

NEUROtransmitter

A PUBLICATION OF SANTA BARBARA NEUROSCIENCE INSTITUTE AT COTTAGE HEALTH

SPRING 2016

Brain Tumor Surgery Using Intraoperative MRI (iMRI)

PAGE 4

Opioid Therapy for
Chronic Pain: Time
for Reconsideration?
(Part Two)

PAGE 6

Using
Telemedicine
to Treat
Stroke Patients

PAGE 8

Eighth Annual
Saving the Brain
Symposium Recap

PAGE 10

Nurse Navigator
Supports Brain
Tumor Patients

PAGE 11



NEUROtransmitter • SPRING 2016

Table of Contents

- 4** Brain Tumor Surgery Using the Intraoperative MRI (iMRI) **BY JOHN PARK, MD, PHD**
- 6** Opioid Therapy for Chronic Pain: Time for Reconsideration? (Part Two) **BY THOMAS H. JONES, MD**
- 8** Using Telemedicine to Address the Shortage of Stroke Specialists and the Need for Timely tPA Treatment **BY ARBI OHANIAN, MD**
- 10** Eighth Annual *Saving the Brain* Symposium Focused on Emerging, Cutting-Edge Topics in the Neurosciences **BY PHILIP R. DELIO, MD**
- 11** Nurse Navigator Supports Brain Tumor Patients Through Difficult Diagnosis **BY KATE MOESKER, RN, BSN**

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About Santa Barbara Cottage Hospital and Cottage Health

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

The Santa Barbara Neuroscience Institute at Cottage Health 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

Intraoperative MRI (iMRI) has been used to improve patient outcomes in a variety of tumor types including low- and high-grade gliomas and pituitary tumors. The iMRI is a state-of-the-art technology that allows neurosurgeons to achieve more complete brain tumor resections with the goal of improving the quality of life and increasing the survival of patients with brain tumors.

Dear Colleagues,

THE YEAR 2016 is full of excitement in the neuroscience arena at Santa Barbara Cottage Hospital. After years of planning and preparation, the "OR Triad" of rooms for the advanced practice of neurosurgery has opened.

This OR suite contains three connected rooms. In the first room is a 21st century, state-of-the-art operating theatre which contains multiple video arrays not only connected to the hospital's radiology DR system but also to the EMR and the operating microscopes. Brain Lab software has enabled the room to take full advantage of the latest in stereotactic navigation inside the brain or spine.

The 3T Siemens large bore intra-operative MRI (iMRI) is situated in the middle room and allows patients, under anesthesia, to be moved from either adjacent room for real-time re-imaging of their neuroanatomy to allow more accurate, safe and complete resection of their brain tumors or management of patients with acute strokes and other vascular lesions. Eventually this iMRI room will allow some procedures to be done in the bore of the magnet, permitting real-time accurate localization of brain probes. Examples of such procedures would initially include functional brain surgery for Parkinson's disease, percutaneous treatment of certain movement disorders, epilepsy surgery and brain biopsies.

The third room contains the Neuro/Vascular space

which houses the Siemens Zeego robotic high resolution imaging device, already being used by the vascular neurosurgeon and the general vascular surgeons.

I am told that no other hospital on the West Coast has this combination of technologies available to them in their operating rooms. Fortunately, we prepared for this

day long ago by recruiting world-class, experienced neurosurgery sub-specialists who can instantly deliver even better care using these tools.

The successful completion of this endeavor was truly a team effort including SBCH administration, nurses, surgeons and, of course, donors. I am also reminded that the building and engineering feat to put these three rooms together was far more complex than building any of the

new hospital. I therefore give thanks to the engineers, architects and laborers who made this happen.

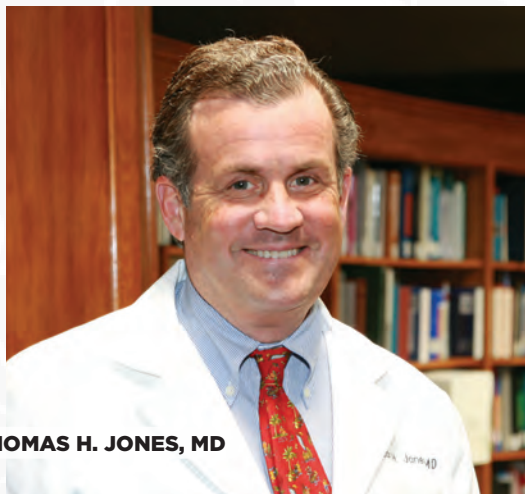
If you would like to get a flavor of the buildout complexities, you may visit the Cottage Health You Tube channel and the video titled "iMRI arrives at Santa Barbara Cottage Hospital."

Sincerely,

THOMAS H. JONES, MD

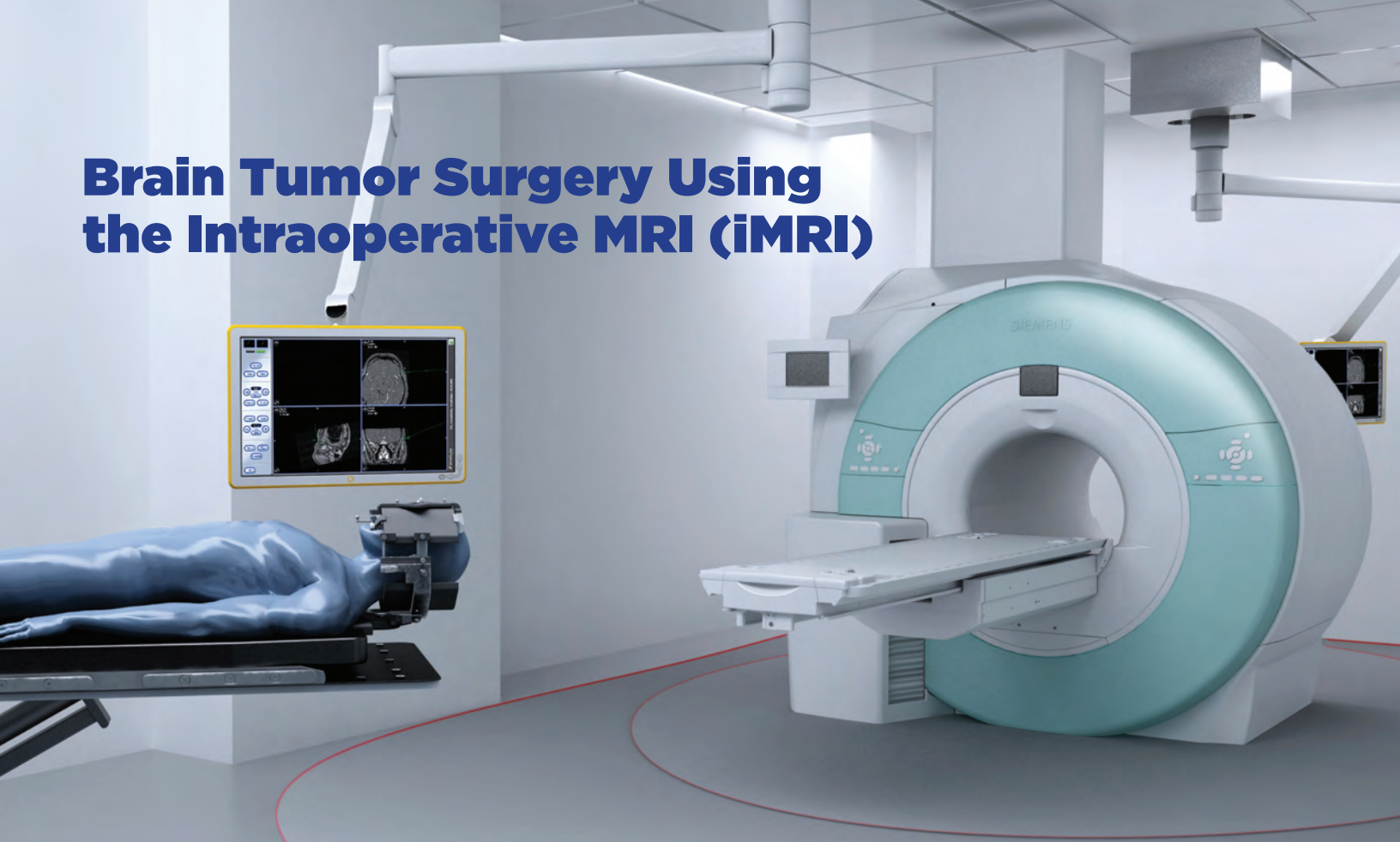
Neurosurgeon and Medical Director

Santa Barbara Neuroscience Institute at Cottage Health



THOMAS H. JONES, MD

Brain Tumor Surgery Using the Intraoperative MRI (iMRI)



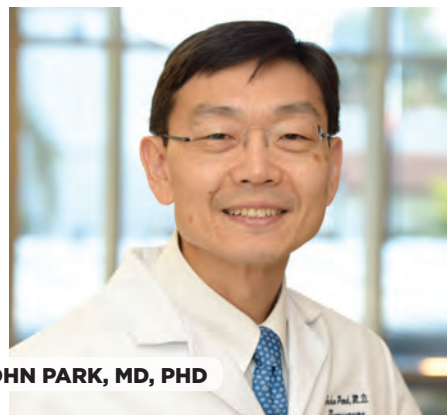
BY JOHN PARK, MD, PHD, Brain Tumor Neurosurgeon and Medical Director of the Brain and Spinal Tumor Program at the Santa Barbara Neuroscience Institute at Cottage Health

There is a growing consensus that, for most types of brain tumors, a patient will survive longer if all, or nearly all, of the tumor is surgically resected. The maximal safe resection of a brain tumor is dependent on the ability of the neurosurgeon to locate the tumor within the brain and distinguish it visually and tactilely from normal peritumoral brain tissue.

THE REMOVAL of surrounding normal tissue must be avoided to minimize the initiation or exacerbation of new or pre-existing neurologic deficits, respectively. Preoperative magnetic resonance imaging (MRI) produces two-dimensional (2-D) images of the brain that can be used to determine the relative location, size and shape of a tumor and is extremely helpful in pre-surgical planning.

Stereotactic neuronavigation is a commonly used technology that digitally co-registers a patient's visible scalp and facial features to a virtual three-dimensional (3-D) model of the head and brain generated using preoperative MRI data. The 3-D model and the corresponding 2-D sections through it are viewed on a

video monitor during surgery. Similarly co-registered surgical instruments that are visible in real space are simultaneously shown in virtual form in spatially accurate relation to the 3-D and 2-D head and brain images displayed on the video



JOHN PARK, MD, PHD

monitor. In other words, a surgical probe placed on the scalp or within the brain is displayed on a video screen as a virtual probe within a preoperative MRI-based 3-D model of the head (*Figure 1*).

Using this technology, a surgeon is able to point to a region of otherwise homogeneous-looking brain tissue and identify areas such as tumor margins that are readily visible and easily distinguishable on MRI. The chances of resecting all or most of a tumor are greatly maximized when its margins can be clearly identified.

Inaccuracies Produced by “Brain Shift”

The major shortcoming of stereotactic neuronavigation is the movement of brain tissue that occurs after a burr hole

Santa Barbara Cottage Hospital opened the first 3.0 Tesla iMRI in California in February 2016. The neurosurgeons utilizing the iMRI are among the world's most experienced users of this technology.

or craniotomy bone flap is made, following the partial resection of a tumor or the draining of a nearby cyst or ventricle. Commonly referred to as “brain shift,” this tissue movement can lead to a significant change in the actual shape and margins of a tumor and render the preoperative MRI-based 3-D model used by the stereotactic neuronavigation system inaccurate (Figure 2).

One solution to overcoming the inaccuracies introduced by brain shift is to acquire new MRI data during surgery, after the brain shift has occurred, and update the 3-D model and 2-D images accordingly. The intraoperative MRI (iMRI) was initially developed for this purpose.

The world's first iMRI was developed by General Electric and installed at Brigham and Women's Hospital in Boston in 1994. It was a 0.5 Tesla system that featured two vertically oriented superconducting magnets with sufficient space in between the “double donuts” for the patient's head and the neurosurgeon. Using non-ferromagnetic instruments and MRI-compatible anesthesia ventilators and patient monitoring equipment, surgery was performed within the magnetic field. Imaging also could be performed in real time without the need to remove the patient from within the magnet. The shortcomings of this pioneering system included the relatively low field strength of the magnet and the resulting lower-quality images compared to those obtained using 1.5 and 3.0

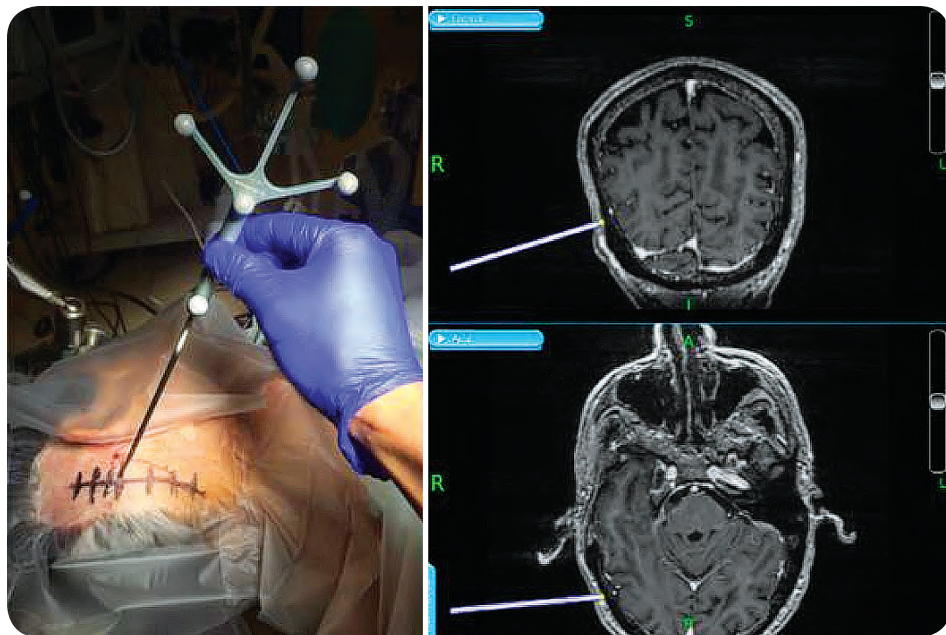


Figure 1: In the left panel, a stereotactic navigation probe has been placed on the scalp prior to prepping and sterile draping. In the top and bottom right panels, a virtual probe is shown on a preoperative MRI-based 3-D model of the head.

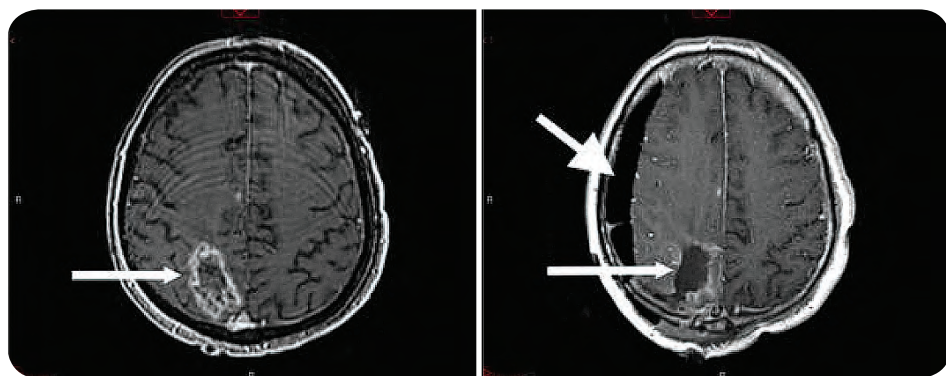


Figure 2: In the left panel, the arrow identifies the tumor on a PRE-operative, T1 weighted, contrast enhanced axial MR image. In the right panel, the similar arrow identifies the resection cavity on an INTRA-operative, T1 weighted, contrast enhanced axial MR image. Also in the right panel, the larger arrow indicates the presence of intracranial air in the subdural space. As can be seen by comparing the left and right panels, the brain has shifted due to the craniotomy and the resection of tumor.

Tesla diagnostic scanners; the limited availability of MRI-compatible instruments and ancillary equipment such as microscopes; and restrictions on the positioning of patients during surgery. In response to these limitations, subsequent iMRI systems were developed in which surgery is performed in a standard operating room environment with ferromagnetic instruments and equipment and either the patient is transported into a fixed iMRI scanner in an adjacent room or a portable iMRI scanner is moved into the operating room after the removal of ferromagnetic objects.

Use of iMRI to Improve Patient Outcomes

The iMRI has been used to improve patient outcomes in a variety of tumor types including low- and high-grade gliomas. In a retrospective study of 156 patients who underwent surgical resection of a unifocal, supratentorial, low-grade glioma in an iMRI suite, the 1-year, 2-year, and 5-year age-adjusted and histologic-adjusted death rates were 1.9 percent, 3.6 percent, and 17.6 percent, respectively. These rates are significantly lower than the

Continued on page 11

Opioid Therapy for Chronic Pain: Time for Reconsideration?

BY THOMAS H. JONES, MD, Neurosurgeon and Medical Director
Santa Barbara Neuroscience Institute at Cottage Health

In the last issue of this magazine, I wrote about the lack of evidence for opioid effectiveness in the management of chronic pain syndrome (CPS), specifically chronic low back pain (LBP). And yet, in spite of this lack of evidence, in the 1980s and 90s both the World Health Organization (WHO) and the Joint Commission not only pushed the concept of “titrate to effect” but forced all American hospitals to adopt the 10-point pain scale as the “fifth vital sign.” All the while, they drew no distinction between acute and chronic pains. I believe that these and other mandates from our politicians have been complicit and instrumental in encouraging physician overprescription of opiates and helped to create the current epidemic of overdoses and deaths.

TO REPAIR THE DAMAGE to chronic pain patients that the system has created, we have to start with a better understanding of the causes of chronic pain and, importantly, how it differs from acute “nociceptive” pain. As Jane Ballantyne, MD, and Mark Sullivan, MD, stated in their recent article (NEJM 2015; 373:2098-99), the current understanding of chronic pain is that “pain-intensity ratings aren’t necessarily a reflection of tissue damage or sensation intensity...” They go on to say that “over time, pain intensity becomes less linked with nociception and more with emotional and psychosocial factors. Suffering may be related as much to the meaning of pain as to its intensity.”

Patients Who Are Prone to Develop Chronic Pain

This information should not be a revelation. For at least 50 years there has been published and experiential evidence that patients with early and/or late life psychosocial issues were prone to develop chronic pain. From our own experience and the medical literature, it is well known that more often than not the chronic pain patients manifesting the highest pain scales are often “overwhelmed, are burdened by coexisting substance abuse or other mental health conditions and need the type of comprehensive psychosocial support offered by multimodal treatment approaches.”

I agree with others that chronic pain is pain that lasts beyond the time of normal tissue healing, usually three months. However, patients with a history of multiple site surgeries for pain (e.g. neck, back and shoulder), or even patients with acute pains without an apparent source in the presence of psychosocial risk factors must be considered at risk. Most of the current medical science strongly suggests that the brains of sufferers of CPS represent the most impor-

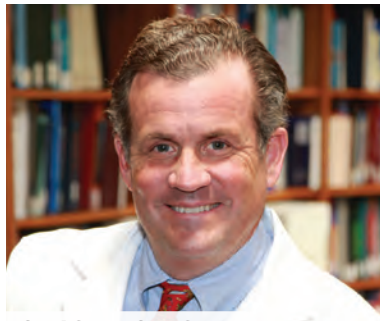
tant distinguishing factor for the patients at risk. Functional MRI (fMRI) has consistently shown that the brains of CPS patients are distinctly different than the control brains of patients with acute or no pains. These maps show a heightened engagement of the historical emotional centers and one study from Northwestern was able to predict which patient would transition from acute to chronic LBP with 85 percent certainty based upon their fMRI study (Ali Mansur et al; Pain 2013 Oct.;154(10): 2160-2168). Other studies actually suggest CPS can lead to neuronal apoptosis. This science nicely dovetails with the clinical observations over the past 50 years that central factors are far more important to the onset of CPS than anatomical studies of the affected part.

Incorrect Attribution of Vague, Diffuse Symptoms

Most spine specialists when dealing with chronic LBP patients have been trained to look at the patient dispassionately, review their exam and X-rays/scans and then draw conclusions about whether medical interventions, including surgery, might help. The problem arises when vague, diffuse symptoms such as axial back pain (i.e., non-radicular) are incorrectly attributed to degenerative disc bulges, nonspecific facet joint osteoarthritis.

Most evidence-based literature suggests there are few changes on an MRI that uniformly produce such chronic pain, and degenerative disc bulges/OA of facets are not the exceptions.

As a profession, we would be much better off not resorting to invasive medical treatments such as epidural injections for chronic, axial LBP. Surgery certainly is not indicated in the majority of such patients. All our experience and evidence currently suggests that opiates will not be effective in this clinical setting and I would argue their risks far outweigh any temporary ben-




THOMAS H. JONES, MD

efit. Most evidence, as indicated above, strongly suggests that patients with such pain require a multispecialty approach. These patients, more often than not, have a complex blend of patho-anatomical, psychiatric and social issues. Any solitary practitioner, whether a pain management specialist, surgeon or medical physician, is ill equipped to manage such a patient. The all-too-often knee-jerk approach of assuaging the “pain” with opiates, and the associated anxiety with sedatives, often takes sway with predictably disastrous outcomes in the long run.

Use the Evidence-Based Literature to Reassure Patients

Since most communities do not contain a true multispecialty pain clinic, what is the solitary practitioner to do? With respect to chronic axial spinal pains, once a specialist has ruled out the consensus agreed-upon patho-anatomical causes (i.e., fracture, tumor, infection, instability, large central disc herniation), it is our obligation as physicians to use the evidence-based literature to reassure patients that this a benign condition. We need to stop using the words “degenerative disc disease” and other terms that medicalize changes consistent with normal aging. The adverse psychological impact of this verbiage is significant and should be avoided. If in doubt, access the Cochrane Data Base (www.cochranelibrary.com) of evidence-based medicine (EBM) and review how effective level 1 or 2 clinical studies have found the various treatments, including epidural injections, PT, chiropractic, opiates. It turns out that, in the realm of chronic spinal pain, none of these options have a reliable track record.

Remind patients that the medical literature is full of studies that have been proven to be ineffective in the management of LBP. A recent JAMA meta-analysis (JAMA Internal Med, 1/11/16; Daniel Steffens PhD et al) about preventing LBP reviewed 6,133 potentially eligible studies, though only 23 reports met the inclusion criteria. They concluded that a combination of exercise and education had the best scientific support. Exercises which improve aerobic capacity combined with those to strengthen the core seem most appropriate for axial LBP. Cognitive retraining seems essential in identifying repressed anger, anxiety and depression and have been ex-



The all-too-often knee-jerk approach of assuaging the “pain” with opiates, and the associated anxiety with sedatives, often takes sway with predictably disastrous outcomes in the long run.

tensively written about by John Sarno, MD, (*Healing Back Pain*) and David Schechter, MD, (*Think Away Your Pain*) as well as many others. Pharmacological treatment of co-morbidities such as depression, insomnia and fibromyalgia spectrum disorder can sometimes be quite helpful.

Conclusion

Restricting our care, in most cases, to using scientifically vetted treatments and avoiding unvetted, expensive high tech “miracle cures” and numerous imaging studies will allow us to take better care of our patients, improve outcomes and lower the cost of care dramatically. Probably the most important take-home point of this two-part article is a plea to avoid protracted opiate and habituating sedative therapy in CPS (*The Effectiveness and Risks of Long Term Opioid Therapy for Chronic Pain: A Systematic Review for a National Institutes of Health Pathways to Prevention Workshop*, Roger Chou MD et al; *Annals of Int. Med.* 2015;162(4):276-286.).

For more information on the Santa Barbara Neuroscience Institute at Cottage Health, visit www.sbni.org

Using Telemedicine to Address the Shortage of Stroke Specialists and the Need for Timely tPA Treatment

BY ARBI OHANIAN, MD, Neurohospitalist, Santa Barbara Cottage Hospital

The use of telemedicine has been exploding. As technology has evolved, it has become clear that telemedicine utilization is a must to fill the ever-growing needs we face in medicine today. In particular, given the new pressures to bring healthcare more quickly to a larger population, telemedicine can address these critical healthcare delivery gaps. No specialty is better positioned to take advantage of telemedicine than neurology. The two most compelling reasons for this are the growing shortage of neurologists required to care for the aging population and the fact that stroke has become the most time-sensitive condition in medicine.

THE U.S. Census Bureau predicts the number of Americans over the age of 65 will more than double while those over 85 will quadruple by the year 2050. Given that the risk of stroke doubles each decade after the age of 55, we will be facing a major public health dilemma in trying to manage the rapidly growing volume of stroke patients resulting from this aging population.

Superimposed on this increasing demand is the fact that stroke therapies and patient outcomes are all very time sensitive. Nationally, the number of patients suffering from strokes receiving acute therapies including IV tPA and intra-arterial mechanical thrombectomy is less than 10 percent. A major challenge is the lack of expeditious availability of neurologists in treating these patients.

Timely IV tPA Treatment is Critical

The number of stroke centers in the United States has grown exponentially over recent years. Among the national goals for these centers is an IV tPA



ARBI OHANIAN, MD

treatment time (door to needle) of <60 minutes (recently a more aggressive target of <45 minutes has been introduced). In order to achieve this, quick access to a neurologist is often needed prior to initiating treatment. In some communities, waiting for a neurologist to leave his or her clinic or home and drive to the emergency department

can take 30 minutes or more. Considering the fact that 1.9 million neurons die per minute during a stroke, these are vital minutes that can impact the outcome for these patients. With telemedicine, the neurologist can stay in his or her office or home and be at the bedside virtually within one to two minutes.

Another concerning fact for the future of stroke care is that the number of graduating medical students pursuing neurology as a specialty has remained stagnant despite the rapidly increasing demand. And those going into neurology are mostly opting for fellowships in specialties such as movement disorders, sleep medicine, intraoperative monitoring, and epilepsy, all of which may offer a better quality of life.

Telemedicine will allow optimal use of those physicians going into fields that can manage stroke. A single stroke specialist at Santa Barbara Cottage Hospital, for example, can now provide services to hospitals throughout the Central Coast area where neurologists are not available for treating these high-acuity and time-sensitive patients.

Santa Barbara Cottage Hospital Tele-Stroke Program

Utilizing a hub-and-spoke telemedicine model, Santa Barbara Cottage Hospital in August 2015 initiated a tele-stroke program with Twin Cities Community Hospital in Templeton. Similar programs have since been implemented with Sierra Vista Regional Medical Center in San Luis Obispo, Lompoc Regional Medical Center and Santa Ynez Valley Cottage Hospital, and more are planned with Ventura County Medical Center and Santa Paula Medical Center. Santa Barbara Cottage Hospital is the only hospital in the Central Coast area that has neurointerventionalists who can provide this definitive care for acute stroke patients.

When a stroke patient presents to the ED at one of the spoke hospitals, the ED staff pages the stroke neurologist at Santa Barbara Cottage Hospital. Using a laptop computer, the neurolo-

Santa Barbara Cottage Hospital is the only hospital in the Central Coast area that has neurointerventionalists who can provide this definitive care for acute stroke patients.

gist connects to the telemedicine robot at the spoke hospital and utilizes the technology to conduct an acute stroke consultation. The neurologist is able to maneuver the robot around the spoke hospital ED, as if he or she were physically there. Using the robot's two-way audio and video capability, the physician conducts a neurological assessment of the patient and is able to interact with the patient's family and ED staff. This gives the neurologist the information needed to make the most informed decision for management of the patient.

Our goal is to recommend transfer for only those patients that require a sub-specialist level of care, typically only found at tertiary medical centers. Santa Barbara Cottage Hospital has two affiliated neurointerventionalists who are



capable of removing brain clots in the neurovasculature. Patients who do not qualify for this intervention often can remain at the spoke facility and be well managed by the medical team without having to leave their community.

Conclusion

I believe telemedicine will continue to evolve and become quickly accepted and implemented. The common theme at every facility where we initiate services is

a medical staff that is very skeptical and concerned about use of the technology. However, once the services are implemented and become fully utilized, in a very short time those who were skeptics often become the main drivers for finding further uses of the technology in their respective facilities and practices.

For more information on the Santa Barbara Neuroscience Institute at Cottage Health, visit www.sbni.org

CASE STUDY: **Tele-Stroke Program Activated to Treat Patient**

The patient is a 52-year-old female with a medical history significant for atrial fibrillation who was last seen normal at 3 pm. At 3:15 pm, her husband found the patient with right-sided weakness and inability to speak. EMS was summoned and the patient taken to Sierra Vista Regional Medical Center. Upon evaluation by the Emergency Department physician, a code stroke is activated.

STEPS:

1. The stroke neurologist at Santa Barbara Cottage Hospital is paged and calls back to receive initial history from the ED physician.
2. Telemedicine is used by the neurologist to examine the patient and obtain further history from the patient's husband at the bedside. The patient is noted to have an NIHSS of 20.
3. The neurologist reviews the CT scan and notes a dense left MCA sign; however, there is no evidence of large territory infarction or hemorrhage.
4. After discussing the risks and benefits with the patient's husband, the neurologist recommends IV thrombolysis and transfer for possible intervention.
5. The patient is transferred by critical care transport to Santa Barbara Cottage Hospital.
6. Upon arrival at Cottage, the patient is evaluated by Alois Zauner, MD, who was contacted while the patient was en route to the hospital.
7. The patient is taken to the interventional suite where successful mechanical thrombectomy is performed. The patient was discharged to inpatient rehabilitation three days later with an NIHSS of 4.

Eighth Annual *Saving the Brain* Symposium Focused on Emerging, Cutting-Edge Topics in the Neurosciences

BY PHILIP R. DELIO, MD, Stroke Neurologist and Medical Director of Stroke Services at Santa Barbara Cottage Hospital



Above left: Ed Wroblewski, MD, VP, Medical Affairs/CMO at Cottage Health, (at left) with John Park MD, PhD, Neurosurgeon and Medical Director, Brain and Spinal Tumor Program at the Santa Barbara Neuroscience Institute (SBNI) at Cottage Health. **Middle:** (from left) Symposium speaker Earle Powdrell, aerospace engineer and stroke survivor; Kathy Powdrell, his wife; Charleen Strebel, MHA, RN, Program Coordinator Emeritus, and Gary Milgram, MBA, RN, Administrative Director, Service Line Development at Cottage Health. **Right:** Thomas H. Jones, MD, Neurosurgeon and Medical Director, SBNI (at left) with guest speaker Michel Kliot, MD, Neurosurgeon and Director of the Peripheral Nerve Center, Northwestern University, Feinberg School of Medicine

THE EIGHTH ANNUAL *Saving the Brain* Symposium in 2015 was our most successful event to date, with 225 registered attendees and over 30 vendors supporting the conference. Importantly, over 80 attendees were not affiliated with Cottage Health, which underscores the value of this program to Central Coast nurses and physicians, in addition to our own local health care providers. As always, the conference served to spark and renew my own enthusiasm for the host of cutting-edge topics currently emerging in the field of the neurosciences.

We were honored to have some of the nation's top neuroscientists provide updates on various topics.

Thomas H. Jones, MD, Medical Director of the Santa Barbara Neuroscience Institute (SBNI) at Cottage Health, the long-standing driving force for neurologic care and research in Santa Barbara, opened with a review of neurosciences at Cottage, how far we have come, and where the future will take us. **Michel Kliot, MD**, Interim Chair of Neurosurgery at Northwestern University, Feinberg School of Medicine, described the latest imaging techniques as they pertain to peripheral nerve trauma and assessment. We are delighted that Dr. Kliot will soon be joining our medical staff at Santa Barbara Cottage Hospital.

Highlighting our own local neuroscientists, **Scott Grafton, MD**, Director of the Institute for Collaborative Biotechnologies at the University of California at Santa Barbara, outlined the amazing advances in MRI imaging of concussion and traumatic brain injury. I have been fortunate to work with him in this field of research, and feel he will soon be defining how concussion and traumatic brain injury should be managed with the use of neuro-

imaging. Similarly, **John Park, MD, PhD**, Medical Director of the Brain and Spinal Tumor Program at SBNI, gave his typically witty perspective on the challenges facing operative treatment of brain tumors. This was followed by a lecture from **Maureen Hemingway, RN**, of Massachusetts General Hospital on intraoperative MRI, a resource that is now operational at Santa Barbara Cottage Hospital.

Other speakers included **Jennifer Fields, RN**, from the University of Cincinnati Medical Center, who discussed the frustrating conflict between compassion and caregiver burnout, a challenge faced by nurses and physicians alike. **Jennifer L. Clarke, MD**, Associate Professor of Clinical Neurology and Neurosurgery at the University of California at San Francisco, provided one of the best overviews of glioblastoma treatment that I have seen in quite a while, no small task given

the rapidly changing data within this field.

Finally, **Thomas Clark, DO**, and **Alois Zauner, MD**, from the Stroke and Neurovascular Center of California, highlighted the challenges faced with establishing a regional stroke center and how to handle complex neurovascular cases.

Coupled with my lecture on recent advances in stroke and the manner in which interventional neurology is changing the way we treat stroke, I feel our topics this year were as timely and relevant as ever.

Please save the date for the 9th Annual Symposium which will be held on Friday, November 4, 2016 at Fess Parker's Doubletree Resort in Santa Barbara. For more information, contact Gary Milgram at (805) 569-7550 or gmilgram@sbch.org.



PHILIP R. DELIO, MD

iMRI continued from page 5

corresponding 12.5-26.6 percent, 18.7-38.6 percent, and 31.7-53.1 percent histology-dependent death rates reported in the CBTRUS/SEER national data bases and may have been due to the more complete tumor resections achieved using the iMRI¹. In a prospective, randomized trial of 58 adults with contrast-enhancing, presumed high-grade gliomas amenable to radiologically complete resection, 24 of 29 (83 percent) patients randomized to the iMRI group and 25 of 29 (86 percent) patients randomized to the standard neuronavigation control group were eligible for analysis. Four patients in each group turned out to have metastases and one patient in the intraoperative MRI group withdrew from the study after randomization. Complete tumor resection was achieved in 96 percent (23/24) of patients in iMRI group while it was achieved in only 68 percent (17/25) of patients in the control group ($p=0.023$). The rate of new neurological

deficits postoperatively did not significantly differ between the two groups².

According to a recent review of the literature, the surgical treatment of non-functioning pituitary adenomas has also benefitted from the use of the iMRI. All nine of the studies examining the correlation of iMRI findings with three-month postoperative MRI findings found a ≥ 90 percent concordance between the two. All 24 studies examining the use of intraoperative imaging to improve a surgeon's ability to achieve a more complete resection reported a positive benefit with 15-83 percent of patients having received a better resection. Finally, both of the studies comparing iMRI to endoscopy for the visualization of residual tumors found iMRI to be valuable, particularly for tumor tissue located lateral of the sella, in the cavernous sinus, or in the suprasellar space³.

Conclusion

The iMRI is a state-of-the-art technolo-

gy that allows neurosurgeons to achieve more complete brain tumor resections with the goal of improving the quality of life and increasing the survival of patients with brain tumors. Santa Barbara Cottage Hospital opened the first 3.0 Tesla iMRI in California in February 2016. The neurosurgeons utilizing the iMRI are among the world's most experienced users of this technology.

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For more information on the Santa Barbara Neuroscience Institute at Cottage Health, visit www.sbni.org

Nurse Navigator Supports Brain Tumor Patients Through Difficult Diagnosis

BY KATE MOESKER, RN, BSN,

Nurse Navigator at Cottage Health

A RECENT STUDY by the American Psychological Association identified money, work, the economy, family responsibilities and health concerns as America's top stressors¹. A brain tumor diagnosis can affect all these domains. Patients may ask: *How am I going to pay for this? Will I be able to return to work? What am I going to tell my kids? How is this treatment going to affect me?* These are the people whose lives I step into and whose hands become mine to hold. As a nurse navigator, my role is to lead these patients and their loved ones through our complex medical system, while helping them also live out their lives to the fullest.

I usually meet patients at their first consultation with their neurosurgeon. When they come to this appointment, patients usually know they have *something* wrong in their brain, but are unsure what this means and what treatment, if any, they will need. After meeting with their surgeon, we often have a debrief

or family meeting in my office that allows patients and their families a safe place to process and troubleshoot some logistics. My patients, their loved ones and I become a team.

After a diagnosis is made, I help facilitate appropriate follow-up and education. Patients may need to undergo extensive courses of chemotherapy and radiation. To help patients cope

with their treatment, I help connect them with supportive services such as nutrition, social work, and wellness classes through the Cancer Center of Santa Barbara and other community agencies. I also collaborate with patients and their healthcare team to make treatment calen-

MY PATIENTS, THEIR LOVED ONES AND I BECOME A TEAM.

dars that allow for vacations and important life events, while also still getting timely treatment. Being able to put something on the calendar that is not related to cancer and having a voice

in treatment planning is very empowering to patients. If I do my job well, I can help give patients back a sense of control over their lives, despite their prognosis.

¹Anderson, N., et al. (2015) *Stress in America: Paying with Our Health*. American Psychological Association. <http://www.apa.org/news/press/releases/stress/2014/stress-report.pdf>

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