

# Management of status Epilepticus in children

S DEB

## DEFINITION

Status Epilepticus (SE) is a life threatening emergency. The traditional definition of SE as continuous seizure activity or repeated seizures with no awakening between seizures lasting for 30 minutes or longer is being proposed to be revised because the duration of 30 minutes was in animal experiments. Many authors have suggested a more rational working definition of seizure activity for more than 5 minutes or two or more discreet seizures with incomplete recovery of consciousness.

SE is a condition which most likely will not terminate rapidly and spontaneously and requires prompt intervention. Any child who continues to convulse when brought to emergency should be treated as a case of SE.

## CAUSES

- ◆ Febrile seizure lasting for more than 30 minutes especially in children less than 3 years is the most common cause of Status Epilepticus.
- ◆ Idiopathic group includes epileptic patients in whom Status Epilepticus follows sudden withdrawal of anticonvulsants (especially benzodiazepines and barbiturates).
- ◆ Epileptic children who are given antiepileptics on an irregular basis or who are noncompliant are more likely to develop Status Epilepticus.
- ◆ Sleep deprivation and an intercurrent illness are more likely to render epileptic patients more susceptible to Status Epilepticus.

## MANAGEMENT

1. A directed history and examination. Confirm diagnosis by observing seizure. Document duration. History of fever or inter-

current illness, medications and compliance especially anti epileptic drugs, head injury, drug ingestion, toxic exposure and history of seizures.

2. Perform brief general and neurological examination, assess oxygenation and ventilation, and note the cyanosis, peripheral perfusion, pupil size asymmetry if any. Also examine for petechiae, purpura or vesicles; deformity or soft tissue injury to the head.
3. Establish vascular access, send samples for laboratory studies. Obtain blood glucose, electrolytes, calcium and magnesium, anti-convulsant blood levels and toxicology screen if indicated.
4. Stabilize patient:
  - ◆ Establish airway: oral suction, administer 100% oxygen by non rebreathing mask
  - ◆ Ventilation in most children will be required by at least bag and mask and most often by two persons
  - ◆ Infuse 10% dextrose (2ml/kg) empirically if facilities for dextrostix are not available immediately or if there is hypoglycemia. Same dose of 25% dextrose may be given by nasogastric tube if IV access is difficult. Hyperglycemia has no adverse effect on the outcome of SE whereas hypoglycemia worsens outcome.
  - ◆ Once the seizures have been controlled with medication and breathing is normal, patient is placed in lateral position (recovery position) to prevent aspiration.
5. Anticonvulsants:
  - ◆ The goals of anticonvulsant therapy in SE are to achieve cessation of clinical and electrical seizure activity and prevent its recurrence
  - ◆ Drugs are given by IV route
  - ◆ Anti convulsant medication is administered in a sequential manner according to a standard protocol.
  - ◆ Sufficient time must be allowed for the drug to act before more of the same medication is used.

<b>Step I</b>  <b>Stabilization</b>  <b>0 - 3 mins</b>	1. Protect from injury  2. ABCD of resuscitation  3. Secure IV line  4. Monitor vital signs	1. Position 2. Secure airway 3. Oral suctioning 4. 100% O <sub>2</sub> 5. Intubate if needed 6. IV 10 % dextrose, if hypoglycemic 7. Start intravenous fluid 8. Maintenance fluids – 2/3 if raised intracranial tension 9. Collect blood for complete blood count, sugar, renal function test, electrolytes, calcium, Mg, blood gas 10. Serum AED levels if indicated
--	---	--



<p><b>Step II</b></p> <p><b>Control of seizures</b></p> <p><b>3 – 5 min</b></p>	<p>1. Diazepam 0.2 – 0.5 mg/kg/dose IV @ 1 mg/min. May repeat every 10 mins for maximum of three doses</p> <p style="text-align: center;">OR</p> <p>2. Lorazepam 0.05 – 0.1 mg/kg/dose IV</p> <p style="text-align: center;">OR</p> <p>3. Midazolam 0.05 – 0.5 mg/kg/dose</p>	<p><b>If IV access is not available:</b></p> <ol style="list-style-type: none"> <li>1. Diazepam 0.5mg/kg per rectal</li> <li>2. Lorazepam 0.05 – 0.1 mg/kg per rectal</li> <li>3. Midazolam 0.2 mg/kg im</li> <li>4. Midazolam 0.5 mg/kg buccal/nasal route</li> <li>5. Lorazepam 0.05 – 0.1 mg/kg sublingual route</li> <li>6. Valproic acid 20 mg/kg per rectal</li> </ol> <ul style="list-style-type: none"> <li>■ Lorazepam has greater duration of action and has a lesser likelihood of producing respiratory arrest and hypotension</li> <li>■ Midazolam is less potent but has added advantages of administration by multiple routes</li> <li>■ Rectal diazepam gels are available in certain countries and are very safe</li> </ul>
<p><b>5 – 15 min</b></p>	<ul style="list-style-type: none"> <li>■ <b>Inj Phenytoin (PHT)</b> 15 – 20 mg/ kg (dilute with equal amt of normal saline).</li> <li>■ Maximum dose is 30 mg/kg given as another 10mg/kg increment.</li> <li>■ Rate of injection is 1mg/kg/min</li> <li>■ If seizures are controlled maintain at 5- 8 mg/kg bd</li> </ul>	<ul style="list-style-type: none"> <li>■ PHT forms a precipitate with g fective</li> <li>■ PHT is given immediately after the benzodiazepines</li> <li>■ The PHT prodrug fosphenytoin has advantages over PHT because it is water soluble, less irritating after IV injection, and well absorbed after IM injection</li> <li>■ Undiluted PHT may cause pain, irritation and phlebitis of the vein</li> <li>■ Systemic hypotension may occur with PHT</li> <li>■ ECG is recommended during loading dose of PHT to identify arrhythmia and bradycardia, rare complications in children</li> </ul>
<p><b>15 – 30 min</b></p>	<ul style="list-style-type: none"> <li>■ <b>Inj Phenobarbitone (PB)</b> 15 – 20 mg/kg @ 1 mg/kg/min</li> <li>■ If controlled continue @ 3-5 mg/kg/24 hr</li> </ul>	<ul style="list-style-type: none"> <li>■ Drug of choice before Phenytoin in neonates</li> <li>■ In neonates dose may be 20 – 30 mg/kg</li> </ul>
<p><b>Refractory Status Epilepticus (RSE):</b> If SE persists for longer than 60 mins even after administration of benzodiazepines, Phenytoin or Phenobarbitone, it is called refractory status epilepticus and it may become life threatening. By this stage the patient is usually sedated and may show signs of respiratory depression, necessitating elective intubation and assisted ventilation</p>		
<p><b>30 – 40 mins</b></p>	<ul style="list-style-type: none"> <li>■ Midazolam infusion: 0.15 – 0.2 mg/kg bolus followed by 1 – 20 mcg/kg/min</li> <li>■ The rate of infusion at which seizure control is achieved is maintained for 48 hrs and subsequently the infusion rate is gradually decreased to 1 mcg/kg/min every 2 hrs.</li> </ul> <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> <li>■ Propofol : 1-2 mg/kg; followed by 2 – 10 mg/kg/hr</li> </ul>	<ul style="list-style-type: none"> <li>■ Comparative studies of midazolam against thiopentone has shown that midazolam is as effective as thiopentone with fewer side effects</li> <li>■ A meta analysis showed that mortality rate was lower in midazolam group compared to barbiturates and isoflurane and the need for invasive monitoring and intubation is less frequent</li> </ul>



<p>40 – 50 mins</p>	<p><b>Barbiturate coma:</b></p> <ul style="list-style-type: none"> <li>■ Thiopental sodium: 3-5 mg/kg bolus followed by infusion of 1-10 mg/kg/hr</li> <li>■ Continued for at least 48 hrs</li> </ul> <p><b>Other alternatives:</b></p> <ul style="list-style-type: none"> <li>■ Increased dose of PB: repeated bolus doses of PB 10-20 mg/kg every 30 mins (max 120 mg/kg/day)</li> <li>■ Valproic acid IV: loading dose of 20 – 40 mg/kg over 1-5 mins and repeated after 10 – 20 mins if necessary. This is followed by infusion of 5mg/kg/hr</li> <li>■ Paraldehyde: 5% soln. is prepared by adding 1.75 ml of paraldehyde (1g/ml) to D5W to a total volume of 35 ml. the loading dose is 150-200mg/kg IV slowly for 15-20 mins, and then seizure control is maintained with an infusion of 20mg/kg/hr in a 5% concentration in a glass bottle. The drug should be of fresh stock.</li> </ul>	<ul style="list-style-type: none"> <li>• Potent respiratory and myocardial depressant</li> <li>• Children need invasive monitoring and inotrope</li> </ul>
<p>Not controlled in 10 mins</p>	<ul style="list-style-type: none"> <li>• General anesthesia</li> <li>+</li> <li>• Neuromuscular blockade</li> <li>+</li> <li>• Mechanical ventilation</li> </ul>	<ul style="list-style-type: none"> <li>• Halothane/ Isoflurane – agents of choice</li> <li>• GA probably acts by reversing cerebral anoxia and the concomitant metabolic abnormalities, allowing the previously administered anticonvulsants to exert their effect.</li> </ul>
<p>Controlled</p>	<ul style="list-style-type: none"> <li>• Give maintenance drugs</li> <li>• Treat underlying cause</li> <li>• Follow up</li> </ul>	<ul style="list-style-type: none"> <li>• Long term anti epileptic therapy is warranted in children with progressive neurological disorder or with a history of recurrent seizures before the SE.</li> <li>• It is unlikely that a lengthy period of anticonvulsant Rx is necessary after an initial attack of idiopathic SE especially when a prolonged febrile seizure was the cause. <b>Anticonvulsant therapy is maintained arbitrarily for 3 months in this case and is discontinued if the child remains asymptomatic.</b></li> </ul>

6. Supportive therapy:

- ◆ Periodic assessment of cardio respiratory functions.
- ◆ Hypotension is treated with fluid boluses and inotropes
- ◆ Maintain hydration and correct dyselectrolytemia.
- ◆ Defer lumbar puncture in unstable patients. Do not delay antibiotic/ antiviral treatment if indicated
- ◆ Treat the treatable: lower raised temperature, correct abnormal parameters/ treat infection if suspected

- ◆ At every step consider intubation and ventilator support as children with SE are at continuous risk of respiratory failure and inadequate ventilation
- ◆ If child does not respond to painful stimulus within 20 – 30 min of termination of GCSE (generalized convulsive SE), rule out hypoglycemia, CNS infection, drug toxicity and non convulsive SE.
- ◆ GCSE and it is common in infants less than 2 months.



## PROGNOSIS

- ◆ Mortality rate is around 5% (most of whom have serious underlying CNS disorder)
- ◆ In the absence of progressive neurological insult (eg Herpes encephalitis) or metabolic disorder, the morbidity from SE is low.
- ◆ Long term sequelae such as hemiplegia, extra pyramidal syndromes, mental retardation and epilepsy are more common in children younger than 1 yr.

## REFERENCES

1. Santhosh Soans: Management of status epilepticus. The Intesivist, 12 – 16, Feb. 2008.
2. Kleigman, Behrman, Jenson, Stanton: Status epilepticus, Nelson Textbook of pediatrics, 18th Ed., chapter 593.8, 2473 – 2475.

## AUTHOR

Santanu Deb, MD  
Consultant & Head of Department of Paediatrics,  
Nazareth Hospital, Shillong

## CORRESPONDENCE

Santanu Deb, MD  
Consultant & Head of Department of Paediatrics,  
Nazareth Hospital  
Shillong  
+91-94361 16560  
drsdeb@rediffmail.com

Rx

# CHERI<sup>®</sup> Capsules

## The CHERished Haematinic

Guarantees  2 gm% Hb rise in just 3 Weeks

### CHERI is a unique combination...

#### Cheri provides

- 99mg of elemental iron
- **Folic Acid** helps in DNA synthesis
- **Vitamin C** helps in Iron absorption
- **Protein hydrolysate** provides all essential Amino Acids
- **Vitamin B6** is important for Protein & Amino Acid metabolism

### CHERished by millions...

- **Vitamin B12** is important for Nucleic Acid synthesis & prevents Megaloblastic Anaemia
- **Copper** is important for Iron metabolism<sup>1</sup>
- **Zinc** prevents IUGR<sup>1</sup>
- **Manganese** is a cofactor in many enzyme activities

### In Pregnancy & Lactation



### The CHERished Haematinic

1. Deack H et al. Acta Obstet Gynecol Scand. 2007 Oct;116(10):911-7