NEUROtransmitter

A PUBLICATION OF SANTA BARBARA NEUROSCIENCE INSTITUTE AT COTTAGE HEALTH SYSTEM

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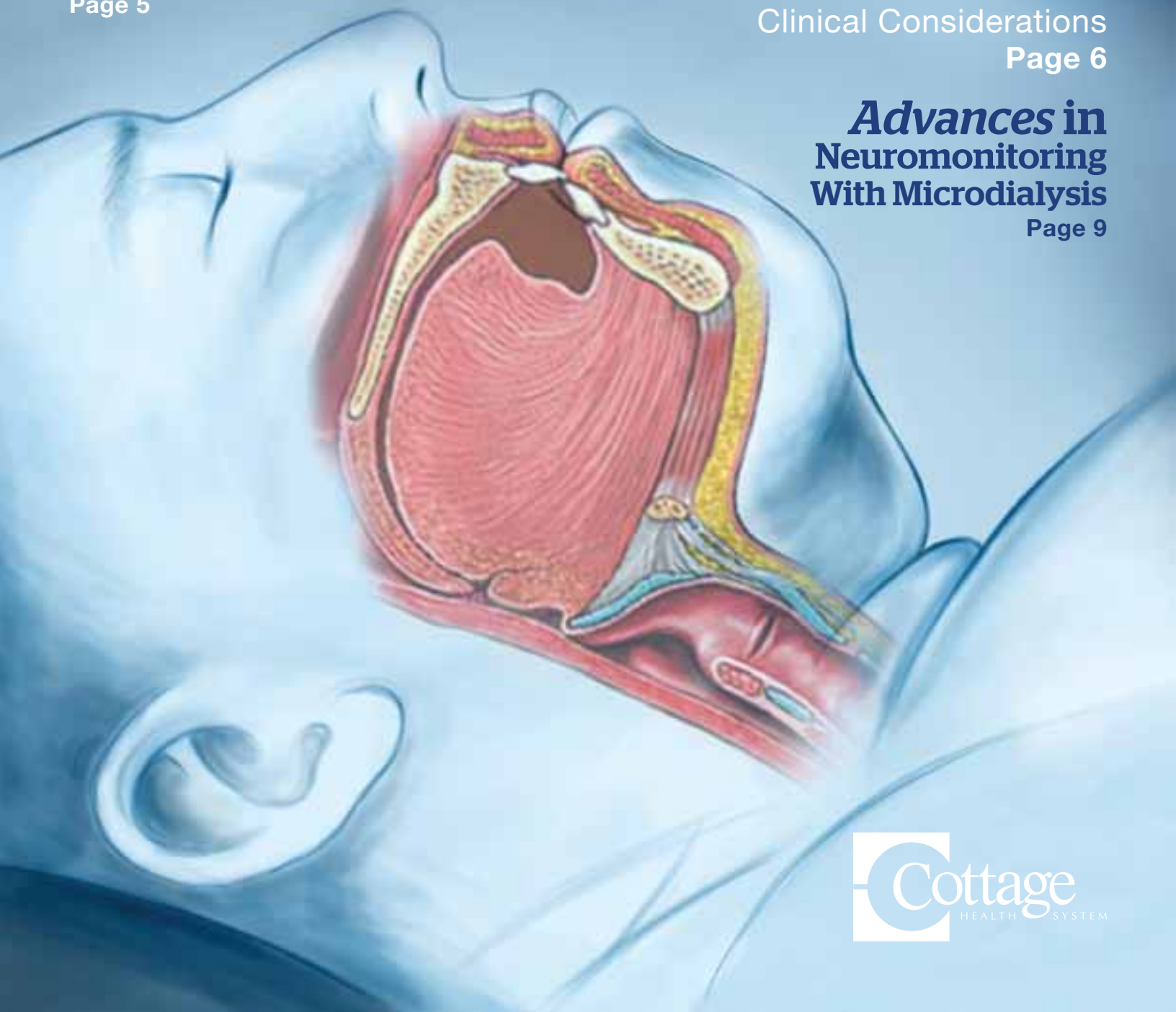

Cottage HEALTH SYSTEM

Case Studies in the Next Issue

- Stroke at tPA—An ED Physician's Perspective
- Stem Cell Research for Macular Degeneration
- Advances in Pediatric Neurology

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Medical Editor, Neurology

Alois Zauner, MD
Medical Editor, Neurosurgery

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Executive Editor

Allan Taylor
Publisher

Candice St. Jacques
Managing Editor

Monika Bliss Morris
Designer

Maria Zate
Advisory Editor

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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: A schematic drawing of an overweight, middle-aged man with obstructive sleep apnea syndrome depicting an obstructive apneic event during sleep with upper airway obstruction at the palate and base-of-tongue level. Illustrated by Joshua Emerson.

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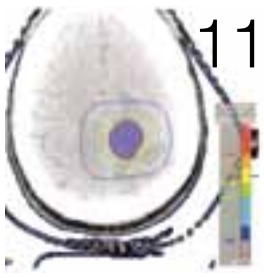


> “I believe that we have passed the inflection point and should abandon the disjointed, largely heuristic medical model of the 19th century.”

Dear Colleagues,

As Atul Gawande, a general surgeon and bestselling author, stated in his recent book *The Checklist Manifesto*, “medicine has become the art of managing extreme complexity.” To date, we seem to be struggling with that task.

A study of the Harvard Vanguard clinic’s medical records, over the course of a year, discovered that their physicians, on average, dealt with 250 different primary diseases/conditions and these same physicians’ patients had more than 900 other active medical problems that had to be factored into their care algorithms. These physicians prescribed 300 different medications. They ordered over a hundred different laboratory tests and performed more than forty types of procedures. In addition, the study points out that existing EMR software programs haven’t evolved quickly enough to keep up with the, almost exponentially, growing diagnostic categories. Consequently, one of the most common daily diagnoses was “Other.” The ICD-9 Book currently lists 13,600 diagnoses. To underscore the level of complexity of care in the ICU setting, Dr. Gawande refers to a 15-year-old Israeli study that discovered that the average ICU patient required 178 nurse and/or physician actions per day. He reminds us that there was only a 1 percent error in these activities. However, this still amounted to 2 errors per patient per day. Studies show that half of ICU patients experience a serious, often life-threatening, complication. Surgical outcomes seem even more alarming. Of the 50 million operations performed in America annually, the death rate approaches 150,000 per year. This is three times the death rate on our roads! The literature suggests that at least half of these peri-operative deaths and major complications could be avoided.

In summary, it appears clear that the quality of our care, its growing complexity and cost are all inextricably linked. I believe that we have passed the inflection point and should abandon the disjointed, largely heuristic medical model of the 19th century. Dr. Gawande refers to this as our entering the B-17 phase of medicine. He summarized this beautifully in “The Velluvial Matrix,” his recent address to the graduating class of Stanford Medical School (posted June 16, 2010, at www.newyorker.com/online/blogs/newsdesk): “Great medicine requires the innovation of entire packages of care—with medicines and technologies and clinicians designed to fit together seamlessly, monitored carefully, adjusted perpetually, and shown to produce better service and results for people at the lowest cost for society.”

Sincerely,

Thomas H. Jones, MD
Neurosurgeon and Medical Director
Santa Barbara Neuroscience Institute

Sybile Wilkins, EMT-P of Reach Air Medical Services

In-Flight Stroke Care

Working in conjunction with air ambulance services, the Santa Barbara Neuroscience Institute at Cottage Health System has expanded the geographic range for advanced stroke care.

> "It is a great resource for everyone to have such highly skilled air medical transportation available for acute emergencies. In many cases, air transport can cut travel time in half. The teams working in the air are an extension of the neuro critical care services we provide here at Cottage. When time is brain, this can mean the difference between life and death."
>
> —Alois Zauner, MD, Neurosurgeon

RAPID RESPONSE IS CRUCIAL for effective stroke treatment, as the sudden loss of circulation to the brain brings associated loss of neurologic function. Because fewer than 25 percent of Americans live close enough to a stroke center to reach help within 30 minutes of the onset of stroke symptoms, introducing air ambulance services significantly improves outcomes. In western states, the use of helicopter emergency medical services (EMS) increases the number of patients able to reach a stroke center within an hour from 51 to 81 percent.

Working with air transport companies, Santa Barbara Cottage Hospital utilizes helicopter EMS services to transport patients over great distances quickly, under severe time constraints. The on-board nurses and medical staff have access to advanced emergency response technology.

Flight nurses Adam Pettit and Collin Goetz care for a critically ill patient while en route to Santa Barbara Cottage Hospital. The helicopter is set up as an intensive care unit in the sky, capable of the most complex procedures and their associated care.

"We equip our air ambulances with technology usually found in an intensive care unit," explains Lisa Abeloe, RN, chief flight nurse for CalStar Air Ambulance service. "Our team includes two critical care registered nurses trained specifically to work in the helicopter setting. These measures help ensure that the patients we transport have the most focused care possible in flight."

CONTINUUM OF CARE

Response teams on the flight and in emergency services at Cottage work together to smooth the transition and ensure the success of each patient transport.

"The protocols we use in the air have all been reviewed and approved by Cottage physicians," says Robert Frick, general manager of Reach Air Medical Services. "Working collaboratively to identify best practices in transport makes the transition from the air to the facility much more seamless—we can complete transitions without missing a beat."

Cottage is notified as soon as a chopper is in the air, allowing physicians and staff members to mobilize and prepare for the incoming patient. Following evaluation, each step of a patient's care is analyzed to consider ways to improve and expedite care.

Santa Barbara Cottage Hospital is the only hospital on the Central Coast to be certified by The Joint Commission as a Primary Stroke Center. To learn more, visit www.sbni.org.

Innovations
in the Treatment of Brain Metastases

George Cheng, MD, PhD, Radiation Oncologist

Treatment for brain metastases was once limited to whole-brain radiotherapy. With new options like the Novalis® Tx™ stereotactic radiosurgery available at Cancer Center of Santa Barbara, physicians can now achieve better outcomes—which is excellent news for the estimated 170,000 Americans diagnosed with brain metastases every year.

ACCORDING TO George Cheng, MD, PhD, radiation oncologist with Cancer Center of Santa Barbara, approximately 20 to 40 percent of patients with cancer will develop brain metastases. Although brain metastases most commonly develop from lung cancer, they also can originate from melanomas or tumor sites in the breasts, kidneys or colon.

"Brain metastases are the most common intracranial tumors in adults, with a ten-fold higher incidence than primary brain tumors," says Dr. Cheng. "However, the condition may become less common as the efficacy of systemic therapies improves."

When brain metastases are detected, patients without a previous cancer diagnosis may require a biopsy of the brain lesion to rule out other malignant and non-malignant etiologies. A treatment plan will be tailored to meet each patient's individual needs based on factors that can include age; overall health and performance; the extent of systemic disease; and the number, size and location of the tumors.

"For patients diagnosed with brain metastases, a referral to a specialized facility such as the Cancer Center of Santa Barbara should be considered to utilize the latest diagnostic and therapeutic technologies and expertise in medical oncology, neurosurgery and radiation oncology," says Dr. Cheng. "Because the selection of treatment strategy can be multifactorial, a multi-disciplinary approach is important."

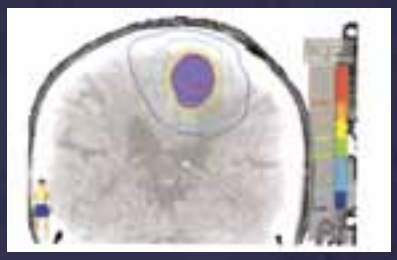
ADVANCED TREATMENT OPTIONS

For the majority of patients with brain metastases, radiotherapy in some form is a large part of effective treatment.

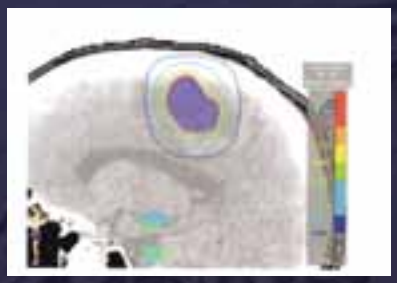
"In a case of single metastasis, the treatment plan may include surgical resection followed by whole-brain radiotherapy—or whole-brain radiotherapy followed by radiosurgery to the individual lesions to 'boost' tumor control," says Dr. Cheng. "Alternatively, stereotactic radiosurgery alone may be recommended when the risk of occult intracranial metastases is relatively low. The Novalis Tx system can sculpt the radiation dose to conform tightly to the shape of the tumor volume and avoid neighboring brain tissue and other critical structures. For patients with two to three metastases, whole-brain radiotherapy is usually followed by consideration of radiosurgical boost. Patients with more than two to three metastases are typically treated with whole-brain radiotherapy alone."

For some patients, systemic therapy such as chemotherapy may be required due to concurrent extracranial disease progression.

For more information about Cancer Center of Santa Barbara or to refer a patient, call (805) 682-7300. To learn more about our services, visit www.ccsb.org or www.sbni.org.



A coronal view of a computer-generated treatment plan shows the radiotherapeutic dose distribution for radiosurgical treatment of a patient with a left parietal brain metastasis. The high dose region conforms tightly to the tumor volume (purple).

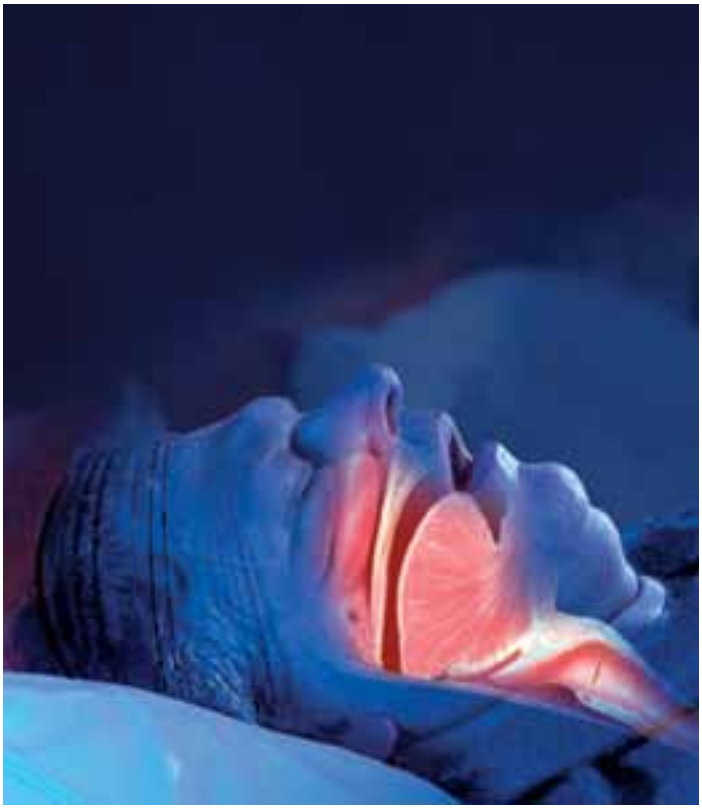


This sagittal view of the plan shows the tightly conformal radiation dose distribution around the tumor.

This is an axial view of the computed radiation dose distribution for this plan.

Stereotactic radiosurgery benefits patients diagnosed with brain metastases by delivering highly targeted and controlled doses of radiation. The Novalis® Tx™ is a platform for frameless, non-invasive, image-guided radiosurgery using a linear accelerator that rotates around the patient for optimal positioning. This technology can be used to destroy sensitively situated tumors that typically cannot be addressed by conventional surgery.

Clinical Considerations FOR Obstructive Sleep Apnea Syndrome



Charles J. Curatalo, MD

Usually associated with a drop in blood oxygen saturation, obstructive sleep apnea syndrome (OSAS) reduces the quality of sleep, causes daytime tiredness and has other potential medical consequences.

by Charles J. Curatalo, MD, neurologist, neurophysiologist and sleep medicine specialist at Santa Barbara Neuroscience Institute at Cottage Health System

Most people with obstructive sleep apnea syndrome (OSAS) are not aware of the disorder and primary care physicians cannot detect it during a routine office visit. If OSAS is suspected, a primary care physician should ask the patient—and family member or bed partner, if available—the following questions:

- **Do you snore?**
- **Do you feel rested and refreshed in the morning after a full night's sleep?**
- **Do you ever fall asleep during the day while reading, watching television, working or driving?**

If affirmative answers are given to any of these questions, consider further evaluation for a possible underlying sleep disorder.

AN ESTIMATED 12 million Americans suffer from OSAS, a sleep disorder caused by the repetitive partial or complete collapse of the upper airway during sleep, resulting in a physical block to airflow despite respiratory effort. OSAS is most common in middle-aged, overweight males; women are more likely to develop OSAS after menopause. Risk factors include excess weight, large neck circumference (more than 17 inches in men or 16 inches in women), advancing age, nasopharyngeal abnormalities that reduce the caliber of the upper airway, use of alcohol or sedatives, cigarette smoking, and certain underlying medical conditions such as hypothyroidism or acromegaly.

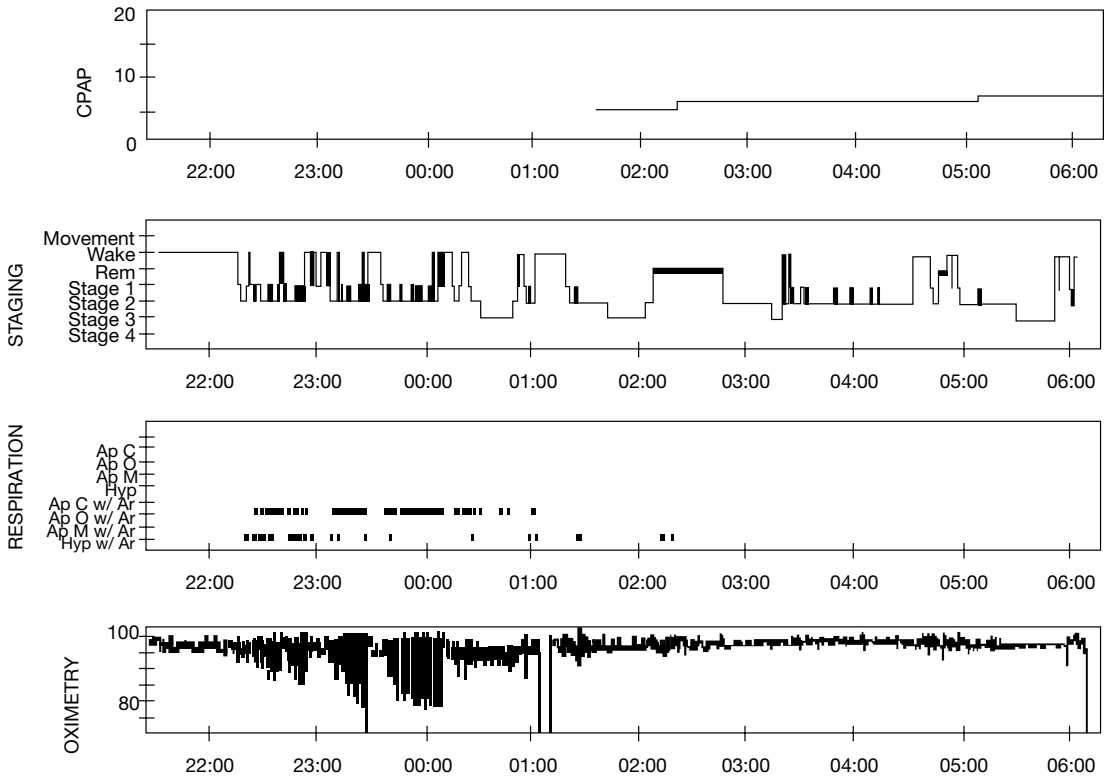
SIGNS AND SYMPTOMS OF OSAS

Indications of OSAS can include loud snoring, excessive daytime sleepiness, witnessed breathing pauses during sleep, nocturia or enuresis, morning headaches, dry mouth or sore throat upon waking, sleep fragmentation, sudden arousals from sleep with a feeling of choking or gasping, sexual dysfunction and poor concentration. Reduced work performance, depression, anxiety or irritability may also be reported.

Untreated OSAS has been associated with hypertension, heart failure, myocardial infarction, atrial fibrillation, sudden cardiac death, stroke, work-related or driving accidents, diabetes, glaucoma, headaches and difficulty controlling epileptic seizures. In one study, severe OSAS—indicated by more than 30 breathing pauses per hour—raised risk of premature death from all causes by 46 percent.

A sleep study conducted by a sleep lab is typically required for accurate diagnosis of OSAS. Modern, fully-equipped sleep labs are available at Santa Barbara Sleep Clinic in Goleta and SleepMed of Santa Barbara, located adjacent to Santa Barbara Cottage Hospital. Board-certified physician sleep specialists

Sleep is divided into two types: rapid eye movement (REM) and non-rapid eye movement (NREM). The American Academy of Sleep Medicine further divides NREM into three distinct stages: N1, N2 and N3. Deep sleep occurs in stage N3.



The patient's sleep study hypnogram demonstrates the elimination of apneic events and oxygen desaturations with some REM sleep rebound following initiation of CPAP at 1:30 am.

supervise and interpret the studies, while certified respiratory technicians perform the studies, set up treatment, monitor patients and coordinate follow-up care.

TREATMENT OPTIONS

Weight loss for overweight patients can potentially be curative and is strongly recommended. For some, not sleeping in the supine position, using a positional sleeping device, and avoiding alcohol and sedatives in the evening can be beneficial. Use of dental appliances—which pull the tongue or mandible forward to open the upper airway during sleep—can be helpful for some.

The most effective treatment for moderate to severe OSAS is continuous positive airway pressure (CPAP) treatment using a nasal mask that applies a positive pressure "splint" to the upper airway to allow normal breathing during sleep. Modern CPAP machines are small, quiet and convenient for travel. Various mask arrangements are available for improved patient comfort. Follow-up contact with a respiratory therapist and sleep specialist to ensure proper mask fit and equipment operation significantly improves long-term compliance and treatment effectiveness.

Surgical treatment for OSAS is sometimes an option and can be curative. Various procedures are used, depending on the specific clinical circumstances. In children or adolescents with OSAS and adenotonsillar hypertrophy, surgery is the treatment of choice.

Patients with significant sleep apnea report feeling dramatically better very quickly after utilizing CPAP or another effective treatment. Outcomes include much-improved sleep quality, better daytime functioning and reduced risk of medical consequences.

For more information, visit www.sbni.org.

CASE STUDY: OBSTRUCTIVE SLEEP APNEA SYNDROME

A 60-year-old male with a history of hypertension, gastroesophageal reflux disease (GERD) and paroxysmal atrial fibrillation was referred by his cardiologist for a sleep study. The patient was overweight and had gained 20 pounds in the preceding three years. Symptoms included witnessed apneic events, nocturia, dry mouth and not feeling rested in the morning, even after eight or nine hours of sleep. Physical examination revealed a low-hanging palate, long uvula and narrow oropharyngeal aperture.

ALL-NIGHT SLEEP STUDY RESULTS

An in-lab, technician-attended polysomnogram showed reduced sleep efficiency of 70 percent at baseline. Loud snoring, no REM sleep and reduced non-REM deep sleep (stage N3) were achieved. Severe obstructive sleep apnea syndrome (OSAS) was documented with a respiratory disturbance index (RDI) of 80 apneas/hour supine and 33/hour on his side. The longest apneic event was 44 seconds in duration, the lowest oxygen saturation was 77 percent, and occasional bradytachyarrhythmia was noted in association with apneic events.

After three hours of sleep, a continuous positive airway pressure (CPAP) titration was performed with a nasal mask and heated humidifier. With CPAP at an optimum pressure of 8cm H_2O, sleep efficiency improved to 89 percent, snoring and all apneic events were eliminated, and sleep architecture showed a rebound in REM and stage N3 sleep. The patient reported feeling more rested and alert in the morning after 4.25 hours of CPAP use.

CPAP TREATMENT RESULTS

The patient reports continued excellent clinical benefit after using CPAP treatment at home for 18 months. In addition to more restful, less fragmented sleep, nocturia episodes were reduced to one or none per night, daytime sleepiness and snoring were eliminated, and he has experienced no further episodes of atrial fibrillation.

Kenneth S. Kosik, MD
Co-Director, Neuroscience Research Institute,
University of California, Santa Barbara

THE NATION'S FIRST "Cognitive Shop" Right Here in Santa Barbara

The Center for Cognitive Fitness & Innovative Therapies (CFIT)

by Kenneth S. Kosik, MD, founder and executive director of the Center for Cognitive Fitness & Innovative Therapies

NOT VERY LONG AGO, the loss of intellectual function associated with aging was largely regarded as one's inevitable fate, something we labeled "senility." Over the past two decades, our understanding of age-related intellectual decline has significantly deepened. The elegance of scientific discoveries and the fascination with the human brain must be tempered with the fact that we still lack treatments for neurodegenerative disease. It is instructive to look across the medical landscape to the 1960s, when we opened a "War on Cancer." Millions of dollars were spent with little to show because the tools of molecular biology, necessary for a truly in-depth understanding, were not in place. As we entered the molecular and genomic eras, we could see the flaw in those early approaches to cancer. It was as if a cure for cancer would cure all cancers because it was one disease. Wrong. Instead, we have chipped away at the specific vulnerabilities of each tumor type and little by little we are learning about each type of cancer.

Similarly, intellectual decline and memory loss among elders is not a single entity. Much of dementia is lumped into the category of Alzheimer's disease, but we are realizing that other diseases account for a portion of all dementia cases. We are increasingly realizing that the inherited risk for Alzheimer's disease stems from a diverse collection of genetic polymorphisms. And importantly, pure Alzheimer's disease is probably less common than mixed dementia, a condition in which Alzheimer pathology co-exists with vascular pathology. Measurements of the hallmark proteins in the senile plaques and the neurofibrillary tangles in patient's cerebrospinal fluid, and even in blood, are making diagnosis more precise and making pre-symptomatic detection possible.

Armed with more information and predictive data about our risk for neurodegenerative disease, we face the question "What can we do right now, before pharmacological treatments arrive?" For this reason, we are pleased to introduce the Center for Cognitive Fitness & Innovative Therapies (CFIT)—the first "brain shop" in the nation—where we assess risk for cognitive decline and implement all known measures to reduce risk with an integrated team of experts in both the medical and lifestyle fields in an outpatient nonprofit clinic located on the grounds of Cottage Rehabilitation Hospital. Each client at CFIT is given a comprehensive assessment and then a personalized program to help address that person's unique risks. If your patient has primary complaints of memory loss or family members with dementia, we can help. At our genesis, we have had the fortunate opportunity to work closely with Santa Barbara Neuroscience Institute at Cottage Health System and Santa Barbara Cottage Hospital as well as with the University of California, Santa Barbara, to build a lasting community-based program with national reach.

For more information, call (805) 899-7777, visit www.sbcfit.org or e-mail info@sbcfit.org. The address for the Center for Cognitive Fitness & Innovative Therapies is 2409 De La Vina, Santa Barbara, CA 93105

Microdialysis in the Neurointensive Care Unit:

Neurochemical Monitoring in the Severely Injured Brain.

Microdialysis in the neurointensive care unit reveals markers of cerebral ischemia and cell damage. After traumatic brain injury (TBI), microdialysis detects early signs of metabolic crisis and ischemia before intracranial pressure rises. After subarachnoid hemorrhage (SAH), a microdialysis catheter in the at-risk brain tissue detects vasospasm hours before clinical signs emerge.

MICRODIALYSIS ALLOWS CONTINUOUS sampling of the interstitial fluid chemistry of brain tissue. The process uses a microdialysis catheter with a 10mm dialysis membrane at the distal end that functions like a capillary. The catheter takes up substances delivered by the blood (glucose) or released from cells (markers of cerebral metabolism). These chemical substances from the interstitial fluid diffuse—at the human brain's perfusion flow rate of 0.3µl/min—across the membrane into the fluid inside the catheter.

The following parameters are monitored in patients after TBI, SAH and selected strokes:

Lactate/Pyruvate ratio: An increase in this marker represents metabolic crisis and energy failure.

Glycerol: Cell membrane breakdown and influx of calcium liberates glycerol into interstitial fluid.

Brain glucose: Measuring brain glucose assists in managing blood glucose as brain hypoglycemia leads to secondary brain injury while in the ICU.

Glutamate: An increase represents cell damage due to opening of neuronal calcium channels.

Microdialysis measures these extracellular substances to continuously gauge the biochemistry of neurons and glia and to determine how seriously brain cells are impaired after ischemia, hyperemia, trauma or hemorrhage. This data and analysis may predict outcome in SAH, TBI and stroke patients and can serve as one of the tools used to individualize patient management in the neurointensive care unit.

In the future, clinical microdialysis may be utilized to deliver drugs or substances to the brain, as well as to continuously analyze neurotransmitters, cytokines and small proteins.

"Microdialysis allows us to examine changes on a cellular and metabolic level after ischemia in a safe and effective manner," says Alois Zauner, MD, general and cerebrovascular neurosurgeon and neuroendovascular and neurointerventional surgeon on the medical staff of Santa Barbara Neuroscience Institute at Cottage Health System. "It also advances indications of increasing intracranial pressure by about 48 hours and allows us to better titrate treatments for patients."

CAPTURING DATA FOR EVALUATION AND TREATMENT

To optimally employ microdialysis, physicians at Santa Barbara Neuroscience Institute at Cottage Health System work with a highly specialized nursing staff to provide continuous bedside monitoring and manage microdialysis equipment.

Microdialysis requires the evaluation of multimodal data with varying ranges for pathology, combined with storing data on an advanced IT system.

> "While this type of technology is still in its infancy in humans, it does show promise in treatment and outcome. Our goal within Santa Barbara Neuroscience Institute is to judiciously apply new technologies and to valuate their cost and benefit in terms of outcome."
>
> —Thomas H. Jones, medical director, Santa Barbara Neuroscience Institute at Cottage Health System

THE LEADING EDGE OF CARE FOR TBI AND SAH

Santa Barbara Neuroscience Institute at Cottage Health System is one of 15 institutions in the United States driving clinical aspects of microdialysis for patients after severe traumatic brain injury and subarachnoid hemorrhage or stroke. Intracerebral microdialysis complements other techniques of neuromonitoring that include measurements of brain tissue oxygen tension. Neurointerventions at Santa Barbara Cottage Hospital are part of an international effort to create an electronic database to further research by pooling information about patients with these diseases and conditions and sharing information regarding the effectiveness of diagnoses and treatment utilizing various neuromonitoring systems.

"With microdialysis, we are able detect changes that indicate cerebral ischemia and hypoxia, which are responsible for secondary brain damage," says Alois Zauner, MD, general and cerebrovascular neurosurgeon and neuroendovascular and neurointerventional surgeon on the medical staff at Cottage. "One recent study, for example, associated elevated cerebral glutamate and lactate concentrations with cerebral hypoxia in patients with severe head trauma who were on hyperventilation therapy. We are working toward using this technology to optimize treatment."

Phil Delio, MD,
Stroke Neurologist
Co-Medical Director for the event

Dr. Alois Zauner,
Co-Medical Director for the event

DON'T MISS NEXT YEAR'S CONFERENCE!
E-mail Gary Milgram at gmilgram@sbch.org to be put on the early bird information list, and you will qualify for a tuition discount to the 2011 conference for next year's event.

From left: Guest lecturers Professor Frank Doyle III, Dr. Erkki Ruoslahti, and Dr. Susan Chang with Mr. Ron Werft, President and CEO of Cottage Health System

The 2010 Symposium: Successful and Stimulating

Santa Barbara Cottage Hospital recently hosted its Third Annual Saving the Brain Neuroscience Symposium of the Central Coast. This year's event featured leading neuroscientists, neurosurgeons and neurologists from around the country, giving presentations on advanced treatments and new research findings.

THE THIRD ANNUAL Saving the Brain Symposium, which focused on neurovascular disorders, was held October 2 at a first-class venue, The Fess Parker's DoubleTree Resort in Santa Barbara.

"The goal of the symposium was to present the latest information and research about stroke, neuro-oncology, neurovascular disease and various other neurologic topics," says Phil Delio, MD, stroke neurologist and medical director of the Stroke Program at Cottage. "Each year we change the topics and format to keep participants interested and ensure we present the most recent data. We've been fortunate to be able to draw some of the most distinguished speakers in their respective fields to a relatively intimate setting here in Santa Barbara where participants and attendees can interact with one another."

Leaders in diverse fields of research and clinical work presented on topics as varied as rapid triage and treatment of acute stroke patients in Los Angeles County, neurotrauma and the use of nanotechnology in brain tumor treatment. Many attendees commented on the rarity of so many noted physicians participating in one weekend program outside of a large, international conference.

"The Saving the Brain Symposium provides a rare opportunity to hear some of the best speakers and scientists in the country talk about neuroscience, right in our own backyard in beautiful downtown Santa Barbara," Dr. Delio says. "Whether you're a primary care physician, neurologist, surgeon or nurse, the topics are of interest. I'm already looking forward to next year's event."

Visit www.sbni.org for more information about the 2010 symposium.

FEATURED PRESENTATIONS

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

- Neuroscience Update by Alois Zauner, MD, Santa Barbara Cottage Hospital
- Vascular Neurosurgery by Fady Charbel, MD, University of Illinois at Chicago
- Neurotrauma by Mathieu Laroche, MD, University of California San Francisco
- Neurocritical Care by Chad Miller, MD, Cedars-Sinai Medical Center
- Intracranial Tumors by Susan Chang, MD, University of California, San Francisco
- Neuroscience Research by Frank Doyle III, PhD, University of California, Santa Barbara
- Neuroscience Research by Erkki Ruoslahti, MD, PhD, University of California, Santa Barbara
- Neuroscience Research by Ryszard Pluta, MD, PhD, *Journal of American Medical Association*—Chicago
- Stroke Update by Jeffrey Saver, MD, UCLA Medical Center
- Heart Disease and Stroke by Joseph Aragon, MD, Santa Barbara Cottage Hospital
- Neuroscience Nursing by Linda Littlejohns, MSN, RN, ACNP

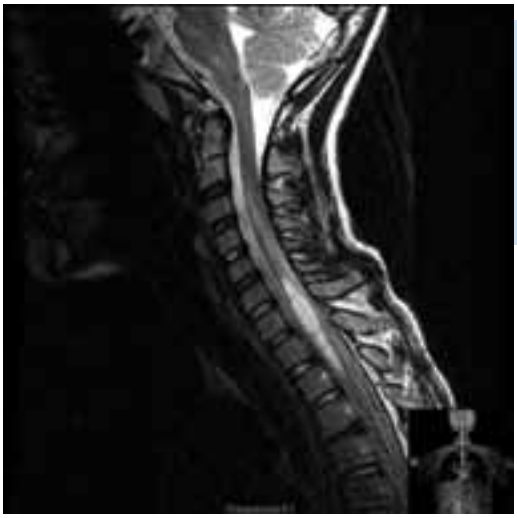
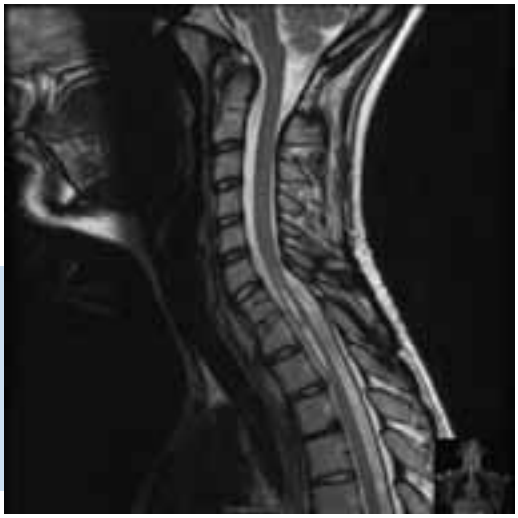


Figure 1A: Shows a distended cervicothoracic level syrinx, which was causing quadriparesis.

Figure 1B: Shows a collapsed syrinx following a surgical shunt. The patient recovered all neurologic function.



Surgical and Non-Surgical **Options for Syringomyelia**

E. Scott Conner, MD, Neurosurgeon

Syringomyelia—the development of elongated, fluid-filled cysts, or syrinxes, within the spinal cord—can arise from several causes, including Arnold-Chiari malformation. While surgery is the generally recommended treatment for syringomyelia, not all patients with the disorder require an operation.

AS A SYRINX lengthens and expands over time, it destroys the center of the spinal cord, causing pain, weakness and stiffness in the back, shoulders, arms or legs. Not all syrinxes, however, are symptomatic.

"Sometimes we see very small, asymptomatic syrinxes that don't increase over time," says E. Scott Conner, MD, neurosurgeon at the Santa Barbara Neurosciences Institute at Cottage Health System. "Syrinxes can also be chronic but asymptomatic."

While most cases of syringomyelia are due to Arnold-Chiari malformation (discussed in the last issue of *NEUROtransmitter*)—brain tissue protruding into the spinal canal—the disorder can also result from a severe spinal injury or arachnoiditis. Type II Arnold-Chiari malformation can cause a congenital form of syringomyelia in patients with spina bifida.

EVALUATION AND SURGICAL CONSIDERATIONS

The use of magnetic resonance imaging (MRI) in recent years has allowed neurosurgeons to diagnose more cases of syringomyelia in its earlier stages than in the past.

"If a syrinx is progressing and displaying symptoms, it will only get worse," Dr. Conner says. "Not all syrinxes progress in a predictable way, and some aren't debilitating enough to necessitate surgery. Individuals for whom surgery is the best option, however, generally respond well to it."

When syringomyelia is due to Arnold-Chiari malformation, an operation can be performed on the back of the skull and upper cervical spine to remove some bone and place a graft to make space for more fluid to move up and down the spine. Syringomyelia resulting from a traumatic injury or arachnoiditis can be treated by placing a shunt in the spinal cord cyst to accommodate the passage of fluid from within the cord or removing focal scar or other subarachnoid obstructions preventing the free flow of spinal fluid around the spinal cord.

The biggest recent advance in the diagnosis and treatment of syringomyelia has been the use of magnetic resonance imaging (MRI) to detect the disorder. According to E. Scott Conner, MD, neurosurgeon at Santa Barbara Neuroscience Institute at Cottage Health System, MRI has greatly improved diagnosticians' ability to confidently identify a diagnosis of Arnold-Chiari malformation.

"Not all treatments are 100 percent effective, but a patient's symptoms can usually be controlled," Dr. Conner says. "An MRI is recommended one month after surgery, followed by yearly scanning depending on the patient's situation. Syringomyelia is not a common condition, but neurosurgeons with a high level of experience and expertise are able to help patients find solutions to the disorder."

To learn more about options for treating syringomyelia, visit www.sbni.org.

Cottage HEALTH SYSTEM

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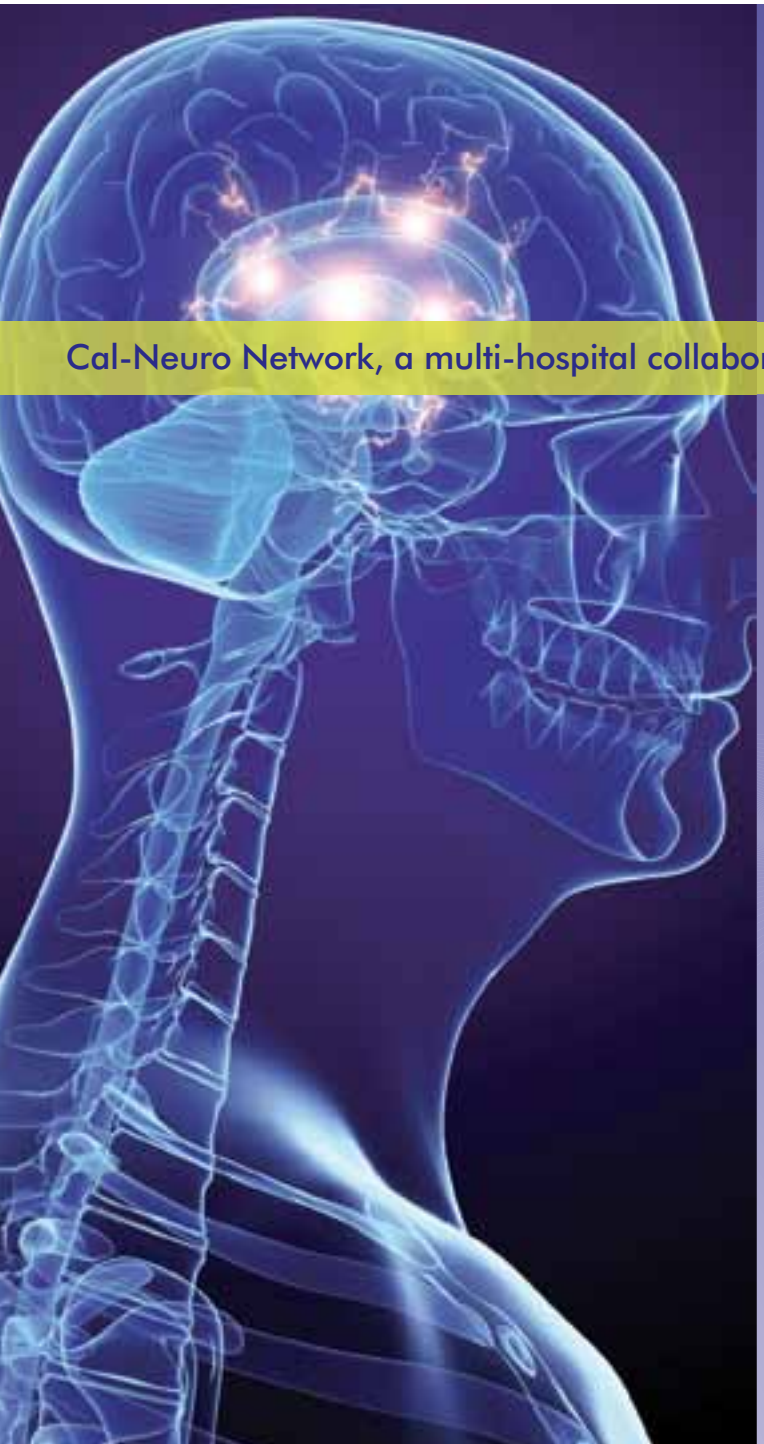

Cal-Neuro NETWORK

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 or call (805) 682-7111 x82008.

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