Synapse
a clinical resource
WINTER 2013, VOL. 4, ISSUE 1

Mercy Neurological Institute Provides Comprehensive Stroke Care

Lucian Maidan, MD

Mercy Neurological Institute (MNI) has expanded stroke care services over the past several years and now offers comprehensive stroke care on par with the best in the nation. MNI offers diagnosis, intervention and treatment for even the most complex cases, receiving referrals from throughout the region. MNI is recognized as an industry leader and sets the national standard in highly-specialized stroke care.

Mercy General Hospital and Mercy San Juan Medical Center were the first two facilities in the state of California to earn The Joint Commission's Gold Seal of Approval for stroke care by demonstrating that their stroke care program follows national standards and guidelines which can significantly improve outcomes for stroke patients. Now all six of the hospitals in Dignity Health's Sacramento system have been designated Primary Stroke Centers by The Joint Commission. Mercy General Hospital and Mercy San Juan Medical Center also have all the elements for comprehensive stroke care available 24/7:

- Policies to ensure quick, efficient identification of and care for stroke patients
- Designated stroke team
- CT and MRI available 24 hours a day
- Neurosurgery and vascular surgery
- Neurocritical care
- Interventional neuroradiology
- Ability to meet all stroke measures and stroke treatment timeline goals

The high volume of endovascular neuro-interventional procedures performed at our facilities set MNI apart from other hospitals in the region. These procedures include embolization of cerebral aneurysms with coils or flow diverters (Pipeline) and mechanical thrombectomy procedures with retrievable stents like Solitaire FR and Trevo Pro or thromboaspiration with Penumbra system. MNI physicians have performed 32 mechanical thrombectomies to date, with most of those involving the new retrievable stents. Between July 2011 and December 2012, 85 aneurysms were treated at Mercy General Hospital, including 11 Pipeline cases.

To serve the most complex stroke cases Mercy Neurological Institute's neurocritical care services are available 24 hours a day, with neuro-intensive care and endovascular neurosurgery now available at Mercy General Hospital and Mercy San Juan Medical Center. Advanced neurological imaging, including CT angiography, cerebral angiography, MR angiography (MRA) and MRI perfusion are available around the clock. In addition, MNI's active research program enrolls patients in NIH-funded ischemic and hemorrhagic stroke trials. MNI is part of the national multicenter Neurological Emergency Treatment Trial Network.

Mercy Neurological Institute's telehealth program is enabling it to expand its reach. Effective networks for stroke care link Primary Stroke Centers to the Stroke Intervention Team at our advanced care center where state-of-the-art equipment and a team of specially-trained physicians work together to optimize outcomes of stroke emergencies. The telehealth program now includes 11 partner hospitals, serving patients from Redding to

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Lucian Maidan, MD

Mercy Neurological Institute of Greater Sacramento
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Register to receive **Synapse** electronically at MercyNeuro.org.

For your convenience in neurological referrals, a dedicated toll-free number is available 24/7: 1.888.MERCY41 (1.888.637.2941)

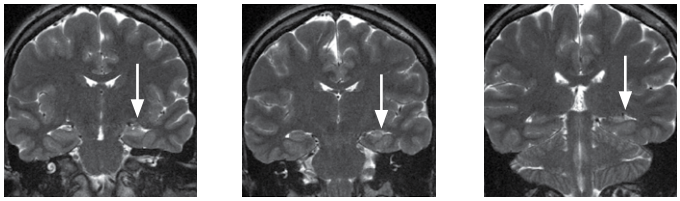
Epilepsy Surgery Can Provide Viable Treatment Option

Edwin Cruz, MD

Shelby J., a 23-year-old woman, began having seizures at nine months of age. She was diagnosed with Sturge Weber Syndrome (SWS), a neurocutaneous syndrome associated with congenital malformations of the eyes, skin and brain. In her case, Shelby only had CNS hamartomas, which caused her seizures. As a child, Shelby's seizures were infrequent and she was taken off antiepileptic medications (AED) at the age of 15, staying seizure-free until a recurrence at age 20. For three years, Shelby experienced 10-20 complex partial seizures per month despite being on multiple AEDs.

For patients who continue to have seizures after an adequate trial of at least two AEDs, the chance of becoming seizure-free with subsequent AEDs is less than five percent. Such patients should be referred to an Epilepsy Center.

Shelby was referred to the Mercy Neurological Institute's (MNI) Epilepsy Program. A brain MRI showed left posterior parietal and occipital leptomeningeal enhancement compatible with SWS, as well as left Mesial Temporal Sclerosis, a common cause of temporal lobe epilepsy. In the appropriate surgical patient, successful resection can lead to seizure freedom in about 70% of cases.



Abnormal hyperintensity and small size of the left hippocampus consistent with Mesial Temporal Sclerosis.

Shelby underwent Phase 1 video EEG monitoring with scalp electrodes which showed seizures that were localized to the left temporal lobe. Shelby also underwent neuropsychological testing as well as Wada testing for language lateralization as part of the pre-surgical workup. A PET scan also confirmed hypometabolism in the left occipital and temporal lobe.

Shelby's case was reviewed at the monthly MNI Epilepsy Conference and she was found to be a good surgical candidate. To localize the seizure foci further, Shelby underwent Phase 2 VEEG monitoring with intracranial electrodes. This included EEG strips over the posterior parieto-occipital SWS lesions, which confirmed that these were not the epileptogenic zone. This meant that the left mesial temporal lobe was the seizure foci.

Shelby underwent temporal lobectomy in January 2012. The procedure was well tolerated with no postoperative deficits. On follow-up a month later, she was seizure-free and very happy with her care. She was taking two AEDs before surgery (Oxcarbazepine and Lamotrigine). It was decided she would try monotherapy with just Lamotrigine, but she had recurrence of focal seizures about eight weeks after surgery. The clinical characteristics of the seizures were suggestive of seizures arising from the SWS lesions in her left occipital and parietal area. She became seizure-free after the addition of a second AED (Levetiracetam).

Shelby's case illustrates a key point in the care of patients with intractable epilepsy: When medical therapy fails to control seizures, further testing is needed to determine if other treatment options such as resective epilepsy surgery would be beneficial.

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Edwin Cruz, MD

Myopathy Due to Statin Medications

Ryan Armour, DO

Statin medications (hydroxymethyl glutaryl coenzyme A reductase inhibitors) are widely used to reduce the risk of morbidity and mortality related to cardiovascular disease and stroke. These medications act by inhibiting metabolic pathways in the liver that are involved in the synthesis of cholesterols. There are seven different statin medications available in the market in the United States, and many of these can be found in combined formulations with medications to treat hyperlipidemia and hypertension.

"Statin myopathy" is a general term to describe muscle aches, fatigue, myositis (elevations in creatinine kinase levels) and muscle weakness that may develop as a result of statin medications. Rarely, these medications may be associated with life threatening rhabdomyolysis and renal failure. The true prevalence of statin myopathy is unknown but an estimated 5-10% of patients will stop these medications due to side effects. Myotoxicity related to statin medications may occur immediately after starting the medication, although there may be a delay of months to years before symptoms develop. A patient who has tolerated statins for years may suddenly develop symptoms if a new drug is added that can alter pharmacokinetics of liver metabolism.

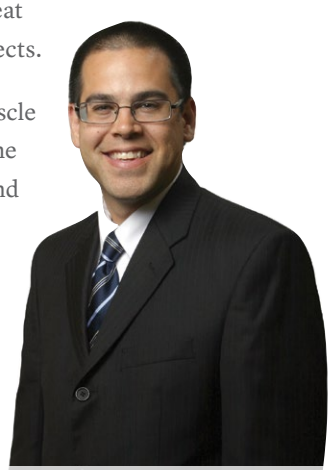
Some patients are at greater risk than others for developing statin myopathy. Polypharmacy, advanced age, hepatic dysfunction, multisystem disease and recent surgery are just a few predisposing factors that can be identified. Patients with certain genetic mutations causing alterations in hepatic transport and metabolism may also be more likely to develop muscle symptoms while on a statin.

Typical practice when encountering a patient with statin myopathy is to stop the offending medication and wait three to six months for symptoms to resolve. Creatinine kinsase levels should be followed every two to three months. If myalgias, weakness or elevated creatinine kinase persist, this may indicate there is an underlying neuromuscular disorder and referral for further evaluation by a neurologist and electrodiagnostic studies (nerve conduction studies and electromyography) should be considered. In some cases patients may require a muscle biopsy for more definitive diagnosis.

There is no approved or recommended treatment for statin myopathy other than stopping the medication and clinical monitoring. There is limited clinical data that suggests supplementation with Coenzyme Q10 and vitamin D may hasten the resolution of symptoms, but further studies are needed to clarify this.

Once symptoms have resolved, practitioners may choose to resume the medication at a lower dose, switch to another statin medication, or even try dosing on alternate days. All three strategies have been used effectively to treat abnormal lipid profiles with fewer side effects.

In summary, if a patient presents with muscle symptoms while on a statin medication, the first step is to review the medication list and remove the suspected offending drug. Symptoms should resolve within a few months, but patients who do not improve should be evaluated for a possible underlying neuromuscular disorder. Once symptoms do resolve, re-challenging with another medication or lower dose should be pursued.



Ryan Armour, DO

For references, comments or questions please email Dr. Armour at MercyNeuro@DignityHealth.org. ■

Mercy Neurological Institute Provides Comprehensive Stroke Care—
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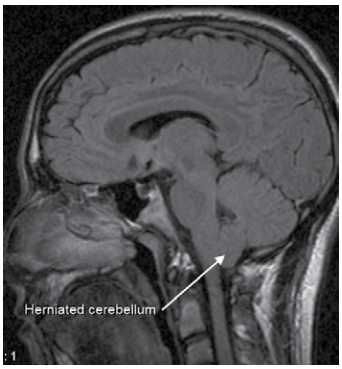
Bakersfield [*Synapse*, Volume 3, Issue 3]. The program has seen rapid growth, leading to more patients being evaluated and appropriately treated for hyper acute stroke. The MNI team is achieving thrombolytic rates of 25–30%, which directly correlates with national standards for active and highly effective stroke centers. ■

Chiari Malformation: When to be Concerned about the Incidental MRI Finding

Kavian Shahi, MD, PhD

Occasionally, Chiari Malformation is noted on reports of MRI brain scans performed for unrelated reasons, leaving the ordering physician uncertain about whether further evaluation or consultation by a neurosurgeon is necessary. Furthermore, the often used terminology "tonsillar herniation," a potentially life threatening finding under different conditions, can evoke a sense of supreme urgency and concern.



Type 1 Arnold-Chiari Malformation: The cerebellum has descended 7mm and there are herniated cerebella tonsils into the foramen magnum.

There are four types of Chiari Malformations, all related to abnormalities of the hindbrain. Type 1 is the most commonly encountered by the primary care physician while the others are diagnosed at infancy and will not be discussed here. By definition, there is cerebellar tonsillar ectopia, or herniation, below the foramen magnum and into the spinal canal. There can be associated hydrocephalus and syringomyelia. The most common presenting symptoms are suboccipital headaches, weakness, numbness and unsteadiness. Because these symptoms are non-specific, average duration of symptoms prior to diagnosis can range from three to seven years with an average presentation age of 41 (the age range is 12-73). Moreover, symptoms can remain stable for years with occasional flare ups and improvement.

Physical exam findings can include hyperactive reflexes, nystagmus, gait disturbance, extremity weakness and cerebellar signs.

Diagnosis is best made with a brain MRI which can clearly show cerebellar tonsil herniation below the level of the foramen magnum. In patients who cannot have MRIs, CT scans with sagittal reconstruction can be helpful. Herniation beyond 5mm into the canal is considered abnormal but occasionally a patient may be completely normal and have tonsillar herniation beyond this cutoff. These patients need to be followed on a regular basis for clinical deterioration. As with most neurological conditions, early diagnosis leads to improved response to treatment.

Early surgery is recommended for symptomatic Chiari Malformation. Posterior fossa decompression is the treatment of choice. It involves removal of the suboccipital bone and the posterior arch of the C1 ring. This technique is usually combined with expanding the dura with a patch graft. Early improvement in signs and symptoms post-op approach 80%. Factors that correlate with less than favorable outcomes include presence of atrophy, ataxia, scoliosis and pre-op symptoms present longer than two years.

In summary, patients with symptomatic Chiari Malformation, even with less than 5mm tonsillar ectopia, asymptomatic Chiari Malformations with greater than 5mm tonsillar ectopia, and malformations with other radiographic findings such as hydrocephalus or syringomielia, should be referred to neurosurgery for treatment and/or follow-up. ■

Kavian Shahi, MD, PhD

Epilepsy Surgery Can Provide Viable Treatment Option—continued from page 2

Despite having had recurrent seizures, Shelby has persevered, continuing to work part-time as well as attend college. Patients should be told, "You are a person with epilepsy, but epilepsy does not rule your life." That they can take back control of their life should be emphasized. Epilepsy surgery is a viable treatment option to that end, but is not for everyone. Choosing the best treatment option requires a multidisciplinary team approach which is available through the Mercy Neurological Institute. ■

Parkinson's Disease: A Diagnostic Challenge

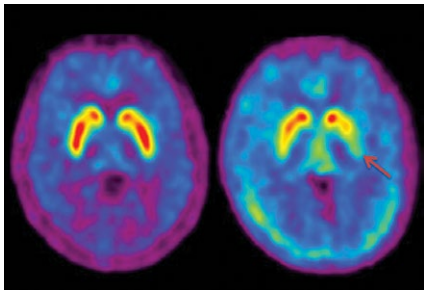
How Close Are We to a Reliable Diagnostic Tool?

Ehsan Hadi, MD

Parkinson's disease is the second most common neurodegenerative disorder in the United States. At least 500,000 people are believed to suffer from Parkinson's disease and about 50,000 new cases are reported annually. These figures are expected to increase as the average age of the population increases.

The average age of onset is about 60 years. A pre-clinical stage of about four to seven years commonly occurs before motor symptoms develop. By the time the diagnosis of Parkinson's disease is established, 70-80% of striatal dopamine and 40-50% of substantia nigra dopamine fibers are lost.

Features of Parkinson's disease include both motor and non-motor symptoms. Diagnostic criteria are based on the UK Parkinson's Disease Society of Brain Bank's clinical criteria, which include bradykinesia and at least one of the following: resting tremor, rigidity, loss of postural reflex, and exclusion of other causes of Parkinsonism. In addition, at least three of the following supportive criteria must be present: unilateral onset, asymmetry, response to levodopa, levodopa-induced dyskinesia, levodopa response for five years or more and a clinical course of 10 years or more. In the hands of experienced neurologists the clinical diagnosis of early Parkinson's disease has a sensitivity of 98% and specificity of 67%, which increases to 94% in more advanced Parkinson's patients.



SPECT scan: Normal versus Parkinsonism—decreased asymmetric dopamine uptake over the Putamen.

There has been a need to develop effective biomarkers for Parkinson's disease that can aid in accurate diagnosis and differentiation of various forms of Parkinsonism. Candidate clinical biomarkers include olfactory dysfunction, REM behavior disorder and constipation. Odor detection, identification and discrimination have been reported to be impaired in more than 90% of patients with Parkinson's disease.

Up to 50% of idiopathic REM behavior disorder patients may develop Parkinson's disease, and constipation has been associated with lower density of substantia nigra neurons and may precede Parkinson's disease by years.

Neuroimaging techniques include radiotracer imaging, such as SPECT scans, sonography, MRI and cardiac meta iodobenzylguanidine scintigraphy. Radiotracer imaging measures functions of the dopaminergic neurons and not the actual density or number of nigral dopa neurons—and thus results can be affected by factors other than biologic processes, such as compensatory changes and medications.

One of the Radiotracer imaging techniques, DatScan (SPECT scan), was approved in 2011 to assist in the evaluation of adult patients with suspected Parkinsonian syndromes. Dopamine transporter (DAT) is specific for dopaminergic neurons and is a marker for presynatic neuronal degeneration. DatScan has been utilized to differentiate essential tremor from Parkinsonian syndromes, though it does not reliably distinguish Idiopathic Parkinson's disease from other Parkinsonian syndromes such as multisystem atrophy or progressive supranuclear palsy even when post synaptic Iodobenzamide (IBZM) SPECT was added. Clinically, DatScan may have a role in complex patients with tremor where the etiology may include neuroleptic-induced, dopa-responsive dystonia, juvenile Parkinson's disease, vascular Parkinsonism and psychogenic tremor. The results have to be interpreted with caution because 5-14% of cases of apparent Parkinson's disease have normal SPECT scan, termed scans without evidence of dopamine deficits (SWEDDs). Therefore, SPECT scans would be best utilized by physicians with experience in Parkinsonian disorders.

Various MRI techniques have shown promising results in the differentiation of Parkinsonian syndromes, however further studies are needed for their effective use in clinical practice.

In summary, Parkinson's disease remains a clinical diagnosis using the clinical criteria with the aid of clinical biomarkers. In complex cases, radiotracer imaging may be useful, especially in the hands of physicians experienced in Parkinson's syndromes. ■

Ehsan Hadi, MD

Review and Update in Sleep Disordered Breathing

Richard A. Beyer, MD

In recent years, the incidence of sleep apnea has increased as has our understanding and treatment of the disorder. Because of the explosion of new cases, the considerable cost of diagnosis and treatment has caught the attention of private insurers and the Centers for Medicare and Medicaid (CMS). It is estimated that 20% of the US population will have an abnormal apnea-hypopnea index (AHI) of five per hour but 45% of those, or 9% of the population, will also have symptoms of disrupted sleep, which are the two factors that define Obstructive Sleep Apnea Syndrome (OSAS).

Sleep apnea can be obstructive, central or mixed. Pure central type is the least common and is characterized by absence of breathing due to no CNS effort, while obstructive type is caused by collapse of part of the airway during the respiratory effort. Complex sleep apnea is the not infrequent coexistence of the two types.

The most important risk factor for OSAS is obesity. However, thin people can suffer from OSAS if they have anatomical features such as short mandible, high arched and narrow palate, tonsillar/adenoid hyperplasia, short thick necks, or if they smoke.

Complications of OSAS include hypertension, cardiac arrhythmias, cor pulmonale, myocardial and cerebral infarction, polycythemia and increased all-cause mortality. National recognition is being paid to the dangers to the general public because of the increased prevalence of OSAS in the operators of our transportation system. OSAS patients are at two to three times greater risk of industrial and motor vehicle accidents.

The manifestations of OSAS include:

- Loud snoring with daytime fatigue or somnolence
- Observed or perceived episodes of cessation of breathing or resuscitative snorts
- Morning, self-limited headaches
- Frequent unexplained awakenings
- Restless sleep or increased sweating
- GERD symptoms during sleep
- Decreased daytime concentration and/or memory, depression or irritability

These complications may be so insidious in onset that patients don't recognize how poorly they are functioning. The physical findings mentioned above should invite suspicion of OSAS. Additionally, neck circumference >17 inches in men and >16 inches in women indicates an increased risk of OSAS.

> Sleep apnea has become a significant public health problem.

The gold standard for diagnosing OSAS has been technician-attended, overnight polygraph recording now known as Type 1 Polysomnography, performed in a laboratory. Driven by cost and by inability to meet demand, type 2, 3 and 4 devices have now been licensed to diagnose OSAS. These mostly portable devices can be used outside of laboratories and measure fewer variables. Their use was accelerated by the 2008 decision by CMS to pay for CPAP (Continuous Positive Airway Pressure) treatment based on results of testing by type 3 or better devices. Some insurers require patients to be initially tested using portable devices. While fairly accurate, limitations of these devices include lack of sensitivity in detection of all respiratory events and data loss because of malfunction or patient noncompliance. Additionally, contraindications to these devices include significant pulmonary disease, known low oxygen saturation, cognitive impairment and diagnoses other than OSAS.

Treatment of OSAS is dependent on the results of the PSG and the patient's symptoms. All patients will benefit from lifestyle changes. Weight loss of 1% will result in 3% decrease in apnea-hypopnea index (AHI). Avoidance of sedative medications and alcohol is helpful and positional changes such as elevating the head of bed 30 degrees can be to helpful in some patients.

Medications play a very limited role in suppress OSAS. Anecdotal and small series of reports claim benefit from progesterone, tricyclic antidepressants and SSRIs. Oxygen may mitigate severe desaturations and decrease AHI. Stimulants such as Modafanil (Provigil), Armodafanil (Nuvigil) and amphetamines are indicated for patients who are successfully treated for OSAS but still have excessive somnolence.

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Richard A. Beyer, MD

Brain Waves: Updates from
the Mercy Neurological Institute

Mercy Neurological Institute Welcomes Neurosurgeon

Mercy Neurological Institute is pleased to welcome Jesse Babbitz, MD, board certified neurosurgeon to its team. Dr. Babbitz joins the practice of Drs. Barry French, Cully "Terry" Cobb and Praveen Prasad.

Dr. Babbitz is a graduate of the University of Louisville (Ky.) Medical School and completed his neurosurgery residency at Stanford University. Dr. Babbitz has participated in various research projects, including regeneration of traumatically-injured cerebral cortex via transplant of adult stem cells and image-guided, minimally invasive spinal surgery protocols. Dr. Babbitz's office will be at 2801 K Street, Suite 300, Sacramento. ■

Jesse Babbitz, MD

Review and Update in Sleep Disordered Breathing—continued from page 6

CPAP is the most effective treatment for OSAS with a success rate over 90%, though a limiting factor is long-term patient compliance, which is estimated at 50-60%. CPAP can be delivered as a single pressure or a variable pressure tailored to the individual's respiratory pattern. CPAP is delivered through a face mask of which there are three major types. The standard mask is the nasal mask that covers the nose. For claustrophobic patients, a nasal pillows mask is available which consists of pylons that plug directly into the nose. Finally there is the whole face mask for oral breathers. The most successful measures for increasing CPAP compliance are intense attention to the patient in the first month of treatment and judicious use of sleeping pills.

Dental appliances are the second line and include the more common Mandibular Advancement Splint (MAS) and the less efficacious Tongue Retaining Device (TRD). Both work by pulling the tongue forward. A new device is an Expiratory Positive Airway Nasal Device (ProventR) which consists of small nasal plugs inserted into each nares that have valves that create a positive back pressure that splints open the airway. This device is probably as effective as the MAS, but does not have a large scale experience yet and insurance coverage is an unknown.

Surgical treatment of OSAS has always been attractive because of the chance of curing the patient forever. The most popular surgical treatment for OSAS has been the Uvulopalatopharyngoplasty (UPPP). It has fallen from favor because of a <40% success rate, a significant recurrence rate, and a 2-4% complication rate. Palatal implants of plastic material under local anesthesia stiffen soft tissue and reduce flutter. Data supporting its use is weak and small studies were generally poorly done. Nasal reconstruction does not improve OSAS but does improve CPAP delivery. Genioglossus advancement with hyoid myotomy and suspension (GAHMS) and Bimaxillary and mandibular osteotomy usually have a high success rate and would be popular for their permanent cure but are not attractive because of the amount of surgery the patient has to endure. Finally, tracheostomy is the only 100% effective treatment for OSAS but is reserved for patients who fail other therapies and have life threatening complications or severe oxygen desaturations not adequately corrected by exogenous oxygen.

Sleep apnea has become a significant public health problem that needs to be addressed because of the associated morbidity and mortality and its rapidly increasing incidence, possibly related to increase in obesity. Treatment of this disorder is expensive but cost effective because it has been shown to decrease healthcare utilization with successful treatment. Although technology has greatly increased access to diagnostic procedures for OSAS, the interpretation of results and implementation of treatment is still best guided by Accredited Sleep Centers. The Sleep Centers of the Mercy Neurological Institute in Woodland and Sacramento stand by ready to help. ■

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CONTINUING MEDICAL EDUCATION 2013

Monthly Neuro Grand Rounds

Mercy San Juan Medical Center
Conference Rooms 2, 3 and 4

First Friday of each month at 12:30 p.m.

tPA and Neurocritical Care Case Conferences

Mercy General Hospital
Third Tuesday of each even month at 6 p.m.

(February, April, June, August, October, December)

Mercy San Juan Medical Center
Third Tuesday of each odd month at 6 p.m.

(January, March, May, July, September, November)

Call for meeting room locations: 916.962.8751

Epilepsy Case Conference

Mercy General Hospital, North Auditorium
Fourth Tuesday of each month at 6 p.m.

Interventional Neuroradiology (INR) Case Conference

Mercy General Hospital
Held periodically; contact MercyNeuro@DignityHealth.org for more information on upcoming dates

If you have any questions about upcoming opportunities, or would like to coordinate WebEx access, contact MercyNeuro@DignityHealth.org or call 916.962.8751.

Insights & Innovations 2013

An accredited, half-day CME opportunity for primary and emergency care physicians about important advancements in multiple sclerosis, movement disorders and stroke care.

Saturday, May 4

Sheraton Grand Sacramento
7:30 a.m. to 1 p.m.
1230 J Street, Sacramento, 95814

Register at MercyNeuro.org or by calling 916.962.8751.

Contact MercyNeuro@DignityHealth.org or call 916.962.8751 for monthly access information.