SVIN Society of Vascular and Interventional Neurology

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Society News

➲ The 1st practicum of the Society of Vascular and Interventional Neurology is scheduled for October 29-30, 2010, to be held in the Georgia Tech Global Learning Center, a unique venue designed with laboratory space for hands-on training. This meeting will include live case video conferencing for audience participation as well as live training and simulator sessions. SVIN executive board member, Dr. Alex Abou-Chebl Dr Alex Abou-Chebl head this meeting planning committee.

➲ The next annual meeting, under the chairmanship of Dr. Raul Nogueira, is being planned. The tentative time will be January-February, 2011, with future location to be announced.

➲ SVIN is drafting a publication as a reference and position statement for endovascular stroke treatment standards. This paper will help fill a void currently existing in the care of stroke patients, with suggested goals of therapy for "times to groin puncture" and "times to recanalization" similar to practice guidelines for acute myocardial infarction.

➲ SVIN will work with the Society of Interventional Radiology on development of a white paper on Quality Improvement Standards for Interventional Stroke Treatment. SVIN members will collaborate with SIR members in a multi-society writing committee on quality improvement of endovascular stroke procedures and outcomes. SVIN agrees with SIR that such a document is needed to establish a quality standard that can be looked at by the performing neurointerventionalists and their medical centers to guide best patient care. The standards will be narrowly focused on technical aspects. The SVIN participants on the Committee are Rishi Gupta and Tudor Jovin.

➲ SVIN is drafting a working document covering ideal criteria for comprehensive stroke centers. A separate survey of state health directors is underway to ascertain the current national landscape of primary and comprehensive stroke center designation.

Science and Industry News

➲ Penumbra, Inc. (San Leandro, CA) is launching the Separator Flex, a new separator design as part of its mechanical aspiration thrombectomy, Penumbra Stroke System. A continuous Nitinol core wire throughout the length of the Separator creates increased tip softness and fatigue resistance.

➲ Concentric Medical, Inc. (Mountainview, CA) has received Eurpoean CE Mark approval for an aspiration indication for its Distal Access Catheter product line, as a treatment for acute ischemic stroke. These 4.3 French catheters are currently used in the United States as a coaxial support system for more distally placed microcatheters such as the 18L and other Concentric microcatheters used with the Concentric Retriever® for acute stroke treatment. They have also recently received market approval for the Concentric Retriever® in Japan.

➲ The Merci Registry has recently completed closed out the initial phase, with enrollment of the trial's 1000th patient. This registry collects initial and 90 day outcome data on patients treated with the Merci Concentric Retriever® with a goal of accumulating Real World Experience with the Merci Retriever System™.

➲ Recent technical reports and small volume series have published reports of cases of internal jugular (IJ) vein stenting for the treatment of multiple sclerosis (MS). A Polish study of 70 patients by Sinkan et al in *International Angiology* (2009;29:109-114) found associations between cerebrospinal venous insufficiency in patients with established diagnoses of MS. This follows other reports including a series by Zamboni et al at the University of Ferrara, Ferrara, Italy. Zaidat and Kalia demonstrate a case of venous stenting in this issue of the SVIN Quarterly.

➲ Boston Scientific, Corp (Natick, MA) recently received approval for its Neuroform EZ Stent System. The intracranial stent, used for treatment of wide necked intracranial saccular aneurysms, is similar in product to Neuroform® Microdelivery Stent System currently available on the market. The new delivery system consists of a stent loaded on a delivery wire inside an introducer sheath which is advanced through a separately packaged Renegade microcatheter, and is designed for easier stent placement and deployment in the cerebral vasculature. Purchase and use of the new system requires institutional review board approval. Centers with active approval of the previous generation Neuroform® Microdelivery Stent System are recommended to request expedited review and approval of the new system.

➲ ev3, Inc. (Irvine, CA) is marketing a new Hyperglide® 5 mm x 30 mm balloon dilatation catheter for use with Onyx HD 500 for the treatment of wide-necked side wall brain aneurysms. The balloon has a reported crossing profile similar to smaller Hyperglide® balloons, at 2.8-2.2 French with a usable catheter length of 150 cm. Onyx HD 500 is the only liquid embolic designed for the treatment of intracranial aneurysms and is used in the United States under institutional review board approval.

➲ ev3, Inc. (Irvine, CA) has filed the company's Pre-Market Approval (PMA) application for the Pipeline Embolization Device for treatment of large, giant and wide-necked cerebral aneurysms with the U.S. Food and Drug Administration (FDA). As a precursor to this, the industry sponsored PUFS (Pipeline for Uncoilable or Failed AneurysmS) study enrolled and treated 108 patients at 10 centers in the U.S. and Europe. PUFS is a single-arm study of large and giant, wide-neck or fusiform aneurysms typically not coilable, with six-month safety and efficacy endpoints.

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President's Message: Stroke Centers, the Time for Action

Since the last update, our young society continues to take the lead in several important stroke related policy issues. Current SVIN initiatives include the independent generation of or participation in the development of several white papers crucial to the provision of endovascular acute stroke care. Many of these issues have been discussed before in the newsletter and at past executive board and society meetings and are mentioned in the society updates of this issue of the newsletter. Among these are the Position Statement for Endovascular Treatment Quality Standards, the co-authorship along with the Society of Interventional Radiology (SIR) on the Quality Improvement Standards for Interventional Stroke Treatment, and the Working Document on Ideal Criteria for Comprehensive Stroke Centers (CSCs) led by SVIN.

The first two items, though complementary, will cover different areas relevant to the endovascular treatment of acute ischemic stroke. The SVIN position paper will be devoted to establishing goals and guidelines, such as ideal times for "onset to groin puncture" pertaining to benchmarks for time elapsed from stroke symptom onset to the commencement of interventional therapy. This will assist in providing reference points for quality control and performance review for centers performing interventional stroke therapy, without which this treatment for one of the most disabling diseases worldwide, cannot move forward.

The Quality Improvement Standards paper is a multi-societal endeavor which aims to establish ideal quality parameter for endovascular stroke therapy. Given the changing landscape of neuro-intervention, with multiple disciplines within and outside of the traditional neurosciences performing these procedures across the country, it is essential that unified 'criteria' are devised, applicable to all proceduralists undertaking these life-saving, though risky, procedures in the acute care setting. The public and health care interest in this area is well known to members of our society and the political background from which this discussion emanates requires those of us providing commentary to be knowledgeable and diplomatic on the subject, ultimately considering the final goal of *availability and quality of care* to the general public as the primary driving force of any such position statement. Though the SVIN has appointed liaisons with SIR on this document, drafts of this document will be reviewed by the full executive board. This is intended as a document representative of our society's opinion as a whole, and I welcome comments from the general body.

Finally, all the work on interventional stroke therapy may be rendered obsolete if an easy mechanism to implement this care to stroke victims does not exist. This leads to the final SVIN initiative mentioned above, the working document on the CSC criteria [see also Newsletter article, page 5]. Currently, several independent entities, such as the Brain Attack Coalition, have drafted guidelines for CSCs. Other entities, such as Departments of Health, have also begun certification in few states. By the vary basis of *our society's expertise in both vascular as well as interventional neurology*, we are the ideal group of people to take the lead in this, and perhaps have an obligation to generate a concise, cohesive document, backed by current literature, as best available, for CSC criteria.

Bringing the Society meeting to the next level: October 2010, Atlanta, GA

On a separate topic, we are excited to be offering the first SVIN practicum this year. The last annual meeting in San Francisco, showcased two new elements: an 'unusual/difficult case' presentation session and a cases and complications session. These proved to be very informative and educational components of the meeting, highlighting the importance of having a forum for direct clinical discussion. Based on the popularity of these types of sessions and the feedback received, we have decided to include more clinical curricula for future meetings. Though the inclusion of practicums and hands-on training was entertained for our last annual meeting, the lengthy didactic curriculum limited the ability to offer such sessions, therefore SVIN has decided that a separate, dedicated practicum is a necessary society offering.

Under the meeting chairmanship of Dr. Alex Abou Chebl and Dileep Yavagal, we will be planning our first practicum, which will include hands on training with simulators and potentially streaming in of live cases, in the esteemed Georgia Tech Global Learning Center. This unique venue provides ample space for animal and simulator training for multiple small groups. This will undoubtedly provide an excellent format for live training in the various ischemic and hemorrhagic endovascular treatment options, as well as once again bringing together multiple specialists in a single platform to share clinical experiences, thereby enriching all our practices. Registration for the meeting is expected to open August 1st; stay tuned to the SVIN website for more information.

Finally, as stated before, no SVIN initiative can be a success without the participation and input of *all* SVIN members, not only in the executive, but also in the general body. I encourage every member to step forward and serve on this meeting, whether as a proctor, or by reaching out to your colleagues, industry supporters, and other interested groups, to lend their support to our meeting and truly make it a success!

Osama (Sam) O. Zaidat, MD, MS
SVIN President
Milwaukee, Wisconsin

Editor's Corner – Stroke Center Certification and the Ideal Pre-Hospital Care of Stroke Patients

At a regional stroke conference, I met with two nurses from a New England hospital, who recounted a case of suspected large vessel occlusion life-flighted to a major medical center within that state. The basic elements of the story represent a success in inter-institution transfer and the 'hub-and-spoke' model of acute stroke care. However, they also stated that although another major medical center with neuro-interventional capabilities was geographically closer, they had transferred their patient, to the farther institution, because of a pre-existing agreement between the two hospitals.

These nurses' story highlights the importance of the designation of primary and comprehensive stroke centers (PSCs and CSCs) and the major hurdles of time and distance involved in inter-institution transfer, more striking as it involved transfer across city lines. In this case, though the medical goal was advanced treatment delivery, the financial incentive that generates these types of hospital agreements impacted the ability to offer care more expeditiously at a closer facility. Considering this, *should such agreements be left to the private sector, at the risk of operating on such incentive, without state or federal oversight?*

Even within a single city, transfers are time consuming, thereby demonstrating the importance of identifying the immediately closest facility *capable of treating their condition*. This requires recognition of those hospitals which have the personnel and expertise to provide acute stroke care. At the PSC level, in addition to providing other standards of care such as urgent computed tomography (CT), the ability to safely administer intravenous tissue plasminogen activator (IV TPA), according to established guidelines, is of paramount importance.

In New York City, where state designation of PSCs directs an ambulance with a suspected stroke victim within two hours of symptom onset to a PSC center, nearly every hospital in Manhattan and a few hospitals in the outer boroughs are capable of performing endovascular acute stroke treatment. These large numbers notwithstanding, the dense urban population of the city still leads to situations where patients with acute stroke may first reach a hospital that does not have these abilities. And the small geography of the New York metropolitan islands does little to circumvent the hurdles that even an ambulance with sirens blazing will encounter while transferring a patient from one hospital to another in rush hour traffic.

It is essential that systems are in place where the necessity of transfer is minimized, without lengthening the primary time of transport from the field to the first acute care facility. The negative aspect of potentially having all stroke victims be delivered to a 'stroke center' first is encountering long drive times for an ambulance to reach such a center, at the expense of compromising early intervention for unstable cardiopulmonary and hemodynamic status, and obtaining early CT.

Once the concept of stroke center designation is accepted, what is the most suitable entity to grant this designation-the Joint Commission, individual state Departments of Health (DOH), or a physician organization such as the American Heart Association (AHA)?

Currently the New York chapter of the AHA is working in collaboration with the DOH to identify ideal criteria for CSCs, which include ready availability of endovascular stroke treatment. Advisors on this subject debated whether these criteria should include treatment considerations pertaining to hemorrhagic as well as ischemic stroke. This juxtaposes the two concepts of setting apart hospitals as CSCs based on the highest qualifications versus the aforementioned concern of limiting such hospitals at the expense of having an adequate number of stroke centers within an emergency medical unit's coverage area.

Because of the exquisitely time sensitive nature of acute ischemic stroke-more so than in any other disease-it is, and should well be, the main consideration in CSC status. However, this may adversely result in hospitals which lack experience in IV tPA administration, to seek this status. Indeed, even hospitals without interventional capabilities may purchase stroke devices such as the Concentric Retriever in order to advertise themselves as a CSC.

Also, disparities between and within states and rural versus urban centers are significant. At the recent Academy meeting in Toronto, SVIN Past President, Dr. Adnan Qureshi, presented data on distribution of certified stroke centers throughout the United States. The vast majority are located in urban areas, leaving much of the wide geography of the non-urban US, without stroke center coverage. In their analysis, this amounts to one in four Americans without a near-by stroke center.

In researching national stroke center certification, it was interesting to see the variability between states. The prototypical *avant garde* states, such as California, reflect their high standard of living in the elaborate hierarchy of health care, with a website is so informative, one health official's email address could directly be obtained from it. Montana distinguished itself with a noble mission statement, in which it not only reflects the health department's commitment to upholding individual health care, but also puts control and responsibility of health care directly in the individual's hands, enjoining them to "contribute to the above [healthy, safe homes, self-sufficiency, and quality health] through community service." Sadly, other states' health department reflected the overall economic crisis, with messages of budgetary department closures. Perhaps as a by-product of this, information for the public was sadly lacking on these websites, myself hitting a dead end in trying to obtain information, reflecting the real life scenario of what people encounter in emergency situations, while having to make important decisions.

The diversity of the nation and variable population densities, covering massive distances, demand regulation into the principles of stroke center designation. These issues bring to the forefront the disparities in availability of neuro-interventional services in the US, and obligate us as a society to address these needs. As more health care professionals recognize endovascular stroke treatment as a treatment option, it is essential that no ambiguity exists in a center bearing this status, with patient access to care of primary importance.

Nazli Janjua, MD
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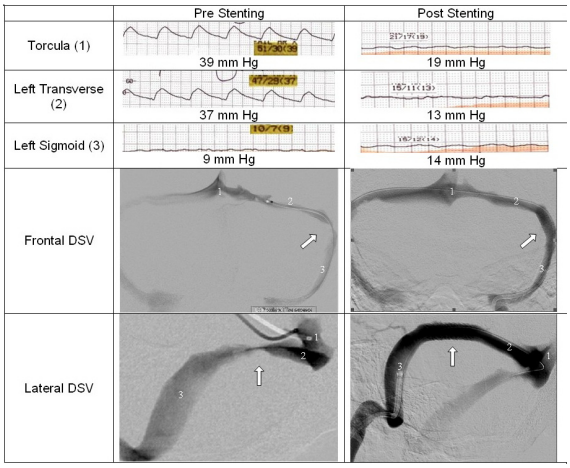
Do you have an issue you wish to discuss? Please send your "Letters to the Editor" to svin.org@gmail.com.

Manometry Guided Angioplasty and Stenting of Dural Sinus Narrowing in Pseudo-tumor Cerebri Patient

by Junaid S. Kalia, MD and Osama O. Zaidat, MD, MS

Bilateral dural sinus narrowing (DSN) was seen on magnetic resonance venography (MRV) in a 36 year old female with 4 year history of pseudo-tumor cerebri. Digital subtraction venography (DSV) showed severe narrowing of the distal left transverse sinus estimated at 80-90%, with a translesion gradient of 30 mmHg, and a pulsatile waveform, resembling central venous-type waveform comparable to caval pressures (Figure, 3rd row). Stenting with angioplasty was recommended after discussions between the neuro-ophthalmologist, neuro-interventional team, and patient.

Under anesthesia, angioplasty was initiated by using a Sterling™ 6 x 20 mm balloon dilatation catheter (Boston Scientific, Natick, MA); post-plasty follow-up DSV revealed 70% residual narrowing. An Express™ 6 x 18 mm balloon mounted stent (Boston Scientific, Natick, MA) was then centered across the narrowing and deployed by balloon inflation with no evidence of residual narrowing. The post-stent pressure gradient was reduced to 5 mmHg, and the waveform pulsatility resolved. There were no complications. Patient had significant symptomatic improvement with no tinnitus, and improved visual acuity and papilledema.

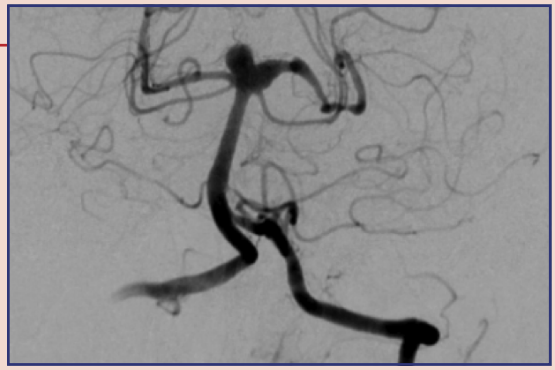


Manometry tracings obtained at the torcula (1), left mid-transverse sinus (2), and left mid-sigmoid sinus (3), demonstrate pulsitility proximal to the stenosis (Pre-stenting Column), which resolved following angioplasty and stenting of the left transverse venous sinus stenosis (Post-stenting Column). Frontal and lateral venography images are provided for reference of manometry locations and illustrate the lesion, pre- and post-treatment. Abbreviations: DSV, Digital Subtraction Venogram. (Note: DSV did not reveal severe right transverse sinus stenosis)

How Would You Treat This Aneurysm?

Case originally appeared in March/April 2010 Newsletter, Vol 3, Issue 1

A 60 year old woman with an unruptured left parieto-occipital brain arteriovenous malformation, s/p multi-staged embolization and resection has residual parent vessel aneurysms. A 5 mm basilar tip/right posterior cerebral artery (PCA) remains unchanged, without significant regression two years post-operatively. The contralateral PCA appears dysplastic. Considerations for treatment include the primary coil embolization, stent supported embolization with single or "Y" stenting technique. Concerns for treatment are the possibility of change in flow dynamics resulting in worsening of the left PCA dysplasia.



Thank You for Your Response

I would evaluate the size of the PCOMs for a possible transcirculation deployment of a stent from P1 to contralateral P1.

Alternatively, one could place a Neuroform stent from the basilar to the left P1. Attempt to coil the aneurysm with a single stent. If a second stent was needed place a second Enterprise stent from the basilar to the right P1.

After coiling the basilar tip aneurysm, bring the patient back in 3 mo. If the aneurysm was recanalized add coils. If the aneurysm was stable and there was still filling of the dysplastic basilar tip-left P1, then consider placing a second stent within the first.

In dysplastic vessels as well as aneurysmal dissections, stent placement alone seems to allow the aneurysmal portion to either heal or thrombose.

Tricky case...the right answer always seems so clear retrospectively!

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Current status of Primary and Comprehensive Stroke Centers in the United States

by Darwin Ramirez-Abreu, MD; Susan W. Law, DO; Nazli Janjua, MD

Introduction to this Series on Comprehensive Stroke Centers

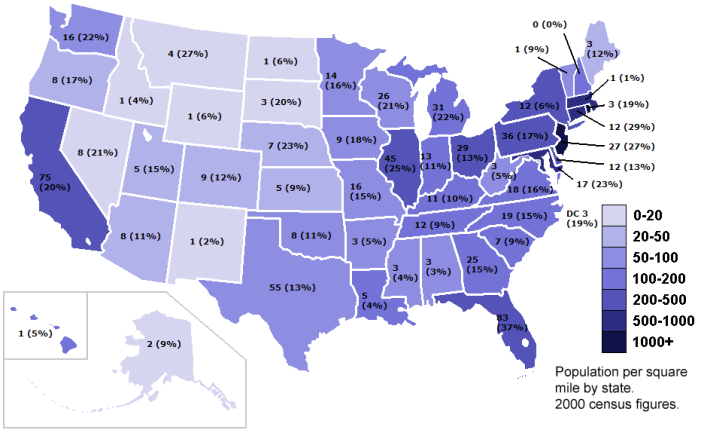
With ischemic stroke being the leading cause of disability in this country, it is not surprising that the majority of states have identified hospitals with capabilities of rendering emergent treatment to acute stroke patients, so called 'primary stroke centers.' Among other care standards, the delivery of systemic thrombolysis perhaps is the hallmark of these designated facilities. As endovascular treatments of stroke are gaining in understanding and acceptance in the medical community, more states are also now establishing criteria to distinguish hospitals capable of offering interventional therapy, so called 'comprehensive stroke centers.' As with the designation of primary stroke centers, this directs ambulances to take stroke victims within pre-defined time criteria, to these hospitals. Because of this direct clinical impact to patients and economic impact to hospitals, numerous entities including health care professionals, and hospital lobbyists, have voiced many opinions at the state legislative levels about the qualifications for these centers.

The SVIN Quarterly Newsletter staff is studying the criteria for primary and comprehensive stroke centers across the United States, by means of a survey, administered to state health directors as well as by studying the literature proposed by various stakeholder societies such as the American Heart Association, Joint Commission of Hospital Accreditation and the Brain Attack Coalition. In this first installment, the basic concepts surrounding primary and comprehensive stroke center definitions are discussed.

Definition of PSC and CSC

Currently there are several organizations with interest in acute stroke management in the United States. The Brain Attack Coalition (BAC) is a key entity in this. The BAC is a national, multidisciplinary group including members of the American Academy of Neurology, American Association of Neurological Surgeons, American College of Emergency Physicians, Centers for Disease Control and Prevention, etc. The BAC has defined two relevant concepts for acute stroke management: Primary Stroke Center (PSC) and Comprehensive Stroke Center (CSC), the details of which have been described in various peer reviewed journals (Mark et al, *Journal of the American Medical Association,* 2000 and Alberts et al, *Stroke,* 2005).

These articles define a Primary Stroke Center is an institution able to provide care for acute stroke though the combination of emergency medical services, emergency department, acute stroke teams, neuroimaging services, laboratory services, stroke unit, neurosurgical services within two hours, stroke center direction, written care protocols, continuing medical education and, outcome and quality improvement activities. In an oversimplification, a **PSC is a hospital capable of the safe administration of intravenous thrombolysis and to manage most intracranial hemorrhage cases**.



Number of stroke units designated by The Joint Commision by May 2010. In parenthesis, the percentage of hospitals in each state with stroke units [8]. Population density of each state is also shown [9].

CSCs, a more recent concept, must have representatives of vascular neurology, vascular neurosurgery, vascular surgery, diagnostic radiology/neuroradiology, critical care medicine, physical medicine and rehabilitation, swallow pathology, respiratory therapy, stroke nursing and advance practice nursing, as well as neuro-interventional services, this last component constituting the greatest distinguishing feature between a PSC and CSC. They should also have capabilities for magnetic resonance imaging (MR) with diffusion, MR angiogram (MRA), MR venogram (MRV), computed tomography angiogram (CTA), digital subtraction angiography (DSA), transcranial doppler (TCD), carotid duplex ultrasound and transesophageal echo.

Furthermore, CSCs should be able to perform carotid endarterectomy (CEA), clipping of intracranial aneurysms (IAs), placement of ventriculostomy, hematoma removal/draining, placement of intracranial pressure transducer, endovascular embolization of intracranial aneurysms or arteriovenous malformations (AVMs), intraarterial reperfusion therapy and endovascular treatment of vasospasm. In addition to all of the above, CSCs should have stroke unit, intensive care unit (ICU), operating room staffed 24/7 and interventional services coverage 24/7. Finally, part of the definition of CSC includes for them to have stroke registry, community education and prevention, and professional and patient education.

In summary, a **CSC is the healthcare center capable of managing every form of stroke or stroke-related complication.** The benefits of establishing PSCs and CSCs may be found elsewhere.

Alberts et al state in their BAC summary *Stroke* paper, patients with suspected acute stroke should be transported

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from the community to the closest PSCs or CSCs, avoiding first stops in non-stroke institutions. A mechanism to transfer patients expeditiously from PSCs to CSCs, when advance management is required, should also exist.

PSCs and CSCs at National Level

The Joint Commission (JC), formerly known as Commission on Accreditation of Healthcare Organizations, a private, non-profit organization, also operates accreditation programs whereby institutions may be accredited as a "hospital", "primary stroke center", "heart failure center", "emergency room", **"hospice care"**, etc. The status of program accreditation (mainly the "hospital" accreditation program) is sometimes used to determine Medicaid reimbursement to institutions.

The Joint Commission, in conjunction with the American Stroke Association (ASA), is the main entity that grants institutions with PSC accreditations at the national level. Even though this accreditation is based on the BAC definition of PSC, a sizable number of hospitals in the US provide acute stroke care compatible with the BAC definition but are not accredited by The Joint Commission. In other words, **the national number of PSC posted by The Joint Commission underestimates the actual number of "functional" PSC in the country** (Figure 1).

The lack of "primary stroke center" accreditation from the JC does not prevent hospitals from receiving reimbursement from acute stroke care management. On the contrary, greater cost may be required to achieve JC accreditation. Apart from potential gain in hospital image with JC PSC status, little incentive thus exists for hospitals to earn JC certification.

Figure 1 also shows the percentage of hospitals within every State that have PSC accreditation by the JC. Caution should be observed when interpreting these numbers. A higher percentage does not necessarily mean better access to PSCs in a particular State, mainly for two reasons: 1)The number of patients that may be managed by PSCs might vary considerably among them; and 2)a majority of PSCs in a given state might be clustered in one region, limiting the patients access in a different geographical region. This latter situation generally follows urban density, whereby the more sparsely populated areas, typically covering wider geographical distributions, face dilemmas of longer transport times between the field and stroke center.

The Healthcare Facilities Accreditation Program (HFAP), an independent institution analog to the JC, has accredited six hospitals in the US as primary stroke centers in six different states.

There are no institutions granting CSC certification or accreditation to hospitals at the national level, to our knowledge, hence **the number of healthcare centers functioning as CSC in the US is unknown.** Certain states, such as New Jersey and Florida, have developed methods for state designation of CSC or are in the process of doing so. None of the dozens of accreditation programs from the Joint Commission are an adequate surrogate marker for CSC. The fact that the neuroendovascular procedures in the U.S. are typically performed by three different medical branches (interventional neurology, interventional neuroradiology and endovascular neurosurgery) makes it challenging to estimate the number of CSCs in the US. A survey to estimate the national number of CSCs (or hospitals functioning as CSCs) is underway.

PSCs and CSCs at Regional level

There are five entities interested in improving stroke care at regional level (Figure 2), none of which certify or accredit hospitals as PSC or CSC: The NorthEast Cerebrovascular Consortium (NECC) for the States of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont; the Northwest Regional Stroke Network (NWRSN), for Alaska, Idaho, Montana, Oregon and Washington; the Tri-State Stroke Network (TSSN), for North Carolina, South Carolina and Georgia; the Great Lakes Regional Stroke Network (GLRSN), for Illinois, Indiana, Michigan, Minnesota, Ohio and Wisconsin; and the Delta States Stroke Network (DSSN), for Alabama, Arkansas, Louisiana, Mississippi and Tennessee. All of them are CDC-funded, except for the NECC, which is supported by the American Heart Association.

The NECC, established in 2006, has given major emphasis on the delivery of stroke care within the north eastern region, by detecting and addressing the disparities among hospitals. A summary of their initial regional assessment is available in the journal *Stroke* (Gropen et al, 2009;40).

PSCs and CSCs at State level

A few states have designated State-defined stroke centers: Connecticut, Florida, Massachusetts, New York and New Jersey. This fact will probably change soon, as more states might be interested in designating stroke centers at a regional level. All these state designations are based on the BAC criteria.

Connecticut has 19 State-designated and 12 JC-accredited PSCs (Figure 3). Florida has designated 122 PSCs (83 JC PSCs) and 17 CSCs.

Massachusetts uses the term Primary Stroke Services (PSS) hospital for PSC; there are 69 PSS and one JC PSC. New Jersey has a designated 40 PSCs (27 by JC) and 12 CSCs at State level).

New York State Department of Health (NYSDOH) has designated 121 stroke centers, contrasting with the only 12 JC-accredited centers, and with no differentiation between PSCs and CSCs (Figure 4). All of the NYSDOH-designated stroke centers are PSCs, and an unknown number of them are also CSCs.

Relevant Indices

In cases of acute stroke, one of the most important variables to consider is the average time from the onset of stroke signs and symptoms to treatment initiation. In acute ischemic stroke this has being referred as "drive time". A drive time of thirty minutes or less is usually considered optimal. It has being showed in studies that the majority of acute stroke mortality cases reached the hospital more than 30 minutes since the time of symptoms onset.

The analog concept of "onset to recanalization" time might be used in the context of endovascular reperfusion. The "readiness" of stroke centers, or volume of patients that each PSC or CSC is able to manage, might also be a relevant index to consider in the epidemiology of stroke care.

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Upcoming meetings:

7th Annual meeting of the Society of NeuroInterventional Surgery
Carlsbad, California
July 26-29, 2010

1st Practicum of the Society of Vascular and Interventional Neurology
Atlanta, Georgia
October 29-30, 2010.

Registration opens August 1, 2010.
Log onto www.svineuro.org
for more information

ESMINT Congress
Nice – France
Sept. 9-11, 2010
www.esmint.com

14th Congress of the Federation of Neurological Societies
Geneva, Switzerland
Sept 25-28, 2010
www.efns.org/efns2010

Selected Abstracts from the International Stroke Conference February 24-26, 2010 San Antonio, TX

by Ramy El Khoury, MD and Amit Kansara, MD

Intracranial Stenting is Associated With Higher Rates of Vessel Recanalization During Endovascular Therapy for Acute Ischemic Stroke

Cheng-Ching, et al looked retrospectively from 2006 until 2009 to compare recanalization rates between pharmacological and mechanical therapy in 12 centers. Among 841 patients treated within eight hours from symptom onset, successful recanalization was achieved in 66% of patients, with a symptomatic hemorrhage rate of 8.4%. Intravenous t-PA was administered to 37% of patients prior to IAT. Intra-arterial t-PA was given to 449(53%) patients, Merci retriever used in 503(60%) patients, Penumbra aspiration catheter in 99(12%) patients, glycoprotein IIb/IIIa antagonists 173(21%) patients, angioplasty in 212(25%) patients, and placement of an intracranial stent in 135(16%) patients. Intra-arterial thrombolytics and placement of an intracranial stent were independent predictors of successful recanalization, in whom successful recanalization occurred in 78% of patients treated with an intracranial stent without an increase in hemorrhagic complications.

General Anesthesia During Endovascular Therapy for Acute Stroke Intervention is Associated With Increased Mortality and Worse Clinical

Gupta, et al compared outcome of patients undergoing endovascular therapy (IAT) for acute ischemic who stroke receive either general anesthesia (GA) or conscious sedation (CS).

Eight hundred forty-one patients in 12 stroke centers underwent IAT for acute stroke between 2006 and 2009. GA was utilized in 40% of patients with a mean time to puncture of 295 +/-150 minutes from symptom onset and successful recanalization was achieved in 66% of patients. The overall mortality rate was 25% and 37% of patients achieved a good outcome. There were no differences in asymptomatic or sICH rates. GA during the procedure was an independent predictors of a poor outcome along with older age, higher admission NIHSS, unsuccessful recanalization, and sICH. Patient placed under GA for IAT had a significantly higher mortality rate compared to CS.

Safety of Drip-and-ship for Delivering Intra-arterial Therapy After IV tPA

El Khoury et al. compared outcome of patients from 2004 to 2008 treated with IV t-PA at outside hospitals transferred to local facility and then treated with IAT (OSH) and all patients directly treated with IV t-PA and then IAT at their local center (Inside Hospital – INH). One hundred forty-six patients were in the INH and 18 patients were in the OSH group. The mean age for patients was 63 in INH and 52 in OSH ($p < 0.05$). Median admission NIHSS was 18 in both groups. The time from last seen normal to intervention was significantly delayed in the OSH patients (339 min) compared with 272 min in INH ($p < 0.05$). There were 11 cases of sICH, 1 of them in the OSH group. LOS was similar between the two groups. The incidence of mRS≤1, mRS ≤2, early good outcome, recanalization, and death were not different. All patients from OSH underwent brain imaging prior to treatment at the receiving hospital.

Should Provision of Angioplasty for Cerebral Vasospasm Be a Mandatory Component for Hospitals Treating Patients With Subarachnoid Hemorrhage?

Khatri et al analyzed the data from Nationwide Inpatient Sample in the United States from 2002-2006, comparing various outcomes between hospitals performing angioplasty with those not performing angioplasty for subarachnoid hemorrhage related vasospasm. In-hospital mortality (primary outcome), discharge status, length of stay, and hospitalization cost were compared in multivariate model, adjusting for patients age, endovascular aneurysm obliteration, and disease severity. Of the 125,590 estimated patients with subarachnoid hemorrhage, 42% (n = 52816) were admitted to hospitals that perform angioplasty for cerebral vasospasm. A higher proportion of large volume, urban teaching hospitals were performing angioplasty ($p < 0.0001$). Hospitals performing angioplasty also had a significantly higher use of endovascular aneurysm obliteration (28% versus 6%, $p < 0.0001$). Patients admitted to hospitals performing angioplasty had a higher proportion of patients discharged home (58% versus 37%, $p < 0.0001$) and lower in-hospital mortality (21% versus 27%, $p < 0.0001$), but with longer hospitalization duration and cost.

Carotid Revascularization Endarterectomy versus Stenting Trial.

The CREST investigators randomly assigned patients with symptomatic or asymptomatic carotid stenosis to undergo carotid-artery stenting or carotid endarterectomy. The primary composite end point was stroke, myocardial infarction, or death from any cause during the periprocedural period or any ipsilateral stroke within 4 years after randomization. For 2502 patients over a median follow-up period of 2.5 years, there was no significant difference in the estimated 4-year rates of the primary end point between the stenting group and the endarterectomy group (7.2% and 6.8%, respectively). The 4-year rate of stroke or death was 6.4% with stenting and 4.7% with endarterectomy. Periprocedural rates for stroke (4.1% vs. 2.3%, $p = 0.01$) and myocardial infarction (1.1% vs. 2.3%, $p = 0.03$). After this period, the incidences of ipsilateral stroke with stenting and with endarterectomy were similarly low (2.0% and 2.4%, respectively; $p = 0.85$).

Selected Abstracts from the Annual Meeting of the American Academy of Neurology, April 10-17, 2010, Toronto, Canada

by Ramy El Khoury, MD and Amit Kansara, MD

Safety of Full Dose Intravenous rt-PA Followed by Intra-Arterial Therapy for Acute Cerebral Infarction

Nogueira et al reported safety of standard (0.9mg/Kg) IV t-PA dose followed by endovascular rescue therapy. One hundred-six patients were studied in whom the overall rate of symptomatic intracranial hemorrhage was 8.5% (9/106) and the 90-day mortality rate was 31%. The overall recanalization rate was 67.4%. The good outcome rate at 90 days was 24% (19/79 available datasets).

Safety of Elective Coiling of Cerebral Aneurysms Equal or Less Than 7mm: A Multicenter Analysis

Zaidat et al presented the retrospectively and prospectively collected data of elective coiling of aneurysm of less than 7 mm size. A total of 647 unruptured aneurysms with mean maximum diameter of 4.81mm (range 1.5-7mm) were treated in 587 patients. There were symptomatic hemorrhages in 0.8% (5/647), thrombo-embolic complications in 3.6% (23/647) of which 0.9% (6/647) were symptomatic. There was no procedure related mortality.

Comparison between Thrombolytic Bridging Therapy and Primary Endovascular Treatment in Acute Ischemic Stroke: A Multicenter Study

Miley et al compared two treatment options for treatment of acute ischemic stroke: Intravenous (IV) recombinant tissue plasminogen activator (rt-PA) followed by endovascular treatment; or primary endovascular treatment. Angiographic arterial recanalization was significantly higher in the combined therapy group compared with those receiving sole endovascular therapy (group B, 80.8% vs 41.8%; p = 0.0006), though with a trend towards lower rates of hemorrhage in group B.

Simulation in Neuro-interventional Training

by Mohamed Taleb, MD

The use of simulation has been used in other industries for the training and evaluation of various professional (air pilots, military personnel, engineers, etc). The use of simulators in endovascular training has been ongoing but not fully developed as part of all training program, though it is an occasional adjunct at professional meetings and a staple of courses for novel device training. As the need for diagnostic cerebral angiography diminishes with improving non-invasive modalities such as magnetic resonance angiography, simulator training may assume a greater role in neuro-interventional physician training.

Many divide simulation into two categories: computer based mathematical models and animal models. Both categories are beneficial techniques to reduce the harm to patients from new trainees, by offering safe introductory methods of instruction. They also afford methods for evaluating practitioners, as well for the development of new technology and its subsequent feasibility and safety testing. In addition simulation can be used for patient specific care such as flow modeling of aneurysm, which Dr. Putman discussed at the last SVIN meeting. He has published many papers on this topic including "Characterization of cerebral aneurysms for assessing risk of rupture by using patient-specific computational hemodynamics models" (*AJNR*, 2005).

Well recognized as a research tool, the utility of simulation in training programs is less appreciated. In academic surgical programs, it has been incorporated as an accepted and obligate tool of resident training. Chaer et al performed a randomized trial of simulation vs no-simulation training and evaluated the residents before and after training, finding enhancement in almost all of the individual measures of performance in the group that used simulation (*Annals of Surgery*, 2006).

Effects of simulator training on practitioners with various levels of experience have also been studied. Hsu et al showed improvement in both novice and advanced groups, though with greater improvement was in the novice group (*J Vascular Surgery*, 2004), supporting this as a tool for training.

In the neuroendovascular world, animal models and computer models have been used for years. Throughout the 1990's till now, groups at University of California at Los Angeles, UC San Diego, Massachusetts General Hospital, and George Mason University have published many works on both simulator types, including "Laboratory Simulations and Training in Endovascular Embolotherapy with a Swine Arteriovenous Malformation Model" (*AJNR*,1996) and "Hemodynamics of the central nervous system arteriovenous malformation nidus during particulate embolization: A computer model," (*AJNR*, 1991).

Though currently simulation is not the standard of training it holds potential *as an adjunct to standard training curricula* and should be considered in training neuro-interventional fellows in the 21st century as well as incorporating it as a research tool.

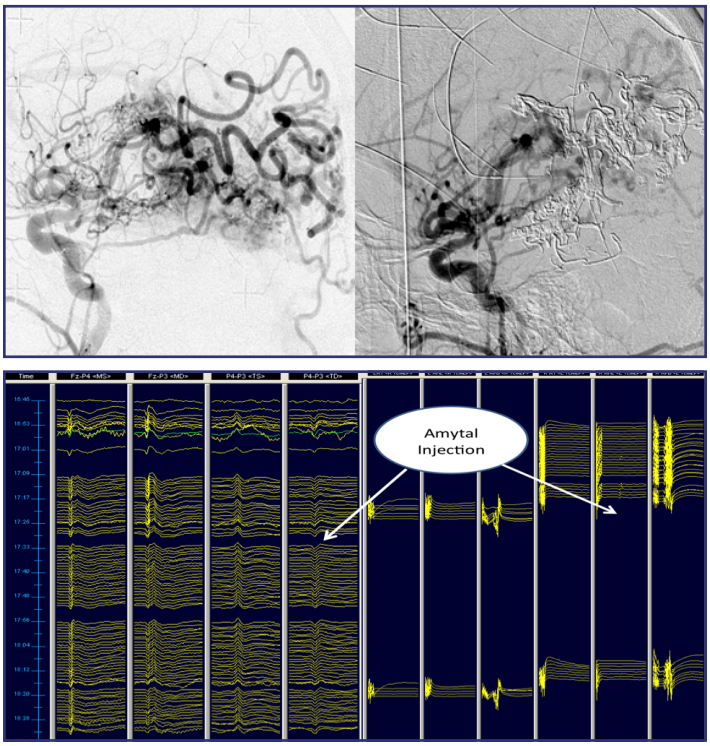
Neurophysiological Monitoring During Embolization of Arteriovenous Malformation.

by Parthasarathy Thirumala, MD,MS

Endovascular embolization of arteriovenous malformation (AVMs) may facilitate surgical removal of these highly challenging lesions. Treatment is not without risk and neurological deficits after the procedure (8-30%) have been reported and can cause significant disability. The risk of a neurological deficit is higher when the AVM is closer to an eloquent cortex in the brain and spinal cord. Generally AVM embolization is performed under general anesthesia, to permit navigation into distal vasculature with optimal visualization of these vessels. Additional methods for monitoring potential neurological vulnerability assume great importance, as the clinical examination is rendered obsolete.

Just as the treatment of unruptured AVMs themselves is undergoing much debate, the use of general anesthesia for neuro-endovascular procedures, particularly the treatment of acute ischemic stroke, has also received much attention in the scientific community lately, with several platform sessions devoted to this subject during the recent Society of Vascular and Interventional Neurology Annual Meeting in San Francisco, CA, January, 2010 as well as the International Stroke Conference in San Antonio, TX, February, 2010.

Neurophysiological monitoring (NM) using somatosensory evoked potentials (SSEP) , transcranial motor evoked potentials (TcMEPs), and brainstem auditory evoked potentials (BAEPs) can be used to predict and prevent post operative neurological deficits after interventional procedures such as aneurysm embolization. Similarly SSEPs, TcMEPs can be used before and during the procedure to reduce neurological deficits. Neurophysiological monitoring of AVMs involving eloquent cortex permits continuous monitoring of the patients neurological function, provides a guide to interventional procedure planning by the use of provocative testing, allowing more accurate risk assessment. The University of Pittsburgh Medical Center, which performs 100 interventions annually, of which many are for the treatment of brain AVMs, routinely utilizes SSEPs and TcMEPS for intra-procedural monitoring including provocative testing. Provocative testing is performed at this center to identify the functional eloquence of the territory of a catheterized vessel. Short acting barbiturates (e.g. sodium amytal) are injected intraarterially into the feeding artery after catheterization. SSEPs and TcMEPs are collected continuously during the procedure, especially before and after the injection of amytal. An immediate decrease in the amplitude of the cortical SSEPs responses by 50% and or loss of amplitude in the TcMEPs is considered as a positive provocative test (PPT, Figure 1). If the test is positive either the catheter is advanced more distally or other vessels chosen to embolize the AVM. Provocative testing and embolization can be performed as one procedure reducing the need for frequent endotracheal intubation and decreasing the length of hospitalization. Significant irreversible changes in SSEPs and TcMEPs responses will most likely result in disabling neurological deficit after the procedure. This information can be used to discuss with the family about the possible outcomes and post operative care.



Lateral view of right internal carotid artery angiogram demonstrates abnormal vascularity of AVM nidus (arrow) before and after embolization. Immediately below, the intraprocedural neurophysiologicial monitoring with SSEPs (left), TcMEPs (right) before and after injection of amytal during embolization of an AVM close to the motor cortex. No changes were seen and the AVM was safely embolized.

Neurophysiological monitoring can be a useful adjunct and increases safety of embolization of AVMs under general anesthesia. However, it cannot replace the careful analysis of the vascular anatomy. Limitations of the procedure include AVMs in the visual cortex and language areas in the brain which currently cannot be monitored under general anesthesia. Understanding the value of monitoring can reduce the disabling neurological deficits after the procedure.