

Is Lumbar Puncture Mandatory for First Simple Febrile Seizures Among Children 6 to 18 Months of Age?

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Abstract

Background: Fever with seizure, is a common complaint with which a child may presented to the emergency department, is mainly due to febrile seizure, but it may also be due to central nervous system infection.

Objective: This study was done to evaluate the utility of Lumbar puncture for first simple febrile seizures among children 6 to 18 months of age.

Method: A prospective study was conducted in emergency department of Karbala teaching hospital for children. Patients who were presented with first simple febrile seizure in age group 6 to 18 months were included. Lumbar puncture was done and meningitis diagnosed on the bases of either cytological and biochemical criteria or Cerebrospinal Fluid culture.

Results: Out of 105 patients with First simple febrile seizure, 41 patients (39.05%) were 6 to 12 months old, 41.5% of them had meningitis while 64 patients (60.95%) were 12 to 18 months old, and 17.2% of them had meningitis. Cerebrospinal Fluid, cultures were negative in all cases. Meningitis was more in males than females for both age groups with a male:female ratio 3:1.

Conclusion: First simple febrile seizure is a common pediatric emergency and high percent of patients with this sole presentation had meningitis.

Key words: First simple febrile seizure, Lumbar puncture, Meningitis.

Abbreviations. FSFS: First simple febrile seizure, L.P: Lumbar puncture, CSF: Cerebrospinal Fluid, P value: Probability Value.

الخلاصة

الاختلاجات الحرارية من الحالات الشائعة التي يعاني منها الأطفال والتي توجب إدخالهم ردهة الطوارئ. تم تنفيذ هذه الدراسة لمعرفة نسبة الإصابة بالتهاب الأغشية السحائية لدى الأطفال الذين يعانون من اختلاجات حرارية للمرة الأولى ومن النوع البسيط, وكذلك لمعرفة مدى ضرورة استخدام تحليل السائل الشوكي لديهم. نفذت هذه الدراسة في مستشفى كربلاء التعليمي للأطفال للفترة من الأول من تشرين الثاني 2009 إلى الحادي والثلاثين من تشرين الأول 2010, وكان مجموع المرضى الكلي 105 مريض تتراوح أعمارهم من 6 أشهر إلى 18 شهر. اجري لهم تحليل السائل الشوكي بعد اخذ موافقة ذويهم. تم تشخيص الإصابة بالتهاب الأغشية السحائية بالاعتماد على معرفة عدد الخلايا والمقياس الكيميائي الحيوي المتضمن البروتين والسكر في السائل الشوكي أو بعزل البكتيريا المرضية عن طريق زرع عينة من السائل الشوكي. وجد ان من بين 105 مريض, نسبة الإصابة بالتهاب الأغشية السحائية للمرضى الذي تتراوح أعمارهم من 6 شهر إلى 12 شهر هو 41.5%, بينما نسبة الإصابة للمرضى الذين تتراوح أعمارهم أكثر من 12 شهر إلى 18 شهر هو 17.2% كما وأظهرت الدراسة ان معدل إصابة المرضى بالتهاب الأغشية السحائية أعلى للذكور منه للإناث وبمعدل 3 : 1

Introduction

Febrile seizures are defined as provoked convulsion secondary to fever without evidence of central nervous system pathology and occurring in children between the ages of 6 months to 6 years¹. Febrile seizure is a common cause of convulsions in young children. They occur in 2 to 4 percent

of children younger than five years of age, but the incidence is as high as 15 percent in some populations. This incidence has been attributed to closer living arrangements among family members making detection more likely, but racial and geographic variations may also be important².

The generally accepted criteria for febrile seizures include:

1. A convulsion associated with an elevated temperature greater than 38°C.
2. A child younger than six years of age.
3. No central nervous system infection or inflammation.
4. No acute systemic metabolic abnormality that may produce convulsions.
5. No history of previous febrile seizures².

Febrile convulsions are divided into two categories, simple (benign), or complex, based upon clinical features.

Simple febrile seizures are the most common and are characterized by seizures that last less than 15 minutes, have no focal features, and, if they occur in a series, the total duration is less than 30 minutes^{2,3}.

Complex febrile seizures are characterized by episodes that last more than 15 minutes, have focal features or postictal paresis, and occur in a series with a total duration greater than 30 minutes^{2,3}.

It is not known how or why seizures are generated in response to fever; it may be that fever-induced factors (eg, interleukin-1beta) are proconvulsant in individuals who are susceptible based upon the stage of brain development and genetic susceptibility^{4,5}. Certain ion channels in

the brain are temperature sensitive and may generate fever-associated desynchronized neuronal activity^{6,7}. There is also evidence to suggest that hyperthermia-induced hyperventilation and alkalosis may play a role⁸.

Susceptibility to febrile seizures has been linked with abnormalities in neurotransmitters. However, whether observed abnormalities were primary events or were secondary to the convulsions is unclear.

Genetic and familial factors appear to be important factors in the expression of febrile convulsions and the subsequent development of epilepsy in some children⁹. Susceptibility to febrile seizures has been linked to several genetic loci in different families, including the long arm of chromosome 8q13-21 (FEB1)⁹, chromosome 19p (FEB2)^{10,11}, chromosome 2q23-24 (FEB3)¹², chromosome 5q14-15 (FEB4)¹³, chromosome 6q22-q24 (FEB5)¹⁴, chromosome 21q22¹⁵

Febrile seizures can be present as the first symptoms of the illness to the parents and can be subdivided into:-

1. Simple Febrile seizure, forms about 2/3 of the usually single, brief, lasting up to few minutes < (15m) and terminate spontaneously with complete recovery
2. Complex (atypical) Febrile seizure forms 10-30% of which characterized by either be:

- A. Focal.
- B. Prolonged (>15 minute).
- C. Repeated within 24 hours

Admission in febrile seizure is Indicated in¹⁶:

1. All children with first febrile seizure.
2. Children under 18 months of age with febrile seizure.
3. Children with complex febrile seizure.
4. If there is suspicion of intracranial diseases.
5. Social factor like parental fear..

Lumbar puncture in febrile seizure is indicated in:

1. Any child under age of 18 months with first febrile seizure whatever of clinical finding.
2. If recovery is slow from the seizure attack.
3. If no obvious causes for the fever is found.
4. If close follow up will not be possible.
5. If any doubt exist about the possibility of meningitis.

This study was conducted to evaluate the significance and necessity of lumbar puncture in children less than 18 months with first simple febrile seizure.

Patients and methods

The study was conducted in Karbala teaching hospital for children, Karbala, Iraq, over one year period from November 1, 2009 to October 31, 2010. The study subjects included 105 patients, 6 - 18 months old, admitted to hospital with FSFS. All patients underwent a detailed focused history and complete physical examination. An inquiry sheet was filled in including, age, sex, degree of fever in Celsius at presentation, character of convulsion (type, duration, and frequency), family history of convulsion or epilepsy, duration of fever prior to seizure, level of consciousness, blood pressure, and fundoscopic examination. Exclusion criteria were:

1. Children with other neurological disease like cerebral palsy or mental retardation.
2. Patients with ventricular-peritoneal shunt.
3. Patients with clinical signs of meningitis or toxicity (bulging fontanel, nuchal

rigidity, petechiae, positive kerning sign, positive Brudzinski sign, irritable or shocked ... etc).The following investigations were done to explore the possible cause of seizure and fever (blood culture and sensitivity, complete blood count, c-reactive protein, blood sugar, serum calcium, general urine examination and chest X-ray when indicated).

Lumbar puncture was performed to all patients in the study, two samples of CSF collected in sterile tubes, one sent for cytology and biochemical assessment and the other sample was sent for culture and sensitivity. Meningitis was diagnosed if CSF more than 5 leukocytes / mm³, polymorphonuclear neutrophils PMNs predominate or positive CSF culture. Verbal consent was taken from care givers of all patients enrolled in the study.

Results

As shown in table (1), 105 cases that presented with febrile convulsion 39% (n=41) children between age group 6 to 12 months, 41.5 % (n=17) had meningitis, and 61% (n=64) children between age group 12 to 18 months 17.2 % (n=11) had meningitis.

Table (2) showed that 58 cases of total number of patients were males, and 47 cases were females. In age group 6 to 12 months that diagnoses as meningitis 12 cases were males and 5 were females. And in age group 12 to 18 months 9 cases were males and 2 cases were females. So we found that males are more liable for meningitis for both age groups.

Table (1) Age of patients and percentage of meningitis

(Month)	Total	Percentage %	Non-Meningitis	Percentage %	Meningitis	Percentage %
6-12	41	39	24	58.5	17	41.5
>12-18	64	61	53	82.5	11	17.2
Total	105		77		28	

P-Value = 0.

Table (2) Sex distribution of the study patients

Age	Total	Male	Female	Meningitis		
				Total	Male	Female
6-12	41	23	18	17	12	5
>12-18	64	35	29	11	9	2
Total	105	58	47	28	21	7

P value = 0.5

Discussion

Meningitis remains an important cause of morbidity and mortality. It is a medical emergency in children and should not be missed in any patient with fever and seizure even in absence of meningeal signs. The AAP recommendation published in 1996 regarding the evaluation of young children with FSFS take into account the possible role of simple febrile seizure as a clinical predictor of meningitis¹⁷. In this study we attempt to evaluate the risk of meningitis among children with first attack of simple febrile seizure in age group 6 to 18 months and if lumbar puncture is indicated in this age group in the absence of clinical signs of meningeal irritation. Among 105 children, presented to ED with FSFS, twenty-eight patients (26.67%) had meningitis. Our study showed that in 6 to 12 months age group, 17 out of 41 patients (41.5%) had meningitis; this is in line to some extent with a study done in Nepal by Jashi Batagoo et al¹⁸, in which the percentage was around 32% in the same age group. While in age group >12 to 18 months age group, 11 out of 64 patients (17.2%) had meningitis which is parallel with Jashi Batagoo et al study in which the percentage was (17.1%). Our finding was slightly higher regarding the age group 6 to 12 months. Our study also agree with Akpede et al (which was done in the children's emergency room of the University of Benin Teaching Hospital, Nigeria)¹⁹ and Laditan et al (which was done in Hofuf, Al-Hassa, Saudi Arabia)²⁰ which reported higher rates of bacterial meningitis among children with febrile convulsion. The diagnosis of meningitis in our study based mainly on CSF cytology (more than 5 leukocytes / mm³, PMNs

predominate) and to a lesser extent on biochemical criteria. CSF cultures were negative in all cases of meningitis because most of our patients (75%) were pretreated with antibiotics before their ED assessment and some of the cases may be viral in origin or partially treated meningitis.

Our study disagree with KIMIA et al²¹, a retrospective cohort review which was done in Boston children's hospital which found that the risk of meningitis presenting as simple febrile seizure at age of 6 to 18 months was low (3.8%), also disagree with the study by Trainer et al²², which reported the risk of bacterial meningitis in age group 6 to 60 months presenting to multiple centers in the Chicago area with FSFS and they found no cases of bacterial meningitis among the 135 patients for whom CSF culture was obtained. Our study also disagrees with Teach and Geil et al and Hampers et al. The introduction of highly effective bacterial conjugate vaccines has significantly reduced the probability of bacterial meningitis among febrile children in developed countries²³, like Hib vaccine which was implemented routinely in 1988, so the incidence of the Hib infection was dramatically decreased. We may be in line with these studies in next few years after implementation of the new Iraqi vaccine schedule which will commence this year.

In 2002, Carroll and Brookfield reported that the incidence of purulent meningitis after a febrile seizure around 0.44%²⁴, while in our study, we found that the incidence of purulent meningitis around 10.7% (3 out of 28 patient with meningitis had >100 leukocytes / mm³, PMNs predominate in CSF, >200 mg/dl protein and sugar less than 2/3 of blood

glucose). Our study agrees with Camfield P.R and Camfield C.S which recommend a lumbar puncture for children under one year of age with first febrile seizure because at this age meningitis may be accompanied by very little nuchal rigidity or other findings of meningeal irritation²⁵. The present study showed that male: female ratio in children with FSFS in 6 to 18 months was 1.2:1, while most of those cases with meningitis were males 21 out of 28 (75%) as compared with 7 out of 28 (25%) females so a male: female ratio in meningitis 3:1. In addition, in our society parents seek early medical device for male sex. We can conclude that any patient with FSFS less than 18 months, L.P is mandatory.

Conclusion

FSFS is a common pediatric emergency and high percent of patients with this sole presentation had meningitis.

Recommendation

Lumbar puncture is highly indicated in a patient with FSFS in age group 6 – 12 months and necessary in the age group 12 – 18 months to rule out meningitis.

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