

# NEUROtransmitter

A PUBLICATION OF SANTA BARBARA NEUROSCIENCE INSTITUTE AT COTTAGE HEALTH SYSTEM

summer 2011

## Cavernous Malformations:

Diagnosis and Surgical Management Case Study

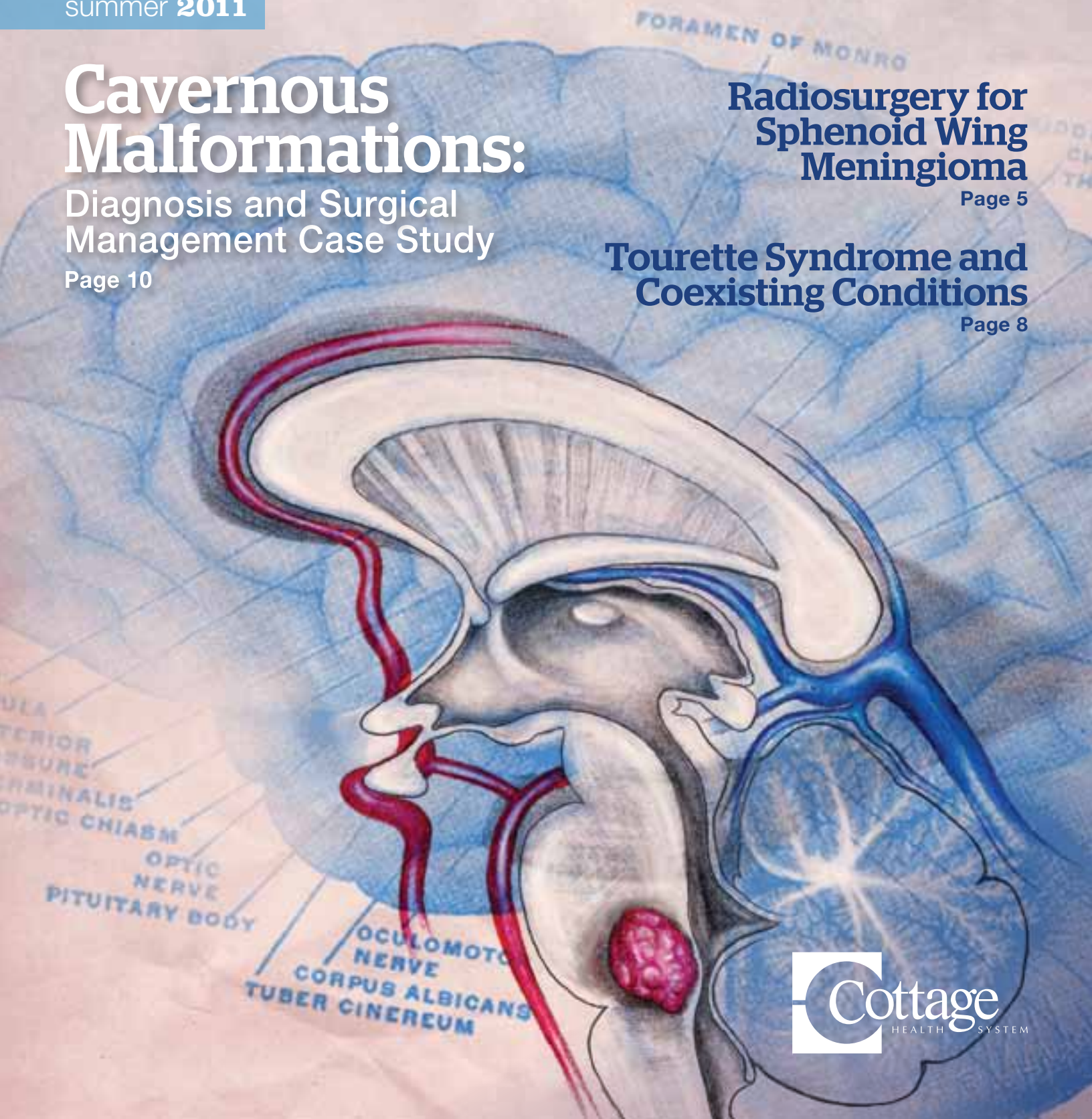
Page 10

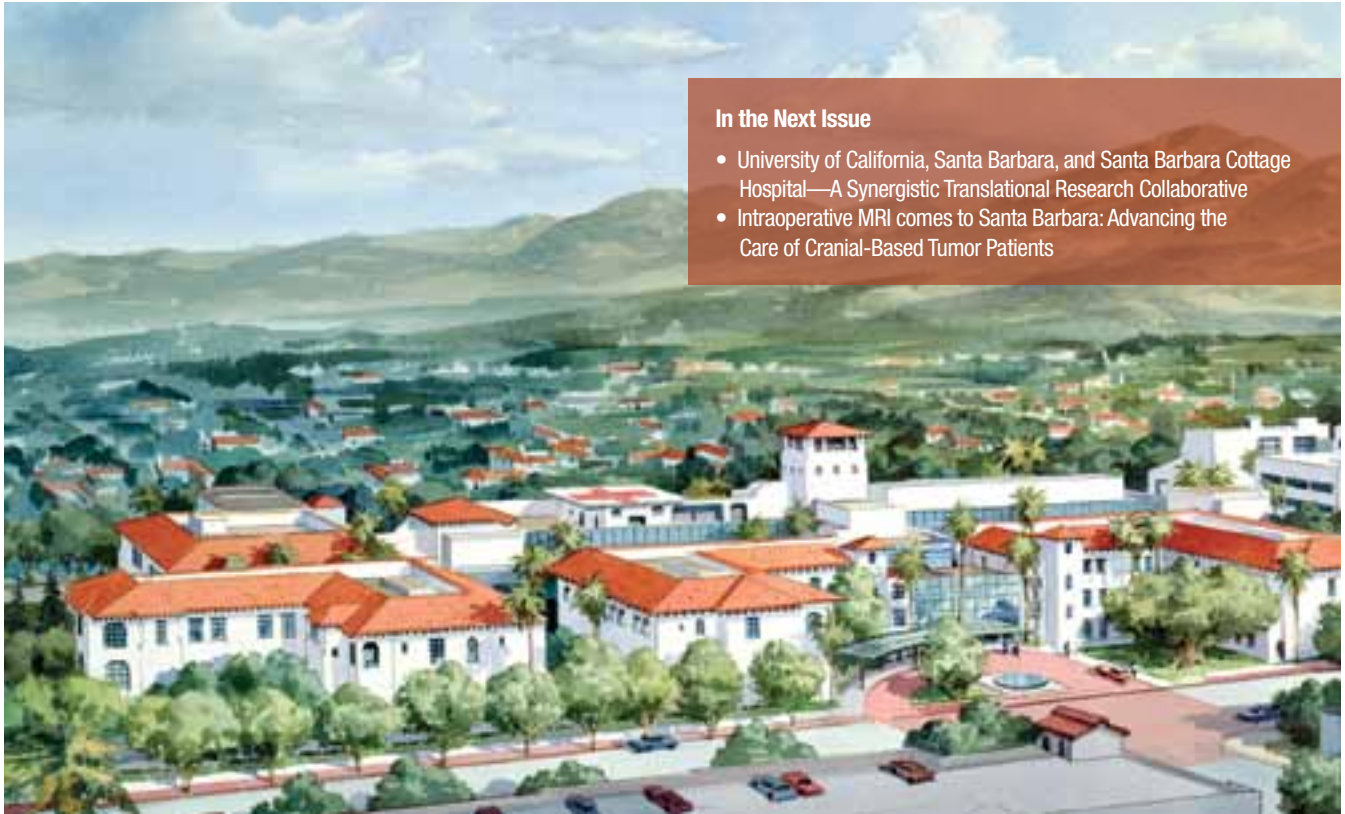
## radiosurgery for Sphenoid Wing Meningioma

Page 5

## Tourette Syndrome and Coexisting Conditions

Page 8





### In the Next Issue

- University of California, Santa Barbara, and Santa Barbara Cottage Hospital—A Synergistic Translational Research Collaborative
- Intraoperative MRI comes to Santa Barbara: Advancing the Care of Cranial-Based Tumor Patients

Thomas H. Jones, MD  
*Executive Medical Editor*

Philip Delio, MD  
*Medical Editor, Neurology*

Alois Zauner, MD  
*Medical Editor, Neurosurgery*

Sean Snodgrass, MD  
*Medical Editor, Neuroradiology*

Gary D. Milgram, RN, MBA  
*Executive Editor*

Charlie Milburn  
*Publisher*

Candice St. Jacques  
*Managing Editor*

Monika Bliss Morris  
*Designer*

Maria Zate  
*Advisory Editor*

*To be added to the mailing list, please contact  
Gary Milgram at [gmilgram@sbch.org](mailto:gmilgram@sbch.org).*

### About Santa Barbara Cottage Hospital and Cottage Health System

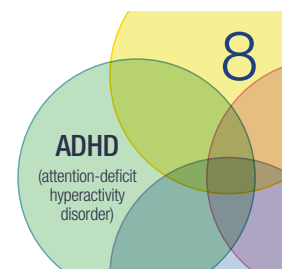
The not-for-profit Cottage Health System is the parent organization of Santa Barbara Cottage Hospital (and its associated Cottage Children's Hospital and Cottage Rehabilitation Hospital), Santa Ynez Valley Cottage Hospital and Goleta Valley Cottage Hospital.

The Santa Barbara Neuroscience Institute at Cottage Health System is a physician-led initiative established to focus on medical conditions over the full cycle of care. The Institute aims to deliver the highest value to the patient by incorporating best practices, applying resources judiciously, and measuring and reporting outcomes relentlessly.

**On the Cover:** The illustration by Joshua Emerson depicts the sagittal view of a pontomedullary cavernous malformation. The vascular lesion is close to the floor of the fourth ventricle and therefore determines the surgical corridor and approach to the lesion.

## Table of Contents

- 4** Acute Inpatient Rehabilitation Referral
- 5** Radiosurgery for Sphenoid Wing Meningioma
- 6** Headache Management—A Guide for Emergency Department and Primary Care Physicians
- 8** Tourette Syndrome and Coexisting Conditions
- 10** Diagnosis and Surgical Management of Cavernous Malformations





## *Dear Colleagues,*

Welcome to the fifth edition of *NEUROtransmitter*.

Over the past year and a half, the neuroscience staff and the administration at Cottage Health System have been working hard as a team to improve our existing programs. These programs include The Joint Commission-accredited stroke service and cerebrovascular/endovascular service, both of which offer 24/7 coverage for patients in need.

Seminal developments at Santa Barbara Cottage Hospital include the anticipated early 2012 opening of two new patient pavilions, including the neuroscience floor, 40 new medical and surgical ICU beds, new operating rooms, new radiology services space with high-field-strength magnetic resonance imaging (MRI) and several rapid-sequence computed tomography (CT) scanners and a rooftop heliport.

From a neuroscience perspective, the centerpiece of this construction will be a three-room neurosurgical operating room suite, which will include a state-of-the-art Brain Lab-computer-enhanced operating room, an adjacent 3T MRI for intra-operative use and a contiguous robotic endovascular room.

To my knowledge this will be the first 3T IMRI and the first Siemens Artis zeego endovascular robot on the West Coast. Plans are also underway to build a dedicated 12-bed neurological intensive care unit, with access to a portable CT, with a completion date of late 2013.

Importantly, we are also recruiting new neurologists and a neurosurgeon to allow us to offer state-of-the-art care for our neurosurgical tumor program. We aim to put together a team approach to deliver “high touch,” evidence-based care, while also offering access to the latest clinical trials. To that end and to facilitate nursing education and improve the communication within the team, we recently recruited Laura Canfield, RN, MSN, a clinical nurse specialist in neurosciences.

Concomitantly, Cottage Health System and the Santa Barbara Neuroscience Institute have been working with the University of California at Santa Barbara (UCSB) to develop space for translational medical research in a soon-to-be-built bioengineering building. We hope to recruit physicians with a strong academic portfolio who will want to continue their research projects in collaboration with the scientists at UCSB.

You can understand why we are excited about the future of the Santa Barbara Neuroscience Institute. We hope to channel all this technological and clinical expertise into “world class” systems of health care and eventually to make our outcomes and costs transparent to the patient and referring physicians.

*Sincerely,*

**Thomas H. Jones, MD**

Neurosurgeon and Medical Director  
Santa Barbara Neuroscience Institute

“ We aim to put together a team approach to deliver ‘high touch,’ evidence-based care, while also offering access to the latest clinical trials.”

# Acute Inpatient Rehabilitation Referral



Sharon Basham, MD,  
Physiatrist—Medical Director,  
Cottage Rehabilitation Hospital

Two common misperceptions regarding Cottage Rehabilitation Hospital at Cottage Health System are that only neurological patients are accepted as inpatients and that strict criteria mandate a discharge plan prior to admission. The reality could make a tremendous difference to a potential referral patient.

THE PATIENTS OCCUPYING the 38 acute inpatient rehabilitation beds at Cottage Rehabilitation Hospital benefit from a full range of medical and therapy services: rehabilitation nursing; internal medicine and psychiatry physician coverage; physical, occupational and speech therapy; neuropsychology; and case management. Most present with neurological (post-stroke, brain injury, spinal cord injury, Parkinson's disease and multiple sclerosis) and/or orthopedic (post-trauma, joint replacement and amputee) conditions.

“We have three physiatrists on staff who lead the transdisciplinary team and care for patients with

multiple medical issues during their hospitalizations,” says Sharon Basham, MD, physiatrist and medical director of Cottage Rehabilitation Hospital. “We treat a wide variety of neurological and orthopedic patients with multiple traumas, rheumatologic disorders, congenital deformities and amputations, as well as deconditioned patients who require prolonged hospitalization due to sepsis or cardiopulmonary issues.”

### REFERRAL PROCESS

Although some inquiries are generated by family members or patients, a physician referral is required for individuals currently being cared for in an acute care setting, skilled nursing facility or private residence.

“Upon referral, a clinical liaison will evaluate the patient and discuss the case with me so that I can determine appropriateness for this level of care,” says Dr. Basham. “Once the decision to admit a patient is made, the admissions department will coordinate transfer and other arrangements.”

In addition to providing the only acute patient rehabilitation setting in the Tri-County area, Cottage Rehabilitation Hospital offers a full spectrum of outpatient services, extending to aquatic therapy, assistive technology support and specialized programs such as adaptive driving. More than 50 percent of referrals result in admission. Patients not admitted will be provided with recommendations for alternative therapy plans and may be re-evaluated if the need for specialized therapy intensifies.

“Our nursing and therapy services staff members educate patients and their family members throughout hospitalization,” says Dr. Basham. “We also provide ongoing counseling.”

That support extends to psychological services geared at helping patients and families cope with lifestyle changes resulting from catastrophic illnesses, injuries and disabilities.

*To learn more, visit [www.cottagehealthsystem.org](http://www.cottagehealthsystem.org) and click on “Our Hospitals” and then “Cottage Rehabilitation Hospital.”*

### ADMISSION CRITERIA

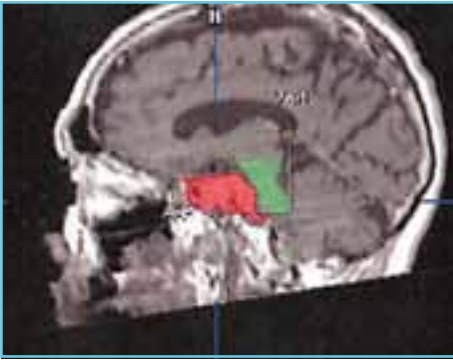
Physicians are urged to refer patients to Cottage Rehabilitation Hospital when these conditions apply:

- The patient needs close medical supervision by a physiatrist.
- The patient requires 24-hour rehabilitation specialty nursing.
- The patient can tolerate and is expected to benefit from at least three hours of therapy per day.
- The patient's program of care includes at least two of the following: physical therapy, occupational therapy or speech therapy.

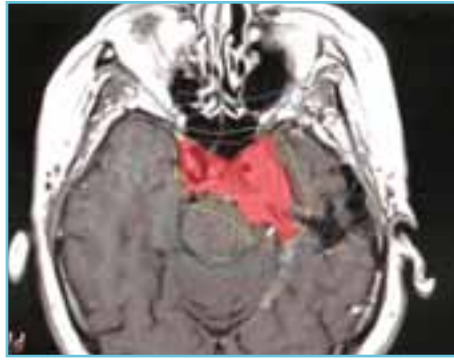
To refer a patient for inpatient services, call (805) 569-8999, ext. 82317.

Cottage Rehabilitation Hospital inpatient and outpatient services include:

- BioNESS L300® and H200® neurostimulation devices
- Tibion Bionic Leg Robotic rehabilitation support
- Suspended gait system
- Aquatic program
- Adaptive driving program
- Neuropsychological testing and support
- Assistive Technology Center



Sagittal view of the plan shows the tightly conformal radiation dose distribution around the lesion



Axial view of a computer-generated treatment plan shows the radiotherapeutic dose distribution for radiosurgical treatment of a patient with sphenoid wing meningioma.

# Radiosurgery for Sphenoid Wing Meningioma

Meningiomas were first identified by the Swiss physician and anatomist Felix Plater in 1614. Although simple lesions, meningiomas were considered unresectable due to their location in the anterior skull base.

“SPHENOID WING MENINGIOMAS occur in the confined space immediately adjacent to the sella turcica, the lateral portion dividing the anterior from the medial cranial fossa,” says Thomas Weisenburger, MD, FACR, radiation oncologist and medical director of the Cancer Center of Santa Barbara. “Advances in anesthesia, microsurgery and neuroradiology have made possible safer surgical treatment. However, for those symptomatic meningiomas that can only be partially resected and for certain deep seated tumors in medically fragile individuals, radiosurgery may become the treatment of choice.”

## DIAGNOSIS AND TREATMENT

All meningiomas do not require treatment. Those in the medial sphenoid wing area that do will typically cause patients to present with symptoms of cavernous sinus invasion (i.e., diplopia, anisocoria, orbital pain, facial numbness, carotid distribution ischemia) and in the lateral sphenoid wing area with headaches and seizures.

“Surgery is the treatment of choice for locations that allow effective resection,” says Dr. Weisenburger. “In circumstances where meningiomas are located too close to critical structures and cannot be excised, radiation therapy using stereotactic radiosurgery would be indicated.”

## UNIQUE LOCAL SOLUTION

The Cancer Center of Santa Barbara is home to the Novalis Tx™ radiosurgery system—the only one of its kind in the Tri-County area.

“We can perform frameless radiosurgery, a single treatment for tumors such as meningioma in sensitive areas, to stop the encroachment on critical structures,” says Dr. Weisenburger. “More efficient and comfortable for the patient, radiosurgery using the Novalis Tx can provide exact positioning for those who require 28 treatments given during a five-and-a-half-week period.”

For more information about services at Cancer Center of Santa Barbara, visit [www.ccsb.org](http://www.ccsb.org). To refer a patient, call (805) 682-7300.



Thomas Weisenburger, MD, FACR, Radiation Oncologist

## MANAGING MENINGIOMAS

Magnetic resonance imaging (MRI) is used in the diagnosis of meningiomas and to calculate the treatment plan for those requiring intervention. Computed tomography (CT) imaging offers physicians the density of patient anatomy in 3D also needed to calculate the dose.

“We perform a CT scan with the patient in the brain lab, wearing an immobilization mask,” says Thomas Weisenburger, MD, FACR, radiation oncologist and medical director of the Cancer Center of Santa Barbara. “We transfer the image to the software and fuse that image with the diagnostic MRI, allowing us to accurately draw on the CT images the volume that needs to be treated.”

## BY THE NUMBERS

**75 PERCENT**—meningiomas occurring in Caucasian women

**50**—average age of onset of meningioma

**LESS THAN 20 PERCENT**—meningioma occurrence in all brain tumors

# HEADACHE MANAGEMENT— A Guide for Emergency Department and Primary Care Physicians

by Paul Willis, MD, neurologist at Sansum Clinic

A COMMON SYMPTOM identified during presentation at physician office visits, headache has the potential to signify a serious condition requiring immediate attention. A systematic approach using diagnostic criteria and a simple mnemonic can help a physician distinguish between primary and secondary headaches and lead to accurate diagnosis.

### CLINICAL INDICATIONS

When a patient presents with a headache complaint, additional symptoms indicating a potentially serious problem include: headaches associated with fever, stiff neck, nausea and vomiting; headaches other than migraine with aura associated with focal neurologic symptoms; and headaches associated with papilledema, cognitive impairment or personality change.

In addition, a progressive or new daily persistent headache; chronic daily headache; headache always on the same side; headaches that fail to respond to treatment; and subacute headaches with increasing frequency or severity indicate further temporal features that call for closer study, as does a patient's use of the words "first" or "worst" in describing symptom onset.

### PRIMARY VS. SECONDARY

Upon thorough evaluation, a patient's sudden onset headache may be diagnosed as primary or secondary, with primary designating classic migraine, tension and cluster headaches,

and secondary denoting headache pain and symptoms caused by an underlying condition.

High-risk (red flag) symptoms potentially associated with intracranial pathologies include: thunderclap headache; pain following exercise, coughing or sexual activity; and headache waking the patient from sleep. Secondary headaches may suggest a subarachnoid hemorrhage, venous sinus thrombosis, pituitary apoplexy, arterial dissection, meningococcal meningitis, acute hydrocephalus, hypertensive crisis or spontaneous intracranial hypotension.

Computed tomography (CT) scans of the brain can miss many secondary causes for headache. Magnetic resonance imaging (MRI) is generally preferred for patients with red flag symptoms.

Patients with red flag headache symptoms who present for urgent care are likely to require quick assessment—including neuroimaging, appropriate laboratory studies and possible spinal tap—and consultation.

### PURSUING THE CAUSE

Migraine headaches can also be approached in a logical fashion. First recognize that migraines are wide-ranging in their presentation. Criteria set by the International

Migraine, the most common headache disorder seen in ambulatory and emergency practice, affects 32 million Americans.



Headache Society—episodic, vascular disabling headaches with accompaniments of photophobia, sonophobia or nausea—are helpful, but other complex features or cervical tension that resembles or mimics sinus may turn out to be triptan-responsive and migrainous in retrospect.

Monitoring and charting the frequency and circumstances can help identify triggers that might encourage and guide the patient to sustain a moderate lifestyle with respect to sleep, diet and exercise. Hormonal influences play a major role in females. Early use of triptans and anti-inflammatories might deflect the evolving headache from disabling levels. Modification of caffeine and analgesic use (opiates are best avoided except for extreme rescue) may be employed.

Preventative strategies from vitamin B2/magnesium to prescription medications (antiseizure medications, Beta-blockers, calcium channel blockers, tricyclics and others) are available for intractable or nonresponsive headaches. Patience and close follow-up are often required to reach satisfactory control of this surprisingly common disorder. Diagnosing physicians should recognize potential danger signs that alert us to the need to seek help for our patients. During a hectic day, a physician may be tempted to overlook the common patient complaint of headache or miss red flag presenting symptoms. However, gaining a better understanding of headache characteristics includes encouraging patients to divulge more about their headache traits, keeping in mind that it never hurts to look further into this symptom. A false negative is a far better outcome than missing a potentially life-threatening condition.

*For more information about headache management and to download a treatment algorithm that complements this article, please visit [www.sbni.org](http://www.sbni.org).*

## SNOOP Out Red Flags

The following mnemonic (SNOOP) provides a useful reminder of atypical symptoms that call for further examination when a patient presents with headache:

- Systemic symptoms (such as fever or weight loss) or secondary risk factors (such as HIV or systemic cancer)
- Neurologic symptoms or abnormal signs (such as confusion or impaired consciousness)
- Onset that is sudden, abrupt or split second
- Older patient (50 or older) reporting new onset and progressive headache (giant cell arthritis)
- Previous headache history with current symptom described as a “first” of its type or a “worst” headache (change in attack frequency, severity or clinical features)

## CASE PRESENTATIONS

The following two cases provide disparate examples from the wide range of migraine manifestations.

### Patient One

A 35-year-old male presented for urgent care with headache. He had a 10-year history of migraine characterized by intermittent scintillating visual phenomena always in the right visual field followed by severe cervical occipital pain.

Migraine accompaniments of photophobia and nausea were generally modest. Without other unusual circumstances, he described this headache as progressing to the worst he could recall. In urgent care, he received a prescription for stronger analgesics.

The next morning, he was found unresponsive. Evaluation revealed a large left occipital hemorrhage ultimately ascribed to an arteriovenous malformation (AVM). Following surgical intervention and prolonged rehabilitation, he recovered with residual right visual field deficit and seizure disorder heralded by right scintillating scotoma. He no longer experiences headaches.

### Patient Two

A 50-year-old woman presented with problematic headaches that had been occurring for decades. She recalled childhood vomiting spells and menarche-onset menstrual headaches but no clear diagnostic migraine symptoms. During the next 25 years, she experienced frequent episodic sinus and cervical tension headaches. Antibiotics, decongestants and ultimately sinus surgery only modestly addressed frontal sinus pressure pain. Anti-inflammatory medications, muscle relaxants, analgesics and chiropractic therapy were frequently employed to mitigate the cervical occipital pain.

During the patient’s perimenopausal epoch, her headaches increased to near-daily frequency. She recalled her mother having “sick headaches” that seemed similar. Neurological workup was negative for any structural abnormality. She responded to triptans and, with appropriate lifestyle modification and preventive medication, remained headache-free.

### Observations and Lessons

The first patient’s headache—a classic migraine with aura in retrospect—resulted from a structural lesion and crossed over to the seizure venue. The two lessons to be learned from this study are that 1) migraines always presenting unilaterally should be imaged to exclude a structural lesion; and 2) a headache described as “the worst ever,” even when it follows the usual pattern, calls for careful evaluation and should never be dismissed.

The second patient case shows the spectrum of migraine presentation over a lifetime: hinted at by symptoms in childhood and adolescence; unrecognized and imperfectly responded to with misdirected symptomatic treatment. The prevalence of nonspecific symptoms mimicking sinus or neck complaints is very common in migraine. Following accurate diagnosis, migraine-specific treatment may provide remarkable and gratifying improvement to quality of life.



Paul Willis, MD, Neurologist

# Tourette Syndrome and Coexisting Conditions

A chronic neurological disorder that begins in childhood, Tourette syndrome (TS) is defined by motor and vocal tics of at least one-year duration.

by Mark Corazza, MD, pediatric neurologist at Santa Barbara Neuroscience Institute at Cottage Health System

THESE REPETITIVE, INVOLUNTARY movements may be simple (forced eye blinking, facial grimacing or jerking of the head and neck) or complex (touching, pulling at clothes). Vocal tics may include throat clearing, coughing, sniffing, snorting and forcibly inhaling or exhaling. Only a small percentage of patients demonstrate coprolalia or the uttering of obscenities, for which TS is commonly known.

Patients report that uncomfortable sensations commonly precede tics. An example is a tickle in the throat, causing the patient to begin throat clearing or coughing, which serves to alleviate the sensation temporarily. Tics may change in character and increase or decrease in frequency over time, even disappearing altogether for weeks or months.

### WHOM DOES TOURETTE SYNDROME AFFECT?

TS occurs in 1 percent of children, predominantly in males. Although tics often accelerate in later childhood, the prognosis for outgrowing tics is generally favorable. At least one-third of patients will completely stop having tics in their early teens. Another third will see their tics markedly reduce in frequency and intensity. The remainder will continue to have tics into adulthood, although some may see improvement during their 20s.

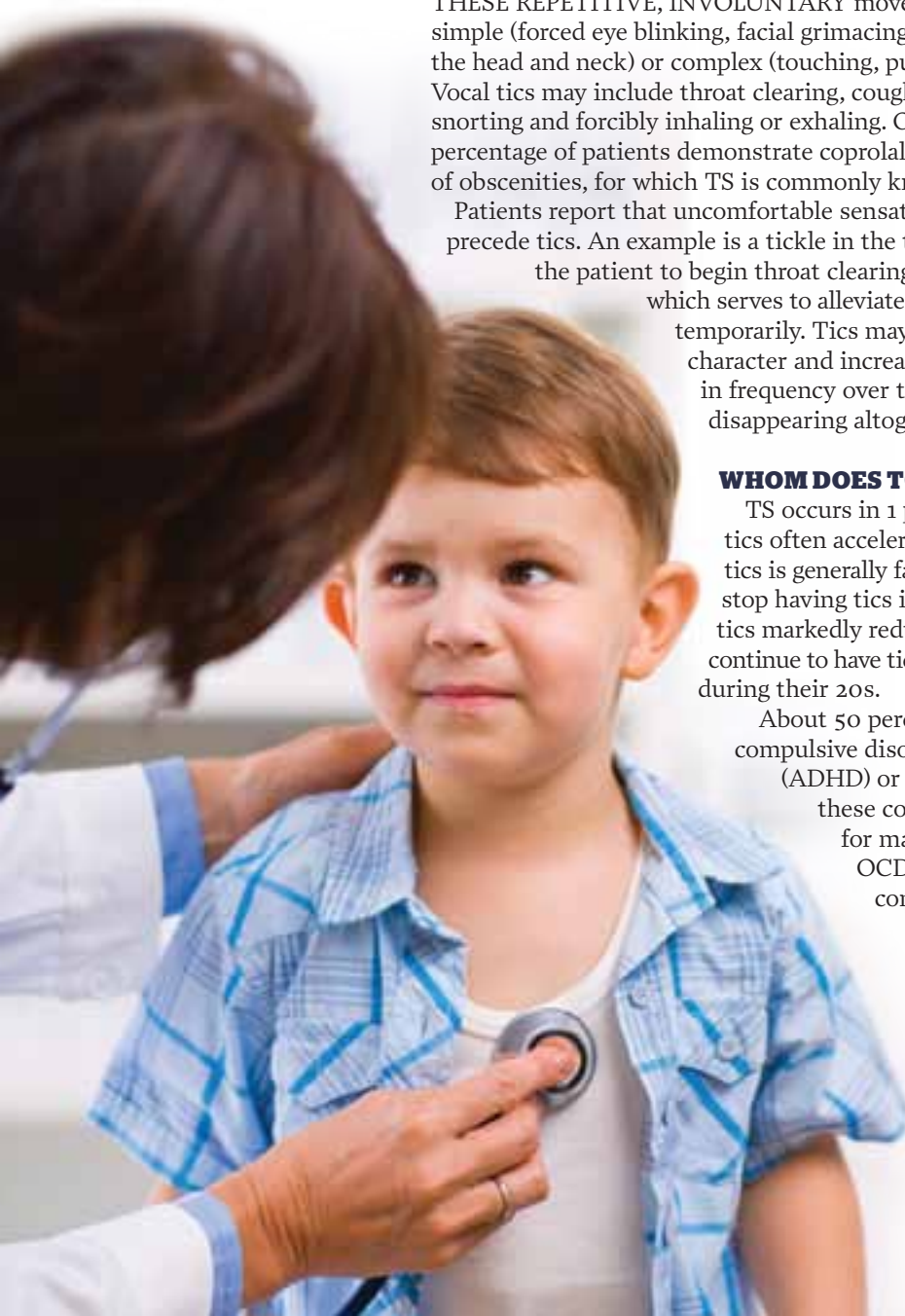
About 50 percent of patients with TS have comorbid obsessive-compulsive disorder (OCD), attention-deficit hyperactivity disorder (ADHD) or both. Genetic studies suggest a predisposition for these conditions may run in families, with a predilection for males to have tics and ADHD and for females to have OCD. A variety of genetic and environmental factors likely combine to produce TS.

### TREATING TOURETTE SYNDROME

The treatment of the tic disorder can vary from simple to complex. Unless the tics are bothersome to the child or cause social embarrassment, no specific therapy is required. If the tics are bothersome, the alpha-agonists clonidine and guanfacine may be helpful. Sedation and irritability are common side effects, although hypotension is seldom a problem.



Mark Corazza, MD, Pediatric Neurologist



Dopamine receptor antagonists such as haloperidol and pimozide are quite effective, as are atypical antipsychotic agents such as risperidone. Sedation, weight gain, glucose intolerance and, very rarely, the movement disorder tardive dyskinesia may complicate their use.

Some authors indicated improvement with selective serotonin reuptake inhibitors (SSRIs) such as fluoxetine. Controlled studies which are limited and small show no benefit.

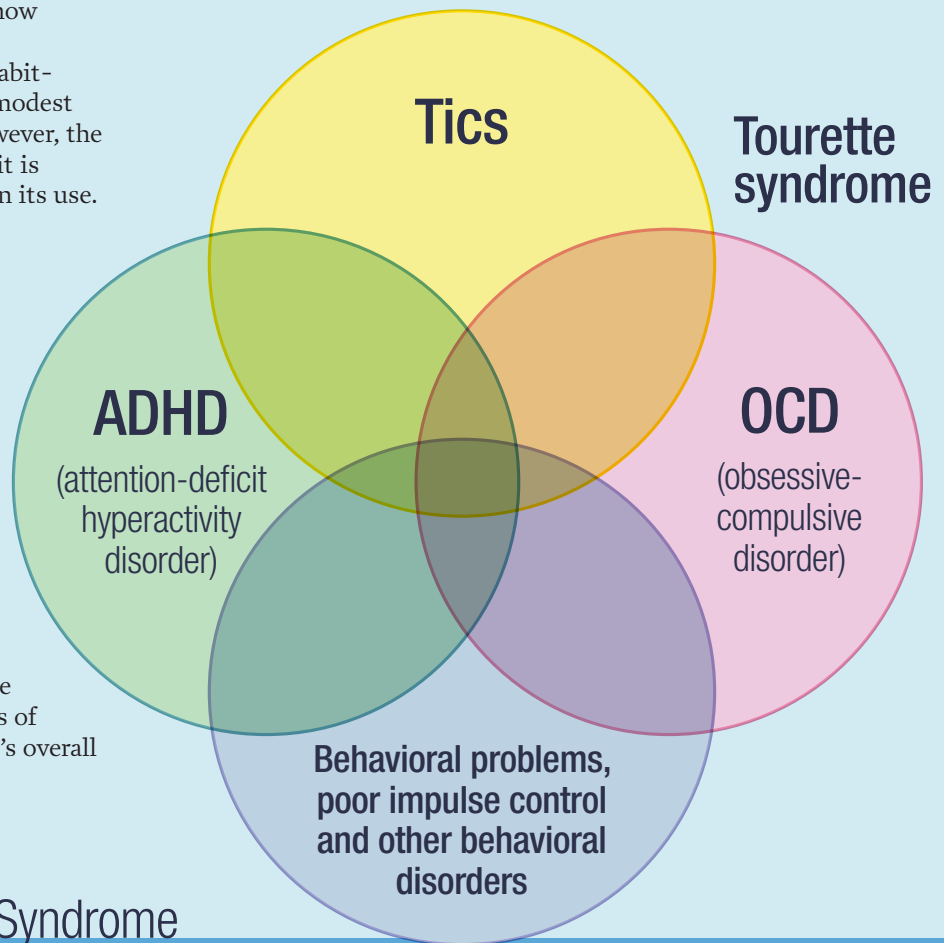
A form of cognitive behavioral therapy called habit-reversal treatment has been shown to produce a modest reduction in tic severity over the short term. However, the long-term benefits of this therapy are unproven, it is time-consuming, and few therapists are trained in its use.

### TREATING THE COEXISTING CONDITIONS

A major challenge in TS is the treatment of its coexisting conditions. In addition to OCD and ADHD, children with TS have higher incidence of anxiety, depression, bipolar disorder and rage attacks. For treatment, alpha-agonists, dopamine receptor antagonists, stimulants, SSRIs, various other antidepressants and mood stabilizers may be utilized, often in combination.

Care must be taken as the medication to treat one facet of the disorder may have negative effects on another (e.g., the use of an antipsychotic for tics may aggravate the inattention of a child with comorbid ADHD). The clinician's skill in choosing and balancing dosages of these medications will greatly influence the child's overall academic and social function.

*For more information about Santa Barbara Neuroscience Institute at Cottage Health System and the services offered, please visit [www.sbni.org](http://www.sbni.org).*



## CASE STUDY: Tourette Syndrome

An 8-year-old boy with a history of being distractible and mildly hyperactive dating back to kindergarten was referred for neurological evaluation. Because the boy's behavioral issues were causing academic and social difficulties in the second grade, his pediatrician started him on a sustained-release form of methylphenidate. Within a week of taking the medication, the boy began clearing his throat frequently. The following week, he started jerking his head and neck to one side. The methylphenidate was discontinued, but the tics persisted, albeit in less dramatic fashion.

When questioned carefully, the parents revealed that one year earlier, the child had developed a peculiar habit of forcibly blinking his eyes. This lasted only a few weeks and was never brought to medical attention. In addition, the parents acknowledged that the child tended to dwell on and discuss certain topics excessively. In addition, he became upset if events did not turn out his way, expressed inordinate fears and required symmetry such that if he touched an object with one hand he would have to touch it with the other as well. At an earlier age, he had insisted that all doors and kitchen drawers remain closed

and would follow his mother around closing them.

The family history was notable for the mother taking escitalopram for obsessive-compulsive disorder.

The boy was started on guanfacine for presumed Tourette syndrome, the first signs of which predated the treatment with methylphenidate. The tics were brought under adequate control. He then underwent formal psychological testing through the school system; no learning disability was identified, although he was felt to have attention-deficit hyperactivity disorder. He was then started on atomoxetine. This produced an inadequate response despite a relatively high dosage, and he remained poorly focused in school. After being restarted on methylphenidate along with the guanfacine, his concentration improved and his tics remained acceptably controlled.

Within the year, the child's obsessive-compulsive symptoms became more problematic and he became increasingly sad. Fluoxetine was introduced, and these symptoms improved. The guanfacine was withdrawn a few months later with continued good control of the tics.

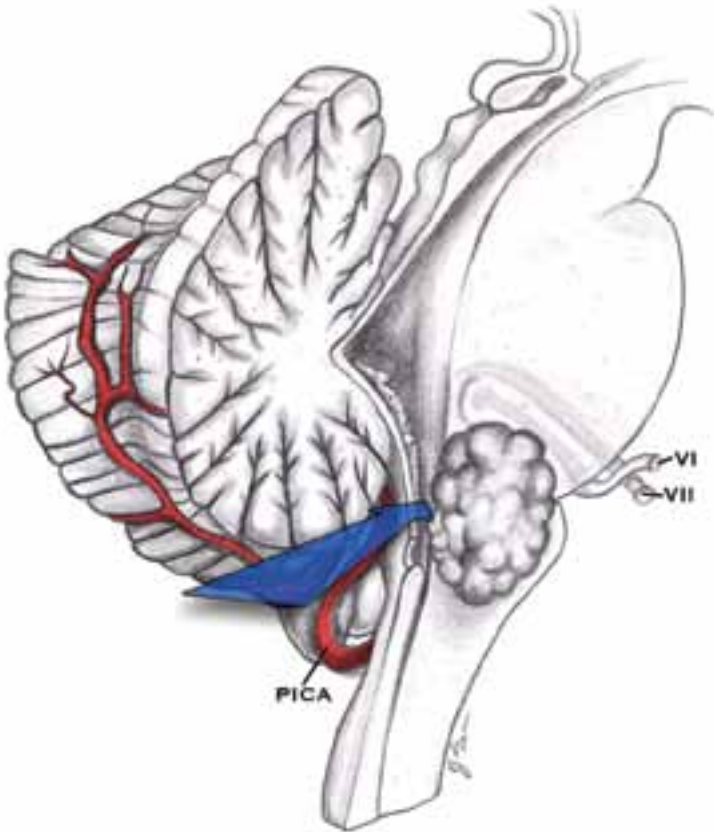
# Diagnosis and Surgical Management of Cavernous Malformations

by Alois Zauner, MD, general and cerebrovascular neurosurgeon and neuroendovascular and neurointerventional surgeon on the medical staff at Cottage

Cerebral vascular malformations occur in 0.5 percent to 4 percent of the general population. Of the four classically described types of vascular malformations—arteriovenous malformations, cavernous malformations (CMs), capillary teleangiectasias and venous malformations—CMs account for 8 percent to 15 percent. CMs occur sporadic and familial (autosomal dominant).



Alois Zauner, MD



A suboccipital approach via the fourth ventricle. This was the preferred route to the pontomedullary vascular lesion, as demonstrated in the drawing. The course of the cranial nerves VI and VII and the posterior inferior cerebellar artery (PICA) are illustrated.

### EPIDEMIOLOGY AND CLINICAL PRESENTATION

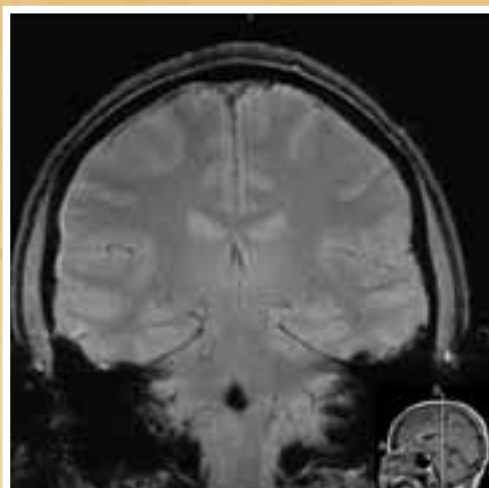
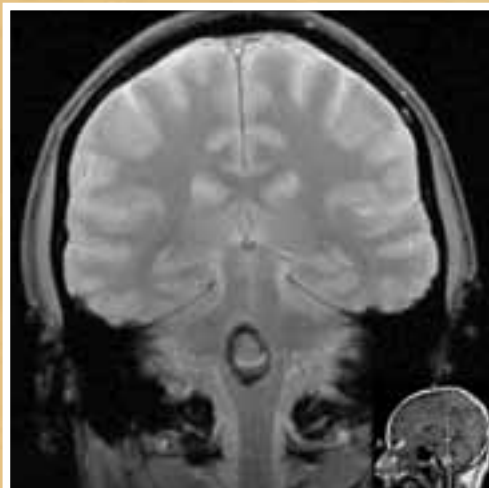
Magnetic resonance imaging (MRI) greatly enhances our understanding of the natural history of these lesions. The spontaneous form occurs generally as a single lesion, whereas the familial form is characterized by multiple lesions. More than 80 percent of all lesions are supratentorial, 15 percent are located in the brainstem and posterior fossa with the remaining lesions in the spinal cord.

Most patients become symptomatic between their second and fifth decades. Approximately 20 percent of lesions are found during a workup for headaches. Seizures are the most common manifestations of supratentorial CMs. Abnormal venous flow and venous hypertension may lead to hemorrhagic angiogenic proliferation. Deposition of hemosiderin and iron is the likely cause for new onset of seizure activities.

The lesions are lobulated and well circumscribed, and are composed of dilated capillary vessels with simple endothelial lining and without brain tissue between the vascular channels. Ultrastructural analysis suggests abnormalities of the interendothelial tight junctions and subendothelial layer of the blood-brain barrier.

CMs may coexist in combination with other vascular malformations or as part of a transitional form of vascular malformations.

The natural history of CMs is generally related to their clinical presentation, MRI findings and location. Incidental lesions have a low risk of symptomatic hemorrhage (<2 percent per year). The risk for recurrent symptomatic hemorrhage is higher in the brain stem and basal ganglia and may lead to severe neurological deficits and disability.



Pre- and postoperative MRI studies. Pontomedullary lesion with various stages of hemosiderin and blood products as seen on MRI. Please note the cervical syrinx due to the mass effect of the cavernoma. As expected, the syrinx disappeared after surgery.

## MANAGEMENT OF CMs

A logical approach to the management of CMs requires that neurosurgeons understand the epidemiology, natural history and proper imaging of these lesions. Microsurgical resection with the aid of neuronavigation and other advanced neurosurgical tools provides good results for the majority of surgical cases. The effectiveness of radiotherapy and radiosurgery in CMs is not well understood and is considered ineffective for most lesions. However, a recent report suggests stereotactic radiosurgery may reduce the risk of re-hemorrhage in selected deep seated CMs in patients who are not good surgical candidates.

## CASE STUDY

A 42-year-old male presented with declining general health and worsening neurological symptoms over a period of four years. The patient had at least three re-hemorrhages, the last two of which occurred within

two months. On admission, patient was unable to walk or swallow and had to be treated for pneumonia prior to surgery.

## SURGICAL CONSIDERATIONS AND APPROACH

Considering the pontomedullary location of the lesion and close approximation to the floor of the fourth ventricle, a telovelar approach to the lesion was chosen. Intraoperative frameless navigation and brainstem monitoring was used to optimize the surgical corridor and to guaranty the safety of the patient.

Postoperatively, the patient's symptoms improved very quickly and he was transferred to our inpatient rehabilitation center within one week. Four months after surgery, patient was able to return to his previous life with only minor neurological deficits.

*For more information about Santa Barbara Neuroscience Institute at Cottage Health System and the services offered, please visit [www.sbni.org](http://www.sbni.org).*



Santa Barbara Cottage Hospital  
 Pueblo at Bath Street  
 P.O. Box 689  
 Santa Barbara, CA 93102-0689

Nonprofit Org.  
 US POSTAGE  
**PAID**  
 Santa Barbara, CA  
 Permit No. 35



**Vascular Neurosurgery,**  
 Giuseppe Lanzino, MD, Mayo Clinic

**Minimally Invasive Cranial Surgery,**  
 Marvin Bergsneider, MD, UCLA

**Neuro Critical Care,** Howard Yonas, MD,  
 University New Mexico

**Spinal Surgery,** Thomas Jones, MD,  
 Santa Barbara Cottage Hospital

**Complex Neurovascular Cases,**  
 Alois Zauner, MD,  
 Santa Barbara Cottage Hospital

**Microdialysis,** Urban Ungerstedt, MD,  
 Karolinska Institute, Sweden

**ICP Monitoring,** DaiWai Olson, PhD, RN,  
 Duke University Medical Center

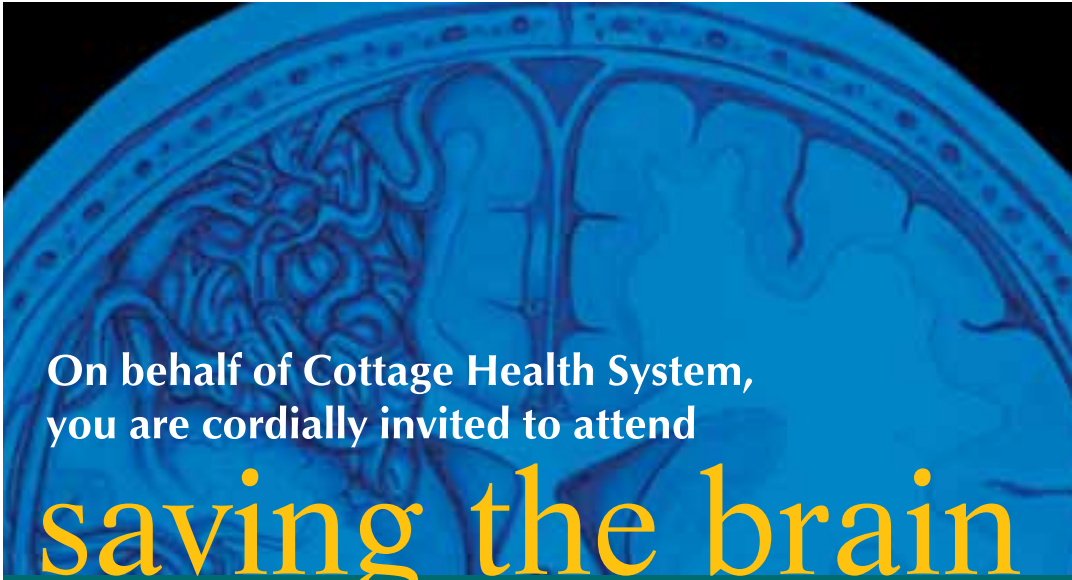
**Development of Regional Stroke Network,**  
 Todd Czartoski, MD,  
 Swedish Medical Center

**Neurotrauma,** Stephen Kaminski, MD,  
 Santa Barbara Cottage Hospital

**Advances in Epilepsy,** Linda Chen, MD,  
 Santa Barbara Cottage Hospital

**Stroke,** David Liebeskind, MD, UCLA

**Update in Brain Tumor Surgery,**  
 Jeffrey Weinberg, MD,  
 MD Anderson Cancer Center



On behalf of Cottage Health System,  
 you are cordially invited to attend

# saving the brain

The 4th Annual Neuroscience Symposium of the Central Coast  
 featuring nationally recognized guest speakers, along with experts  
 in the Neurosciences from Santa Barbara Cottage Hospital

**Saturday, September 24, 2011**

7:15 AM to 4:15 PM

Fess Parker's DoubleTree Resort  
 633 East Cabrillo Boulevard  
 Santa Barbara, CA 93103

**register today**

For content review of previous conferences go to  
[www.sbni.org](http://www.sbni.org) or email [sbni@sbch.org](mailto:sbni@sbch.org)