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Differences in kinematic and spatio-temporal parameters assessed by instrumented “timed up and go” test between idiopathic normal pressure hydrocephalus associated with parkinsonism and Parkinson’s disease

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Introduction: Idiopathic normal pressure hydrocephalus can be associated with parkinsonism. Both iNPH-P and PD are characterized by hypokinetic gait disorders, with decreased walking speed and short stride length.

Objectives: To assess differences in quantitative gait parameters and motility during standardized tasks between idiopathic Normal Pressure Hydrocephalus (iNPH-P) and Parkinson disease (PD).

Methods: We selected one group of 21 patients with clinical diagnosis of “possible iNPH” by adapted Relkin criteria and the simultaneous presence of parkinsonism in accordance with the MDS diagnostic definition, and a second group of 21 patients of newly diagnosed “clinically probable” PD based on current MDS diagnostic criteria, who were untreated with dopaminergic medication. Both groups of patients performed the instrumented Timed Up-and-Go test (iTUG).

Results: The mean age was higher for iNPH-P as compared to PD (71.4 ± 10.7 vs 60.6 ± 10 ; $p=0.007$). MMSE score was significantly lower in iNPH-P (23.9 ± 4.3 vs 27.9 ± 1.3 ; $p=0.003$). We found no significant differences in disease duration (2.7 ± 2.3 vs 2.9 ± 2.1 ; $p=0.788$) and UPDRS-ME score (23.8 ± 8.6 vs 28.5 ± 10.3 ; $p=0.154$). Both turning tasks of the iTUG showed significantly longer duration in iNPH-P, while peak and average angular speeds were lower. Vertical variation in acceleration during the sit-to-stand phase was lower in iNPH-P patients while duration of the stand-to-sit phase was significantly longer. iNPH-P showed smaller stride length and a longer gait cycle duration with a more represented swing and single support phase. At multivariate analysis adjusting the analysis for age and MMSE as potential confounders, average angular speed on turning-before-sitting was the discriminating parameter between groups. Applying ROC curve analysis, an average angular speed cut-off of $49^\circ/s$ on turning-before-sitting discriminated iNPH-P from PD with a sensitivity of 67% and a specificity of 91%.

Conclusion: Patients with iNPH-P showed abnormal balance performances with respect to untreated PD, specifically during adaptation manoeuvres and postural changes.