Management of Status Epilepticus

Michael J. Aminoff

ABSTRACT: The pharmacologic management of major motor status epilepticus is summarized. When general anesthesia is required, the electroencephalogram (EEG) is used for monitoring the adequacy of treatment. The EEG findings may also be important in recognizing status epilepticus and monitoring its response to treatment when this is clinically difficult, as when it occurs in comatose or pharmacologically paralyzed patients or in the context of severe brain damage. Finally, the EEG helps to clarify the nature of motor activities of uncertain basis in patients in the intensive care unit and has indicated that non-convulsive seizures or seizures without electrographic seizures are more common than clinically suspected in such patients.


Status epilepticus is becoming increasingly common, poses difficult management problems, and sometimes has a fatal outcome. Major motor status epilepticus may occur in known epileptics or in patients without previous seizures, and arises for many different reasons. Prognosis depends on the time required to control seizures: as this increases, and particularly when this exceeds 2 hours, the outlook for survival or recovery without sequelae diminishes significantly. Effective treatment must generally be instituted before the cause of the status is known.

Initial management (Table) is with intravenous diazepam (10-20 mg) or lorazepam (4-8 mg), which often controls seizures temporarily. Long-lasting control requires intravenous phenytoin (18 mg/kg at 50 mg/min); this is best administered as fosphenytoin sodium, the dose of which is expressed as phenytoin equivalents (PE). Fosphenytoin is water soluble, can be infused in saline or dextrose, and is better tolerated at the infusion site than phenytoin. It is converted in the body to phenytoin (18 mg/kg at 100 mg/min); this is best administered as fosphenytoin sodium, the dose of which is expressed as phenytoin equivalents (PE). Fosphenytoin is water soluble, can be infused in saline or dextrose, and is better tolerated at the infusion site than phenytoin. It is converted in the body to phenytoin (18 mg/kg at 100 mg/min); this is best administered as fosphenytoin sodium, the dose of which is expressed as phenytoin equivalents (PE). Fosphenytoin is water soluble, can be infused in saline or dextrose, and is better tolerated at the infusion site than phenytoin. It is converted in the body to phenytoin.

Alternatively, phenobarbital (15 mg/kg at 100 mg/min) can be infused intravenously. The side effects of phenytoin or phenobarbital include hypotension, respiratory depression, and cardiac arrhythmias. If these measures fail, the patient is paralyzed pharmacologically, ventilated, and transferred to the intensive care unit (ICU) to be treated by pentobarbital- or midazolam-induced anesthesia. The electroencephalogram (EEG) is used for monitoring control of seizures and level of anesthesia. The aim is to suppress electrographic seizures and epileptiform activity, and usually to obtain a burst-suppression pattern, but it is unclear whether inducing a burst-suppression pattern provides any added advantage if seizures are controlled with lower levels of medication.

Pentobarbital is given in an intravenous loading dose of 15 mg/kg over 1 hour, followed by maintenance doses of 0.5 mg/kg/hour; higher doses are used depending on the clinical and EEG response. With midazolam, a loading bolus of 200 µg/kg is followed by continuous intravenous infusion of 0.75 to 10 µg/kg/min. In either case, hypotension may occur and is treated by pressor agents and intravenous fluids. The pentobarbital or midazolam is stopped after 12 hours but restarted for a further 12 to 24 hours (or longer) if seizures recur; it may have to be continued for several days. Prognosis depends on the cause of status and condition of patients. A poor prognosis is associated with advancing age and the occurrence of hypotension or multiorgan failure.

Development of status epilepticus may be difficult to recognize in comatose or pharmacologically paralyzed patients already in the ICU, or when severe brain damage restricts the clinical manifestations of convulsions to, for example, the extraocular muscles. The EEG findings may then be definitive, especially when they consist of repeated electrographic seizures or continuous spike-wave activity. The significance of a burst-suppression pattern or periodic spiking is less clear. In a personal series of 10 patients in electrographic status epilepticus with
Table: Management of Convulsive Status Epilepticus in Adults.

<table>
<thead>
<tr>
<th>Time/Procedure</th>
<th>Drug</th>
<th>Dose (intravenous)</th>
<th>Comment</th>
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</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
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<tr>
<td>Immediate</td>
<td>Diazepam or Lorazepam</td>
<td>10 mg or 0.1 mg/kg or 4 mg</td>
<td>Give over 2 min; repeat once if necessary</td>
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<tr>
<td>Monitor vital signs</td>
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<tr>
<td>Insert intravenous catheter; draw venous blood for laboratory studies; commence infusion with N saline; give 50 ml of 50% dextrose and thiamine (250 mg)</td>
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<tr>
<td><strong>Step 2</strong></td>
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<tr>
<td>Concurrent with or immediately after Step 1</td>
<td>Phenytoin plus or Fosphenytoin plus</td>
<td>18 mg/kg or 18 mg PE/kg</td>
<td>Infuse at 50 mg/min or Infuse at 150 mg PE/min</td>
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<tr>
<td><strong>Step 3</strong></td>
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<tr>
<td>Immediately after conclusion of Step 2, if seizures continue</td>
<td>Phenobarbital</td>
<td>15 mg/kg</td>
<td>Infuse at 50-100 mg/min</td>
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<tr>
<td><strong>Step 4</strong></td>
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<tr>
<td>Proceed immediately after Step 3 if seizures continue</td>
<td>Midazolam plus or Pentobarbital plus</td>
<td>0.2 mg/kg or 0.5 mg/kg</td>
<td>Intubation and ventilatory support required. Stop after 12 hrs; if seizures recur, reintroduce for a further 12 hrs. Repeat every 12-24 hrs for as long as necessary.</td>
</tr>
</tbody>
</table>

EEGs (routine recordings or continuous monitoring) suggest, however, that nonconvulsive seizures and status are more common than clinically suspected, especially in patients with acute cerebral dysfunction or recent craniotomy. Delay in diagnosis affects outcome significantly, especially in such patients. The EEG typically shows continuous spike-wave activity, repeated partial (focal or lateralized) seizures, or some combination of these findings. Recent studies show that, in nonconvulsive status epilepticus occurring in the ICU, seizure duration is strongly associated with mortality, regardless of etiology. The EEG thus has an important role in evaluating the adequacy of treatment of convulsive status by barbiturate- or midazolam-induced anesthesia. It is essential for the recognition of status epilepticus with minor or no motor manifestations, and in monitoring its response to treatment. Finally, the EEG is important in clarifying the nature of certain motor and behavioral disturbances, especially in ICU patients, and showing that they do not relate to seizure activity.

**REFERENCES**