Children's Hospital of Philadelphia
PolicyLab

Predictors of Impaired Neurodevelopmental Outcomes at One Year of Age After Infant Cardiac Surgery

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OBJECTIVE: For most newborns, congenital heart defects (CHD) appear to be isolated anomalies and the brain is presumed to have normal developmental potential. Most studies of neurodevelopmental outcomes have focused on operative management strategies.

METHODS: Infants with complex CHD and no identified syndromes other than 22q11 microdeletions enrolled in a study of apolipoprotein E (APOE) polymorphisms and developmental outcome were evaluated at one year of age; including genetic evaluation and the Bayley Scales of Infant Development-II [mental (MDI) and psychomotor developmental indices (PDI)].

RESULTS: Five hundred and fifty infants enrolled and 359 (20 with 22q11) of 501 survivors (72%) returned. Mean MDI was 90+/-15 and PDI was 78+/-18. Genetic syndromes not identified at birth were confirmed in 28 (8.1%) and suspected in 51 (15.0%). By multivariable analysis, suspected/confirmed genetic syndromes and APOE varepsilon2 allele predicted lower MDI and PDI, all $p<0.04$. Lower birth weight ($p<0.001$) and preoperative intubation ($p=0.012$) predicted lower MDI. Higher hematocrit during the initial operation was associated with higher MDI ($p=0.007$). Longer postoperative length of stay was predictive of lower PDI ($p=0.002$). Additional operations with cardiopulmonary bypass were associated with lower MDI and PDI (both $p<0.002$), but use of deep hypothermic circulatory arrest was not.

CONCLUSIONS: Patient factors (birth weight and preoperative status) are significant determinants of neurodevelopmental outcomes as opposed to operative management strategies. In this cohort, genetic syndromes unsuspected at birth were surprisingly common and correlate with poor neurodevelopmental outcomes. Without multiple congenital anomalies, syndromes may be missed in infancy. Genetic evaluation should be considered in all infants with CHD.

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