Inside Neurosurgery
Wayne State University School of Medicine
Department of Neurosurgery Newsletter
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Inside

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Editorial Board

From the Chair...

Hello and welcome to our department.

...and welcome to our inaugural issue of Inside Neurosurgery.

For almost 50 years, the Department of Neurosurgery at Wayne State University has provided a unique and exciting program to its neurosurgical residents and to the community at large.

I have recently been named the Chairman of the Department of Neurosurgery at Wayne State University. I am pleased and honored to hold such a position here at Wayne State University and look forward to developing a department, from both a clinical and a research standpoint, of which my predecessors would be proud.

Many great advancements, both clinically and in the research arena, are taking place here in our department. The purpose of this periodic newsletter will be to inform you, our colleagues, of these advancements.

This first issue of Inside Neurosurgery is dedicated to the topic of neuro-endovascular procedures on which we have included two case studies involving stent-assisted coiling and tumor embolization. Our Department of Neurosurgery has joined forces with the Department of Radiology to provide advanced endovascular neurosurgery and interventional neuroradiology services at Harper University Hospital. This program is dedicated to treating cerebrovascular disorders of the brain, spine and spinal cord and vascular disorders of the head, neck and spine through minimally invasive procedures and using a multidisciplinary approach.

In addition, we treat complex cranial lesions, skull base tumors and intracranial vascular lesions using state-of-the-art techniques. We are proud of our latest minimally invasive endeavor performing endoscopically-assisted cranial surgery.

The research in our department is active and offers multidisciplinary programs in clinical and basic research. Various topics include computer-assisted neurosurgery, bioengineering advances in endovascular surgery, pathophysiology of hydrocephalus, cerebral ischemia and reperfusion and the effect of BMP in a corpectomy model in the goat.

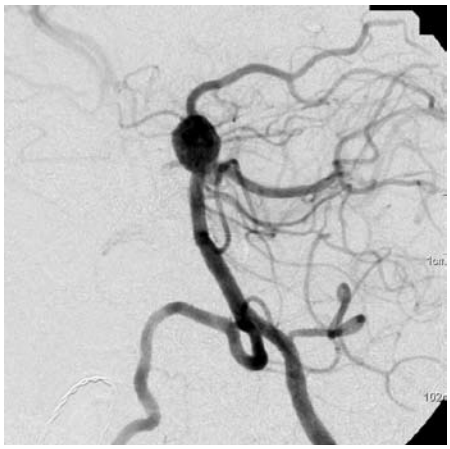
I am personally thrilled to be a part of this department's great tradition of excellence and look forward to you joining me in its continued success.

Murali Guthikonda, MD

Of Clinical Interest . . . Endovascular Neurosurgery - Stent-Assisted Coiling

Endovascular Treatment of Basilar Tip Aneurysm with Stent and Coils.

Pretreatment



AP and Lateral views of the wide neck Basilar Tip Aneurysm.

Stent Placement

3-D rotational angiography.

AP view: after displacement of Neuroform Stent from basilar trunk.

Coil Placement

AP and Lateral veiws: results post coiling of basilar aneurysm through the stent.

1. Case Background Diagnosis

This is a 56 yo female that presented initially with headaches and seizures. She was admitted to ER and the initial work up included a CT-SCAN and a LP which did not reveal SAH. She underwent an MRI and a basilar tip aneurysm was detected. She was referred to our institution for further work-up and treatment.

2. Procedural Description

The initial angiogram demonstrated a broad base 9x7 mm basilar tip aneurysm. The 3D images allowed a careful analysis of the aneurysm geometry.

The aneurysm was treated by placing a 4.5 x 30 mm Neuroform stent which remodeled the neck of aneurysm and allowed the successful obliteration of the aneurysm dome with GDC coils.

3. Post Procedure Outcome

The patient was discharged from the hospital 48 hours after the procedure without any neurological complication.

4. Comments:

The detection rate of unruptured aneurysms has increased from 0.3 to 2 per 100,000 person per year between 1965 and 1995 due to advances in CT and MR angiography. The sensitivity for detecting an aneurysm larger than 5 mm in diameter by CTA is considered to be 95 to 100%.

Studies such as the ISUIA, provide critical information regarding the risk of rupture of cerebral aneurysms. The most recent published analysis of this data, reveals an overall incidence of aneurysm rupture of 0.8% per year. In the group of patients presenting without SAH the lesion's size and location were the best predictor of future rupture. Aneurysms located at the basilar apex have a relatively higher risk of rupture. The statistical demarcation for low rupture risk in terms of size was 7 mm.

Since the first reports in the early 1990s, the endovascular obliteration of aneurysm has fast become recognized as a safe alternative to surgical clipping for high grade patients and lately has been proven to be effective in the treatment of the incidentally found aneurysm.

Direct surgical clipping provides permanent aneurysm obliteration, but the current coil technology provides a low morbidity treatment of incidental aneurysms regardless of the aneurysm location and the patient's medical condition. The absence of brain retraction and cranial nerve damage make the endovascular approach a particularly suitable therapeutic approach for basilar bifurcation aneurysms.

Since the introduction of the Guglielmi detachable coil (GDC) system, the evolution in coil designs, the use of balloons to remodel wide-necked aneurysms, and finally, the introduction of intravascular stents has significantly impacted the daily neurosurgical practice.

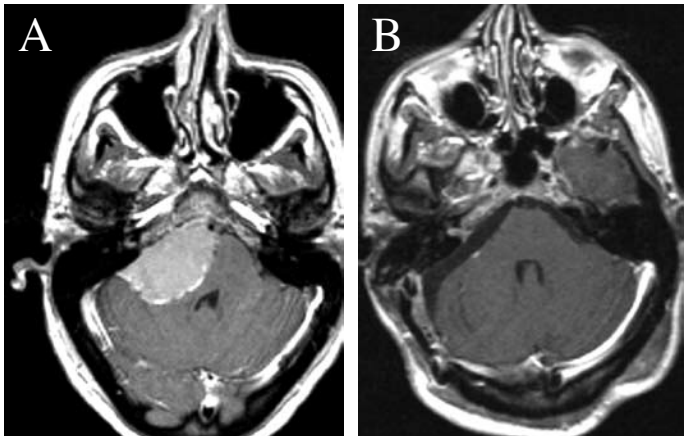
The Neuroform stent is a self-expanding nitinol stent that is particularly flexible, and specifically designed to treat cerebral aneurysm that allows us to obliterate broad based aneurysms by reconstructing the parent vessel wall.

The cases included in this issue were provided by Dr. Patricia Fernandez, Chief of the Endovascular Neurosurgery and Interventional Neuroradiology Service at WSU.

Of Clinical Interest . . . Endovascular Neurosurgery - Tumor Embolization

Presurgical Embolization of Skull Based Meningioma.

MRI



Post-Gd T1 weighted axial images demonstrating a large petroclival meningeoma (A).

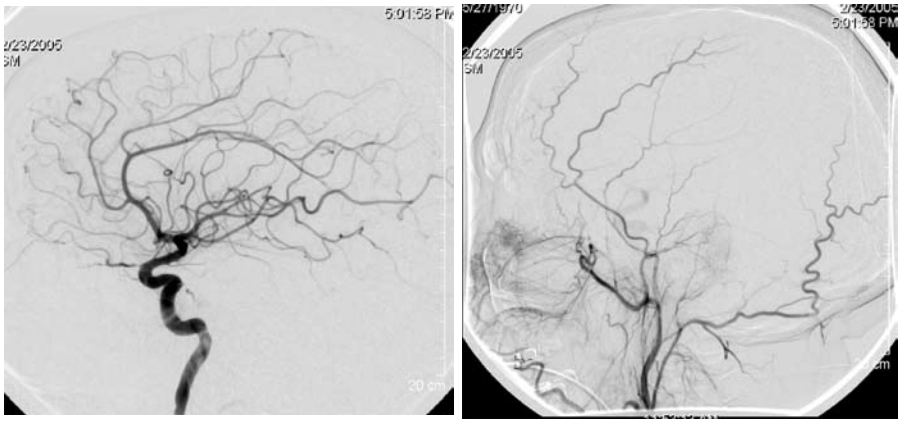
T1WI post surgical removal (B).

Pretreatment

Right Internal Carotid angiogram demonstrating tumor feeders from the C5 segment.

Angiogram of the Right External Carotid Artery showing the vascular supply arising from the Ascending Pharyngeal Artery.

Post-treatment



Lateral views of the R. ICA and ECA post embolization demonstrating tumor devascularization.

1. Case Background Diagnosis

This is a 34 year old female that presented with right sided facial numbness, hearing loss and gait disturbance. The MRI demonstrated a large petroclival meningioma.

2. Procedural Description

The patient underwent a diagnostic angiography which demonstrated a hypervascular tumor supplied by the neuromeningeal branch of the Right Ascending Pharyngeal Artery (ECA) and C5 level branches of the R. ICA. Subsequently the embolization was performed:
1) ECA supply: PVA
2) ICA supply: N-BCA.

3. Procedure outcome

The next day the patient underwent surgery for the removal of the tumor using minimally invasive techniques. The patient recovered completely.

4. Comments

Petroclival meningiomas are slowly growing, but progressively devastating tumors. The rate in tumor growth is still not well understood but it is recognized that these lesions, although histologically benign, functionally act in a very aggressive manner.

In our institution surgical removal followed by radiosurgery if there is residual tumor is favored.

Angiography is only indicated when embolization is planned. The typical angiographic findings in meningiomas is a hypervascular homogenous tumor blush. Most meningiomas are mainly supplied by dural arteries but in the case of petroclival meningeomas the contribution of branches of the ICA is significant.

The preoperative meningioma embolization were first described during the early 1970s and the subsequent experience has provided evidence of the efficacy of preoperative embolization. Endovascular devascularization of meningiomas is particularly beneficial for large meningiomas by diminishing the intraoperative blood loss and transfusions.

Management of cranial base tumors requires an interdisciplinary approach and when treating these lesions supraselective embolization of skull base tumors plays an important role in the successful outcome. It is true that decreasing the tumor vascularity by embolization facilitates resection, but it is also a procedure that should be performed with minimal morbidity.

The surgical resection of these hypervascular tumors is particularly difficult since most of the vascular arterial supply arises from tentorial branches of the internal carotid artery (ICA), making intraoperative hemostasis complicated since the largest arterial feeders are inaccessible. Thereafter sole embolization of the external carotid artery vascular supply provides only limited help.

The endovascular approach to petroclival meningeomas is particularly demanding because the embolization of the branches of the external carotid artery, although straightforward, minimally impacts the overall devascularization of the tumor. On the other hand the selective catetherization of the tentorial branches of the ICA can be difficult.

Proposed options for dealing with the vascular supply provided by branches of the ICA has been permanent occlusion of the ICA or temporary balloon occlusion of the ICA as a means of protecting the distal circulation while simultaneously injecting particulate embolic agent.

In this example the ECA supply was embolized with particules and the feeders arising from the ICA were selectively catheterized and then permanently occluded with N-BCA, providing an effective devascularization of the tumor.

Announcements

WSU School of Medicine appoints Murali Guthikonda, M.D., Chair of Neurosurgery

Dean Robert Frank recently announced that Murali Guthikonda, M.D., has been appointed chair of the Wayne State University School of Medicine's Department of Neurological Surgery, pending formal approval by the WSU Board of Governors. The appointment comes after an extensive national search. Dr. Guthikonda has served as interim chair of the department since 2001.

"I have full confidence that Dr. Guthikonda is the right person to lead the school's neurosurgeons," Dean Frank said. "He will continue a long tradition in the department to develop advanced technologies while providing an outstanding learning experience for our students and compassionate care to some of our sickest patients."

"Having the university fill these important leadership positions with nationally recognized clinicians is a key part of our success in recruiting and retaining great physicians. Dr. Guthikonda agreeing to step in this leadership role, with his experience and reputation will allow us to continue to build national leadership in this area of medicine," said Mike Duggan, Detroit Medical Center CEO.

Dr. Guthikonda is a specialist in Skull-base and Cerebro-Vascular surgery. He has special interest in minimally invasive cranial surgery. He has a special interest in the treatment of Pituitary tumors.

In 1993, Dr. Guthikonda joined the WSU School of Medicine as an assistant professor and was promoted to associate professor.

After obtaining his medical degree from Guntur Medical College, Guntur, India, Dr. Guthikonda completed a general surgery residency at St. Elizabeth Hospital, in Youngstown, Ohio, and a neurosurgery residency at the University of Vermont's Medical Center Hospital of Vermont. He also trained at The Institute of Neurolgy, Queen Square, London. He spent additional time under Dr. Yasargil in Zurich learning ascular neurosurgery.

Dr. Guthikonda obtained fellowship training in skull-base and vascular surgery at University of Cincinnati. He has also been trained to perform endoscope-assisted neurosurgery and gamma knife radiosurgery.

Dr. Guthikonda is the author of numerous articles and a frequent lecturer throughout the United States and India on topics related to skull base surgery. He is currently involved in laboratory research to further the understanding of skull base anatomy and surgical techniques.

With more than 1,000 medical students, the WSU School of Medicine is among the nation's largest institutions of its kind. Together with its clinical partner, the Wayne State University Physician Group, the school is a leader in patient care and medical research in a number of areas, including cancer, genetics, neuroscience and women's and children's health.

Research and Technology Advancements

Recently the Neurosurgery Department set a "record" when 3 doctorate degrees were received in the same year. Two residents, Chaim Colen and John Steele, and a Wayne State University School of Medicine graduate student, Janet Miller, all received their PhD degrees during a three-month period.

In March, Dr. Miller defended her thesis entitled *Gene Expression in Congenital Hydrocephalus and the Subsequent Effects of Gliosis*. This study involved a substantial amount of work using gene array technology, molecular biology, and immunohistochemistry, and was conducted under the direction of Dr. McAllister in the core Neurosurgery Labs. Dr. Miller will remain in the Neurosurgery Department as a postdoctoral fellow.

Dr. Colen completed an impressive series of experiments under the guidance of Drs. Saroj Mathupala and Andrew Sloan; his thesis was entitled *Silencing Glycoltic Metabolism in Gliomas: Combined Gene Therapy and Radiotherapy*. Dr. Colen has now returned to full-time clinical training.

In early July, Dr. Steele completed his thesis on *Patterns of Neuronal Degeneration in a Novel Murine Closed Head Injury Model*. His work, conducted jointly with Dr. McAllister and members of the Emergency Medicine department, sets the stage for future studies using genetic manipulations to examine injury mechanisms in neurotrauma. Dr. Steele has continued his clinical training as Senior Resident.

These accomplishments underscore the department's long-standing commitment to basic research. In the past, doctorates have been awarded to eight other residents since 1996;

1996 - Steven Dutcher, DO, PhD on *Patterns of Heat Shock Protein 70 Biosynthesis following Traumatic Brain Injury*
1997- Miguel Melgar, MD, PhD on *Alterations in Cortical Blood Flow and Cerebral Microvessels During Reperfusion in an Awake Rat Model of Global Forebrain Ischemia*
1998 - Louis Caragine, MD, PhD on *Real Time Glutamate Release Into, and Removal from, The Extracellular Space in Low Flow States, and a Novel Eleven-Vessel Occlusion Model, of Rat Ischemia; Correlation with EEG Spectral Analysis*
1999 - Ramin Abdolvohabi, MD, PhD on Effects of Infantile Hydrocephalus and *its Early and Late Treatments on the GnRH System in Rats*
2000 - Lisa Guyot, MD, PhD on *The Effects of Stroke on the Release of Amino Acids from the Rat Cerebral Cortex*
2001 - Bill Underwood, MD, PhD on *Phosphorylation of Eukarytoc Initation Factor 2-Alpha and Cytochrome C Release After Traumatic Brain Injury in the Rat*
2002 - Julie Pilitsis, MD, PhD on *The Effect of Stroke and Other Cerebral Insults on the Release of Free Fatty Acids*
2004 - Richard Rhiew, MD, Phd on *Gene Expression in Profiling of Chemoresistance in Human Malignant Gliomas*

Submitted by J.P. (Pat) McAllister II, Ph.D., Director of Basic Neurosurgical Research.