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BASIC AND TRANSLATIONAL RESEARCH

Association between age-related hearing loss and gait disorders in older fallers

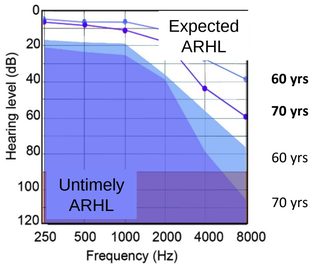
S. Boucher[a,b], A. Teplitxky[a], C. Annweiler[c, d, e].

[a] Department of ENT and Head and Neck Surgery, University hospital of Angers, France; [b] Mitolab Team, UNIV Angers, Mitovasc, CNRS UMR6015, INSERM U1083, Angers, France; [c] UNIV ANGERS, School of Medicine, Health Faculty, Angers, France; [d] Department of Geriatric Medicine and Memory Clinic, Research Center on Autonomy and Longevity, University Hospital, Angers, France; [e] UNIV ANGERS, UPRES EA 4638, University of Angers, France.

Abstract

Falls are associated with hearing loss, which may be explained by the onset of gait impairment. In a population of fallers aged 75+, we investigated whether **untimely age-related hearing loss (ARHL)** (earlier onset, or worse ARHL than expected for age and sex) was associated with **gait impairment** as assessed by the GAITRite® walkway.

Untimely ARHL in older fallers was not associated with gait impairment in the population studied.



Gender- and age-matched hearing thresholds according to ISO 7029 for Men.

Lines correspond to expected hearing thresholds according to the population median. Areas under the curves correspond to the hearing thresholds of patients with untimely ARHL: worse (higher) than the 10% of the general population with the most severe hearing loss.

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

Objective

The aim of this study was to investigate the association between untimely ARHL and gait impairment as assessed by the GAITrite® walkway in a population of fallers aged 75 years and older, controlling for vestibular function.

Methods and materials

- Design: Monocentric **observational** study at the University Hospital of Angers, France, from January 2018 to August 2021.
- Population : 53 people aged **75 years and older** with history, of fall.
- Method:

Medical examination in geriatrician department: **general and GAITrite® walkway assessment**
Audiological assessment according to **ISO7029**
Vestibular assessment, including diagnosis of presbyvestibulopathy (PVP) accordingly to Barany Society criteria, in ENT department.
Univariate and **multiple logistic regressions** adjusting for potential confounders including age, sex, Body mass index (BMI), PVP and MMSE score.

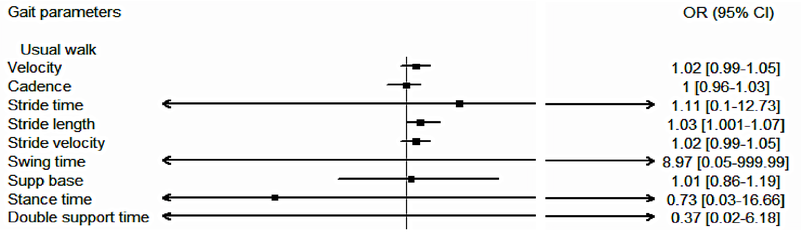
References: ISO 7029:2017; Sakurai R, et al. (2021) Gait Posture; Mikkola TM, et al(2015) J Am Geriatr Soc ; Chen DS, et al (2015) J Gerontol A Biol Sci Med Sci;Viljanen A, et al (2009). J Am Geriatr Soc

Results

	Total (n =53)	Expected ARHL (n=23)	Untimely ARHL (n=30)	*p-value**
Women, n (%)	34(64.2)	13(56.5)	21(70.0)	0.311
Age, years, mean ± SD	84.2±5.1	83.5±4.5	84.7±5.2	0.410
BMI, Kg/m², mean ± SD	27.5±4.6	27.5±4.5	27.5±4.7	0.974
MMSE score (/30), med [IQR]	26[24-27]	26[25-27]	26[24-28]	0.404
Romberg ratio, med [IQR]	0.8[0.5-1.0]	0.8[0.5-1.0]	0.7[0.5-1.0]	0.523

Population Characteristics
ARHL: Age Related Hearing Loss; BMI: Body Mass Index; IQR: Interquartile Range; MMSE: Mini Mental State Examination; SD: Standard Deviation; *Chi² test for qualitative variables, Student test, or Mann-Whitney Wilcoxon test for quantitative variables.

- After adjustment for age, sex, BMI, MMSE score and PVP, we found a **longer stride length** mean in the untimely ARHL group (p = 0.046), but no difference in stride length variability, cadence or velocity. This longer stride lenght was **not reproductible** during dual task walk.
- 23 patients with PVP, within12 untimely ARHL. After adjustment for age, sex, BMI, and MMSE score there was no association between ARHL and PVP.



Forest plot of gait parameters during usual walk adjusted for age, sex, BMI, MMSE score and presbyvestibulopathy in the untimely ARHL and expected ARHL groups. OR (95% CI): odds ratio with 95% confidence interval.

Conclusion

We do **not** consider a longer stride length to be **clinically relevant** in premature ARHL.

This study is the first to analyse **hearing loss according to the ISO7029** standard and not only according to WHO-defined severity.

Hearing loss worsens with age, and the previously reported impairment of gait speed in hearing impaired elderly may be due to aging. Further studies are needed to better characterise the relationship between gait and ARHL.

References

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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