Selected Summaries

Cerebrospinal Fluid Abnormalities in Seizures

[Rider LG, Thapa PB, del Beccaro MA, Gale JL, Foy HM, Farxvell JR, Mendelman PM. Cerebrospinal fluid analysis in children with seizures. Pediatr Emerg Care 1995, 11: 226-229]

Cerebrospinal fluid (CSF) examinations of 212 children aged 2 to 24 months with idiopathic non-febrile seizures, complex febrile seizures, or status epilepticus, who had a lumbar puncture (LP) within 24 hours of the convulsion, were reviewed to determine whether an idiopathic convulsion can result in CSF abnormalities. All eligible cases were reviewed by a panel of pediatricians, pediatric neurologists, and epidemiologists for inclusion in the study and were also categorized by their history of neurologic events before the onset of qualifying illness. Any child with a preexisting seizure disorder, prior febrile seizures, congenital abnormalities of the central nervous system, and/or documented developmental delay was considered to have an abnormal prior neurologic status. Patients were excluded for any of the following: cases of probable viral meningitis (CSF WBC count <100/mm^3 with negative bacterial cultures), positive tumors, septicemia/ bacteremia, enteric pathogens in stool cultures, seizures from trauma or poisoning, or simple febrile seizures Children with complex febrile seizures had a median CSF white blood cell (WBC) count of 1 cell/mm3 (range 0-19 cells/mm^3) and a median CSF polymorphonuclear (PMN) cell count of 0 cells/mm^3 (range 0-8 cells/mm^3). The CSF WBC count was elevated above the upper limit of normal of 5 cells/mm^3 in 9.8% and the absolute number of PMN cells was more than 0 cells/ mm^3 in 26.2% of the complex febrile seizure subjects. A total of 8 WBC/mm^3, 4 PMN/mm^3, protein of 73 mg/dl and glucose of 119 mg/dl determined the 95th percentile CSF values for the patients with complex febrile seizures. Patients with non-febrile seizures or with status epilepticus had similar findings. There was no statistically significant difference in the CSF WBC count or PMN counts between patients with complex febrile seizures versus patients with non-febrile seizures or status epilepticus. Analysis of patients with all three types combined showed that 9.5% had CSF WBC count outside the normal range of 5 WBC/mm3. Fourteen of the 142 (with a differential count of their CSF available) had 2-9 PMN/mm^3, 7.5% had CSF protein between 45-100 mg/dl and 2% between 115-419 mg/dl, 2.5% had a value of CSF glucose of <45 mg/dl.

It was concluded that complex febrile seizures, idiopathic non-febrile convulsions or status epilepticus may affect CSF findings in children; however, CSF with >20 WBC/mm^3 or > 10 PMN/mm^3 should not be attributed to seizures *per se.*

Comments

CSF examination is a part of the evaluation of most of the infants who present with seizures. The examination is often rewarding when it suggests acute bacterial meningitis (ABM) or other pathological processes. However, in many clinical situations the CSF WBC count, protein and sugar may be equivocal and one may not be able to decide whether these CSF abnormalities are due to some other pathologic process or due to convulsions *per se*.

Postictal pleocytosis of >5 WBC/mm^3 has been reported in 18%, elevation of CSF protein (range 45-200 mg/dl) in 10-23% and CSF glucose ranging from 38-204 mg/dl in up to 15% adult patients with repetitive generalized tonic clonic seizures, status epilepticus or partial epilepsy. In contrast, studies in children with simple febrile seizures have reported CSF pleocytosis in 0-3%(l,2) and CSF protein >40 mg/dl in less than 2% cases(l,2). PMN have been reported in CSF in 20% of cases in children with status epilepticus in one study(3) but most of the earlier reports have not thoroughly examined this aspect. Most studies describe adult patients, children with simple febrile convulsions, or do not provide complete LP findings. The information on CSF findings exclusive to infants aged 2 to 24 months, population at high risk for ABM, has not been reported earlier. This retrospective study has reviewed the CSF findings in this age group with complex febrile seizures, status epilepticus, or idiopathic non-febrile seizures to determine whether a convulsion may be associated with CSF abnormalities. While higher CSF WBC count, protein and lower CSF glucose values have been widely accepted in healthy preterm and term infants <1 month of age as normal, the standard values for children <1 month are not as ' well documented. The present study has examined this issue with reference to some of the non-infectious conditions of CNS which present with convulsions in children. The authors have highlighted the fact that 26% of their complex febrile seizures (20% for all seizure types combined) would have been considered to have had an abnormally high CSF PMN count using the generally accepted norms of no PMN in the CSF of children older than 2 months of age. The increase in CSF protein as a consequence of seizures may be due to a break down of the blood brain barrier. Both CSF and blood glucose may transiently rise within 24 hours of a seizure because of an epinephrine induced stress response^). Since none of their children with seizures had >20 WBC/mm^3 or >9 PMN/ mm^3 they suggest that children with this degree of pleocytosis should be evaluated more rigorously for meningitis.

The results of this study are quite interesting particularly with reference to borderline CSF findings which are often encountered in clinical practice. However, limited inferences can be drawn from this study since it is based on retrospective data. As only 44% of their patients with a seizure had a CSF examination within 24 hours of the convulsion, it was not possible for them to have details for all the patients for WBC differential, paired CSF and serum glucose concentration, elapsed time from seizure to time of LP or comparison of patients with positive bacterial cultures versus patients without evidence of bacterial disease. A well designed prospective study controlling for these factors will prove helpful in documenting the usual CSF picture in a number of seizure disorders. In our context, it would be prudent to note that in the present study all cases with positive bacterial or viral cultures from the CSF, enteric pathogens in stool cultures and evidence of septicemia/ bacteremia were excluded. In view of the high morbidity, mortality and long term sequelae associated with ABM in young children and with the limited availability of microbiological support to rule out infection, it seems unwise to attribute CSF changes of up to 4 PMN/mm^3 and protein of 73 mg/dl in the CSF to the convulsions *per se.* Diligent efforts are warranted to exclude ABM even with such CSF findings.

REFERENCE

1. Wolf SM, Carr A, Davis DC, *el al.* The value of phenobarbital in the child who has a single febrile seizure: A controlled prospective study. Pediatrics 1977, 59: 378-385.
2. Yachha SK, Patwari A, Bhan *et al* Cerebrospinal fluid and blood glucoselevels in febrile convulsions. Indian Pediatr 1981, 18: 117-119.
3. Woody RC, Yamauchi T. Cerebrospinal fluid cell counts in childhood idiopathic status epilepticus. Pediatr Infect Dis J 1988, 7: 298-299.
4. Rutter N, Smales OR. Calcium, magne sium and glucose levels in blood and CSF of children with febrile convulsions. Arch Dis Child 1976, 51: 141-143.

A.K. Patwari,

Professor of Pediatrics,
Lady Hardinge Medical College and
Associated Kalawati Saran Children's
Hospital, New Delhi 110 001.