STRONG CHILDREN'S RESEARCH CENTER

Summer Research Scholar

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ABSTRACT

Title: Renal Outcomes 2 Years After Therapeutic Cooling Protocol for Hypoxic Ischemic Encephalopathy

Background: Therapeutic cooling is the standard of care for hypoxic ischemic encephalopathy (HIE) in term and near-term infants. Unfortunately, this treatment has been observed to result in peripheral damage to other organs. HIE is often associated with acute kidney injury (AKI). AKI itself is associated with future impaired renal function. The effects of a therapeutic cooling protocol alone on renal outcomes are not well known. The aims of this study are to:1.) describe the renal function of 2 years olds with a history of having undergone therapeutic cooling for HIE and 2.) to determine if AKI during the neonatal period in infants who have undergone cooling predicts worse renal function compared to infants post cooling without history of AKI, and 3.) examine neonatal predictors of renal function at 2 years of age.

Methods: This is a retrospective study of 41 participants who were patients with a history of whole-body therapeutic cooling for HIE as neonates and seen in renal clinic for follow-up examinations of renal function. Chart review extracted variables on maternal conditions, delivery room resuscitation, cord gas values, APGAR scores, discharge diagnoses, and other NICU variables. The renal outcomes assessed at 2 years included blood pressure, serum creatinine (Creat) and Cystatin C (Cys C), urine protein/creatinine and microalbumin/creatinine, and kidney length. The CKiD U25 equations based on serum Cys C and Creat were used to estimate GFR. The average of the Cys C and Cr GFRs (Avg eGFR) was used to classify renal outcome as normal or abnormal (<90 or > 130 ml/min/1.73m^2) The Fisher's test or logistic regression was used to explore relationships between neonatal variables and 2-year outcome. $p < 0.05$ was considered significant.

Results: 19 subjects completed 2 years of follow-up. 4 subjects had an abnormal Avg eGFR at 2 years and 2 subjects with a history of AKI. None of the variables were associated with an abnormal Cys C-eGFR or average-eGFR at 2 years of age. AKI in the NICU was not associated with any of the 3 abnormal eGFR outcomes. Presence of neonatal hypotension (MAP < 40) and maternal chronic hypertension were significantly associated with an abnormal Creat-eGFR at 2 years. AKI was associated with maternal hypertension, DR resuscitation and hypotension. Greater than 20% wt gain in the 1st week was borderline significant for association with AKI, $p = 0.051$. No patient had hypertension, abnormal urine protein, or abnormal renal length at the 2-year visit.

Conclusions: All neonates who have undergone a therapeutic cooling protocol for HIE in the NICU should continue to be seen until 2 years of age at renal clinic. Incidence of hypotension during admission or maternal chronic hypertension may indicate a risk for abnormal Creat GFR. Further research is required to differentiate which patients will have impaired eGFR at 2 years to avoid unnecessary visits for patients and promote efficient care visits. Future studies should include a larger patient group for a greater possibility of detecting relationships between neonatal events in this population and renal outcome at 2 years.