EVALUATION AND MANAGEMENT OF A CHILD WITH FEBRILE SEIZURE

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Abstract: Febrile seizures (FS) are self-limiting and benign convulsions associated with fever, affecting children from 6 months to 5 years of age, most commonly in children between 12-18 months of age and last only few minutes. The international League Against Epilepsy (ILAE) defines FS as "a seizure in association with a febrile illness in the absence of a central nervous system infection or acute electrolyte imbalance in children older than a month of age without prior afebrile seizures". There are simple and complex FS. A simple FS is a generalized clonic or tonic-clonic seizure, lasts less than 15 minutes and is not caused by brain infection or any other brain disease. While a complex FS is a focal or prolonged seizure and lasts more than 15 minutes. The child, either with a simple or complex FS is neurologically healthy. Evaluation of a child with febrile seizure includes medical history, family history of FS or epilepsy, physical examination, recent antibiotic therapy, recent immunization and day care attendance. Physical examination reveals normal neurological status as well as normal development of the child. In addition, signs for meningitis or encephalitis should be excluded during physical examination (e.g. stiff neck, altered consciousness). The prevalence of meningitis in children with FS is reported to be 1-2%. Management of a child with a febrile seizure includes maneuvers for cessation of seizure used as an acute phase treatment and evaluating the child for the etiology of the fever. Acute phase treatment includes appropriate lateral posturing with head extension, keeping airways open and administration of rectal diazepam. Intravenous diazepam is administrated while the child in the emergency room with a complex FS or febrile status epilepticus. When administration of intravenous diazepam is not possible, buccal midazolam is reported to be more useful than rectal diazepam. For a child with FS specific laboratory studies are not indicated except laboratory studies indicated by the underlying illness. For example in a child with diarrhea and vomiting laboratory studies for electrolytes are indicated and beneficial. Lumbar puncture (LP) is considered in children younger than 18 months because meningeal signs may be absent or subtle in this age group, while in children older than 18 months LP is considered only when there is a suspicion of meningitis. Brain MRI or CT is indicated in a child with FS if there is an increased intracranial pressure and history of trauma or a possible neurologic abnormality. Studies have not found electroencephalography (EEG) to be helpful in predicting the development of later afebrile seizure or epilepsy and that majority of these children have a normal EEG. For a child with a simple febrile seizure consultation with a neuropediatrician is rarely needed. In healthy children the consequences of FS are rare. As a first line therapy in a febrile child, antipyretics may be used as a symptomatic treatment after FS. However there is no reported evidence for prevention or decrease of FS when using antipyretics at the onset of fever. The use of neuroleptics or benzodiazepines after a simple FS currently is not recommended because of associated adverse effects, even though their use is reported to be effective in reducing the FS. However, if prevention of FS were essential oral diazepam would be used, because it is intermittent and has less adverse effects.
Keywords: Febrile seizures, meningitis, fever, epilepsy, diazepam.

I. INTRODUCTION

Febrile seizures (FS) are the most common childhood convulsions occurring only in association with fever. The international League Against Epilepsy (ILAE) defines febrile seizures as "a seizure in association with a febrile illness in the absence of a central nervous system infection or acute electrolyte imbalance in children older than a month of age without prior afebrile seizures". They are self - limiting and the most benign seizures that affect 2-14% of children. Furthermore, they affect children from 5 months to 6 years of age, with the peak incidence between 12 – 18 months of age.

Febrile seizures are classified as simple febrile seizures and complex febrile seizures. A simple febrile seizure is a generalized clonic or tonic-clonic seizure that lasts less than 15 minutes and is not caused by brain infection or any other brain disease. They represent 65-90% of all febrile seizures. While, a complex febrile seizure is a focal or prolonged seizure that lasts more than 15 minutes. Complex febrile seizures are multiple, occurring more than once during the febrile illness. Studies demonstrated that recurrent seizures within 24 hours occurred in 16% of cases with febrile seizures. Characterization of a febrile seizure as complex is important in predicting the risk of epilepsy

occurrence. A child with a simple febrile seizure is reported to have a 98% probability of not developing epilepsy in the future, while a child with a complex febrile seizure has an 85-95% probability of not developing epilepsy.
The child, either with a simple or complex febrile seizure is neurologically healthy.
Febrile seizures occur with the initiation of fever, in fact, they also may occur before the fever. A fever is an elevation of body temperature above 38C, measured rectally. So, a rectal temperature under 38C should raise concern that the seizure was not a simple febrile seizure.
Approximately in 5-9% of children with first febrile seizure, febrile status epilepticus can occur, lasting longer than 30 minutes. The recurrence of a febrile seizure in the following 12 months may occur approximately in 30-40% of children who experienced a febrile seizure, most commonly in children younger than 15 months of age, those with a family history of febrile seizure in a first degree relative, and children with occurrence of the seizure at a lower temperature.

2. EVALUATION

Evaluation should be implemented promptly in every child with a febrile seizure.
Most of the time children present for medical attendance after the seizure have been resolved.
The evaluation of a child with febrile seizures should be focused on determining the etiology of the fever that occurred in association with the seizure.
It includes medical history, physical examination and corresponding diagnostic studies.

1. The **medical history** includes questioning the parents about duration of the seizure, main complaints and other symptoms, family history of febrile seizures or epilepsy, recent immunization and recent antibiotic therapy, and day care attendance. *Hamnbidge et al* found that the delaying of the first dose of MMR (measles, mumps and rubella) or MMRV (measles, mumps, rubella and varicella) vaccine more than 15 months of age may double the risk of post vaccination seizures during the second year of life. In addition, in infants there was no association between the vaccination time and post vaccination seizures. Vaccines associated with increased risk of seizures include influenza trivalent inactivated vaccine, DTP (diphtheria, tetanus and pertussis) and MMR vaccine. Febrile seizure was reported only during the first two weeks after the immunization and was more related to the post vaccination fever. There has been postulated a genetic predisposition, but though, no susceptibility gene for febrile seizures is identified. Genetic abnormalities are reported in children with a febrile epilepsy syndrome such as severe myoclonic epilepsy of infancy or generalized epilepsy with febrile seizures. Approximately 10% of siblings and 10% of offspring of a person who had had a childhood febrile seizure were reported to have a febrile seizure. Infections with viruses such as influenza, adenovirus and parainfluenza are often associated with febrile seizures, causing fever that initiates the febrile seizure. Approximately 18% of children who experienced first febrile seizure are reported to have acute infection with herpesvirus 6. Bacterial infections including meningitis and bacteremia with Streptococcus pneumonia are also reported in children with febrile seizures.

2. **Physical examination** of a child with febrile seizure reveals normal neurological status as well as normal development of the child. In addition, signs for meningitis or encephalitis should be excluded during physical examination, such as, stiff neck, altered consciousness and Kernig's and Brudzinski's signs. The incidence of meningitis in children with febrile seizure is reported to be 2-5%. Bacterial meningitis is reported to be more common in children with a seizure while in emergency room, focal seizure, first complex febrile seizure, febrile status or with present meningeal signs.

3. **Diagnostic studies**: For a child with febrile seizure specific laboratory studies are not indicated except laboratory studies indicated by the underlying illness. For example in a child with diarrhea and vomiting laboratory studies for electrolytes as well as complete blood count are indicated and beneficial, even though, electrolyte abnormalities in children with febrile seizures are rare. Blood glucose should be measured if the seizure has duration of more than 15 minutes and if there is a depressed level of consciousness in the child for a prolonged period of time following the seizure. Blood culture and urine culture also should be performed in children with a prolonged febrile seizure. Lumbar puncture (LP) is considered in children from 12 to 18 months of age because meningeal signs may be absent or subtle in this age group, should be performed in all children younger than 12 months of age with a febrile seizure, while in children older than 18 months of age LP is considered only when there is a suspicion of meningitis. In addition, lumbar puncture is also recommended in children who received antibiotic therapy because antibiotics may have masked the clinical features of meningitis or encephalitis. According to the updated guidelines of AAP, the use of lumbar puncture is an option when evaluating children with febrile seizure, from 6 to 12 months of ages, whose immunization status for *Haemophilus influenza* type b and *Streptococcus pneumonia* is unknown or incomplete and who were treated with antibiotics. Brain magnetic resonance (MRI) or computed tomography scan

(CT) are indicated in a child with febrile seizure only if there is an increased intracranial pressure and history of trauma or a possible neurologic abnormality or deficit as well as in those with recurrent febrile seizure. No intracranial findings have been reported in children with first febrile seizure, needing any medical or surgical intervention. Studies have not found electroencephalography (EEG) to be helpful in predicting the development of later afebrile seizure or epilepsy and that majority of these children have a normal EEG. It may only be considered in children with neurologic abnormality or deficit and in children with recurrent febrile seizure. Epileptiform abnormalities in EEG such as generalized spike waves with an occurrence of 49% of children and photosensitivity in 42% of children with simple febrile seizure are reported to be common in these children and followed until 11-13 years of age.

3. MANAGEMENT

Management of a child with a febrile seizure includes maneuvers for cessation of seizure used as an acute phase treatment and treating the child for the etiology of the fever as well as additional treatment for the underlying illness. Acute phase treatment includes appropriate lateral posturing with head extension, keeping airways open and administration of rectal diazepam. Rectal diazepam should be used with a dosage of 0.5 mg/kg and a maximum dose of 10 mg. When measuring blood glucose, it is less than 3mmol/l, than 10% dextrose should be administrated with a dosage of 5ml/kg. Administration of intravenous antibiotic or antiviral therapy should be considered if a prolonged febrile seizure is present, until lumbar puncture is performed and diagnosis is clarified.

Most of the febrile seizures have been ceased before the child is being assessed. Furthermore, if the seizure is still present, indicated is the use of intravenous lorazepam with a dosage of 0.1 mg/kg over 1 minute and a maximum dose of 4 mg, or intravenous diazepam with a dosage of 0.3 mg/kg over 3 minutes and a maximum dose of 5 mg in infants and 10 mg in older children, or buccal diazepam with a dosage of 0.5 mg/kg and a maximum dose of 10 mg.

Intravenous diazepam is administrated while the child is in the emergency room with a complex febrile seizure or febrile status epilepticus. Intravenous diazepam, with a dosage of 0.2 – 0.5 mg/kg every 15 minutes and a maximum dose of 5 mg in children from 1 month to 5 years of age, often is effective in febrile status epilepticus.

When administration of intravenous diazepam is not possible, buccal midazolam is reported to be more useful than rectal diazepam. Intranasal midazolam is reported to be as safe and effective as intravenous or rectal diazepam when treated acute febrile seizure.

As a first line therapy in a febrile child, antipyretics may be used as a symptomatic treatment for instant comfort after febrile seizure. However there is no reported evidence for prevention or decrease of febrile seizure when using antipyretics at the onset of fever.

The long-term or intermittent use of neuroleptics or benzodiazepines such as phenobarbital (5 - 8 mg /kg/day in children 2-24 months of age, and 3-5 mg/kg/day in children older than two years) or valproate (10 -15 mg/kg/day in divided doses, with a maximal dosage of 60 mg/kg/day) after a simple febrile seizure is reported to be effective in reducing the occurrence of febrile seizure. Currently, both treatments are not recommended because of associated adverse effects. Phenobarbital usually is associated with somnolence, decreased memory, and reduced concentration. Valproate is associated with hematopoietic irregularities, renal toxicity, pancreatitis, and hepatic failure.

There is no evidence reported that any used therapy after a first febrile seizure would reduce the risk of afebrile seizure or epilepsy.

However, if prevention of febrile seizure were essential oral diazepam would be used at a dose of 0.3 mg/kg every 8 hours, because it is intermittent and has less adverse effects.

The most important and necessary is the education of the parents about febrile seizure, which includes dealing with the child having seizure and domestic use of rectal diazepam in emergency cases.

4.CONCLUSION

Fever and seizure are symptoms of different variety of diseases; meanwhile, the occurrence of a seizure during a febrile illness may be a symptom of an acute infection that needs to be treated. Such infection can be a bacterial meningitis or viral encephalitis.

For a child with a simple febrile seizure consultation with a neuropediatrician is rarely needed. In healthy children the consequences of febrile seizures including neurologic sequelae, epilepsy or death, are rare. The risk of developing epilepsy is approximately 1% in children with simple febrile seizures. Febrile seizures are associated with excellent prognosis and neurological development of the child and their school progress is not affected by the seizures.

Every pediatrician and physician should be familiar with the nature of febrile seizures adopting regular approach, as they are the most common and benign seizures seen in infants and children.
Every physician should act as an educator, helping the parents knowing more about the febrile seizures and so they would be acting properly during a convulsive state.
All parents with a child who experienced a febrile seizure should be trained about administration of a rectal diazepam during an emergency case.
Benzodiazepines are the best treatment drug used during an acute phase of febrile seizures.

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