What is Vagus Nerve Stimulation?

Vagus nerve stimulation (VNS) was approved by the FDA in 1997 to prevent or interrupt electrical disturbances in the brain for persons with hard to control epileptic seizures. Used in conjunction with anti-seizure medications, VNS uses electrical pulses that are delivered to the vagus nerve in the neck and travel up into the brain. The vagus nerve has very few pain fibers, and therefore acts as an excellent pathway to deliver signals to the brain without the need for direct brain stimulation.

How does VNS work?

Although it is not known exactly how VNS reduces seizure activity, it is believed that persistent VNS causes changes in brain chemistry that may reduce excitatory amino acids, and/or increase inhibitory levels, thus reducing seizure activity.

What does VNS surgery involve?

Using general anesthesia, the VNS system is implanted using two small incisions — one in the patient’s neck for access to the vagus nerve, and one below the collarbone in the chest wall or armpit. The VNS pulse generator is placed under the skin of the chest in a surgically created pocket and the electrode is tunneled subcutaneously from the neck incision. The electrodes are wrapped around the vagus nerve. The battery within the generator supplies energy for approximately 6 years, at which time surgical replacement of the battery is required. The surgery usually lasts one hour and can be done as an outpatient procedure.

How do patients with epilepsy benefit from this procedure?

Approximately half of the patients who have received VNS report up to a 50% reduction in seizure frequency, a 75% reduction in hospital admission days and substantial improvement in their quality of life.

What are the side effects?

Complications are rare and mild to moderate when reported, but can include transient vocal cord or lower facial paralysis, hoarseness, throat pain, shortness of breath, coughing and fluid accumulation or generator site infection.

Case Study: Intractable seizures

Case Overview: A 13-year old female presented experiencing developmental delay and multiple seizure types. The seizures were both nocturnal and included drop attacks and daily intermittent staring spells. An MRI of the
brain showed shrinkage of the left temporal lobe. A positron emission tomography (PET) study of the brain did not show focal cortical abnormalities. She had failed multiple trials of anticonvulsants because of allergic reactions or lack of efficacy.

**TREATMENT**  Vagus nerve stimulation was recommended by specialists at the California Pacific Epilepsy Program. Dr. Peter Weber implanted the device without complications.

**OUTCOME**  One month post VNS implantation she continued her antiepileptic medications but was much more bright and interactive. Six months later, she had had over 90% reduction in the frequency and intensity of the seizures, with great improvement in the quality of her life.

**Patient referral to the Epilepsy Program**

Patients need a referral from their primary care provider or physician specialist prior to scheduling vagus nerve stimulation evaluation and surgery. Medical records, pertinent laboratory reports, and imaging reports can be forwarded to the California Pacific Epilepsy Program to determine referral indication appropriateness.

**Insurance Coverage**

Medicare, Medi-Cal and most private insurance plans cover VNS surgery. In order to avoid unexpected medical expenses, it is always best for patients to contact their insurance company prior to treatment to confirm coverage for this service and obtain prior authorization.

**Indications for VNS**

- Seizures uncontrolled with anti-seizure medications
- Not a candidate for resective epilepsy surgery
- Quality of life issues due to uncontrollable seizures

**For more information**

Please contact the California Pacific Epilepsy Program

Kenneth D. Laxer, M.D.  
Medical Director, Epilepsy Program  
(415) 923–3055

Peter B. Weber, M.D.  
Surgical Director, Epilepsy Program  
(415) 885–8628

David King-Stephens, M.D.  
Co-Director, Epilepsy Program  
(415) 923–3055

Luis Bello-Espinosa, M.D.  
Pediatric Neurology  
(415) 885–8635

California Pacific Medical Center  
2333 Buchanan Street  
San Francisco, California 94115  
(415) 600–6000  
www.cpmc.org/epilepsy

For Patient Referrals  
(888) 637–2762