SVIN Society of Vascular and Interventional Neurology

THE CORE

SVIN QUARTERLY NEWSLETTER

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Society News

- Elections for new officers for the positions of vice president, secretary, and treasurer will be held in February, 2011, during the in person board meeting in Los Angeles, CA. Recent amendment to SVIN bylaws allow for the ascension of the Vice President to the position of President and for the President to ascend to Immediate Past President. Outgoing Secretary and Treasurers may indicate their wish to ascend or apply for the President Elect (previously Vice President) Position which will then ascend to President at the end of the next two year term.
- The American Heart Association has agreed to the position of a SVIN-AHA liaison, who would attend the AHA meetings (e.g. International Stroke Conference) regularly and represent SVIN to the AHA on issues of mutual concern such as endovascular stroke treatment.
- SVIN will hold an in-person board meeting in February 9, 2011 from 6-9 PM. in Los Angeles during the scheduled dates of the International Stroke Conference. Final location to be announced to board members.
- WellPoint, a major umbrella health insurance provider, recently invited comment from the American Academy of Neurology on its recent update on policy regarding endovascular procedures for intracranial arterial disease. AAN leadership reached out to SVIN to help review this document and provide comment
- Work is ongoing to develop a national registry for neurointerventional procedures sponsored by the Society of Vascular and Interventional Neurology (SVIN) and coordinated through Saint Louis University.
- Persons interested in serving as SVIN Newsletter editor are requested to contact Jane Svinicki at jane@svinicki.com

Science and Industry News

- Johnson & Johnson Co. (New Brunswick, New Jersey) announced the completion of acquisition of Micrus Endovascular, a global developer and manufacturer of minimally invasive devices for hemorrhagic and ischemic stroke. Micrus Endovascular is currently operating under Codman Neurovascular, a business unit of Codman & Shurtleff, Inc., the global neurosurgery device company of the DePuy Family of Companies within Johnson & Johnson.
- Concentric Medical, Inc. (Mountain View, California) announced the start of the TREVO Study (Thrombectomy REvascularization of large Vessel Occlusions in acute ischemic stroke). The first patients were enrolled and successfully treated at the Hospital Clinic de Barcelona by the Neuroradiology team of Drs. Juan Macho and Jordi Blasco. It is the first study to evaluate Stentriever™ technology in a European, multicenter, prospective trial. The Trevo stent- retriever is designed for quick access, rapid clot integration and retrieval in ischemic stroke. Functional outcomes at 90 days will be collected. Professor Olav Jansen, Head of Interventional Neuroradiology at Universitatsklinikum Schleswig-Holstein, and Professor Nils Wahlgren, Professor of Neurology at Karolinska University Hospital, are co-Principal Investigators of the Study.
- The Penumbra Imaging Collaboration Study (PICS) is nearing the end of its enrollment phase. Institutions currently participating in this registry have been notified to cease enrollment of new patients following January 1, 2011.

Penumbra, Inc. (Alameda, California) enrolled first patients in PULSE clinical trial to evaluate a fully retrievable, dense mesh temporary stent for immediate flow restoration by the teams at the University Hospital Dresden in Dresden, Germany, and the University Hospital Göttingen in Göttingen, Germany.This international clinical trial will assess the safety and effectiveness of aspiration with the Penumbra System® in conjunction with the Pulse™ flow restoration device.

- Codman & Shurtleff, Inc. (Raynham, MA) announced the launch of NEUROSCOUT™ 14 Steerable Guidewire, a newly developed steerable guidewire that facilitates the placement of diagnostic or therapeutic catheters within the neurovasculature.The NEUROSCOUT 14 Guidewire has a uniquely designed, flattened distal segment with a stainless steel core that retains its shape over time, enabling easy vessel access and reaccess. A technologically enhanced surface with a highly lubricous surface coating reduces frictional forces with compatible devices and a 10cm platinum distal coil section provides increased visualization under fluoroscopy. Exclusive core wire technology is designed to deliver precise torque transmission, excellent tip control and pushability. The NEUROSCOUT 14 guidewire measures .014 inches in diameter and is available in standard and soft versions with usable lengths of 205 and 300 cm.

Inside this issue

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President's Message: Back to the front line?

As we close on the second presidential term of our beloved society, we are slowly establishing history and implanting our roots deeper. As I pass the baton to the third president of our society; it would be worthwhile to review the achievements and future challenges and opportunities, as well as SVIN administrative and policy implementations.

First, the board of director has voted to set the president's term at two years starting on April 1 following the stroke meeting. Newly elected positions would include; President Elect, Secretary and Treasurer. The President Elect would be moved to the President position in two years. The Secretary and Treasurer would have the opportunity as they volunteer their time and effort to move the society mission and goals forward to be elected as President Elect in two years. The board will be electing these three positions during their in Person board meeting scheduled to coincide with the International Stroke Conference in Los Angeles.

The society has transformed over the past four and a half years in the following ways including several accomplishments:

Administrative

1. Hiring of a full time management company to assist with society administration including the annual meeting, membership administration, society finances, and day-to-day management.

Research, Position Statement and Publication:

2. Acceptance of the *Journal of NeuroInterventional Surgey (JNIS)* (soon to be indexed in Pubmed) as our official journal with SNIS

3. Establishment and editorial support of the Endovascular Section at the *Journal of Neuroimaging* (Pubmed)

4. Editorial support of the Frontiers of Endovascular & Interventional Neurology, currently an independent Section/Journal at the *Frontiers of Neurology* (Pubmed)

5. Collaboration and co-drafting of multi-society position statements, three of which are published, and the fourth of which is forth-coming.

6. The SVIN Research Consortium (SRC) chaired by Randall Edgell, MD; from St Louis University, submitted the first paper to *Neurology*. The seed money for novel projects for the Consortium from SVIN has been launched with a cyclical grant application process. More active members are encouraged to apply for their research project via SRC

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Coming Up in Next Issue:

- Interview with Interventional Neurologists around the globe
- Summary of the International Stroke Conference
- Interim Results of State Department of Health Stroke Center Survey

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7. The SVIN Endovascular Acute Ischemic Stroke Supplement was submitted to *Neurology* journal.

8. We successfully held three annual scientific meetings, the first one chaired by Rishi Gupta, second one by Tudor Jovin, and the third one co-chaired by Jawad Kirmani and Nazli Janjua.

9. The first SVIN practicum held this past September2011, Chaired by Alex Abou-Chebl and Co-Chaired by Dileep Yavagal, was a great success,

10. We continue to publish an Amazing SVIN Quarterly Newsletter, recently entitled as "The Core", by the great effort of our editor Nazli Janjua and an ever increasing and committed editorial staff.

Credentialing, Intersociety Collaborations and Guidelines:

11. SVIN representative served as voting member on new guidelines to credential hospitals as Carotid Stroke Centers, for the Inter-societal Accreditation Commission Carotid Stenting facility accreditation (IACCSF) program. Please visit the IAC website for information on hospital certification processes.

12. We have a voting seat on the Neurovascular Coalition

13. We have recently been offered to have one member serve in the capacity as SVIN-AHA Liaison

14. We have a SVIN-Neuro-Critical Care Society Liasion; Roberta Novakovich

To be brief I would stop at mentioning what we have achieved and say that we pass on more challenges than accomplishments to our upcoming president for the next two years; Dr. Dileep Yavagal.

Sustainability is the number one challenge for our society, it is hard to maintain the enthusiasm, the passion, and drive for the active members and board of directors. Adding new blood and giving people such as myself a break to re-charge and return with new vigor may be a good idea. Adding 4 new members (Andre, David, Thanh and Randy) has been great for SVIN, Dileep may want to consider a similar strategy.

Maintaining and taking the SVIN to the next level as a research consortium would be by itself a monumental task for both Randy and Dileep.

Taking the newsletter to the next level which may be 6 issues instead of 4 issues

Training more neurologists, streamlining training standards for neurologists, expanding membership number here and abroad are giant tasks.

Financial independence, by investing in the stock market, real estate, and other resources is a big challenge and is connected to everything else we do at SVIN.

Activating committees and volunteerism are critical steps to achieving these challenges.

Finally, the past three years have been a privilege and honor for me to serve the SVIN members, the field and future vascular and interventional neurologists. The minor mile stones we achieved would not have been accomplished without the help and support of many people, it is difficult to mention them all. Thanks to our most recent addition SVINICKI management company (Jane and Annette), the board of directors, my co-officers for this term (Dileep, Tudor, and Rishi), the chairs and committees of all the previous annual meeting and the practicum. The amazing effort of our newsletter editor Nazli Janjua is extremely appreciated as well as all the members of SVIN who helped her in this task. Thanks to everyone who reviewed any statement that the SVIN is asked to endorse. Thanks to the first team of officers (Edgard, Alex, Dileep and Adnan). Also, I would like to thank all our prior managers including my office assistant years ago Diane Rumble. Thanks to the general body of members who attended the annual meeting and showed their passion and support to our society. I am sure, given our society's young age and future goals that we still need every one and I will continue to serve and give time and effort to achieve SVIN missions and goals.

See you all in the fall of 2011 for our next annual meeting, chaired this year by Raul and good luck to Dileep and SVIN.

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

SVIN members interested in serving in the capacity of SVIN Newsletter editor please contact us via website at www.svineuro.org or email svin.org@gmail.com

Editor's Corner: A Series of 10

This 10th issue of the SVIN Quarterly newsletter closes out the first year of the second decade of the 21st century. The year 2000-2001 heralded the 'Neuroscience in the New Millenium,' during which the National Institutes of Neurological Disease and Stroke (NINDS) launched their agenda "to conquer all forms of neurological disease." NINDS collaborated with the National Advisory Neurological Disorders and Stroke Council and invited public comment in 1998 to shape their strategic plan, encompassing four modules in basic science, clinical, translational, and disease-related research.

Prior to this, the ten year block from 1990 to 1999, designated the 'Decade of the Brain,' by the Library of Congress and National Institutes of Health (NIH), introduced intravenous alteplase (IV tPA) for acute ischemic stroke (AIS) and certified stroke centers, acute care facilities uniquely capable of high-end delivery of IV tPA and all other aspects of stroke care. Former President George Bush announced this special decade in a proclamation in which he described the mystery of the human brain and the vital importance of this organ. "The seat of human intelligence, interpreter of senses, and controller of movement, this incredible organ continues to intrigue scientists and layman alike…we still have much more to learn. The need for continued study of the brain is compelling: millions of Americans are affected each year by disorders…such as…stroke." In addition, President Bush's proclamation also highlighted government and private industry cooperation toward this effort. "Many studies regarding the human brain have been planned and conducted by scientists at the National Institutes of Health, the National Institute of Mental Health, and other Federal research agencies. Augmenting Federal efforts are programs supported by private foundation and industry. The cooperation between these agencies and the multidisciplinary efforts of thousands of scientists and health care professionals provide powerful evidence of our nation's determination to conquer brain disease." (The full proclamation is available online at http://www.loc.gov/loc/brain/proclaim.html, accessed 1/3/11).

Though IV tPA represents a major breakthrough for acute stroke treatment, limitations were noted even at its introduction, and reflected in former NINDS director, Dr. Zach Hall's budget request and address to Congress. "Last year…NINDS… organized a clinical trial showing for the first time that prompt administration of a clot-buster …gives a 30% increase in the chance for full recovery… Widespread use of the new treatment will not follow automatically, however, because to be effective, therapy must be delivered within three hours after symptoms." He then concluded his statement with a request for over 722 million dollars in NINDS budget.

Following this was the announcement in 2001 of one of the major initiatives of the new millennium, the highly sought federally funded SPOTRIAS (Specialized Program of Translational Research in Acute Stroke) grants, which provided 5-10 year funding for projects concerning acute stroke research. Awardees are required to share results with other SPOTRIAS researchers. Furthermore, receipt of SPOTRIAS grant funding requires involvement of emergency medicine experts in the project leadership and that the institution should deliver IV tPA within 2 hours to at least 12 patients per year, thereby generating an increased interest in the delivery of this medicine. Many of the SPOTRIAS projects, which cover stroke imaging techniques and acute treatments such as oxygen and hypothermia, are still ongoing.

Current statistics offer perspective on the financial aspects of SPOTRIAS, which may fund up to 1.5 million dollars per project per year. In 2002 the federal government spent approximately $34.3 billion (2.2 percent of total health care spending) on health research of which 20 percent was allocated to clinical research (www.chsr.org/fundingreport.pdf). The current NINDS budget is estimated at 1.5 billion dollars (www.ninds.nih.gov/news_and_events/congressional_testimony/ninds_fy_2009_cj.htm, accessed 1/7/11), double that requested by Dr. Hall in 1999. Other major institutes within the NIH, such as the National Heart, Lung, and Blood Institute, which funds the bulk of cardiovascular research, had a 2004 budget almost twice that, at $2.7 billion. Whether the difference reflects greater incidence of cardiovascular disease versus greater lobbying, effect of this is borne out by the trend of cerebrovascular therapy to follow those of cardiac and other vascular disease, and that the despite more treatment for stroke, the most recent statistics show its incidence has increased by over 100,000 in the past 10 years.

A travel on the roadmap of medicine shows the use of tPA in the early 1990s for acute myocardial infarction (AMI), following nearly half a decade later in the brain. Similarly whereas percutaneous coronary intervention was established as superior therapy in the latter half of the 1990s, we have yet to establish the validity of endovascular therapy as a treatment option for AIS. Though it may seem humbling that neurological intervention must first await discovery in other fields of medicine, important areas where treatments of brain specific diseases have successfully applied to other diseases include the use of Onyx for brain arteriovenous malformations (AVMs), which is now utilized for treatment of aortic endograft leaks. Indeed, this latter purpose of the liquid embolic agent in fact surpasses its use for the far more rare brain AVMs in today's market.

The recent allocation of SVIN capital to the funding of "seed grants" is an important first step for us to poise ourselves as the leaders of vascular and interventional neurotherapeutics discovery. What important treatments will find their origins by initial SVIN support remains to be seen. Concurrently, as we begin to fund novel research, we also continue to create bridges between our society and others, such as the American Heart Association, with the recently designated liaison position. Perhaps as we move into the next phase of our society-so young that we are yet measuring our incremental grown in demi-decade epochs-perhaps we should seek to bridge ourselves with organizations holding more federal interest, such as the NINDS. Such bridges will catapult us for the next five and ten years to greater achievements.

Nazli (Sophia) Janjua, MD
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Brooklyn, New York

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

ICA Aneurysm Treatment Complicated by MCA Embolus and Salvaged with SSEP Monitoring

by Parthusarathy Thirumala, MD, MS

A 67 year old man with left anterior communicating artery aneurysm, status post failed endovascular treatment secondary to parent vessel tortuosity, subsequently developed an enlarging internal carotid artery pseudoaneurysm, due to dissection from the prior procedure. Subjective bruit led to repeat angiography during which enlargement of the pseudoaneurysm occurred. Based on angiographic and clinical symptoms, endovascular treatment was undertaken with somatosensory evoked potentials (SSEPs) and electroencephalography (EEG). A 7-French Cook Shuttle catheter (Cook Medical®, Bloomington, IN) was placed in the left CCA through which stent was deployed, with plan for subsequent coil embolization. However, repeat runs showed contrast stagnant in the aneurysm. Sudden decrease in the amplitude of the left cortical responses from the right hand SSEPs were observed (Figure 1). Left internal carotid artery angiography show occlusion of the inferior M2 division. Treatment with induced hypertension and intravenous eptifibatide 15 mg was administered and a Rapid Transit microcatheter (Codman Neurovascular, Raynham, MA) was advanced past the occlusion, through which thrombectomy was performed with the wire. The left cortical responses gradually returned towards baseline. Repeat runs showed opacification of the previously occluded vessel (Figure 2).

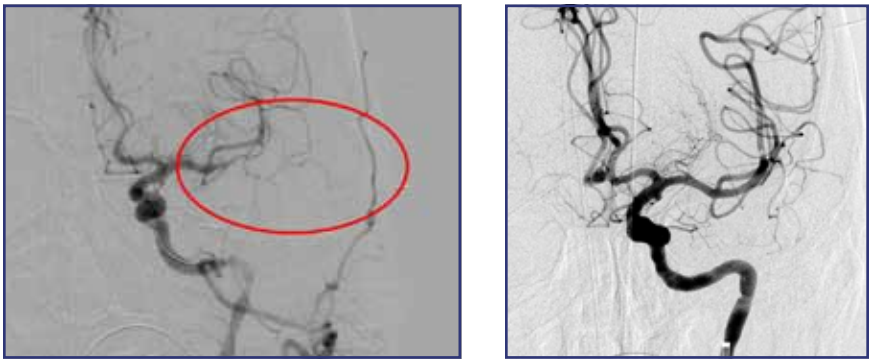

Figure 2: *Angiogram during the time when there was a change in SSEP responses from the left cortex. The figure above shows a clot in the left middle cerebral artery (circle) before and after treatment.*

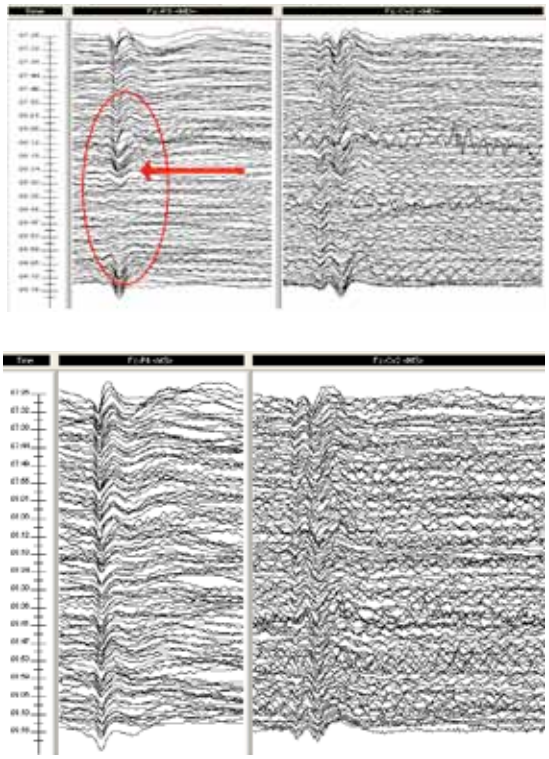

Figure 1: *Right median nerve stimulation (MD) and responses from cortical (Fz-P3) and subcortical (Fz-CV2); figure 1b left median nerve stimulation (MS) and responses from (Fz-P4) and subcortical (Fz-CV2). Please note the cortical and subcortical channels are not the traditional configuration (P3-Fz, and P4-Fz). Circle denotes sudden decrease in the amplitude of the cortical responses from the left hemisphere secondary to left middle cerebral artery embolus. This was later treated with thrombectomy and prompt improvement in the amplitude of the responses.*

Post procedure the patient manifested mild global aphasia and diffusion weighted changes in the posterior inferior middle cerebral artery territory (Figure 3). In this case report, ***real time continuous neurophysiological monitoring*** was able to identify the change in the amplitude of the cortical SSEP responses from the right median nerve. The contralateral hemisphere responses were normal, as were the lower limb SSEPs, which prompted the above treatment. There was significant decrease in the amplitude and frequency of the background EEG, which improved to baseline towards the end of the procedure.

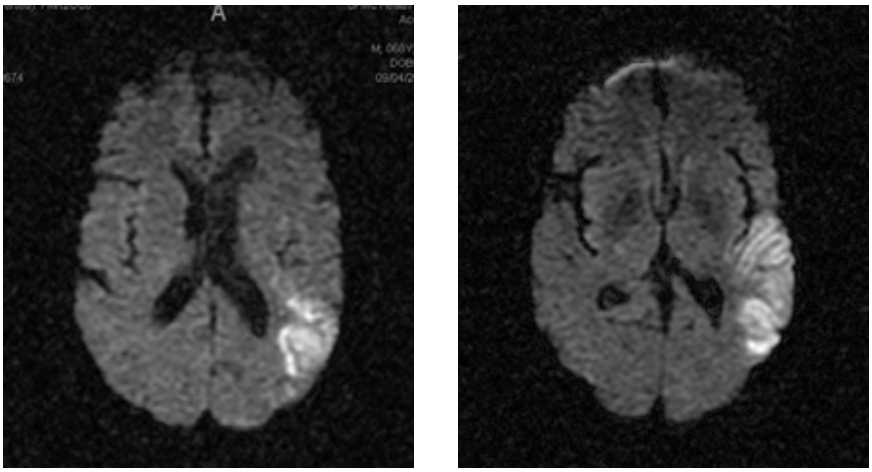

Figure 3: *Diffusion Weighted MRI obtained after the procedure was completed. Acute stroke is present in the posterior inferior middle cerebral artery.*

Current Update of Endovascular Acute Ischemic Stroke Devices

by Dhruvil J. Pandya, MD
Muhammad Taqi, MD

Endovascular mechanical interventions have evolved as alternative or adjunctive treatments for acute ischemic stroke and may be classified into six different categories: 1) mechanical clot disruption, 2) endovascular thrombectomy, 3) augmented fibrinolysis, 4) clot entrapment, 5) thromboaspiration, and 6) flow augmentation.

Mechanical intervention has not only extended the treatment window for acute stroke, but may lessen and even preclude the use of pharmacological thrombolysis by increasing the surface area accessible to fibrinolytic agents by fragmenting a clot. In continued attempts to improve the outcome of endovascular stroke treatment, a number of devices have entered the market; these differ regarding where they apply the force (proximal vs distal) and the type of force (suction/ hydraulic, laser, ultrasound, and mechanical force). Some devices have been discontinued, either due to financial constraints of continued device development, a constant dilemma in this niche industry, as well as for safety concerns. Furthermore, among those devices that are approved by Food and Drug Administration (FDA), the labeling may be non-specific and evasive such as "to remove foreign bodies from a vessel", Devices that are commercially available tend to undergo constant revisions and reiterations to improve device efficacy.

Mechanical clot disruption is a technique by which a thrombus is mechanically fragmented or completely destroyed within the artery rapidly re-establishing a blood flow and cerebral perfusion. This technique appears to be most useful in facilitating chemical thrombolysis. Multiple devices are available which include even traditional microguide wires used for navigation into the cerebral circulation, whereby probing the thrombus with multiple passes through the clot may fragment the thrombus; Snare and Nets, of which four devices are currently available (I) Microsnare (Microvena, Minneapolis, MN), constructed of Nitinol cable and a gold plated tungsten loop which can be introduced through catheters, II)Neuronet (Guidant, Temecula, CA), III) In-Time Retriever (Target, Fremont, CA) IV) and EnSnare (Medical Device Technologies, Gainesville, FL).

Intracranial angioplasty is particularly helpful in atheroembolic disease and generally reserved for salvage therapy secondary to risk of vessel rupture and distal emboli. Laser disruption of thrombus may also be used to this effect, though previously introduced devices have been removed from the market due to failed technology.

Endovascular Photo Acoustic Recanalization (EPAR, Endovasix Inc, Belmont, CA) is the first mechanical thrombolysis device for which safety and efficacy in patients with stroke were reported. It has four "windows" in the side of the catheter where the micro bubble is created, and uses a less powerful laser that is fired at the rate of about one thousand pulses per second to attack the clot. Energy is delivered by means of fiber optics on the tip of the catheter, absorption occurring by laser light by dark pigmented materials (i.e. the clot). With little to no energy absorbed into the blood vessel wall, this allows vaporization and photo acoustic mechanical disruption of the thrombus while minimizing the risk to the vessel wall and perforation. One study demonstrated its safety and further study was warranted, and although an international efficacy trial was approved, loss of funding stopped further clinical testing.

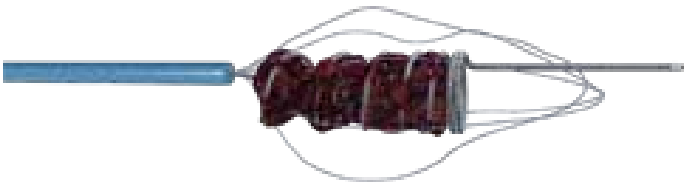

Figure 1: *Drawing of the Merci Concentric Retriever, V series type device, with entrapped thrombus, Courtesy Concentric Medical*

Thrombectomy involves the extraction of the thrombus through a catheter providing rapid recanalization by reducing the risk of distal emboli. These devices differ in regard to where force is applied on the thrombus proximal vs distal. These devices include: Merci Retriever™ (Figure 1) (FDA approved since 2004) (Concentric Medical Inc., Mountain View, CA); this device consists of a platinum-tipped nitinol wire with a moderately stiff, gradually enlarging helix that is deployed via a micro catheter. In addition, an 8-F or 9-F balloon-tipped guide catheter is used for flow arrest during retrieval. Multiple generations of the device have been developed with varying loop diameters, addition of filaments on some Retrievers, and differing device conformability and tensile strength.

The Alligator Retriever Device (ARD) (Chestnut Medical Technologies, Menlo Park, CA), a retriever with grasping jaws attached to the tip of the flexible wire, though originally devised for use in acute stroke, has found market niche for the removal of foreign bodies such as neurovascular coils. The grasping jaws and the distal end of the ARD are made of radio opaque alloy.

The Neuronet Device (Guidant Corp, Santa Clara, CA) is a microguidewire based laser-cut nitinol basket open proximally with the criss-crossing basket portion tapering into shapeable platinum-tipped wire. The opening is eccentric with respect to the proximal wire to facilitate capture. The Phenox Clot Retriever (Phenox, Bochum, Germany) has numerous backwards oriented polyamide fibers on a core wire compound that create a dense

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palisade of perpendicularly oriented microfilaments of gradually increasing length in the unfolded condition. The device is available in 3 sizes ranging from 1 to 3 mm proximally and from 2 to 5 mm distally. It is currently available for the treatment of acute ischemic stroke in Europe. The second generation of the device (Phenox Clot Retriever CRC) is available for the treatment of thrombi with firmer consistency.

The Attracter 18: (Target Therapeutics, Freemont, CA) has thin filaments that run parallel to each other and are connected at the distal tip. These filaments are intended to intertwine with foreign bodies and thrombi on rotation of the proximal end of the device. The In Time retriever (Boston Scientific, Natick, MA) device has 4-6 wire loops and design to capture thrombus in a tortuous segment, as it often opens eccentrically. Conversely, the exposed basket and all-in-one catheter and wire design may limit navigation to the occlusion owing to frictional drag against the vessel wall. This device also does not have a specific open region, which may limit capture. The Catch Device (Balt Extrusion, Montmorency, France) available in Europe, consists of a self expanding nitinol basket closed at its distal end and anchored with a pair of nitinol wires at the proximal end. The basket and its pusher are positioned in an insertion tube used for thrombectomy.

Augmented fibrinolysis devices include the EKOS MicroLys Ultrasound catheter (EKOS, Bothell, WA) and the OmniWave Endovascular System (OmniSonic Medical Technologies, Wilmington, MA) device. The EKOS device is specifically designed for augmented fibrinolysis, a cylindrical ultrasonic transducer at the tip of the micro catheter is used to micro fracture the embolic material and create micro streaming of the thrombolytic agent into the thrombus. The idea is that ultrasound changes the structure of the clot to increase permeability to move the drug into the clot. The OmniWave system (OmniSonic Medical Technologies, Wilmington, MA) is currently indicated to infuse thrombolytic and remove thrombus in the peripheral vasculature. It directs low power ultrasonic energy to fracture the fibrin matrix of the thrombus, therefore augmenting fibronolysis and direct clot disruption. It is currently under process to develop specific devices suited for neurovasculature.

The goal of suction thrombectomy is to extract as much thrombus as possible to achieve recanalization, potentially also decreasing or eliminating additional local lytic agents. These devices include the Penumbra system, Angiojet, Oasis, and NeuroJet devices. The Penumbra system (figure 2) uses a suction aspirator attached to the proximal end of the microcatheter. A separator is advanced back and forth within the microcatheter to remove debris and augment aspiration thrombectomy. (Penumbra Inc, Alameda, CA): In 2007 FDA approved Penumbra System to open vessels in patients with ischemic stroke. The device uses aspiration to remove the clot. Angiojet (Possis Medical Inc/Medrad, Warrendale, PA) uses saline jets to create a low-pressure zone around the catheter tip inducing suctions pulling the clot into the exhaust lumen. The FDA has approved the device for use in other organs including coronary and peripheral vascular bed, however clinical trials for the treatment for acute strokes are no longer in progress, though it has been used in cases of refractory cerebral dural thrombosis. Other aspiration devices developed for extra cerebral circulation using high pressure streams to generate force that fragments, draws in, and aspirates thrombi include the Oasis™ (Boston Scientific, Natick, MA), similar to the Angiojet, though using a single retrograde high pressure fluid jet to create a hydrodynamic vortex that draws in, traps, and degrades adjacent thrombus. Another device, the NeuroJet (Possis Medical/Medrad): is a single-channel device similar in size to a micro-guide wire and uses the same method as the AngioJet. It has been designed specifically for intracranial navigation.

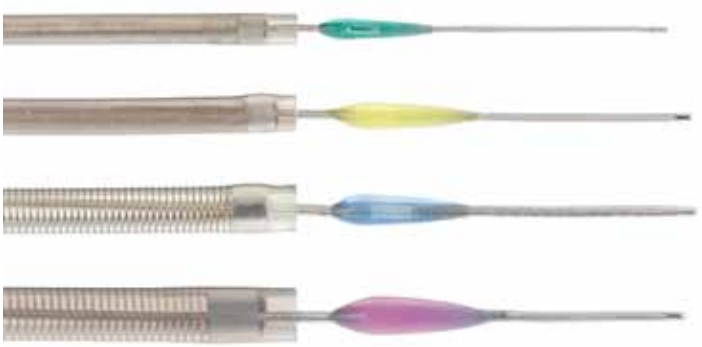


Figure 2: *Drawing of the various Penumbra Reperfusion catheters and separators, Courtesy, Penumbra, Inc."*

Thrombus entrapment utilizes stents such as the Neuroform Stent (Boston Scientific) or the Enterprise Stent (Codman Neurovascular, Raynham, MA), actually designed for aneurysm embolization support. However, specific stents, such as the Solitaire FR™ (eV3 Inc., Irvine, CA) are available for use in acute stroke.

Augmented Perfusion with devices like NeuroFlow Device (CoAxia Inc., Maple Grove, MN) involves balloon counterpulsation in the aorta above or below the origin of the renal arteries which may preferentially direct cardiac output to the brain.

CONCLUSION

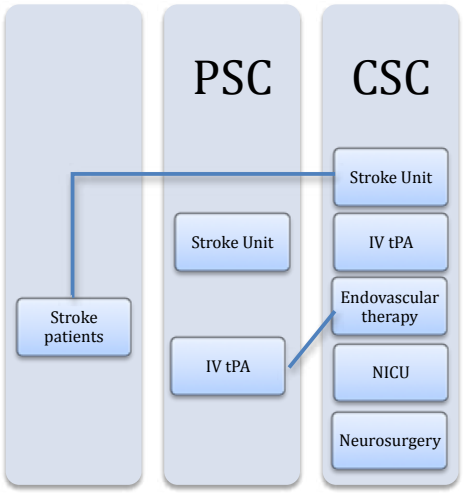
At the present time, the mainstay of treatment for acute ischemic stroke is intravenous fibrinolysis. Other endovascular treatment strategies that can be applied in the treatment of acute stroke are now undergoing feasibility and safety studies, though multiple areas of device development are underway.

Triaging Stroke from the Field — The Prehospital Aspect

by Susan Law, DO
Nazli Janjua, MD

Since 2002, the task force by National Institutes of Neurological Disorders and Stroke of the National Institutes of Health has been attempting to provide greater coordination and better support mechanisms for both pre hospital and acute stroke care. The Brain Attack Coalition recommends Emergency Medical Services (EMS) providers to be instructed in the use of a prehospital stroke scale – similar to Cincinnati Prehospital Stroke Scale, to increase EMS identification of potential stroke victims. Emphasis on EMS recognition of stroke and transport of suspected stroke victims to designated centers directly impacts time to assessment and targeted therapy, such as intravenous tissue plasminogen activator (IV tPA) , the only treatment for acute ischemic stroke (AIS).

While use of IV tPA in AIS is restricted to three hours (or 4.5 hours for select patients), the benefit of care of stroke patients in focused specialty nursing units extends for the duration of the acute phase of hospitalization. The presence of stroke units thus may guide the transport of patients to hospitals having the ability to offer these forms of care, e.g. primary stroke centers. Where the impetus of transport is driven by potential administration of IV tPA, this may translate to EMS directives for potential stroke patients within 4 hours or less. However, if the benefit of stroke centers, which as stated, extends far beyond the potential time benefit of IV, then this may impact EMS transport of suspected stroke patients at presentations extending well beyond the ultra-early period. Though there is no consensus that organized stroke care improves outcomes, it is evident it remains the key in increasing usage of IV tPA.



An example of a triage scheme in which EMS is designed to send stroke patients. Initial stroke patients can be sent directly to PSC or primary stroke centers for treatment and IV tPA. If patients are eligible, they may be transported to a CSC or comprehensive stroke center where they can undergo endovascular therapy. CSC are also available for transfer of patients who develop complications from stroke and IV tPA.

The New York state stroke center designation project was a collaboration between the New York State Department of Health (NYSDOH), the Fire Department of New York Emergency Medical Service (FDNY EMS), the American Heart Association (AHA), and IPRO (Gropen et al, *Neurology*, 2006). The goal of this integrated system was to provide early recognition and transport of acute stroke patients to designated stroke centers to improve quality of care for patients with stroke within 2 urban regions – Brooklyn and Queens. Other states using their own established criteria of PSC designation include Massachussets, New Jersey, and Illinois. Some of these states additionally mandate EMS to transport patients who may be suffering from stroke to a PSC.

Currently there are 636 PSCs in United States. Identification of primary stroke centers, those hospitals capable of offering stroke specific treatment and after care may be based on criteria established by the Joint Commission or individual state's own criteria (see SVIN Quarterly, Vol 3, Issue 2, June/July 2010).

In the Northeast region, 3 states have state-based primary stroke center designation programs – Massachusetts, New York, and New Jersey. In New York alone, there are 119 stroke designated centers and which are listed online at http://hospitals.nyhealth.gov/browse_search.php?form = CENTER&rt = 7.

However, in other states such as Illinois, a unified stroke designation system is limited. The time window of prehospital triage of AIS patients varies from 3 to 12 hours in each state. Factors contributing to this variabiliy include a potential loss of revenue from non-PSCs when patients with AIS are transported to a stroke center, crossing state lines in EMS transport, and availability of air ambulance.

The ACCESS (Acute Cerebrovascular Care in Emergency Stroke Systems) study calculated the United States' population access to PSCs based on each state EMS policy. The investigators concluded about 135.7 million Americans do not have access to a PSC within 60 minutes. With prehospital regionalization and air ambulance transport for acute stroke patients, the number of Americans without 60-minute ground access could be halved. (Albright et al, *Arch Neurology*, 2010) This data suggest the impending need for the development of a national emergency stroke system to cater to the time-sensitive interventions of AIS.

See also SVIN newsletter Volume 3, Issue 2, for the first article in this series on Primary and Comprehensive Stroke Centers

Mergers and Acquisitions

by Mohammed Taleb, MD

Mergers and Acquisitions (M&As) are common strategic business tactics undertaken by businesses to increase the overall value of the combined company, greater than what could be achieved by the sum revenue of each individual company. There is a growing trend for health care companies to partake in larger-scale and more complex mergers and acquisitions. As for the neurovascular companies, three have recently been acquired by larger companies, eV3 by Covidien, Boston Scientific Neurovascular by Stryker, and Micrus by Johnson and Johnson.

The first and largest acquisition was that of eV3 "(Irvine, CA) in June. The deal will give Irish based Covidien a bigger stake in the vascular surgery market, said Covidien Chief Executive Officer Richard Meelia in a conference call according to *Business Week* magazine.

"Ev3 significantly expands our presence in the $3 billion peripheral vascular market and gives us a strong entry point into the $1 billion neurovascular market," said Meelia. "As there is virtually no product overlap we foresee a very straight forward integration plan."

Shortly after in July, Covidien competitor Johnson & Johnson (New Brunswick, NJ) bought San Jose, Calif.-based Micrus Endovasculat Corp., an ev3 rival, for about $480 million, boosting J&J's own neurovascular portfolio. Micrus Endovascular will join Codman & Shurtleff, Inc., the neuro device business of the DePuy Family of Companies within Johnson & Johnson.

The latest acquistion, happening at the end of October, was Boston Scientific Neurovascular (San Francisco, CA) division by Stryker (Kalamazoo, MI). This deal was worth 1.5 billion. Analysts at massdevice.com call the price "pretty impressive valuation for an underperforming asset". Stryker CEO on the other hand stated the following.

"The acquisition of Boston Scientific Neurovascular is an important strategic move as it positions us as a leader in the highly attractive neurovascular space, which we believe is well positioned to remain one of the fastest growing and most innovative sectors in medical technology," Stryker chairman, president and CEO Stephen MacMillan said in prepared remarks. "Going forward, the proposed acquisition allows us to substantially broaden our product offerings and relevance to these customers and over time, we believe will afford us with a unique competitive advantage. We are highly enthusiastic regarding the prospects for Boston Scientific Neurovascular's next generation portfolio of coils and other diagnostic and therapeutic devices, which are expected to provide the opportunity to regain momentum and return to market leading growth."

Looking at all three companies portfolio's and their performance, from their own websites, one can only conclude that all the purchases reflect potential growth of the industry rather than current market value. The biggest value is that they are growing fast. Looking at eV3, it has only been profitable the last

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Prior Company	Products	Merged With	Product
Ev3 (Irvine, CA)	**Peripheral Vascular Products** • Spider filter for carotid stenting and Protégé carotid stent) **Neurovascular Products** • Onyx 34 and Onyx 18 liquid embolic agent • Pipeline Stent **Interventional Cardiology Products**	Covidien (Dublin, Ireland)	**Pharmaceuticals** • acetominophen **Hospital Equipment** • pulse oximeters • operating room sterilization equipment • ventilators
Boston Scientific Neurovascular (San Francisco, CA)	**Neurovascular** **Glugielmi Detachable and Matrix coils** • Neuroform ™ Stent • Wingspan ™ Stent	Stryker (Kalamazoo, MI)	**Orthopedic Medical Technology** • joint replacement implantable devices **Hospital Equipment** • hospital beds
Micrus Neurovascular (San Jose, CA)	**Neurovascular** • Cerecyte coils • Ascent balloon catheter	Codman Neurovascular a subsidiary of Johnson & Johnson, (J&J, Raynham, MA)	**Codman Neurovascular Products** • Orbit coils • Cyanoacrylate liquid embolic agent • Enterprise Vascular Reconstruction Device J&J products are wide ranging covering household health care items, pharmaceuticals and a large coronary and peripheral vascular device market

Summary of the 8th Annual Neurocritical Care Society Meeting

by Robin Novakovic, MD
Darwin Ramirez-Abreu, MD

The 8th annual meeting of the Neurocritical Care Society held in September 2010 in San Francisco, California, carried the theme "Setting Standards – In Education, Research and Practice". Similar to SVIN, as the Neurocritical Care Society (NCS) grows, including members in 30 different countries and from varied disciplines throughout the neurosciences, it assumes increasing responsibility to establish standards in the field. As such, the format of the conference was to emphasize setting standards in the key areas of education, research and practice.

Relevant to SVIN members, the Neurocritical Care Society established a Liaison Committee to help build a better communication venue for the various subspecialties/specialties that participate in the care of the neurologically critically ill patients. Participants in the Liaison Committee include representatives from 18 different societal venues. A few of the participating societies include: the American Academy of Emergency Medicine, American Thoracic Society, Brain Attack Coalition, American Stroke Association, Society of Neuroscience in Anesthesiology and Critical Care, Society of Critical Care Medicine, Society for Neurointerventional Surgery, and Society of Vascular and Interventional Neurologists. Over the next 3-5 years, the Liaison Committee will establish a working relationship with representatives in each of these organizations with the goal to optimize the communication for areas and programs of mutual interest. Potential future topics to address with the Liaison Committee include training protocols and certification for individuals with crossed subspecialties.

Education was highlighted at the conference, exemplified by a review course for the United Council for Neurological Subspecialties Neurocritical Care (UCNS) board examination, hands-on/small group workshops and a basic science-translational science workshop. A highly useful syllabus was provided to complement the review course, which serves as a review for the board examination as well as a stand-alone text for those interested in reviewing Neurocritical Care fundamentals.

The hands-on/small group workshops were new to the societal meeting in 2010 and aimed at teaching techniques relevant to the field. Some of the session topics included mechanical ventilation, airway management, percutaneous tracheostomy, using transcranial Doppler ultrasound, basic and advanced neuroimaging, intracranial monitor placement and interpretation, and financial aspects of how to start and run a neurocritical care unit or a neurohospitalist program.

The main meeting of the Neurocritical Care Society then focused the agenda on setting standards in practice through the roll out of the Neurocritical Care Society Practice Guidelines and a new program called Emergency Neurologic Life Support (ENLS). This was the first public presentation of their efforts to develop a plan of action, similar to Advanced Cardiac Life Support (ACLS), in patients with a neurological crisis.

Additional topics that were highlighted in the main discussions included uses and limitations of microdialysis, brain oxygen and continuous EEG monitoring in the neuro-ICU. There were also discussions on induction of hypothermia in the management of acute brain injury. Furthermore, some topics had complimenting workshops for further educational purposes. One platform session was dedicated to discussions of end of life care, discussion of a new brain death guideline; and relevant to current issues regarding health care costs, there was a discussion of dilemmas in delivering care in the setting of futility.

As its final and new goal, the Neurocritical Care Society acknowledged the need to develop and set standards in research within the field. To emphasize this new directive, there was an afternoon dedicated to new and developing technologies; and within the presence of representatives from different funding sources, there were discussions on how to coordinate research efforts. Selected abstracts from the meeting are reviewed.

Upcoming Meetings:

World Federation of Interventional and Therapeutic Neuroradiology/ ABC WIN Meeting
January 16-21, 2011
Val d'Isere, France.
www.valdisere-congres.com

American Stroke Association International Stroke Conference
February 9-11, 2011
Los Angeles, CA.
www.strokeconference.org

International Congress of Endovascular Specialists
February 13-17, 2011
Scottsdale, AZ
www.iconmeeting.org

4th Annual Meeting of the Society of Vascular and Interventional Neurology
Fall 2011

63rd Annual Meeting American Academy of Neurology
April 9-16, 2011
Honolulu, HI
www.aan.com

Selected Abstracts from the Neurocritical Care Society Meeting

by Darwin Ramirez-Abreu, MD

- Dr. Adnan Qureshi from University of Minnesota discussed treatment modalities being studied for vasospasm. Interventional therapeutic options for subarachnoid hemorrhage-induced vasospasm resistant to medical therapy include intra-arterial administration of papaverine, magnesium sulfate, nifedipine, nimodipine, verapamil, nitroprusside, milrinone, or certain combinations of these drugs. Balloon-angioplasty or combined modalities may also be performed.

  Experimental therapies include intrathecal lavage, cisternal drainage and intrathecal/intraventricular drug administration (nimodipine, nicardipine, nitroprusside, fibrinolytics).

- *Brain Tissue Oxygen* monitoring. Drs. Ramon Diaz-Arrastia, from the University of Texas SW, and Dr. Nerissa Ko, from UCSF, lectured on this topic.

  Partial Pressure Brain Tissue Oxygen (PB_{O2} or BT_{PO2}) is measured using a device that is inserted into the white matter, and is often used together with intracranial pressure/cerebral perfusion pressure (ICP/CPP) or pH/PB_{CO2} monitors. BT_{PO2} may be superior to jugular bulb oxygen saturation ($SjvO_2$), since the latter measures global oxygenation rather than local tissue oxygenation.

  Tissue oxygen *saturation* (rSO_2) is measured using non-invasive near infrared spectroscopy (NIRO). Its accuracy is limited in adults because of limited and variable penetration of infrared light through the skull.

  The goal of the tissue oxygen monitors is to identify (and possibly subsequently correct) secondary injury not detected by other monitors in patients with acute brain lesions (mostly SAH and severe TBI).

- Continuous *Brain tissue perfusion* monitoring. A microprobe may be inserted intra-parenchymally to measure local tissue perfusion (rCBF). The goal of this technology is to identify early vasospasm after SAH, which may lead to the performance of a cerebral angiogram and changes in the therapeutic maneuvers.

  This goal may be achieved by using thermal diffusion (TD), laser-Doppler flowmetry (LDF) or diffusion flowmetry (TDF) probes. Dr. Carmen Graffagnino, from Duke University, addressed this topic. This technology differs from static measurements of brain tissue perfusion such as SPECT, PET, PWI-MR or near-infrared spectroscopy.

- *Intracranial microdialysis*. This technique allows the local measurement at regular intervals of concentrations of a number of substances in the extracellular space (including glucose, lactate, pyruvate, glutamate, glycerol, choline, acetylcholine, adenosine, urea, nitrate, anticonvulsants, antibiotics).

  A common application of microdialysis is to estimate the tissue metabolic activity. For example, local increase in lactate/pyruvate ratio, choline and glycerol, with decrease in tissue glucose, may be indicators of hypoxia and ischemia.

  Used together with monitor for CBF, tissue perfusion and tissue oxygen, the goal of microdialysis is to identify early secondary brain injury in large ischemic strokes, SAH or severe TBI.

  Dr. Urban Ungerstedt, from the Karolinska Institute, discussed the subject of intracranial microdialysis.

The conjunctive use of monitors of brain oxygen, perfusion, metabolites, ICP, CPP, systemic hemodynamic, continuous EEG and brain imaging is currently known as Multimodality Monitoring (MMM). MMM should only be handled by professionals trained in the field. The morbidity/mortality benefits of MMM-guided management in patients with severe brain injury are under study. Interested readers may consult *Wartenberg et al. Multimodality Monitoring in Neurocritical Care. Crit Care Clin 23 (2007) 507–538*.

⇨ *Mergers and Acquisitions Continued from page 10*

few years but its growth rate of 27% is impressive. Essentially the parent companies believe this sector will grow & they want the market share now on the up swing.

For the neurovascular field, this involves working with larger companies, which has its benefits and down sides. It also indicates that the business world sees neurovascular procedures and volume expanding.

Personal emails with Stryker reveals that they see the growth in ischemic stroke as evident by their response.

"Today, approximately 89% of sales in the global neurovascular market are derived from products for the treatment of hemorrhagic stroke (brain aneurysms). However, just 13% of stroke patients actually suffer from hemorrhagic stroke, with ischemic stroke (blockages) making up the remaining 87%. Next generation neurovascular treatments for ischemic stroke, including revascularization stents along with other treatments in development, hold significant promise to meaningfully grow the market for treatment of ischemic stroke."

He also stated that, "Worldwide sales of neurovascular devices to treat stroke were approximately $900 million in 2009 and are expected to grow to $1.4 billion by 2014." That is a little over 50 % growth in just 5 years.

Hopefully these larger companies and growing markets, will give us more resources to help us give the best possible care for our patients and improve outcomes for all cerebrovascular disease.

Summary of the First SVIN Practicum and Interactive Laboratory Meeting

by Susan W. Law, DO
Amir Zangiabadi, MD

In the heart of Georgia, neurointerventionalists and fellows flocked to Atlanta's Georgia Tech Global Learning center to participate in interactive curricula discussing the latest advancements in endovascular treatments.

The real stars were the fellows and residents presenting the cases complicated by endovascular treatment. The cases – varying from "iatrogenic emboli during stroke rescue" to "ICA dissection after mechanical thrombectomy" – by Dr. Chandra of Massachusetts General Hospital, were reviewed by well-seasoned neurointerventionalists who bestowed each presentation with their own experiences.

Figure 1: *A woman is listening very closely to the SVIN conference.*

"A live comparison of Balloon Assisted vs. Stent assisted coiling" was a televised demonstration at the St. Joseph Translational Center. The demonstration started with Dr. Rishi Gupta of Emory University who introduced the basics of balloon remodeling and stenting. The live demonstration was performed to treat 10 mm bovine grafted jugular aneurysms – the balloon assisting was performed by Dr. Osama Zaidat (University of Wisconsin) while Dr. Raul Nogueira (Emory University) performed the stent assisting coiling.

Figure 2: *SVIN hands on laboratory at St. Joseph's Translational Learning Center. Dr. Rishi Gupta is preparing the penumbra device.*

A New Trick Up the Sleeve: Aneurysm Treatment Technology and Discussion

Retrieval in Acute Ischemic Stroke: Latest and Greatest by Dr. Tudor Jovin reviewed the MERCI trial and multi MERCI part I. He pointed out a few unresolved issues in the latest interventions of clot retrieval in acute ischemic strokes including: adjunctive pharmacological therapy, proximal flow control, the usage of distal angiographic catheter, and manual aspiration during clot retrieval.

Treatment of Acute Stroke: A Bigger Straw A Better Draw by Dr. Yavagal of University of Miami provided an expert opinion on techniques of revascularization – "Don't make it worse. Maximize probability of benefit. Perform rapid reperfusion." He shared his own criteria in deciding on thrombectomy vs thromboaspiration by using the Thrombus aspiration thrombectomy indication score (TATI score) – based on the location (ICA-M1, M1-2, M > 2), age, presence or absence of atrial fibrillation (yes 0, no 1). Per this scoring mechanism, A lower score indicates thrombectomy, while a higher score, thromboaspiration. Dr. Gupta discussed preliminary data regarding the usage of the new Penumbra 054 catheter (Penumbra Inc., San Leandro, CA) for thromboaspiration of large occlusions. The study's demographics included a mean National Institutes of Health Stroke Scale (NIHSS) score of 18, predominantly women and a TIMI 0-1. The average time of symptoms were 4.8 hours with a median time required for aspiration of 14 minutes. The rate of TIMI revascularization were 89% with symptomatic hemorrhage rates similar to mechanical thrombectomy, 9.4% at 24 hours.

The practicum continued to St. Joseph's Translational center where residents and fellows were given the opportunity to become familiar with the newest endovascular devices – including the Penumbra 054 catheter and separator. Endovascular devices were performed on live pig models as well as still models all provided by Emory University.

The practicum ended with a talk entitled "**What Does the Field Need: Devices and Protocol.**" In treatment of ischemic strokes the panelists agreed that the devices needed to be faster and provide direct carotid access. Though newer technology is leaning towards retrievers, there is a need for increase treatment at the site of occlusion. Protocols are in need of improvement and further definition. These included involving comprehensive evaluation, providing a systematic study of each device or drug, evaluating proof of concept "open artery theory," defining standard Penumbra imaging protocol. More clinical randomized trials are needed.

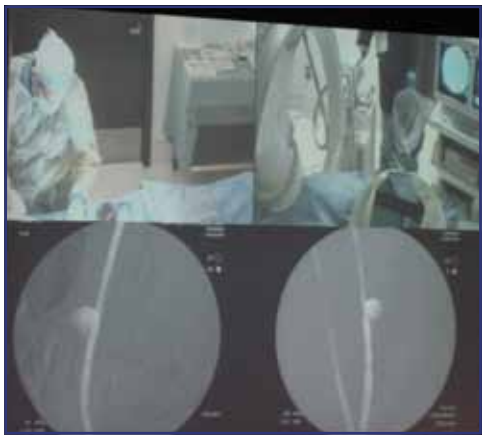

Figure 3: *Live discussion and demonstration of (left) balloon of aneurysm and (right) stenting of the aneurysm.*