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BASIC AND TRANSLATIONAL

Association between presbyvestibulopathy and gait disorders in elderly aged 75 and over

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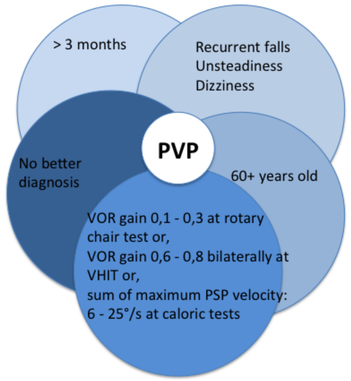
Introduction

Accidental falls are the leading cause of injury-related hospitalisations in older adults [1] and are predictors of disability. The **GAITrite® walkway**, an automated and validated tool for quantifying temporal and spatial gait parameters [2], provides a **comprehensive and reproducible** assessment of mobility to diagnose any **modifiable predisposing factors to falls**. Gait disturbances may sometimes be due to vestibular dysfunction, which affects 50% of people aged 60+ to nearly 80% of people aged 80+ [3,4], including progressive bilateral impairment called **presbyvestibulopathy (PVP)**, defined by the Bárány Society.

GAITRite® walkway
Gold, CIR Systems, PA, USA.
Assessment of gait during a natural walk, or during a dual task walk, on a 7.32 x 0.61 m electronic walkway sensitive to pressure connected to a laptop. Measures of velocity, cadence, stride length, swing time, stance time, support base, double support time



Presbyvestibulopathy criteria from the Bárány Society

Objective

Investigate an association between presbyvestibulopathy and gait parameters on a GAITRite® walkway.

Methods and Materials

- Design: Monocentric **observational** study at the University Hospital of Angers, France, from January 2018 to August 2021.
- Population: 55 people aged **75 years and older** with gait disorders
- Methods.

Standardised gait assessment (The GAITRite® Gold, CIR Systems, PA, USA)

Vestibular assessment: Video Nystagmo-Graphy and Video Head Impulse Test (Synapsys), allowing the diagnosis of PVP according to the criteria of the Bárány Society [4].

Univariate and **multiple logistic regressions** adjusting for potential confounders including age, sex, body mass index (BMI) and MMSE score.

Results

- 42 % of PVP, no difference on gender, age, BMI between PVP and no PVP groups, mean age of 84,2 +/-5,2 years old
- Univariate analysis (n=55):

shorter stride length in PVP: 91.1cm [76.9-105.9] versus 99.6cm [85.6-114.9], p=0.044 at usual walking pace and 91.3 cm [73.8-101.7] versus 103.6 cm [89.0-118.9], p=0.048 under dual tasking condition

higher support base in PVP: 11.16 cm [8.30-13.83] versus 9.94 cm [7.08-11.46], p=0.031, under dual tasking condition

- Multivariate analysis (n=54) under dual tasking condition:

	Presbyvestibulopathy	
	OR [95% CI]	P-value†
Velocity	0.98 [0.96-1.01]	0.282
Cadence	1.02 [0.97-1.06]	0.499
Stride time	0.44 [0.03-6.18]	0.542
Stride length	0.96 [0.932-0.997]	**0.032**
Stride velocity	0.99 [0.96-1.02]	0.310
Swing time	0.15 [<0.001-101.33]	0.564
Support base	1.20 [1.003-1.430]	**0.046**
Stance time	1.51 [0.07-31.39]	0.790
Double support time	4.20 [0.22-78.75]	0.338

† Multiple logistic regressions adjusted for age, sex, BMI and MMSE score. CI: Confidence Interval. OR: Odds ratio. p<0.05 are indicated in bold

Conclusion

PVP was associated with **a shorter stride length** at normal speed and during dual tasking -> PVP may induce a more cadenced gait within a shorter stride length to maintain posture.

PVP was associated with an **increase in the support base**, i.e. the lateral distance between two steps, in favour of a slight **widening of the sustentation polygon** to adjust balance during dual tasking.

These adaptations would **compensate for the altered vestibulospinal reflex due to presbyvestibulopathy** to reduce the imbalance generated during walking, at the cost of increased attention and consequent brain fatigue, both of which are risk factors for falls [3,5].

Further studies are needed to determine whether PVP rehabilitation would improve gait parameters and reduce the risk of falls.

Références

Study approval by the ethics committee (on April 7, 2021) and CNIL declaration no ar21-0040v0 registered on April 22, 2021, in accordance with the declaration of Helsinki.

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