Published in final edited form as:
Clin Pediatr (Phila). 2011 September ; 50(9): 876–878. doi:10.1177/0009922810384726.

Occlusive Patch Therapy for Reduction of Seizures in Dravet Syndrome

Catherine Choi, BS[1], **Nausheen Khuddus, MD**[1], **Casey Mickler, MD**[1], **Sanjeev Tuli, MD**[1], and **Sonal Tuli, MD**[1]

[1]University of Florida, Gainesville, FL, USA

Case Presentation

A 2-year-old Caucasian male presented with a history of nystagmoid eye movements. He also had a history of seizures that were poorly controlled with medications. The parents felt the seizures were exacerbated by exposure to light as they were worse on waking up from a nap.

The patient was born at 38 weeks gestational age with a birth weight of 8 lbs 13 oz and birth height of 20.25 inches. His gestational history was complicated only by preeclampsia, for which his mother underwent induction of labor. At 9 months of age, he had his first febrile seizure leading to status epilepticus. His past medical history until that time was only significant for recurrent acute otitis media, for which he had been on amoxicillin treatment at the time of his seizure. He was evaluated by neurology, underwent an electroencephalogram (EEG), and was diagnosed with generalized epilepsy of unknown origin. His parents were given a prescription for diazepam by rectal suppository to be given at the onset of a seizure.

The patient continued to have seizures and was placed on multiple antiepileptic medications, including topiramate (Topamax), levetiracetam (Keppra), clonazepam (Klonopin), and lamotrigine (Lamictal). These were all ineffective and he was finally started on valproic acid (Depakene), which was changed to divalproex sodium (Depakote), which partially controlled his seizures.

Around 15 to 18 months of age, the patient began regressing developmentally. Although he had been walking previously, he resorted back to crawling and could no longer verbally communicate with his parents with well-formed words. His receptive language skills surpassed those of expressive language. The parents continued to notice that the seizures appeared to be triggered by exposure to bright light and began to keep him in totally dark environments and made him wear sunglasses constantly.

Given the intractable seizures and photosensitivity, genetic testing was performed, which revealed that the patient had a severe-type mutation in the SCN1A gene. Both parents tested negative for the same SCN1A gene mutation indicating a de novo mutation. The patient was

Corresponding Author: Nausheen Khuddus, Department of Ophthalmology, University of Florida, 1600 SW Archer Road, Gainesville, FL 32601, USA nkhuddus@ufl.edu.

Declaration of Conflicting Interests: The author(s) declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

diagnosed with Dravet syndrome previously known as severe myoclonic epilepsy of infancy.

At his first consultation with ophthalmology, a complete examination could not be performed because of seizure activity with exposure to light when attempting a Hirschberg examination. It was noted that he had jerky nystagmoid movements of the eyes and that his eyes crossed. A trial of alternating monocular patching was initiated where each eye was patched for 6 hours in an alternating pattern. The patient's parents noted a dramatic improvement in his seizure activity after a few months of starting the patching. The number of seizures decreased from 20 seizures in 2007 to 12 seizures in 2008, the year he was being patched. All these seizures occurred while he was not wearing the eye patch. In addition, his tolerance for dim, low-wattage light had also improved. He returned for another eye examination in 2008 and had been seizure-free for 5 months prior to the examination, which was a marked improvement. At this examination his vision was estimated to be 20/80 in the right eye (9.8 cy/cm at 38 cm) and 20/150 in the left eye (4.8 cy/cm at 38 cm) using Teller acuity cards. At a subsequent examination, 3 months later, his vision had improved to 20/50 (9.8 cy/cm at 55 cm) in each eye. He could also tolerate a full eye examination without seizure activity with each eye evaluated separately and the other eye patched.

Discussion

Dravet syndrome is a debilitating condition characterized by persistent convulsive seizure activity and cognitive impairment. Dravet syndrome, also known as severe myoclonic epilepsy in infancy, is a rare disease with an incidence ranging from 1 in 40 000 to 1 in 20 000.[1,2] It has been linked to genetic mutations in the SCN1A gene encoding the α-1 subunit of a neuronal voltage-gated sodium channel, and up to 80% of patients with Dravet syndrome have this mutation.[3,4] The disease typically manifests with prolonged febrile seizures during the first year of life that frequently progress to status epilepticus and later develop into other seizure types, including myoclonic, partial, and atypical absence. These seizures may or may not be associated with fevers, can be focal or generalized, and are usually unresponsive to antiepileptic medications.[5,6] A gradual developmental delay after an initial period of normal psychomotor development is often seen.[7] The mortality rate associated with the condition is 16% to 18%.[4]

A total of 40% of patients also demonstrate photosensitivity, in which light triggers seizure activity.[7] This number is significant, as only 3% to 5% of the general epileptic population has associated photosensitivity.[7] The most common triggers of seizures are natural sunlight and television screens, though striped walls or clothing may also trigger them. Several factors affect the sensitivity of an individual to light; these include distance from light stimulus, color of light, pattern of light (ie, flashing, striped), light intensity, frequency of change, and area of light source.[8] The exact cause of this light sensitivity is not known. However, recent studies have shown that in normal retinal ganglion cells, sodium channels work to mediate sensitivity to light. They increase sensitivity in dim light conditions to detect small visual inputs, and decrease sensitivity in bright environments to prevent saturation.[9] Because of the disruption of normal sodium channel function in Dravet syndrome patients with the SCN1A gene mutation, this modulation may be lost, making them more sensitive to changes in lighting.

Dravet syndrome is notoriously difficult to treat. Antiepileptic medications such as valproic acid and benzodiazepines may reduce the frequency and duration of seizures, but they do not eliminate epileptic activity completely.[10] Ketogenic diets (high fat, low carbohydrate, and moderate protein) have also shown to have some favorable effects in patients with Dravet

syndrome by reducing the number of seizures. The increase in ketone bodies secondary to these diets has been thought to have an antiepileptic effect.[11]

Polarized sunglasses have been proposed as adjunctive therapy in photosensitive epilepsy.[12] Authors have advocated simple polarized, cross-polarized, and blue polarized glasses as various methods for decreasing seizures caused by light exposure.[13] We did not try this in our patient as review of the literature suggests that it does not consistently decrease seizure activity. Monocular or binocular occlusion using a cupped hand has been advocated as a method of aborting myoclonic jerks whenever exposed to a provocative visual stimulus.[14] Interruption of binocular vision appears to control seizure activity as the visual input to the brain is reduced by half. Merely closing both eyes does not seem to have the same effect as red light filtering through the eyelids does not effectively eliminate the light stimulus.[10] We alternated patching the eyes in the patient every 6 hours as he was 3 years old at the time and only patching one eye would lead to amblyopia in that eye.

The success of alternate monocular patching for photosensitive seizures in our patient with Dravet syndrome indicates that it could be a valuable adjunct therapy to medication in this condition. By allowing patients to function in normal lighting conditions, it would be valuable in enhancing the quality of life for patients with Dravet syndrome.

Acknowledgments

Funding: The author(s) disclosed receipt of the following financial support for the research and/or authorship of this article:

This study was supported in part by an unrestricted grant from Research to Prevent Blindness.

References

1. Yakoub M, Dulac O, Jambaqué I, Chiron C, Plouin P. Early diagnosis of severe myoclonic epilepsy in infancy. Brain Dev. 1992; 14:299–303. [PubMed: 1456383]
2. Hurst DL. Epidemiology of severe myoclonic epilepsy of infancy. Epilepsia. 1990; 31:397–400. [PubMed: 1695145]
3. Nabbout R, Gennaro E, Dalla Bernardina B, et al. Spectrum of SCN1A mutations in severe myoclonic epilepsy of infancy. Neurology. 2003; 60:1961–1967. [PubMed: 12821740]
4. Dravet Syndrome Advocacy, Education, Research and Support Network. 2010. www.idea-league.org
5. Sugawara T, Mazaki-Miyazaki E, Fukushima K, et al. Frequent mutations of SCN1A in severe myoclonic epilepsy in infancy. Neurology. 2002; 58:1122–1124. [PubMed: 11940708]
6. Roger, J.; Bureau, M.; Dravet, C.; Genton, P.; Tassinari, CA.; Wolf, P. Epileptic Syndromes in Infancy, Childhood and Adolescence. 4th. Montrouge, France: John Libbey Eurotext; 2006.
7. Dravet C, Bureau M, Oguni H, Fukuyama Y, Cokar O. Severe myoclonic epilepsy in infancy: Dravet syndrome. Adv Neurol. 2005; 95:71–102. [PubMed: 15508915]
8. Fisher RS, Harding G, Erba G, Barkley GL, Wilkins A. Epilepsy Foundation of America Working Group. Photic-and pattern-induced seizures: a review for the Epilepsy Foundation of America Working Group. Epilepsia. 2005; 46:1426–1441. [PubMed: 16146439]
9. Ichinose T, Lukasiewicz PD. Ambient light regulates sodium channel activity to dynamically control retinal signaling. J Neurosci. 2007; 27:4756–4764. [PubMed: 17460088]
10. Covanis A, Stodieck SR, Wilkins AJ. Treatment of photosensitivity. Epilepsia. 2004; 45(Suppl 1): 40–45. [PubMed: 14706045]
11. Caraballo RH, Cersósimo RO, Sakr D, Cresta A, Escobal N, Fejerman N. Ketogenic diet in patients with Dravet syndrome. Epilepsia. 2005; 46:1539–1544. [PubMed: 16146451]

12. Kepecs MR, Boro A, Haut S, Kepecs G, Moshé SL. A novel nonpharmacologic treatment for photosensitive epilepsy: a report of three patients tested with blue cross-polarized glasses. Epilepsia. 2004; 45:1158–1162. [PubMed: 15329083]

13. Jain S, Woodruff G, Bissessar EA. Cross polarized spectacles in photosensitive epilepsy. J Pediatr Ophthalmol Strabismus. 2001; 38:331–334. [PubMed: 11759770]

14. Jeavons, PM.; Harding, GFA. Photosensitive Epilepsy A Review of the Literature and a Study of 460 Patients. London, UK: William Heineman Books; 1975.