Maternal and Infant Factors Associated With Infantile Hydrocephalus

Source: *Tully HM, Capote RT, Saltzman BS. Maternal and infant factors associated with infancy-onset hydrocephalus in Washington State. Pediatr Neurol. 2015;52(3):320-325; doi:10.1016/j.pediatrneurol.2014.10.030*

PICO

Question: Among children with hydrocephalus, what maternal and infant characteristics are associated with its diagnosis in the neonatal period?

Question type: Causation

Study design: Case-control

Investigators from the University of Washington and Seattle Children's Hospital conducted a case-control study to determine risk factors for hydrocephalus in infants. Cases were children with hydrocephalus born in Washington State from 1987-2012, and were identified through review of birth certificate data and ICD-9 codes of hospital discharge records through the first year of life. Control infants were identified from birth records and matched to cases by year of birth. Hydrocephalus among the case infants was subdivided into 3 groups: hydrocephalus with neural tube defect, prenatal-onset hydrocephalus, and hydrocephalus associated with intracranial hemorrhage. Maternal/infant demographic data and clinical characteristics of case and control infants were abstracted from birth certificate data and included maternal age, gestational age at delivery, race/ethnicity, diabetes, hypertension, and gender. Logistic regression was used to identify independent risk factors associated with each of the 3 types of infantile hydrocephalus after controlling for confounding variables.

Data on 1,748 case infants with hydrocephalus and 19,700 controls were analyzed. Among the cases, 332 infants had hydrocephalus with neural tube defects, 402 had prenatal-onset hydrocephalus, and 446 developed hydrocephalus associated with intracranial hemorrhage. Maternal Asian race was independently associated with reduced risk of all subtypes of hydrocephalus, compared with white mothers. Pre-existing maternal diabetes was associated with a statistically increased risk of prenatal-onset hydrocephalus and hydrocephalus associated with intracranial hemorrhage (OR = 5.20 and 5.26, respectively). Maternal hypertension had a positive association with hydrocephalus with intracranial hemorrhage subtype but an inverse association with hydrocephalus with neural tube defect. Gestation <30 weeks was associated with an increased risk for all 3 subtypes of hydrocephalus, especially hydrocephalus associated with intracranial hemorrhage. Male gender was associated with hydrocephalus with intracranial hemorrhage. No associations occurred with maternal age or parity.

The authors conclude that the risk profile for infantile hydrocephalus supports its biologically heterogenous nature and should inform future research.

Commentary by

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Dr Millichap has disclosed no financial relationship relevant to this commentary. This commentary does not contain a discussion of an unapproved/investigative use of a commercial product/device.

In a review of the epidemiology, classification, and causes of hydrocephalus, Tully and Dobyns[1] conclude that infantile hydrocephalus is a complex condition with both genetic and environmental causes. In acquired hydrocephalus, an extrinsic cause is often apparent by history or imaging findings but in many children, hydrocephalus is a marker of abnormal brain development, assumed to be genetic. The majority of genes known to cause hydrocephalus are associated with clinical syndromes, and geneticists divide hydrocephalus into syndrome (eg, L1CAM-associated hydrocephalus) and nonsyndrome forms. In a series of 411 infants with hydrocephalus, 175 had a confirmed or suspected extrinsic or acquired cause, most commonly prematurity-associated intraventricular hemorrhage (other causes include neoplasm and infection, usually bacterial meningitis). The remaining 236 patients had no extrinsic cause for the hydrocephalus, but 28 had an identifiable genetic syndrome.[1] In a Danish population-based study, strong evidence of familial aggregation of developmental hydrocephalus suggests a major contribution from unrecognized genetic factors.[2]

Editors' Note

The current study adds to our knowledge by identifying potentially modifiable risk factors for specific subtypes of hydrocephalus. Because the etiologies of infantile hydrocephalus are multiple and potentially unrelated, it is not surprising that clinical conditions in mothers had variable effects on the different subtypes.

References

1. Tully HM, et al. *Eur J Med Genet*. 2014;57(8):359-368; doi:10.1016/j.ejmg.2014.06.002
2. Munch TN, et al. *Brain*. 2012;135(Pt 8):2409-2415; doi:10.1093/brain/aws158

Key words: hydrocephalus, intraventricular hemorrhage

Continuing Thoughts — Evidence eMended*

*emend — from the Latin (c. 1400), "to free from fault"; to improve by critical editing

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