

# What's new in the diagnosis and treatment?: Movement disorders



박 정 호

순천향대부천병원

---

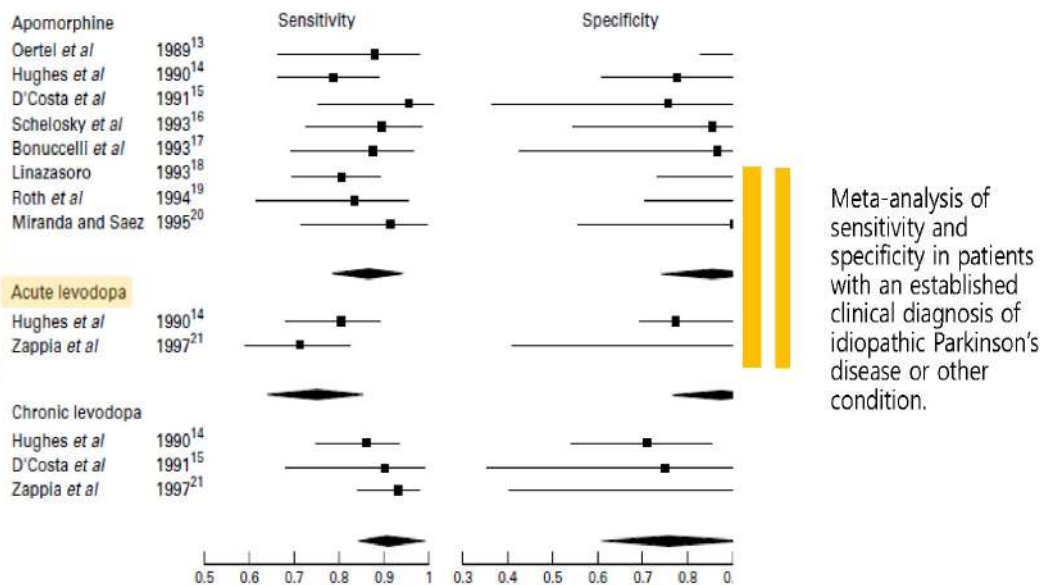
## ***Contents***

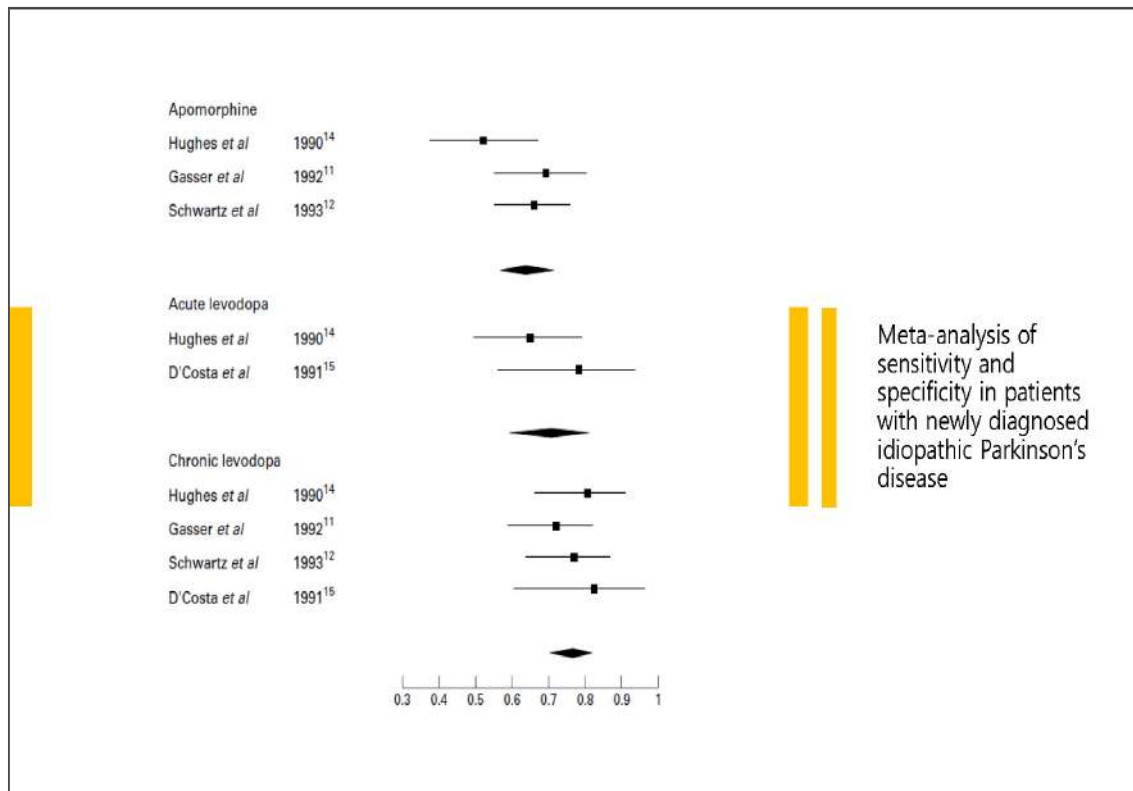
1. Levodopa challenge test
2. Tilt training treatment in neurogenic orthostatic hypotension

## Acute Levodopa Challenge Test

- Levodopa is the gold-standard treatment for Parkinson's disease
- The extent of responsiveness of motor symptoms to levodopa is crucial in diagnosis and management of PD (*a key supportive criterion*, UKPDSBB criteria)
- In both clinical and research settings, the extent of motor benefit provided by a single-dose of levodopa is often sought using the levodopa challenge test

### *Systematic review of acute levodopa and apomorphine challenge tests in the diagnosis of idiopathic Parkinson's disease.*





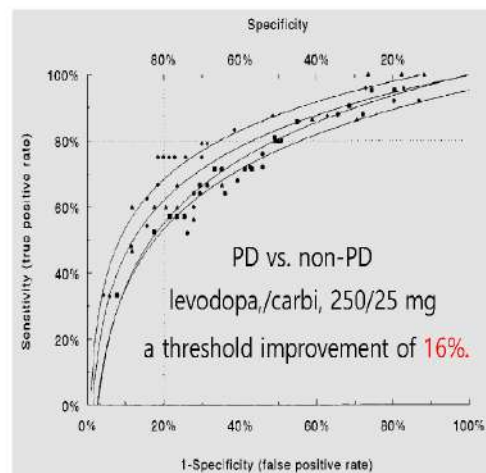
***Motor response to acute drug challenge may provide useful clues for the correct diagnosis of parkinsonian syndromes.***

Average percent UPDRS motor score improvement in PD, non-PD, MSA and PSP patients

| Drug               | PD, % | Non-PD, % | MSA, % | PSP, % | NC, % |
|--------------------|-------|-----------|--------|--------|-------|
| Apomorphine 1.5 mg | 27.1  | 10.5      | 11.9   | 12.4   | 9.6   |
| Apomorphine 3.0 mg | 27.7  | 9.7       | 14.3   | 5.8    | 7.6   |
| Apomorphine 4.5 mg | 28.8  | 11.8      | 13.3   | 6.9    | 11.4  |
| Levodopa/carbidopa | 29.8  | 12.2      | 12.8   | 13.4   | 13.1  |

Comparison of PD cases to any other group was statistically significant ( $p < 0.01$ , in each case, with Student's  $t$  test).  
NC = Unclassified parkinsonian syndrome.

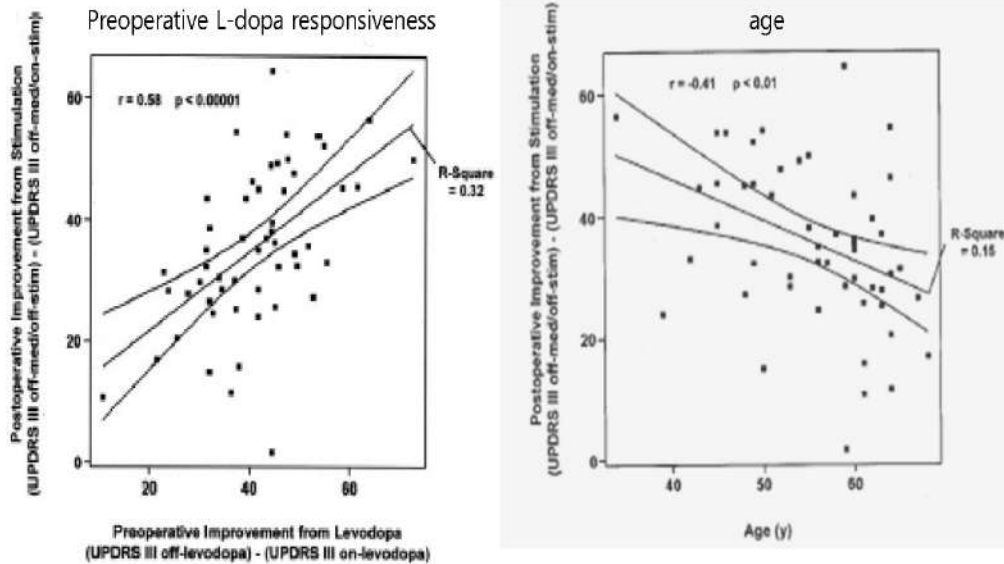
Levodopa challenge had the most convenient trade-off for the diagnosis of PD (71.1% sensitivity, 71.7% specificity)



Eur Neurol 2000;43:95-101

### Key predictors of outcome for bilateral DBS?

120% of the regular morning levodopa dose plus additional levodopa equivalent to the dopamine agonist dose



NEUROLOGY 59 September (2 of 2) 2002

### Acute levodopa challenge test may predict the amount of postoperative improvement

Predicted postoperative improvement relative to preoperative UPDRS-III off score  
 $= 38 - \text{age} \times 0.36 + \text{duration} \times 0.33 + \text{rigidity response to L-dopa} \times 1.3$   
 $+ \text{pull test response to L-dopa} \times 3.9 + \text{freezing response to L-dopa} \times 2.4$

Simplified by retaining only the three most powerful factors...

Predicted postoperative improvement relative to preoperative UPDRS-III off score  
 $= 34 - \text{age} \times 0.29 + \text{rigidity response to L-dopa} \times 1.3 + \text{pull test response to L-dopa} \times 3.8$

## CAPST-PD protocol

(the core assessment program for surgical interventional therapies in Parkinson's disease)

The levodopa challenge test was incorporated into the CAPST-PD protocol in 1999 and used to screen PD patients for DBS (%LR )

UPDRS, in the morning after overnight (approximately 12 h) withdrawal of levodopa

20–60min after 1.5 times of usual morning levodopa dose

The best possible ON time by the patient and the examiner.

Motor improvement of at least 30% is an objective response criterion (no fixed limitation!)

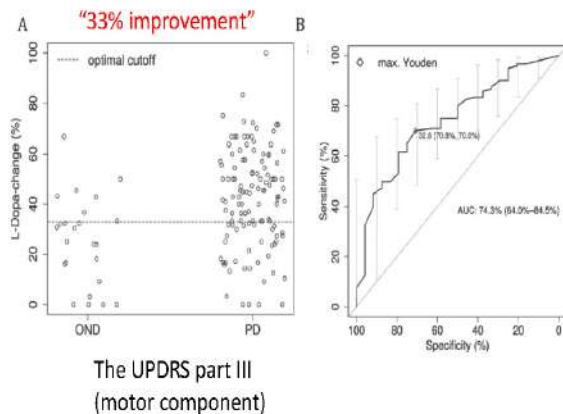
Conventionally, DBS is only offered to the patients who fulfill this response criterion because only those symptoms which are improved by levodopa are expected to be improved by DBS.

### *Different dopamine agonists have different criteria to be paused before testing*

| Withdrawal scheme           | Medication  |
|-----------------------------|---|
| Overnight withdrawal (12 h) | Levodopa/Benserazide<br>Levodopa/Carbidopa<br>Levodopa/Carbidopa/Entacapone<br>Entacapone<br>Amantadine<br>Safinamide<br>Selegiline, Rasagiline |
| Withdrawal >24 h            | Opicapone   |
| Withdrawal >48 h            | Pramipexole, Ropinirole, Rotigotine   |
| Withdrawal >72 h            | Cabergoline   |

## Acute Levodopa Challenge Test in DE novo PD

Standardized acute LDCT in 144 patients with de novo PD in a prospective, single-center study (the DeNoPa study)



Drug-naïve patients with PD

Pretreatment, domperidone (20 mg)  
;12 hr before and 1 hr before L-dopa

The morning between 8 and 9 AM.

**250 mg L dopa**, under fasting conditions

One hour after administration, the UPDRS part III (motor component) was performed once again by the same investigator.

2017 International Parkinson and Movement Disorder Society

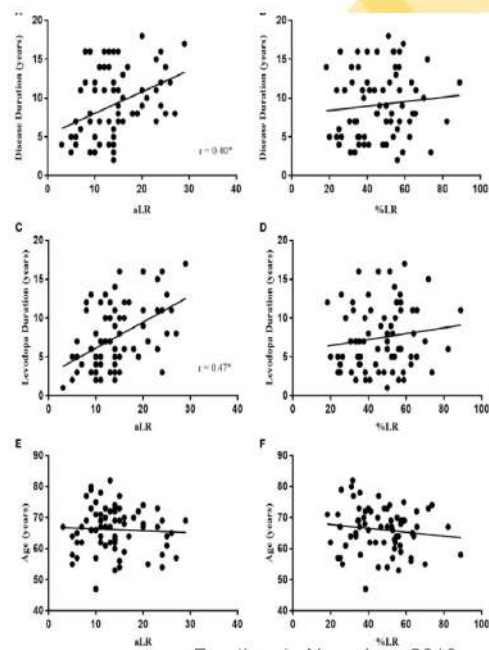
| 투약 전                  |      | 투약 후 |      |
|-----------------------|------|------|------|
| 투약 전                  | 투약 후 | 투약 전 | 투약 후 |
| MDS UPDRS Score Sheet |      |      |      |
| Part I                |      |      |      |
| 1.1                   | 1.1  | 1.1  | 1.1  |
| 1.2                   | 1.2  | 1.2  | 1.2  |
| 1.3                   | 1.3  | 1.3  | 1.3  |
| 1.4                   | 1.4  | 1.4  | 1.4  |
| 1.5                   | 1.5  | 1.5  | 1.5  |
| 1.6                   | 1.6  | 1.6  | 1.6  |
| 1.7                   | 1.7  | 1.7  | 1.7  |
| 1.8                   | 1.8  | 1.8  | 1.8  |
| 1.9                   | 1.9  | 1.9  | 1.9  |
| 1.10                  | 1.10 | 1.10 | 1.10 |
| 1.11                  | 1.11 | 1.11 | 1.11 |
| 1.12                  | 1.12 | 1.12 | 1.12 |
| 1.13                  | 1.13 | 1.13 | 1.13 |
| 1.14                  | 1.14 | 1.14 | 1.14 |
| 1.15                  | 1.15 | 1.15 | 1.15 |
| 1.16                  | 1.16 | 1.16 | 1.16 |
| 1.17                  | 1.17 | 1.17 | 1.17 |
| 1.18                  | 1.18 | 1.18 | 1.18 |
| 1.19                  | 1.19 | 1.19 | 1.19 |
| 1.20                  | 1.20 | 1.20 | 1.20 |
| 1.21                  | 1.21 | 1.21 | 1.21 |
| 1.22                  | 1.22 | 1.22 | 1.22 |
| 1.23                  | 1.23 | 1.23 | 1.23 |
| 1.24                  | 1.24 | 1.24 | 1.24 |
| 1.25                  | 1.25 | 1.25 | 1.25 |
| 1.26                  | 1.26 | 1.26 | 1.26 |
| 1.27                  | 1.27 | 1.27 | 1.27 |
| 1.28                  | 1.28 | 1.28 | 1.28 |
| 1.29                  | 1.29 | 1.29 | 1.29 |
| 1.30                  | 1.30 | 1.30 | 1.30 |
| 1.31                  | 1.31 | 1.31 | 1.31 |
| 1.32                  | 1.32 | 1.32 | 1.32 |
| 1.33                  | 1.33 | 1.33 | 1.33 |
| 1.34                  | 1.34 | 1.34 | 1.34 |
| 1.35                  | 1.35 | 1.35 | 1.35 |
| 1.36                  | 1.36 | 1.36 | 1.36 |
| 1.37                  | 1.37 | 1.37 | 1.37 |
| 1.38                  | 1.38 | 1.38 | 1.38 |
| 1.39                  | 1.39 | 1.39 | 1.39 |
| 1.40                  | 1.40 | 1.40 | 1.40 |
| 1.41                  | 1.41 | 1.41 | 1.41 |
| 1.42                  | 1.42 | 1.42 | 1.42 |
| 1.43                  | 1.43 | 1.43 | 1.43 |
| 1.44                  | 1.44 | 1.44 | 1.44 |
| 1.45                  | 1.45 | 1.45 | 1.45 |
| 1.46                  | 1.46 | 1.46 | 1.46 |
| 1.47                  | 1.47 | 1.47 | 1.47 |
| 1.48                  | 1.48 | 1.48 | 1.48 |
| 1.49                  | 1.49 | 1.49 | 1.49 |
| 1.50                  | 1.50 | 1.50 | 1.50 |
| 1.51                  | 1.51 | 1.51 | 1.51 |
| 1.52                  | 1.52 | 1.52 | 1.52 |
| 1.53                  | 1.53 | 1.53 | 1.53 |
| 1.54                  | 1.54 | 1.54 | 1.54 |
| 1.55                  | 1.55 | 1.55 | 1.55 |
| 1.56                  | 1.56 | 1.56 | 1.56 |
| 1.57                  | 1.57 | 1.57 | 1.57 |
| 1.58                  | 1.58 | 1.58 | 1.58 |
| 1.59                  | 1.59 | 1.59 | 1.59 |
| 1.60                  | 1.60 | 1.60 | 1.60 |
| 1.61                  | 1.61 | 1.61 | 1.61 |
| 1.62                  | 1.62 | 1.62 | 1.62 |
| 1.63                  | 1.63 | 1.63 | 1.63 |
| 1.64                  | 1.64 | 1.64 | 1.64 |
| 1.65                  | 1.65 | 1.65 | 1.65 |
| 1.66                  | 1.66 | 1.66 | 1.66 |
| 1.67                  | 1.67 | 1.67 | 1.67 |
| 1.68                  | 1.68 | 1.68 | 1.68 |
| 1.69                  | 1.69 | 1.69 | 1.69 |
| 1.70                  | 1.70 | 1.70 | 1.70 |
| 1.71                  | 1.71 | 1.71 | 1.71 |
| 1.72                  | 1.72 | 1.72 | 1.72 |
| 1.73                  | 1.73 | 1.73 | 1.73 |
| 1.74                  | 1.74 | 1.74 | 1.74 |
| 1.75                  | 1.75 | 1.75 | 1.75 |
| 1.76                  | 1.76 | 1.76 | 1.76 |
| 1.77                  | 1.77 | 1.77 | 1.77 |
| 1.78                  | 1.78 | 1.78 | 1.78 |
| 1.79                  | 1.79 | 1.79 | 1.79 |
| 1.80                  | 1.80 | 1.80 | 1.80 |
| 1.81                  | 1.81 | 1.81 | 1.81 |
| 1.82                  | 1.82 | 1.82 | 1.82 |
| 1.83                  | 1.83 | 1.83 | 1.83 |
| 1.84                  | 1.84 | 1.84 | 1.84 |
| 1.85                  | 1.85 | 1.85 | 1.85 |
| 1.86                  | 1.86 | 1.86 | 1.86 |
| 1.87                  | 1.87 | 1.87 | 1.87 |
| 1.88                  | 1.88 | 1.88 | 1.88 |
| 1.89                  | 1.89 | 1.89 | 1.89 |
| 1.90                  | 1.90 | 1.90 | 1.90 |
| 1.91                  | 1.91 | 1.91 | 1.91 |
| 1.92                  | 1.92 | 1.92 | 1.92 |
| 1.93                  | 1.93 | 1.93 | 1.93 |
| 1.94                  | 1.94 | 1.94 | 1.94 |
| 1.95                  | 1.95 | 1.95 | 1.95 |
| 1.96                  | 1.96 | 1.96 | 1.96 |
| 1.97                  | 1.97 | 1.97 | 1.97 |
| 1.98                  | 1.98 | 1.98 | 1.98 |
| 1.99                  | 1.99 | 1.99 | 1.99 |
| 2.00                  | 2.00 | 2.00 | 2.00 |
| 2.01                  | 2.01 | 2.01 | 2.01 |
| 2.02                  | 2.02 | 2.02 | 2.02 |
| 2.03                  | 2.03 | 2.03 | 2.03 |
| 2.04                  | 2.04 | 2.04 | 2.04 |
| 2.05                  | 2.05 | 2.05 | 2.05 |
| 2.06                  | 2.06 | 2.06 | 2.06 |
| 2.07                  | 2.07 | 2.07 | 2.07 |
| 2.08                  | 2.08 | 2.08 | 2.08 |
| 2.09                  | 2.09 | 2.09 | 2.09 |
| 2.10                  | 2.10 | 2.10 | 2.10 |
| 2.11                  | 2.11 | 2.11 | 2.11 |
| 2.12                  | 2.12 | 2.12 | 2.12 |
| 2.13                  | 2.13 | 2.13 | 2.13 |
| 2.14                  | 2.14 | 2.14 | 2.14 |
| 2.15                  | 2.15 | 2.15 | 2.15 |
| 2.16                  | 2.16 | 2.16 | 2.16 |
| 2.17                  | 2.17 | 2.17 | 2.17 |
| 2.18                  | 2.18 | 2.18 | 2.18 |
| 2.19                  | 2.19 | 2.19 | 2.19 |
| 2.20                  | 2.20 | 2.20 | 2.20 |
| 2.21                  | 2.21 | 2.21 | 2.21 |
| 2.22                  | 2.22 | 2.22 | 2.22 |
| 2.23                  | 2.23 | 2.23 | 2.23 |
| 2.24                  | 2.24 | 2.24 | 2.24 |
| 2.25                  | 2.25 | 2.25 | 2.25 |
| 2.26                  | 2.26 | 2.26 | 2.26 |
| 2.27                  | 2.27 | 2.27 | 2.27 |
| 2.28                  | 2.28 | 2.28 | 2.28 |
| 2.29                  | 2.29 | 2.29 | 2.29 |
| 2.30                  | 2.30 | 2.30 | 2.30 |
| 2.31                  | 2.31 | 2.31 | 2.31 |
| 2.32                  | 2.32 | 2.32 | 2.32 |
| 2.33                  | 2.33 | 2.33 | 2.33 |
| 2.34                  | 2.34 | 2.34 | 2.34 |
| 2.35                  | 2.35 | 2.35 | 2.35 |
| 2.36                  | 2.36 | 2.36 | 2.36 |
| 2.37                  | 2.37 | 2.37 | 2.37 |
| 2.38                  | 2.38 | 2.38 | 2.38 |
| 2.39                  | 2.39 | 2.39 | 2.39 |
| 2.40                  | 2.40 | 2.40 | 2.40 |
| 2.41                  | 2.41 | 2.41 | 2.41 |
| 2.42                  | 2.42 | 2.42 | 2.42 |
| 2.43                  | 2.43 | 2.43 | 2.43 |
| 2.44                  | 2.44 | 2.44 | 2.44 |
| 2.45                  | 2.45 | 2.45 | 2.45 |
| 2.46                  | 2.46 | 2.46 | 2.46 |
| 2.47                  | 2.47 | 2.47 | 2.47 |
| 2.48                  | 2.48 | 2.48 | 2.48 |
| 2.49                  | 2.49 | 2.49 | 2.49 |
| 2.50                  | 2.50 | 2.50 | 2.50 |
| 2.51                  | 2.51 | 2.51 | 2.51 |
| 2.52                  | 2.52 | 2.52 | 2.52 |
| 2.53                  | 2.53 | 2.53 | 2.53 |
| 2.54                  | 2.54 | 2.54 | 2.54 |
| 2.55                  | 2.55 | 2.55 | 2.55 |
| 2.56                  | 2.56 | 2.56 | 2.56 |
| 2.57                  | 2.57 | 2.57 | 2.57 |
| 2.58                  | 2.58 | 2.58 | 2.58 |
| 2.59                  | 2.59 | 2.59 | 2.59 |
| 2.60                  | 2.60 | 2.60 | 2.60 |
| 2.61                  | 2.61 | 2.61 | 2.61 |
| 2.62                  | 2.62 | 2.62 | 2.62 |
| 2.63                  | 2.63 | 2.63 | 2.63 |
| 2.64                  | 2.64 | 2.64 | 2.64 |
| 2.65                  | 2.65 | 2.65 | 2.65 |
| 2.66                  | 2.66 | 2.66 | 2.66 |
| 2.67                  | 2.67 | 2.67 | 2.67 |
| 2.68                  | 2.68 | 2.68 | 2.68 |
| 2.69                  | 2.69 | 2.69 | 2.69 |
| 2.70                  | 2.70 | 2.70 | 2.70 |
| 2.71                  | 2.71 | 2.71 | 2.71 |
| 2.72                  | 2.72 | 2.72 | 2.72 |
| 2.73                  | 2.73 | 2.73 | 2.73 |
| 2.74                  | 2.74 | 2.74 | 2.74 |
| 2.75                  | 2.75 | 2.75 | 2.75 |
| 2.76                  | 2.76 | 2.76 | 2.76 |
| 2.77                  | 2.77 | 2.77 | 2.77 |
| 2.78                  | 2.78 | 2.78 | 2.78 |
| 2.79                  | 2.79 | 2.79 | 2.79 |
| 2.80                  | 2.80 | 2.80 | 2.80 |
| 2.81                  | 2.81 | 2.81 | 2.81 |
| 2.82                  | 2.82 | 2.82 | 2.82 |
| 2.83                  | 2.83 | 2.83 | 2.83 |
| 2.84                  | 2.84 | 2.84 | 2.84 |
| 2.85                  | 2.85 | 2.85 | 2.85 |
| 2.86                  | 2.86 | 2.86 | 2.86 |
| 2.87                  | 2.87 | 2.87 | 2.87 |
| 2.88                  | 2.88 | 2.88 | 2.88 |
| 2.89                  | 2.89 | 2.89 | 2.89 |
| 2.90                  | 2.90 | 2.90 | 2.90 |
| 2.91                  | 2.91 | 2.91 | 2.91 |
| 2.92                  | 2.92 | 2.92 | 2.92 |
| 2.93                  | 2.93 | 2.93 | 2.93 |
| 2.94                  | 2.94 | 2.94 | 2.94 |
| 2.95                  | 2.95 | 2.95 | 2.95 |
| 2.96                  | 2.96 | 2.96 | 2.96 |
| 2.97                  | 2.97 | 2.97 | 2.97 |
| 2.98                  | 2.98 | 2.98 | 2.98 |
| 2.99                  | 2.99 | 2.99 | 2.99 |
| 3.00                  | 3.00 | 3.00 | 3.00 |
| 3.01                  | 3.01 | 3.01 | 3.01 |
| 3.02                  | 3.02 | 3.02 | 3.02 |
| 3.03                  | 3.03 | 3.03 | 3.03 |
| 3.04                  | 3.04 | 3.04 | 3.04 |
| 3.05                  | 3.05 | 3.05 | 3.05 |
| 3.06                  | 3.06 | 3.06 | 3.06 |
| 3.07                  | 3.07 | 3.07 | 3.07 |
| 3.08                  | 3.08 | 3.08 | 3.08 |
| 3.09                  | 3.09 | 3.09 | 3.09 |
| 3.10                  | 3.10 | 3.10 | 3.10 |
| 3.11                  | 3.11 | 3.11 | 3.11 |
| 3.12                  | 3.12 | 3.12 | 3.12 |
| 3.13                  | 3.13 | 3.13 | 3.13 |
| 3.14                  | 3.14 | 3.14 | 3.14 |
| 3.15                  | 3.15 | 3.15 | 3.15 |
| 3.16                  | 3.16 | 3.16 | 3.16 |
| 3.17                  | 3.17 | 3.17 | 3.17 |
| 3.18                  | 3.18 | 3.18 | 3.18 |
| 3.19                  | 3.19 | 3.19 | 3.19 |
| 3.20                  | 3.20 | 3.20 | 3.20 |
| 3.21                  | 3.21 | 3.21 | 3.21 |
| 3.22                  | 3.22 | 3.22 | 3.22 |
| 3.23                  | 3.23 | 3.23 | 3.23 |
| 3.24                  | 3.24 | 3.24 | 3.24 |
| 3.25                  | 3.25 | 3.25 | 3.25 |
| 3.26                  | 3.26 | 3.26 | 3.26 |
| 3.27                  | 3.27 | 3.27 | 3.27 |
| 3.28                  | 3.28 | 3.28 | 3.28 |
| 3.29                  | 3.29 | 3.29 | 3.29 |
| 3.30                  | 3.30 | 3.30 | 3.30 |
| 3.31                  | 3.31 | 3.31 | 3.31 |
| 3.32                  | 3.32 | 3.32 | 3.32 |
| 3.33                  | 3.33 | 3.33 | 3.33 |
| 3.34                  | 3.34 | 3.34 | 3.34 |
| 3.35                  | 3.35 | 3.35 | 3.35 |
| 3.36                  | 3.36 | 3.36 | 3.36 |
| 3.37                  | 3.37 | 3.37 | 3.37 |
| 3.38                  | 3.38 | 3.38 | 3.38 |
| 3.39                  | 3.39 | 3.39 | 3.39 |
| 3.40                  | 3.40 | 3.40 | 3.40 |
| 3.41                  | 3.41 | 3.41 | 3.41 |
| 3.42                  | 3.42 | 3.42 | 3.42 |
| 3.43                  | 3.43 | 3.43 | 3.43 |
| 3.44                  | 3.44 | 3.44 |      |



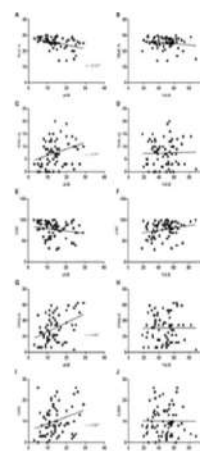
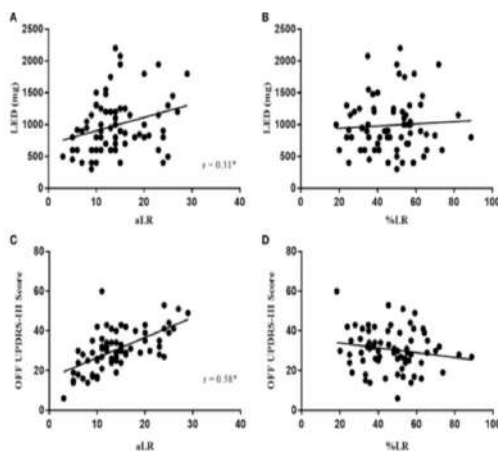
**Calculation of Levodopa Response;  
absolute increase? or relative increase?  
- Obviously, it's an arithmetic issue!**

[OFF - ON; absolute LR (aLR)]

$[(\text{OFF} - \text{ON}) / \text{OFF} * 100\%; \%LR]$



Frontiers in Neurology 2018



Dual measurement may uncover significant relationships not seen as a result of sole use of the %LR.

분류번호, 수가코드, 행위명, 행위설명

노686 FZ686 레보도파 경구 투여 후 반응검사/ L-DOPA challenge test

단일 경구 레보도파를 투여한 후 시간간격을 두고 손의 운동과 보행속도를 정량적으로 측정하여 레보도파에 대한 반응정도를 판정하는 검사로서, 약물치료의 반응을 예측하고 효과를 판정, 각 질병 간의 감별진단, 수술적 치료 효과의 예측 및 판정 등에 객관적이고 정량적인 자료를 제시함.

#### 실시목적/적응증

파킨슨증을 포함한 이상운동증 환자의 진단 및 치료 과정 중 약물치료의 반응을 예측하고 효과를 판정, 유사 질병 간의 감별진단, 수술적 치료 효과의 예측 및 판정을 위해 전문가의 판단에 따라 시행

#### 금기증

레보도파 금기증과 동일 (협우각녹내장 등)

#### 실시방법

단일 경구 레보도파를 투여전과 투여 후 시간간격을 두고 운동증상을 정량적으로 측정하여 (통합 파킨슨병 척도검사 등, 2회 시행) 약물에 대한 반응정도를 판정

#### 소요인력 및 시간

신경과의사 1인 또는 교육받은 전공의/간호사 1인, 환자 개개인의 반응 양상에 따라 소요 시간이 달라지므로 시간을 특정할 수 없음 (일반적으로 2시간 전후이나 경우에 따라 최소 3시간 이상 소요될 수 있음)



### 시술 전

신경과 의사 1인 또는 교육받은 전공의/간호사, 30분  
 최적 약물 용량 결정 및 약물 투약 전 통합 파킨슨병 척도 검사 시행  
 신경학적 검사 및 임상기록을 확인 한 후, 목적에 적합한 약물 용량 결정하고, 통합된 파킨슨병 척도  
 검사 시행, 금기증 확인 및 필요시 부작용 발생 예방을 위한 조치 시행

### 시술 중

신경과 의사 1인 또는 교육받은 전공의/간호사, 최소 180분  
 운동증상의 변화를 지속적으로 관찰 및 평가  
 최적 약물 반응 상태를 확인 후 통합 파킨슨병 척도 검사 시행  
 심각한 이상운동증/무동증 발생시 적절한 조치를 취해야 함

### 시술 후

신경과 의사 1인 또는 교육받은 전공의/간호사, 30분  
 약물 투약 전후의 척도 검사 변화 정도를 평가하고 약물 반응성을 판단

## Tilt Training Treatment

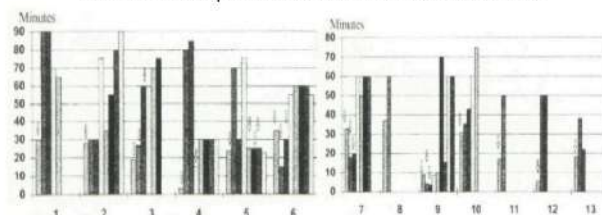
It was developed after the observation that there was a decrease in positivity of tilt tests with recurrent tilt testing

### Tilt Training: A New Treatment for Recurrent Neurocardiogenic Syncope and Severe Orthostatic Intolerance

HUGO ECTOR<sup>1</sup>, TONY REYBROUCK<sup>2,3</sup>, HEIN HEIDBÜCHEL<sup>1</sup>, MARC GEWILLIG<sup>2</sup>,  
 FRANS VAN DE WERF<sup>1</sup>

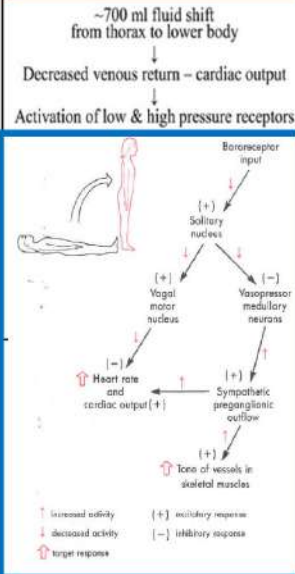
From the Departments of Cardiology<sup>1</sup>, Pediatric Cardiology<sup>2</sup> and Cardiovascular Rehabilitation<sup>3</sup>, University Hospital Gasthuisberg, Leuven, Belgium

Results In hospital consecutive tilt table session

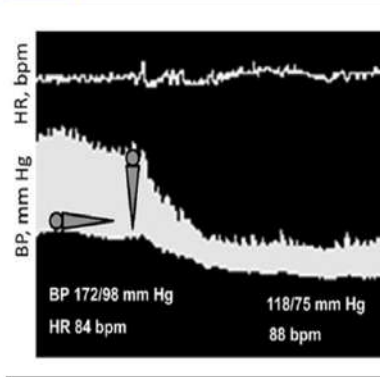


## NOH is not acutely life-threatening, but can be associated with significant morbidity and mortality (esp. in MSA)

### ADAPTATION TO UPRIGHT POSTURE



### NOH



|                             |            |
|-----------------------------|------------|
| Sex (M/F)                   | 63/41      |
| Age (years) (mean±SD)       | 71±10      |
| MSA                         | 45 (43.2%) |
| PD                          | 43 (41.3%) |
| PAF                         | 9 (8.6%)   |
| Other                       | 7 (6.7%)   |
| Follow-up (months) (median) | 52.8       |

|                              |            |
|------------------------------|------------|
| <b>Comorbidities</b>         |            |
| Hypertension                 | 32 (30.7%) |
| Benign prostatic hypertrophy | 17 (16.3%) |
| Gastroenterological          | 14 (13.4%) |
| Psychiatric                  | 14 (13.4%) |
| Cerebrovascular              | 13 (12.5%) |
| Cancer                       | 12 (11.5%) |
| Respiratory                  | 11 (10.5%) |
| Cardiac                      | 10 (9.6%)  |
| Endocrinological             | 6 (5.7%)   |
| Peripheral vascular disease  | 5 (4.8%)   |
| Chronic renal failure        | 5 (4.8%)   |
| Haematological               | 3 (2.8%)   |
| Neurological                 | 2 (1.9%)   |
| Dermatological               | 2 (1.9%)   |
| Orthopaedic                  | 1 (0.9%)   |
| Osteoporosis                 | 1 (0.9%)   |

|                   |            |
|-------------------|------------|
| <b>Therapies</b>  |            |
| Midodrine         | 77 (74.0%) |
| Fludrocortisone   | 68 (65.3%) |
| Ocrotide          | 14 (13.4%) |
| Dihydroergotamine | 6 (5.7%)   |
| Acarbose          | 3 (2.8%)   |
| ACE-inhibitors    | 31 (29.8%) |
| Nitrates          | 18 (17.3%) |

|                      |            |
|----------------------|------------|
| <b>Complications</b> |            |
| Heart failure        | 22 (21.2%) |
| Atrial fibrillation  | 5 (4.8%)   |

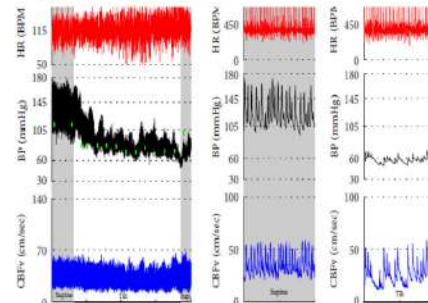
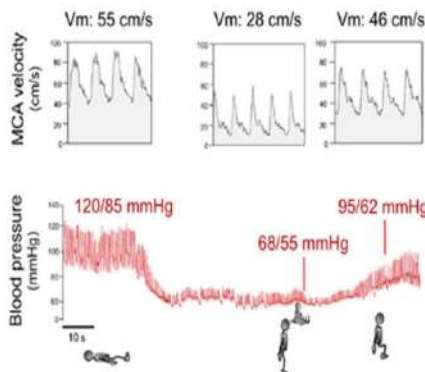
Functional Neurology 2012;

## Recognition and management of NOH is essential in the care of patients with PD and atypical parkinsonism

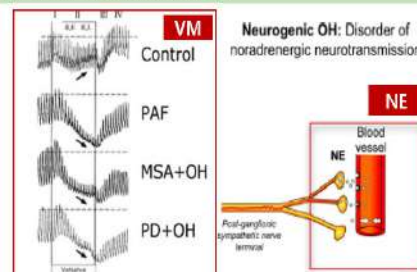
Prevalence of symptomatic OH within each diagnostic category.

| Diagnosis (N)        | Symptomatic OH (%) | No symptomatic OH (%) |
|----------------------|--------------------|-----------------------|
| Idiopathic PD (1125) | 18                 | 82                    |
| MSA (26)             | 81                 | 19                    |
| DLB (32)             | 31                 | 69                    |
| VP (38)              | 26                 | 74                    |
| Other (57)           | 12                 | 88                    |
| PSP (26)             | 11                 | 89                    |
| CBD (14)             | 7                  | 93                    |

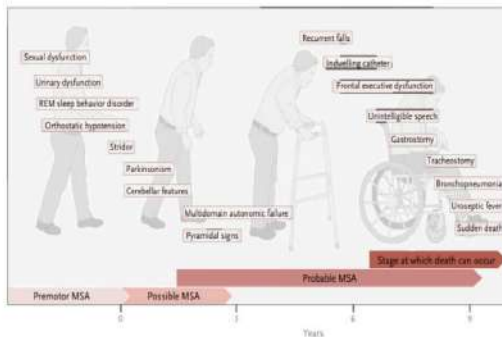
Parkinsonism and Related Disorders 17 (2011)



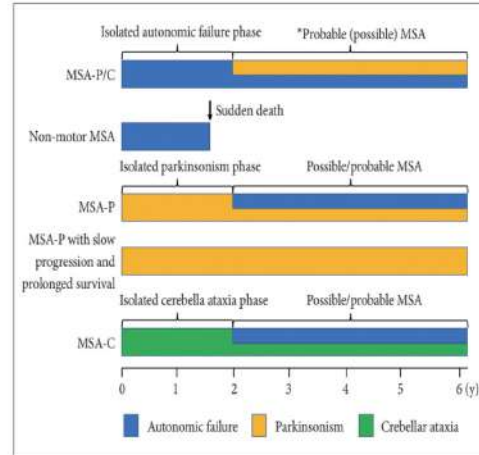
OH = sustained fall of SBP > 20 mmHg or DBP > 10 mmHg within 3 min of standing (or HUT)



## Early and severe autonomic failure is a key feature of “probable” multiple-system atrophy



Natural History of MSA

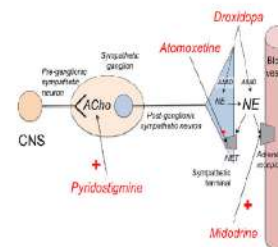
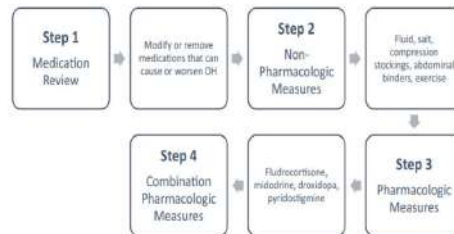


## Treatment of Neurogenic OH

### Non-pharmacological interventions

- Discontinue potentially contributory medications
- Alpha-antagonists (including drugs for benign prostatic hypertrophy)
- Diuretics
- Venodilators
- Avoid suddenly standing up
- Avoid standing motionless
- Leg crossing or calf clenching when standing
- Increase fluid and salt intake
- Use waist-high stocking compression devices or abdominal binders
- Elevate head of bed 6-9 inches
- Pharmacological interventions
- Increase plasma volume (PRN or daily)
- Fludrocortisone PO 0.1-0.2 mg qdaily
- Erythropoietin SQ 25-50 units/kg body weight if Hgb less than 12 g/dl
- Pressor agents (PRN, planned situational use, or regular daily dosing [listed])
- Midodrine PO 2.5-10 mg q4H x 3/day
- Yohimbine PO 5.4-10.8 mg TID
- Pyridostigmine PO 60 mg TID
- Pseudoephedrine PO 30 mg TID
- Atomoxetine PO 18 mg BID
- Other pressor agents
- Ergotamine/Caffeine PO 1 mg/100 mg BID
- Octreotide SQ 12.5-50 mcg BID

2013 Prog Cardiovascular diseases



2017 International Parkinson and Movement Disorder Society

MZ002

기립경사훈련

기립경사훈련은 심장신경성 실신환자에서 기존의 약물치료법에 반응하지 않거나 장기간의 약물치료로 부작용이 있는 경우에 외부로부터 반복되는 자극을 주어 체내 자율신경계의 과민한 반응을 억제 시킴으로 실신재발을 치료하는 비 약물적인 치료임.

| 분류번호 | 코 드   | 분 류                                 | 점 수    |
|------|-------|-------------------------------------|--------|
|      |       | 제7장 이학요법표                           |        |
|      |       | 제4절 기타 이학요법표                        |        |
| 사-46 | MM460 | 기립경사훈련[1일당] Tilt Training Treatment | 372.41 |

| 항 목                      | 제 목                  | 세부인정사항   |
|--------------------------|----------------------|--|
| 사46<br>기립 경 사<br>훈련[1일당] | 기립경사훈련[1일당]의<br>급여기준 | 사46 기립경사훈련[1일당]의 급여기준은 다음과 같이 함.<br><br>- 다 음 -<br><br>가. 기존의 약물치료법에 반응하지 않거나 장기간의<br>약물치료로 부작용이 있는 심장 신경성 실신<br>환자<br><br>나. 경수 및 흉수 6번 상위 척추손상환자, 뇌간<br>뇌졸중환자, 다발계통 위축환자에서 자율신경계<br>부전으로 인한 기립성 저혈압이 있는 환자 |



### Clinical Dilemma of management for neurogenic orthostatic hypotension: pharmacologic or nonpharmacologic?

