



THE CORE

SVIN QUARTERLY NEWSLETTER

Volume 3, Number 3

September/October 2010

Society News

- The Society of Vascular and Interventional (SVIN) gears up for its first practicum, scheduled October 29-30, 2010, at the Georgia Tech Global Learning Center in Atlanta. The two day meeting includes program material for interventional neurology fellows. A limited number of travel and housing stipends will be offered to trainees.
- An executive board meeting will be held October 28, 2010 from 7-9 PM, before the scheduled program of the SVIN Practicum, at the Georgia Tech Learning Center Hotel, in Atlanta, Georgia.
- Selected members of SVIN board are reviewing the forthcoming American Heart Association guidelines paper on recommended metrics for Comprehensive Stroke Centers. Invitation to review and endorse the AHA paper represents an important step towards creation of scientific advisory statements and policy regarding CSCs, a key agenda item of the SVIN.
- The American Heart Association has accepted SVIN request to send society representatives to the task force on Comprehensive Stroke Center, working towards establishing standardized criteria for the designation of Comprehensive Stroke Centers and quality

assessments for care delivered and goals of therapy. As with other such multi-organizational initiatives, the CSC metric workgroup aims to develop a white paper summary statement.

- SVIN is launching international outreach initiatives to increase global society membership and visibility. Dr. Shakir Hussein (New Delhi, India) who has trained over 50 neurologists in diagnostic angiography and stroke will help launch a SVIN India chapter (see *SVIN Quarterly*, Vol. 1, No. 3, October, 2008). Dr. Hussein has hosted numerous annual practicums and conferences on stroke and interventional neurology with invitation accepted by Dr. Osama Zaidat most recently. Other SVIN board members have engaged in ongoing exchange between the US and India. In addition, Dr. Edgard Pereira will reach out to interested persons in Brazil for SVIN membership and to foster greater international participation in our society.
- SVIN executive board recently approved a 'seed grant' proposal which will provide limited start up funds for two novel research projects a year led by SVIN members in the areas of interventional neurology. The purpose of the grant is to continue to foster science and discovery in the field by independent research pursuits.

Science and Industry News

- Ev3, Inc. (Irvine, CA) is actively recruiting patients for the Researching AXIUM Coiling Experience and Recanalization (RACER) comparing occlusion rates and morbidity and mortality of patients treated with the Axium Progressive Coil System®. Unique properties of the coil include a fibrous lattice work at the distal end of the coil system, directly exposed in vivo upon coil deployment, designed to enhance endosaccular thrombosis and permit more breakage points and greater flexibility of coil deployment within aneurysms. A total of 125 patient are expected to be enrolled in this study which will be used for international regulatory submissions. Information available at www.clinicaltrials.gov (accessed 9/13/10).
- Machi et al. presented results of the initial Montpellier, France experience using the Solitaire FR™ (ev3, Irvine, CA) device for recanalization of occluded cerebral vasculature in acute ischemic stroke in 21 patients at the 7th annual meeting of the Society of NeuroInterventional Surgery, July 26-29 in Carlsbad, CA. They achieved successful racanalization (thrombolysis in myocardial infarction score of 3) in 19 patients (90.4%) with four reported adverse events (21%, two thromboembolic events and two intracranial hemorrhages). Selected centers in the United States are currently evaluating the device in a trial setting.
- Investigators from the University of California at Los Angeles presented animal data on a novel microcatheter based device designed for mechanical thrombectomy in the setting of acute ischemic stroke, The ReStore device (Reverse Medical, Irvine, CA). The device consists of a flexible guide catheter intended for more distal placement and coaxial stability and a microcatheter based attached stent filter within the distal end of the microcatheter. The microcatheter may also function as an infusion microcatheter for thrombolytics (and other agents).
- Results of the Clinical and Anatomic Results in the Treatment of Ruptured Intracranial Aneurysms (CLARITY) trial, comparing angiographic outcomes of endovascularly treated intracranial aneurysms

with bare platinum Guglielmi detachable coils (GDC) versus matrix bioactive coils, manufactured by Boston Scientific Corporation (Natick, MA,) were reported at the 7th Annual SNIS meeting. In this study of 782 patients, good angiographic treatment results according to the Montreal scale (defined as either complete occlusion or with only minimal neck filling) were found in both arms: complete occlusion, 49.1% versus 44.9% and 38.7% versus 45.7% (GDC versus matrix respectively).

- White, et al. reported the results of the HydroCoil Endovascular Aneurysm Occlusion and Packing Study (HELPS) at the 7th Annual

➔ continued on page 4

Inside this issue

President's Message	2
Editor's Corner.....	3
Neurologists Take the Lead	4
Interventional Pain Management	7
Selected Abstracts from the Society of Neurointerventional Surgery 7th Annual Meeting	9
X-configured Stent Assisted Coil for Complex Anterior Communicating Artery Aneurysm	12
Intracranial Stents for Neurovascular Intervention	13

Officers**President**

Osama O. Zaidat, MD, MS, szaidat@mcw.edu

Vice President

Dileep R. Yavagal, MD, DYavagal@med.miami.edu

Secretary

Tudor Jovin, MD, jovintg@upmc.edu

Treasurer

Rishi Gupta, MD, guptar@ccf.edu

Immediate Past President

Adnan I. Qureshi, MD

Executive Director

Jane Svinicki, director@svin.org

Executive Board

Alex Abou-Chebl, MD, Louisville, KY
 Andrei Alexandrov, MD, Birmingham, AL
 Arani Bose, MD, San Francisco, CA
 Randall Edgell, MD, St Louis, MO
 Rishi Gupta, MD, Nashville, TN
 Vallabh Janardhan, MD, Dallas, TX
 Nazli A. Janjua, MD, Brooklyn, NY
 Tudor Jovin, MD, Pittsburgh, PA
 Jawad F. Kimani, MD, Newark, NJ
 David Liebeskind, MD, Los Angeles, CA
 Italo Linfante, MD, Miami, FL
 Thanh Nguyen, MD, Boston, MA
 Raul G. Nogueira, MD, Boston, MA
 Edgard L. Pereira, MD, Louisville, KY
 Adnan I. Qureshi, MD, Minneapolis, MN
 Robert A. Taylor, MD, Minneapolis, MN
 Andrew R. Xavier, MD, Detroit, MI
 Dileep R. Yavagal, MD, Miami, FL
 Osama O. Zaidat, MD, MS, Milwaukee, WI

Newsletter Staff

Nazli A. Janjua, MD, Brooklyn, NY, Editor
 Ramy El-Khoury, MD, Houston, TX
 Amit Kansara, MD, Detroit, MI
 Susan Law, DO, Brooklyn, NY
 Thanh Nguyen, MD, Boston, MA
 Dhruvil Pandya, MD, Milwaukee, WI
 Darwin Ramirez-Abreu, MD, Brooklyn, NY
 Mohammed Taleb, MD, Phoenix, AZ
 Mohammed Taqi, Milwaukee, WI
 Parthasarathy Thirumala, MD, MS, Pittsburgh, PA
 Ambooj Tiwari, MD, Detroit, MI
 Andrew R. Xavier, MD, Detroit, MI
 Amirhossein Zangiabadi, MD, Philadelphia, PA

Copy Editor/Graphic Design

Jon Brunner, brunner@svinicki.com

Send comments or queries to Nazli Janjua at
NJanjua@chpnet.org

Copyright 2010 by the Society of Vascular
 and Interventional Neurology.

**Society of Vascular &
 Interventional Neurology**

6737 West Washington St, Suite 1300
 Milwaukee, WI 53214
 Phone: 414-389-8613 • Fax: 414-276-7704
 www.svin.org

President's Message: Past Accomplishments and Future Directions



Dear SVIN members; as we closing our fourth year as new and upcoming society, it would be prudent to overview the society's past and current contributions and future directions.

The society's primary responsibility remains our annual scientific meeting;

so far the SVIN had completed three successful meeting in Boston, MA; Miami FL, and the last meeting in San Francisco, CA in January 2010. The meeting featured international and national experts in the field of vascular and interventional neurology.

Other activities include involvement of Vascular Neurologists' as well as Interventionalists' voices involved in our credentialing committees and standards papers. The SVIN has published three standards papers so far; Ultrasound standards and general neurointerventional standards in Journal of Neuroimaging in conjunction with American Society of Neuroimaging, and Stroke Training Standards in conjunction with AAN, SNIS and AANS / cerebrovascular section, which have appeared in multiple journals. We are also involved with a Quality in Endovascular Therapy paper with SIR, SNIS and other societies.

The SVIN is also involved in carotid stenting center certification, these guidelines and criteria are devised by more than 10 societies to certify hospitals as Carotid Stenting Center by IAC (Intersocietal Accreditation Commission). One voting representative from SVIN on the board of directors for this accreditation is actively involved with the guidelines development.

The SVIN Research Consortium (SRC) completed the vertebral artery origin registry, which would represent the largest series and may lead to a prospective trial in the future by the SRC. The Endovascular Stroke SVIN supplement is submitted to Neurology green journal and will hopefully appear in the next 6 months.

Ongoing activities include efforts to incorporate the diagnostic angiography requirements within the vascular neurology fellowship in programs, which has been approved by neurology Residency Review Committee [RRC], preliminarily accepted by radiology RRC, and is pending neurosurgery RRC approval, the three constituencies involved in neuroendovascular postgraduate training under Accreditation of Graduate Medical Education (ACGME) regulations. This would mean that a neurology resident can complete the preliminary neuroimaging requirements with the stroke fellowship after which he may complete an additional; ACGME approved Endovascular Surgical Neuroradiology year. If this is approved, it would be the second achievement of SVIN with ACGME after the first lobby to permit wording allowing interventional neurologists to serve as program director.

We are looking forward to future activities with research, credentialing, and standards papers and ongoing successful annual meetings. This will be accomplished with every one's participation, dedication and volunteering time to the Newsletter, Website update, international committee and outreach, bylaws committee, and writing committees. We will touch in detail on each aspect of these strategic plan separately in future newsletter. Full commitment to the SVIN with time, creativity and effort is what got us here and we are looking forward for the new graduates to get involved and participate further.

The election is coming soon; this March we will an elect new officers, and we will consider in the upcoming meeting if we are ready for all general member votes or to continue for another term for board of director voting.

I would like to take this opportunity to welcome the newest board of director members: David Liebeskind and Andrei Alexandrov, well known vascular neurologists from California and Alabama respectively.

I would like to conclude by inviting you all to attend the First SVIN Practicum. This coming October 29 and 30th of 2010; we are looking forward to unique and different neurointerventional practicum, our first and challenging hands on and practical meeting. This would include live cases, flow models, and animal models with hands on experience to hopefully all attendees. This work shop would only be successful with your attendance and participation; please visit the SVIN website today for registration.

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

Upcoming Meetings:

**Vascular Interventional
 Advances (VIVA) 2010**

October 19-22, 2010

Aria at City Center Las Vegas
Las Vegas, NVInformation at www.VIVAPVD.com

**Catheter Lysis of Thromboembolic
 Stroke (CLOTS) Conference**

Sponsored by Society
of Interventional Radiology

October 24-26, 2010

Grand Hyatt DFW
Dallas, TXInformation at www.SIRweb.org

1st SVIN PRACTICUM

October 29-30, 2010

Georgia Tech Global Learning Center
Atlanta, GARegistration open, information at
www.svineuro.org

Editor's Corner – The Cost of Treating Stroke: Can Professional Society and Industry Work Together?

Neurologists directing interventional programs face standard difficulties of budgetary constraints familiar to all disciplines, as well as the additional complexities of dealing with budget and cost sharing across departmental lines, as the procedures themselves are often performed in radiology special procedures units with radiology technologist and nurse support staff, whose salaries may fall under a separate cost center. This leaves us accountable for a budget, not entirely under our direct control.

A typical stroke case may involve two to three thrombectomy devices, each costing upwards of \$2,500, in addition to thrombolytic drugs and other standard materials required for the procedure such as catheters, wires, tray equipment, etc, a grand tally which could well amount to \$10,000 per case. Beyond the actual acute stroke procedure, the supportive care of a critically ill patient requires added hospital costs of intensive care unit nursing, frequent neuroimaging, medications, and possibly additional procedures. In the state of New York, the average reimbursement for a diagnosis related group of ischemic stroke and mechanical thrombectomy, may amount up to \$40,000. However, for a complicated hospital course, this may ultimately not cover the overall hospital expenditure. Inflationary hospital costs and continually diminishing Medicare reimbursements, combined with Draconian policies of large private insurance companies to deny payment for endovascular revascularization acute stroke procedures, place the burden of cost directly on the health care provider.

The enormity of resources involved in the interventional procedure begs the question of possible cost containment of procedural costs. An average case may utilize two stroke device systems and a variety of microwires, guide catheters, and guide wires. The procedure itself may last a few hours which in some instances may require anesthesia, in addition to room time and on-call time for support staff. Similarly, for the treatment of a patient with subarachnoid hemorrhage, an embolization procedure to prevent further rerupture may utilize multiple coils and possibly assistive devices such as stents or balloons, in addition to standard interventional materials. Each coil may vary in prices from \$900-almost \$2,000. Reimbursement for the case occurs en masse, rarely accounting for the individual line item expense. A variety of 'bioactive coils' are available on the market, at prices for the most part, much greater than bare platinum coils, (despite the fact that no scientific evidence to date has shown a benefit with these coils).

The neurovascular market of coils, balloons, and stents designed for the cerebrovasculature represents a small portion of the overall endovascular industry, making it difficult to lower costs of the products, considered niche industry. Indeed the stakes are high for the indications these devices exist, but with so few procedures being performed nationally and internationally, in comparison with comparable cardiac or peripheral interventional markets, the production costs cannot be curtailed. Accordingly, movement of technology from company to company and flux of smaller start-up companies to larger parent enterprises occurs frequently.

Recent mergers of neurovascular device markets include

Micrus, Corp (San Jose, CA) and Codman Neurovascular (Raynham, MA), a subsidiary of Johnson and Johnson (New Brunswick, NJ) as well as the potential merger between ev3, Inc (Irvine, CA), and Covidien (Mansfield, MA). Larger parent companies may help absorb costs of smaller divisions. Optimistically, these huge conglomerates could lower costs of devices and also partner with physician advocacy groups such as SVIN to help increase hospital reimbursement commensurate to care. Whereas regulatory process exists for the development and approval of such orphan technology, by way of the Humanitarian Use Device stipulation, little regulation exists to control pricing. Currently the benchmark of cost is left to the manufacturer which may run the risk of few market controlling companies, given these continued mergers taking places.

The merger between Micrus and Codman combines the current technologies of the one of the most rapidly growing fractions in the overall neurovascular coil market share with the most rapidly growing of the currently available adjunct aneurysm embolization support stents. Similarly, Covidien's absorption of ev3, Inc yields for the surgical supply company one of the most promising agents in vascular malformation treatment, which is finding application beyond its intended original purpose of brain arteriovenous malformations, to aortic endograft leaks.

During the final year of training, at the Boston Scientific annual fellows' symposium in San Francisco, CA, soon to be attending interventionalists witness first-hand the process of neurovascular coil manufacture, astoundingly incorporating hand-made elements to final device shaping. As a senior neuro-endovascular fellow, on the same trip as this fellows' symposium, I took a detour to Mountainview, CA, where the staff in the then single floor headquarters of Concentric Medical, Corp. allowed me one-on-one time in their lab for in vivo training with the Merci Concentric Retriever. I have not met a counterpart graduate of a cardiology or other training program who can speak of a similar story of such an insider, yet informal, experience at a major device company. The rare opportunity of these fellows programs exemplifies the uniqueness of our field. With such a relatively small scale of market, the atmosphere between trainee and manufacturer is extraordinarily personal, for the vast scope of health care, and the element of human touch which goes into the design of these devices is unimaginable. Yet the epidemiology and morbidity rates of the diseases in question are sobering.

Many peer scientific groups hold themselves aloft from issues of industry and reimbursement. However, perhaps a key function of our society, one of many interventional specialty focus groups, should be to foster new collaboration with industry such that we may lobby on the same side for issues of more affordable health care to the patient and hospital. Conference practicums are one such venue of collaboration, whereby companies help support platforms for learning and academic exchange. Ideally what may be the first of a recurring SVIN meeting, will be a springboard for future alliance between our professional group and industry towards the cause of rendering health care more accessible and affordable for those in need.

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

Neurologists Take the Lead

by Nazli Janjua, MD

Interventional neurologists arise from a background of vascular neurology, training offered either in stroke/cerebrovascular or critical care neurology fellowships. In practice settings, both vascular neurology disciplines often take a back seat to physician leaders from other medicine disciplines. Many stroke related treatments and disease principles draw from lessons in cardiology, reflected in the offshoot of the American Heart Association, the American Stroke Association and its gargantuan and paramount International Stroke Conference. Similarly, because of the shortage of neurointensivists and the relative recency of a formalized training pathway, most intensive care units (ICUs) offering specialty care of neurologically ill patients, are led by pulmonologists or other members of other disciplines.

Recently, neurologists are changing this landscape. Dr. Thomas Bleck, Neurological Sciences, Neurosurgery, Medicine, and Anesthesiology, and Assistant Dean, Rush Medical College at Rush University Medical Center, in Chicago, IL, and first president of the Neurocritical Care Society, serves in a newly created role as Associate Chief Medical Officer of Critical Care at Rush University Medical Center, overseeing a broader group of intensivists from the disciplines of Pulmonary/Critical Care Medicine, Anesthesiology, Pediatrics, and Emergency Medicine. Dr. Ralph Sacco, Professor and Chairman of the Department of Neurology, University of Miami School of Medicine, named the President of the American Heart Association in July 2010, the first neurologist to do so, will hold this role till June 2011. Both distinguished physicians graciously participated in a private interview for the SVIN Quarterly Newsletter.

Pioneer in Critical Care, Neurointensivist, Dr. Thomas Bleck

Dr. Bleck completed residency training both in neurology and internal medicine at Rush University Medical Center. After finishing an epilepsy fellowship in 1983, he remained on faculty at Rush Medical College in neurology and medicine, where he had the opportunity to work with Roger Bone, "one of the major figures of critical care medicine in the latter part of the 20th century," he described.

From Rush he moved to University of Virginia in 1990 to start the neurology/neurosurgery ICU there, at a time of infancy in the field of Neurocritical Care. Like the handful of founders of the

field, development of a neuroICU under his directorship was a combination of an incidental chain of events arising out of elemental issues of hospital organization and architecture, exceptional need for expert care of a highly specific and challenging subpopulation of patients, and utilization of an unusual and unique set of skill sets traversing the most demanding areas of internal medicine and neurology.

"At that time, it was the fourth such unit in the country, after MGH, Columbia, and Hopkins."

After completing a long tenure in Virginia, in 2006, Dr. Bleck moved to Evanston Northwestern Healthcare, (later named the North Shore University Health System in Evanston, IL, becoming affiliated with the University of Chicago, after Dr. Bleck's departure), "a major teaching hospital of the Northwestern University Feinberg School of Medicine at the time I worked there," he stated. "I was professor of neurology, neurosurgery, and medicine, and vice-chairman of neurology for academic programs, at Northwestern during that time."

At Rush, before Dr. Bleck's appointment, the neuro-ICU had intermittently been in existence since 1996. "The current one was started about three years ago by Richard Temes, who came here after his fellowship at Columbia. He is presently the research director of the unit; Sayona John is the clinical director, and Pratik Patel is the fellowship director."

Dr. Bleck spoke about the breakdown of ICU services at Rush and more specifically about the Neuro-ICU. "Currently there are 17 ICU beds and four stepdown beds, but we are chronically short of space. In November we will eliminate the stepdown and have 17 ICU beds on one floor and eight ICU beds on another floor. The attendings are all intensivists. The model is closed except for an occasional brain tumor or complex spine patient, admitted under their surgeons' names, although the intensivists care for them as well."



Dr Thomas Bleck,
photographed 2006

⇒ continued on page 5

⇒ Science and Industry News continued from page 1

SNIS meeting July, 2010 in Carlsbad, CA. Though there was a trend in favor of HydroCoils, manufactured by Microvention, Inc (Tustin, CA), overall low rates of remnant/recurrence rates occurred in both arms which were not statistically different (2.9% recurrence for HydroCoils versus 3.6% for bare platinum coils).

⇒ Molyneux et al., presented preliminary data and trial design methodology at the 7th Annual SNIS meeting of a randomized trial comparing angiographic results and recurrence of treated aneurysms using either bioactive Cerecyte® (manufactured by Micrus, Inc., San Jose, CA) or GDC coils as well as clinical events and outcomes based on coil type for ruptured and unruptured aneurysms. Five hundred patients in 23 centers were randomized. Primary end-point is based on angiographic data obtained at 6 months with additional data being obtained at 12-24 months. Final results are forthcoming.

⇒ Concentric-medical, Corp. (Mountain View, CA) offers potential reimbursement for the Merci Concentric Retriever™ via their 1-2-3 incentive program. According to this program, based on data that up to and as many as three passes with the Merci Retriever device appears to offer greater rates of recanalization, and that device labeling is for two passes per device, if the Merci Retriever is the initial device employed in an acute stroke case, and two devices are utilized though with achieving recanalization, Concentric will reimburse the hospital for the cost of the second device. Documentation is required and cases must meet criteria for eligibility. Users are encouraged to check with their local area sales representative for further information.

⇒ continued from page 4

There are three full-time neurointensivists (with a fourth joining in October); in addition, there is an intensivist who is also trained in internal medicine and anesthesiology who attends 12 weeks a year in the neuroICU (his only critical care time), and I attend about eight weeks a year. Currently there are two attendings on all the time; one for the 17 bed ICU, and the other who covers the stepdown, consults as a neurointensivist for other ICUs, and patients receiving hypothermia after cardiac arrest who are in other units. When the second neuroICU will open later this year, it will have its own attending, and the other responsibilities of the current stepdown attending will be reassigned. I round intermittently in all of the ICUs, both to teach and to stay in touch with what actually goes on."

Apart from the duties of directing the overall ICU services, "There is another responsibility: covering calls from physicians at other hospitals who need to transfer patients or need advice. This is shared among the intensivists at present, but will soon have its own schedule.

Because of his pioneering in Neurocritical Care, he was chosen as the newly formed Neurocritical Care Society's first president, serving in this capacity from 2003-2005. In his presidential address, he poignantly gave an account of the original pioneers in Neurocritical Care, caring for polio victims in the days of the iron lung. This fact surprises many who forget the early history in the current day of medical intensivist led ICUs, and a still poor representation of neurologists as primary care providers of neurologically critically ill patients.

Nationwide shortages of neurointensivists often necessitate collaboration in many units with anesthesia, pulmonary-critical care medicine/neurosurgery. etc., similarly seen at Rush. "There are not enough attendings in several of the units here, not just neuro; we are trying to hire more in several areas. With the new faculty member joining this fall, neuro will be in reasonable shape for a while. All academic neuroICUs need strongly consider training fellows to help with the shortage of intensivists."

Though Dr. Bleck's role as CMO of CCS may reflect neurologists' ability to assume leadership roles in this capacity, he qualifies broad assumptions. "I'm not sure that any generalizations are warranted. I was a student and house officer here, so I was a relatively known quantity before returning. In addition, I'm a general internist and medical intensivist, which may have eased my path here for five or ten minutes. I think that neurointensivists are well qualified for broader leadership roles, but since the field is so young most are still involved with building their own units and careers."

As for the burgeoning field of interventional neurology, though many interventional neurologists may be trained in Neurocritical care, many endovascular specialists may hail from backgrounds of radiology or neurosurgery. In such instances, they admit under their own names but rely on the expert care of neurointensivists to manage their patients in the postoperative phase. At Rush,



Thomas P. Bleck, MD, FCCM Professor of Neurological Sciences, Neurosurgery, Medicine, and Anesthesiology, and Assistant Dean, Rush Medical College; and Associate Chief Medical Officer (Critical Care) Rush University Medical Center circa 1974

"Interventional work is shared between an interventional trained vascular neurosurgeon and an interventional trained vascular neurologist. We meet weekly to discuss cases, and the ICU attending and the interventionalists work together to plan the cases and manage the patients.

Ground Breaking Vascular Neurologist, Dr. Ralph Sacco

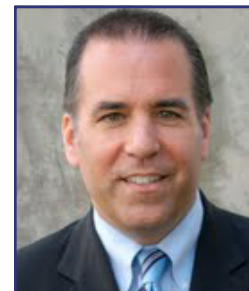
Still considered the largest peer conferences in the field of vascular neurology, the International Stroke Conference is one of the major scientific meeting programs of the American Stroke Association (ASA) a division of the American Heart Association (AHA), which itself is the greatest source of funding to stroke related research after the federal government.

Well known in the areas of public health and stroke research, Dr. Sacco has volunteered for the AHA for over 20 years and is well acknowledged nationally and internationally for epidemiological work related to stroke risk, and thus an obvious choice for this position. In addition it highlights the AHA's commitment to conquering stroke. Dr. Sacco describes the importance of stroke research in the AHA, "stroke is front and

center, occupying all parts of the AHA. In the old days we used to say that the ASA [American Stroke Association] is a division of the AHA, but stroke is very integrated in the AHA's [overall] strategic plan. The AHA mission statement is 'Building healthier lives, free of cardiovascular disease and stroke' and the current strategic plan is centered around improving health and prevention. The AHA is very committee driven and a collaborative organization. I may chair the Science Advisory Coordinating Committee but many other people from different councils sit on this."

The AHA consists of 22 million voluntary and paid staff. After completing his 1 year tenure as president, he will serve as immediate past president. Asked to comment on his new role, supervising other health care professionals from non-neurology fields, Dr. Sacco stated, "Other people provide input. Every Monday there is the President's Call that includes the president, president elect and past president, chief executive officer, chief science officer, and chief mission officer, and often the legal counselor mission. Cardiologists will be happy to know that I am surrounded by 2 cardiologists. The past-president, Clyde Yancy, is a heart failure specialist, and the president-elect, Gordon Tomaselli is a cardiac electrophysiology specialist from Hopkins." Though Dr. Sacco also clarified, "the AHA is not just cardiologists and neurologists, there are members that deal with peripheral vascular disease, surgery, radiology, hypertension, basic scientists, nutritionists, epidemiologists, and geneticists.

"We, neurologists, are trained in how the brain works. There will always be the need for more multidisciplinary perspectives. We always learn much more when we have people with different backgrounds working together on committees. We have



Dr. Ralph Sacco, Professor and Chairman, Department of Neurology, University of Miami School of Medicine, First Neurologist President of the American Heart Association, 2010-2011

Photo courtesy of Jessica Busquets Miami, FL.

⇒ continued on page 6

⇒ continued from page 5

behavioral scientists, dieticians, nutritionists. We're bringing behavioral modification front and center. Guidelines just came out supporting modifying what actually works when it comes to counseling, reminder systems, and remediation. That is behind the frame shift in the new 2020 goal to focus away from more negative reinforcement (reducing risk factors) to positive reinforcement (improving health factors: diet and exercise)."¹

To this end, the field of cardiology has also gained from lessons in stroke care, as Dr. Sacco described, "One area where the cardiac world learned from the stroke world is in the 'systems of care' model which led to the mission lifeline initiative and taking the approach to acute MI. We had found that within each center, care was well organized but not organized from a system approach from EMS to hospital to post-acute stroke care in the chain of survival."

In discussing the differences and similarities between stroke treatments and insights and those pertaining to acute MI, Dr. Sacco stated, "The overlap is more in the preventative approaches to stroke and cardiovascular disease. We differ as we go further along the spectrum of tertiary care-when a stroke or MI [myocardial infarction] has already occurred. We share in the types of medications we may choose to prevent a recurrence, but differ in our approaches to acute interventions."

As for endovascular treatments of stroke, of particular interest to neuro-interventionalists, one area of similarity between acute stroke treatment and MI is transcatheter intervention, whereby in the cardiac literature, PCI is superior to thrombolysis for ST elevation MI, but has yet to be proven for large vessel cerebrovascular occlusion. The recommendation of the AHA, "involves the issue of opinion versus evidence and the evidence continues to accumulate [for intervention]. The AHA makes recommendations when the weight of evidence is in favor of the intervention. Right now it's not class I status for intervention," says Dr. Sacco.

Dr. Sacco originally previously served on the board of the AHA, as chair of the stroke advisory committee of the ASA. "The ASA is a separate division in terms of some support staff and volunteers. They have different needs and constituencies that require specific attention such as a stroke advisory committee. However, stroke is integrated into the strategic plan and fabric of the entire organization from mission to 2020 goal." In addition to the ASA chair, other AHA board members include the various coordinating committee chairs, and affiliate heads.

"I have [tried to make sure] that stroke people are on all these committees, [whose representation] has slowly been improving." Of the 22 board members, Dr. Larry Goldstein from the mid Atlantic Affiliate and the former chair of the Advocacy Coordinating committee, and Dr. Sacco are the two stroke neurologists. Conversely, Dr Sacco states, "for the first time, a non-neurologist, who is a strong stroke advocate, is chairing the ASA advisory committee. He comes from a marketing/advertising background. This reflects a push towards improving awareness of stroke, which still suffers because people don't recognize signs and don't think about it as much as they think about heart disease."

The AHA partners with many other organizations in its work towards health related goals, including the American College of Cardiology [ACC]. In addition, "We partnered with BAC [Brain

2010 Goals of the AHA

IMPACT GOAL: By 2010, to reduce coronary heart disease, stroke and risk by 25 percent.

Indicators:

- Reduced death rate from coronary heart disease and stroke by 25 percent
- Reduced prevalence of smoking, high blood cholesterol, and physical inactivity by 25 percent
- Reduced rate of uncontrolled high blood pressure by 25 percent
- Elimination of the growth of overweight and diabetes

Attack Coalition] to define primary stroke centers, then worked with the Joint Commission [JC] to work out a stroke certification program. We're now working on comprehensive stroke center criteria and other new hospital certification programs. We've done some geographic mapping initiatives to assess what population is covered by stroke centers. Currently 85% of the US population is within 1 hour of a GWTG [Get With the Guidelines] stroke center and only 81% are within 1 hour of a JC certified PSC. So that means 15-20% of the population is without PSC within 1 hour's distance. One way the AHA is looking into impacting that is by telemedicine services, regionalization of stroke care, and networking stroke hub/spoke centers," says Dr. Sacco.

Certain key differences between the AHA and other advocacy physician organizations such as the American Academy of Neurology (AAN), distinguish the work of these societies, which have many shared interests. "AAN focuses more on policy issues with direct impact to the profession of neurology and AHA is more public/patient concerned. For example, AHA does not get involved in issues of reimbursement with CMS unless it impacts delivery of care such as with acute stroke care or preventive services. We should be thinking about partnerships with different organization such as cancer and diabetes and are also arranging a summit between the AHA and AAN. We have a close working relationship with ACC. Maybe in the future there will even be the same collaboration between AHA and SVIN."

Potential role for interventional neurologists to serve on the AHA board exists. "Interventional cardiologists, I assume sat on board in past and definitely SACC [Science Advisory Coordinating Committee]. We would welcome interventional neurologists as candidate for the board. When we look to populate committees we look at people who are members, and particularly fellows of the AHA. We encourage interested people to join locally in the regional or affiliate programs and serve on those boards and committees then perhaps move up to the national committees."

On a practice related issue, regarding the interactions between multiple disciplines in the area of interventional neurology, in his own institution, the University of Miami, Dr. Sacco stated, "The biggest issue boils down to financial considerations. I strongly believe in partnerships, having neurology, neurosurgery, and radiology at the table to get combined governance, sharing of revenue and liability in a collaborative manner. Service line approaches may help break down barriers and encourage shared governance instead of traditional department approaches."

¹ 2020 goal of the AHA: "Improve cardiovascular health of all Americans by 20% and reduce cardiovascular mortality by 20%"

Interventional Pain Management

by Darwin Ramirez-Abreu, MD

Interventional Pain management, the practice devoted to the treatment of acute and chronic pain through minimally invasive procedures, includes interventions performed under fluoroscopic guidance. Interventional pain procedures, such as acupuncture, epidural injections, vertebroplasty and spinal cord stimulation (see table, at end) are additional tools in the management of pain. Other aspects of Pain Medicine include drug therapy, behavioral modification/psychotherapy, physical therapy and surgical procedures. Generally, interventional treatment may be considered as first or second line therapy, with differing levels of scientific evidence supporting the various procedures. Many interventional neurologists include spine intervention in their practice, though broader interventional pain practice may be more limited.

Most comprehensive pain centers in the US emphasize the multidisciplinary management of pain, by professionals with expertise in interventional pain medicine, along with specialists in non-interventional pain medicine, anesthesiology, gynecology, mental health/psychiatry, neurology, neurosurgery, oncology, orthopedics, palliative Care/hospice medicine, pharmacology, psychiatry, radiology, rheumatology and others. The scope of interventional pain specialists includes perioperative, neuropathic, cancer and pediatric pain. Pain specialists may have inpatient, outpatient or combined practices.

Training

There are 92 Pain Medicine fellowships in the US accredited by the Accreditation Council for Graduate Medical Education (ACGME). The Pain Medicine fellowship was first recognized by the ACGME in 1998 and is usually of one year duration. Fellowship includes training in either interventional or non-interventional pain management (one program, Beth Israel Medical Center in New York, NY offers a combined track.). As prerequisite physicians must have training in Anesthesiology, Child Neurology, Neurology, Physical Medicine and Rehabilitation, or Psychiatry. Currently, the majority of Pain medicine physicians are Anesthesiologists, and some programs exclusively accept anesthesiology-trained physicians.

Physicians may obtain training in certain interventional procedures during other fellowships such as Headache medicine (e.g. occipital botulinum toxin injection), Interventional Radiology (vertebroplasty/kyphoplasty and other procedures), Neuromuscular medicine (peripheral nerve blocks), Palliative care/Hospice medicine, Regional Anesthesia, Spine medicine, Sports medicine, etc. Multiple institutions across the country offer courses and continuing medical education (CME) credit courses in Pain medicine.

Certification

The American Board of Anesthesiology (ABA), American Board of Psychiatry & Neurology (ABPN) and American Board of Physical Medicine & Rehabilitation (ABPMR) offer examinations in Pain medicine to physicians in their respective specialties who completed fellowship training in an ACGME program. These boards are part of the American Board of Medical Specialties (ABMS).

The American Board of Interventional Pain Physicians (ABIPP), a non-ABMS organization, offers an examination to concede a Diploma/Board certification in Pain medicine after completion of an ACGME approved Pain medicine fellowship, for graduates from neurology, anesthesiology, psychiatry, or psychiatry/rehabilitation residencies. Physicians not trained in an ACGME Pain medicine fellowship may sit for this exam after (1) board certification by ABA, ABPMR or ABPN, (2) practicing Pain medicine for 50% or more of the time for at least 6 years, plus (3) completion of 300 hours of CME credits by the ABIPP or the American Society of Interventional Pain Physicians (ASIPP).

The American Board of Pain Medicine (ABPM), also a non-ABMS institution, will similarly offer a Board certification exam to physicians who have completed an ACGME-certified program in Pain medicine. Alternatively, physicians not trained in an ACGME Pain medicine fellowship may sit to this exam after (1) board certification by ABA, ABPMR or ABPN, (2) practicing Pain medicine for at least 18 months of the last 36 months, plus (3) completion of 50 hours of CME credits in Pain medicine.

In the United States, the World's Institute of Pain (WIP) offers a title in Fellow of Interventional Pain practice (FIPP) after successful completion of an examination for physicians certified by the ABPM. These requirements vary in other countries.

Selected references of interest and sources pertaining to Interventional Pain as well as Interventional Pain procedures listed in accompanying tables on page 8.

⇒ continued from page 7

Leading peer reviewed scientific journals in the field of Interventional Pain medicine include:

Selected Journals in Pain Medicine

Journal	Professional Society	Impact factor
Pain	International Association for the Study of Pain (IASP)	5.371
Molecular pain	None	4.19
Regional Anesthesia and Pain Medicine	American Society of Regional Anesthesia and Pain Medicine	4.157
The Journal of Pain	American Pain Society (APS)	3.778
European Journal of Pain	European Federation of the International Association for the Study of Pain chapters (EFIC)	3.612
The Clinical Journal of Pain	Eastern Pain Association (of the American Pain Society)	3.005
Journal of Pain and Symptom Management	American Academy of Hospice and Palliative Medicine, the National Hospice and Palliative Care Organization and the US Cancer Pain Relief Committee	2.423
Pain Medicine	American Academy of Pain Medicine (AAPM)	2.393
Journal of Headache and Pain	Journal of European Headache Federation	2.137
Pain Physician	American Society of Interventional Pain Physicians (ASIPP)	NS
Pain Practice	World's Institute of Pain (WIP)	NS
Pain Research and Management	Canadian Pain Society	NS

Other resources

- University of Michigan's Back and Pain Center procedure videos: <http://www.med.umich.edu/anes/pain/procedures/procedures.htm>
- Other institutions: American Academy of Pain Management, American Chronic Pain Association, American Pain Association, International Spinal Interventional Society, The American Association of Allied Pain Management Professionals, The Society of Interventional Pain Management Surgery Centers.

Selected procedures in Pain medicine (Listed Alphabetically)

Acupuncture	Medial branch nerve block
Botulinum toxin injection	Nerve root block
Cryotherapy (cryoablation/cryoneurolysis)	Peripheral joint injection (hip, knee, shoulder, etc)
Discal nucleoplasty	Peripheral nerve blocks (intercostals, occipital, sphenopalatine, supraorbital, etc)
Discography	Peripheral nerve stimulator
Epidural blood patch	Radiofrequency ablation
Epidural injection (caudal, interlaminar and transforaminal)	Regional stimulating catheter
Epidural neuroplasty and adhesiolysis	Sacroiliac joint blocks
Facet joint injection	Spinal cord stimulation management
Gasserian ganglion block	Sympathetic nerve/ganglion block (celiac, hypogastric, impar, lumbar, stellate, thoracic)
Intradiscal electrothermal therapy (IDET)	Transcutaneous electrical nerve stimulation (TENS)
Intrathecal drug delivery	Trigger point injection
Intravenous lidocaine infusion	Vertebroplasty and Kyphoplasty

Selected Abstracts from the Society of Neurointerventional Surgery 7th Annual Meeting July 26-30, 2010 • Carlsbad, California

by Amirhossein Zangiabadi, MD

For Unruptured Cerebral Aneurysm, Clinical Outcome is Better With Balloon Assisted Coiling than Stent Assisted Coiling in ECOSA Multicenter Study.

Owais et al. evaluated technical and procedural outcome of Embolization of Small (< 7mm) Unruptured Cerebral Aneurysm (ECOSA) on 351 patients treated with either balloon (n = 247) or stent (n = 104) assisted coiling. The mean age in the stent group was 55.6 ± 11 versus 53.5 ± 12.5 for the balloon group (p value = 0.06). Mean size of the aneurysm in the stent group was $5 \text{ mm} \pm 1.2 \text{ mm}$ versus $4.6 \pm 1.2 \text{ mm}$ for the balloon (p = 0.003). Overall events rates of all thromboembolic events and rupture complications were 1.6% for the balloon vs. 4.2% for stent group (p = 0.02). Larger prospective studies are needed to confirm these results. The authors did not report clinical outcomes from procedural events in this study.

Intra-arterial Nicardipine Through Guide Catheter is an Effective and Safe Treatment for Cerebral Vasospasm Following Subarachnoid Hemorrhage

Pandey et al. described a new method of treatment of vasospasm with slow infusion of Intra-Arterial Nicardipine (IAN) from a cervical guide catheter. They treated 27 patients with symptomatic vasospasm following subarachnoid hemorrhage over three years. IAN was infused at a starting rate of 20mg/hr for 30-60min. The doses were calibrated to maintain mean arterial pressure above 90 mmHg, with mean doses per session of 19.2 mg (5-50 mg) and mean doses per treated vessel of 12.8 mg (5-30 mg). Outcomes were evaluated using Glasgow Outcome Scales (GOS). A total of 27 patients, (mean age 49.8 years) with Hunt and Hess grades of II (n = 6), III (n = 15) and IV (n = 6) and Fisher grades of III (n = 26) and IV (n = 1) received IAN on average at a mean post-hemorrhage date of 7.2 days. In addition, 12 patients received multiple IAN treatments (2-5 treatments) and four patients underwent adjunctive angioplasty for severe vasospasm. Overall, 17 patients (62.9%) patients had good outcome (GOS 4, 5) at discharge while 11 patients had poor outcome and one patient died. Follow up was available for 19 patients, of whom 18 reported good outcomes (GOS 4, 5), though the authors did not specify duration of the follow-up period.

Percutaneous Transluminal Angioplasty and IA Verapamil Are Safe With a Very Low Complication Rate for Treatment of Medically Refractory Cerebral Vasospasm Following Aneurysmal Subarachnoid Hemorrhage

Hetts et al. examined the charts of 546 patients admitted with subarachnoid hemorrhage (SAH) from July 2003 to January 2008. 231 (42%) developed symptomatic cerebral vasospasm (CV) and 189 patients (35% required endovascular Therapy. A total of 346 endovascular sessions (1 single angioplasty, 286 IA Verapamil infusions and 59 combined therapies) were performed. IA Verapamil doses ranged from 2.0 to 30.0 mg per vessel segment and 3.0 to 55.0 mg per treatment session. Repeat treatments were necessary in 182 patients (96%) for persistent, recurrent or worsening CV. No deaths were attributable to endovascular therapy. Sixteen patients died from causes related to SAH while three died from other medical complications. At follow-up, 115 patients (61%) had a good outcome and 55 patients (29%) had a poor outcome. Further studies are required to determine appropriate patient selection and treatment efficacy.

The Use of Balloon Mounted Stents (BMS) is Associated With Lower Risk of Restenosis Rates Compared to Self-Expanding Stents (SES) for Intracranial Atherosclerotic Disease (ICAD)

Hussain et al. examined the results on stent placement in ICAD on 259 patients (mean age 61 ± 13) from three academic centers between 2006 and 2009. These cases (stroke, 68% and TIA, 32%) either treated with BMS (31%) or SES (69%). The data on percent stenosis prior to treatment and after treatment, lesion classification with the Mori scale, if the treatment was within two weeks of clinical symptomatology and follow-up imaging for restenosis were collected retrospectively. They found the degree of stenosis reduction was significantly higher in BMS cases than SES ($81 \pm 10\%$ to $7 \pm 11\%$ vs. $80 \pm 12\%$ to $24 \pm 9\%$; p < 0.0001). Among treated patients, 6.5% developed a periprocedural stroke and there was no difference between two types of stents. The independent predictors of periprocedural stroke were Mori B or C lesion (OR 6.7 [3.3 to 10.1];

⇒ continued on page 10

⇒ continued from page 9

$p < 0.001$), treatment within 2 weeks of presenting event (OR 2.5 [1.2 to 5.6]; $p < 0.01$), and patients with an index event of a stroke (OR 1.5 [1.2 to 3.4]; $p < 0.018$). The independent predictors of restenosis at follow-up were use of SES (OR 3.22 [1.40 to 7.41]; $p < 0.006$) and Mori B or C lesion (OR 3.97 [2.05 to 7.71]; $p < 0.0001$). They also noticed that placement of stents in patients with more complex lesions is associated with higher periprocedural stroke rates and restenosis.

Preclinical Data of “TREVO”, a Novel Stroke Thrombectomy Device is Satisfactory in Animal Models of Thrombo-Occlusive Disease

Nogueira et al. reported the use of TREVO device in two animal models, Swine ($n = 2$), Canine ($n = 1$). Trevo device (Concentric Medical Inc, Mountain View, California, USA) is a novel thrombectomy device, which designed to achieve immediate recanalization by quickly removing clot. Sixteen autologous thrombin generated thrombi with different hardness and consistencies implanted in a variety of vascular settings including the swine internal maxillary, lingual and forelimb arteries as well as the canine external carotid and vertebral arteries. The angiographic response and degree of device-clot incorporation were assessed. The device-thrombus-vessel interaction was evaluated using a high resolution flat panel 3-D CT. They achieved TIMI 2-3 in all cases immediately after deployment. Fifteen clots were retrieved after one pass with the device and one clot after two passes. Histopathological analysis of three swine vessels treated with six passes showed severe disruption of the intima but no hemorrhage of media or adventitia. Initial human studies are underway.

VISSIT Early Experience Report: Treatment of Symptomatic, High-Grade Intracranial Stenosis With the Pharos Vitesse Stent

Wakhloo et al. reported their early experience using the balloon expandable Pharos Vitesse stent in symptomatic, high-grade intracranial stenosis, based on stent placement in five enrolled patients (range 49-76 yr-old, mean 63 yr-old, four men) in VISSIT (Vitesse Intracranial Stent Study for Ischemic Therapy), a prospective, multicenter, randomized trial to compare best medical therapy alone to best medical therapy plus stenting for symptomatic, high-grade intracranial stenosis (70-99%). All treated patients had 70-80% stenosis of intracranial carotid, middle cerebral or intradural vertebral arteries. Three patients were randomized to stenting arm, but one patient who was randomized to medical therapy arm continued to have recurrent ischemic stroke in the territory of stenotic vessel and underwent stent placement. Four patients were treated with the stent, with no residual stenosis in

three. The fourth patient had a heavily calcified plaque which resulted in a 30% residual stenosis. One patient experienced neurological deficits localizable to the treated territory which resolved within 24 hours. Two of the patients had pre-treatment abnormal perfusion imaging, which normalized after stent implantation. In the stenting arm, the mRS (modified Rankin scale) improved in three patients. The fourth patient died > 30 days after randomization due to unrelated medical illness (median 1, range 0-6). The patient randomized to medical therapy awaits 30 days assessment. They concluded treatment with Pharos Vitesse stent is a safe procedure that has resulted in no permanent procedure related complications.

Estrogen Modifying Agent May Protect Against Aneurysm in Women

Feldman et al. studied the rate of exogenous estrogen modifying agent with oral contraceptive pill therapy (OCP) or hormone replacement therapy (HRT) in a cohort of women with cerebral aneurysms and compared the results with a large control population. The 2-year data of a single center on female patients with cerebral aneurysm compared with a publicly available data set of 4682 random female controls. Between 2008 and 2009, 49 cases (31-80 years old) were successfully interviewed. The rate of any or current OCP use was 51% and 78% in cases and controls respectively ($p < 0.0001$) and the rate of any or current use of HRT was 24% and 41% in cases and controls respectively ($p = 0.0292$). Independent test showed a statistically significant lower mean duration of OCP among cases compared with control (2.6 yr vs. 5.2 yrs, $p = 0.0041$). These results support the hypothesis that physiologic drop in estrogen that occurs during the menstrual cycle and particularly at menopause may explain why cerebral aneurysm are more frequently found in women, particularly during menopause. Further studies needed for pharmacologic estrogen stabilization in women who are at risk for cerebral aneurysm formation.

Reopening the Chronically Occluded Basilar Artery

Albuquerque et al. reported the technical consideration and complications associated with reopening subacute to chronically occluded basilar artery. They implanted Wingspan stents in ten patients (20-80 yr-old, mean 63 yr-old, 7 men) between 2004 and 2010. The median time between onset of symptoms to treatment was 50 days (range 4-150 days). Recanalization was successful in eight of 10 patients. Immediately following the procedure seven patients were either improved or stable, and three were worse (two patients died of procedural complications and one patient suffered a mild brain stem stroke who made a substantial recovery later). Another patient died

⇒ continued on page 11

⇒ continued from page 10

from unrelated causes. Three subacute complications occurred (acute thrombosis (n = 1) required repeat angioplasty, symptomatic basilar dissection (n = 1) requiring second stent deployed, mild recurrent stroke (n = 1). Of the seven surviving patients, five were improved or clinically stable. They concluded that with current endovascular techniques, recanalization of the subacute and chronically occluded basilar artery is feasible. However, the procedure carries substantial risk and it should be reserved for patients with medically refractory symptoms. Meticulous clinical and radiographical post-procedure care and management is essential.

US Multi-Center Experience With the Wingspan Stent System for the Treatment of Intracranial Atherosclerosis

Turk, III from US Wingspan multicenter group reported the results of Wingspan stent system for the treatment of symptomatic intracranial stenosis. Over a period of 16 months, 158 patients were enrolled in five US medical centers, and 168 stenoses treated with the Gateway™ PTA Balloon catheter and Wingspan stent delivery system™. Data were tracked prospectively, in a formalized central database. Primary end points were major ipsilateral stroke or death. Secondary end points were restenosis, minor stroke or transient ischemic attacks. The Wingspan stent was successfully deployed in 96% of cases. Long-term clinical follow-up was available for 91% of patients and angiographic follow-up for 84% of patients, with an average follow-up time of 14.2 months. The rate of in-stent restenosis was 31.6% and 9% of patients suffered subsequent stroke or death, with overall rate of periprocedural (within 30 days) events in 5.7% of cases. Of the reported strokes, 9.7% were symptomatic. The result of this study shows that intracranial angioplasty and stenting with the Wingspan system is safe and effective at reducing the risk of stroke. This data reinforces the necessity of the ongoing randomized SAMMPRIS trail.

Efficacy and Safety of Superior Interspinous in Patients With Moderate Lumbosacral Stenosis

Rappard et al. evaluated the effectiveness and safety of Superior Interspinous Spacer (SIS) in moderate lumbosacral stenosis (LSS). SIS is minimally invasive spinal implant that limits back extension at the symptomatic level. In this prospective study, they treated 121 patients (aged 58 ± 14 years) with moderate LSS at EMMA KliniK (Seligenstadt, Germany) from February 2008 to August 2009. Follow-up was performed at

1, 3, 6 and 12 months after procedure with 111, 96, 81, 52 patients respectively. The study outcome measured by Oswestry Disability Index (ODI), axial and extremity pain severity with a visual analog scale, health related quality of life with Physical Component Summary (OCS) and Mental Component Summary (MCS) scores from the SF-36 for pre- and post- intervention, and adverse events. The results showed that back function (ODI, lower scores show better function) rapidly improved from pre-intervention state ($60.2 \pm 7.9\%$) to 1 month post-intervention ($33.6 \pm 0.3\%$) with continued improvement through to 12 month post-intervention ($21.0 \pm 13.7\%$), a 64% overall improvement ($p < 0.001$). Overall in 12 month follow up course, Axial pain and extremity pain improved 49% ($p < 0.001$) and 53% ($p < 0.001$) respectively compared to pre-intervention state and furthermore health related quality of life improved 41% for PCS and 22% for MCS (both $p < 0.001$ compared to pre-intervention). Procedure related adverse events seen in eight patients (superficial incision seroma (n = 5), minor wound pain (n = 2) and infection (n = 1). Four explants were performed, although three were unrelated to the device. They concluded SIS is an effective and safe treatment option for patients with moderate LSS who are unresponsive to conservative care.

Long-Term Outcome in The Repair of Spinal Cord Perimedullary Arteriovenous Fistulae

Hetts et al. reported the long-term outcome of 32 patients with PMAVFs (perimedullary arteriovenous fistulae) who were treated at University of California San Francisco between 1983 and 2009. PMAVFs, also known as type IV spinal cord AV fistulae are being treated with either open surgical or endovascular approach. Thirty patients were treated (four by embolization, 11 by surgery and 15 with combination therapy). PMAVFs were categorized into three types based on angiogram findings. Data on ambulation and micturition symptoms gathered through clinical notes were quantified using the Aminoff and Logue Scale (ALS). Mean follow-up period was 54 months (range 1-228 months). Follow up angiogram were done on 28 patients, which showed residual shunting in 6 patients. Analysis of ALS scores revealed that treatment of PMAVFs, independent of modality, resulted in a significant improvement in ambulation, but inconsistent changes in micturition seen. Furthermore, patients with residual shunting had worsened neurological status or lack of improvement. In addition, patients with type 3 fistulae had more dramatic improvement (62%) in ALS ambulation scores compared to type 1 and 2 (26 and 27% respectively).

X-configured Stent Assisted Coil for Complex Anterior Communicating Artery Aneurysm

by Dhruvil J. Pandya MD, Osama O. Zaidat MD, MS

Brief Clinical History

A 62 year old man presented with an incidental anterior communicating artery aneurysm, noted to enlarge over surveillance imaging at six months interval, prompting endovascular treatment of the aneurysm after discussing additional options of conservative management and surgical clipping.

Procedure Description

The patient was treated with aspirin 81 mg and clopidogrel 75 mg daily for 7 days prior to the procedure. The procedure was performed under general anesthesia with heparin 8000 U to achieve an activated coagulation time of > 250 seconds.

Based on the configuration of the aneurysm, pointing anteriorly and inferiorly with a small daughter sac pointing inferiorly and anteriorly, and measuring 7.4 x 5.4 mm with a 5 mm neck (Figure 1 A, 1B), stent support was attempted, with dual crossing stents covering the neck via each A1 to contralateral A2 segment. A coaxial system using a 6 French Neuron guiding catheter over a diagnostic catheter was used to sequentially access the internal carotid arteries. A 4.5 mm x 22 mm Enterprise (Codman Neurovascular, Raynham, MA) was placed from the

left A1 to the right A2 and a second 4.5 mm x 22 mm Enterprise stent was placed from the right A1 to the left A2 (Figure 1C), after which the aneurysm was reaccessed via an Excelsior SL 10 micro catheter (Boston Scientific Corp., Natick, MA) and coil embolization was performed (Figure 1D).

Discussion:

In this case report we are describing a new technique, "X" stent configuration using the closed cell designed Enterprise stent, for a complex, wide necked anterior communicating artery aneurysm. Overlapping ("Y" or "X") configuration dual stenting may be challenging with closed cell stents, and are less frequently performed, but was attempted in our case to maximize the coverage at the neck of the aneurysm. Saatchi I et al. recently described the same technique in five patient (AJNR, July 2010); unlike our technique, they used a jailing technique for the aneurysm coiling microcatheter. "Y" stenting was feasible in their patient secondary to equal filling of the anterior communicating aneurysm from both carotids, however in the situation where it predominantly fills from one carotid, other reconstruction modalities such as balloon assisted or single stent assisted techniques can be utilized for coil embolization.

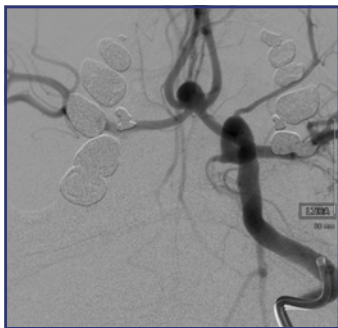


Figure 1A: AP Pre-Procudural Angio: Anterior Communicating artery aneurysm measuring 7.4*5.4 mm with 5 mm neck

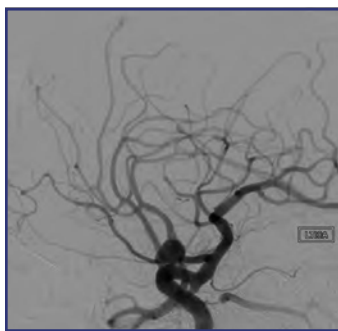


Figure 1B Lateral Pre-Procudural Angio: Anterior Communicating artery aneurysm measuring 7.4*5.4 mm with measuring 7.4*5.4 mm

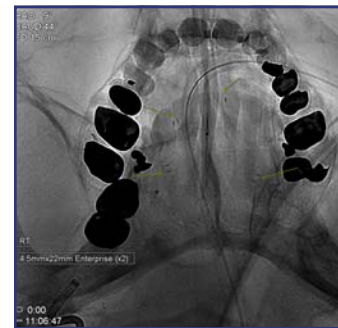


Figure 1C: Post X configured enterprise stent across the neck of an anterior communicating artery aneurysm



Figure 1D: Post coil of anterior communicating artery aneurysm using x stent configuration.

Intracranial Stents for Neurovascular Intervention

by Ramy El-Khoury, Ambooj Tiwari, MD, Nazli Janjua, MD

Neuro-endovascular therapy includes treatment for acute and chronic ischemia, and aneurysms. Navigation into the intracranial circulation and deployment of devices requires superior device trackability and safety. A limited number of stents are currently available in the United States (US) and a few other stents are now used in other countries for the treatment of ischemic stroke and also as an adjunct to aneurysm embolization. The safety of these stents is already established, however clinical benefits of some of these stents is still under investigation.

For atherosclerotic disease, the Wingspan™ stent (Boston Scientific, Natick, MA, Figure 1.) is the only stent currently approved for chronic atherosclerosis and is being investigated as part of the SAMMPRIS trial. Reported success rates (Zaidat et al., *Neurology*, 2008) with this device are high, over 97%, though late in-stent restenosis rates of 25% have also been seen, though these events may not be clinically significant. Usage of this device requires active local site institutional review board (IRB) approval. The stent is a catheter delivered, self-expanding stent. Instructions for use stipulate predilation with the accompanying Gateway™ PTA balloon dilatation catheter. Micrus, Inc. (San Jose, CA) has devised two balloon expandable stents, Revasc®, a retrievable stent for use in acute ischemic stroke as well as the Pharos stent for use in subacute ischemic atherosclerotic cerebrovascular disease, which is being trialed in limited sites. Solitaire (ev3, Inc., Irvine, CA) and Trevo® (Concentric-Medical Inc., Mountain View, CA) are stents under active clinical investigation for the treatment of large vessel occlusion in acute ischemic stroke. The Solitaire, a wire mounted stent which may be partially unsheathed and still retrieved, utilizes an electrolytic detachment system analogous to that used for steerable aneurysm coils. Trevo is a 'non-implantable stent-triever' and is currently available in Europe and Canada.

For hemorrhagic disease, stents are primarily used adjuncts for stabilization of coils in a wide neck aneurysm not amenable to surgical clipping. Enterprise Vascular Reconstruction Device® (Codman Inc., Raynham, MA, Figure 2.), Neuroform® (Boston Scientific, Figure 3.), the first stent approved for intracranial aneurysm treatment in 2002, and Solitaire (ev3, Inc) stents are available in the US. The two stents are distinguished both by design, Enterprise being a 'closed cell' and Neuroform an "open cell" design, which also leads to differences in retrievability. The Neuroform3, a later generation of this device, was marketed in 2005 and consists of a hybrid cell design for increased coverage, but continued stent flexibility. Neuroform is approved for usage in vessels of diameter ranging from 2-4.5 mm. Enterprise is approved for use in vessel diameters of 2.5-4.5 mm. Both stents come in varying lengths (10-30 mm for Neuroform and 14-32 mm for Enterprise), in addition the Neuroform stent comes in varying diameters (2.5-4.5 mm) compared with the uniform 4.5 mm diameter of the Enterprise. The Enterprise stent may be unsheathed as much as 2/3 of the stent



Figure 1: Open cell design Wingspan® Stent System with Gateway® PTA Balloon Catheter, Image courtesy of Boston Scientific



Figure 2: Enterprise Vascular Reconstruction Device™, note the closed cell design, image courtesy of Codman Neurovascular

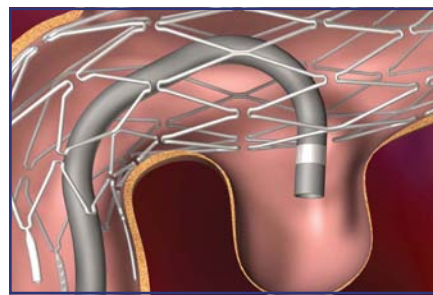


Figure 3: graphical description of open cell Neuroform3® Microdelivery Stent System, seen with microcatheter in place in aneurysm for coil embolization, Image courtesy of Boston Scientific

distance and still be resheathed in contradistinction to the Neuroform. The Enterprise stent is also a wire mounted stent, delivered through a Prowler Plus Select (Codman Neurovascular) microcatheter which may be navigated to the target vessel over a standard microwire. This has afforded considerable ease with stent delivery, perhaps providing an advantage of use. Till recently the Neuroform stent came only as a catheter mounted stent, similar in design and deliverability to later generation Wingspan stent. However, recently, the Neuroform EZ system has been launched, which offers an alternative wire-mounted stent, which may be delivered through a Renegade (Boston Scientific) microcatheter, again delivered to the target site over a standard microwire. Like other Neuroform stents, the Neuroform EZ is not-retrievable once deployed. Both Enterprise and Neuroform require use under hospital IRB approval. Implementation of the Neuroform EZ requires separate amendment/IRB approval. The Solitaire stent mentioned above for acute stroke treatment, may also be marketed as an aneurysm embolization adjunct. In Europe, the Leo and Silk stents, both made by Balt Extrusion (Montmorency, France) are marketed for the treatment of intracranial aneurysms. Like the Enterprise and Neuroform EZ, the Leo is a self-expanding stent, which may be delivered through a standard microcatheter, for the treatment of post-carotid siphon aneurysms. This stent may be completely unsheathed and still be recaptured, though using an open cell design. Additional inter-connectors between cells allows for more coverage than the Neuroform. In case reports, enhanced radiographic visibility are reported (Pumar et al., *American Journal of Neuroradiology*, 2008). The tightly woven design of the Silk stent is intended to create flow diversion away from aneurysm sacs, al-

⇒ continued on page 14

⇒ continued from page 13

lowing primary treatment with this stent, and is the main focus of investigation in the Marco Polo study in Europe and Canada, as a treatment for saccular internal carotid or vertebrobasilar aneurysms measuring 7-15 mm. Like other stent technology this device consists of nitinol braided wires, but in addition includes radiopaque wires interwoven in the netting for increased coverage. Another stent under study as a flow diversion device in the US is the Pipeline (ev3), a braided, tubular, bimetallic microstent with struts of exceptional coverage, allowing for high coverage of

aneurysm sacs though permitting flow through small perforator vessels. preliminary phase of investigation is completed and ev3 has submitted a pre-market approval application to the Food and Drug Administration. In the US, the Pipeline is being studied solely for anterior circulation aneurysms.

A listing of the currently available neurovascular stents, manufacturer, and unique properties are listed in the accompanying tables.

Intracranial Stents Hemorrhagic Stroke

Available in the US

Type of Stents	Manufacturer	Indication for use	Comments
Entreprise	Codman Neurovascular	Wide Neck Aneurysm	Closed cell design -2/3 may be deployed before being able to recapture
Neuroform	Boston Scientific	Wide Neck Aneurysm	Open cell design - 1st approved in US for aneurysm Rx
Solitaire	Ev3 Neurovascular	Wide Neck Aneurysm	Electrolytically detachable

Available in Europe

Type of Stent	Manufacturer	Indication for use	Comments
Silk	Balt	Wide Neck Aneurysm	Very tightly meshed closed cell design, being used for flow diversion
Leo	Balt	Wide Neck Aneurysm	Full stent can be deployed and still be recaptured

Ischemic Stroke Treatment of Atherosclerotic Stenosis

Available in the US

Type of Stent	Manufacturer	Indication for use	Comments
Wingspan	Boston Scientific	Intracranial Stenting	Only stent approved for atherosclerotic disease
Pharos	Micrus	Intracranial Stenting	in trial status, balloon expandable - for atherosclerotic disease

For Treatment of Acute Large Artery Occlusion

Available in the US

Type of Stent	Manufacturer	Indication for use	Comments
Revasc	Micrus	N/A	Not yet available, for AIS, clot retrieval

Available in Europe

Type of Stent	Manufacturer	Indication for use	Comments
Trevo	Concentric	N/A	Stent-triever' non implantable, approved in Canada and Europe for clot retrieval