prodromal PD and the search for biomarkers



# OUR UNDERSTANDING OF PARKINSON'S DISEASE

## Genetics

Single gene mutations
(autosomal and recessive
vs.
Risk gene variants

## Brain aging

**Cellular stress**

Abnormal protein
accumulation and propagation

Loss of dopaminergic neurons
(and other neurotransmitters)

***Parkinson's Disease***

## Environmental exposure

# THE CLINICAL SPECTRUM OF PARKINSON'S DISEASE

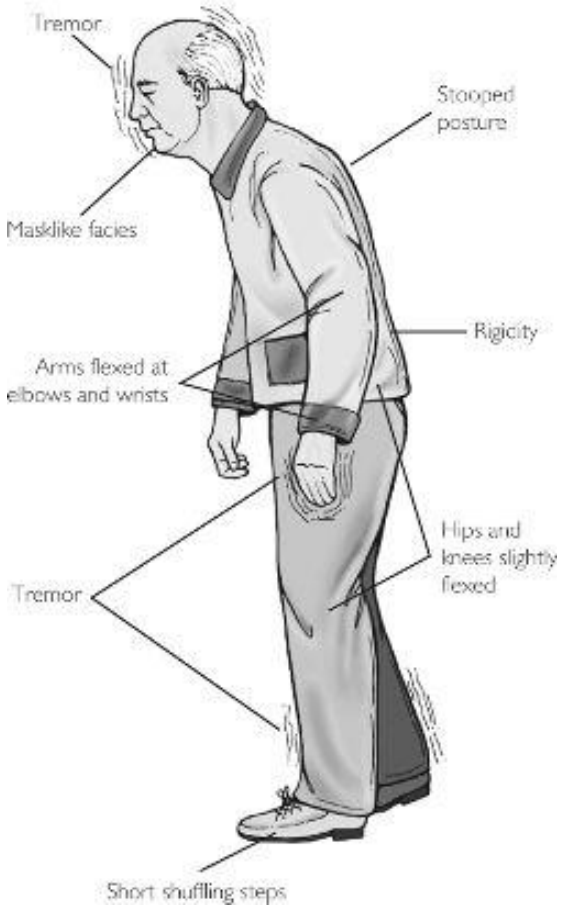
## Motor Symptoms

Bradykinesia

Rest Tremor

Muscular rigidity

Changes in gait and balance




## Non Motor Symptoms

Daytime fatigue and sleepiness

Reduced sense of smell

Constipation

Urinary, sexual dysfunction

Fluctuating blood pressure

Insomnia, REM sleep disorder

Mood disorders

Cognitive decline

Hallucinations and delusions

# STAGES OF PARKINSON'S DISEASE

## Early stage
**(Hoehn and Yahr 1, 2)**

- Mild symptoms - One/both sides
- Independent with ADLs
- Walking independently
- Good medication response
- Some slight problems with attention and concentration

## Mid- stage
**(Hoehn and Yahr 3)**

- Moderate symptoms - bilateral
- Some assistance with ADLs
- May need cane or walker
- Increased frequency of medications
- Onset of dyskinesias (dance-like movements
- Mild-moderate memory problems
- Susceptibility to psychosis

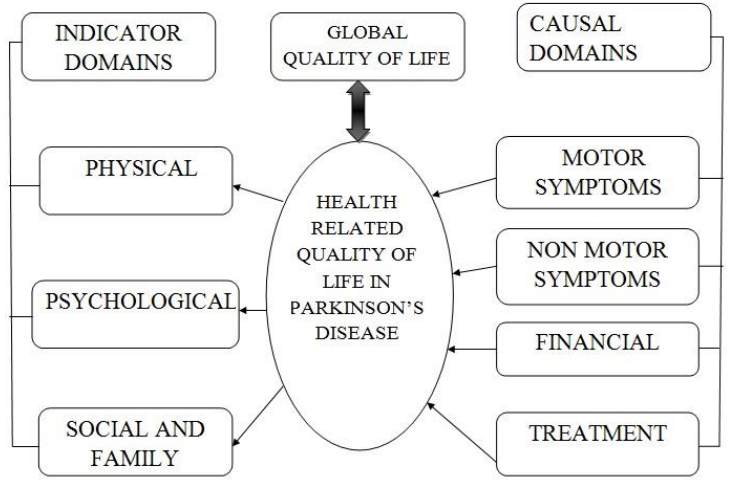
## Advance stage
**(Hoehn & Yahr 4,5)**

- Moderate -severe symptoms
- Needs assistance with most ADLs
- Walker or wheelchair dependent
- Frequent medication dosing.
- Prominent dyskinesias
- Swallowing difficulty
- Significant cognitive issues.
- +/- hallucinations, behavioral challenges

# QUALITY OF LIFE IN PARKINSON'S DISEASE

**Individuals with Parkinson's can face many challenges to their quality of life due to:**

- Progressive motor disability and risk of falls with diminished ability to maintain independence over the years.
- Impact on employment, driving capabilities, traveling.
- Impact of emotional well-being and associated social stigma
- Personal financial cost of chronic illness—medical copays, hospitalizations, loss of employment, long-term care.




Aggarwal R, et al. Journal of Clinical and Diagnostic Research. 2016;10(9)☺35-OC39

# MORTALITY IN PARKINSON'S DISEASE

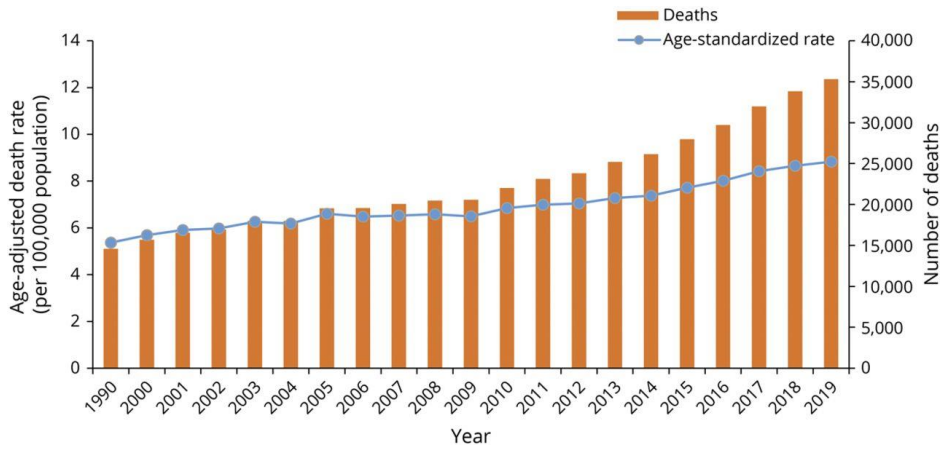
## Most common causes of death in PD:

- Pneumonia – most commonly related to dysphagia and aspiration
- Falls – head injuries or fractures
- Other infections

## Factors influencing risk of mortality:

- Advanced age
- Male sex
- Disease severity
- Presence of dementia and/or psychosis associated with PD

**Figure 1** Number of Deaths and Age-Adjusted Rate From Parkinson Disease: United States, 1999 to 2019




Rong S, Xu G et al. Neurology.2021:97 (20) e1986-e1993

- Access to specialty and multidisciplinary care, access to surgical therapies such as DBS and lifestyle factors such as regular exercise, have been associated with increased survival.

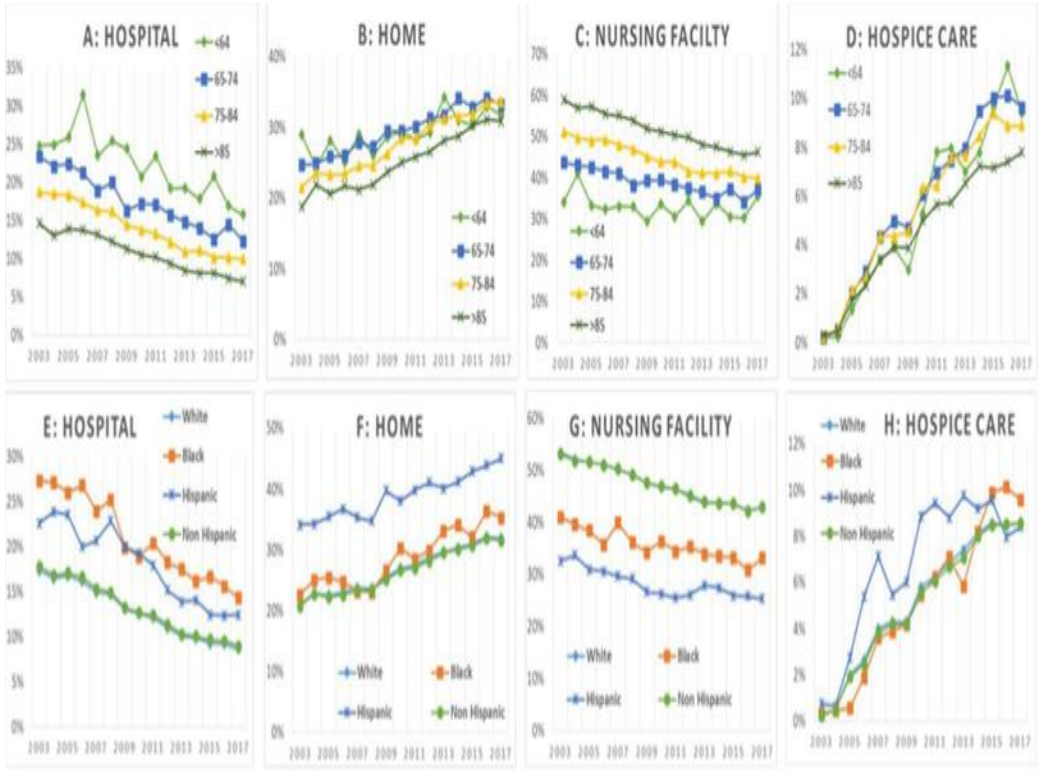
# PALLIATIVE CARE IN PARKINSON'S DISEASE

**Palliative care** – comprehensive approach to disease management with goal to improve QOL, not increase survival.

- Non motor symptom management
- Home supportive services
- Emotional and spiritual support
- Reduce caregiver stress
- Help with goals of care and advance care planning in later stages

## Place of death in Parkinson's disease**

- Home and hospice facility deaths in PD patients are gradually increasing.
- Increased odds of hospital deaths in non-Caucasian populations with less access to advanced care.




Kluger BM, Katz M, et al. JAMA Neurol. 2024 Jan 1;81(1):39-49.PMID: 37955923

**Kumar P, Yasmin F, *et al. BMJ Supportive & Palliative Care* 2024;**14:**e1060-e1066.

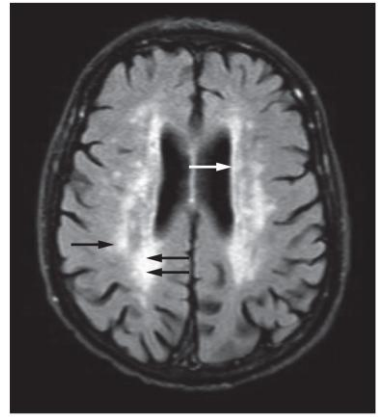
# YOUNG ONSET PARKINSON'S DISEASE (YOPD)


- Diagnosis before age 50
- 5-10% of people with PD.
- Diagnosis less recognized in this group and can be challenging – rule out secondary causes.
- Different clinical course vs. late onset PD (over age 50):
  - Prone to more muscular stiffness and dystonia (cramping and posturing), less early problems with gait and falls
  - Slower progression with longer period of preserved functional ability and less cognitive decline
  - Higher risk of mood disorders and neuropsychiatric side effects to therapy – depression/anxiety, compulsivity/impulsivity.
  - More sensitive to dopaminergic medications, higher risk of motor complications such as dyskinesias.
- Higher impact on professional and family life and quality of life.
- More commonly familial, genetic mutations may play a more prominent role as compared to late-onset PD.

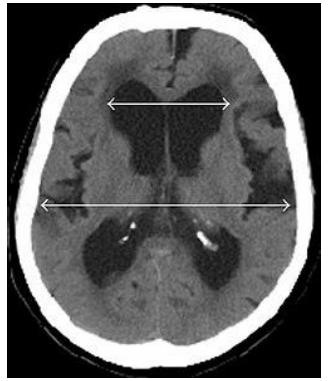
Mehanna R, Jankovic. Parkinsonism Relat Disord. 2019 Aug;65:39-48.

# DIAGNOSIS OF PARKINSON'S DISEASE

- Clinical diagnostic criteria - 89.5% accuracy for early stages and 92.5% for later stages, based on neuropathological confirmation.*
- Diagnostic accuracy usually improves with later age of onset.
- Ancillary testing considered:
  - Younger age of onset – prognosis/planning and risk of exposure to PD medications
  - Mimics of Parkinson's disease – essential tremor, vascular parkinsonism, normal pressure hydrocephalus
  - Secondary causes of Parkinson's disease – medication or drug induced



Nature Reviews | Neurology

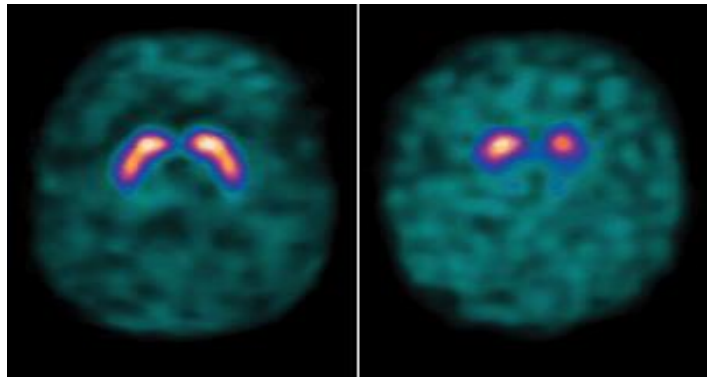


Wikipedia

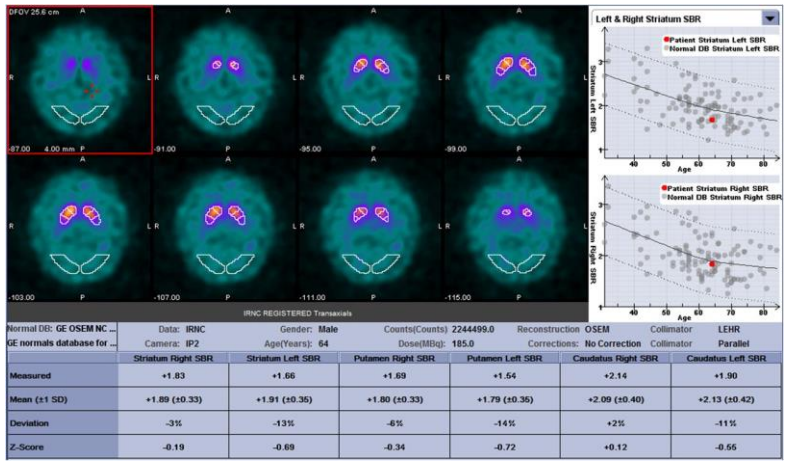
* Virameteekul, S., et. Mov Disord. 2023; 38: 558-566.

# DIAGNOSIS OF PARKINSON'S DISEASE

## NM BRAIN DAT SCAN



**Not PD** **PD**



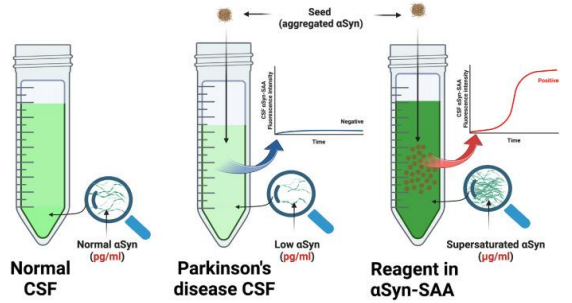

| | Striatum Right SBR | Striatum Left SBR | Putamen Right SBR | Putamen Left SBR | Caudatus Right SBR | Caudatus Left SBR |
|---|---|---|---|---|---|---|
| Measured | +1.83 | +1.66 | +1.69 | +1.54 | +2.14 | +1.90 |
| Mean (±1 SD) | +1.89 (±0.33) | +1.91 (±0.35) | +1.80 (±0.33) | +1.79 (±0.35) | +2.09 (±0.40) | +2.13 (±0.42) |
| Deviation | -3% | -13% | -6% | -14% | +2% | -11% |
| Z-Score | -0.19 | -0.69 | -0.34 | -0.72 | +0.12 | -0.56 |

- Nuclear medicine brain (SPECT) scan with Ioflupane I 123 injection - quantifies dopamine producing neurons
- Sensitivity 80-100%, specificity 97-98%
- The following medications may interfere with DaT imaging (false positive):
  - Amoxapine, amphetamine, benztropine, bupropion, buspirone, methamphetamine, methylphenidate, norephedrine, phentermine, phenylpropanolamine, selegiline, sertraline, citalopram and paroxetine
- Limitations:
  - Not quantitative – does not correlate with severity
  - Not used to monitor progression
  - Cannot distinguish between other parkinsonian syndrome

# DIAGNOSIS OF PARKINSON'S DISEASE
# Alpha-synuclein as a biomarker

## SAAmplify-αSYN - (Mayo Clinic Labs and Amprion)

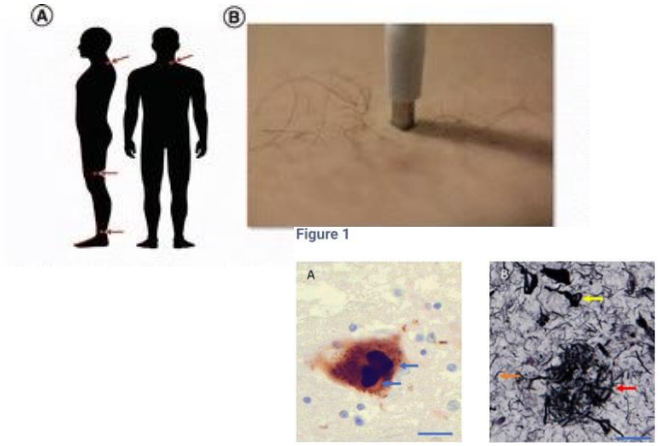
- Seed amplification assay to detect the seeding activity of misfolded alpha-synuclein in spinal fluid.
- 87% sensitivity and 97% specificity
- Requires lumbar puncture, risk of spinal headache




Espay AJ et al. Parkinsonism & Related Disorders,. 2025;Vol 131:107256,

## Syn-One (skin biopsy) test - (CND Lifesciences)

- Uses immunofluorescence to detect presence and distribution of phosphorylated alpha-synuclein within dermal nerves
- 95% sensitivity and 99% specificity in detecting synucleinopathies.
- In office procedure - three tiny skin biopsies on the upper back, lower thigh and lower leg under local anesthetic.



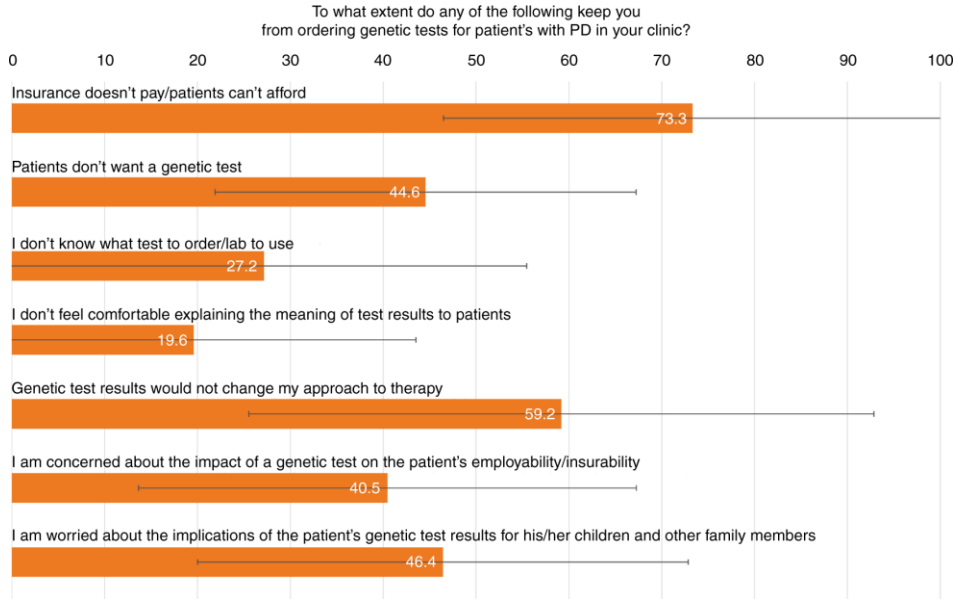

Courtesy of CND Lifesciences

**Only diagnostic of alpha-synucleinopathy – does not predict disease onset or track progression and does not distinguish various types of synucleinopathy

# GENETIC TESTING AND PARKINSON'S DISEASE

- Not common practice and relatively little guidance on genetic testing for physicians or patients.
- Generally considered in the following populations:
  - Young onset (<50) patient
  - Patients with strong family history
  - High-risk ethnicity groups such as Ashkenazi Jewish or North African ancestry (high risk of GBA and LRRK2 gene variants)
- Challenges in genetic testing:
  - Available tests vary–single gene, gene panels, exome sequencing.
  - Not diagnostic – test does not mean patient will develop disease
  - Limited access to genetic counseling
  - Significance of a negative test
- Free testing available through research groups – PD Generation, PPMI
- Targeted therapeutics are being studied for LRRKS and GBA variants.

**Genetic testing for Parkinson disease: current practice, knowledge, and attitudes among US and Canadian movement disorders specialists**




Alcalay, R.N., Kehoe, C., *et al. Genet Med. 2020:* 22, 574–580).

# FDA APPROVED MEDICATIONS FOR PARKINSON'S DISEASE

## Levodopa

1. Sinemet (carbidopa/Levodopa) IR and CR
2. Parcopa (Carbidopa/levodopa disintegrating tab)
3. Dhivy (quartered tab)
4. Inbrija (levodopa inhaler)
5. Rytary (Carbidopa/levodopa ER caps)
6. Crexont (Carbidopa/levodopa ER caps)
7. Duopa (levodopa intestinal infusion)
8. Vyalev – levodopa SC infusion)

## Dopamine Agonists:

9. Pramipexole (mirapex) IR and ER
10. Ropinirole (requip) – IR and ER
11. Rotigotine (Neupro) pach
12. Apomorphine injectable (Apokyn)
13. Onapgo - apomorphine SC infusion

## Anticholinergic:

14. Trihexylphenidyl (Artane)
15. Benztropine (Cogentin)

## MAO-B Inhibitors

16. Selegiline (Eldepryl)
17. Rasagiline (Azilect)
18. Safinamide (Xadago)

## COMT Inhibitors

19. Entacapone (Comtan)
20. Tolcapone (Tasmar)
21. Opicapone (Ongentys)

## Other

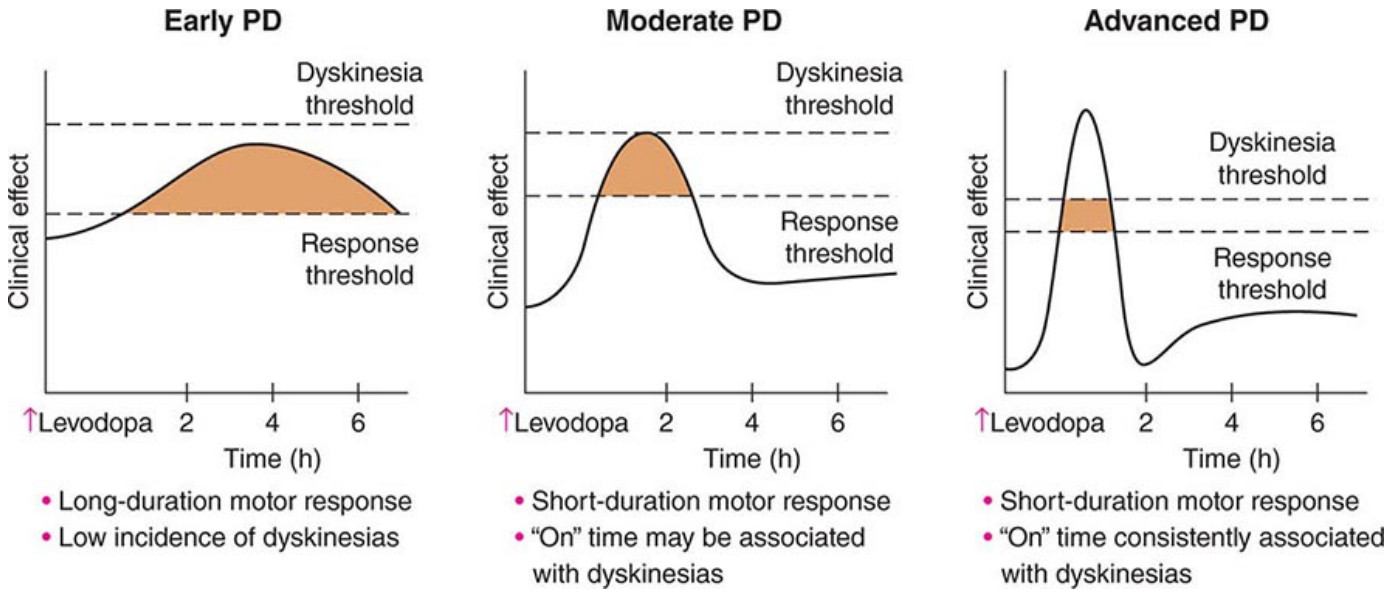
22. Amantadine IR
23. Amantadine XR (Gocovri)
24. Istradefylline (Nourianz)

# MEDICAL THERAPY FOR PARKINSON'S DISEASE

- Medical therapy treats symptoms only, not curative or disease modifying.
- Goal of treatment is to improve function, prolong independence and improve QOL and decrease caregiving burden.
- Treatment in early stages tailored to the individual – age of onset, main symptoms, comorbid conditions and non motor symptoms, judgement of long-term risks
- Treatment in advanced disease:
  - Management of medication-related motor complications
  - Emergence of less-responsive symptoms: dysphagia, worsening gait and balance, dementia and psychiatric symptoms

# ADVANCED PARKINSON'S DISEASE - MOTOR COMPLICATIONS

**Change in dopaminergic treatment response over time**




## Motor Complications:

- Fluctuation in medication effect:
  - predictable – end of dose
  - unpredictable
- Dyskinesias

## Risk Factors

- Younger age at disease onset
- Higher levodopa dosage
- Severity disease on initiation of levodopa

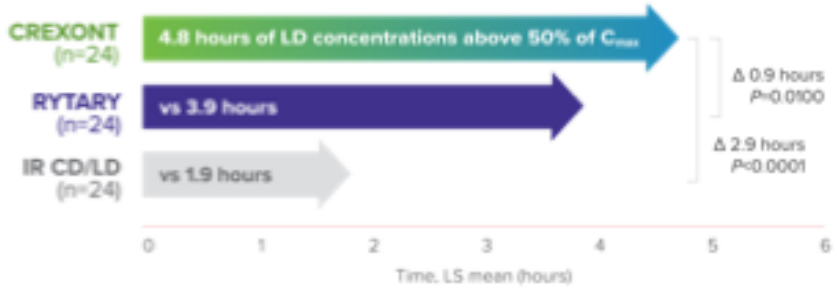
Schapira AH et al. Eur J Neurol. 2009;16:982-989

# NEW UPDATES IN PARKINSON'S TREATMENT

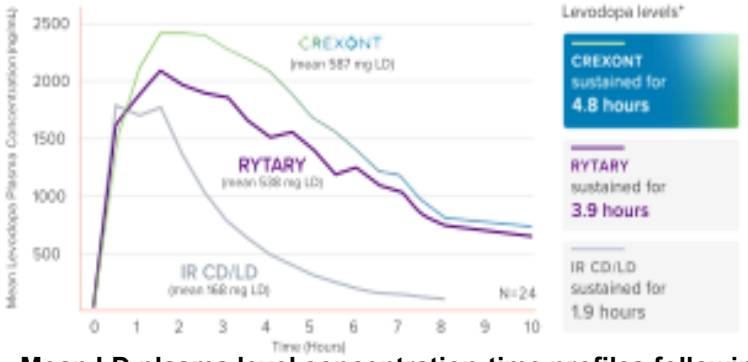
## EXTENDED RELEASE FORMULATIONS OF ORAL LEVODOPA

### ❑ Crexont (ER carbidopa/levodopa) – 2024

- ¼ immediate-release granules and ¾ extended-release pellets
- Novel mucoadhesive polymer to maximize intestinal absorption
- Minimize dosing (i.e 5 times daily vs. 3 times daily)
- **Rise-PD study**
  - Nearly 2 hours additional on-time per dose of Crexont vs IR levodopa
  - 0.5 hours more "on" time with Crexont 3 times daily vs. IR levodopa 5 times daily.




Hauser RA et al. *JAMA Neurol.* 2023;80(10):1062-1069.
Modi NB et al. *Clin Neuropharmacol.* 2019;42(1):4-8.

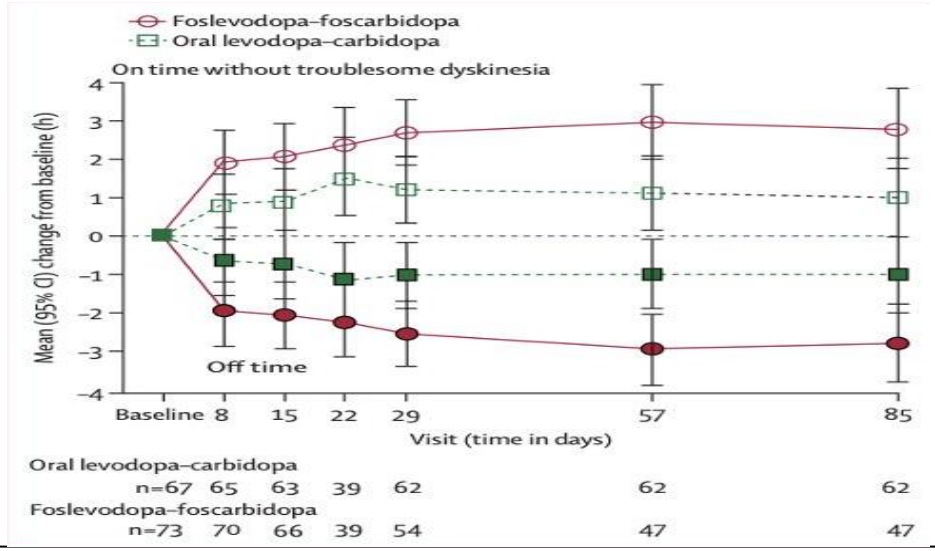



**Mean LD plasma level concentration-time profiles following a single dose of CREXONT, RYTARY, and IR CD/LD**

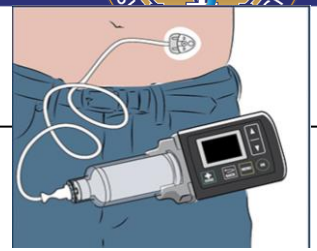
# NEW INFUSION THERAPIES IN PARKINSON'S DISEASE

## Vyalev

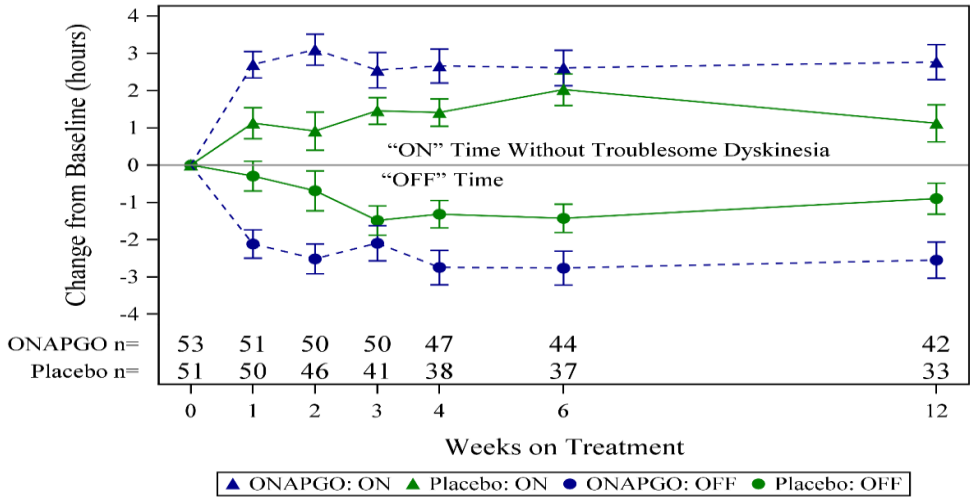
- Approved October 2024
- 25bhr SC infusion foslevodopa-foscarbidopa
- 1.75 hrs Increase in daily on-time and 1.79 hrs decrease in daily off-time (vs oral levodopa)
- 23% improvement in sleep disruptions
- 62% with mild-mod infusion site reactions




## Onapgo

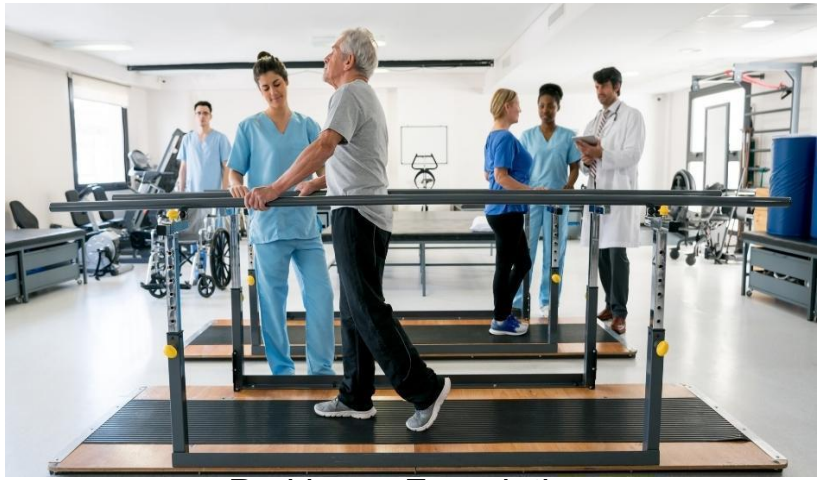


- Approved February 2024
- 16 hour SC apomorphine infusion
- 1.7 hrs increase in daily on-time and 1.7 hrs decrease in daily off-time (vs placebo)
- 44% mild-mod infusion site reactions



# ALLIED THERAPIES

- **Allied therapies such as physical, occupational and speech / language therapy in combination medical therapy has been shown to:**
  - Improve endurance and mobility, improve balance and walking
  - Identify strategies to help patients complete daily tasks
  - Make home environments more safe and prevent caregiver injury
  - Improve communication and swallow function
  - May slow need for further medications in early disease*



Parkinson Foundation

- **Specialized therapy (vs. general therapy) is associated with**
  - More efficient – less treatment sessions needed
  - Fewer PD-related complications (orthopedic injury and pneumonia) and with lower costs of care**
  - Associated with a lower mortality rate***

*Frazzitta G, Maestri R, et al. *Neurorehabilitation and Neural Repair*. 2014;29(2):123-131. **Ypinga, Jan H L et al. Lancet Neurology. 2018:;17(2) :153 – 161
***Ypinga, J.H.L.,. *et al. . npj Parkinsons Dis.2025;11:214*

# LIFESTYLE FACTORS IN THE TREATMENT OF PARKINSON'S DISEASE

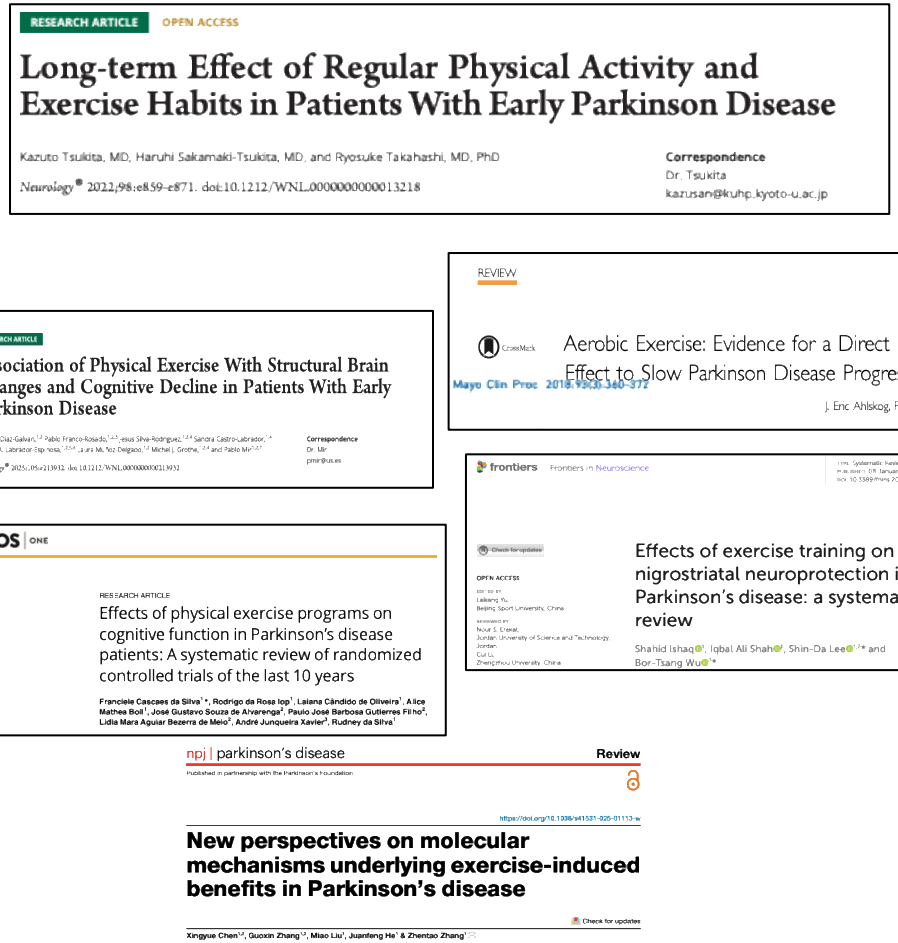
## Exercise

- Growing body of evidence to suggest that exercise clinically improves symptoms of PD, has neuroprotective effects, and should be recommended to patients with PD.

- Proven benefits:
  - Helps maintain strength, flexibility, endurance, balance
  - Helps alleviate depression, constipation and improves sleep
  - Accumulating evidence that those that exercise are able to maintain good QOL for longer, promotes brain health
  - Regular exercise during life reduces risk of developing PD

- Mechanisms:
  - induces expression of brain neurotrophic factors, - BDNF, GDNF
  - Reduce systemic inflammation
  - Improve mitochondrial function and reduce oxidative stress
  - increased cortical gray matter or hippocampal volumes

Exercise is now considered a treatment by many movement disorder specialists.

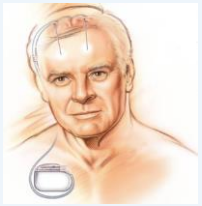


# SURGICAL THERAPIES FOR PARKINSON'S DISEASE

## When to consider surgical options for PD:

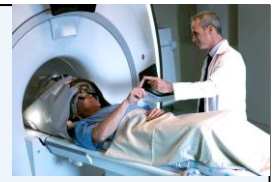
- Confirmed diagnosis of Parkinson's disease in mid to later stages ( ≥ 4-5 years after diagnosis)
- Significant levodopa response with disabling medication wearing off periods or bothersome dyskinesias.
- Medically refractory tremor

## Deep brain stimulation (DBS)



- Surgically implanted system.
- Delivers electrical stimulation to disrupt abnormal brain oscillations in specific brain targets.
- Nearly 20 years of clinical efficacy and safety data.
- Adjustable over lifetime and reversible if needed
- Continued neurological follow up and programming

## Focused Ultrasound (MRIgFUS)

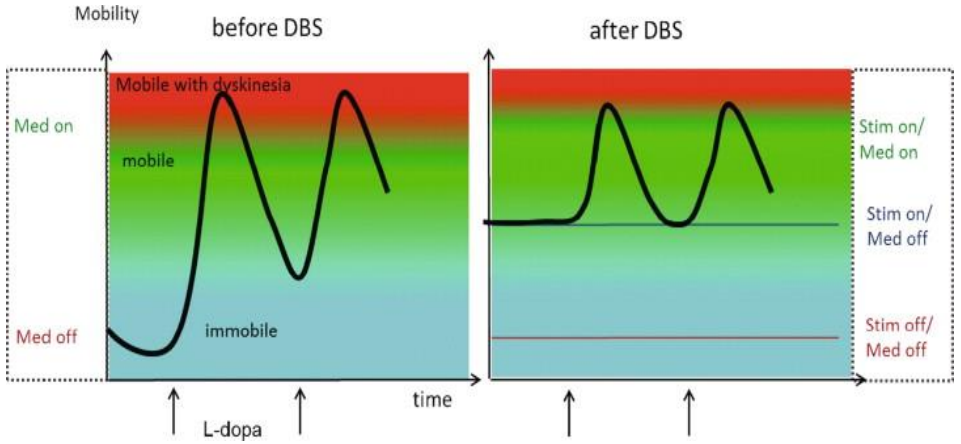


- Stereotactic thermal brain lesioning using high frequency ultrasound waves under MRI guidance.
- Incisionless, same-day procedure
- Staged procedure – unilateral to bilateral after 6-9 months
- Relatively new therapy for PD
- "One and done" – irreversible, no follow up needed.

# DBS FOR PARKINSON'S DSEASE

## Efficacy vs Best Medical Therapy

- Decrease in motor severity (UPDRS III) in off-meds state by 30-50%
- Increase in daily "on" time without dyskinesias by 2-5 hrs.
- Improvement in dyskinesia severity, ADLs and QOL.
- Continued efficacy with STN beyond 15 years**
- EARLYSTIM study - earlier intervention (> 4 yrs disease duration, <3 years motor complications) with significant long-term benefits in motor function and QOL.



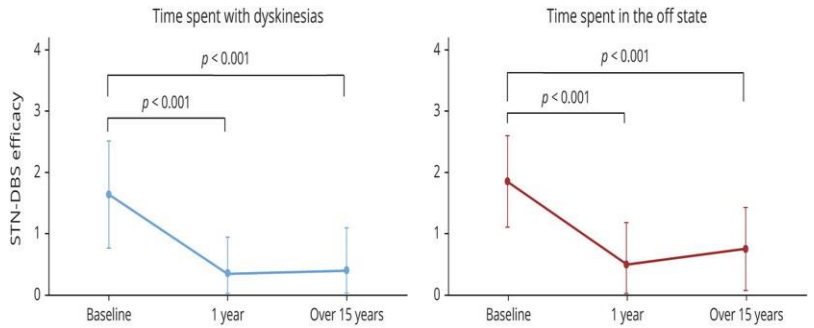



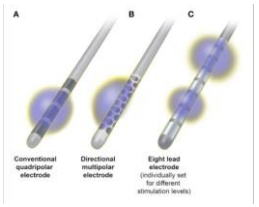

Figure 2 Long-term Deep Brain Stimulation of the Subthalamic Nucleus (STN-DBS) Efficacy on Motor Complications.
**Francesco Bove et al. Neurology 2021;97:e254-e262**

* Mahlknecht P et al. Movmt DO.2022;37(8):1581-92. **Schuepbade WMMM et al. NEJM.2013;368:610-22

# ADVANCES IN DBS THERAPY FOR MOVEMENT DISORDERS

## Advances in DBS systems

- Rechargeable battery – >15 years
- Newest models are all now MRI compatible
- Directional leads and independent current control allows current steering to maximize efficacy and lower side effects
- Virtual, remote programming available



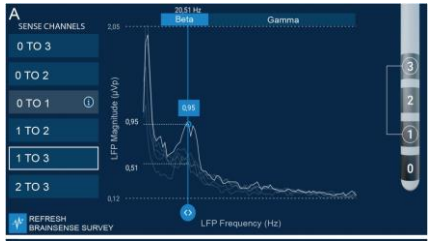


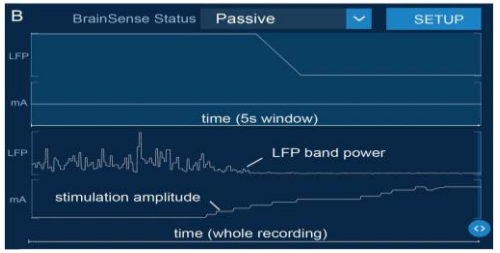
Courtesy of Abbott
approved for media use

**STIMVIEW XT – Boston Scientific**

## Advances in DBS Programming

- Image guided – recreation of patient's individual brain anatomy and lead placement
- LFP- guided – monitoring a patient's own brain signals to hone in stimulation and correlate to symptoms

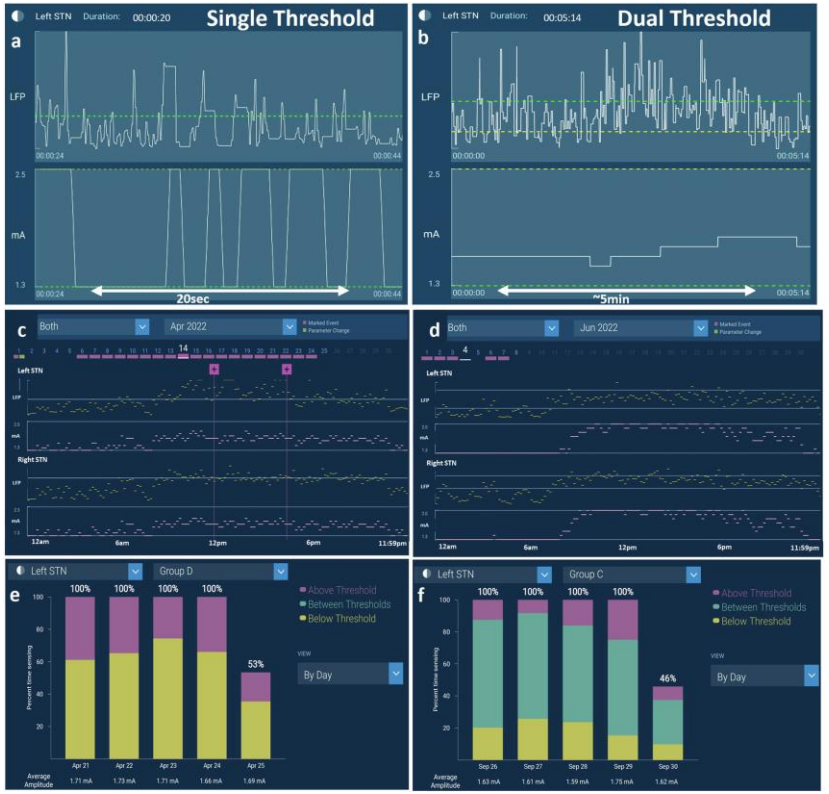



Courtesy of Medtronic

# NEW ADAPTIVE DBS FOR PARKINSON'S DSEASE

- Approved Feb 2025 (aDBS)
- Personalized therapy automatically adjusts stimulation based on a patient's own local brain activity in real-time.
- Delivers stimulation "on demand" rather than being continuous.
- Thresholds for stimulation set by clinician (single or dual thresholds)
- Adapt-PD Trial (aDBS vs cDBS)
  - Safe and well tolerated, no serious adverse events
  - Significant mproved on time (+1.3 hrs) and decreased off time (-1.6 hrs) vs cDBS
  - Reduced battery power
  - 98% participants opted to continue with aDBS



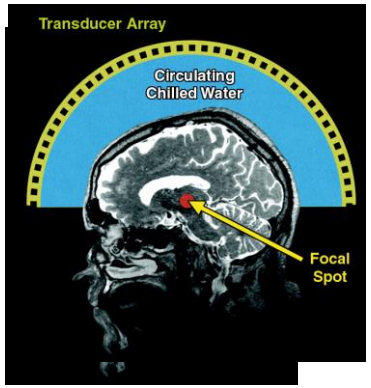

Stanslaski, S *et al. npj Parkinsons Dis.* **10**, 174 (2024).. Bronte-Stewart HM, Beudel M, et al. JAMA Neurol. 2025. doi:10.1001/jamaneurol.2025.2781

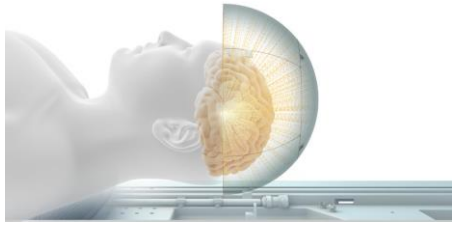
# MRIgFUS FOR PARKINSON'S DISEASE

**Advantages and disadvantages over DBS:**

- Less invasive – incisionless, minimal risk of infection, no anesthesia
- Same- day procedure, no hospital stay
- Immediate effect – minimal follow up required
- Option for non-DBS or non-surgical candidates – cognitive or psych impairment, comorbid medical exclusions.

- Newer technology – less clinical and safety data
- Thus far, not as effective as DBS
- Staged procedure for bilateral treatment
- Head shave is mandatory
- MRI exclusions

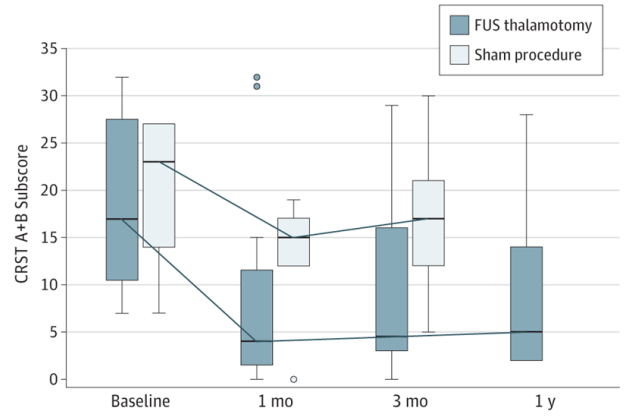


# MRIgFUS FOR PARKINSON'S DISEASE

## Unilateral thalamotomy (tremor dominant PD - 2018)

- 62% improvement in combined tremor (vs 22% in sham group)
- Sustained improvement out to 1 year.



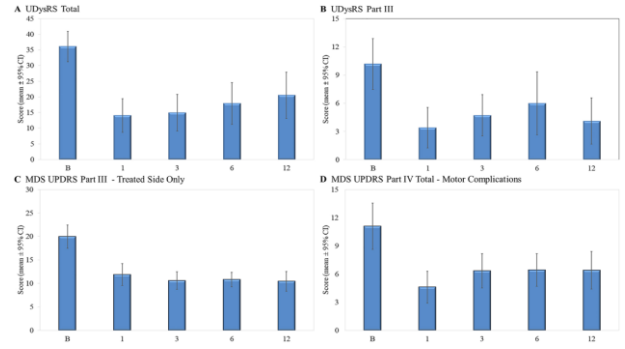

Bond A,E et al. JAMA Neurol. 74 (12) (2017) 1412–1418

## Unilateral pallidotomy (advanced PD with motor complications - 2021)

- 69% responders (threshold significant improvement in motor symptoms Effects sustained to 12 months

## New ** Staged (6 months) bilateral pallidothalamic tract (advanced PD with motor complications – 2025)

- Improvement in off-medication symptoms - 84% tremor reduction, 70% improvement rigidity, and 73% for bradykinesia,
- 100% suppression of on-medication dyskinesias
- 55% reduction in mean levodopa dose
- Sustained at 12 months




Miller et al. J Neurosurg. 2023;134(4):1083-90

* Krishna V, etal. N Engl J Med 2023;388:683-693

# ON THE HORIZON FOR PARKINSON'S DISEASE TREATMENT

## Symptomatic therapies:

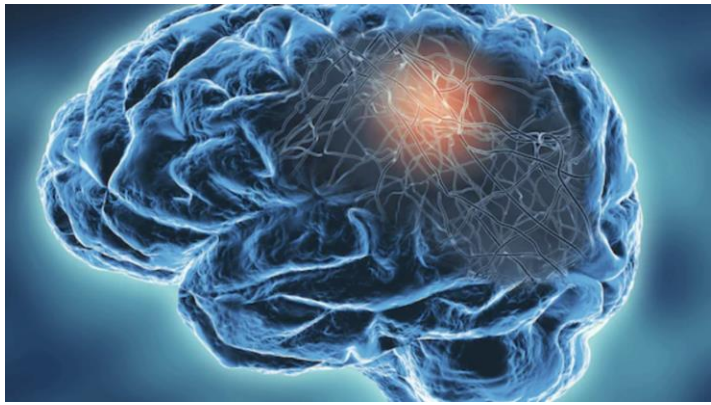
- ND0612 (FDA) – subcutaneous levodopa infusion
- Tavapadon (FDA)- first selective D1/D5 receptor partial agonist. Once daily oral monotherapy or adjunctive therapy.
- P2B001 (PhaseIII) – low dose extended release pramipexole (dopamine agonists) and rasagiline (MAO-B inhibitor)
- Solengepras (Phase III) - non-dopaminergic adjunctive therapy to improve OFF time

# ON THE HORIZON FOR PARKINSON'S DISEASE TREATMENT

## Disease modifying therapies

### Alpha-synuclein and protein aggregation target therapies

- Prazinezumab - monoclonal antibody targeting alpha-synuclein
- Buntanetap - oral small molecule inhibiting neurotoxin protein formation



### Targets of cellular stressors

- GLP-1R agonists - lixisenatide
- Products for neuroinflammaton, oxidate stress, and mitochondrial autophagy

### Gene- based targeted therapies

- LRRK2 kinase inhibitors - to improve lysosomal dysfunction,
- Ambroxol and other therapies targeting GBA1 mutations to restore enzyme function

### Cell and gene therapies

- Phase III trial bemdameprocel - dopaminergic neuron precursors are derived from pluripotent stem cells
- Phase II gene therapy AB-1005 – amplified gene for GDNF delivered by AAV vector
- NNI-362 - stimulates kinases to induce the creation of new neurons from neural progenitor cells in the brain

# SUMMARY

- Parkinson's disease is a chronic neurodegenerative disease with progressive disability and morbidity from progressive motor and non-motor symptoms leading to reduced quality of life.

- PD is not considered a fatal condition but mortality is increased due to secondary complications and palliative care may help with advance care planning.

- Age of onset (young vs late) and genetics play a role in symptom presentation, progression in motor and non motor symptoms and response to medical and surgical therapies.

- Medical and surgical treatments for PD are tailored to the individual and research is developing more fine tuned treatments with exciting disease modifying therapies to slow progression in the works.

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