Seizures in childhood: causes and management

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Seizure

1. The clinical event with a sudden disturbance of neurological function caused by an abnormal or excessive neuronal discharge.
2. Seizure is manifested in sudden temporary change in:
   - physical movement
   - sensation
   - behaviour
3. Seizures may be epileptic or non-epileptic.
4. Seizures affect 4 to 7 % of children.
5. Epileptic seizures affect 1-2% of the population and 4% of children.

Causes of seizures

Epilepsy

- Idiopathic (70–80%) – cause unknown but presumed genetic
- Secondary:
  - Cerebral dysgenesis/malformation
  - Cerebral vascular occlusion
  - Cerebral damage (e.g. congenital infection, hypoxic-ischaemic encephalopathy, intraventricular haemorrhage/ischaemia)
- Cerebral tumour
- Neurodegenerative disorders
- Neurocutaneous syndromes

Non-epileptic

- Febrile seizures
- Metabolic
  - Hypoglycaemia
  - Hypocalcaemia/hypomagnesaemia
  - Hypo/hypernatraemia
- Head trauma
- Meningitis/encephalitis
- Poisons/toxins

Febrile seizures

1. Febrile seizures are accompanied by a fever in the absence of intracranial infection.
2. There are usually brief and are generalised tonic-clonic seizures.
3. Occurence 3% of children, between the ages of 6 months and 5 years.
4. Genetic predispostion -> 10% risk of febrile seizures occurence when is a positive family history
5. About 30–40% will have further febrile seizures.
6. The seizure usually occurs early in a viral infection when the temperature is rising rapidly.
7. EEG or MRI are not required, lumbar puncture indicated in all infants with fever and seizures.
8. Management includes treatment of acute attack, excluding neuro-infections, finding cause of fever, prophylaxis of future episodes and parental counseling.

Febrile seizure

Febrile seizure is more likely:

- the younger the child is
- the shorter the duration of illness before the seizure
- the lower the temperature at the time of seizure
- there is a positive family history

Simple febrile seizures do not cause brain damage.

There is a 1–2% chance of developing epilepsy, similar to the risk for all children.

Complex febrile seizures; i.e. those which are focal, prolonged, or repeated in the same illness, have an increased risk of 4–12% of subsequent epilepsy.

Paroxysmal disorders

The paroxysmal events are or one of the many conditions which can mimic epilepsy.

Paroxysmal disorders

Name	Age	Trigger	Symptoms	Managment
Breath-holding episodes	Toddler	anger	Child cries, holds breath, goes blue, then limp, lose consciousness, rapid recover	Attacks resolve spontaneously, treatment-behaviour modification therapy, with distraction
Reflex anoxic seizures	Infant, toddler	Pain, discomfort (minor head trauma), fright	Child stops breathing, goes pale, brief seizure sometimes, rapid recovery, the hypoxia may induce a generalised tonic–clonic seizure	The episodes are due to cardiac asystole from vagal inhibition. Seizure is brief and the child rapidly recovers.

Epilepsy

Epilepsy is a chronic neurological disorder with

- recurrent unprovoked seizures,
- consisting of transient signs and/or symptoms associated with abnormal, excessive or synchronous neuronal activity in the brain

The incidence of epilepsy is about 0.05% (after the first year of life when it is even more common) and a prevalence of 0.5%.

60% of later age epilepsy begins in childhoood, 40% develop epilepsy before the age of 16 yrs.

Focal epilepsies are commoner than generalized.

*Lancet 2006;367:499-524

Classification

Partial/ focal seizure

- Originate from localized area of one hemisphere
- Common causes include: idiopathic, cryptogenic, structural
- In young infants & children focal seizures are very subtle.

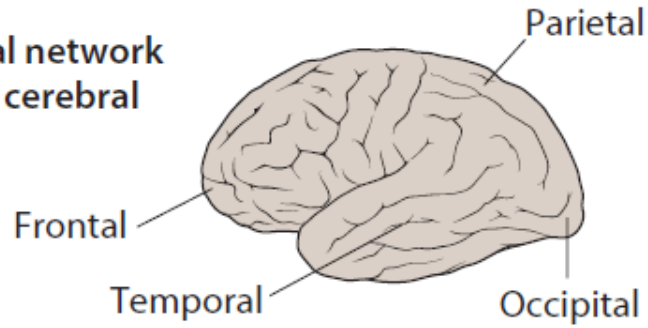
Generalized seizure

- Discharge arises from both hemispheres
- Synchronous involvement of both cerebral hemispheres.
- Important to differentiate them from focal seizure with very fast secondary generalization
  - absence
  - myoclonic
  - tonic
  - tonic- clonic
  - atonic

Partial seizure

Focal seizures

Onset in neural network limited to one cerebral hemisphere



Focal seizures:

- begin in a relatively small group of dysfunctional neurones in one of the cerebral hemispheres
- may be heralded by an aura which reflects the site of origin
- may or may not be associated with change in consciousness or more generalised tonic-clonic seizure

Focal seizures →

Frontal seizures – motor phenomena
Temporal lobe seizures – auditory or sensory (smell or taste) phenomena
Occipital – positive or negative visual phenomena
Parietal lobe seizures – contralateral altered sensation (dysaesthesia)

Partial seizure

SIMPLE – conciousness remains intact

Motor

- Jerking
- Muscle Rigidity
- Head Turning

Sensory (unusual sensation affect)

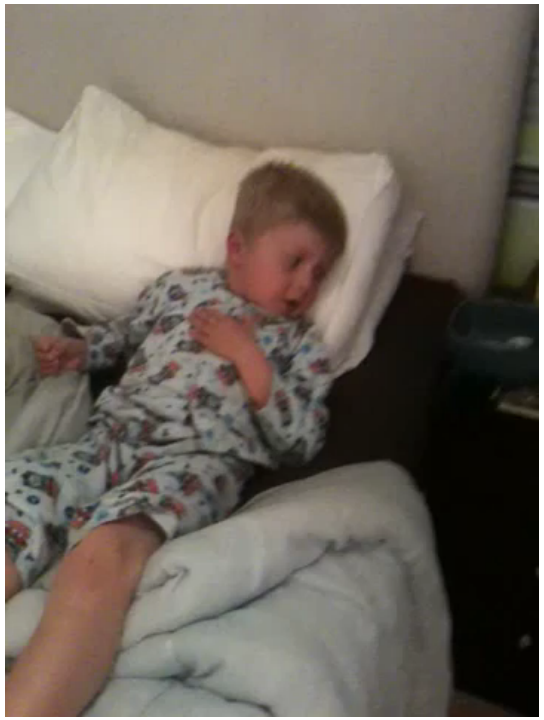
- Visual
- Hearing
- Taste
- Touch

Psychiatric symptoms

COMPLEX- impairment of conciousness

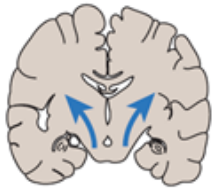
- Begin in one part of brain and spreading to another part of brain.
- Postictal symptoms (seizure state)
  - ✓ Aura Phase
  - ✓ Motionless, automatic movement
  - ✓ Excessive emotion – irritate, anger
  - ✓ Not remember when episode is over
- Leading to generalised seizure

Partial complex seizure



Generalized seizure

Onset in both hemisphere



In generalised seizure disorders, there is:
- always a loss of consciousness
- no warning
- symmetrical seizure
- bilaterally synchronous seizure discharge on EEG or varying asymmetry

Absence seizures	Transient loss of consciousness, with an abrupt onset and termination, unaccompanied by motor phenomena except for some flickering of the eyelids and minor alteration in muscle tone. Absences may be typical (petit mal) or atypical and can often be precipitated by hyperventilation
Myoclonic seizures	Brief, often repetitive, jerking movements of the limbs, neck or trunk Non-epileptic myoclonic movements are also seen physiologically in hiccoughs (myoclonus of the diaphragm) or on passing through stage II sleep (sleep myoclonus)
Tonic seizures	Generalised increase in tone
Tonic–clonic seizures	Rhythmical contraction of muscle groups following the tonic phase. In the rigid tonic phase, children may fall to the ground, sometimes injuring themselves. They do not breathe and become cyanosed. This is followed by the clonic phase, with jerking of the limbs. Breathing is irregular, cyanosis persists and saliva may accumulate in the mouth. There may be biting of the tongue and incontinence of urine. The seizure usually lasts from a few seconds to minutes, followed by unconsciousness or deep sleep for up to several hours
Atonic seizures	Often combined with a myoclonic jerk, followed by a transient loss of muscle tone causing a sudden fall to the floor or drop of the head

Absence seizure

- Sudden onset
- Duration 5-10 sec / happen 100x daily
- Commonly cause by:
  - ✓Stress
  - ✓Fatigue
  - ✓Hypoglycemia
- Some known as ‘day dreaming’
- Abrupt cessation of motor activity and speech
- Sudden impairment of consciousness with blank face and eye-lid flickering without loss of postural control
- Lasts for only few seconds followed by continuation of pre-seizure activity

Absence seizure

Myoclonic seizure

- Movement Disorder
- Seen when awake/ fall asleep
- Cause by touch/ visual stimuli
- Symmetrical/ asymmetrical
- Sign and symptoms :
  - ✓Sudden and simple
  - ✓Shoclike involuntary
  - ✓Dropping things (most common)

Tonic seizure

Muscle are maintained in continuous contracted state (rigidity)

Sign and symptoms :

- ✓Pupils dilated
- ✓Eyes roll up
- ✓Possible incontinence
- ✓May appears foam at mouth

Clonic seizure

Opposing muscle contract and relax alternately (jerking)

May occur only one limb or more.

Sign and symptoms :

- Mucus production
- Muscle Stiffness

Tonic-clonic seizure

Tonic phase:

- sudden loss of consciousness
- generalized body stiffness
- lasts for 10 to 30 sec

Clonic phase:

- rhythmic clonic contractions and relaxation of the body, cyanosis, salivation, incontinenence
- lasts for 1 to 2 min

Post ictal phase:

- stupor followed by agitation, confusion & child may have headache & vomiting.
- lasts for minutes to few hours

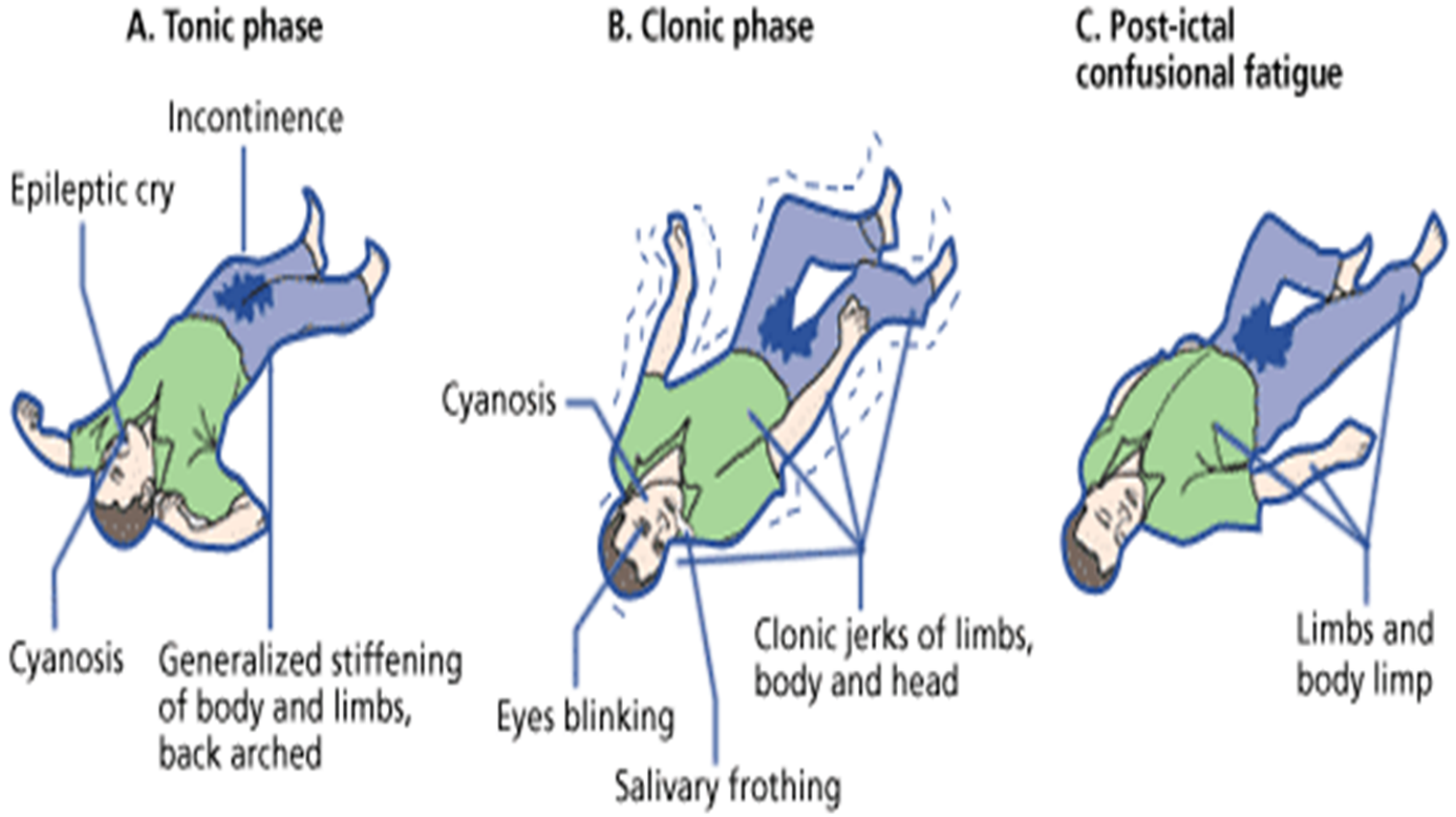
Generalized tonic clonic seizures

Kinds of tonic- clonic seizure

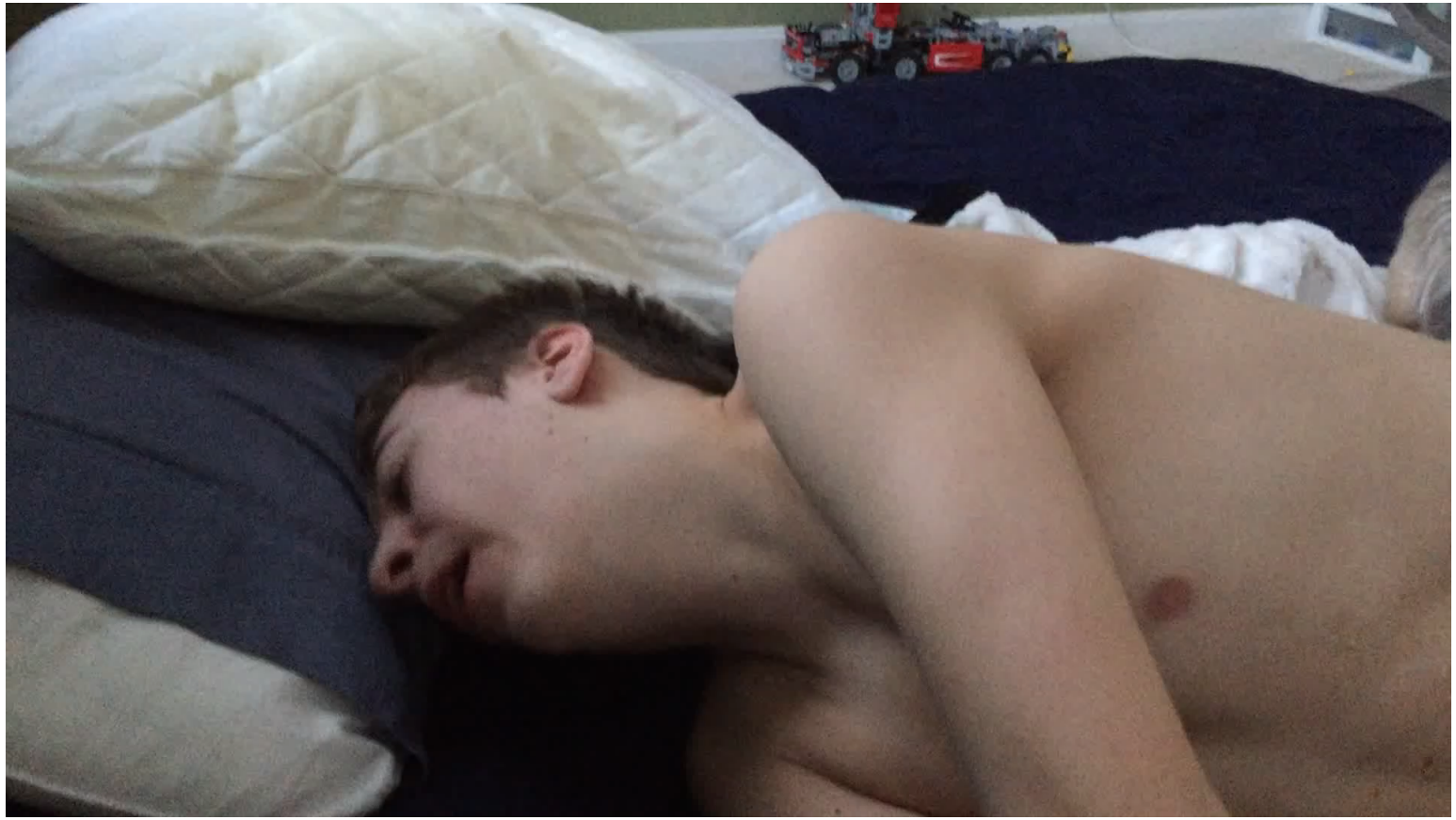
a. Primarily generalized
b. Focal with secondary generalization
c. Part of other epileptic syndromes.

Etiology is idiopathic (mainly genetic) while child with secondary generalization may have underlying focal lesion.

Tonic-clonic seizure



Generalized tonic-clonic seizure



Childhood epilepsy syndromes

Conditions with common features such as age of onset, seizure type, EEG pattern and prognosis.

Comprises 10% of childhood epilepsy.

Syndrome	Age of onset	Clinical features	Drugs	Outcome
Childhood absence epilepsy (CAE)	5 to 7 yrs	Multiple absence seizures, Hyperventilation	Sodium valproate, Ehosuxamide Limotrigene	good, remits by puberty
Benign epilepsy with centrotemporal spikes (BCECT)	4 to 12 yrs	Partial seizure, Hemifacial, motor, In sleep	carbamazepine, oxcarbamazepine	good, remits by puberty
Juvenile Myoclonic Epilepsy (JME)	12 to 18 yrs	Myoclonic jerks on awakening Positive family history	Sodium valproate, Limotrigene, Levitracetam	good, life long treatment
Infantile spasms (West syndrome)	4 mo to 1 yr	Spasms in cluster Developmental delay	ACTH, Vigabatin, Sodium valproate, Clobazam, Pyridoxine	poor
Severe Myoclonic Epilepsy (Dravet Syndrome)	6 mo to 1 yr	Recurrent partial febrile seizure Psychomotor regression Myoclonic seizures	Sodium valproate Clobazam Topiramate	poor
Lennox Gestaut Syndrome	1 to 8 yrs	Multiple seizure types Psychomotor retardation Generalized slow spike wave	Sodium valproate Limotrigene, Topiramate Zonisamide	poor

Status epilepticus

- Acute prolonged seizure activity- ictus more than 15-20 min.
- Series of generalized seizures that occur without full recovery of consciousness between attacks
- A status epilepticus is most dangerous with tonic seizures, which occures 70-90% of casee.
- It is a life- threatening condition with the considerable mortality rate.

Diagnosis

Information about seizure:

a. Age of onset
b. Generalized/ focal; single/ multiple;
c. Aura
d. Sequence
e. Loss of sensorium
f. Injury due to fall
g. Post-ictal deficit
h. Recall of the event

History of fever, diarrhea, trauma, perinatal insult.

Development – normal/ delay/ regression.

Birth history, family history of epilepsy, febrile seizures.

Evaluation of Patient

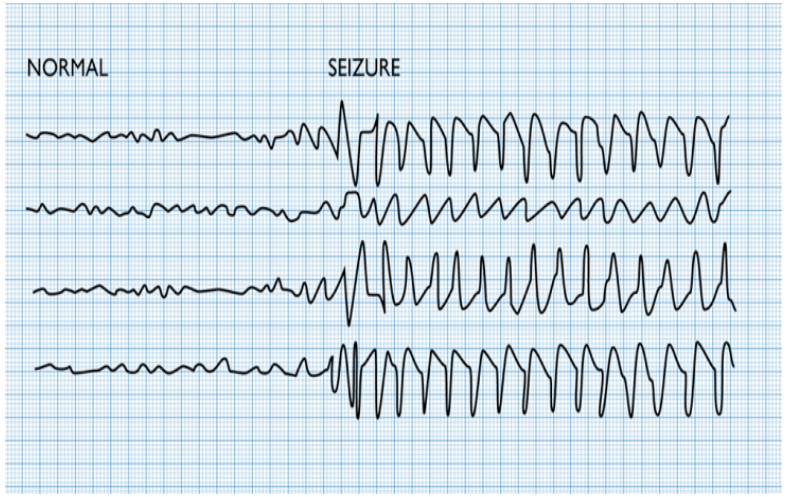
Examination :

- Clinical & neurological examination
- Head circumference
- Dysmorphism
- Cutaneous marker- hypo/ hyper pigmented lesions
- Focal deficit
- Fundus examination

Investigations

EEG :

- Recommended in all patients with paroxysmal event.
- Helps to distinguish seizure from non - seizure, classification of seizure type and syndrome, deciding treatment.
- Video EEG needed for differentiating true seizures from non - seizure paroxysmal disorders.



Investigatons

Radiology:

- CT scan- a space occupying lesion
- MRI- pathologic changes
- Indications for neuro- imaging :
  - Seizures in early infancy
  - Focal seizures (not indicated in benign partial seizure)
  - Developmental delay

Lumbar Puncture:

- need to consideration - persistent fever/ altered mental status /headache

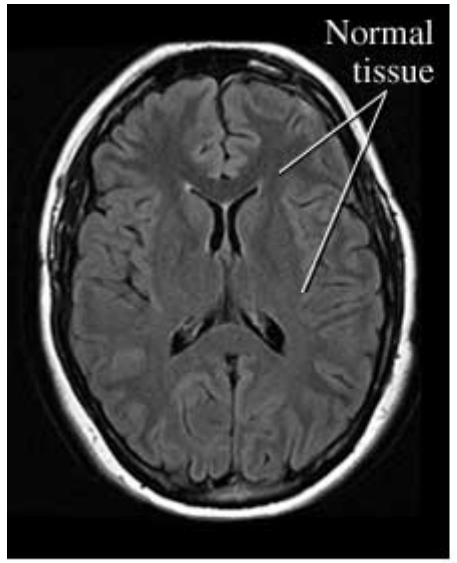


Figure 1

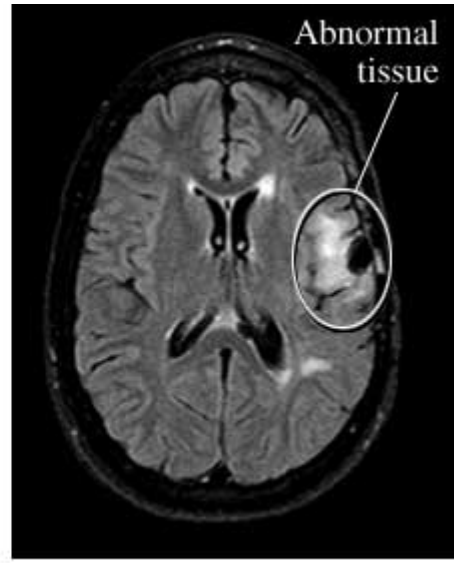


Figure 2

Seizure management

Provide privacy and protect the patient from curios on-lookers

Ease the patient to the floor or the lowest position, if possible.

Protect the head with a pad to prevent injury (from striking a hard surface)

Loosen constrictive clothing

Push aside any furniture that may injure the patient during the seizure.

Management of first unprovoked seizure

- History and examination
- Mostly a developmentally normal child with first, idiopathic generlized tonic- clonic seizure doesn't require treatment.
- Neuro- imaging must be done to rule out granuloma

Indications of drugs after a first seizure :

- Focal seizures
- Myoclonic seizures, absence seizures
- First episode of status- epilepticus
- Underlying structural lesion

Principle of therapy

1. Monotherapy is best option and is mandatory when treatment is started first.
2. Always start monotherapy at low dose and enlarge it slowly until seizure remit or adverse effects emerge.
3. Monotherapy in appropriate dosage controls seizure in 70 to 80% cases.
4. If seizures are uncontrolled by first drug, choose alternate monotherapy and slowly withdraw first drug.
5. In case drug failure, always check compliance.

Conslusions

1. Current childhood epilepsy treatment is based on specific epilepsy syndromes.
2. Conform diagnosis, type of seizure and syndrome, do EEG at the onset and follow principle of monotherapy.
3. For better compliance, always explain nature of disease to parents.
4. Goal is to maintain quality of life.

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