Aussie F.O.L.K.S.

Issue 9 Winter, 2000

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Gosh! doesn't time fly when you having fun. Welcome everyone to our third edition this year.

As some of you know we have a little girl this quarter, Nerhys Francis Bell Price, 8lb 6oz. Our little one was born with special needs of her own and well, time passed us by as we tried to co ordinate a case management team for her as well as continue to pursue educational services for Tyler, who is supposed to start school in the new year. For those parents with children of the same age, NOW is the time to start filling out forms and investigating what will happen to your child in 2001. Don't leave it til later in the year as services and funding may have already been allocated and you will miss out.

Anyway thanks to the generous support of Chris and Sue (who are putting out the newsletter for us this quarter) we have been able to finish the book and distribute it. So for all those who ordered a copy, you should have it by now. However if you have not received it by the end of August, give us a buzz and we will send out another copy. We are looking forward to some feedback.

Good Luck and God's Speed.

Katherine Price

Social Security

The disability pension has now been divided into three sections, the health care card, the carer's allowance and the carer payment. This means you can receive a reduced payment by not meeting the appropriate criteria. So if you are having trouble in this area, don't forget to document everything, time, place, person and put the appeals process into action. That's what its there for so use it. Remember to take lots of documentation with you and bring your doctor along if he can spare the time.

Oh! and a little known secret, if you find that one of your children does not meet enough criteria for the allowance, try adding a second child. For example, Social Services may say that only children requiring 20+ hours of extra care a week are entitled to the carer allowance. Your ADHD child might just come under the criteria for the allowance say at 18 hours. But if your second child requires speech therapy for 2 hours a week or physio for 6 hours a week for a different disorder the amount of hours dedicated to looking after two children might be added to your existing claim making 26 hours thus making you eligible for the allowance. Since quite a few disorders like epilepsy and ADHD do tend to run in families it is something to be aware of.

Condolences

Our heart goes out to Sandie Parkes and her family for the loss of their loved one. No words can express how we feel about the number of children we know who have lost their battle with epilepsy. We need to remind our parents that sometimes LKS is a secondary symptom of a metabolic disorder and if in doubt, parents should contact their specialist, especially if their child continues to regress. This is truly the section of the newsletter I wish we did not have to print. One day we won't have to.

Disclaimer

The contents of this newsletter are for informational and educational purposes only. While every effort has been made to ensure accuracy, readers should not rely on the information provided herein as a substitute for consultation with a qualified health professional.

Parent Contacts

Anna, in WA would like to start a support group. If anyone knows of more LKS children near her, her contact is (08) 9307 8213.

We know that there are many more parents that are out there in WA. They just have to stumble upon us. As always we encourage parents to drop our newsletter off at their early intervention centre or specialists office so someone else might read it after they are done. Word of mouth is still the best recommendation.

Parents Required

Parents of children with epilespy and a disabilty are being invited to participate in a study on how their child's behaviour affects family life, for those interested contact:
Dee MC Laughlin Epilesy QLD (07) 3404 3131

Parents of children with autistic symptomology but not the label autism, are invited to register their child. Children with disorders such as Aspergers Syndrome, Sematic Pragmatic Disorder, Pervasive Developmental Delay/Disorder, Landau Kleffner Syndrome, or any other label on the autistic spectrum are invited to participate in a study. The study is simply trying to identify how many kids there are out there not receiving autistic services but who are in need of them contact the New Children's Hospital on (02) 9845 2008 or e mail marshalt@nch.edu.au

What Is Epilepsy?

Epilepsy is a tendency to have recurring seizures. A seizure is a brief disturbance of consciousness, behaviour, motor function or sensation. The type of seizure experienced depends upon the part of the brain the abnormal activity starts in and the parts to which it may spread.

Partial Seizures

Epileptic activity starts in one small area of the brain. The seizure may be simple or complex, that is they may stay in one area of the brain that is they may stay in one area of the brain (simple) or travel outwards from that point (complex). This distinction is important as the child will show different presentations for the same area of the brain. The activity causing a simple or generalised seizure may spread and may sometimes produce a generalised seizure.

Simple Partial Seizures

The seizure mimics the normal function of the part of the brain which has been disturbed. The seizure is usually brief. Consciousness is not lost. Possible symptoms are intense feelings of happiness or fear. Unpleasant smells tastes or stomach sensations can occur. These are often called an "aura". There may be symptoms affecting movement. The head may be drawn to one side. The hand or arm may become stiff and is drawn upwards. There may be jerking movements in the limb affected. Physical sensations may be experienced. Perhaps a tingling or warmth down one side of the body. Vision may be affected. Flashing lights, balls of light or strange colours are typical symptoms affecting half of the vision.

Complex Partial Seizures

These can develop from simple partial seizures or consciousness may be impaired from the outset, affecting the ability to function normally. They can be brief or occasionally more prolonged. Such seizures can result in complicated automatic behaviours. These can include pulling at clothing, picking up objects, chewing or lip smacking, and aimless repeated movements. Sometimes perceptions change and things can appear bigger or smaller than they really are. There can be feelings of detachment from the environment. The patient may experience voices, music or scenes from their past - this can be very frightening. Where only sensations or automatic behaviour occurs the seizures may be difficult to recognise, especially in a child who cannot speak. On recovery the patient may be agitated and confused. After the episode they usually remember nothing.

Generalised Seizures

In generalised seizures epileptic discharges involve both hemispheres of the brain

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Generalised Seizures

In generalised seizures epileptic discharges involve both hemispheres of the brain simultaneously and consciousness is lost.

Absences (Petit Mal)

These are brief periods of interrupted or clouded consciousness. They mainly affect children. They can be easily mistaken for day-dreaming or inattentiveness. Duration is 5-15 seconds. There is no warning. The patient will stop what they are doing and will stare into space. Slight flickering movements in the eyelids can be seen. Eye blinking, eyeball rolling, face pulling or facial twitching can occur. Seizures can be very frequent sometimes occurring several hundred times a day, usually precipitated by hyperventilation. Short intervals of loss of consciousness usually last only seconds, so muscle tension is not affected and the patient does not collapse. Found more commonly in females than males between 5-12 years. Medication is highly successful with remission on around 75% of cases.

Tonic-Clonic Seizures (Grand Mal)

These seizures tend to happen in the following sequence. The patient will lose consciousness and may fall to the ground without any waring. They may cry out. Breathing may stop. The arms and kegs will go stiff which is the tonic phase. This is followed by jerking which is the clonic phase. There is a build up of saliva which may look like foam around the mouth. The patient may bite their tongue or cheek. The patient may be incontinent. The seizure may last several minutes. Consciousness gradually returns without medical intervention. There may be a period of confusion afterwards and the patient may experience a severe headache. Such a seizure is extremely tiring and the patient may need to rest. Full recovery may take longer than an hour but each patient is different. Grand mal's have a good overall prognosis with medication. Children with other neurological disorders as well as tonic clonic fair less well than those without.

Myoclonic Epilepsies of Early Childhood

A variety of seizures may occur in myoclonic

neurological disorders as well as tonic clonic fair less well than those without.

Myoclonic Epilepsies of Early Childhood

A variety of seizures may occur in myoclonic epilepsy. They include:-

1. Atonic - akinetick attacks. These are violent falls occurring suddenly, with immediate recovery and resumption of activity. Duration is less than one second and injuries may occur.
2. Head dropping or head nodding
3. Atypical absences. Brief interruption of consciousness (clouded rather than lost) with gradual onset and cessation. Automatisms may occur.
4. Myoclonic phenomena, ie flexion movements (jerks).
5. Major tonic clonic generalised seizures or brief tonic attacks.

The prognosis for children with myoclonic epilepsy varies with age of onset and previous history being important indicators. Again indicators of myoclonic epilepsy are similar to LKS and are often confused.

Partial Epilepsy

This group of seizures occurs in a well defined area of the brain also called focal seizures. It is believed that they are caused by hypoxia at birth, severe childhood infections metabolic disturbances dur to dehydration or prolonged febrile seizure.

Jacksonian Convulsion

These attacks which begin in a distal (or extremity) part of a limb and travel proximally (towards the body). Clonic movements occur and consciousness may be lost if the seizures travel form the head to the neck. Pins and needles and sensations of hot and cold accompany the seizure. Post ictal confusion and sleep and transient paralysis is common.

Benign Focal Epilepsy

This is probably the commonest type of partial

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Benign Focal Epilepsy

This is probably the commonest type of partial epilepsy of childhood. Age of onset is usually 7-10 years, males are predominant and attacks occur usually during sleep. These attacks during sleep consist of turning to one side, then to another, accompanied by clonic jerking on one side of the face, salivating gurgling jaw contractions and tongue sensations. Consciousness is maintained but the children cannot speak during an episode. Seizures largely diminish by puberty.

Electrical Status Epilepticus During Sleep

ESES is caused by electrical disturbance in brain activity. It disrupts the 3rd and 4th stages of sleep. Then in effect causing sleep deprivation. The brain is not given a chance to regenerate and heal itself during this critical time of growth for the child. Sleep deprivation can be recognized as:

Poor Memory recall, behavioral problems, hyperactivity, regression in cognitive ability, tiredness, lower immunity to illness, signs of ADD, the list can go on.

This form of epilepsy is only recognized when a 24hr EEG or longer is performed, called a Telemetry EEG. It is associated with other forms of epilepsy also, called Landau-Kleffner Syndrome, and Lennox Gastaut Syndrome.

ESES (electrical status epilepticus sleep) is also known as CSWS (continuous spike wave during sleep). It is confusing to hear these words but basically they are the same just different terminology. LKS and ESES classified as different clinical-EEG syndromes represent two aspects of the same brain dysfunction and they may exist separately or pass one into the other with a change in the clinical-EEG picture.

Speech and Language Milestones

Gard, Gilman, and Gordon (1993)

Speech Production

9-12 months

- ◇ vocalizes during play
- ◇ vocalizes to mirror
- ◇ jabbers loudly-wide variety of sounds
- ◇ uses most sounds in vocal play
- ◇ may acquire first true word (10-18 months)
- ◇ variegated babbling begins-combines different syllables in vocal play

12-18 months

- ◇ jargon- sentence-like intonations
- ◇ some echolalia
- ◇ uses most sounds in vocal play
- ◇ omits final consonants and some initial consonants
- ◇ words produced with CV structure (consonant-vowel)
- ◇ accurately imitates some words

18-24 months

- ◇ more words than jargon- jargon almost gone by 2
- ◇ asks questions by raising intonation at end of phrase
- ◇ improvement in intelligibility--now 65% by 2
- ◇ appearance of words produced with CVC structure (consonant-vowel-consonant)

Pragmatics

9-12 months

- ◇ shouts or coughs to get attention
- ◇ shakes head "no" and pushes objects away
- ◇ waves "bye"
- ◇ affectionate to familiar people
- ◇ begins directing others behavior physically
- ◇ extends arms to be lifted
- ◇ moves away from stranger
- ◇ participates in "pat-a-cake" and "peek-a-boo"
- ◇ begins to vary behavior according to others' reactions
- ◇ reaches to request object

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- ◇ begins to vary behavior according to others' reactions
- ◇ reaches to request object
- ◇ imitates novel sounds and actions

12-18 months

- ◇ brings object to show adult
- ◇ requests by pointing and vocalizing
- ◇ solicits another's attention vocally, physically, and possibly with a word
- ◇ says "bye" and possibly a few other ritual words
- ◇ protests by saying "no", shaking head, moving away
- ◇ comments on object /action by directing listener's attention to it
- ◇ answers simple "wh" questions with vocal response
- ◇ acknowledges speech of others with eye contact

18-24 months

- ◇ uses single words or short phrases to express intentions
- ◇ names in front of others
- ◇ says "what's that?" to elicit attention
- ◇ begins using single words and 2 word phrases to command, indicate possession, and 2 word phrases to command,
- ◇ indicate possession, and express problems
- ◇ verbal turn-taking

Expressive Language

9-12 months

Semantics

- ◇ looks for or names subject out of sight
- ◇ gestures and/or vocalizes to indicate wants and needs
- ◇ recognizes inverted object

12-18 months

Semantics

- ◇ uses 3-20 words
- ◇ vocalizes with gestures

12-18 months

Semantics

- ◇ uses 3-20 words
- ◇ vocalizes with gestures
- ◇ says "all gone"
- ◇ answers "what's that?"
- ◇ asks "more"

Syntax

- ◇ 50% of all utterances are nouns
- ◇ MLR is one or more words

18-24 months

Semantics

- ◇ uses approximately 50 recognizable words
- ◇ uses names of most familiar objects
- ◇ produces animal sounds or uses its name
- ◇ verbalizes toilet needs
- ◇ identifies or name on request
- ◇ verbalizes "no"
- ◇ verbalizes immediate experiences
- ◇ combines 2 words into phrases
- ◇ begins to use some verbs and adjectives

Morphology

- ◇ follows directions using 2 or more spatial concepts (in/on)
- ◇ negation used in form of "no"
- ◇ possessives emerging (daddy car)
- ◇ refers to self with pronoun and name

Syntax

- ◇ 33% of utterances are nouns
- ◇ combines 2 words into phrase in N+V or N+Adj format
- ◇ MLR=1.8 words

24-30 months

Semantics

- ◇ uses 200 intelligible words
- ◇ names 6 objects by use
- ◇ repeats 2 numbers correctly
- ◇ answers "where" questions
- ◇ answers "what... doing" questions
- ◇ answers "what do you hear?"

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◇ answers "what... doing" questions
◇ answers "what do you hear?"

Morphology

◇ articles appear in sentences
◇ present progressive "ing" on verb
◇ regular plural forms emerging
◇ uses in/on correctly
◇ irregular past tense emerging
◇ contractions in memorized form
◇ appropriate use of a least 2 pronouns
◇ asks basic questions
◇ understands concept of first and second pronouns (I, you)

Syntax

◇ 25% of utterances are nouns, 25%of verbs
◇ combines 3 to 4 words in subject + verb + object format
◇ MLR=3.1 words

Receptive Language

9-12 months

◇ begins to relate symbol and object-first true word
◇ give block, toy, or object on request
◇ understands and follows simple commands regarding body action
◇ responds with searching movements to simple questions
◇ looks in correct place for toys out of sight
◇ turns head to own name
◇ understands "hot"
◇ in presence of more than one object, shows awareness of more than one
◇ indicates displeasure when object is removed

12-18 months

◇ follows simple one step commands
◇ points to recognized objects
◇ points to wanted objects
◇ begins to claim certain objects
◇ points to 1-3 body parts
◇ identifies 2 or more objects or pictures from a group
◇ perceives others' emotions

18-24 months

◇ comprehends approximately 300 words
◇ listens as pictures are named
◇ points to 5 body parts on self or doll
◇ responds appropriately to yes/no questions
◇ object permanence fully acquired
◇ discriminates food from other objects

Signs of Hearing Loss

0-12 months

◇ Awakens to touch but not to voice (occurs from birth)
◇ Does not seem startled by loud sounds (occurs from birth)
◇ Does not attempt to turn toward a sound made at eye level (occurs from three to four months of age)
◇ Responds to comforting only when held (occurs from three to four months of age)
◇ Shows little interest in babbling or imitating sounds (occurs from six months of age)
◇ Does not respond to the sounds of speech, footsteps or noise-producing toys. This means that the infant does not stop
◇ activities to listen to speech from two months of age. The infant does not turn toward the sound of footsteps from four
◇ months of age.

12-24 months

◇ Does not imitate speech or talk by age two or speech is very unclear
◇ Does not follow simple directions
◇ Ignores the ring of a telephone or doorbell
◇ Seems startled to look up and see a person in the room
◇ May pay attention to very loud noises, but does not respond to speech or listen on the telephone
◇ Uses gestures rather than speech to express needs. These gestures include pointing, pulling and touching.

Rett Syndrome

BJ Almond (balmond@bcm.tmc.edu)

Baylor researchers discover defective gene that causes Rett Syndrome

HOUSTON--The cause of Rett syndrome, a neurodevelopmental disorder that affects females, has been traced to a defective gene on the X chromosome The gene, called MECP2 ("meck-p-two"), plays a significant role in "silencing," or turning off, other genes. Rett syndrome is the first human disease found that is caused by mutations in this type of gene.

A research team led by Dr. Huda Y. Zoghbi, a Howard Hughes Medical Institute (HHMI) Investigator at Baylor College of Medicine in Houston, reports this discovery in the October issue of the scientific journal Nature Genetics. The team collaborated with Dr.Uta Francke, an HHMI Investigator at Stanford University School of Medicine.

"Finding the genetic cause of Rett syndrome has been the most challenging problem I've worked on," said Zoghbi, who, along with Dr. Alan Percy, made the first confirmed diagnosis of Rett syndrome in the United States in 1983 at Texas Children's Hospital."Usually we can map the location of a disease gene by studying the way the genetic defect is inherited in families," she said. "But Rett syndrome occurs sporadically more than 99 percent of the time, so we had very few families to study where more than one member is affected with this neurologic disorder."

When Zoghbi began the search for the Rett syndrome gene 16 years ago, information from two families in which half-sisters developed Rett syndrome helped her zero-in on the X chromosome. "Because the girls had different fathers, we suspected that the disease gene was being transmitted from their mother," she said. The X chromosome was the likely suspect because females carry two X chromosomes while males carry an X and Y chromosome, which means they lack a "back-up" copy of the X chromosome that can compensate for a defective one. Defects in MECP2 are lethal to the male fetus.

up" copy of the X chromosome that can compensate for a defective one. Defects in MECP2 are lethal to the male fetus.

Zoghbi began hunting for the disease gene on the long arm of the X chromosome, which contains 2,000 to 3,000 genes. Finding more families with Rett syndrome enabled the researchers to narrow their focus to 2000 candidate genes. A family in Brazil in which several girls had Rett helped researchers confine the hunt to 200 genes.The Zoghbi group analyzed more than a dozen before finding the culprit, MECP2.

"This gene is essential for life, not just for brain development," said Zoghbi, a professor of pediatrics, molecular and human genetics, neurology and neuroscience at Baylor and a pediatrician at Texas Children's Hospital and Ben Taub General Hospital. Researchers have also known that MECP2 is critical for the regulation of many other genes. Certain genes need to be activated at critical times during development and inactivated at others. MECP2 is supposed to help turn off the expression of a number of genes. But in Rett patients, the defective MECP2 might fail to keep those genes "silent." If those genes remain active at inappropriate times, they could affect the function of nerve cells and alter normal development.

Zoghbi is hopeful that knowing the genetic cause of Rett syndrome might make it possible to treat or prevent the disorder. "Because brain development continues long after birth, and symptoms of Rett Syndrome do not develop for several months, there appears to be a window of opportunity during infancy in which we might be able to intervene to prevent further damage," Zoghbi said. "Now that we know the problem gene, we can explore the possibility of developing treatments that could be given in early infancy before symptoms appear."

The National Institute for Child Health and Human Development and The International Rett Syndrome Association, 1-888-430-RETT, funded Zoghbi's research. The Blue Bird Circle Rett Center of Baylor College of Medicine, directed by Dr. Daniel G. Glaze, provided a number of

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funded Zoghbi's research. The Blue Bird Circle Rett Center of Baylor College of Medicine, directed by Dr. Daniel G. Glaze, provided a number of patients for the study.

Baylor researchers who co-authored the Nature Genetics paper with Zoghbi are Dr.Ruthie Amir, Dr. Ignatia Van den Veyver and Charles Tran. Additional research at the Rett Center: Growth and Nutrition in Rett Syndrome Neurophysiological Manifestation of Rett Syndrome - Sleep and Seizure Problems Changes in the Brain in Rett Syndrome

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Vagus Nerve Stimulation (VNS)

VNS is an exciting new technique available at the New York Hospital-Cornell Comprehensive Epilepsy Centre .

Vagus nerve stimulation is a type of surgery for poorly controlled seizures, but does not involve surgery on the brain. A small pacemaker-like device is placed under the skin, and periodically stimulates a nerve (the vagus) in the side of the neck with a small amount of electrical current. This process reduces seizure frequency and severity. The vagus nerve serves as one of many highways of information carrying messages to and from the brain. Nerve fibres in the vagus nerve relay information from the body's organs (such as the stomach and heart) to the brain. The vagus nerve has many connections to areas in the brain instrumental in producing seizures.

Research in animal models suggested that stimulation or electrical activation of the vagus nerve can disrupt the abnormal brain activity stimulation or electrical activation of the vagus nerve can disrupt the abnormal brain activity responsible for seizures. By stimulating the vagus nerve, the brain's potential to generate or spread abnormal seizure activity can be reduced.

These important findings led researchers to create a small, implanted device which would provide stimulation of the vagus nerve on a regular, programmed basis - with the aim of reducing seizure frequency and severity.

A device, approximately the size of a small tape measure, is implanted under the skin in the upper left chest area. This device, known as the generator, functions as the "pacemaker". A connecting wire, also implanted under the skin, connects this "pacemaker" with the vagus nerve, by delicate leads which are carefully attached to the vagus nerve on the left side of the neck.

The operation to implant a vagal nerve stimulator takes approximately two hours. Over the next two days, the vagal nerve stimulator is programmed to automatically deliver stimulation on a regular, frequent basis, usually every few minutes, around the clock. All vagus nerve stimulators are produced by Cyberonics, Inc.

After extensive clinical trials, vagus nerve stimulation is now FDA approved, and available at specialized epilepsy centers such as ours. The Comprehensive Epilepsy Center at The New York Hospital-Cornell is the most active and experienced center with VNS treatment in the Mid-Atlantic region. In Europe, vagus nerve stimulation has been available for all appropriate patients at specialized centers for several years.

Most of the clinical trials for vagal nerve stimulation focused on patients with partial seizures. However, we have just published the results of our experience here at New York Hospital-Cornell, which suggests that VNS is extremely helpful for generalized epilepsies, as well.

Trials currently in progress are examining details of different stimulation frequencies and settings, in an effort to rigorously establish guidelines for most efficacious seizure control. For further information about vagus nerve stimulation or other exciting treatment options, please contact:

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details of different stimulation frequencies and settings, in an effort to rigorously establish guidelines for most efficacious seizure control. For further information about vagus nerve stimulation or other exciting treatment options, please contact:

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Vagus Nerve Stimulator

From issue No. 240 (September, 1997) of Medical Sciences Bulletin.

Generic Name: Vagus nerve stimulator
Trade Name: NeuroCybernetic Prosthesis System
Use: Reduction of seizures in people who remain refractory despite optimal drug therapy.

On January 27, 1997, the U.S. Food and Drug Administration (FDA) received an application for marketing of a device that would help reduce seizures in people who remain refractory despite the utilization of optimal drug therapy. This device is called the NeuroCybernetic Prosthesis System and is manufactured by Cyberonics, a company based in Houston. The process of approval was expedited by the favorable recommendation of the Neurological Devices Panel of FDA's Medical Devices Advisory Committee. This device was approved as an adjunct to drug or surgery in patients with partial-onset seizures.

How It Works

Vagus nerve stimulation was first tried in 1988 as a treatment for seizures. This idea was proposed by Jacob Zabarra, who believed that stimulation of the vagus nerve might disrupt or prevent a seizure. Through animal studies, he was able to show that brain wave patterns can be changed via vagus nerve stimulation. This proposed theory serves as the backbone for the modern-day vagus nerve stimulator (VNS).

The NeuroCybernetic Prosthesis System is a vagus nerve stimulator. A generator is implanted under the collarbone, much like a pacemaker. This generator is then connected to the vagus nerve in the neck. At this site, the generator regularly releases electrical signals 24 hours a day, regardless of seizure activity. These signals are relayed to the brain and are responsible for maintaining control of any seizure activity. This device includes an external programming system, which is used by physicians to control stimulation settings. Patients can also turn this device on or off by placing a magnet directly over it.

The exact mechanism of action of this device is not fully understood. However, there are two hypotheses. The first theory states that the anticonvulsant activity of the VNS is caused by an increased threshold of the connections to the nucleus. The second theory states that the continuous electrical stimulation of the vagus nerve increases the number of inhibitory neurotransmitters and decreases the number of stimulatory neurotransmitters.

Clinical Tips

In one study, the safety and effectiveness of this device were tested. The majority of patients showed some improvement while using the VNS. Fifty percent of those enrolled in this study showed at least a 20% reduction in the number of seizures per day, and 25% of patients reported a 50% reduction in the frequency of seizures. In contrast, 20% of patients demonstrated increased seizure activity. Treatment with the vagus nerve stimulator was not free of side effects. Patients experienced cough, hoarseness, alterations in their voice, and shortness of breath.

Another study tested the safety and tolerability of this device by monitoring patients for changes in vital signs and electrocardiographic

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activity, and for the occurrence of adverse events. The authors concluded that the lack of change in both vital signs and electrocardiographic activity dictates that this device can be safely implanted for use as an anticonvulsant.

Approximately 1.7 million Americans suffer from epilepsy. The vast majority of these patients can be controlled by conventional drug therapy. However, more than 200,000 people remain refractory to pharmacologic intervention. This device may serve an essential function in their lives.

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As seen on PharmInfoNet (http://pharminfo.com)

Landau-Kleffner Syndrome
A Parents Guide

R.K. & K.A. Price

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