

Gait analysis in normal pressure hydrocephalus: a meta-analysis

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Background and aims: Gait analysis is a useful instrument to assess gait impairment in Normal Pressure Hydrocephalus (NPH) patients. This is the first meta-analysis to summarize quantitative gait data in NPH. Specifically, we investigated which gait parameters are more likely to improve after tap-test (TT) and CSF shunt surgery (CSS), and differentiate responders (R) from non-responders (NR).

Methods: A literature review was conducted by accessing PubMed. Papers were selected using search criteria of idiopathic NPH with at least one instrumented measure of gait. We defined three time points of gait assessment: baseline (PRE), after TT (POST-TT) and after CSS (POST-CSS). Five gait metrics were consistently reported and taken into account for the meta-analysis: gait velocity, cadence, step length, stride length, and double limb support time (DLS). Findings were categorized as iNPH (total sample), NPH-NC, not classified according to diversion procedures responsiveness, R (TT-R and CSS-R), and NR (TT-NR and CCS-NR). Healthy controls (HC) were included when reported.

Results: Twenty studies met the inclusion criteria. TT-R patients improve significantly POST-TT and POST-CSS in each meta-analyzable gait metric. NPH-NC improved in gait velocity, stride length and DLS POST-TT, whereas only in gait velocity POST-CSS. Several gait parameters consistently discriminated R from NR and HC.

Conclusions: This meta-analysis demonstrates gait analysis is a reproducible quantitative instrument to assess gait in NPH, and is useful in selecting responders to shunt placement. Specific parameters seem to delineate the gait pattern of TT-R, providing a critical opportunity to select patients that will respond to CSS.