Validity of Serum Sodium and Calcium Screening in Children with Febrile Convulsion

Azar Nickavar[*1], Hosein Hasanpour[1], and Kambiz Sotoudeh[2]

[1] *Department of Pediatric Nephrology, Aliasghar Childrens' Hospital, School of Medicine, Iran University of Medical Sciences, Tehran, Iran*

[2] *Department of Pathology, School of Medicine, Iran University of Medical Sciences, Tehran, Iran*

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Abstract- Febrile convulsion (FC) is the most common seizure disorder in young children. Different predisposing factors have been suggested to enhance the susceptibility to febrile seizure and its recurrence. The main objective of this study was to identify the adverse effect of electrolytes disturbance in FC and its recurrence. The medical records of 175 children with convulsive disorders were reviewed. Patients were divided into 3 groups. Group A (n=71) with simple febrile convulsion (FC) and group B (n=54) with recurrent FCs. Fifty children (group C) with non-FC served as control. Serum sodium and calcium concentrations were significantly lower in groups A and B compared to the control group. Serum sodium level was not significantly different between group A and B patients (134.4 vs. 134.7 mEq/l) but was significantly lower in group A than the control group (*P*= 0.014). Serum calcium concentration did not differ among the 3 groups. Minor abnormal levels of serum sodium concentration were detected in children with febrile convulsions. Thus, routine serum electrolytes screening are not recommended in febrile seizure.

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Key words: Febrile convulsion, recurrence, sodium, calcium, electrolytes

Introduction

Febrile convulsions (FC) are seizures occurring in a neurologically healthy child. 2-4% of children experience a FC during the first 6 years of life (1) and approximately 1/3 will have recurrent episodes (2). Therefore, recognition of predisposing factors seems important to prevent of a repeated attack.

During an acute febrile disease, mild disturbance of water and electrolyte balance occurs frequently (2). It has been suggested that changes in serum electrolyte levels, might enhance the susceptibility to seizure and its recurrence during a febrile disease in childhood (2-4). On the other hand, Kenney et al. (1992) have shown that routine measurements of biochemical tests are not necessary in FC (5). These investigators have shown that measurement of serum sodium, calcium and glucose levels may result in a very low number of abnormal findings, particularly in children with febrile seizure (6).

The aim of this study was to assess the prevalence of electrolytes disturbance in children with simple and recurrent FC.

Patients and Methods

This is a study conducted in children with febrile seizure admitted at Aliasghar Children Hospital in the past 5 years (2002-2007) in Tehran, Iran. Hospital admission medical records of children (6 months to 6 years) with FC in the past 5 years were carefully reviewed.

Patients were grouped in simple FC (group A) and recurrent FC (group B). The inclusion criteria for group A were: generalized tonic clonic seizure in a febrile child (axillary temperature > 38 degree centigrade) lasting less than 15 minutes and occurring once in 24 hours. The inclusion criteria for group B were: generalized tonic clonic seizure in a febrile child (axillary temperature > 38 degree centigrade) lasting more than 15 minutes and occurring more than once in 24 hours. A third group (group C) of patients with generalized non febrile seizure (with duration of less than 15 minutes) with measured serum electrolytes after seizure in emergency department (ED) was considered as control group. Children with preexisting neurologic and nephrologic disease or central nervous system infection were excluded

***Corresponding Author:** Azar Nickavar
Department of Pediatric Nephrologist, Aliasghar Childrens' Hospital, School of Medicine, Iran University of Medical Sciences, Tehran, Iran
Tel: +98 21 22226127, 912 3151651, Fax: +98 21 22226127,E-mail: anickavar@yahoo.com

Table 1. Patients demographic and biochemical characteristics*

Variables	All patients with febrile convulsions (Groups A and B) N = 125	Patients with Non-febrile Convulsions (Control group) N = 50	*P value**
Age (months)	23.7 ± 14.5	21.3 ± 18.7	*NS***
Female / Male	55 / 70	17/33	*NS***
Sodium mEq/l	134.5 ± 3.9	136.9 ± 5.5	*0.001*
Calcium mg/dl	9.1 ± 0.6	9.3 ± 0.6	*0.037*

*Mean ± SD, **NS = Not Significant

from the study.

Serum concentrations of electrolytes were performed by conventional methods in the hospital laboratory. Normal serum sodium was considered as 135- 150 mEq/L and normal calcium level as 9-11 mg/ dl, according to the hospital reference values.

SPSS software program version 11.5 was used for data analysis. Data are reported as mean ± SD or mean and *P value* of 0.05 or less is considered statistically significant. Comparison between two groups (A + B and C) was performed by Student's t-test and triple group (A and B and C) comparison was performed using analysis of variance. Bonferroni test with corrected P value was used for post hoc comparison. Levene's test was done for equality of variances.

Results

Data collected from 175 patients (72 female and 103 male) were analyzed. Mean age at presentation was 23 (range 1-72) months. 71 (56%) had simple and 54 (44%) recurrent FC.

Comparison of FC in groups A and B combined with control group (C) showed that sodium and calcium levels were higher in control group than FC groups (Table 1).

Analysis of variance showed that the mean age and gender distributions between the groups were not different significantly (Table 2). In group A, serum sodium level was significantly lower in group A than group C, but was not different compared to group B. Serum calcium levels were similar among the 3 groups. In all three groups, the abnormal test results were rather low.

Discussion

FC is a terrifying event for the parents, which seeks emergent medical attention. Attempts have been made to identify predisposing risk factors and predictors of seizure recurrence. This knowledge has a practical value whether to admit the child and advising parents of a repeated convulsion (7).

Pathogenesis of FC is not completely recognized. Interleukine-1(IL-1), a pyrogenic substance, triggers the ADH secretion and presents in significantly higher titers in peripheral monocytes of children with FC. However, it is of debate whether the increased level of IL-1 is involved in the pathogenesis of FC (8).

Table 2. Comparison of laboratory data in patients with convulsion*

Variables	Patients with simple febrile convulsion (Group A) N = 71	Patients with recurrent febrile convulsion (Group B) N = 54	Patient with non-febrile convulsion (Group C) N = 50	*P value*
Age (months)	24	22.9	22.8	*NS***
Female/Male	31/40	24/30	17/33	*NS***
Sodium mEq/l	134.40	134.78	136.98	*0.014**
Calcium mg/dl	9.17	8.97	9.32	*NS*

* A<C

* Mean value **NS = Not Significant

The main objective of this study was to evaluate serum electrolytes of children with either simple or recurrent (FC). In the current study, we did not find significant causal relationship between serum electrolytes abnormalities and incident FC. This findings are in consistent with the results reported by the American Academy of Pediatrics (9, 10).

There are conflicting reports of serum sodium as an independent predictor of FC (2, 3, and 7).

However, because abnormal serum electrolytes are very rare in children with FC (6, 10-14), it is difficult to interpret results of these reports.

The weakness of the association between serum electrolytes changes and incident FC suggests that alteration in serum electrolytes is unlikely to play a clinically significant role in causing seizures in patients with FC. Therefore, routine measurement of serum electrolytes is not warranted in this group of seizure disorders. In conclusion, there was not significant alteration of serum electrolytes in children with simple or recurrent febrile convulsion in this study. Longitudinal studies may be needed to provide a definite answer to this question.

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