Gait, freezing, postural instability and FALLS

Professor Bastiaan R. Bloem
Parkinson Center Nijmegen (ParC)
Radboud University Nijmegen Medical Center

@BasBloem

Falls typically have a single cause
Most falls are environmental
Falls are mainly motor disorders
Falls cannot be prevented
Falls have relatively little importance for patients
Why are falls so important?

Importance of falls

... and immediately decides to retire!
The best predictor of falls is a prior fall

(but falls predict much more ...)

“Take home” message!
**Is falling an issue in Parkinson disease?**

- **Falls are a “late” feature in Parkinson’s**

- **Risk of falls (in subjects with no prior falls)**

---

**Scientific confirmation**

- **The prognosis of falls in elderly people living at home**

- **Is falling an issue in Parkinson disease?**

- **Falls are a “late” feature in Parkinson’s**
But when falls do occur ...

Changes in Motor Subtype and Risk for Incident Dementia in Parkinson’s Disease

Guido Sato, MD, 1–3 Jan Peter Larsen, MD, PhD, 1, 2 Meeri Cena, MD, 1 Torre Werntz-Larsen, MSc, 1 and Dag Aarsland, MD, PhD 1

1The Norwegian Center for Movement Disorders, Bergen, Norway
2Department of Neurology, Haukeland University Hospital, Bergen, Norway
3Basal Ganglia Laboratory, Department of Neurology, University of Bergen, Bergen, Norway

Fear of falling

“Take home” message!

Fewer falls is not necessarily better!
Fear also leads to inactivity

I will never fall again!

Physical inactivity in Parkinson disease

Physical Activity (LAPAQ questionnaire)

![Graph showing physical activity levels across different Hoehn & Yahr stages]

-13% -21% -84%

Hoehn & Yahr stages

Van Nimwegen, Speelman, Bloem & Munneke (submitted)

The ParkFit trial

ParkFit

[Logo of ParkFit]
Signing up is not enough!

Prevention of physical inactivity

Promotion of physical activity and fitness in sedentary patients with Parkinson’s disease: randomised controlled trial

BMJ

RESEARCH

Promotion of physical activity and fitness in sedentary patients with Parkinson’s disease: randomised controlled trial

Title: Promoting physical activity and fitness in sedentary patients with Parkinson’s disease: randomised controlled trial

(Clinical) assessment of falls

STEP 1: classification of falls

WITH preceding loss of consciousness

WITHOUT preceding loss of consciousness
Useful tips & tricks

Contact moment with the floor!

Nature of the injuries!

Further classification of falls

Intrinsic falls

Extrinsic falls

Analysis of security videos

Video capture of the circumstances of falls in elderly people residing in long-term care; an observational study

www.thelancet.com Published online October 11, 2012 http://dx.doi.org/10.1016/S0140-6736(12)61351-X
Fall type 2: narrowed base of support

Fall type 4: trip over obstacle

Commonest environmental hazard??
Most falls in Parkinson’s disease are intrinsic
→ Treat the patient, not the environment

STEP 2: prior falls yes or no?

The falls telephone

Evaluation of the Falls Telephone: An Automated System for Enduring Assessment of Falls
Marleen A. van der Hark, MSc,1 Sebastian Oostrum, MD, PhD,1 Philippa C.M. Kivil, MSc,2 Katrina M. Allsopp, MD, PhD,1 and Maureen Knuiman, PT, PhD1

Automated falls detection

- 3 linear accelerometers
- 1 altitude sensor
- Validated algorithms

Is my patient likely to fall (again)?
Intoxications

Avoid benzodiazepines!

Bloomberg et al. J Neurol 2001;248:950-958
Also common in COGNITIVE disorders

Incidence and Prediction of Falls in Dementia: A Prospective Study in Older People

Also common in COGNITIVE disorders

Falls are common in dementias

Particularly often in MIXED disorders

Parkinson disease

Normal pressure hydrocephalus
‘Spot’ diagnosis

Perhaps even particularly cognitive?

Severity (in Parkinson’s disease)

Hypothesis

Gait impairment & postural instability

Compensatory mechanisms

Cognitive impairment

Falls and injuries

Time

Beware of EPISODIC gait disorders

Continuous gait disorder

Episodic gait disorder

Normal
Hypokinetic walking & turning

EPISODIC: freezing of gait

This is NOT freezing of gait
Freezing = most often trembling

Freezing of gait questionnaire, version 2.0

Courtesy of Alice Nieuwboer
Nieuwboer et al., Gait & Posture 2009;30:459-463

Important cause of falling

Important cause of falls

Predictors of future falls in Parkinson disease

SOFAS
- Sensory Organization Test,Romberg and tandem gait, Wii balance board
- Timed Up and Go test
- Stance and gait stabilization tests
- Tandem gait
- Balance self-efficacy
- Pain in the lower limbs
- Depression screen (GDS 15)

Method
- Stratified randomization, n=101
- Intervention group: 40 participants treated with the so-called "European" approach
- Control group: 61 participants treated with best clinical practice
- Intervention group compared to the control group on the above-mentioned outcome measures, mainly by using the Wilcoxon rank sum test

Results
- Significant difference in the favor of the intervention group on the Sensory Organization Test, Romberg and tandem gait, and Tandem gait, Pain, and Depression screen
- No difference in the favor of the intervention group on the Timed Up and Go test, Stance and gait stabilization tests, and Balance self-efficacy

Conclusion
- Significant difference in the favor of the intervention group on the Sensory Organization Test, Romberg and tandem gait, Tandem gait, Pain, and Depression screen
- No difference in the favor of the intervention group on the Timed Up and Go test, Stance and gait stabilization tests, and Balance self-efficacy

References
Falls in Parkinson’s disease = freezing!

Absent when being examined

A good illustration
Rapid turning “on the spot”

Recommendations for clinical practice

Forced rapid, small steps
Forced rapid, small steps

Analysis of security videos

Fall type 1: turning (& freezing?)
Consider freezing of gait when patients
• Fall forward
• Claim “spontaneous” falls
• Fall while turning around

Freezing in other species 😊

Treatment of freezing
Dopaminergic abnormalities

Dopa-induced abnormalities

Non-dopaminergic abnormalities

Clinical state while freezing

Increase levodopa

"OFF" period freezing

Dopa-responsive freezing

PINK1 parkinsonism

Part 1

OFF Med

My private hypothesis

Appendicular symptoms & signs

Freezing of gait

ON state freezing

Threshold for treatment response

Pseudo ON state freezing

Threshold for treatment response

OFF state freezing

Dose of antiparkinson medication

Dose of antiparkinson medication

ON state

OFF state

threshold for treatment response
Dopaminergic abnormalities
Dopa-induced abnormalities
Non-dopaminergic abnormalities

Clinical state while freezing

“OFF” period freezing

Decrease levodopa
Decrease agonist

ON state freezing of gait

Espay et al., Neurology 2012;78:454-457

What is this?

Růžička, Nutt and Bloem, Mov Disord, in press
Looks just like ...

“Silly Walks” in Parkinson’s Disease: Unusual Presentation of Dopaminergic-Induced Dyskinesias

Evgen Růžička, MD, DSc,1,6 Karolína Zámečková, MD,2 John G. Nutt, MD,3 and Bastiaan R. Bloem, MD, PhD6

Clinical state while freezing
Effects on gait


STN stimulators ON

STN stimulators OFF

Effects on gait

Effects on gait
Postoperative Gait Deterioration
After Bilateral Subthalamic
Nucleus Stimulation in
Parkinson’s Disease

Burt F.L., van Nuenen, MD,1
Rianne A.J. Esselink, MD, PhD,1,2
Mutsan Muramata, PhD,1
Johannes D. Speelman, MD, PhD,3
Teus van Laar, MD, PhD,4
and Bastiaan R. Bloem, MD, PhD5

Targeting the PPN
PPN stimulation (OFF)

PPN stimulation (ON)

Specific tests
Traditional testing

Real life example
Real life example

Multiple tasking and falls in PD

Tandem gait testing

Blam et al, J Neurol 2001; 248: 950-954
## Parkinson’s disease

<table>
<thead>
<tr>
<th></th>
<th>Parkinson’s disease (n = 36)</th>
<th>Atypical parkinsonism (n = 49)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Able</strong></td>
<td>33 (92%)</td>
<td>9 (18%)</td>
</tr>
<tr>
<td><strong>Unable</strong></td>
<td>3 (8%)</td>
<td>40 (82%)</td>
</tr>
</tbody>
</table>

- Sensitivity 82%, specificity 92%
- Positive likelihood ratio 9.8
- Post-test probability 87%

Abdo et al, JNNP 2006;77:1367-1369

## The bicycle sign


## Main findings

Stopped cycling since diagnosis

Even in Japanese Alps (and Korean mountains?!)  

“Take home” message!  

Tandem gait and cycling are easy ways to differentiate Parkinson disease from atypical parkinsonism.

Freezing in vascular parkinsonism
Benign paroxysmal positional vertigo in Parkinson's disease

E. van Wijnen 1,*, R.B. van Leeuwen 1, I.I. van der Zwaag-Boomen 5, S. Muisson-Obholzler 1, R.R. Rees 6

1 Department of Neurology, University Medical Center Utrecht, Utrecht, the Netherlands
2 Department of Neurology, University Medical Center Utrecht, Utrecht, the Netherlands
3 Department of Neurology, University Medical Center Utrecht, Utrecht, the Netherlands
4 Department of Neurology, University Medical Center Utrecht, Utrecht, the Netherlands
5 Department of Neurology, University Medical Center Utrecht, Utrecht, the Netherlands
6 Department of Neurology, University Medical Center Utrecht, Utrecht, the Netherlands

Main results

- 305 consecutive Parkinson patients

- Dizziness
  - Handicap Inventory
  - Dix-Hallpike manoeuvre
  - Test for orthostatic hypotension

- Dizzy (n=151, 49%)
- Not dizzy (n=154, 51%)
- Orthostatic hypotension (n=57, 38%)
- Classical BPPD (n=12, 8%)
- Atypical BPPD (n=4, 3%)

- Canalith-reposition manoeuvre
- 3-month follow-up

- Symptom Free (n=10, 63%)
- Improved (n=3)
- No improvement (n=3)
Benign paroxysmal positional vertigo is common, under recognized but treatable

"Take home" message!

Falls are NOT untreatable

Some rules of thumb
Thank you