Concussions and Idiopathic Normal Pressure Hydrocephalus: Is there a correlation?

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PURPOSE / OBJECTIVES

TBI affects millions of people and results from external forces impacting the head or body that causes a disruption in brain function. Concussion and mTBI are the most common cause of TBI.

There is evidence that repeated concussions may increase the risk of post-traumatic brain degeneration, predisposing patients to neurodegenerative diseases like CTE, Alzheimer's disease and Parkinson's disease, which has also been found in iNPH patients.

This relationship emphasizes the need to explore the connection between concussion and iNPH, as they share key pathophysiological traits, including BBB disruption, white matter abnormalities, and ventricular dilation. Athletes in contact sports often show significant BBB disruption, through both concussive and sub-concussive impacts.

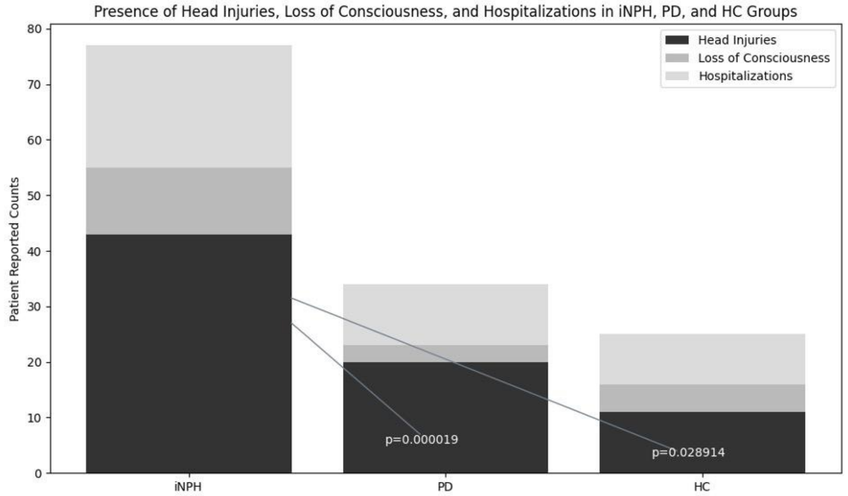
Limited research has explored the link between lifetime concussions and iNPH, despite indications of elevated neurodegenerative disease risk associated with concussions], shared pathophysiological findings (e.g., intracranial pressure outcomes) and the association between TBI and acquired NPH [3]. Thus, our study sought to explore the history of concussion in patients with iNPH diagnosis.

METHOD

This study took place at the Movement Disorders Centre of Toronto Western Hospital with prior approval from the University Health Network research ethics committee (REB # 15-8777).

A standardized case report form was developed using REDcap to collect demographic, lifestyle factors and clinical data regarding lifetime head injury exposure and other medical history. The study aimed to contact all iNPH patients followed by the clinic and a cohort of age- and sex-matched PD patients (263 individuals in total) from our database.

RESULTS



- NPH group showed a significantly greater proportion (n = 43, 76.8%) of head injury history, compared to the PD (n = 19, 47.5%) and HC (n = 10, 25.0%) groups (X^2 = 23.66, df = 2 p = .00000726).
- HC group reported the highest proportion of LOC events (n = 5, 50.0%), the NPH group the second highest proportion (n = 12, 27.9%) and the PD group had the lowest proportion (n = 3, 15.8%).
- HC group reported the highest proportion of hospitalizations due to head injury (n = 9, 90.0%) while the NPH (n = 22, 51.16%) and PD (n = 11, 57.9%) groups both showed a similar proportion.
- No significant statistical between-groups difference was detected (X^2 = 3.4048, df = 2, p = .182248 and X^2 = 2.767, df = 2, p = .250696, respectively).

CONCLUSIONS

To our knowledge, this is the first study to examine the relationship between concussion and iNPH. Among the 56 iNPH patients, 40 PD controls, and 40 healthy controls sampled, we found evidence that prior head trauma is commonly reported in patients with an established diagnosis of iNPH.

These findings are plausible given the shared aspects of iNPH and concussion pathogenesis. Key pathophysiological similarities include reduced cerebral blood flow in both NPH and TBI patients. Additionally, both conditions exhibit alterations in white matter structure. In NPH, gait abnormalities are linked to microstructural damage in motor and sensory pathways around the ventricles, while TBI is associated with abnormalities in white matter tracts as well as generalized cerebral atrophy.

Given the comparable pathophysiological features shared by concussion and iNPH, it prompts consideration whether more minor head traumas such as subconcussive impacts could induce the CSF dysfunctions that later typify iNPH.

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