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Clinical Spotlight: The History and Evolution of Functional Neurosurgery at MCG

Editor-in-Chief's Message

Since the publication of our previous issue of Neuroscience Outlook, our Department has undergone change. In this issue we feature the history and evolution of Stereotactic and Functional neurosurgery. This is especially timely as **Dr. Joseph Smith**, our Stereotactic and Functional neurosurgeon, retired from active surgical practice after 22 years of dedicated service. We also highlight the contribution of **Dr. Mark Lee** who recently stepped down as Chairman of our department to transition into private practice. **Dr. John Vender**, previously Clinical Vice-Chair, was selected by the Dean to be interim chair during the transition and **Dr. Cargill Alleyne** has been selected as the new Chairman of Neurosurgery as of September 1, 2007. As we anticipate the next chapter in our department's history we look forward to continued growth and to maintaining excellence in patient care, education and research.

Our goal of maintaining excellence in education and research is facilitated by the strong link between our Department and the Department of Medical Illustration. This link is evidenced by the dedication of the Steven Harrison Gallery in the Department News section. The contributor donations to our department also further this goal.

As in previous issues, we feature the accomplishments of our faculty and residents. Our department is academically productive with 100 presentations and 56 publications in a mere 3 years from January 2004 to December 2006. This issue highlights our academic productivity in the previous 6-month period from January to June 2007. Finally, our Grand Rounds conference schedule and selected upcoming national meetings are listed. We hope you enjoy this update.

Cargill H. Alleyne, Jr., M.D.

Editor-in-Chief

*Associate Professor and
Marshall Allen Distinguished Chair
Department of Neurosurgery*

Department News

Steven J. Harrison gallery dedicated

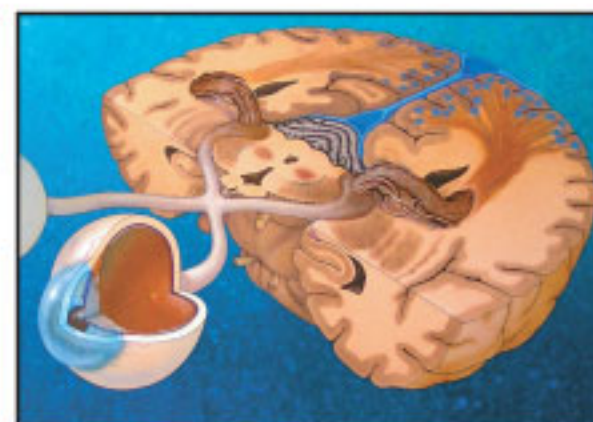


Steve Harrison, M.S., C.M.I., F.A.M.I.

On March 16, 2007, Steve Harrison, Associate Professor and Chair of the Medical Illustration department and Director of the MCG Medical Illustration Graduate Program, was honored in a dedication ceremony during which the 3West Neuroscience Amphitheatre was designated the Steven J. Harrison Medical Illustration gallery. Several of his works were unveiled and now adorn the walls of the auditorium. The close relationship between our two Departments recapitulates that bond between "the father of Neurosurgery", Harvey Cushing, and the "father of Medical Illustration", Max Brodel at the turn of the last century.



"Heart and Mind", from the Harrison Gallery



"Visual Pathway", from the Harrison Gallery



"Cerebral Arterial Vasospasm", from the Harrison Gallery

Contributor acknowledgement

From January to July of 2007 we were fortunate to receive monetary donations, anatomical models and book donations from external sources. They include:

- **Crosslink Orthopedics, LLC**, donated funds that defrayed the publication and mailing costs of the previous issue of our Newsletter. We greatly appreciate their generosity.
- **Walter Lorenz Surgical** presented us with 3 anatomical spine models for resident education.
- **Synthes Craniofacial** presented copies of Rhoton's Cranial Anatomy and Surgical Approaches to the junior residents.
- **Confluent** provided a copy of Fessler and Sekhar's Atlas of Microsurgical Techniques: Spine and Atlas of Microsurgical Techniques: Brain, to the two most senior residents.

We applaud the aforementioned companies for their commitment to education.

Clinical Spotlight

The History and Evolution of Functional Neurosurgery at MCG



The Section of Neurosurgery at the Medical College of Georgia was formally established in 1956 under **Dr. George Smith**. During Dr. Smith's tenure, Dr. Marcelino Chavez joined the MCG Neurosurgery staff. He had been previously fellowship trained in stereotaxic neurosurgery at Temple University by Dr. Henry Wycis (Dr. Wycis and his neurology associate Dr. Ernst Spiegel had introduced clinical human stereo-taxic surgery in 1947). Dr. Chavez performed thalamotomies at MCG, both for movement disorders and for psychoaffective disorders.

After Dr. Smith's untimely death in 1964, **Dr. Marshall Allen** took over as chief in 1965 and remained in that capacity until his retirement in 1994. Dr. Allen completed his residency training under Dr. Orlando Andy at the University of Mississippi where he received training in both functional stereotaxic and in epilepsy surgery. After residency, Dr. Allen did a one-year fellowship in neurophysiology at L'Hopital Henri Russel in Paris. Dr. Allen then returned as chief of neurosurgery at the Jackson, Mississippi VA hospital until his departure for Augusta.



Marshall Allen, M.D.

After Dr. Chavez' departure from the MCG staff, Dr. Allen began performing stereotaxic procedures himself. These included ventrolateral thalamotomies for movement disorders and occasional stereotaxic cingulumotomies for psychoaffective disorders. Dr. Allen also performed a number of pain procedures. These included percutaneous alcohol rhizotomies for trigeminal neuralgia, open trigeminal tractotomies for head pain due to cancer, and both open and percutaneous high cervical cordotomies and high thoracic cordotomies for cancer pain. Dr. Allen performed several hemispherectomies for intractable epilepsy related to infantile hemiplegia. This included one hemispherectomy on a five-year-old child which was performed using wakeup i.v. anesthesia. After the hemisphere was exposed, the patient was awakened and speech was tested after the middle cerebral artery was cross-clamped to confirm absence of ipsilateral language representation. Dr. Allen also performed occasional resections for epilepsy with intraoperative electrocorticographic guidance.

During Dr. Allen's tenure as chief of service, an NIH grant for setting up an epilepsy monitoring unit was obtained. This was in large part through the efforts of Mr. Howard Phillips of Warner Robbins, GA. Howard had been a Flying Tiger fighter pilot in WWII and had a daughter with epilepsy. He was a delightful man and remained a strong supporter of the MCG epilepsy surgery program throughout his life. The epilepsy monitoring unit became active in the late 1970s after two epileptologists (Dr. Don King and Dr. Brian Gallagher) joined the neurology staff.

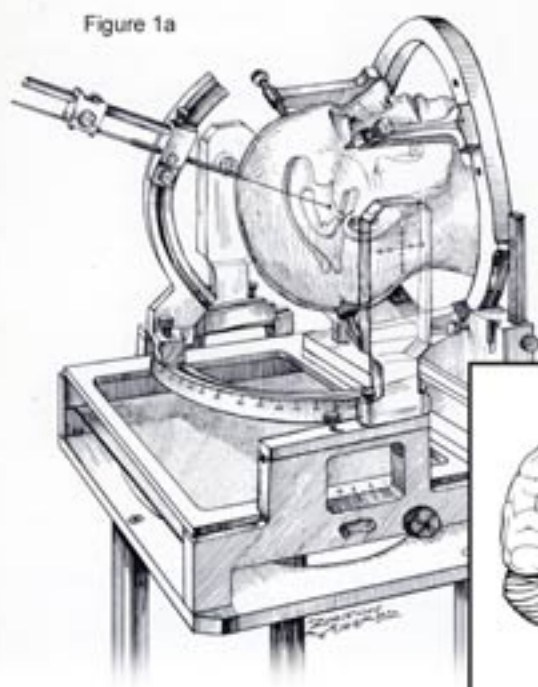


Figure 1a

After the epilepsy-monitoring unit had been operational for several years, a search for a trained epilepsy surgeon was undertaken. Ultimately, **Dr. Herman Flanigin** came to MCG in December of 1980. Dr. Flanigin had been one of Dr. Wilder Penfield's early residents at the Montreal Neurological Institute where Dr. Penfield introduced epilepsy surgery to the North American continent. Prior to finishing his neurosurgery training at MNI, Dr. Flanigin wrote the first article on a series of patients undergoing anterior temporal resections between 1939 and 1949 for temporal lobe epilepsy.



Herman Flanigin, M.D.

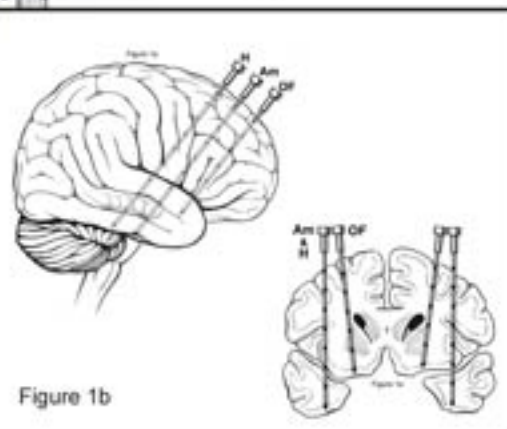


Figure 1b

This was a landmark paper. Dr. Flanigin remained very active in epilepsy surgery prior to coming to MCG. By the time he arrived in Augusta, he had performed over 200 epilepsy surgeries and was one of only a few neurosurgeons in the world who was also board certified in electroencephalography.

Dr. Flanigin introduced anterior temporal lobectomy to MCG, as well as intraoperative language and sensorimotor mapping,

corpus callosotomy, and depth and subdural electrode implantation. **Figure 1a** shows the Todd-Wells stereotaxic apparatus, and **figure 1b** shows depth electrode implant trajectories that Dr. Flanigin used for invasive monitoring. Dr. Flanigin used this same stereotaxic device for movement disorder surgery, limbic leucotomies and stereotaxic percutaneous high cervical cordotomies for intractable cancer pain. **Figure 2a** shows head fixation in the Todd-Wells apparatus, and **figure 2b** shows electrode placement in the cervical



Figure 2a

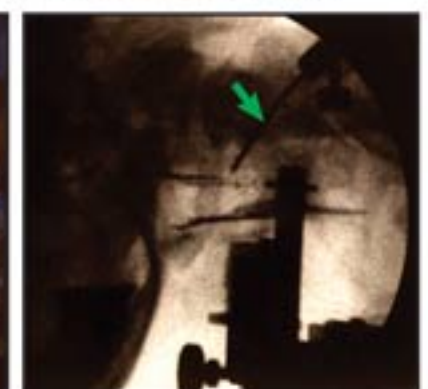


Figure 2b

Clinical Spotlight *(continued...)*

spinal cord just anterior to the dentate ligament outlined by Pantopaque. Dr. Flanigin also introduced radiofrequency rhizotomy for trigeminal neuralgia at MCG.

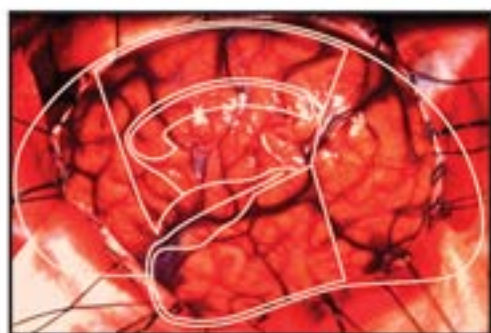


Figure 3a

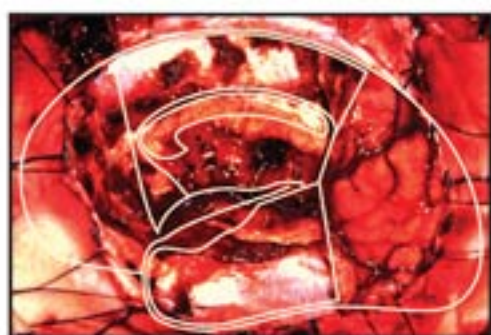


Figure 3b

During Dr. Flanigin's tenure from 1980-1990, other procedures were also added to the list of functional procedures performed at MCG. Other epilepsy surgery procedures included multiple subpial transection, functional hemispherectomy, and MRI-guided, computer assisted depth electrode implantation. **Figure 3a** shows an exposed hemisphere with outline of the resection and disconnection margins, and **figure 3b** shows the completed functional hemispherectomy. **Figure 4** shows examples of the modified depth electrode trajectories introduced in late 1987. **Figure 5** shows the Codman-Roberts-Wells stereotaxic apparatus introduced at MCG in 1990, as well as an example of depth electrode trajectories planned on the stereotaxic computer workstation (also obtained in 1990). **Figure 6** shows an example of a subdural electrode array. During this same time period, a nurse monitoring station was added to the epilepsy-monitoring unit that significantly enhanced patient care. The MRI-guided, computer-assisted stereotaxic computer workstation was also used for thalamotomies and later for pallidotomies. **Figure 7** shows a sagittal MRI scan with the

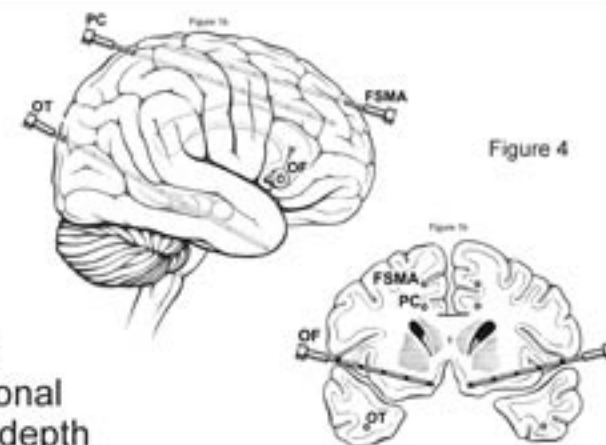


Figure 4



Figure 5

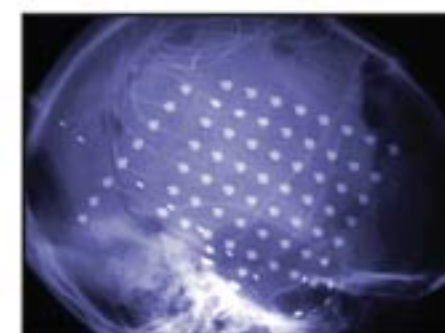


Figure 6

superimposed, digitized Schaltenbrand-Wahrens atlas used to enhance localization of the thalamotomy target. Thalamotomies were used infrequently in the 1980s and 1990s as a result of the recent introduction of L-DOPA to the medical management of Parkinson's disease. Pallidotomy underwent a reintroduction in the mid 1990s, and with it, a great resurgence in movement disorder surgery occurred. **Figure 8** shows a successful pallidotomy lesion performed at MCG in the mid-90s. Between 1996 and 2000, 25 pallidotomies were done at MCG to treat Parkinson's disease. Rare cases of dystonia and other movement disorders underwent either thalamotomy or pallidotomy. Occasional cases of torticollis underwent bilateral upper cervical rhizotomy plus peripheral myotomy.

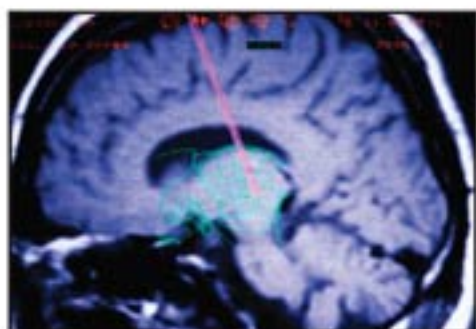


Figure 7

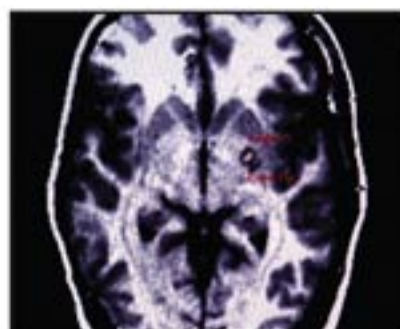


Figure 8



Figure 9

For the treatment of pain, microvascular decompression and glycerol rhizotomy for trigeminal neuralgia were added. **Figure 9** shows a photomicrograph of the root entry zone of a right trigeminal nerve wrapped in shredded Teflon; **Figure 10** shows a guide needle in the trigeminal cistern that has been

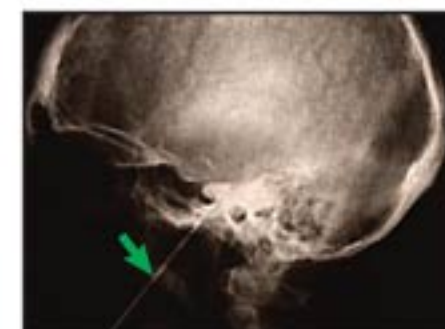


Figure 10

outlined with injected water-soluble contrast agent. Spinal cord stimulation was utilized for selected cases of failed back surgery syndrome and other conditions. **Figure 11** shows a subdural 4-contact electrode implanted in the low thoracic region for treatment of leg pain due to sciatic nerve injury.



Figure 11

Stereotaxic mesencephalic tractotomy was utilized for cranial and cervical neoplastic pain. Periventricular grey and thalamic deep brain stimulation (DBS) were used for nociceptive and peripheral neuropathic pain, respectively. **Figure 12** shows a left periventricular grey (deep electrode) and left sensory thalamic electrode in the same patient. Stereotaxic frontothalamic tractotomy (anterior capsulotomy) was used for cancer pain and OCD. **Figures 13a** and **13b** show axial and coronal views of the radiofrequency lesions. Several stereotaxic amygdalotomies for episodic disinhibition were performed during this period. Dorsal

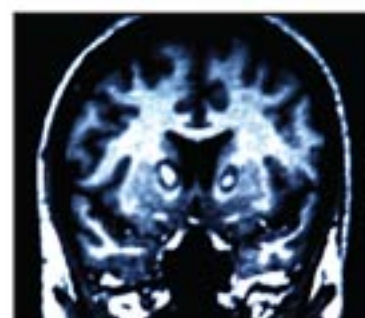


Figure 13a

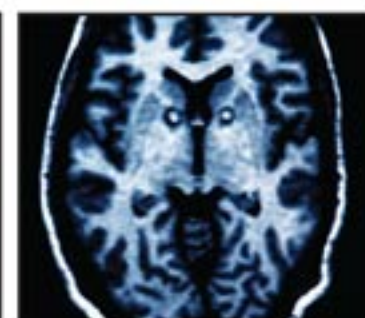


Figure 13b

Root Entry Zone (DREZ) lesioning was introduced at MCG in the mid 80s, and a small number of these procedures were successfully performed for brachial plexus avulsion pain and end zone pain of paraplegia.

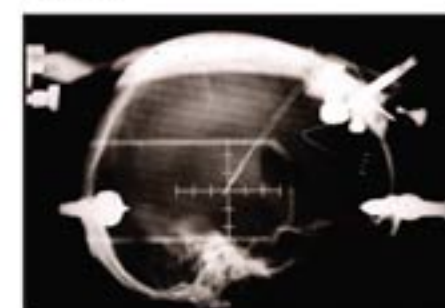


Figure 12

Clinical Spotlight *(continued...)*



Figure 14a

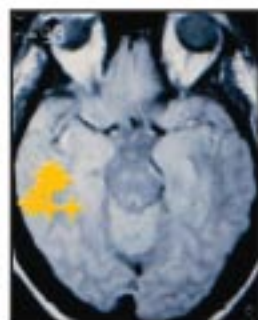


Figure 14b

In the early 1990s the epilepsy surgery program became involved in utilizing magneto-encephalography (MEG) for seizure focus localization. Figures 14a and 14b illustrate a right lateral temporal epileptiform focus. MEG was very productive in assisting with localization. Over 100 epilepsy surgery candidates underwent MEG at the Scripps Institute in LaJolla, CA, and this was one of the largest epilepsy MEG series at that time. A number of papers were generated from the obtained data.

More recently, the epilepsy surgery program has become involved in a multi-institutional research program using a cranially-implanted responsive neurostimulation device that is



Figure 15

programmed to detect epileptiform activity and then deliver high frequency stimulation to the seizure focus. Figure 15 shows a case with 2 4-contact subdural electrodes implanted over the area of the left language cortex and attached to the pulse generator at its connector port. So far our data suggest this may be a very effective alternative in treating well-localized seizure foci in non-resectable areas such as language cortex (the patient in figure 15 has been seizure free for over 2 years). Also, in 1997 the epilepsy surgery program began performing hemispherotomies. This procedure is an alternative to hemispherectomy in certain cases.

It is primarily a disconnective procedure which can be performed in a shorter time with less blood loss than hemispherectomy. Figure 16a shows the left frontotemporal craniotomy (overlying the area of extensive encephalomalacia in the distribution of the left middle cerebral artery). Figure 16b shows the entire left lateral ventricle laid open (after the pia-arachnoid in the area of the previous infarct has been resected). The amygdala has been removed and the hippocampus has been transected posteriorly including the fimbria-fornix and stria terminalis. The pial plane has been followed superiorly to encounter and transect the corpus callosum transventricularly. The suction and curette are being used to remove the subcallosal gyrus and posterior orbitofrontal cortex, which completes the procedure.

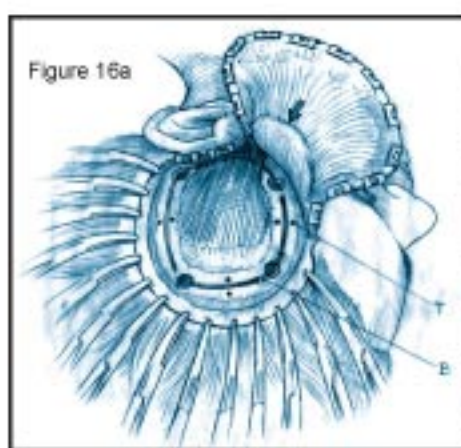


Figure 16a

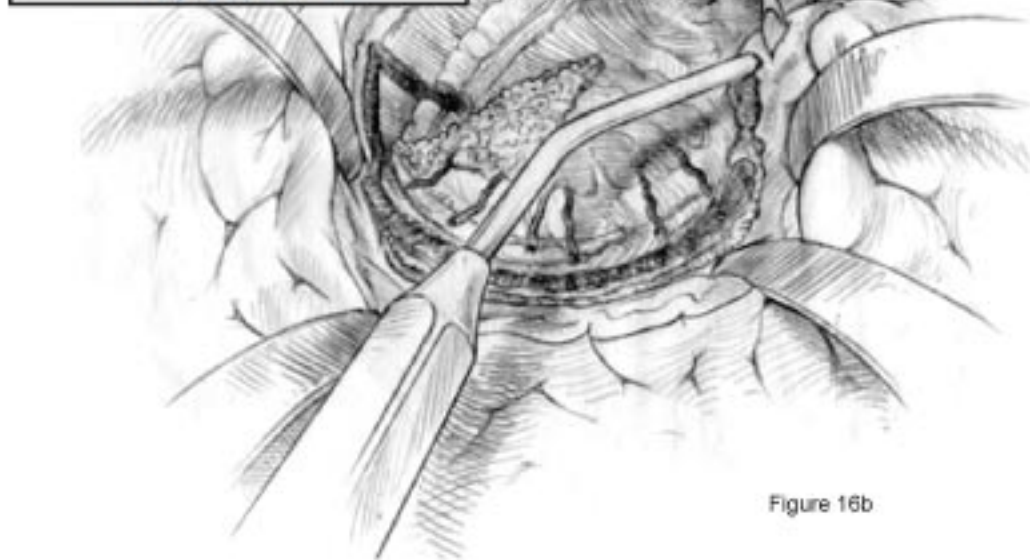


Figure 16b

"This makes the MCG epilepsy surgery program one of the most experienced in both the USA and the world."

From 1980 to the present, the MCG Epilepsy Surgery program has performed well over 1000 therapeutic craniotomies for drug resistant epilepsy. More than 600 invasive monitoring cases involving depth and/or subdural electrodes have been done. This makes the MCG epilepsy surgery program one of the most experienced in both the USA and the world.

The functional program has also remained active in movement disorder surgery. DBS (Deep Brain Stimulation) was introduced to MCG in 1998, and has been very successful in treating cases of essential tremor, Parkinson's disease, and torticollis. Figure 17a

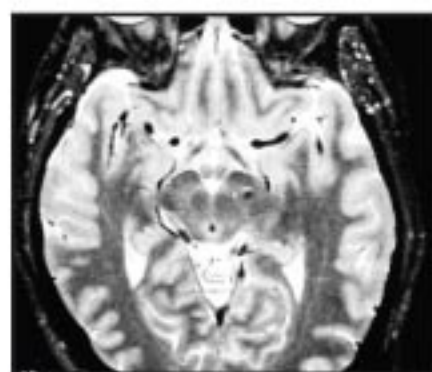


Figure 17a

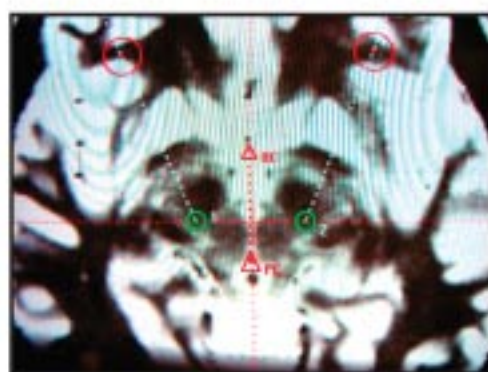


Figure 17b

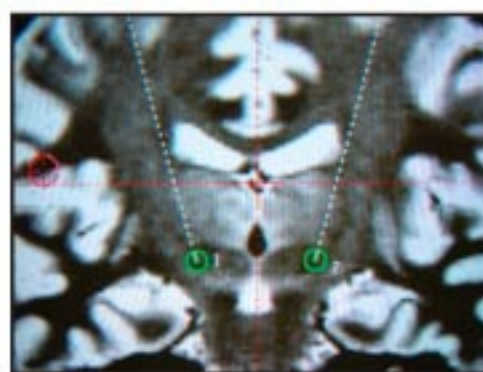


Figure 17c



Figure 18a

shows an implanted subthalamic DBS electrode, and figures 17b and 17c show computer-planned trajectories for bilateral subthalamic DBS implants. Figures 18a and b show steps in the implantation of DBS electrodes - 18a shows the microelectrode drive apparatus and 18b shows subsequent intraoperative fluoroscopic verification of proper placement of a subthalamic DBS electrode. Approximately 160 DBS implants have been performed on about 90 patients at MCG. This experience will be reported at an upcoming international DBS seminar in Europe in October of 2007.

MRI-guided stereotaxic mesencephalic tractotomy for pain (Figure 19, see following page) and amygdalotomy for episodic inhibition (Figure 20) have been recently successfully performed at MCG and reported in the literature.

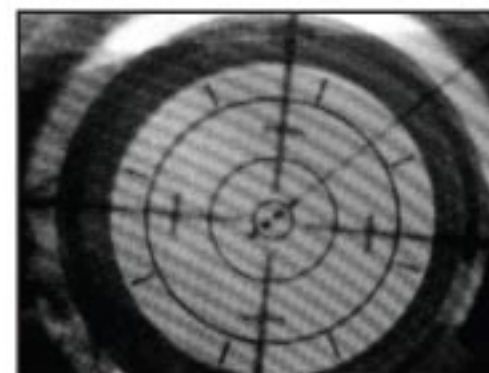


Figure 18b

Clinical Spotlight *(continued...)*

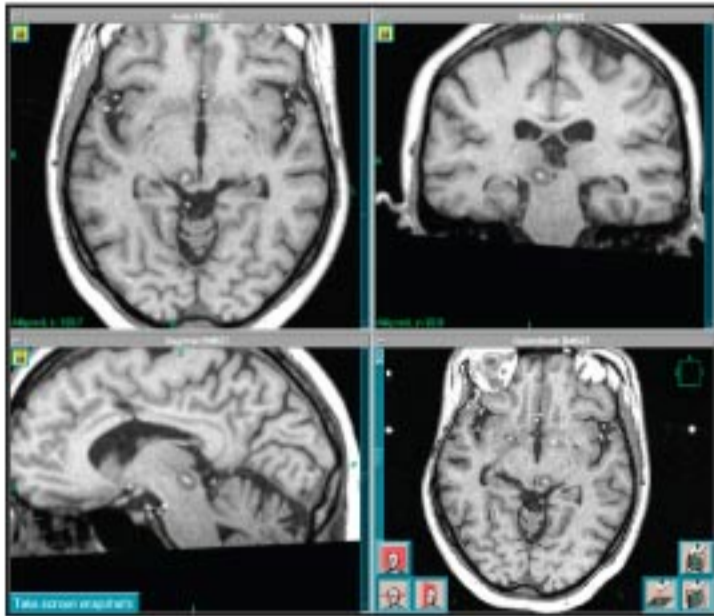


Figure 19

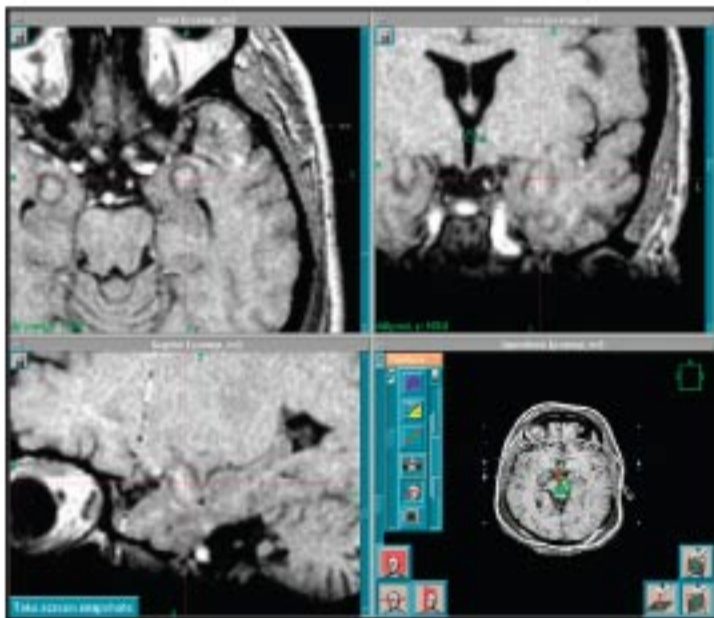


Figure 20

In 2000, MCG acquired a Gamma Knife which has remained active and successful. Over 100 trigeminal rhizotomies have been performed and the data have been published. **Figures 21a-c** show the multiplanar reformatted MRI with the location of the treatment (yellow represents the 50% isodose line and green represents the 30% isodose line). The gamma knife has also been used effectively for treating several patients with lesion-related epilepsy. **Figure 22a** shows a left posterior fusiform gyrus cavernous angioma. **Figure 22b** shows the area of treatment with post-radiation changes. This patient has been seizure free for over two years. Also, several medically unstable patients with intractable tremor have undergone successful thalamotomy with the Gamma Knife. **Figure 23** shows a lesion in the left ventrolateral thalamus 3 months post-radiation.

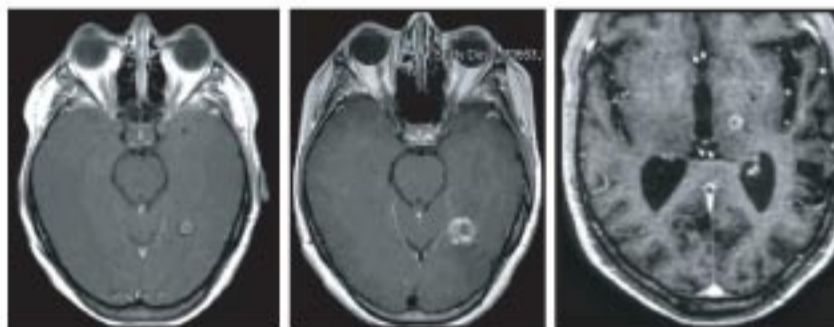


Figure 22a

Figure 22b

Figure 23

For nearly 50 years, MCG has provided comprehensive functional neurosurgery services of which it can be proud. With proper support this service will succeed in the future.

Joseph R. Smith, M.D., F.A.C.S.

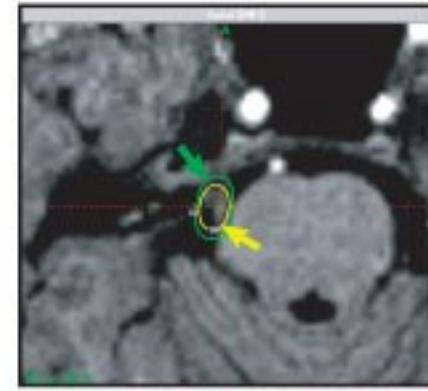


Figure 21a

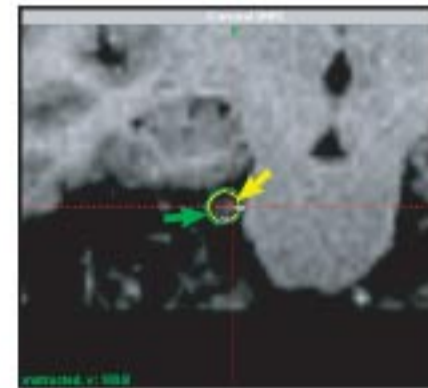


Figure 21b

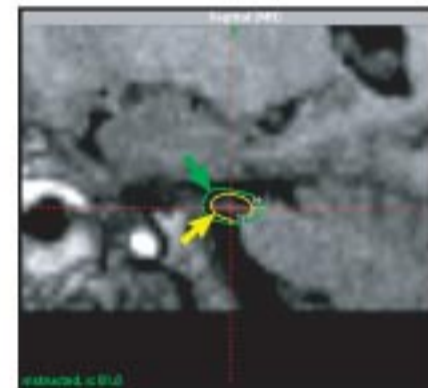
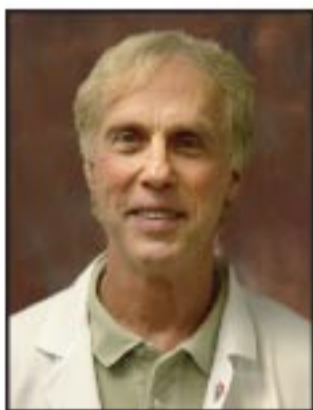


Figure 21c

Faculty Update



Joseph Smith, M.D., F.A.C.S.

Transitions

Joseph R. Smith, M.D. retired from active clinical practice at the end of June 2007 after 22 years of dedicated service at MCG. Stereotactic and Functional neurosurgery has been a flourishing specialty at MCG for almost 50 years, with Dr. Smith heading that for much of that time. He plans to continue to publish and to participate in resident education as he transitions to Professor Emeritus which status was recently granted by the Board of Trustees. A retirement party was held on July 21st at the Augusta Country Club where many well-wishers gathered to celebrate his many years of service.

Mark R. Lee, M.D., Ph.D. stepped down as Chair of our department to transition into private practice. Dr. Lee became Head of the Division of Neurosurgery in 1999 and led it to Departmental status in 2002. Under his leadership the department underwent remarkable growth in its first 5 years including the recruitment of 4 neurosurgeons, 1 neurologist, and 2 neuroscientists. We also witnessed an expansion of our research endeavors including the establishment of the Human Brain laboratory and the Cerebrovascular laboratory, both of which continue to be successful. Dr. Lee plans to continue his subspecialty interest in pediatric neurosurgery while in private practice.



Mark Lee, M.D., Ph.D.



John Vender, M.D.

Accomplishments and Recognition

John R. Vender, M.D. selected and served as Interim Chair of the Department of Neurosurgery from May 16 to September 1st, 2007. Dr. Vender was previously the Clinical Vice-Chairman of the Department.

Cargill H. Alleyne, Jr., M.D. was selected as the new Marshall Allen Distinguished Chair in Neurosurgery. He was previously the Academic Vice-Chairman of the department. Dr. Alleyne was also selected as one of the Best Doctors in America, 2007-2008.



Residents' Corner

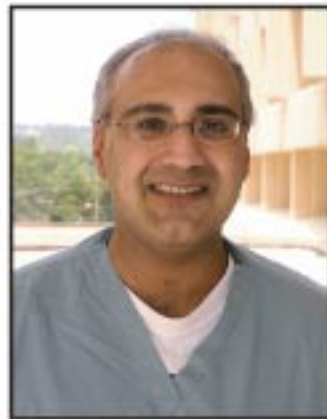
Accomplishments and Recognition

John Hain, M.D. graduated from the MCG residency program in June 2007. Dr. Hain has taken a private practice position at the Nebraska Medical Center in Omaha, Nebraska. We wish him all the best.

Hamid Shah, M.D. passed the written portion of the Neurosurgery Board Examination in March 2007. We congratulate him.



John Hain, M.D. with Residency Training Program Director, Cargill Alleyne, M.D.



Hamid Shah, M.D.



David Wang, M.D.

Residency program update

After much preparation, our residency program underwent a scheduled review by the Residency Review Committee on July 10th. We are currently awaiting the assessment.

This summer we welcomed our new PGY-1 resident **David Wang, M.D.** David completed his medical training at the University of Miami School of Medicine. We wish him well as he begins his career in neurosurgery.

Presentations and Publications (January-June 2007)

Presentations

Alleyne CH: Neurologic support. Fundamental Critical Care Support Course (Instructor), Medical College of Georgia, January 2007

Kirov SA: What induces mature hippocampal pyramidal neurons to form new dendritic spines rapidly? 31st Winter Conference on Learning and Memory. Park City, Utah, January 2007

Kirov SA: Real-time imaging of neurons and glia during simulated stroke. Translational Neuroscience Series. Mount Sinai School of Medicine, New York, NY, January 2007

Andrew RD, **Kirov SA:** Two-photon microscopy reveals real-time volume responses by astrocytes to osmotic and ischemic stress in cortical brain slices. Annual Meeting of Canadian Physiological Society. Mont-Sainte-Anne, Canada, February 2007

Voloschin A: Paraneoplastic Neuro-Psychiatric Syndromes. Psychiatry Grand Rounds. Medical College of Georgia, Augusta, GA, February, 2007

Vender JR: Surgical Management of Clots and Strokes, Family Medicine Grand Rounds, Medical College of Georgia, Augusta, GA, February, 2007

Vender JR: Stereotactic Surgery and Radiosurgery, Georgia Association of Medical Transcriptionists, Augusta, GA, March, 2007

Vender JR: Vestibular Schwannomas, Masters of Otolaryngology Symposium: Temporal bone dissection and Otology Update, Medical College of Georgia, Augusta, GA, March, 2007

Vender JR: Common neurological tumors. Clinical Medicine Lecture Series, Physician Assistant training Program, Medical College of Georgia, Augusta, GA, March 2007

Kirov SA: Human neocortical slices in translational neuroscience. Department of Neurosurgery, Mount Sinai School of Medicine, New York, NY, April 2007

Risher WR, **Kirov SA:** Neuroprotective effect of dibucaine in a human brain tissue model for stroke. GA-SC Neuroscience Consortium. Augusta, GA, April 2007

Vender JR: Surgical treatment of intracerebral hemorrhage and big strokes. Brain and Heart Attack Course. Hilton Head, SC, April 2007

Alleyne CH: How to treat carotid stenosis: Stenting vs. Endarterectomy. Brain and Heart Attack Course. Hilton Head, SC, April 2007

Alleyne CH, Wakade C, Laird MD, Dhandapani KM: Curcumin reduces the development of cerebral vasospasm following subarachnoid hemorrhage in mice. Georgia Neurosurgical Society. Sea Island, GA, May 2007

Kirov SA: Two-photon microscopy: real-time imaging of single neurons

Presentations (continued...)

and glia deep in cortex during ischemia and osmotic stress. Neurology Grand Rounds, Medical College of Georgia. Augusta, GA, May 2007

Andrew RD, **Kirov SA:** Real-time volume responses of astrocytes to osmotic and ischemic stress in cortical brain slices. The Canadian Association for Neuroscience meetings. Toronto, Canada, May 2007

Vender JR: Invasive options/rhizotomy, myelotomy and pumps. Unlocking the Mysteries of Spasticity Conference, Augusta, GA, May 2007

Publications

Dhandapani KM, Brann DW: Role of astrocytes in estrogen-mediated neuroprotection. *Exp Gerontol* 42: 70-75, 2007

Dhandapani KM, Khan MM, Wade FM, Wakade C, Mahesh VB, Brann DW: Induction of transforming growth factor-beta 1 by basic fibroblast growth factor in glioma and astrocytes is mediated by MEK/ERK signaling and AP-1 activation. *J Neurosci Res* 85: 1033-1045, 2007

Brann DW, **Dhandapani KM, Mahesh VB, Khan MM:** Synaptic plasticity and neuroprotective actions of estrogen: basic mechanisms and clinical implications. *Steroids* 72: 381-405, 2007

Dhandapani KM, Mahesh VB, Brann DW: Curcumin suppresses the growth and chemoresistance of human glioblastoma cells via modulation of AP-1 and NFkappaB. *J Neurochem* 102: 522-538, 2007

Dalmau J, Tuzun E, Wu HY, Masjuan J, Rossi JE, **Voloschin A, Baehring JM, Shimazaki H, Koide R, King D, Mason W, Sansing LH, Dichter MA, Rosenfeld MR, Lynch DR.** Paraneoplastic anti-N-methyl-D-aspartate receptor encephalitis associated with ovarian teratoma. *Ann Neurol* 61:25-36, 2007

Voloschin A, Batchelor TT. Paraneoplastic Syndromes. In: Brust J (ed) *Current Diagnosis & Treatment in Neurology*. McGraw-Hill 2007

Fountas K, **Smith JR:** Historical evolution of stereotactic amygdalotomy for the management of severe aggression. *J Neurosurg* 106:710-713, 2007

Hughes B, Pruitt JN, **Vender JR:** Neurosarcoidosis. *Contemporary Neurosurgery* 29(3), 2007

Vender JR, McDonnell DE, Jensen MA: High anterior cervical retropharyngeal approach to the craniocervical junction. *Pan Arab Journal of Neurosurgery*, 2007

Rahimi SY, Park YD, Witcher MR, Lee KH, Marrufo M, Lee MR: Corpus callosotomy for treatment of pediatric epilepsy in the modern era. *Pediatr Neurosurg* 43:202-208, 2007



Department of Neurosurgery
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Neuroscience Outlook

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

Conference Schedule (July 2007 - December 2007)

Grand rounds and conferences take place each Friday in the 3 West amphitheater.

Jul 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	Sep 07	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Anatomy Spine Conference Case Conference Brain Tumor Board	Nov 02	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Anatomy Spine Conference Case Conference Brain Tumor Board
Jul 13	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuro 101: Dr. Jonathan Tuttle <i>"Cervical Spondylosis"</i> Spine Conference Case Conference Brain Tumor Board	Sep 14	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuro 101: Dr. John Vender <i>"Head Injury"</i> Spine Conference Grand Rounds: Dr. Stephan Mayer, New York (TBA) Brain Tumor Board	Nov 09	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuro 101: Dr. David Floyd <i>"Clinical Localization in Disk Disease"</i> Spine Conference Grand Rounds: Dr. L.N. Hopkins, University of Buffalo (TBA) Brain Tumor Board
Jul 20	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuropathology Spine Conference Radiology Review Brain Tumor Board	Sep 21	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuropathology Spine Conference Radiology Review Brain Tumor Board	Nov 16	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuropathology Spine Conference Radiology Review Brain Tumor Board
Jul 27	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Anatomy Spine Conference M&M Brain Tumor Board	Sep 28	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuro 101: Dr. Scott Rahimi <i>"Peripheral Neuropathies"</i> Spine Conference M&M Brain Tumor Board	Nov 23	NO CONFERENCE: THANKSGIVING HOLIDAY	
Aug 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	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	Nov 30	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuro 101: Dr. Ahmed Shakir <i>"Acoustic Neuromas"</i> Spine Conference M&M Brain Tumor Board
Aug 10	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuro 101: Dr. Alfredo Voloschin <i>"New Standards in Neurooncology"</i> Spine Conference Case Conference Brain Tumor Board	Oct 12	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuro 101: Dr. Chris Hall <i>"Etiology and Management of Spontaneous ICH"</i> Spine Conference Case Conference Brain Tumor Board	Dec 07	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 17	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuropathology Spine Conference Radiology Review Brain Tumor Board	Oct 19	TENTATIVE INTERVIEW DATE 9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00		Dec 14	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuro 101: Dr. Patrick Youssef <i>"Craniofacial Anomalies"</i> Spine Conference Case Conference Brain Tumor Board
Aug 24	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuro 101: Dr. Hamid Shah <i>"Cervical Spinal Stenosis"</i> Spine Conference M&M Brain Tumor Board	Oct 26	TENTATIVE INTERVIEW DATE		Dec 21	9:00 - 10:00 10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Neuropathology Spine Conference Radiology Review Brain Tumor Board
Aug 31	10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Spine Conference Case Conference Brain Tumor Board	Nov 02	TENTATIVE INTERVIEW DATE		Dec 28	10:00 - 11:00 11:00 - 12:00 12:00 - 1:00	Spine Conference M&M Brain Tumor Board

Upcoming Meetings (July - December 2007)

Congress of Neurological Surgeons
 9/15-20, San Diego, CA

Research Update in Neuroscience for Neurosurgeons
 10/20-27, Woods Hole, MA

American Board of Neurological Surgery (Orals)
 11/6-9, Houston, TX

Georgia Neurosurgical Society
 11/17, Atlanta, GA

AANS/CNS Section on Pediatric Neurological Surgery
 11/26 - 12/1, Miami, FL

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