PEDIATRIC NEUROLOGY BRIEFS

A MONTHLY JOURNAL REVIEW

Vol. 29, No. 8 August 2015

PEDIATRIC NEUROLOGY BRIEFS © 1987-2015, **ISSN 1043-3155 (print) 2166-6482 (online)**, is published monthly by Pediatric Neurology Briefs Publishers, PO Box 11391, Chicago, IL 60611. **Mission:** Pediatric Neurology Briefs is an Open Access (OA) continuing education service designed to expedite and facilitate the review of current scientific information for physicians and other health professionals. **Disclaimer:** While the information is believed to be true and accurate at publication, neither the authors nor the editors nor the publisher can accept any legal responsibility for any error or omissions. The publisher makes no warranty, express or implied, with respect to the material contained herein. Visit Pediatric Neurology Briefs online: http://www.pediatricneurologybriefs.com. Current Issue DOI: http://dx.doi.org/10.15844/pedneurbriefs-29-8

SEIZURE DISORDERS

Seizure Action Plans and Health Care Utilization

Dara V.F. Albert, DO[1] and Anup D. Patel, MD[1]*
[1]*Division of Neurology, Department of Pediatrics, Nationwide Children's Hospital and The Ohio State University College of Medicine, Columbus, OH*
**Correspondence: Dr. Anup Patel, E-mail: anup.patel@nationwidechildrens.org*

Related Article: Roundy LM, Filloux FM, Kerr L, Rimer A, Bonkowsky JL. Seizure Action Plans Do Not Reduce Health Care Utilization in Pediatric Epilepsy Patients. J Child Neurol 2015 Aug.
Keywords: Epilepsy; Hospitalizations; Quality Improvement

Investigators from University of Utah School of Medicine studied the impact of a seizure action plan (SAP) on pediatric patients with epilepsy by measuring health care utilization as an outcome measure. The study included 120 unique patients, 60 of which were utilized as historical controls. Patients were identified from the inpatient service and given a SAP prior to hospital discharge. The SAP used was an internally generated document containing key information such as the child's daily medications, emergency medications and Neurology provider contact. The patients were then followed for 18 months. Emergency Room (ER) visits, hospitalizations, clinic visits and Neurology office phone calls were tracked. They found no significant difference in ER or inpatient utilization between the patients who received an action plan and those who did not. This lack of difference persisted when they compared a subgroup of patients with less severe epilepsy, defined as less than 3 anticonvulsant medications. There was however, an increase in outpatient clinic visits in the group who received the SAP. The authors pose several possibilities as to why their results were not significant, such as a small cohort leading to insufficient power, the retrospective design and the format and layout of the SAP itself. They also suggest perhaps utilization was not the correct outcome measure. [1]

COMMENTARY. Pediatric epilepsy patients are complex and their families require an exceptional amount of education and support. Education has been shown to improve self-management and quality of life in adult epilepsy patients [2]. In pediatric patients, the child's self-perceived quality of life is strongly influenced by their social support system and less so their seizures [3]. In a recent meta-analysis, Ferro examined the literature for risk factors for health-related quality of life in pediatric epilepsy patients. His results also show that parental anxiety negatively impacted the child's quality of life [4]. Therefore, a quality of life metric may be more appropriate. In addition, the current study may be underpowered to detect changes in utilization based on the numbers of patients enrolled. Also, the patients enrolled in the study were selected from the inpatient service, which may have created a selection bias and limits the patient population. The outpatient arena may be more applicable for such an education driven intervention. The SAP developed is a text laden document. As the authors suggested, a color coded or less dense action plan might be easier to read and reference as what has been similarly used in other disease states, such as asthma. Despite the lack of significant findings in the current study, we believe educational tools such as a seizure action plan for patients with epilepsy and their families can still beneficial, the key will be determining the correct tool.

Disclosures

The author(s) have declared that no competing interests exist.

References

1. Roundy LM, Filloux FM, Kerr L, Rimer A, Bonkowsky JL. Seizure Action Plans Do Not Reduce Health Care Utilization in Pediatric Epilepsy Patients. J Child Neurol 2015 Aug. http://dx.doi.org/10.1177/0883073815597755 PMID:26245799
2. Yadegary MA, Maemodan FG, Nayeri ND, Ghanjekhanlo A. The effect of self-management training on health-related quality of life in patients with epilepsy. Epilepsy Behav 2015 Sep;50:108–112.http://dx.doi.org/10.1016/j.yebeh.2015.04.051 PMID:26232570
3. Fayed N, Davis AM, Streiner DL, Rosenbaum PL, Cunningham CE, Lach LM et al.; QUALITÉ Study Group. Children's perspective of quality of life in epilepsy. Neurology 2015 May;84(18):1830–1837.http://dx.doi.org/10.1212/WNL.0000000000001536 PMID:25841031
4. Ferro MA. Risk factors for health-related quality of life in children with epilepsy: a meta-analysis. Epilepsia 2014 Nov;55(11):1722–1731. http://dx.doi.org/10.1111/epi.12772 PMID:25243908

Pediatric Neurology Briefs 2015;29(8):58. http://dx.doi.org/10.15844/pedneurbriefs-29-8-1.
ISSN: 1043-3155 (print) 2166-6482 (online). Received 2015 Aug 17. Accepted 2015 Aug 30. Published 2015 Sep 7.

SEIZURE DISORDERS

Does Listening to Mozart benefit Children with Severe Epilepsy?

J. Gordon Millichap, MD[1]*
[1]*Division of Neurology, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL; and Departments of Pediatrics and Neurology, Northwestern University Feinberg School of Medicine, Chicago, IL*
**Correspondence: Dr. J. Gordon Millichap, E-mail: jgmillichap@northwestern.edu*

Related Article: Coppola G, Toro A, Operto FF, Ferrarioli G, Pisano S, Viggiano A et al. Mozart's music in children with drug-refractory epileptic encephalopathies. Epilepsy Behav 2015 Sep;50:18–22.
Keywords: Mozart; Music Therapy; Epileptic Encephalopathy

Investigators from the Universities of Salerno and Perugio, Italy, studied the effect of listening to a set of Mozart's compositions on sleep quality, behavior, and seizure recurrence in 11 outpatients (7 males and 4 females), between 1.5 and 21 years of age (mean age, 11.9 years), with drug-resistant epilepsy. All patients had severe intellectual disability and cerebral palsy. They listened to Mozart 2 h per day for 15 days for a total of 30 h. The music was filtered by a device that delivered higher sound frequencies (>3000 Hz). A variety of Mozart musical compositions presented to each patient included symphonies 41 and 46, piano concerto 22 (k482), violin concertos 1 and 4, and flute concerto (k314). During music therapy, 3 patients had a seizure reduction of 75-89%, and 2 out of 11 patients had a reduction of 50-75% in seizure recurrence. The average seizure reduction for all patients was 48.4 +/- 48.7% (p=0.02). In the two weeks after the end of music therapy, the percentage decrease of total seizure number compared with base-line was 20.7%. The majority (10/11) had multiple EEG foci; occipital/bioccipital discharges were present in 20% of responders and in 66.7% of nonresponders. Responders had an increased frequency of extra occipital EEG discharges and a relative paucity of occipital discharges. Nighttime sleep was improved in 4 (36.4%) patients, all seizure responders. All responders showed improvement in behavior. [1]

COMMENTARY. Previous studies have emphasized the "Mozart effect" of listening to the K448 sonata for two pianos. A wider set of Mozart musical compositions was selected in the present study to improve children's compliance with music listening. The responsiveness of not only seizures but also the EEG interictal discharges is stressed. Generalized and central spike and wave discharges in particular are controlled while listening to Mozart [2]. Very few studies have demonstrated a reduction in clinical seizures in children in response to music, and these are uncontrolled.

Limitations of the present study noted by the authors include the study design (nonrandomized, open-label), and small sample size. Potential strengths include a longer listening period compared to previous studies, and a homogeneous patient sample. Overall, there is limited evidence to recommend Mozart's music as an antiepileptic therapy. The authors find their preliminary findings encouraging and they propose to continue an objective assessment of Mozart as a promising complementary treatment of epilepsy.

Disclosures

The author(s) have declared that no competing interests exist.

References

1. Coppola G, Toro A, Operto FF, Ferrarioli G, Pisano S, Viggiano A et al. Mozart's music in children with drug-refractory epileptic encephalopathies. Epilepsy Behav 2015 Sep;50:18–22. http://dx.doi.org/10.1016/j.yebeh.2015.05.038 PMID:26093514
2. Lin LC, Lee WT, Wu HC, Tsai CL, Wei RC, Jong YJ et al. Mozart K.448 and epileptiform discharges: effect of ratio of lower to higher harmonics. Epilepsy Res 2010 May;89(2-3):238–245.http://dx.doi.org/10.1016/j.eplepsyres.2010.01.007 PMID:20129759

Pediatric Neurology Briefs 2015;29(8):59. http://dx.doi.org/10.15844/pedneurbriefs-29-8-2.
ISSN: 1043-3155 (print) 2166-6482 (online). Received 2015 Aug 21. Accepted 2015 Aug 30. Published 2015 Sep 7.

PERINATAL DISORDERS

MRI and Motor Outcomes in Children with Cerebral Palsy

Deborah Gaebler-Spira, MD[1]* and Kristen McCormick, DO[1]
[1]*Rehabilitation Institute of Chicago; and*
Departments of Pediatrics and Physical Medicine and Rehabilitation, Northwestern University Feinberg School of Medicine, Chicago, IL
**Correspondence: Dr. Deborah Gaebler-Spira, E-mail: dgaebler@ric.org*

Related Article: Englander ZA, Sun J, Laura Case, Mikati MA, Kurtzberg J, Song AW. Brain structural connectivity increases concurrent with functional improvement: evidence from diffusion tensor MRI in children with cerebral palsy during therapy. Neuroimage Clin 2015;7:315–324.
Keywords: Cerebral Palsy; Diffusion Tensor Imaging; GMFM-66; Structural Connectome

Investigators from University of Melbourne, Monash Children's Hospital, Royal Children's Hospital & Murdoch Children's Research Institute sought to identify correlation between magnetic resonance imaging (MRI) characteristics including white matter injury (WMI) in children with cerebral palsy (CP) and severity in motor outcomes later in life, irrespective of CP subtype. Their goal was to develop a severity classification for WMI that can discriminate children with different levels of functional ability. Data was collected from children seen at Melbourne Children's Campus, in a cohort population from 1999-2008. A total of 272 children were identified from the Victorian Cerebral Palsy Register with a diagnosis of CP and WMI on MRI. Their MRI findings were divided into broad patterns of injury that reflected pathogenesis & timing of injury: unilateral, asymmetrical, or symmetrical, then based on location: anterior, mid, and posterior white matter. These data were then analyzed using Chi square tests to assess the strength of association between known Gross Motor Function Classification System (GMFCS) levels and symmetrical WMI, and between motor topography groups for children with symmetrical WMI & bilateral CP. There were clear associations between extent of signal abnormality in the worse hemisphere and laterality/symmetry of WMI ($p = 0.004$), extent/location of WM loss & laterality/symmetry ($p<0.001$), and GMFCS/motor topography and MRI laterality/symmetry ($P<0.001$). Despite the strong association between MRI symmetry & motor topography, there was only 56% agreement between the two. While WMI seen on imaging correlated with physical exam findings in a large majority of patients, physical exam findings correlated with MRI findings less frequently. Overall, it seems that the best model for predicting GMFCS level was MRI laterality/symmetry, extent of WM loss, cerebellar abnormality, and thinning of the corpus callosum ($p<0.001$). These findings were used by the authors to create a new WMI severity classification for children with CP that could provide valuable predictors of future function to families. [1]

COMMENTARY. This article continues the quest to link structural brain findings to functional outcome and severity of condition [1,2]. The relationship of structure linked to function is of increasing importance as the process of targeted neuro-rehabilitation and recovery of the impact of injury to the neonatal brain is also progressing [3]. With 56% of variance or severity yet explained, the linkage is still elusive. This is the link between parent's and neurologist, what is seen on scan and what is expected in real life.

Until a unified approach to reporting MRI findings with validated outcomes in function are used, the opportunity exists to advance the link, especially with the use of the population-based registries in Australia, Scandinavia and Europe [4,5,6]. Population registry methodology is the most efficient means to this end. Cooperation and collaboration of registries in the United States would increase available data which could and would advance the remaining unexplained variance of function seen in this study.

Disclosures

The author(s) have declared that no competing interests exist.

References

1. Englander ZA, Sun J, Laura Case, Mikati MA, Kurtzberg J, Song AW. Brain structural connectivity increases concurrent with functional improvement: evidence from diffusion tensor MRI in children with cerebral palsy during therapy. Neuroimage Clin 2015;7:315–324. http://dx.doi.org/10.1016/j.nicl.2015.01.002 PMID:25610796
2. Van't Hooft J, van der Lee JH, Opmeer BC, Aarnoudse-Moens CS, Leenders AG, Mol BW, et al. Predicting developmental outcomes in premature infants by term equivalent MRI: systematic review and meta-analysis. Syst Rev. 2015;4:71. http://dx.doi.org/10.1186/s13643-015-0058-7 PMID: 25982565
3. Berger R, Söder S. Neuroprotection in preterm infants. BioMed Res Int 2015;2015:257139.http://dx.doi.org/10.1155/2015/257139 PMID:25650134
4. Granild-Jensen JB, Rackauskaite G, Flachs EM, Uldall P. Predictors for early diagnosis of cerebral palsy from national registry data. Dev Med Child Neurol. 2015. http://dx.doi.org/10.1111/dmcn.12760 PMID: 25855100
5. Hurley DS, Sukal-Moulton T, Msall ME, Gaebler-Spira D, Krosschell KJ, Dewald JP. The cerebral palsy research registry: development and progress toward national collaboration in the United States. J Child Neurol. 2011;26(12):1534-41. http://dx.doi.org/10.1177/0883073811408903 PMID: 21677201
6. Hurley DS, Sukal-Moulton T, Gaebler-Spira D, Krosschell KJ, Pavone L, et al. Systematic Review of Cerebral Palsy Registries/ Surveillance Groups: Relationships between Registry Characteristics and Knowledge Dissemination. Int J Phys Med Rehabil 2015;3:266. http://dx.doi.org/10.4172/2329-9096.1000266

Pediatric Neurology Briefs 2015;29(8):60. http://dx.doi.org/10.15844/pedneurbriefs-29-8-3.
ISSN: 1043-3155 (print) 2166-6482 (online). Received 2015 Aug 31. Accepted 2015 Sep 5. Published 2015 Sep 7.

HEADACHE DISORDERS

Intracranial Hypertension in Children without Papilledema

Ana B. Chelse, MD[1] and Leon G. Epstein, MD[1]*
[1]*Division of Neurology, Ann & Robert H. Lurie Children's Hospital of Chicago; and*
Departments of Pediatrics and Neurology, Northwestern University Feinberg School of Medicine, Chicago, IL
**Correspondence: Dr. Leon G. Epstein, E-mail: lepstein@luriechildrens.org*

Related Article: Aylward SC, Aronowitz C, Roach ES. Intracranial Hypertension Without Papilledema in Children. J Child Neurol 2015.
Keywords: Headache; Intracranial Hypertension; Pediatric; Pseudotumor Cerebri

Researchers at Nationwide Children's Hospital studied the frequency of intracranial hypertension without papilledema in children followed in a multispecialty pediatric intracranial hypertension clinic. Children aged 2 to 22 years (mean age of 12 years) were diagnosed with intracranial hypertension by 2 neurologists based on history, physical exam and opening pressure measurements on lumbar puncture. An eye exam by an ophthalmologist determined the presence or absence of papilledema. The study included both primary and secondary intracranial hypertension. Patients were divided into 2 groups depending on the presence or absence of papilledema. The primary outcome was to determine the frequency of intracranial hypertension without papilledema in children. 152 patients were included in the study. Group 1 consisted of 27 (17.8%) patients who met the criteria of intracranial hypertension without papilledema. Group 1 was compared to 125 (82%) children with intracranial hypertension and the presence of papilledema. Groups did not differ significantly in age, opening pressure, or body mass index. [1]

COMMENTARY. Aylward and colleagues concluded that 17.8% of children with intracranial hypertension did not have papilledema. These results are in line with previously published rates in pediatric and adult studies. Previous studies and case reports have reported rates of intracranial hypertension without papilledema ranges from 5.7% to 48 % [2-5]. A large review of 353 adult and pediatric patients with idiopathic intracranial hypertension at the University of Utah showed a frequency of 5.7% (20/353) of patients with intracranial hypertension lacked papilledema [2]. The Utah study reported a lower opening pressure (30.9 cm of water vs 37.3 cm) in patients without papilledema [2]. Among 27 pediatric patients with intracranial hypertension in a small University of Texas-Houston study, 48% (13/27) of patients who met the diagnostic criteria for intracranial hypertension lacked papilledema [5]. The current study had missing variables for BMI and initial opening pressure in 15.8% and 9.3% of patients, respectfully. Inclusion of these variables may have changed the author's reported frequency rate. Previous research reported normal ranges of OP in both sedated and nonsedated patients. Avery et al included sedated and nonsedated study patients and determined the upper limits of normal for OPs in children to be 28 cm of water without anesthesia and 30 cm with anesthesia [6]. Other papers cited in the current study used lower OP values as the upper limit of normal. As lower ranges of normal OP were used, the percentage of pediatric patients with increased pressure in the absence of papilledema was likely overstated. Current research suggests that pediatric lumbar puncture OPs are not significantly lower than those of adults and are not strongly related with age or body mass index [6,7]. Taking the present data and previous reports into consideration, physicians should not dismiss the possibility of intracranial hypertension in patients with symptoms suggesting intracranial hypertension based solely on the presence or absence of papilledema. Intracranial hypertension should be considered in children with persistent headaches refractory to standard management.

Disclosures

The author(s) have declared that no competing interests exist.

References

1. Aylward SC, Aronowitz C, Roach ES. Intracranial Hypertension Without Papilledema in Children. J Child Neurol 2015 May. http://dx.doi.org/10.1177/0883073815587029 PMID:26012507
2. Digre KB, Nakamoto BK, Warner JE, Langeberg WJ, Baggaley SK, Katz BJ. A comparison of idiopathic intracranial hypertension with and without papilledema. Headache 2009 Feb;49(2):185–193. http://dx.doi.org/10.1111/j.1526-4610.2008.01324.x PMID:19222592
3. Beri S, Gosalakkal JA, Hussain N, Balky AP, Parepalli S. Idiopathic intracranial hypertension without papilledema. Pediatr Neurol 2010 Jan;42(1):56–58. http://dx.doi.org/10.1016/j.pediatrneurol.2009.07.021 PMID:20004864
4. Huff AL, Hupp SL, Rothrock JF. Chronic daily headache with migrainous features due to papilledema-negative idiopathic intracranial hypertension. Cephalalgia 1996 Oct;16(6):451–452. http://dx.doi.org/10.1046/j.1468-2982.1996.1606451.x PMID:8902257
5. Faz G, Butler IJ, Koenig MK. Incidence of papilledema and obesity in children diagnosed with idiopathic "benign" intracranial hypertension: case series and review. J Child Neurol 2010 Nov;25(11):1389–1392.http://dx.doi.org/10.1177/0883073810364853 PMID:20357237
6. Avery RA, Shah SS, Licht DJ, Seiden JA, Huh JW, Boswinkel J et al. Reference range for cerebrospinal fluid opening pressure in children. N Engl J Med 2010 Aug;363(9):891–893. http://dx.doi.org/10.1056/NEJMc1004957 PMID:20818852
7. Lee MW, Vedanarayanan VV. Cerebrospinal fluid opening pressure in children: experience in a controlled setting. Pediatr Neurol 2011 Oct;45(4):238-240. http://dx.doi.org/10.1016/j.pediatrneurol.2011.07.002 PMID:21907885

Pediatric Neurology Briefs 2015;29(8):61. http://dx.doi.org/10.15844/pedneurbriefs-29-8-4.
ISSN: 1043-3155 (print) 2166-6482 (online). Received 2015 Aug 17. Accepted 2015 Aug 22. Published 2015 Sep 7.

CEREBELLAR ATAXIAS

De Novo Mutations in Patients with Ataxic CP

Sonika Agarwal, MD[1] and Lisa Emrick, MD[1]*
[1]*Departments of Neurology and Developmental Neuroscience, Baylor College of Medicine, Houston, TX*
**Correspondence: Dr. Lisa Emrick, E-mail: emrick@bcm.edu*

Related Article: Parolin Schnekenberg R, Perkins EM, Miller JW, Davies WI, D'Adamo MC, Pessia M, et al. De novo point mutations in patients diagnosed with ataxic cerebral palsy. Brain. 2015;138(Pt 7):1817-32.
Keywords: Cerebral Palsy; Ataxia; Genetics

As a part of a large study investigating childhood ataxias in the UK and Switzerland, Schnekenberg et al. analyzed the genetic associations with congenital cerebellar ataxia in 10 patients using either a targeted next generation sequencing panel of 118 genes or trio-based exome sequencing [1]. The testing identified de novo mutations in three different genes, KCNC3, ITPR1 and SPTBN2 in 4 patients. Three of the four patients fulfilled criteria for ataxic cerebral palsy (lack of clinical or imaging regression and absence of syndromic features). The similarity in the phenotypes leads the authors to propose shared molecular mechanisms of pathogenicity. In three cases the combination of bioinformatics and electrophysiology combined with previous reports supported the variants to be pathogenic. In the 4th case, the novel variant was de novo, the authors classified it as a possible mutation. The fathers of these four cases all ranged from 34-40 years old. The identification of specific, proven pathogenic mutations leads the authors to suggest use of DNA sequencing for patients with ataxic CP [2,3].

COMMENTARY. Cerebral palsy (CP) is a sporadic disorder with multifactorial etiologies, frequently associated with birth asphyxia, though a cause may not always be found. If no evidence of adverse perinatal events or imaging abnormalities are found, genetic work up is warranted. Ataxic CP is one of the least common types of CP and was thought to be inherited as an autosomal recessive trait in almost 50 % of the cases in a study in 1992 [4]. However, recent WES data shows higher incidence of de novo mutations as cause of genetic disorders than expected [5]. The report found a de novo mutation or likely mutation in 4/10 patients in genes previously reported in familial ataxia syndromes, expanding the phenotypes for these genes.

The study uses good methodology using SNPs to confirm parentage and functional studies if available to classify variants as pathogenic in 3/4 patients. Trio-WES sequencing has higher yield in detecting de novo mutations than traditional WES, without compromising the diagnosis of recessive conditions. The study highlights the association of advanced paternal age with de novo mutations, thought at least to be due to DNA methylation abnormalities in the age-related sperm [2].

Determining a genetic etiology for a patient with CP is important for prognosis (static or progressive disorder), recurrence risk and possible treatments in the future.

The phenotype of ataxic CP may include hypotonia, tremors, seizures, auditory and speech impairment, and may be confused with other progressive genetic disorders. We would recommend a step wise approach to the diagnostic evaluation to include assessment of the clinical phenotype and imaging characteristics, and to look for the "red flags" [6], which may suggest the utility of DNA sequencing either next generation sequencing panel or trio-based whole exome sequencing.

Disclosures

The author(s) have declared that no competing interests exist.

References

1. Parolin Schnekenberg R, Perkins EM, Miller JW, Davies WI, D'Adamo MC, Pessia M, et al. De novo point mutations in patients diagnosed with ataxic cerebral palsy. Brain. 2015;138(Pt 7):1817-32. http://dx.doi.org/10.1093/brain/awv117 PMID: 25981959
2. de Ligt J, Veltman JA, Vissers LE. Point mutations as a source of de novo genetic disease. Curr Opin Genet Dev 2013 Jun;23(3):257–263. http://dx.doi.org/10.1016/j.gde.2013.01.007 PMID:23453690
3. de Ligt J, Willemsen MH, van Bon BW, Kleefstra T, Yntema HG, Kroes T et al. Diagnostic exome sequencing in persons with severe intellectual disability. N Engl J Med 2012 Nov;367(20):1921–1929. http://dx.doi.org/10.1056/NEJMoa1206524 PMID:23033978
4. Hughes I, Newton R. Genetic aspects of cerebral palsy. Dev Med Child Neurol 1992 Jan;34(1):80–86. http://dx.doi.org/10.1111/j.1469-8749.1992.tb08568.x PMID:1544520
5. Yang Y, Muzny DM, Xia F, Niu Z, Person R, Ding Y et al. Molecular findings among patients referred for clinical whole-exome sequencing. JAMA 2014 Nov;312(18):1870–1879. http://dx.doi.org/10.1001/jama.2014.14601 PMID:25326635
6. Lee RW, Poretti A, Cohen JS, Levey E, Gwynn H, Johnston MV et al. A diagnostic approach for cerebral palsy in the genomic era. Neuromolecular Med 2014 Dec;16(4):821–844. http://dx.doi.org/10.1007/s12017-014-8331-9 PMID:25280894

Pediatric Neurology Briefs 2015;29(8):62. http://dx.doi.org/10.15844/pedneurbriefs-29-8-5.
ISSN: 1043-3155 (print) 2166-6482 (online). Received 2015 Aug 10. Accepted 2015 Aug 22. Published 2015 Sep 7.

NEONATAL DISORDERS

Diagnostic Yield of Continuous Video EEG for Neonatal Seizures

Tammy N. Tsuchida, MD[1,2]*
[1]Division of Neurophysiology, Epilepsy and Critical Care in Center for Neuroscience and Behavioral Health, Children's National Health System, Washington, DC;[2]Departments of Neurology and Pediatrics, George Washington University School of Medicine and Health Sciences, Washington, DC
*Correspondence: Dr. Tammy N Tsuchida, E-mail: ttsuchid@childrensnational.org

Related Article: Wietstock SO, Bonifacio SL, Sullivan JE, Nash KB, Glass HC. ContinuousVideoElectroencephalographic (EEG) Monitoring for Electrographic Seizure Diagnosis in Neonates: A Single-Center Study. J Child Neurol 2015 Jun.
Keywords: Critical care; Neonatal seizures; EEG; Neonatal encephalopathy

Investigators from the University of California, San Francisco studied the yield of continuous video EEG (vEEG) in diagnosing electrographic seizures in their neonatal intensive care unit. Over a 4.5 year period, 595 neonates were evaluated, of which 66% were term and 67% referred from an outside hospital. Therapeutic hypothermia was completed in 25%. There was a 14% mortality rate. Neonates with electrographic seizures were identified by reviewing clinical vEEG reports.

vEEG was clinically indicated for 400/595 (67%) of the neonates, with approximately equal proportions for two or more of the following indications: event concerning for seizure, encephalopathy, or high risk for seizures. Continuous vEEG was performed for a median of 49 hours (interquartile range 22-87). All neonates undergoing therapeutic hypothermia received vEEG until rewarmed. Electrographic seizures were detected in 105/400 (26%), and of those 25/105 (24%) had only electrographic seizures, with no clinical seizures even prior to vEEG. No seizures were detected on vEEG in 52/400 (13%) of those with events concerning for seizure. Phenobarbital was given prior to vEEG in 38/51 (75%) of those patients and to 93/400 (23%) of the entire study population.

The indication for vEEG did not affect the likelihood of seizure diagnosis. There was some variability in seizure diagnosis based on etiology. Arterial and venous strokes had the highest proportion with seizures in 58%, and hypoxic-ischemic encephalopathy, intracranial hemorrhage and infection all around 29% and lower rates with brain malformation or genetic syndromes. [1]

COMMENTARY. Continuous vEEG is increasingly utilized in the intensive care setting. As discussed by the authors, there is variability in the use of EEG with 40-70% of neonatologists and neurologists using EEG or amplitude integrated EEG (aEEG) to evaluate at risk infants [1]. There is literature to support the use of continuous vEEG for at risk neonates. Of those neonates at high risk for seizures, 45-51% had seizures, of which 26-41% were only electrographic [2,3]. After major cardiac surgery, 11-20% have seizures, and 59-100% have electrographic only seizures [4,5]. Of neonates undergoing hypothermia for hypoxia-ischemia 34-65% have seizures and 43-47% are only electrographic [1]. As discussed by the authors, there are also studies that show video EEG is needed to correctly identify neonates with electroclinical seizures1. These studies have been of moderate size, with 51-183 neonates.

The authors discuss limitations of the study including inability to confirm how many clinical seizures might have had electrographic correlate prior to treatment with phenobarbital and potential over-representation of infants at higher risk for seizures. In addition, the systematic use of continuous vEEG for all neonates undergoing hypothermia could introduce screening bias.

This large study is consistent with earlier studies demonstrating a large proportion of neonates with electrographic seizures, many of whom would only be detected by vEEG. In addition, there are neonates with suspected seizures that are not confirmed on vEEG. This supports the use of continuous vEEG to optimize treatment of neonatal seizures. With continuous vEEG, one can ensure that treatment is only given to those with EEG confirmed seizures. And those with seizures detectable only with EEG will be identified and receive seizure treatment.

Disclosures

The author(s) have declared that no competing interests exist.

References

1. Wietstock SO, Bonifacio SL, Sullivan JE, Nash KB, Glass HC. ContinuousVideoElectroencephalographic (EEG) Monitoring for Electrographic Seizure Diagnosis in Neonates: A Single-Center Study. J Child Neurol 2015 Jun. http://dx.doi.org/10.1177/0883073815592224 PMID:26129976
2. Laroia N, Guillet R, Burchfiel J, McBride MC. EEG background as predictor of electrographic seizures in high-risk neonates. Epilepsia 1998 May;39(5):545–551. http://dx.doi.org/10.1111/j.1528-1157.1998.tb01418.x PMID:9596208
3. Bye AM, Flanagan D. Spatial and temporal characteristics of neonatal seizures. Epilepsia 1995 Oct;36(10):1009–1016. http://dx.doi.org/10.1111/j.1528-1157.1995.tb00960.x PMID:7555951
4. Clancy RR, Sharif U, Ichord R, Spray TL, Nicolson S, Tabbutt S et al. Electrographic neonatal seizures after infant heart surgery. Epilepsia 2005 Jan;46(1):84–90. http://dx.doi.org/10.1111/j.0013-9580.2005.22504.x PMID:15660772
5. Helmers SL, Wypij D, Constantinou JE, Newburger JW, Hickey PR, Carrazana EJ et al. Perioperative electroencephalographic seizures in infants undergoing repair of complex congenital cardiac defects. Electroencephalogr Clin Neurophysiol 1997 Jan;102(1):27–36. http://dx.doi.org/10.1016/S0013-4694(96)95079-8 PMID:9060852

Pediatric Neurology Briefs 2015;29(8):63. http://dx.doi.org/10.15844/pedneurbriefs-29-8-6.
ISSN: 1043-3155 (print) 2166-6482 (online). Received 2015 Aug 14. Accepted 2015 Aug 28. Published 2015 Sep 7.

EDITORIAL

Hypsarhythmia or Hypsarrhythmia?

John J. Millichap MD[1]* and J. Gordon Millichap, MD[1]
[1]*Division of Neurology, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, I; and Departments of Pediatrics and Neurology, Northwestern University Feinberg School of Medicine, Chicago, IL*
**Correspondence: Dr John J. Millichap, E-mail: j-millichap@northwestern.edu*

Keywords: EEG; Epilepsy; Infantile Spasms

Hypsarhythmia was originally spelled with one 'r' by Drs Frederick and Erna Gibbs when they coined the term in 1952 [1]. They wished to emphasize that "the term applied to a specific type of electroencephalographic abnormality", and preferred the specific one 'r' spelling to avoid confusion with a literal translation of the two 'r' Greek root, "mountainous arrhythmia" [2,3]. The one 'r' spelling was the rule in the 1950s-60s [4]. The two 'r' spelling eventually became convention in the literature by the mid-1970s (Figure 1).

Although the Editor of *Pediatric Neurology Briefs* prefers the single 'r' spelling in deference to Dr Gibbs, the intended meaning is accepted for both spellings today.

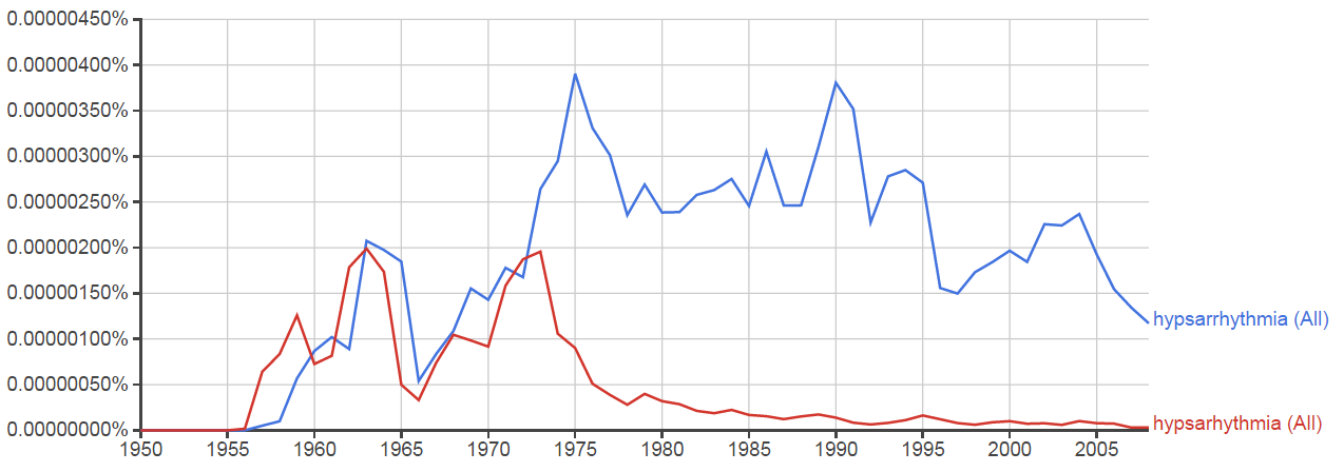
Disclosures

The author(s) have declared that no competing interests exist.

References

1. Gibbs FA, Gibbs EL. Atlas of Electroencephalography. Volume 2. Reading (MA): Addison-Wesley; 1952. http://www.worldcat.org/oclc/768435492
2. Gibbs FA. Infantile Spasms and Hypsarrhythmia or Hypsarhythmia. Dev Med Child Neurol 1965 Jun;7(3):329. http://dx.doi.org/10.1111/j.1469-8749.1965.tb10947.x PMID:14343238
3. MacKeith R. Infantile Spasms and Hypsarrhythmia or Hypsarhythmia. Dev Med Child Neurol 1965 Apr;7(2):204. http://dx.doi.org/10.1111/j.1469-8749.1965.tb10916.x PMID:14317541
4. Millichap JG, Bickford RG. Infantile Spasms, Hypsarhythmia, and Mental Retardation. JAMA 1962;182(5):523–527. http://dx.doi.org/10.1001/jama.1962.03050440015004.

Figure 1. Google Ngram Viewer: Book text search for case-insensitive 'Hypsarrhythmia' (blue line) and 'Hypsarhythmia' (red line) from 1950-2008 in English. [Cited August 31 2015.] Available from: https://goo.gl/sJI1uG



Pediatric Neurology Briefs 2015;29(8):64. http://dx.doi.org/10.15844/pedneurbriefs-29-8-7.
ISSN: 1043-3155 (print) 2166-6482 (online). Received 2015 Aug 25. Accepted 2015 Aug 28. Published 2015 Sep 7.