

# NEUROtransmitter

A PUBLICATION OF SANTA BARBARA NEUROSCIENCE INSTITUTE AT COTTAGE HEALTH SYSTEM

winter 2012

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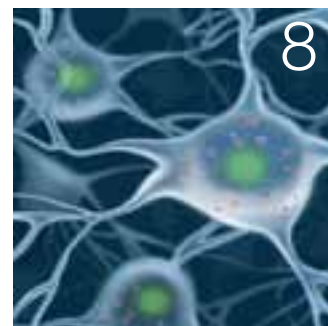
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### About Santa Barbara Cottage Hospital and Cottage Health System

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:** An illustration by Josh Emerson depicts the more widespread distribution of abnormal deposits of an intraneuronal protein that creates the core pathology seen in diffuse Lewy Body Dementia.





## *Dear Colleagues,*

On September 24th, the Santa Barbara Cottage Hospital-sponsored Fourth Annual Saving the Brain Symposium was held. As usual, it was well attended and had a strong guest faculty.

Drs. Alois Zauner and Phil Delio were the course directors. Dr. Howard Yonas, chair of neurological surgery at the University of New Mexico, started the day off with an informative update on neurocritical care. The next speaker was Professor Urban Ungerstedt from the Karolinska Institute in Stockholm, a world expert in the use of microdialysis and its potential for improving brain physiology monitoring in the neurocritical care unit. Later in the morning, Dr. Jeffrey Weinberg, a neurosurgeon from M.D. Anderson Cancer Center in Houston, brought us all up to date on the use of intraoperative MRI scans in the management of patients with brain neoplasms. He was enthusiastic about its role and felt that it improved surgical as well as patient outcomes. Dr. Marvin Bergsneider, a professor of neurological surgery at UCLA, gave a talk enhanced with surgical videos on the relatively new use of endoscopes for removing intracranial skull base tumors through the transnasal approach.

After lunch in a large outdoor pavilion overlooking the ocean, Dr. David Liebeskind, the associate director of the stroke service at UCLA, reviewed the underappreciated importance of collateral flow in the management of acute stroke. Then, Dr. Todd Czartoski, the director of neurology at the Swedish Neuroscience Institute in Seattle, reviewed their extensive experience in the use of telemedicine to help deliver expert stroke care to underserved rural Washington State. Our last guest lecturer, Dr. Giuseppe Lanzino, a professor of neurological surgery at the Mayo Clinic in Rochester, presented an array of complex intracranial aneurysms treated successfully with endovascular approaches.


Santa Barbara Cottage Hospital medical staff also contributed. Dr. Linda Chen of the neurology service reviewed advances in the management of epilepsy. Dr. Stephen Kaminski, the director of the SBCH trauma service and the surgical ICU, discussed controversies in the resuscitation of acutely brain injured patients. As a change of pace, I spoke about the global treatment of spine problems in the USA and tried to make the case that we appear to be spending much more than other countries and without adequate outcome studies to justify this excess. Dr. Alois Zauner closed the meeting with a discussion of his considerable experience treating complex vascular lesions.

In summary, the 2011 Saving the Brain Conference was a great success. This was largely due to the efforts of the SBCH staff's organizational skills, the support of vendors, and the efforts of Drs. Zauner and Delio. We look forward to next year.

*Sincerely,*

**Thomas H. Jones, MD**

Neurosurgeon and Medical Director  
Santa Barbara Neuroscience Institute



“The 2011 Saving the Brain Conference was a great success, largely due to the efforts of the SBCH staff's organizational skills, the support of vendors, and the efforts of Drs. Zauner and Delio.”

## 4 Saving the Brain Symposium

# 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

SPONSORED BY THE Santa Barbara Neuroscience Institute at Cottage Health System, the symposium on September 24 drew leading neuroscientists, neurosurgeons, neurologists, intensivists, emergency department physicians and ancillary staff to Fess Parker's DoubleTree Resort in Santa Barbara to hear presentations about advanced treatments and new research findings.

"Our goal for this event was to provide an atmosphere conducive to learning about the latest advances in technology and products for this vital area of clinical care," says Philip R. Delio, MD, stroke neurologist and medical director of the Stroke Program at Cottage. "We are thrilled to have been able to draw some of the most distinguished speakers in their respective fields. Many have told us they welcome the opportunity to interact during the symposium itself and at the pre-symposium vendor-presenter events."

Leaders in diverse fields of research and clinical work presented on topics as varied as microdialysis, regional stroke network development and neuro-critical care. Attendee feedback consistently mentions the benefit of access to so many noted physicians participating in a weekend program in an intimate venue.

"We have been honored by the response of internationally renowned speakers and scientists to the Saving the Brain Symposium," Dr. Delio says. "This exciting event is a high point of the year for physicians and other medical professionals in the Tri-County area, whether in primary care, emergency care, neurology or neurosurgery."

Visit [www.sbni.org](http://www.sbni.org) for additional information about the 2011 symposium. To be placed on the early bird list for next year, please email Gary Milgram at [gmilgram@sbch.org](mailto:gmilgram@sbch.org).

### FEATURED PRESENTATIONS

The Fourth Annual Saving the Brain Neuroscience Symposium of the Central Coast hosted the following presentations:

- **Vascular Neurosurgery** by Giuseppe Lanzino, MD, Mayo Clinic
- **Minimally Invasive Cranial Surgery** by Marvin Bergsneider, MD, University of California, Los Angeles
- **Neurocritical Care** by Howard Yonas, MD, The University of New Mexico
- **Spinal Surgery** by Thomas Jones, MD, Santa Barbara Cottage Hospital
- **Microdialysis** by Urban Ungerstedt, MD, Karolinska Institute, Sweden
- **ICP Monitoring** by DaiWai Olson, PhD, RN, Duke University Medical Center
- **Development of Regional Stroke Network** by Todd Czartoski, MD, Swedish Neuroscience Institute
- **Neurotrauma** by Stephen Kaminski, MD, Santa Barbara Cottage Hospital
- **Advances in Epilepsy** by Linda Chen, MD, Santa Barbara Cottage Hospital
- **Update in Brain Tumor Surgery** by Jeffrey Weinberg, MD, MD Anderson Cancer Center
- **Stroke** by David Liebeskind, MD, UCLA Stroke Center



Dr. Phil Delio and Dr. Alois Zauner, co-medical directors for this year's conference, are shown with Charleen Strebel, RN, program coordinator.

# Diagnosis and Management of Glioblastoma Multiforme

by Daniel R. Greenwald, MD, oncologist and hematologist, Cancer Center of Santa Barbara

Glioblastoma multiforme (GBM) is the most common primary brain tumor in older adults and one of the most aggressive forms of cancer.

GBM CAN PRESENT with focal neurologic deficits or manifestations such as headache, seizure, loss of limb function or global cognitive impairment such as memory deficit or personality changes. Other diagnostic considerations include stroke, vascular abnormalities, infection or other forms of cancer.

## EPIDEMIOLOGY AND RISK FACTORS

As with many types of cancer, the precise cause of GBM remains unknown in the majority of cases. Described risk factors include age greater than 50 with a slightly increased risk in men compared with women.

Many associations with occupational exposure to chemicals, ionizing radiation and potential viral causes have been studied, although none has been conclusively linked as causal agents. Rare cases of defined familial inherited cancer syndrome arise, indicating multiple family members have inherited a susceptibility to develop one or more forms of cancer.

## DIAGNOSTIC CONSIDERATIONS AND TREATMENT OPTIONS

Neurologic symptoms typically prompt the evaluating physician to obtain a computed tomography scan or brain magnetic resonance imaging. Surgical excision of a revealed mass is required to diagnose the tumor type definitively.

Treatment options have historically consisted of surgical resection followed by radiation therapy with or without simultaneous chemotherapy. Standard cytotoxic chemotherapy can enhance the effect of initial treatment and slow disease progression in some cases, although tumor recurrence is common. The current standard remains surgery, when possible, followed by radiation in combination with an oral chemotherapy.

For patients not healthy enough to undergo surgery, other options may include stereotactic radiosurgery or conventional fractionated radiotherapy. Bevacizumab (Avastin®) infusions have been shown to improve the outcome for recurrent GBM following standard therapy.

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.



Daniel R. Greenwald, MD

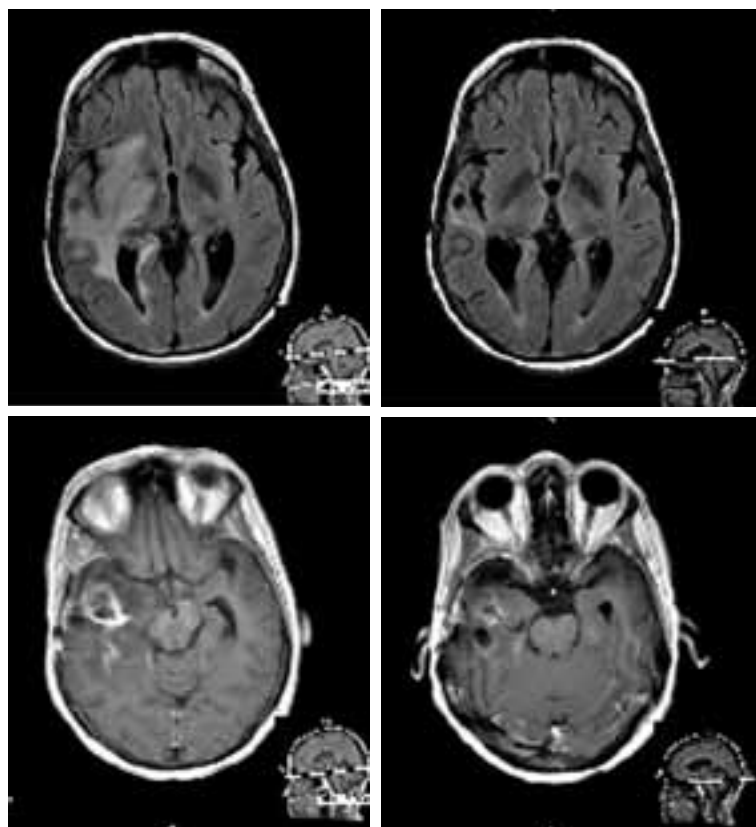


Image of glioblastoma/high grade glioma patient after three treatments with bevacizumab (Avastin) and CPT-11. The image on the left represents her magnetic resonance imaging prior to treatment, and on the right is her more recent study. The image taken after treatment (on the right) demonstrates a reduction in both the tumor size as well as the surrounding vasogenic edema associated with the tumor. The patient's symptoms improved accordingly.



## ONGOING RESEARCH

The Cancer Center of Santa Barbara has participated in glioblastoma tissue banking in support of the gene expression data analysis being conducted by the UCLA Neuro-Oncology Program.

“Genomic analysis helps clinicians and researchers better visualize and understand how gene expression relates to the overall survival of patients diagnosed with brain cancer,” says Daniel R. Greenwald, MD, oncologist and hematologist at Cancer Center of Santa Barbara. “After obtaining patient consent, we contribute for analysis tissue from individuals who are either newly diagnosed or experiencing recurrent primary brain tumors. The great majority of these patients are diagnosed with glioblastoma multiforme.”

The data collected for this genomic analysis research is shared with the scientific community to benefit patients with brain tumors.

## 6 Traumatic Brain Injury

Seeking Answers to Key Questions

# About MTBI



Stephen Kaminski, MD



Scott Thomas Grafton, MD

Neurologists at the Santa Barbara Neuroscience Institute at Cottage Health System are currently enrolling patients in a clinical trial taking place at the University of California, Santa Barbara (UCSB) that may significantly impact the treatment of mild traumatic brain injury (MTBI).

MTBI, OR CONCUSSION, is one of the most prevalent neurologic disorders, occurring most commonly as a result of injuries sustained during athletic competition, car accidents or falls. Individuals with MTBI typically experience a brief loss of consciousness or amnesia and will recover within one week. Approximately one in 10 patients, however, continues to complain of symptoms such as inattentiveness, forgetfulness and cognitive deficits, although bedside testing and conventional magnetic resonance imaging (MRI) results appear normal. Researchers at the UCSB Brain Imaging Center are using high-resolution white matter MRI to uncover a potential biomarker that can guide treatment decisions for such patients.

**“Finding answers to important questions surrounding mild traumatic brain injury—one of the most common disorders neurologists see in patients—will significantly improve patients’ lives by helping physicians better advise them on how to stay safe and when to return to work or play after experiencing the injury. We are pleased to play a part in the important research taking place at the Brain Imaging Center at the University of California, Santa Barbara.”**

—Stephen Kaminski, MD, medical director of trauma services and the surgical intensive care unit at Santa Barbara Cottage Hospital

“The Network Analysis in Mild Traumatic Brain Injury clinical trial involves performing state-of-the-art imaging of the brain’s white matter using diffusion spectrum imaging,” says Scott Thomas Grafton, MD, director of the UCSB Brain Imaging Center. “We want to model the brain in terms of network properties by looking at structure and function.

“Our partners in the physics department at UCSB look at complex systems and model all brain white matter as a large network, allowing us to investigate whether or not anything is wrong with the network as a whole.”

“Functional MRI allows us to see actual disruption of axonal pathways and fiber tracts that may account for the host of neurologic symptoms seen after MTBI,” says Philip R. Delio, MD, stroke neurologist and medical director of the Stroke Program at Cottage. “This type of data could have tremendous implications for how we manage and treat patients with MTBI, answering questions like: ‘When can patients return to work or competitive athletics?’ ‘What kind of symptoms can they expect after injury?’ and ‘How long will their recovery take?’”

### **INSIDE THE CLINICAL TRIAL**

Researchers at UCSB are currently recruiting patients across Santa Barbara County for the Network Analysis in Mild Traumatic Brain Injury clinical trial. Candidates for the trial are

individuals who have experienced a concussion leading to loss of consciousness and amnesia and who have persistent complaints one month after the injury.

Participants are screened by telephone and in person at the UCSB Brain Imaging Center, where they also complete a questionnaire about their head injury. Researchers obtain a blood sample from each patient and send it to a biomedical company, where it is examined for brain proteins present in the blood after most injuries as part of the effort to identify a biomarker. Finally, patients spend approximately one hour in a 3-Tesla MRI scanner. Participants receive feedback if researchers discover anything abnormal on conventional scans.

“We expect to conclude the study in approximately one year,” Dr. Grafton says. “It is a first step toward finding a biomarker for a common and difficult diagnostic problem. Once we find a biomarker, physicians will be able to use it to steer treatment decisions and monitor a patient over time for changes in his or her condition, as well as utilize it in a medical/legal context. The current guidelines for determining when a patient can return to work or competition after MTBI are based on an American Academy of Neurology recommendation that is more than a decade old. The question is: ‘Can we do better?’ We certainly want to, and that’s what we’re focused on.”

*Patients do not need a referral to enroll in the Network Analysis in Mild Traumatic Brain Injury clinical trial at UCSB. To do so, they can call the UCSB Brain Imaging Center at (805) 893-5235 or email [beach@psych.ucsb.edu](mailto:beach@psych.ucsb.edu).*

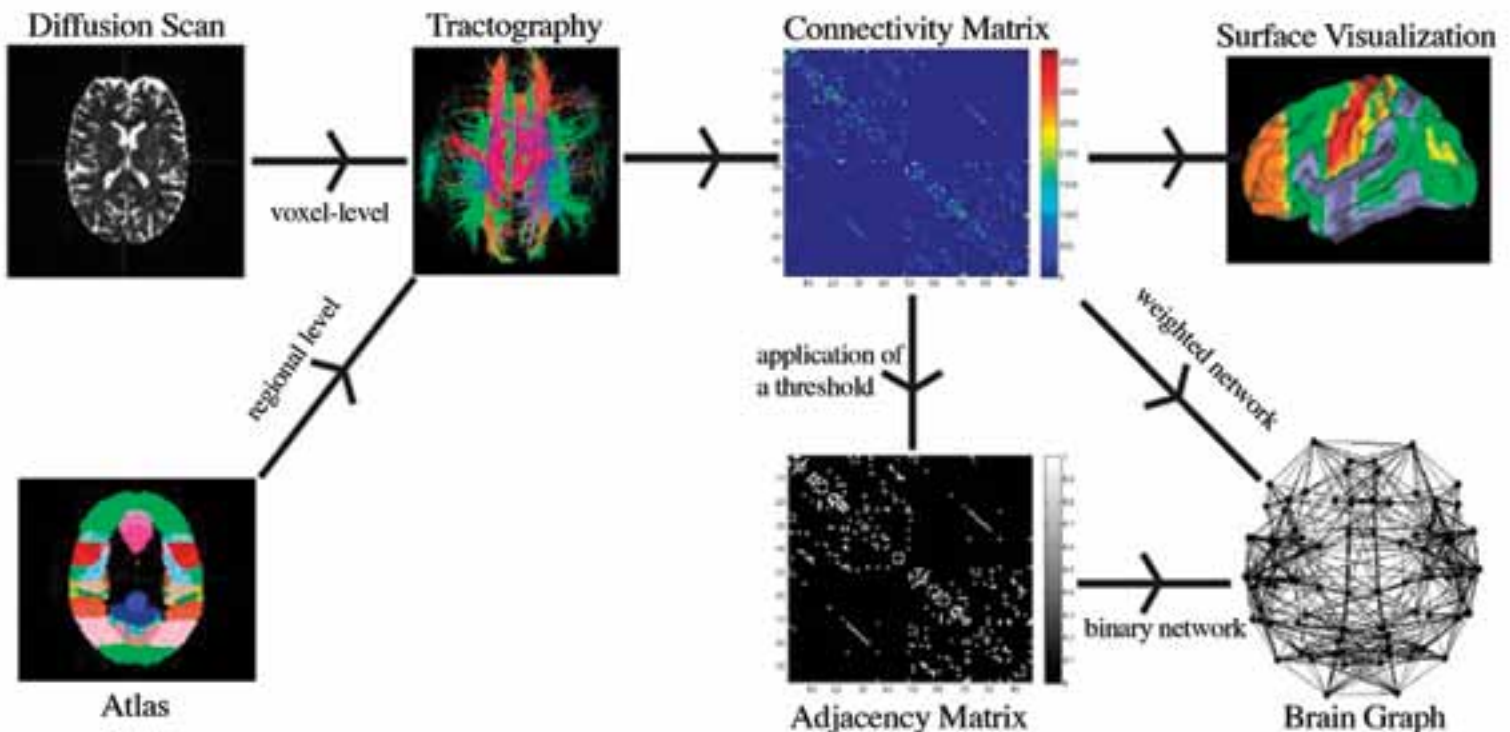
The Centers for Disease Control and Prevention report that as many as 75 percent of all people who experience injury to the brain sustain mild traumatic brain injuries.



### IMPORTANT INQUIRIES

According to Philip R. Delio, MD, stroke neurologist and medical director of the Stroke Program at Cottage, the Network Analysis in Mild Traumatic Brain Injury clinical trial may help fill some gaps in physicians’ knowledge about mild traumatic brain injury (MTBI), answering questions such as:

- Why do some patients have significant residual neurologic deficits after injury, while others with the same injury make rapid and complete recoveries?
- What are the best ways to rehabilitate patients who have deficits?
- Should physicians focus on methods of compensation to teach patients how to accommodate their deficits, or should they try therapies to encourage patients to recover from the deficits?
- Are there ways to predict who will be affected by MTBI, how long symptoms will last and if the symptoms will be permanent?



Data analysis pipeline for converting high-resolution maps of brain diffusion into wiring diagrams of brain connectivity. The imaging research is testing if concussion can lead to the strength of these connections throughout the brain.

# Alzheimer's Disease: The Gray Tsunami



Robert Harbaugh, MD

In the growing epidemic of Alzheimer's Disease (AD) and related disorders, the most salient discussion centers on the increasing costs and societal implications of an aging population. Less noted but more influential in day-to-day care are the behavioral and/or psychological symptoms of dementia (BPSD).

APPROXIMATELY 90 PERCENT of patients affected by AD and related disorders will experience one or more significant BPSD. In 30 percent of those cases, the symptoms will have a significant effect on quality of life for both patients and caregivers. To a large extent, the degenerative disorders are really "social" disorders in that they have a major impact upon the people around them as well as society at large.

The International Psychogeriatric Association classifies symptoms like aggression, agitation, socially inappropriate behaviors, restlessness and verbal outbursts as behavioral components, while anxiety, delusions, depression and hallucinations are cataloged as psychological components. Current research suggests the complex mechanisms behind these aspects of AD and dementia stem from a loss of connectivity in the emotional and information-processing hubs of the brain.

### THE DEMENTIA POINT OF VIEW

BPSD are a complex set of disorders of the mind that arise from longstanding personality traits, co-existent

psychiatric disorders, or more commonly, evolve as a direct result of the devastating direct effects of dementia on the brain. When the causes are understood in that context and coupled with the realization that behavior is a form of communication, it is easier to appreciate why a nursing home patient with AD would express fear when a nurse arrives to perform a morning ritual like a bath. In conceptualizing how the AD patient might view the world, imagine having virtually no short-term memory, so each "new" visit by one's nurse or even spouse is that of a stranger. Aggression and fear are the natural responses when a person interprets the interaction as a stranger trying to take his or her clothes off, as the patient would view the nurse's visit. It would be natural for that patient to express anxiety and feel threatened when the professional home aid or spouse simply tries to bathe the affected person, leading in this case to an exhibition of verbal and physical aggression, which is only "natural" as a self-defensive behavior in the mind of the demented patient. Negotiations and a firm confrontational approach will only exacerbate this

## CASE STUDY: Lewy Body Disease

A 72-year-old, right-handed, white married male presented to his primary care physician's office with a two-year history of "fluctuating" confusion.

The patient describes no family history of neurological diseases. Born, raised and educated in the Midwest, he completed his graduate work in electrical engineering at a prestigious East Coast university and founded a small, successful electronics company. He had enjoyed excellent health throughout his life.

However, his wife noted subtle changes in his personality had begun approximately five years before he presented for examination. One year earlier, after a routine knee arthroscopy, the patient manifested several days of marked confusion and hallucinations. In addition, the patient developed violent dreams at night, during which he would swing his arms at his wife while she slept. The patient became lost on three

occasions while walking to meet friends two blocks from his house. During the recent flu epidemic, the patient became severely "delirious" and had difficulty walking for several weeks after becoming ill. During this time, the patient also developed an unusual tremor of the arms, which had since dissipated. His prior athleticism declined significantly; a top-tier tennis player eight years earlier, he now struggles to return a ball. The patient has turned over his financial affairs to his wife.

### Referral for Neurological Examination

With the exception of mild hypertension and intermittent osteoarthritis of the spine and knees, the patient enjoys excellent physical health. He currently takes only losartan and occasional Advil.

His screening physical exam was essentially unremarkable, except for non-specific changes in gait and some "slowing down" according to

his primary care physician. Routine laboratory studies are unremarkable.

A neurological consultation was pursued and, in addition to the history provided above, the patient admitted to more frequent visual apparitions associated with mild paranoia. In addition, the patient developed severe insomnia, had become very depressed over the past three months and developed severe daytime sleepiness.

The neurological examination demonstrated a moderately depressed 72-year-old male with a mild gait disorder associated with a subtle postural tremor of both arms, left greater than right. Mental status examination suggested visuospatial impairment. A mini-mental status exam was 25/30. The remainder of the exam was essentially unremarkable.

The possibility of a degenerative central nervous system disorder, specifically Lewy Body Disease, was raised by the neurologist. A magnetic resonance imaging (MRI) brain scan and full neuropsychological profile was ordered. The patient was placed upon rivastigmine transdermal (Exelon Patch) and was seen seven weeks later. The MRI brain scan was unremarkable for age. Psychometrics demonstrated mild deficits in several areas including visual and verbal memory, both short- and long-term, as well as substantial impairment in spatial skills.

### Diagnosis and Management

When seen two months later, the patient was “remarkably” better, according to his family, but nocturnal rapid eye movement sleep behavior appeared to worsen. A sleep study was discussed, but instead a therapeutic trial of clonazepam was initiated with excellent results. An in-depth discussion of Lewy Body Disease subsequently followed, and the family was provided with several sources of educational materials, including the Central Coast Alzheimer’s Association.

The patient was able to remain at home for several years with careful medical management. He died of pneumonia at age 78.

potentially explosive situation. This illustrates only one common, daily BPSD challenge, which requires a combination of behavioral and pharmacological approaches to improve all parties’ quality of life.

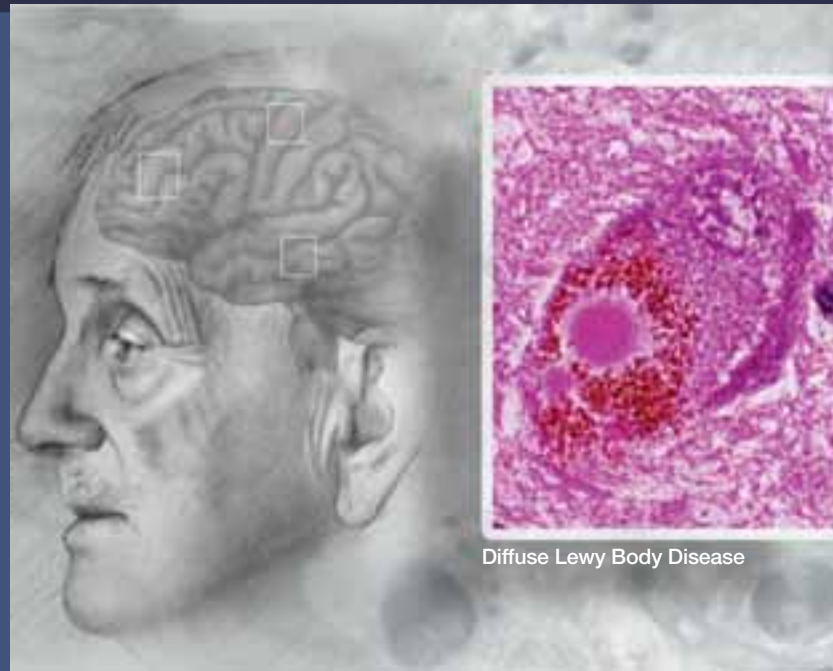
Management of BPSD begins with non-pharmaceutical approaches, wherein caregivers and physicians employ behavioral strategies such as exercise, humorous or calming distractions, and non-verbal reassurances.

### SECURING PATIENT SAFETY

Pharmaceutical management becomes necessary when a patient’s BPSD develops to the point of affecting his or her wellbeing or a caregiver’s quality of life. Treatment is determined according to a prioritization of individual behaviors and carefully titrated.

Specialists at Santa Barbara Neuroscience Institute at Cottage Health System have found a select group of medications effective in symptom management. These medications are prescribed at a low dosage and then gradually titrated to the appropriate dose. When carefully chosen, the right combination of medications, in addition to caregiver education and support from the medical community, can affect great benefits to a patient’s and his or her caregiver’s quality of life.

*To meet to the specialists at Santa Barbara Neuroscience Institute at Cottage Health System, visit [www.sbni.org](http://www.sbni.org).*



Diffuse Lewy Body Disease

“Managing BPSD [behavioral and/or psychological symptoms of dementia] requires creative approaches that focus upon non-pharmacological strategies. However, over the past 15 years, a dramatic and quiet revolution in better medication options has occurred. Although, surprisingly, there are no FDA-approved drugs for BPSD, experienced clinicians can employ a ‘start low, go slow, but don’t stop’ philosophy for most affected patients. Targeting the most problematic BPSD and taking the utmost caution to avoid creating a chemical straightjacket has been a gratifying approach for most families.”

—Robert Harbaugh, MD, neurologist at Santa Barbara Neuroscience Institute

# Endovascular Management of Ischemic Stroke

by Matthew Tenser, MD, neurologist



Knowing your care options in advance for stroke patients is essential in optimizing outcomes. Many acute stroke patients are not candidates for IV tPA. Endovascular stroke therapies should be considered for acute stroke patients who have failed, or are not eligible for IV tPA.

STROKE IS THE leading cause of disability and the third leading cause of death in the United States. Approximately 800,000 people suffer a stroke each year, resulting in over 140,000 deaths. It was estimated that over \$73 billion were spent on stroke-related medical costs and disability in 2010.

The natural history of intracranial large vessel occlusive disease is particularly poor, with morbidity and mortality rates over 90 percent, depending on the affected vessel. Intravenous tissue plasminogen activator (IV tPA), the only widely available FDA-approved treatment for ischemic stroke, has been shown to be efficacious in recanalization of occluded intracranial vessels and improvement of clinical outcome. In 2007, a meta-analysis of more than 50 studies involving 2,000 acute stroke patients revealed an overall recanalization rate of 46 percent with IV fibrinolysis. Studies have shown, however, that the overall frequency of recanalization is lower for large vessel occlusions. Reported rates range from 29 percent to 55 percent in the middle cerebral artery (MCA), 30 percent to 80 percent in the vertebro-basilar (VB) system, and from 6 percent to 14 percent in the internal carotid artery (ICA).

Many acute stroke patients are not candidates for IV tPA, as eligibility is restricted by medical contraindications and stringent exclusion criteria. A narrow time window and inadequate public awareness of stroke symptomatology and urgency further limit the number of patients who may benefit from this therapy.

It is estimated that only 3 percent to 10 percent of those patients eligible for IV tPA actually receive the drug.

Endovascular stroke therapies should be considered for acute stroke patients who have failed, or are not eligible for, IV tPA. Intra-arterial (IA) tPA administration decreases the undesired effects of systemic infusion and allows for direct delivery to the region of maximal clot burden, but is limited to six hours of symptoms or less. Mechanical revascularization establishes vessel patency via clot extraction, providing an alternative treatment for those who are not eligible for, or fail, thrombolytics. The same meta-analysis described above demonstrated a 63 percent overall recanalization rate for IA thrombolysis and an 83 percent revascularization rate for mechanical therapy. Revascularization was significantly associated with good functional outcome, defined as a modified Rankin Score (mRS)  $\leq 2$  (58 percent mRS  $\leq 2$  for recanalized patients versus 25 percent with no recanalization), and lower mortality (14 percent versus 41 percent).

At this time, there are two FDA-approved devices for endovascular treatment of acute ischemic stroke. These are the **Merci Retrieval System**, which uses a corkscrew-shaped device to engage and remove the clot, and the **Penumbra System**, which uses a catheter to aspirate the clot. The Penumbra device is indicated for use in patients with symptoms for eight hours or less. While the Merci retriever was approved for use without a time window, many physicians use eight

hours as the maximum time limit for treatment based on initial mechanical thrombectomy studies.

However, the traditional dogma that eligibility for endovascular stroke therapy should be limited by strict temporal criteria is being challenged. Recent reports suggest that penumbral imaging and perfusion mismatch may supplant time since symptom onset as the principal selection criteria for revascularization, and many stroke centers are using imaging in addition to time of symptom onset to determine eligibility for endovascular treatment.

Several randomized controlled trials (RCT) are ongoing to attempt to clarify the role of endovascular stroke treatment. Two examples are:

- **The MR and Recanalization of Stroke Clots Using Embolectomy (MR RESCUE)** trial is a RCT comparing best medical care versus endovascular therapy for large vessel occlusions with symptoms less than 8 hours, and to determine if diffusion and perfusion MR imaging can identify patients who may benefit from recanalization.
- **The Interventional Management of Stroke (IMS) III** trial is a RCT comparing full dose IV tPA versus a 2/3 dose of IV tPA plus endovascular therapy in patients with large vessel occlusions.

Because so few acute stroke patients are eligible for IV tPA, the information gained from these and future studies is vital. Positive results help expand the treatment window and therapeutic options for a devastating disease.

## CASE STUDY: Stroke Treatment for Acute Large Vessel Occlusion

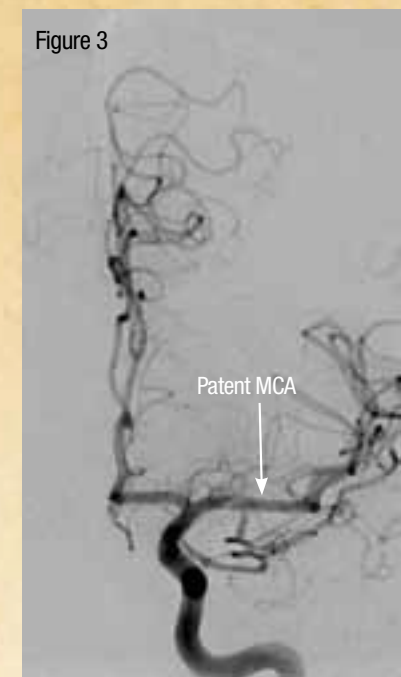
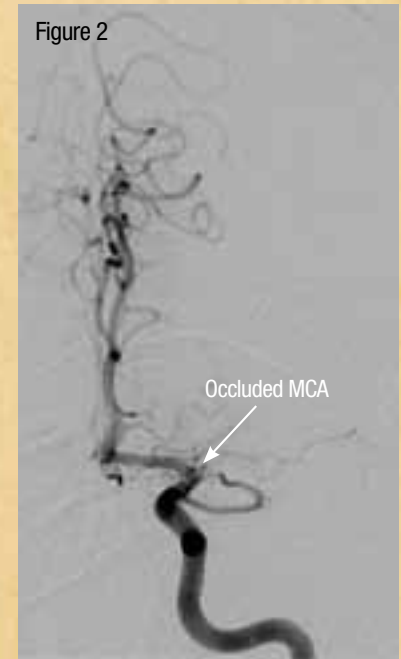
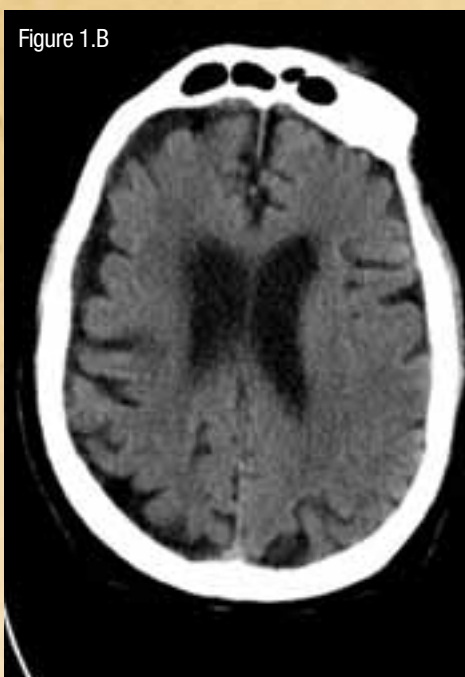
A 72-year-old woman with a history of atrial fibrillation was admitted to the hospital for surgical repair of cervical disc disease. She was taking Coumadin prior to hospitalization, and was treated with therapeutic doses of Lovenox when the Coumadin was held for surgery. She was seen in the intensive care unit (ICU) at 6 p.m. the evening before her planned procedure at her normal, non-focal neurologic baseline.

During a routine nursing check at 7 p.m., she was found to be lethargic with a global aphasia, right homonymous hemianopsia, left gaze preference, and complete loss of strength and sensation on the right. Her NIH Stroke Scale score was 25. A computed tomography (CT) scan of the head and CT angiogram (CTA) of the head and neck were performed (see figures 1A, B).

Once it was determined that the non-contrast head CT did not have any evidence of hemorrhage, the patient was temporarily taken out of the scanner and given IV tPA. After the bolus was given and infusion was started, the patient was returned to the scanner to complete the imaging. Imaging revealed no significant parenchymal changes to suggest a completed infarct. The CTA revealed an occlusion of the proximal M1 segment of the left middle cerebral artery (MCA).

Once the imaging was completed, the patient was re-examined and demonstrated no clinical improvement. Since she had no response to the IV thrombolytics, had no significant changes on CT to suggest completed infarct, and had a large vessel occlusion on the CTA, she was felt to be a candidate for endovascular stroke therapy.

After a discussion of the poor natural history of the lesion, as well as the risks of the procedure, consent was obtained from the family who felt that she would want every possible option of treatment considered.



The patient was taken to the angiography suite, and the procedure began at 8:20 p.m. Initial angiography confirmed the presence of the proximal MCA occlusion and poor collateralization to the left MCA territory (see figure 2).

Based on her arterial anatomy and clot location, the Penumbra System was chosen for recanalization therapy. After only a few minutes of clot aspiration, angiography revealed complete

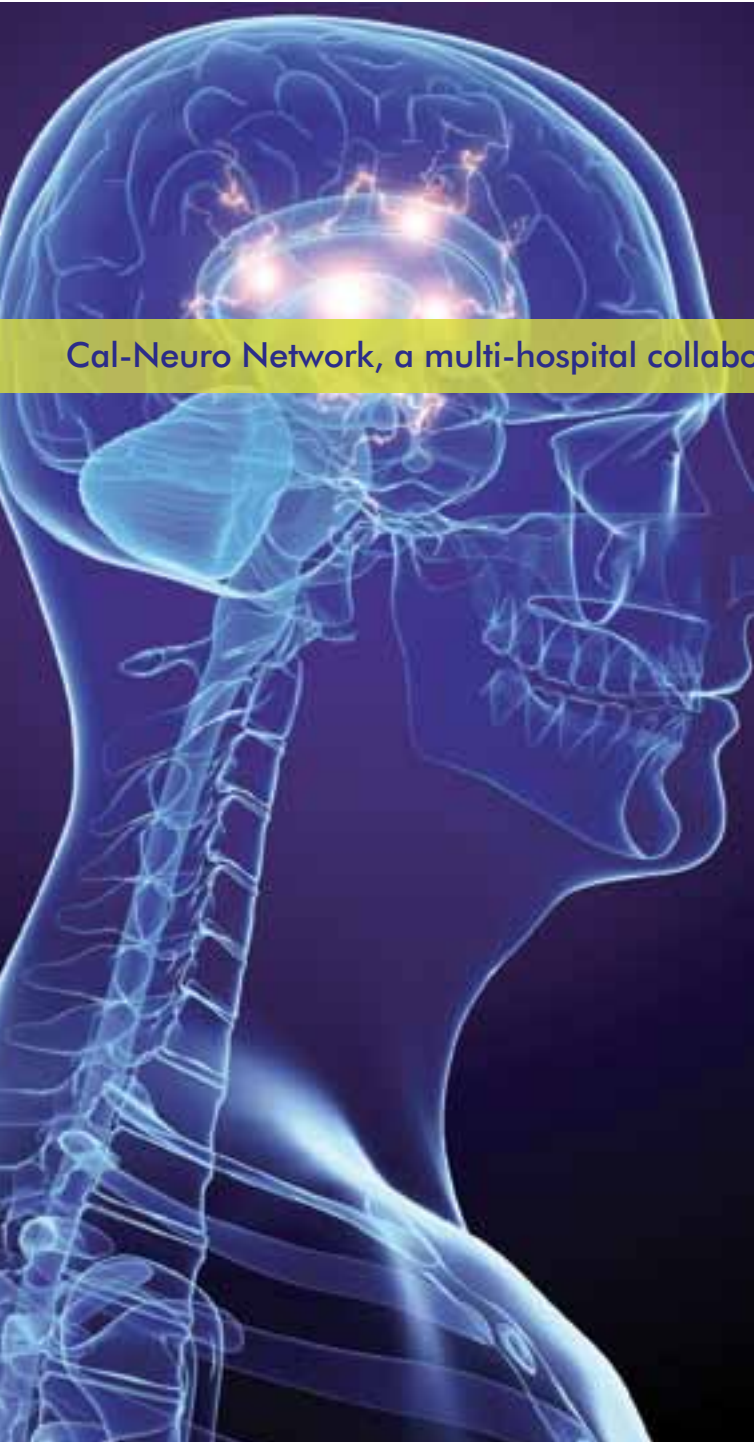
recanalization of the proximal MCA lesion and reperfusion of the distal MCA territory without any distal emboli (see figure 3).

She was returned to the ICU for the remainder of her stroke care. By the next morning, she had only mild word-finding difficulties. She was back to her normal neurologic baseline within two days, and had successful spine surgery one week later.



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# Cal-Neuro NETWORK

Cal-Neuro Network, a multi-hospital collaborative established by Santa Barbara Cottage Hospital

**What is the Cal-Neuro Network?** The Cal-Neuro Network is a multi-hospital collaborative established by Santa Barbara Cottage Hospital (SBCH) for the care and advanced treatment of neurologic emergencies. As a Certified Stroke Center, SBCH has formed this network to offer its resources to patients and physicians in the surrounding communities and beyond.

**Why have a network at all?** While the significant investments in neuroscience technology and human resources are not feasible for all hospitals, every patient should have access to the highest levels of care possible.

**When do I access the network?** It is important to note that the network does not take the place of neuroscience resources in your local hospitals. The network is to be contacted only after consultation with your local on-call neurologist and/or local neurosurgeon.

**How do I learn more?** Please contact Gary Milgram, Service Line Director at [gmilgram@sbch.org](mailto:gmilgram@sbch.org) or call (805) 682-7111 x82008.

## 24-HOUR CONSULTATION

*Ischemic Stroke, ICH, SAH, AVM, brain aneurysm and other neurovascular emergencies*

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**1-888-MY-CAL-NEURO**  
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