

# Electrolyte Therapy for Refractory Seizures in Familial Dysautonomia

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**Summary:** *Purpose:* Video-EEG in a family of three patients with slow development and familial dysautonomia demonstrated absence seizures associated with 3-Hz generalized spike-and-wave discharges. The seizures were refractory to antiepileptic drugs (AEDs).

*Methods:* Treatment was given with rice-based cereal electrolyte oral solution.

*Results:* Treatment induced seizure freedom and normalization of EEG in all three patients. Repeated video-EEG

monitoring with discontinuation of AEDs and maintenance of the oral hydration therapy was associated with recurrence of epileptic activity. All three patients have remained seizure free (~1 year) with a combination of topiramate and electrolytic therapy.

*Conclusions:* Rice-based oral electrolyte hydration therapy may play a role in prevention and control of seizures in patients with familial dysautonomia. **Key Words:** Electrolytes—Familial dysautonomia—Seizure—EEG—Riley-Day.

Familial dysautonomia (FD) is a rare autosomal recessively inherited disorder characterized by frequent syncope episodes (1). Riley (2) described frequent abnormal EEGs, and Niedermeyer (3) reported EEG paroxysmal abnormalities in 90% of a series of 10 patients. About 40% of patients with FD will experience at least one seizure with provocation. Alterations in extracellular-to-intracellular ion gradients can have both direct and indirect effects on neuronal discharges. Animal preparation studies have shown that decrease in osmolarity enhances epileptiform bursting, whereas increase in osmolarity blocks epileptiform discharges (4,5).

## METHODS

Three patients previously were reported (6): two are monozygotic twins, with genetic confirmation of FD and absence epilepsy and underwent video-EEG monitoring for confirmation of their refractory epileptic disorder. The history, physical examination, and diagnostic workup were published elsewhere (6).

Video-EEG monitoring in both twins captured frequent bursts (every 30 s) of generalized 3-Hz spike-and-wave discharges, lasting from 1 to 6 s, and absence-type seizures. The older sibling had bifrontal spikes followed

by rhythmic theta and delta slowing lasting several seconds, associated with a brief pause in behavior. The absence seizures continued on a daily basis despite treatment with a combination of topiramate (TPM) and ethosuximide (ESM), salt tablets (180 mg/day), and 40 oz daily of PedalyteR to prevent syncope episodes. All three patients suddenly were switched to a rice-based oral solution containing sodium of 90 mEq/L, potassium, 20 mEq/L, citrate, 30 mmol; each liter with 40 g of rice-carbohydrate as the substrate to deliver the electrolytes. They were given an average of 40 oz/day. Concomitant treatment including AEDs was unchanged.

## RESULTS

All three patients were reported to be seizure free 2 days after initiation of the hydration therapy. Routine EEG showed no evidence of epileptic activity in any of them. Repeated video-EEG monitoring was performed 4 weeks later after 24-h AED discontinuation. Concomitant treatment, including rice-based oral solution treatment, was kept unchanged. EEG background during the first 24 h of recording showed no evidence of epileptic activity. After 48 h, all three of them showed recurrence of occasional generalized spike-and-wave discharges, as previously documented, without clear clinical seizures. All three patients were discharged with TPM, 400 mg/day. ESM was discontinued, whereas electrolyte therapy remained unchanged.

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Clinical and routine EEG follow-up over a 1-year period showed no evidence of recurrence of the seizure activity. No adverse effects have been reported after >2-year use of electrolyte solution. Monitoring of serum electrolytes has not shown any significant changes.

### DISCUSSION

The abrupt and long-lasting improvement after changing oral hydration therapy is highly suggestive of a therapeutic effect on seizure control of the electrolyte therapy in these patients.

This rice-based oral hydration solution quickly reaches the small intestine, promoting early recovery and faster restoration of blood volume, preventing major hemodynamic changes that may trigger seizures. Expansion of the extracellular volume may be associated with reduction of the seizure threshold in these patients, lead-

ing to better seizure control. No previous published data are available about this treatment modality for seizures; therefore controlled studies are needed to validate this report.

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