Electroconvulsive therapy for refractory status epilepticus in a child: A case report

Sir,

Status epilepticus (SE) is a life-threatening condition with a high mortality rate in spite of aggressive treatment. Electroconvulsive therapy (ECT) is a reasonable alternative in the treatment of SE after exhausting conventional therapy.

ECT is a well-known treatment that is used daily in several psychiatric disorders.[1] However, this treatment is rarely used in daily practice and remains poorly assessed in refractory SE. Only a few case reports have discussed the efficacy of ECT with refractory SE in children.[2-5] We present a child with drug-resistant refractory SE who improved following therapeutic ECT.

The patient was a 16-year-old girl with cerebral palsy, and was referred to our pediatric intensive care unit (ICU) because she had continued convulsions despite midazolam and rectal diazepam treatment. The patient had a history of recurrent seizures (complex partial seizures with and without secondary generalization and myoclonic attacks) since age 2. Her epilepsy had previously been well-controlled, but in the last 5 years, adequate trials of numerous anticonvulsant medications (e. g., valproicacid, carbamazepine, levetiracetam, topiramate, clobazam, and others) failed to suppress all of her seizure types.

On examination in the ICU, she was intubated, sedated, and unconscious. Her vital signs were normal. Pupillary was isochoric and light reflexes were positive bilaterally. Her tone was increased, deep tendon reflexes were brisk, and the Babinski response was bilaterally extensor. Other system examinations were normal.

In the our ICU, we used several theraphy to her SE, but her seizures were not controlled. Used therapies consisted of topiramate, levetiracetam, clobazam, vigabatrin, diphenylhydantoin, midazolam infusion, thiopental infusion, ketamin infusion, ketogenic diet, high-dose steroids, and intravenous immunoglobulin. Cranial magnetic resonance imaging revealed cortical atrophy. Multifocal epileptiform anomaly and ictal epileptiform discharges were shown on continuous electroencephalography (EEG) monitoring. We decided to do therapeutic plasma exchange for SE. The therapeutic plasma exchange was performed, but convulsions were not

stopped. There were a lot of seizures as 10-20 times a date. Her seizures continued. On month 4 of hospitalization, the ECT theraphy was performed. She was treated with five sessions of ECT over 9 days. However, topiramate, levetiracetam, clobazam, diphenylhydantoin and midazolam infusion were continued during ECT sessions. After 5 days of ECT, frequency and duration of her seizures were significantly reduced. Midazolam infusion was stopped. The patient was weaned from ventilation 5 days after ECT were completed. We detected focal epileptiform anomaly on EEG. Anticonvulsant therapy was agreed on asclobazam, topiramate, levetiracetam, and diphenylhydantoin. The patient was discharged on the 4 months and 15 days. On follow-up 1 month after discharge, she was seizure-free.

There have been published case reports have shown varying degrees ofsuccess in the use of ECT to treat refractory seizures.[2-5] However, the exact mechanism for ECT to anticonvulsive effect is not clear. Multiple theories have been suggested. The most commonly accepted thought is its gamma-aminobutyric acid (GABA) ergic effect. Electroconvulsive shock in animals is associated with the engagement of strong anticonvulsant mechanisms, probably mediated by GABA. These anticonvulsant effects build and accumulate with repeated induced seizures given over several days, and the effect persists for days up to a few weeks after ECT is over.[6]

Despite the effectiveness of ECT in SE, very few cases have been reported in the literature.[2,5] Griesemer *et al*.,[2] reported one pediatric case series on the use of ECT to treat two children with refractory epilepsy. The first patient was a 13-year-old boy with microgyria and intractable epilepsy despite multiple automated external defibrillators (AEDs) with frequent seizures. He received four sessions of ECT treatment over 9 days with mild improvement in seizure frequency and severity. One year later, National Center for Science Education (NCSE) in the same patient was halted by three daily sessions of ECT. He also reported successful ECT outcome on a 10-year-old girl with microcephaly and intractable epilepsy despite AEDs after six sessions of ECT over 2 weeks. However, in both cases, AEDs were either held or completely stopped before the ECT treatment. Then, Morales *et al*., reported a case of an 8-year-old girl with a history of two prior episodes of SE secondary to ceroid lipofuscinosis.[3] ECT was administered concomitantly with antiepileptic drugs with no adverse effects. ECT treatment failed to demonstrate any improvement. The authors mentioned this situation was because of the progressive and overwhelming nature of the underlying disease. Shin *et al*., reported the case of a 7-year-old girl with non-convulsive SE secondary to bilateral polymicrogyria who was treated with valproate, levetiracetam, and clobazam.[4] They used ECT treatment to patient. After first two ECT sessions, they detected in a cessation of non-convulsive SE. They reported that ECT was used successfully to treat medically refractory non-convulsive SE without complete withdrawal of antiepileptic drugs. We described a patient who was in convulsive SE for 4 months and then treated with ECT after all standard pharmacological strategies were exhausted. In our case, SE was treated successfully without any adverse effects.

Also, transcranial magnetic stimulation (TMS) is a potential therapy for SE. TMS provides a non-invasive evaluation of separate excitatory and inhibitory functions of the cerebral cortex. Several case reports describe low-frequency TMS application in medication-refractory focal epilepsy or SE in non-ICU patients, with mixed results.[7,8] Hypothetical concerns about interference with ICU electronic equipment may also limit clinical use and warrant further exploration. TMS is not use in our hospital.

In conclusion, ECT may be successful in terminating an episode of treatment-resistant SE that was unresponsive to all conventional medical treatments. It is recognized that ECT is not a first-line treatment of SE, but ECT may be a treatment option for refractory SE in childhood after conventional treatments fail.

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References

1. Versiani M, Cheniaux E, Landeira-Fernandez J. Efficacy and safety of electroconvulsive therapy in the treatment of bipolar disorder: A systematic review. J ECT 2011;27:153-64.
2. Griesemer DA, Kellner CH, Beale MD, Smith GM. Electroconvulsive therapy fortreatment of intractable seizures. Initial findings in two children. Neurology 1997;49:1389-92.
3. Morales OG, Henry ME, Nobler MS, Wassermann EM, Lisanby SH. Electroconvulsive therapy and repetitive transcranial magnetic stimulation in children and adolescents: A review and report of two cases of epilepsia partialis continua. Child Adolesc Psychiatr Clin N Am 2005;14:193-210.
4. Shin HW, O'Donovan CA, Boggs JG, Grefe A, Harper A, Bell WL, *et al*. Successful ECT treatment for medically refractory nonconvulsive status epilepticus in pediatric patient. Seizure 2011;20:433-6.
5. Lambrecq V, Villéga F, Marchal C, Michel V, Guehl D, Rotge JY, *et al*. Refractory status epilepticus: Electroconvulsive therapy as a possible therapeutic strategy. Seizure 2012;21:661-4.
6. Sackeim HA. The anticonvulsant hypothesis of the mechanisms of action of ECT: Current status. J ECT 1999;15:5-26.
7. Joo EY, Han SJ, Chung SH, Cho JW, Seo DW, Hong SB. Antiepileptic effects of low-frequency repetitive transcranial magnetic stimulation by different stimulation durations and locations. Clin Neurophysiol 2007;118:702-8.
8. Liu A, Pang T, Herman S, Pascual-Leone A, Rotenberg A. Transcranial magnetic stimulation for refractory focal status epilepticus in the intensive care unit. Seizure 2013;22:893-6.

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