



Medical College of Georgia
Neuroscience Outlook

Department of Neurosurgery Newsletter

Volume 3, Issue 1 - Summer 2006

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www.mcg.edu/som/neurosurgery

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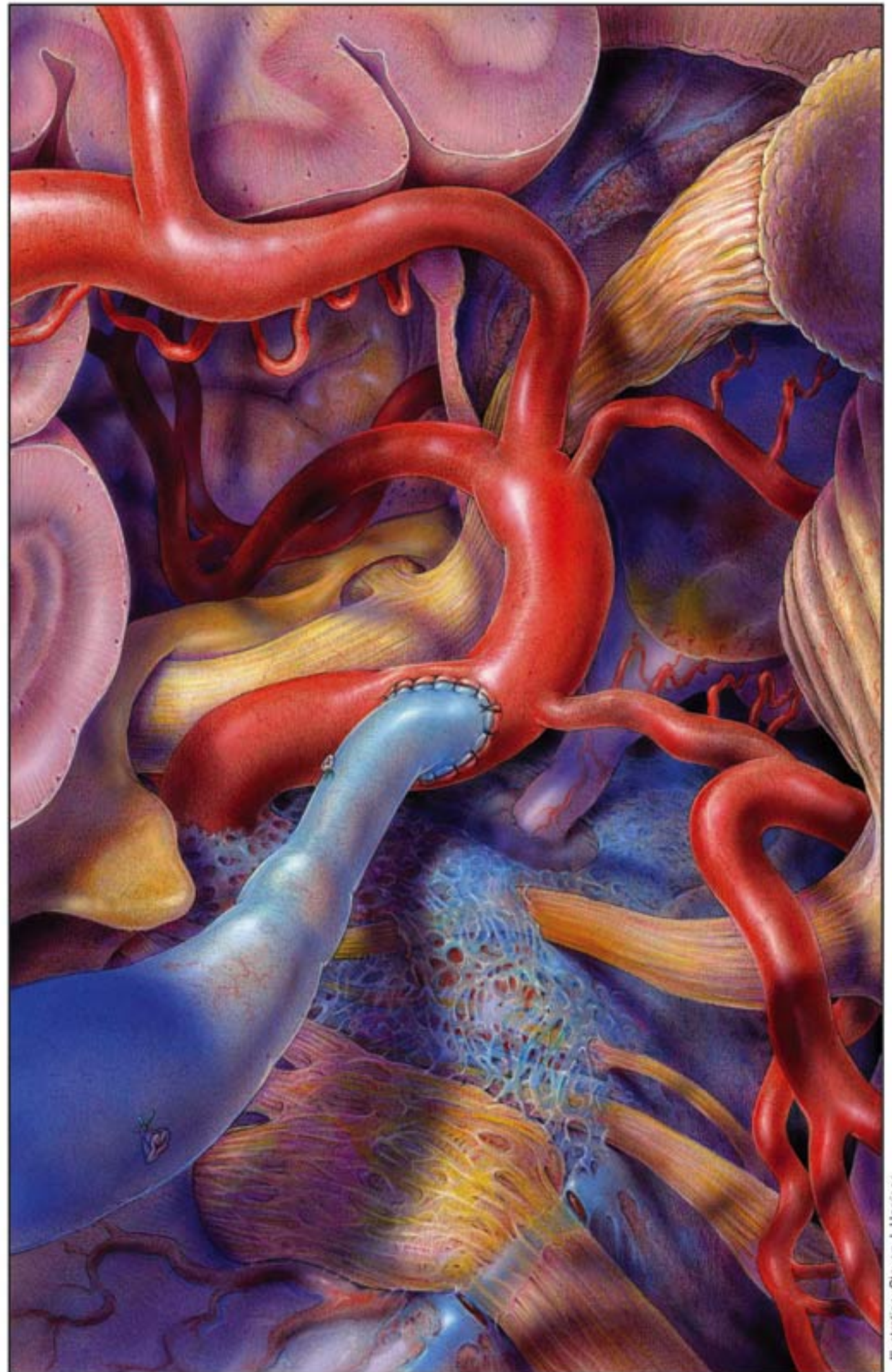


Illustration: Steven J. Harrison

Educational Spotlight: Medical Illustration in the Neurosciences at MCG

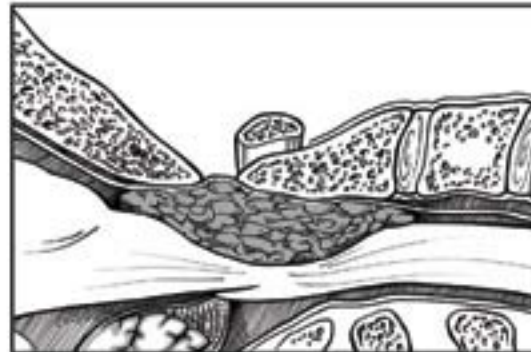
Chair's Message

Welcome to Neuroscience Outlook, the newsletter of the Department of Neurosurgery at the Medical College of Georgia, now in its third year of publication. Neurosurgery at the Medical College of Georgia has been a formal program since 1956 when **Dr. George Smith** was recruited from the University of Maryland to head the new Section of Neurosurgery formed within the Department of Surgery. Dr. Smith was an innovative and charismatic individual; however, his tenure was cut short by a tragic airplane accident in which he was the pilot. **Dr. Marshall Allen** became the section chief in 1964 until his retirement in 1994. Dr. Allen created a strong clinical residency program with a good regional reputation. **Dr. Dennis McDonnell** was section chief from 1994 to 1999. Dr. McDonnell was a very good, and hardworking neurosurgeon with impeccable ethics who made a significant impact on the educational and clinical programs under his leadership. I took over in 1999 as section chief, and became the first chair of the new Department of Neurosurgery in 2002.

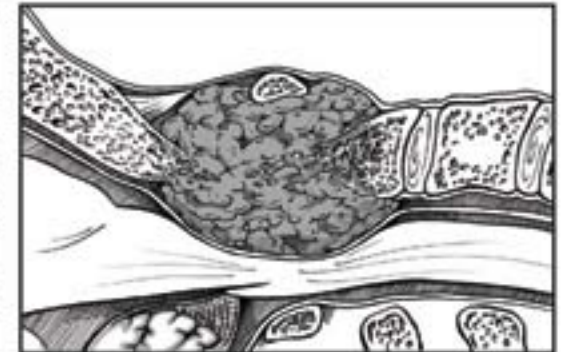


While this brief history shows that academic neurosurgery has a greater than 50 year history at the Medical College of Georgia, an even more illustrious program is the Medical Illustration Department at the Medical College of Georgia. We have been quite fortunate to have a strong association with this group for some time, and members of their faculty have been instrumental in producing this newsletter. We are honored that Department Chair **Steve Harrison** has agreed to submit an article on the history of medical illustration at the Medical College of Georgia. Also in this issue, we present our Neurovascular group, and the very exciting clinical and basic research work they are producing. As always, we are very grateful to **Dr. Cargill Alleyne** who has served as the outstanding Editor-in-Chief for the Neuroscience Outlook since its inception. We hope that you enjoy the current issue.

Mark R. Lee, M.D., Ph.D., F.A.C.S.
Professor and Allen Distinguished Chair
Department of Neurosurgery



Subdural tumor at C1-C2



Extradural tumor at C1-C2

Department News

Contributor Acknowledgement

We are pleased to announce that **Synthes Spine** has provided an educational grant to defray the costs associated with the publication and distribution of the Neuroscience Outlook. We greatly appreciate this important contribution.

AANN Chapter Approved

The American Association of Neuroscience Nursing (AANN) recently approved a charter for the newly developed Georgia-Carolina chapter. The officers are **Randy Murphy** (Neuroscience Practice Site), President; **Jill Williams** (Neurological ICU), Vice president; **Susan Rucker** (Epilepsy Unit) Secretary; **Charlotte Byrum** (Epilepsy Unit), Treasurer.

The goals of the new chapter are to increase membership, to provide educational opportunities for healthcare professionals caring for patients with neurological disorders, and to participate in community events such as health fairs.



Private cubicles in angiography recovery suite.



New Angiography/Special Procedure Recovery Suite Completed

At the end of June a new six-bed recovery suite was completed in the radiology department. This suite is in close proximity to the angiography suite and will facilitate recovery of patients undergoing diagnostic angiography, endovascular neurosurgery, interventional neuroradiologic procedures as well as other interventions such as myelograms.



Nursing station in recovery suite.

Educational Spotlight

Medical Illustration in the Neurosciences at MCG

Medical Illustrators are specially trained visual artists who communicate complex scientific ideas in an aesthetic, understandable, and meaningful manner. Arguably, the first medical illustrators were among the Renaissance artists of the 15th and 16th centuries, such as Leonardo da Vinci and Stefan van Calcar, who illustrated the first anatomy textbook, "de Humani Corporis Fabrica" by anatomist Andreas Vesalius.

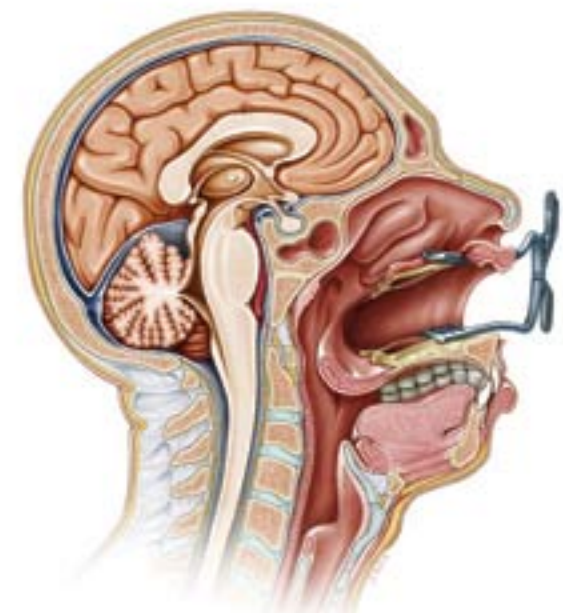
Schools for the training of medical illustrators were instituted in the 20th century, with the first established at the Johns Hopkins School of Medicine in 1911 by Max Brödel. Brödel (1870-1941) directed the program until his retirement in 1940. Among his students were Jack Wilson and **Orville A. Parkes** (class of 1935). Wilson was brought to the Medical College of Georgia in April of 1948 by Dr. G. Lombard Kelly (who became MCG's first president in 1950) to illustrate for the faculty and to develop an academic program in art as applied to medicine similar to that at Johns Hopkins. While still a non-degree program, Wilson accepted his first student, George Lynch, and continued to develop a curriculum which was approved for the Master of Science in Medical Illustration degree in 1949. At that point, Jack Wilson decided to



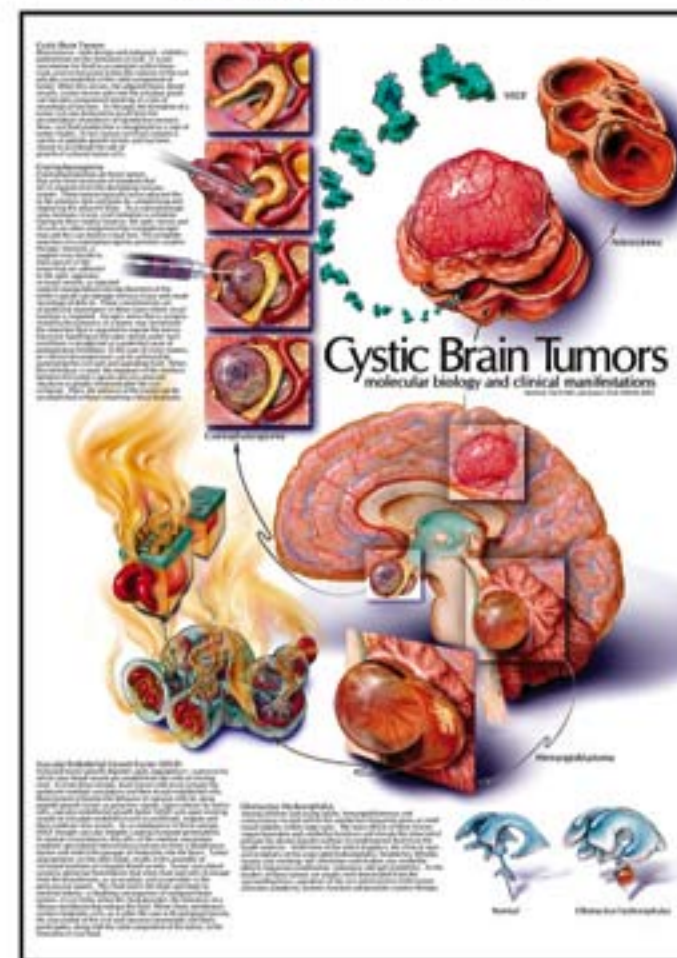
Orville A. Parkes

leave the Medical College to pursue other interests, and contacted his Hopkins classmate, Orville Parkes, who became the first director of the medical illustration program at MCG from 1949 until his retirement in 1974. George Lynch decided not to pursue the master's degree, and accepted the position vacated by Parkes at Duke University. He later moved to Bowman Gray (Wake Forest University) School of Medicine where he headed the biomedical communications department for many years. The first graduate of the MCG program was Robert C. Benassi, in 1951, who for many years was the head of the Section of Medical Illustration at the Mayo Clinic.

The Medical Illustration Graduate Program at MCG was the first program of its kind to become accredited (1967) by the Association of Medical Illustrators and the American Medical Association (CAHEA). To date, the MCG Medical Illustration program has trained nearly 300 graduates. Many of these individuals have specialized in neurosurgical, neurological, and neuroanatomical illustration. In 1959, Dr. George C. Smith hired program graduate **Frances DeRoller** as the first medical illustrator in the MCG section of Neurosurgery, a position she held until her death in 1973. In the years following, MCG medical illustrators **Octavia Garlington**, **David Mascaro**, **Milton Burroughs**, and **Steve Harrison** were commissioned to do medical illustrations for the Department of Neurosurgery, until **Andrew E.B. Swift** was hired in 1999. In December of 2000, Swift accepted a full-time teaching position in the Department of Medical Illustration, but continued to do some illustrations for Neurosurgery. In June of 2002, **Andrew J. Rekito** was hired to illustrate for Neurosurgery, and completed numerous anatomical, surgical, and clinical illustrations until he relocated to Portland, Oregon in 2005, where he now works for the Department of Neurosurgery at the Oregon Health Sciences Center. Rekito was replaced by **Michael A. Jensen** in the summer of 2005, and Mr. Jensen brings the added dimension to his neuroscience illustration of being an experienced animator.



Transoral LeFort Approach to the Clivus, by Andy Rekito, copyright 2006 OHSU



Cystic Brain Tumors, by Andrew Swift, copyright 2002



Sphenoorbital Tumor, by Steven J. Harrison, copyright 1992

Over the years, medical illustration graduates from the Medical College of Georgia have practiced neuroscience illustration at such prestigious institutions as the Barrow Neurological Institute in Phoenix, the University of Florida in Gainesville, the Mayfield Clinic in Cincinnati, the Mayo Clinic in Rochester, MN, and the University of Virginia in Charlottesville.

Steven J. Harrison, M.S., C.M.I., F.A.M.I.

To learn more about the MCG Medical Illustration Graduate Program, please visit: www.mcg.edu/medart



Transcochlear Approach, by Andy Rekito, copyright 2006 OHSU

Clinical Spotlight

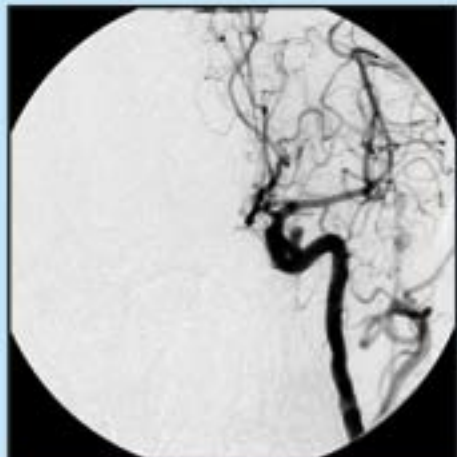
Cerebrovascular Program

The mission of the cerebrovascular division at MCG is to promote the education, diagnosis and treatment of patients with cerebrovascular disorders. Our division consists of a cerebrovascular neurosurgeon trained in both open vascular and endovascular techniques and an interventional neuroradiologist. These two individuals work closely together while treating these patients. The division has a cost center that is separate from both neurosurgery and radiology and the clinics for these two specialists are conducted at the same time and in the same location. This has greatly promoted a close working relationship that we believe enhances our ability to provide the best possible patient care. Other key components to the program are the stroke neurology team, operative nursing staff, neuroscience unit and nursing staff, neuroscience clinic staff, biplanar angiography suite, Gamma Knife unit, BrainLab stereotactic unit and new angiography recovery suite. We treat the gamut of cerebrovascular diseases, a fraction of which is outlined below.

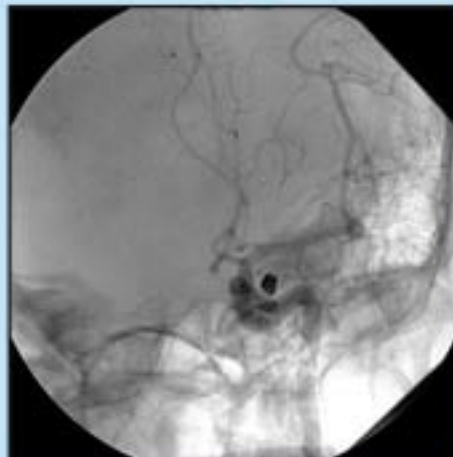
Cerebral aneurysms

Cerebral aneurysms are present in up to 5% of the population. While an estimated 1% of the population will experience an aneurysmal bleed, up to a third of these patients will die within days of the hemorrhage if untreated. We provide the full spectrum of treatment of both unruptured and ruptured aneurysms including surgical clip ligation with intraoperative arteriography, and coil embolization. The stent-coil technique has expanded the role of coil embolization in aneurysms with wide necks that might not otherwise be suitable for coiling.

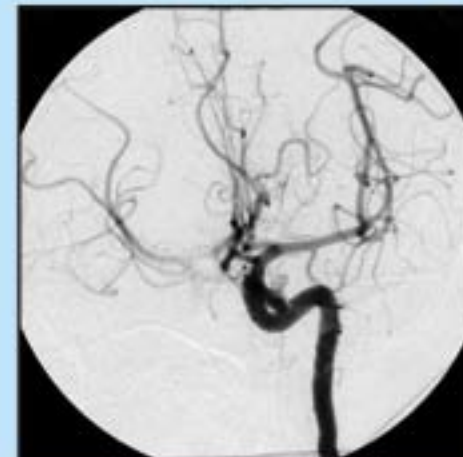
Case illustration: A 55-year old woman was incidentally found to have a proximal internal carotid aneurysm. After a discussion of the treatment options she elected to undergo coil embolization. During the procedure the neck of the aneurysm was noted to be wider than previously thought and this precluded stable deployment of the coil loops. The procedure was aborted and after further discussion, we decided to proceed at a later date with a two-stage stent-coil procedure. At the first stage we deployed a stent across the base of the wide-necked aneurysm. She later returned for coil deployment resulting in 100% occlusion (see accompanying figures).



Cerebral angiogram reveals a proximal left ICA aneurysm.



Cerebral angiogram shows coil mass with Neuroform stent in place.



Complete occlusion of the aneurysm is noted.

Cerebral arteriovenous malformations

Cerebral AVMs are vascular anomalies consisting of fistulous connections between arteries and veins without a normal intervening capillary bed. Most of these lesions are considered congenital and they typically present by age 40. The most common presentation is intracranial hemorrhage (65%), followed by seizures (15-35%), headaches (15%), and focal neurological deficits (less than 10% of cases). The rupture rate is 3-4% per year. The treatment options include surgical resection, embolization, stereotactic radiosurgery, or a combination. The decision to treat, however, is often a complex one which factors in the age, health, and presentation of the patient characteristics of the lesion, and treatment risks.

Carotid stenosis

While asymptomatic carotid stenosis carries a low annual risk of ipsilateral stroke of approximately 2%, the 2-year risk of stroke in patients with greater than 70% symptomatic stenosis is 21%. When the plaque is ulcerated this risk steadily increases with increasing degrees of stenosis. A 75% symptomatic stenosis with an ulcerated plaque carries a 26.3% 2-year risk of stroke while a 95% stenotic lesion carries a 73% risk. The options for treatment include carotid endarterectomy and stenting with distal protection. While endarterectomy is the most frequently performed technique, stenting is often the preferred treatment in patients with a high surgical risk such as those with contralateral carotid occlusion, previous neck surgery, or previous radiation treatment.

Stroke

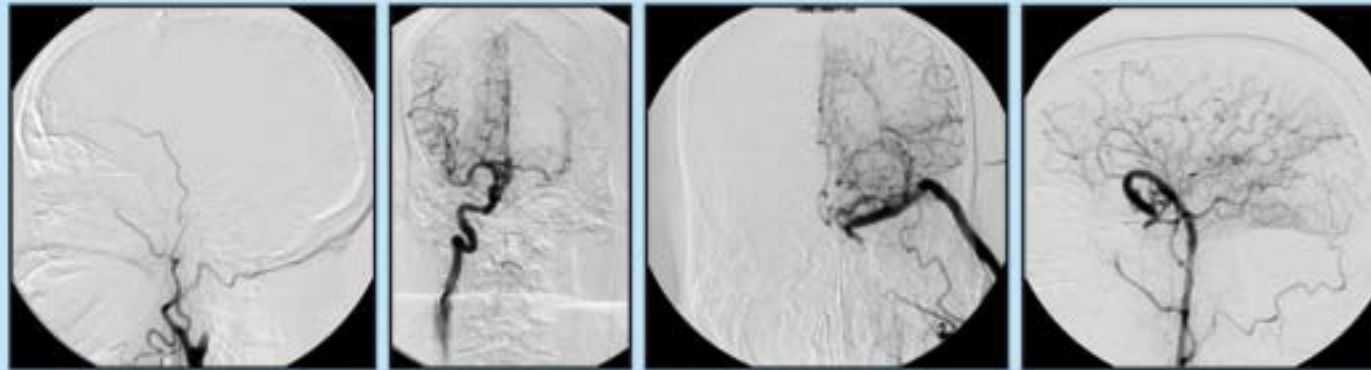
The approval by the NIH of the thrombolytic tPA greatly expanded the treatment options for patients presenting with stroke. The NINDS IV tPA trial demonstrated its safe and effective use if given within 3 hours after the onset of symptoms. Unfortunately only 4% of stroke patients presents within this time window. Those presenting within 6 hours may be eligible for intra-arterial thrombolysis.

Clinical Spotlight *(continued...)*

Cerebral vascular insufficiency

Cerebral vascular insufficiency may occur in a variety of patient subgroups such as those with moyamoya disease, sickle cell disease and cervical or cerebral vessel occlusions. Some patients who suffer from insufficient perfusion to the hemispheres may be candidates for a revascularization procedure such as a superficial temporal to middle cerebral artery bypass, a saphenous vein bypass, or an encephaloduroarteriosynangiosis (EDAS).

Case illustration: A 62-year old man presented with a history a multiple strokes and progressive TIAs despite maximal medical therapy. He eventually required pressors in a recumbent position to prevent a recurrent dense right hemiparesis. An arteriogram showed a completely occluded right internal carotid artery near its origin. It also showed minimal cross-flow from the right ICA injection to the left hemisphere via a stenotic anterior communicating artery. His left superficial temporal artery was very small. A cervical to supraclinoid ICA saphenous vein bypass was performed with good perfusion to the left hemisphere.



Right CCA injection (lateral view) shows an occluded ICA.

Right ICA injection shows inadequate cross-filling of the left hemisphere.

Left CCA injection (AP and lateral views) show saphenous vein bypass.



Artist's illustration of the bypass.

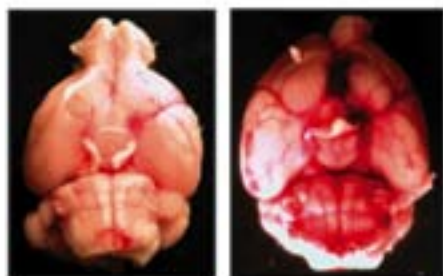
Cargill H. Alleyne, Jr., M.D. and Jeffrey A. Stone, M.D.

Research Spotlight

Cerebrovascular Research Laboratory

The broad goal of the Cerebrovascular Research Laboratory, established less than a year ago, is to elucidate neurobiologic mechanisms that play a role in the pathogenesis of cerebral ischemia, to investigate methods of neuroprotection and mechanisms of plasticity, and to explore the role and interaction of other cell types with the neuron in various cerebrovascular disorders. Some of our interests are described below.

1. We seek to understand the pathogenesis of cerebral vasospasm resulting after subarachnoid hemorrhage (SAH) with the goal of identifying novel therapeutics. Astrocytes, a type of glial cell and the most abundant cell type in the brain, are anatomically located in juxtaposition to blood vessels and participate in the development and maintenance of the blood-brain-barrier. Traditionally, astrocytes have been regarded as supportive cells, nourishing neurons and maintaining homeostasis in the brain. However, recent work has suggested that astrocytes may actively participate in brain function, including neuronal protection during brain injury and in the control of cerebral blood flow. In contrast to the recognized protective functions of glia, glial pathologies may represent an important component of neurological disease that has yet to be exploited.



Ventral view of brain taken 1h post-SAH in the murine model of SAH.

Following SAH, inflammatory markers rapidly increase within the CSF, suggesting brain inflammation may contribute to the pathogenesis of the complications of SAH, including the development of cerebral vasospasm and secondary brain ischemia. However, the cell type(s) responsible for these changes remains unclear. Presently, we are investigating the possible role of astrocytes in this process, which may permit a better understanding of the mechanisms involved in the development of cerebral vasospasm. Using a murine endovascular perforation model of SAH, inflammatory genes were increased within hours of brain injury. Interestingly, administration of an anti-inflammatory compound, *curcumin*, prevented the development of secondary brain ischemia, suggesting that brain inflammation may contribute to the development of vasospasm. We also observed a pronounced and rapid inflammatory response in cultured astrocytes, leading to the hypothesis that astrocyte-derived inflammatory factors may participate in the pathogenesis of

subarachnoid hemorrhage and cerebral vasospasm. Current work is focused on elucidating the molecular mechanisms underlying the induction of inflammatory genes as a way to develop targeted novel therapeutics to limit the development of cerebral vasospasm and secondary brain ischemia following SAH.

2. Ischemic stroke is a leading cause of death and disability. Stroke-induced CNS injury is caused by a combination of factors including oxidative stress, which is implicated in many neurodegenerative diseases. We explored the ability of curcumin to protect murine cortical neurons from H₂O₂-, NMDA-, and hypoxia/reoxygenation-induced neuronal injury using a rodent suture model of acute stroke. Our studies show that curcumin completely blocked the damage induced by hypoxia/reoxygenation and by H₂O₂, and significantly reduced



Curcumin protects against tMCAo injury in the mouse - assessed by TTC staining 24h post occlusion (2h/22h perfusion)

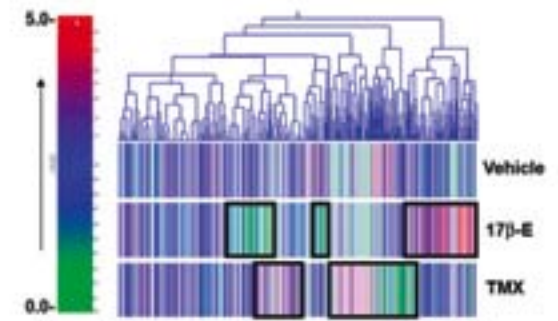
Research Spotlight *(continued...)*

NMDA-induced neuronal injury. The findings suggest that curcumin may be a powerful compound to reduce oxidative stress following ischemic brain injury.

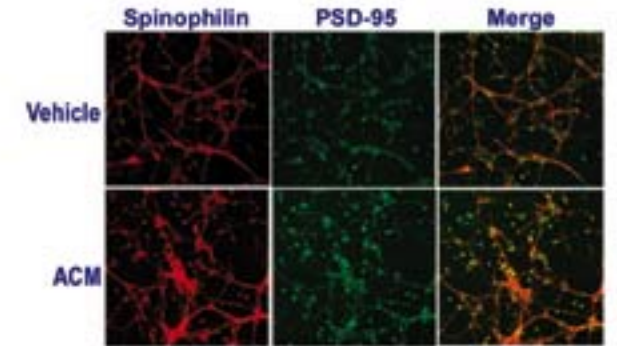
3. After menopause, ovarian production of the steroid hormone 17β -estradiol ceases. At this time women can experience impaired cognitive functioning and exhibit an increased risk of neurodegenerative diseases. Our laboratory is elucidating the molecular and cellular events underlying the gender-specific protection of the brain and regulation of cognitive function. Recently, we identified estradiol-induced release of transforming growth factor- β from astrocytes as an important component of neuroprotection against stroke-induced injury. In collaboration with Dr. Darrell Brann (IMMAG; Dept of Neurology), we have employed genomic and proteomic approaches to provide a mechanistic understanding underlying estradiol-induced synapse formation. This knowledge will provide molecular and cellular insights into the gender-specific protection of the brain and regulation of cognition, which may have implications for neuroprotection and brain repair following stroke.

4. Another interest of the laboratory is the role of astrocytes in the regulation of synaptic plasticity. We have recently determined that an astrocyte-derived soluble factor(s) induces a robust increase in the expression of pre- and post-synaptic markers in cultured cortical neurons. This increase appears in both glutamergic and GABAergic neurons suggesting that astrocytes may globally enhance neuronal connectivity. Current work is focused on the cellular regulation of these gene changes, with an emphasis on the ERK/MAP kinase pathway. These findings have relevance in the understanding of developmental neuroscience. Furthermore, these pathways could potentially be exploited to promote plasticity and "rewiring of the brain" following neurological trauma, including stroke and traumatic brain injury.

Krishnan M. Dhandapani, Ph.D. and Cargill H. Alleyne, Jr., M.D.



Hierarchical clustering of microarray data taken from the cerebral cortex of rat following treatment with estrogen or tamoxifen.



Effect of astrocyte-conditioned media on synapse formation (assessed by spine marker, spinophilin) and post-synaptic marker (PSD-95; seen as puncta) in cultured cortical neurons.

Faculty Update



Accomplishments and Recognition

Cargill H. Alleyne, Jr., M.D. was elected to the Society of Neurological Surgeons ("Senior Society") at the May 2006 meeting hosted by Duke University in Durham, North Carolina.

Mark R. Lee, M.D., Ph.D. has been included in the *Best Doctors in America*, 2005-2006 listing, and was featured on the cover of the June/July issue of Augusta Magazine.

Roslyn Marshall, R.N., B.S.N., nurse manager of the Neuroscience unit, received the Family Choice award for her outstanding leadership and innovations for incorporating and supporting Patient/Family Centered Care in the Neuroscience Center and MCGHI.

Residents' and Fellows' Corner

Accomplishments and Recognition

Darlene Lobel, M.D. graduated from the MCG residency program in June 2006. Dr. Lobel will be commencing a one-year fellowship in Stereotactic neurosurgery at UCLA. We wish her all the best.

Darlene Lobel, M.D. won the prize for best resident presentation at the spring meeting of the Georgia Neurosurgical Society meeting in Sea Island, GA. Dr. Lobel's presentation was entitled "Closed loop responsive neurostimulator (RNS) for epilepsy".



Drs. Vender, Lee, Alleyne and Lobel at her graduation.



Dr. Tuttle and his wife, Amy.

Johnathan Tuttle, M.D. passed the written portion of the Neurosurgery Board Examination in March 2006. Congratulations!

Residency Program Update

To facilitate the change in program length from 5 to 6 years after internship, we matched 2 applicants this year in the neurosurgery match. Douglas Hughes, M.D. and Patrick Youssef, M.D. started their PGY-1 year in July 2006. Douglas completed his medical training at Indiana University while Patrick completed his at SUNY-Buffalo. We welcome them and wish them all the best at the start of their careers in neurosurgery.

Spine Fellowship Update

Haroon Choudhri, M.D. (Director, Neurosurgery Spine Service) and Craig Chebuhar, M.D. (Neurosurgery Spine Fellow) have started work on a project entitled *Evidence-Based Medicine Guidelines for Spinal Instrumentation*. They will lead an effort to determine the guidelines for the replacement, removal and revision of spinal instrumentation. This will be conducted by a panel consisting of neurosurgeons and orthopedic spine surgeons from institutions across the country.

Presentations and Publications (January-June 2006)

Presentations

Andrew RD, Boehnke SE, **Kirov SA**: Physiological evidence that pyramidal neurons lack functional water channels and how this relates to Leo Renaud. Canadian Physiological Society Annual Meeting. Lake Louise, Canada, February 2006

Kirov SA, Andrew RD: CNS neurons withstand osmotic but not ischemic stress. Biophysical Society Annual Meeting. Salt Lake City, UT, February 2006 (Poster)

Alleyne CH: Decreasing surgical risk in the era of ISUIA. American Association of Neurological Surgeons and Congress of Neurological Surgeons Section on Cerebrovascular Surgery Meeting. Orlando, FL, February 2006 (Poster)

Hain J, Alleyne CH, Bingaman K, Stone J: Normal perfusion pressure breakthrough phenomenon complicating surgical treatment of neonatal arteriovenous fistula with excellent outcome. American Association of Neurological Surgeons and Congress of Neurological Surgeons Section on Cerebrovascular Surgery Meeting. Orlando, FL, February 2006 (Poster)

Alleyne CH: Skull-base tumor surgery. Cancer and the Brain Course. Augusta, GA, March 2006

Vender J: New technologies in brain tumor surgery. Cancer and the Brain Course. Augusta, GA, March 2006

Voloschin A: Awareness of early signs of cancer in the brain. Cancer and the Brain Course. Augusta, GA, March 2006

Voloschin A: New developments in the Brain Tumor Program; Clinical Trials and Basic Science Research. Cancer and the Brain Course. Augusta, GA, March 2006

Hessler R, **Voloschin A**: New tools (molecular markers) for the diagnosis and treatment of brain tumors. Cancer and the Brain Course, Augusta, GA, March 2006

Lobel DA, Smith JR: BrainLAB image fusion guides closed loop stimulator implant. BrainLAB Residents Academy. Munich, Germany, April, 2006

Vender JR: Invasive options - Rhizotomy, myelotomy and pumps: Unlocking the mysteries of spasticity. The Who, the Why and the What Now Spasticity Conference. Augusta, GA, May 2006

Alleyne CH, Dhandapani KM: Curcumin reduces cortical neuronal cell death in a murine model. Georgia Neurosurgical Society Meeting, Sea Island, GA, May 2006

Alleyne CH: Case presentations and panel discussion. Vascular neurosurgery. Georgia Neurosurgical Society Meeting, May 2006

Choudhri HF: Case presentations and panel discussion. Spine surgery. Georgia Neurosurgical Society Meeting, Sea Island, GA, May 2006

Lobel DA, Smith JR: Closed loop responsive neurostimulator (RNS) for epilepsy. Georgia Neurosurgical Society Meeting, Sea Island, GA, May 2006

Rahimi SY, Park YD, Witcher MR, Lee MR: Corpus callosotomy for treatment of pediatric epilepsy in the modern era. Georgia Neurosurgical Society Meeting, Sea Island, GA, May 2006

Lobel DA, Smith JR: Follow-up results with a closed loop stimulation system in the control of focal epilepsy. American Society for Stereotactic and Functional Neurosurgery Meeting. Boston, MA, June 2006

Publications

Andrew RD, Labron MW, Boehnke SE, Carnduff L, **Kirov SA**: Physiological evidence that pyramidal neurons lack functional water channels. Cereb. Cortex. May 24, 2006; [Epub. ahead of print].

Smith JR, Lee GP, Fountas KN, King DW, **Jenkins PD**: Intracranial stimulation study of lateralization of affect. Epilepsy & Behavior 8: 534-541, 2006.

Morgan JC, diDonato CJ, Iyer SS, **Jenkins PD, Smith JR**, Sethi KD: Self-stimulatory behavior associated with deep brain stimulation in Parkinson's disease. Mov Disord 21: 283-285, 2006.

Fountas KN, Kapsalaki E, Kassam M, Feltes CH, Dimopoulos VG, Robinson JS, **Smith JR**: Management of intracranial meningeal hemangiopericytomas: outcome and experience. Neurosurg Rev 29 (2): 145-153, 2006.

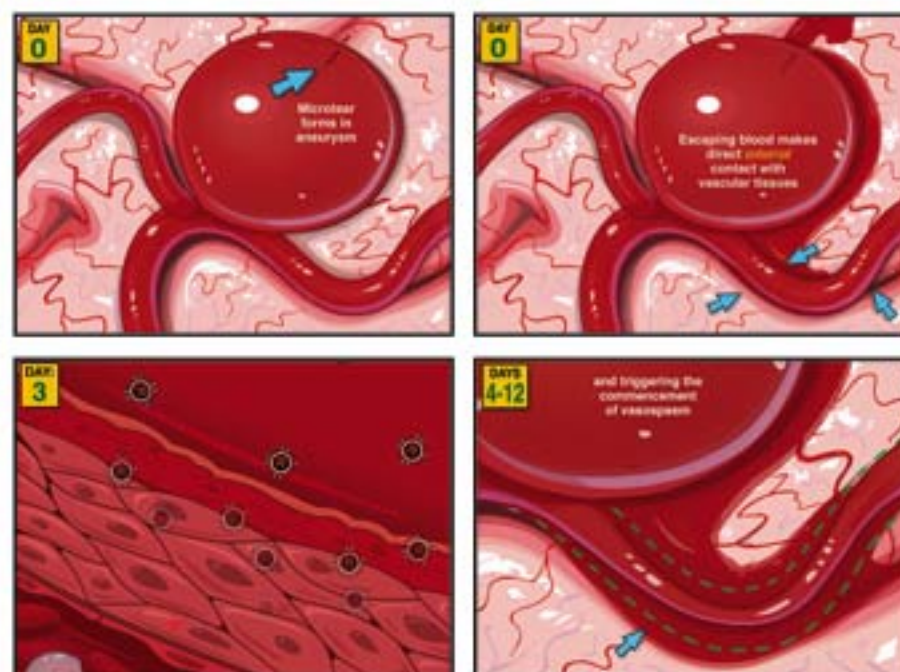
Smith JR, Fountas K, King DW: The limited role of resective surgery in nonlesional neocortical epilepsy. In: Miller, J.W., Silbergeld, D.L. (ed) Epilepsy Surgery: Principles and Controversies. pp730 - 734, 2006

Vender JR, Hester S, Houle PJ, **Choudhri HF, Rekito A**, McDonnell DE: The use of closed-suction irrigation systems to manage spinal infections. J Neurosurg: Spine, October 3(4): 276-82, 2005

Choudhri HF, Perling LH: Diagnosis and management of juxtafacet cysts, Neurosurgery Focus 15; 20(3):E1, 2006

Tuttle J, Shakir A, and Choudhri HF: Paramedian approach for transforaminal lumbar interbody fusion with unilateral pedicle screw fixation. Technical note and preliminary report on 47 cases. Neurosurg Focus 20(3):E5, 2006

Rahimi SY, Brown JH, Macomson SD, Jensen MA, Alleyne CH: Evolution of the treatment of cerebral vasospasm. Neurosurg Focus 20(6):E4, 2006



Frames from the animated sequence accompanying Dr. Rahimi's paper on vasospasm.



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Neuroscience Outlook

To learn more about the MCG Department of Neurosurgery, please visit:
www.mcg.edu/som/neurosurgery

Conference Schedule (August 2006 - Dec 2006)

All grand rounds and conferences take place on Friday in the 3 West amphitheater.

Aug 04	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Journal Club Spine Conference Case Conference Brain Tumor Board	Sep 22	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuro 101: Dr. Dion Macomson "Cervical Spine Trauma" Spine Conference M&M Brain Tumor Board	Nov 17	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuro 101: Dr. David Floyd "Clinical Localization in Disc Disease" Spine Conference M&M Brain Tumor Board
Aug 11	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuro 101: Dr. Cargill Alleyne "An Introduction to Subarachnoid Hemorrhage" Spine Conference Case Conference Brain Tumor Board	Sep 29	NO CONFERENCE		Nov 24	NO CONFERENCE / THANKSGIVING	
Aug 18	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Anatomy Spine Conference Radiology Review Brain Tumor Board	Oct 06	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Journal Club Spine Conference Case Conference Brain Tumor Board	Dec 01	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Journal Club Spine Conference Case Conference Brain Tumor Board
Aug 25	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuro 101: Dr. Mark Lee "An Introduction to Hydrocephalus" Spine Conference M&M Brain Tumor Board	Oct 13	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuro 101: Dr. Chris Hall "Etiology and Management of Spontaneous ICH" Spine Conference Case Conference Brain Tumor Board	Dec 08	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Anatomy Spine Conference Case Conference Brain Tumor Board
Sep 01	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Journal Club Spine Conference Case Conference Brain Tumor Board	Oct 20	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Anatomy Spine Conference Radiology Review Brain Tumor Board	Dec 15	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuro 101: Dr. Alfredo Voloschin "New Approaches to Brain Tumor Treatments" Spine Conference Radiology Review Brain Tumor Board
Sep 08	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuro 101: Dr. John Vender "Head Injury" Spine Conference Case Conference Brain Tumor Board	Oct 27	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuro 101: Dr. Haroon Choudhri "Thoracolumbar Spine Trauma" Spine Conference M&M Brain Tumor Board	Dec 22	NO CONFERENCE / CHRISTMAS HOLIDAYS	
Sep 15	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Anatomy Spine Conference Radiology Review Brain Tumor Board	Nov 03	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Journal Club Spine Conference Case Conference Brain Tumor Board	Dec 29	NO CONFERENCE / NEW YEARS HOLIDAYS	
			Nov 10	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Anatomy Spine Conference Case Conference Brain Tumor Board			

Upcoming Meetings (July - December 2006)

Congress of Neurological Surgeons
 10/7-12, Chicago, IL

Research Update in Neuroscience
 for Neurosurgeons
 10/21-28, Woods Hole, MA

American Board of Neurological
 Surgery (Orals)
 11/7-10, Houston, TX

Georgia Neurosurgical Society Meeting
 11/18, Atlanta, GA

AANS/CNS Section on Pediatric
 Neurological Surgery
 11/28 - 12/1, Denver, CO

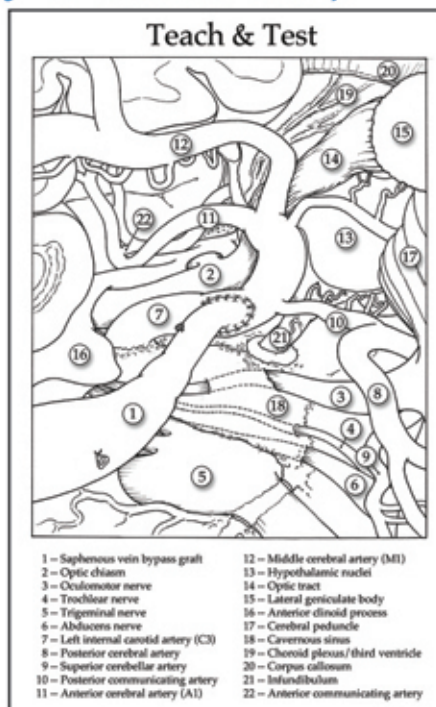
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|---------------------------------------|---------------------------------------|
| 1 - Saphenous vein bypass graft | 12 - Middle cerebral artery (M1) |
| 2 - Optic chiasm | 13 - Hypothalamic nuclei |
| 3 - Oculomotor nerve | 14 - Optic tract |
| 4 - Trochlear nerve | 15 - Lateral geniculate body |
| 5 - Trigeminal nerve | 16 - Anterior clinoid process |
| 6 - Abducens nerve | 17 - Cerebral peduncle |
| 7 - Left internal carotid artery (IC) | 18 - Cavernous sinus |
| 8 - Posterior cerebral artery | 19 - Choroid plexus / third ventricle |
| 9 - Superior cerebellar artery | 20 - Corpus callosum |
| 10 - Posterior communicating artery | 21 - Infundibulum |
| 11 - Anterior cerebral artery (A1) | 22 - Anterior communicating artery |

Refer to cover illustration

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