Febrile Convulsions

Synonyms: febrile seizure, febrile fit

Definition
Febrile convulsions are seizures (fits or convulsions) occurring in children aged 6 months to 5 years, associated with fever, without other underlying cause such as CNS infection or electrolyte imbalance. There are uncommon atypical occurrences outside this age range which nonetheless otherwise fit the definition of a febrile convulsion.

Consensus guidelines agree that:
- Axillary temperature should be >37.8°C; or
- There is a clinical history and examination indicative of febrile seizure.

Emergency treatment of febrile seizures
- If the child is still convulsing or not fully alert:
  - Recovery position, check and maintain Airway, Breathing, Circulation.
  - Check blood glucose.
  - If still seizing >5 minutes, give rectal diazepam (this may be repeated after five minutes if the seizure has not stopped) OR a single dose of buccal midazolam (off-licence use).
- Benzylpenicillin or cefotaxime if meningococcal disease is suspected:
  - Suspect meningitis in any child who is systemically unwell, irritable, or was drowsy before the seizure.
  - Important signs are: neck stiffness; petechial rash, photophobia; Kernig’s sign; Brudzinski’s sign; bulging fontanelle; reduced level of consciousness.
- Call 999/112/911 ambulance/senior help if: the seizure lasts >10 minutes after giving the first dose of anticonvulsant medication (this includes ongoing twitching even if large jerking movements have stopped, OR a further seizure before the child recovers consciousness); OR serious illness is suspected.

Classification
- Simple febrile seizures
  These are generalised, tonic-clonic seizures lasting less than 15 minutes, which do not recur within 24 hours or within the same febrile illness.
- Complex febrile seizures
  These have one or more of the following:
  - Focal features at onset or during the seizure.
  - Duration of more than 15 minutes.
  - Recurrence within the same febrile illness.
- Febrile status epilepticus
  This is a febrile seizure lasting for longer than 30 minutes.

NB: other types of seizure related to acute illness in children are:
- Febrile myoclonic seizures.
- Afebrile convulsions in young children with mild gastroenteritis - clusters of seizures with/without fever over several days, in the setting of gastroenteritis. The prognosis is good.

Epidemiology
Between 2% and 5% of European children have a febrile convulsion.\[1\] By definition, febrile convulsions occur between 6 month and 5 years of age. There are uncommon atypical occurrences outside this age range (particularly between 3 and 6 months old and between 5 and 6 years old) which nonetheless otherwise fit the definition of a febrile convulsion. Most are the simple febrile seizure type. Complex febrile seizures occur in about 20% and febrile status epilepticus in about 5%. Susceptibility to febrile convulsions follows a multifactorial polygenic mode of inheritance with a maternal preponderance in transmission. There is a 27% risk in a child with an affected mother and 6% with an affected father.\[8\] Iron-deficiency anaemia has been suggested as being associated with febrile convulsions. However, studies have shown both increased and decreased risk of febrile convulsions in children with iron-deficiency anaemia compared to non-anaemic controls.\[9, 10\]

Aetiology\[1\]
The mechanisms are unknown. It is uncertain whether the degree of fever or the rate of rise of temperature is a trigger in febrile seizures.

Genetic factors are involved: there is a family history of febrile seizures in 24%. Inheritance patterns are probably polygenic, although in a few families a particular gene or autosomal dominant inheritance has been identified.

Causes of fever in children with febrile seizures
The vast majority are:

- Viral infections
- Otitis media
- Tonsillitis

Other causes of fever with seizure are:

- Gastroenteritis
- Post-immunisation

Serious illnesses which need excluding are:

- Meningitis and septicaemia.
- Urinary tract infection (UTI).
- Lower respiratory tract infection.
- Cerebral malaria (if history is suggestive of it).

Assessment\[3\]

History
Including:

- Eyewitness account of the seizure: conscious level prior to seizure, duration, focal or generalised, time taken to recover and state of the child afterwards.
- Symptoms of meningitis or septicaemia, such as: rapid onset of illness, abnormal behaviour or cry, stiffness or floppiness, vomiting, (and meningism in older children). Early symptoms are: leg pains, cold hands and feet, pallor or mottled skin.\[11\]
- Establish whether it was a febrile seizure. This may be difficult to decide if the seizure occurs early in the illness. Parental perceptions of fever are valid.
- Past/family history of febrile seizure or epilepsy.

Examination

- Vital signs, conscious level, rash (blanching or non-blanching), fontanelle, meningism.
- Look for focus of infection.

NB:

- For babies and young children, clinical examination (more than history) is important in detecting serious illness. The vital signs are informative (temperature, pulse rate, respiratory rate and effort, capillary perfusion and oxygen saturation - compare with the normal range for the child's age).\[12\]
- The National Institute for Health and Care Excellence (NICE) traffic light system can help assess the likelihood of serious illness in a child with fever.\[13\]

When to refer urgently\[3\]
First febrile seizure.
Serious illness not excluded.
Previous history of febrile seizure with:
- Child <18 months of age (meningitis is harder to detect in this age group).
- Diagnostic uncertainty about the cause of the present seizure.
- A complex seizure (as defined above - these are more likely to recur or be due to intracranial infection compared with simple seizures).
- Antibiotics taken currently/recently (in case these mask signs of meningitis).
- Early review by a doctor is not possible.
- Home circumstances are unsuitable.

Also, consider referral if no focus of infection is found (for a period of observation and to investigate for UTI).

Paediatric assessment[^2]

Admit and treat as meningitis if there are any alarming features:
- Drowsy before seizure OR Glasgow Coma Scale (GCS) <15 at one hour after seizure.
- Neck stiffness.
- Petechial (non-blanching) rash.
- Bulging fontanelle.

Admit and review (review within two hours by paediatric registrar, to consider lumbar puncture (LP)), if:
- Under the age of 18 months.
- Complex seizure.
- The child has had antibiotics.
- No focus of infection is found: consider admission.

Other children may go home if the child is well, the parents agree, they are able to manage the child at home and they can promptly access medical care. (See 'Advice for parents', below).

Initial investigations[^1, 2]

Initial investigations are according to the febrile illness rather than the seizure itself. These may include:
- Blood tests: FBC, erythrocyte sedimentation rate (ESR), glucose, U&E, coagulation, culture.
- Urine microscopy/culture if: age <18 months, complex seizure or no focus of infection found.
- LP should be considered for:
  - A child <12 months - LP advised unless a paediatric registrar decides against LP and will review within two hours.
  - A child 12-18 months - has a low threshold for LP.
  - Any 'serious features' (see details relating to hospital assessment above).

Contra-indications to LP

- Reduced consciousness (GCS <13 or falling consciousness level).
- Septicaemic shock (poor perfusion, tachycardia, low blood pressure).
- Likely invasive meningococcal disease (rapid onset of illness, haemorrhagic rash).
- Signs of raised intracranial pressure (coma, abnormal posture or pupils, high blood pressure, low pulse, papilloedema).
- Focal neurology.
- Bleeding tendency - known or clinically suspected.

Differential diagnosis[^3]

- Rigors.
- Syncope.
- Breath-holding spells.
- Reflex anoxic seizures - a precipitant (eg, a minor bump) causes vagally mediated cardiac asystole lasting many seconds - the child may be pale, floppy, and lose consciousness, followed by tonic and clonic movements.
- Apnoea.
- Postictal fever (unlikely unless the seizure lasted >10 minutes; usually they would have a temperature >38°C).
- Other cause of seizures - eg, epilepsy, head injury, encephalitis, hypoglycaemia, hypocalcaemia, poisoning, other metabolic disorders, neurological disorders.
- Afebrile seizures with gastroenteritis. [^1]

Further management[^3]

Children may be managed at home if:
- The child looks well.
- Parents understand how to treat febrile illness and further seizures, have prompt access to medical care and are happy with this plan (see 'Advice for parents', below).
- Arrange review; the timing depends on the clinical condition - early review is advisable if the cause of fever is unclear.
Remember:

- Review the child and address questions a parent may have.
- Consider outpatient referral if:
  - An alternative cause for seizures is suspected - eg, epilepsy or a neurodevelopmental condition.
  - Parental request or concerns.

Advice for parents[^3]

Explanation is important, as seizures can be very frightening for parents. The following points should be covered and a leaflet provided:

- **What febrile seizures are.**
- **How to treat fever at home** - remove excess clothing, give fluids, give antipyretics if the child is uncomfortable. Tepid sponging or excessive cooling are not recommended. Check for a non-blanching rash, check for dehydration and stay with the child at night.
- **First aid if the child has a fit** - position; do not put anything in their mouth.
- **When to call 999/112/911 ambulance** - a seizure lasting more than five minutes.
- **When and how to seek urgent medical advice** - any seizure, serious symptoms such as non-blanching rash, lack of normal alertness, dehydration, the child getting worse, the parent worried and fever for more than five days.

Prognosis[^1, 14]

Generally the prognosis is very good:

- By definition, febrile seizures do not recur beyond the age of 5 years approximately.
- There is no evidence for an increased risk of death, even for children with status epilepticus.[^3]
- Intellect is not affected.
- Febrile seizures recur in about 30%.
- Risk factors for recurrence are: family history of febrile seizures, onset aged <18 months, lower temperature or shorter duration of fever at onset.
- Risk of epilepsy: 2-7% of children with febrile seizures will go on to develop epilepsy with afebrile seizures, the risk being higher with complicated febrile convulsions.[^8]

Prevention[^3]

- Immunisations do not appear to increase the risk of recurrent febrile seizures.
- There is no evidence that antipyretics reduce the number of febrile seizures.[^13]
- A Cochrane review found no clinically important benefits for children with febrile seizures treated with intermittent oral diazepam, phenytoin, phenobarbital, intermittent rectal diazepam, valproate, pyridoxine, intermittent phenobarbital, intermittent ibuprofen or for diclofenac.[^15]

Further reading & references

3. Febrile seizure; NICE CKS, October 2013 (UK access only)
8. Diagnosis and management of epilepsy in adults; Scottish Intercollegiate Guidelines Network - SIGN (2015)
12. Davies F; Paediatric health: Recognising the sick child, Electronic Doctor
13. Fever in under 5s - assessment and initial management; NICE Guideline (updated August 2017)

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