PEDIATRIC NEUROLOGY BRIEFS
A MONTHLY JOURNAL REVIEW

J. GORDON MILLICHAP, M.D., F.R.C.P., EDITOR

METABOLIC DISORDERS

BRAIN INJURY PATTERNS AFTER NEONATAL HYPOGLYCEMIA

Brain injury patterns on early MRI and neurodevelopmental outcome after symptomatic neonatal hypoglycemia were studied in 35 term infants at Hammersmith Hospital, Imperial College London, UK. The infants showed no evidence of hypoxic-ischemic encephalopathy, and the median glucose level was 1 mmol/L. Perinatal history was compared with data from 229 term, neurologically normal infant controls. Outcome was assessed at a minimum of 18 months. MRI revealed white matter abnormalities in 94% of infants, severe in 43%, predominantly posterior in location in 29%, and hemorrhagic in 30%. Cortical abnormalities occurred in 51% infants, basal ganglia/thalamic lesions in 40%, and abnormalities of the posterior limb of the internal capsule in 11%. Middle cerebral artery infarctions were present in 3 infants. Patterns of injury were not correlated with severity or duration of hypoglycemia. Nine children with neonatal seizures had moderate or severe white matter injury and 7 had cortical involvement.

At 18-month follow-up of 34 children, outcome was normal in 8, showed mild impairment in 15, moderate in 8, and severe impairment in 3. Six had cerebral palsy, and 3 had mild motor delays. Cognition was mildly delayed in 3 and moderately delayed in 5. Seizures developed later, before age 2 years, in 12; these were infantile spasms in 3, generalized in 2, focal in 1, associated with recurrent hypoglycemia in 1, and unspecified in 2 children. Febrile seizures occurred in 3 infants. Suboptimal head growth occurred in 9 of 28 children, growth restriction in 14, and visual impairments in 11. Outcomes correlated with MRI findings; 9 of 14 children with severe global white matter changes had very low developmental quotients and 5 had normal or mildly abnormal outcomes. Family history of seizures, pregnancy-induced maternal hypertension, emergency cesarean section, and need for resuscitation were more common in hypoglycemic patients than controls. (Burns CM,

Rutherford MA, Boardman JP, Cowan FM. Patterns of cerebral injury and neurodevelopmental outcomes after symptomatic neonatal hypoglycemia. **Pediatrics** July 2008;122:65-74). (Respond: Frances M Cowan MRCPCH, PhD, Dept Paediatrics, Hammersmith Hospital, 5th Floor, Ham House, Du Cane Rd, London, England W12 0HS. E-mail: fcowan@imperial.ac.uk).

COMMENT. The definition of hypoglycemia in the newborn is unclear because the lower limit of an accepted 'safe' normal has not been determined. Susceptibility to brain injury following hypoglycemia varies with the individual, based on gestational age GA), maternal glucose metabolism, glucose content of early feeding, and occurrence of hypoxemia and ischemia. Some authorities consider a glucose level of <50 mg/dL should be viewed with suspicion and a threshold level for recommended treatment. (Behrman-Nelson **Textbook of Pediatrics**, 17th ed. Philadelphia, Saunders, 2004;505-518). Others state that serum glucose of <30 mg/dL (1.65 mmol?l) in the first 24 hours after birth and <45 mg/dL (2.5 mmol/L) thereafter constitute hypoglycemia of the newborn. (Cornblath M et al. **Pediatrics** 2000;105:141-5). The criteria employed for inclusion in the above Hammersmith Hospital study were a GA of >36 weeks, one or more episodes of hypoglycemia (blood or plasma glucose level of <2.6 mmol/L) associated with acute neurologic symptoms in the first week (eg jitteriness, seizures, hypotonia), and MRI at postnatal age of <6 weeks. Patients with evidence of HIE, congenital infection or brain malformations were excluded. Hypoglycemia of <1.5 mmol/L was considered severe.

The study provides new evidence of variability of MRI-defined brain injury in neonates with symptomatic hypoglycemia, and their neurodevelopmental outcomes at 18-24 months. MRI abnormalities fail to correlate with severity and duration of neonatal hypoglycemia. In contrast, severity of white matter injury, the most common MRI abnormality, is a good predictor of outcome. A review of the literature for case series with longer follow-up found a study in the Netherlands involving 75 term infants with transient hypoglycemia on the first day of life, born to non-diabetic mothers, and examined at 4 years of age by the Denver Developmental Scale and the Child Behavior Check list. No significant differences in psychomotor development are observed between children with normal neonatal glucose levels and hypoglycemic subjects (plasma glucose <2.2 mmol.L/one hr after birth, or <2.5 mmol/L subsequently). (Brand PL et al. **Arch Dis Child** 2005;90:78-81). In the present series, with shorter follow-up, 85% are walking by 2 years, 14% have moderate cognitive delay, one third have small head size, one third have visual abnormalities, and 27% develop later seizures. Further follow-up is recommended to assess functional impairments at school age.

TRAUMATIC DISORDERS

DIAGNOSIS AND TREATMENT OF TRAUMATIC CAROTID ARTERY DISSECTION

Nineteen reports of pediatric cases of extracranial traumatic carotid artery dissection (CAD), obtained through PubMed search, were reviewed by researchers at Texas Children's Hospital and Baylor College of Medicine, Houston, TX. Diagnosis made after onset of ischemic symptoms was confirmed by cerebral angiography in 24 of 34 patients, and