

## Clinical Note: How I Examine My Patient

---

# Medio-Lateral Balance Impairment Differentiates between Parkinson's Disease and Atypical Parkinsonism

Jorik Nonnekes<sup>a,\*</sup>, Marjolein B. Aerts<sup>b</sup>, W.F. Abdo<sup>b</sup> and Bastiaan R. Bloem<sup>b</sup>

<sup>a</sup>*Radboud University Medical Center, Donders Institute for Brain, Cognition and Behaviour, Department of Rehabilitation, Nijmegen, The Netherlands*

<sup>b</sup>*Radboud University Medical Center, Donders Institute for Brain, Cognition and Behaviour, Department of Neurology, Nijmegen, The Netherlands*

**Abstract.** In early disease stages, it can be difficult to differentiate clinically between Parkinson's disease and the various forms of atypical parkinsonism, like multiple system atrophy or progressive supranuclear palsy. Balance impairment in the medio-lateral plane (i.e. sideways) is often seen in patients with a form of atypical parkinsonism, but not in patients with Parkinson's disease. This is reflected by the distance between the feet during gait, which is typically normal (or even narrow) in Parkinson's disease, but widened in atypical parkinsonism. Estimating this stance width depends on subjective judgement, and is difficult to quantify in clinical practice. Here, we emphasize that this medio-lateral balance impairment can also be revealed using two simple tests: (1) inability to perform tandem gait (taking one or more side steps being abnormal); and (2) self-report by patients who have lost the ability to ride a bicycle. Both tests have a good diagnostic yield in differentiating between Parkinson's disease and atypical parkinsonism, even early in the course of the disease.

**Keywords:** Balance, cycling, Parkinson's disease, parkinsonism, postural control, tandem gait

## INTRODUCTION OF THE CLINICAL DILEMMA

There is a large clinical overlap between Parkinson's disease (PD) and the various forms of atypical parkinsonism, which include multiple system atrophy (MSA), progressive supranuclear palsy (PSP) and vascular parkinsonism. Many patients are therefore often misdiagnosed, particularly in early stages of the disease [1]. An accurate diagnosis is, however, important clinically (for adequate patient counselling, e.g. about

the prognosis) as well as scientifically (to ensure that properly diagnosed patients are included in clinical trials).

The so-called 'red flags' are clinical clues that can help to differentiate between PD and atypical parkinsonism. Red flags are specific symptoms and signs that can be seen in patients with atypical parkinsonism, but less commonly so in PD. Here, we focus on one such red flag, namely the occurrence of balance impairment in the medio-lateral plane (i.e. sideways). Medio-lateral balance impairment is reflected by a compensatory wide-based walking pattern, and this can be seen in patients with atypical parkinsonism, probably reflecting the more widespread pathology in these patients including the cerebellum, brainstem and their connections. In contrast, in PD gait, the distance

---

\*Correspondence to: Jorik Nonnekes, MD, Radboud University Medical Centre, PO Box 9101, 6500 HB, Nijmegen, The Netherlands. Tel.: +31 24 36 68 425; E-mail: jorik.nonnekes@radboudumc.nl

between the feet is typically normal or even narrow [2]. The preserved balance in the medio-lateral direction also explains why many patients with Parkinson's disease are still able to ride their bicycle, even in the face of severe walking difficulties [3]. In clinical practice, estimating the stance width depends on subjective judgement, and is difficult to quantify, while asking about cycling is rarely done in clinical practice. Here, we discuss two simple tests that clinicians can use to screen for the presence of medio-lateral balance impairment in patients with parkinsonism.

## THE TESTS IN CLINICAL PRACTICE

### *Tandem gait*

To evaluate tandem gait, patients are instructed to take 10 consecutive steps along an imaginary straight, thin line (the diagnostic properties of tandem gait along an actual line on the floor have not been formally studied, although it is unlikely to influence test performance dramatically). Eyes are kept open throughout the test, and walking aids are not allowed. At each step, the heel of the leading foot should be put against the toe of the trailing foot, and right in front of the other foot, as in tightrope walking. An abnormal tandem gait is scored if one or more side steps are taken to maintain balance. We usually allow one practice trial, and the second test should be performed without any side steps to yield a normal test score. An examiner can walk besides the patient to lend support if needed, but this will count as an abnormal test result. A prospective study that included 36 patients with PD and 49 patients with atypical parkinsonism showed that only 18% of patients with atypical parkinsonism were able to perform tandem gait without a single side step, as opposed to 92% of patients with PD [4]. The same diagnostic accuracy was seen in patients with disease duration less than three years (Table 1). It is important that patients are convinced that tandem gait can be performed safely. Fear of falling can force the patient to abort tandem gait, or to perform the test too cautiously. It is our impression that very slow test performance increases the likelihood of a corrective side step, and we allow such patients a new trial at higher speed, telling them that this is likely easier.

### *Preserved ability to bicycle*

Riding a bicycle requires a coordinated interplay between rhythmic pedalling and maintaining balance in the medio-lateral plane. Patients with medio-lateral

Table 1  
Diagnostic accuracy of tandem gait and lost ability to ride a bicycle in differentiating PD from atypical parkinsonism

	Sensitivity	Specificity
Tandem gait total cohort ( $n = 85$ )	82%	92%
Tandem gait disease duration < 3 years ( $n = 41$ )	85%	95%
Lost ability to ride a bicycle ( $n = 109$ )	52%	96%

balance impairment experience cycling therefore as demanding and unsafe. A recent study reported that the simple question 'Can you still ride a bicycle?' provides good diagnostic yield to differentiate between PD and atypical parkinsonism [5]. In this study, 45 patients with PD and 64 patients with atypical parkinsonism were included; all of them were used to riding a bicycle before their first disease manifestation (this test is obviously not useful in patients not normally used to cycling). At the time of inclusion (median disease duration 30 months), 52% of patients with atypical parkinsonism had stopped cycling, as opposed to only 4% of patients with PD (Table 1). The loss of cycling ability was observed in all forms of atypical parkinsonism, although the numbers of patients for the various subgroups were small. Importantly, this test merely evaluates the patient's own perception of safety to continue riding a bicycle or not, as revealed during history taking; this test specifically does not advocate to ask patients to perform a cycling trial to see if they are still able to do this, which could well be dangerous in patients with medio-lateral balance impairment.

## DISCUSSION

An abnormal tandem gait (defined as need to take one or more corrective side steps, when asked to perform 10 tandem steps) and a lost ability to cycle should be regarded as 'red flags' that strongly signal the presence of atypical parkinsonism. Both tests are easy to perform in clinical practice and have a good diagnostic accuracy, even early in the course of the disease. Importantly, these tests should not be judged in isolation, but always in the clinical context and presence of other red flags or supportive features. Future studies are needed to investigate the diagnostic yield of a combined evaluation of tandem gait and preserved ability to cycle.

## ACKNOWLEDGMENTS

This paper was funded by a Radboud University Medical Centre Research Grant to JH Nonnekes.

## CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

## REFERENCES

- [1] Litvan I, Bhatia KP, Burn DJ, Goetz CG, Lang AE, McKeith I, Quinn N, Sethi KD, Shults C, & Wenning GK, Movement Disorders Society Scientific Issues C (2003) Movement Disorders Society Scientific Issues Committee report: SIC Task Force appraisal of clinical diagnostic criteria for Parkinsonian disorders. *Mov Disord*, **18**, 467-486.
- [2] Bloem BR, & Bahtia KP (2004) Gait and balance in basal ganglia disorders. In *Clinical Disorders of Balance, Posture and Gait*, Bronstein A, Brandt T, Woollacott MH, Nutt JG eds. Arnold, London, pp. 173-206.
- [3] Snijders AH, van Kesteren M, & Bloem BR (2012) Cycling is less affected than walking in freezers of gait. *J Neurol Neurosurg Psychiatry*, **83**, 578-581.
- [4] Abdo WF, Borm GF, Munneke M, Verbeek MM, Esselink RA, & Bloem BR (2006) Ten steps to identify atypical parkinsonism. *J Neurol Neurosurg Psychiatry*, **77**, 1367-1369.
- [5] Aerts MB, Abdo WF, & Bloem BR (2011) The "bicycle sign" for atypical parkinsonism. *Lancet*, **377**, 125-126.