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Patient Care • Teaching • Research

Department becomes third center in nation to treat aneurysms using Onyx liquid embolic agent

by Michael Horowitz, MD
Chief of Neurosurgery, UPMC Presbyterian

Until recently, endovascular embolization of intracranial aneurysms has involved the placement of platinum coils via a microcatheter into the lesion until no additional coils could be placed. Such introduction of coils into an aneurysm would lead to thrombosis and exclusion of the aneurysm from the native circulation. Due to the mechanics of placing coils into a three dimensional space (analogous to filling a box with Slinkys) only about 35% such a space's volume can be filled with coils when maximum packing is achieved thus leaving numerous interstices between abutting platinum wires.

In late 2007 Onyx liquid embolic material (ev3, Irvine, CA) became the first liquid embolic agent to be available in the United States for the treatment of intracranial aneurysms. This material is an ethylene vinyl alcohol copolymer dissolved in the organic solvent dimethyl sulfoxide (DMSO) opacified with tantalum powder. Once coming into contact with an ionic solution the DMSO dissipates and the Onyx solidifies into a spongy, cohesive material. Onyx HD 500 is a viscous form of the material used for the occlusion of intracranial aneurysms. This substance is delivered to the aneurysm via a microcatheter once the neck of the aneurysm is temporarily occluded by a balloon which reduces the risk of the copolymer exiting the aneurysm and entering the native circulation.

Several European centers have reported the results and variable techniques for Onyx 500 embolization of cerebral aneurysms. Most of these studies and case reports have centered around the use of Onyx with temporary balloon occlusion of the aneurysm neck. Some however have mentioned the use of endovascular coils and stents in conjunction with balloons to achieve effective lesion obliteration.

In November 2007 the Department of Neurosurgery at the University of Pittsburgh Medical Center became the third location in the United States to use Onyx 500 for the treatment of cerebral aneurysms. This newsletter reports on our first three clinical cases performed that involved treatment of intracranial aneurysms using a combination of stents, platinum coils, balloons, and Onyx.

Case reports

• Case 1:

A 38-year-old African-American woman with an unruptured 8 mm (124.41 mm^3) right ophthalmic aneurysm elected to undergo endovascular therapy for lesion obliteration. After induction of general anesthesia, placement of a 7F Cook Shuttle catheter into the right internal carotid artery (ICA) (Cook, Bloomington, IN), and insertion of EEG and SSEP neurophysiologic monitoring lines the patient was administered 5000 units Heparin IV (ACT 250 sec) and underwent planning angiography.

Using roadmapping techniques, the aneurysm was catheterized with a Rebar 14 microcatheter over an Xpedion 0.014 wire. A second Rapid transit microcatheter (Cordis, Miami Lakes, FL) over a Gold Tip Glide Wire (Terumo, Somerset, NJ) was advanced into the distal right middle cerebral artery (MCA). The wire was removed and a 300 cm 0.010 Accelerator wire (ev3) was advanced through the Rapid Transit catheter. The catheter was removed and 4mm x 20 mm Neuroform stent (Boston Scientific, Fremont, CA) was advanced and deployed across the aneurysm neck. An 8 mm Micrus spherical coil (Micrus Endovascular Corporation, Sunnyvale, CA) was then introduced into the aneurysm and released.

Over the 0.010 Accelerator wire a 4 mm x 30 mm Hyperglide balloon was advanced through the deployed stent and positioned across the aneurysm neck as well. At this point the aneurysm was embolized with 0.22 cc Onyx 500 using the recommended 2-3-2 technique.

Complete occlusion was achieved without complication. Procedure time was less than two hours. At the procedure's

*(see **Onyx** on page 5)*

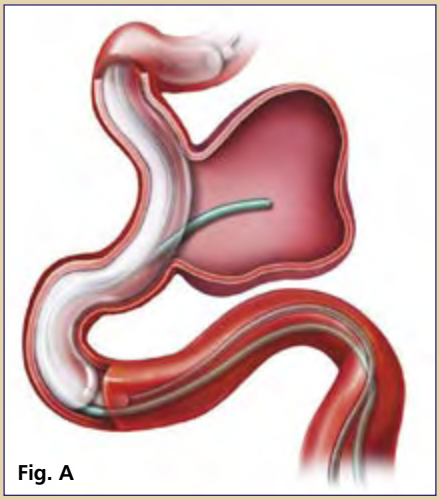
Fig. A

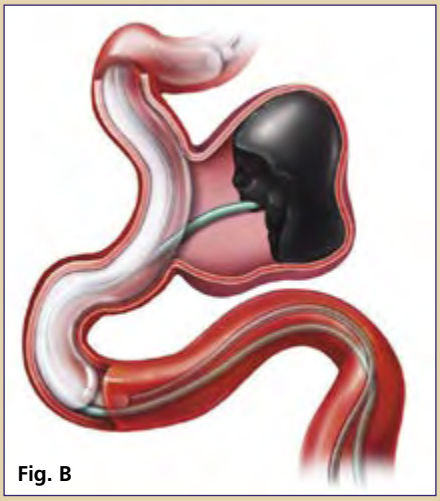
Fig. B

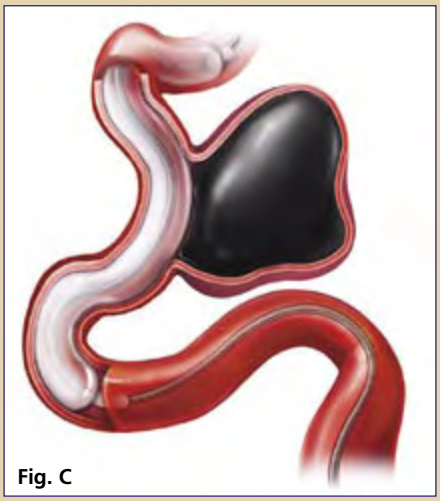
Fig. C

(A) Aneurysm with balloon across neck and catheter in aneurysm; (B) Onyx injection begins; (C) Onyx injection ends.

CHAIRMAN'S LETTER

What a difference a decade makes

In this issue of our department newsletter we highlight treatment of cerebral aneurysms, suprasellar tumors, and posterior fossa neoplasms with tools that effectively manage these intracranial conditions without the aid of a scalp or facial incision.

Along with descriptions of these minimally invasive approaches to cranial disease we also announce the hiring of our first fellowship trained minimally invasive spine surgeon.

Minimally invasive neurological surgery (aka: minimally intrusive neurosurgery) is here to stay. An increasing number of intracranial mass lesions and vascular abnormalities can now be treated through small percutaneous or transnasal surgical channels or by using highly focused radiation.

These approaches have served to maximize patient outcomes, shorten hospital stays and minimize occurrence of significant complications thus leading to improved quality of life for many.

While many of these treatments were available for years, it is largely within the last decade that improvements in technology and surgical training along with changes in patient expectations and requests that minimally invasive approaches have flourished and entered the mainstream.

As a department we look forward to seeing how new technologies over the next decade further maximize outcomes while minimizing the impact that neurosurgical treatment has on patient lifestyle.

As these advances begin to involve the subaxial spine we hope that both mechanical/non-mechanical back pain and neural impingement can be managed in a way that returns patients to work and recreation rapidly and effectively. Only time will tell. •

Amin Kassam, MD
Professor and Chairman
Department of Neurological Surgery
Director
Minimally Invasive endoNeurosurgery Center (MINC)

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Endoscopic endonasal treatment of a dermoid tumor causing visual loss

by Daniel Prevedello, MD
Clinical Instructor

Amin Kassam, MD
Chairman and Professor, Department of Neurological Surgery

Dermoid cysts are bizarre in that they contain developmentally mature skin complete with hair follicles and sweat glands, sometimes luxuriant clumps of long hair, and often pockets of sebum, blood, fat, bone, nails, teeth, cartilage, and thyroid tissue. Because they contain mature tissue, these cysts are almost always benign. Usually solitary, they expand slowly over many years due to the central accumulation of epithelial debris and glandular secretions, and are not tender unless ruptured. They most frequently occur on the face, on the lower back, and in the ovaries. Rarely they can arise in the brain.

Dermoid cysts are congenital and are caused when skin and skin structures become trapped during the third to fifth week of embryonic life, at which time the neural tube closes at the midline. This may explain their frequent location in the midline of the body.

A 25-year-old man presented with a two-week history of rapid visual deterioration. After having his glasses changed by an optometrist, he realized the blurriness was getting worse and went to an emergency department for evaluation.

Ophthalmologic examination confirmed he lost color vision and had a visual field cut on the right side (figure 4a). His vision acuity was 20/20 in the left eye and 20/200 in the right.

The patient underwent a head CT followed by head MRI that showed a large suprasellar mass with both solid-cystic component. It measured 4.3 x 3.2 cm without signs of calcification, however it had signs of fat in the solid portion (figure 1).

An expanded endonasal approach was then performed in order to resect the lesion. With the use of the endoscope and other instruments through the nose, a window was opened in the skull base. A transplanum approach was utilized in order to protect the pituitary gland.

The dura mater was opened above the sella and the cyst was immediately encountered. An abundant yellowish fluid was drained from the cyst. The pituitary stalk and gland were preserved.

Once the cyst component was drained, attention was then directed to the solid component. Still under endoscopic endonasal visualization, the solid portion was encountered and resected completely. The solid tissue had mature hair inside (figure 2).

Once the tumor was totally removed and the surrounding arachnoid membrane was kept in place, the space was irrigated until it was clean (figure 3).

The skull base was closed with vascularized tissue harvested from the nose—a nasoseptal flap. This technique has changed tremendously the incidence of postoperative CSF leaks.

An MRI performed 24 hours after the surgery confirmed complete tumor resection and showed no complications.

The patient recovered vision immediately after surgery. His ophthalmologic exam became entirely normal during the first week after surgery (figure 4b). There was no complication and the patient is asymptomatic and back-to-work. •

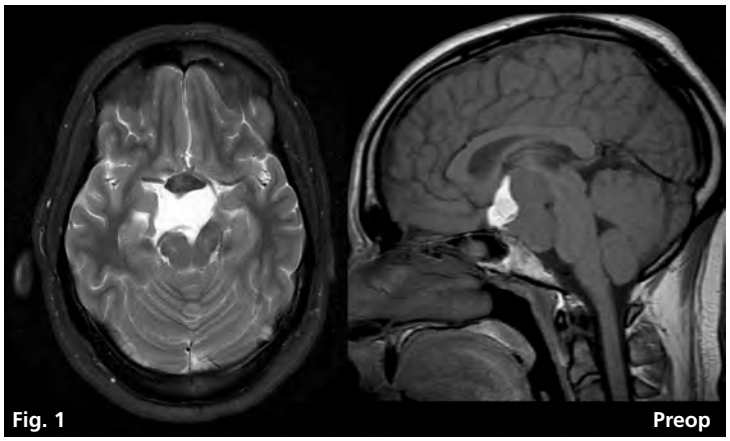

Fig. 1

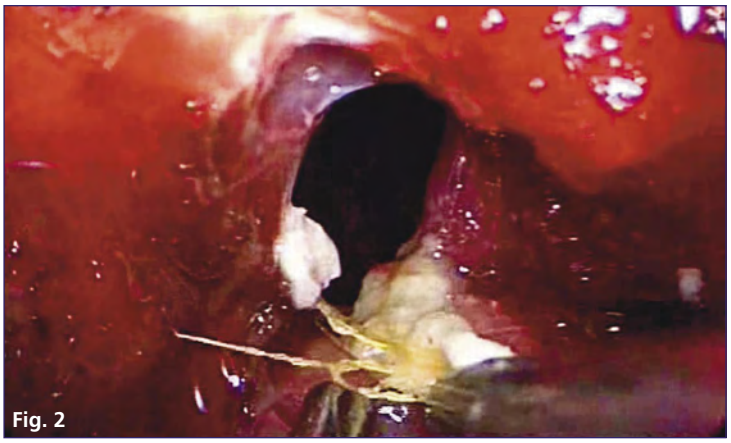
Fig. 2

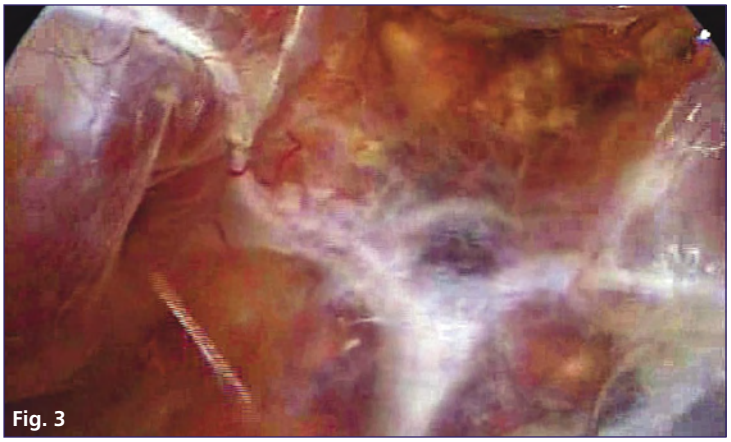
Fig. 3

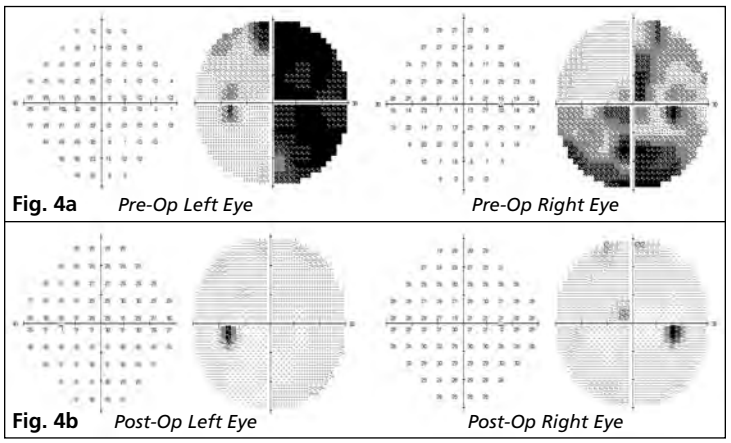

Fig. 4a Pre-Op Left Eye Pre-Op Right Eye

Fig. 4b Post-Op Left Eye Post-Op Right Eye

Stereotactic radiosurgery effective for juvenile pilocytic astrocytomas

by Hideyuki Kano, MD, PhD
Clinical Instructor

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Associate Professor of Neurological Surgery

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Professor of Neurological Surgery

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Juvenile pilocytic astrocytomas (JPAs) are low grade glial tumors of the brain that occur most commonly in children and young adults. JPAs are considered one of the histological types of grade one astrocytomas according to the World Health Organization (WHO) classification.

JPAs are the most common gliomas in children and represent cerebral and cerebellar astrocytomas. JPAs typically present in the first two decades without gender preference. JPAs usually are well-circumscribed tumors which may be cystic, solid or a mixture of the components.

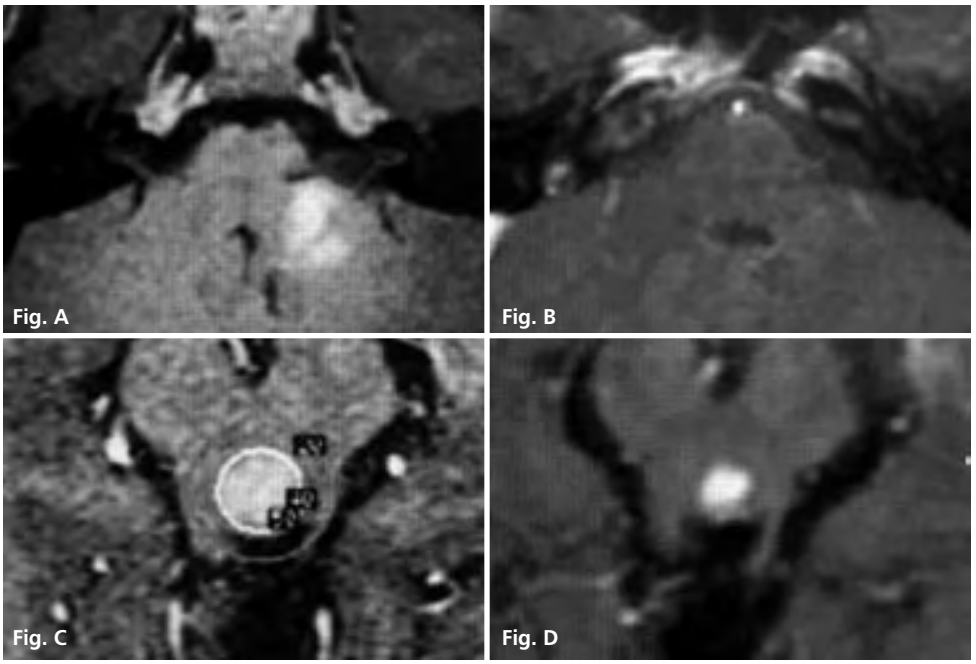
The cystic form is found in more than 75% of patients. Frequently the tumor consists of a mural nodule at the edge of a cystic mass. These tumors are slowly growing masses that may progress, stabilize or, even regress. Both the tumor grade and differentiation may remain stable for decades.

Radical tumor removal is not always feasible if the tumor is located in critical brain locations. Attempted surgical excision in areas such as the hypothalamus or brain stem may prove fatal. Clinical recurrence can be a reflection of cyst reformation or enlargement of the solid tumor.

Fractionated radiotherapy has been used after surgery for unresectable tumors. In younger children, chemotherapy has been recommended to avoid the side effects of conventional radiation although it is rarely curative and the median duration of effect is approximately three years. Stereotactic radiosurgery (SRS) provides less invasive and more accurate delivery of radiation in a single procedure.

University of Pittsburgh Experience

Sixty-two patients (32 male and 29 females) with pilocytic astrocytomas had Gamma knife stereotactic radiosurgery at the University Pittsburgh between 1987 and 2006. The median patient age was 12.0 years (range, 2.0-52.4 years). Forty six patients had prior surgical resection while 16 were diagnosed by biopsy. Thirteen patients had received multimodal therapy prior to radiosurgery. The median radiosurgery target volume was 3.0 cc (range, 0.17-33.7 cc) and the median margin dose was 14 Gy (range, 10-22.5 Gy).



(*top row*) MR images of a 4-year-old boy show a solid pontine juvenile pilocytic astrocytoma at the time of SRS (Fig. A). MR images obtained 11 years after SRS show complete resolution of enhancing tumor (Fig. B). (*bottom row*) A 12-year-old boy underwent surgical resection for a midbrain JPA. After five years his tumor recurred in midbrain and he underwent SRS. MR images show the solid tumor at the time of SRS (Fig. C). MR images obtained seven years after SRS showing regression of enhancing tumor in the midbrain (Fig. D).

With mean follow-up of 50.6 months (range 6.0-171.1 months), five patients had died and 57 were alive. Overall survivals after stereotactic radiosurgery at 1, 5, 10 years, were 96.4, 90.0 and 77.1%. Tumor control rates for solid tumors were 94.1% and 82.9% at one and five years. Patients with solid tumors had 1-, 3- and 5-year progression free survivals of 94.1%, 90.5 % and 82.9%, respectively. Patients with mixed cystic and solid tumors had 1-, 3- and 5-year progression free survivals of 82.2%, 38.0% and 15.2%, respectively. The mean progression-free survival time of solid versus mixed cystic and solid JPAs was 138.1 months versus 35.4 months. Patients with solid tumors had significantly better progression free survivals ($p<0.0001$,). Factors associated with a poorer progression-free survival included older age, cystic features, and failed previous radiation therapy and chemotherapy before SRS.

For some patients cystic progression may be more critical than solid tumor growth. Whenever safely feasible, symptomatic or progressive JPAs should be resected completely. However, if the tumor cannot be removed totally or if there is a recurrent tumor, other treatment modalities are necessary. These options include external beam radiation therapy, stereotactic intracavitary irradiation using phosphorus-32 for cysts, and chemotherapy. Some patients exhibit a more aggressive course characterized by progression of either solid or cystic components. These patients often have poor outcome if further treatment fails.

Progressive cystic pilocytic astrocytomas that are located in critical or deep areas of the brain will require multimodal therapy. Stereotactic cyst aspiration is a low-risk procedure that can be used prior to radiosurgery to reduce the target volume of cystic tumors in critical brain locations. The combination of cyst aspiration and radiosurgery results in early symptom improvement and helps to prevent cyst recurrence.

Stereotactic radiosurgery as part of multimodal therapy for progressive, recurrent or unresectable pilocytic astrocytomas is especially effective for younger patients with smaller, non cystic pilocytic astrocytomas. JPA located in critical areas of the brain require multimodality management strategies including resection, radiosurgery, chemotherapy and radiation therapy. •

Onyx successful in aneurysm treatment

(continued from page 1)

conclusion the patient was administered 15 mg eptifibatide IV, 600 mg Plavix OG, and 325 mg ASA OG. Heparin at 500 units/hour was continued for 12 hours and the patient was discharged home the next day on ASA and Plavix with the Plavix to be discontinued in 60 days.

• Case 2:

A 68-year-old white woman with an asymptomatic unruptured 11 mm (222.41 mm^3) right posterior communicating artery segment aneurysm elected to undergo endovascular therapy for lesion obliteration. Her procedure was performed identically to the one described in Case 1 above except for a few changes which included the use of a 6F cook shuttle catheter and the insertion of two helical ev3 Axium coils (10 mm x 20 mm; 8 mm x 20 mm). This patient also achieved complete aneurysm occlusion with Onyx in a procedure that took less than two hours to complete. She was discharged the following day.

Aneurysm before (top) and after (bottom) treatment.

• Case 3:

A 48-year-old white woman with an asymptomatic, unruptured 9 mm left posterior carotid wall aneurysm elected to undergo endovascular therapy for lesion obliteration. Her procedure was performed identically to the one described in Case 2 above except for the insertion of three helical ev3 Axium coils (9 mm x 20 mm; 9 mm x 20 mm; 8 mm x 20 mm) and a 4.5 mm x 20 mm Neuroform stent. This patient also achieved near complete aneurysm occlusion with 0.18 cc Onyx. She was discharged the following day. •

UPMC surgeon devises aneurysm treatment

(Reprinted with permission from the *Pittsburgh Tribune-Review*)

By Allison M. Heinrichs
Pittsburgh Tribune-Review

A UPMC brain surgeon is the first in the United States to use a new procedure to treat aneurysms, a potentially deadly condition that one in 20 people walk around with every day.

Dr. Michael Horowitz is fixing aneurysms—bulging blood vessels in the brain that can burst and kill—by filling the bulge with small flexible platinum coils and a liquid that becomes a firm pudding-like substance upon contact with blood. The coils and the liquid work together like concrete and rebar to stabilize the aneurysm and prevent more blood from entering and causing it to rupture.

"I think it's exciting to have the new technology," said Horowitz, chief of neurosurgery at UPMC Presbyterian. "I, personally, think it's going to prove safer and more durable" than traditional treatment.

There are two ways that aneurysms usually are treated. The first is to is open the patient's skull and clip the aneurysm to prevent blood from entering. The other is less invasive and involves threading a catheter into an artery in the groin, through blood vessels and up to the brain. The catheter is used to feed platinum coils into the aneurysm to initiate blood-clotting that blocks the bulge.

In April, the U.S. Food and Drug Administration approved Onyx HD 500—created by ev3 Inc., a medical device company based in Irvine, Calif.—for treating aneurysms. Onyx is delivered to the aneurysm through a catheter. It turns from a liquid to the pudding-like substance in the aneurysm, blocking unwanted blood flow. It is only approved for use in aneurysms that have not ruptured and do not originate at a fork in the vessel.

In November, Horowitz combined Onyx with a few coils to form a structure in the aneurysm, which he believes will last longer and work better than the coils or Onyx alone. The coils create a structure for the Onyx to solidify around.

"The hope is that it will be more durable, so we'll have a lower chance of having to treat them again," Horowitz said.

Two other hospitals—Lee Memorial Hospital in Fort Myers, Fla. and Vanderbilt University Medical Center in Nashville—use Onyx, but without the coils, according to ev3 spokeswoman Laura Nobles.

In 20 percent of patients whose aneurysms are treated with coils alone, the surgery has to be redone because the coils shift and blood re-enters the bulge, Horowitz said.

So far he has used Onyx in three aneurysm patients, all successfully. He is submitting his research for publication in the American Journal of Neuroradiology.

"It's sort of like space-age medicine," said patient Patricia Amato, 68, of Greenville in Mercer County. "It's just amazing."

Amato was diagnosed with an aneurysm by chance after she had a CT scan for sinus problems. Because aneurysms grow slowly, the brain adjusts to them and most people have no symptoms. People can live with them for decades and not realize it.

If the blood vessel walls around aneurysms become too stressed, they can burst, letting blood rush into the brain, causing a stroke.

Amato said she agreed to the Onyx treatment because it would be less likely she would have to have a repeat surgery—and because of a little serendipity.

"The clincher for me," she said, laughing, "was when I saw that the FDA had approved it for use with aneurysms on my birthday." •

Kanter joins department

Adam S. Kanter, MD, has joined the faculty of the Department of Neurosurgery as an assistant professor serving as director of the department's Minimally Invasive Spine Program and co-director of the Spine Biomechanics Research Laboratory.

Dr. Kanter

In addition to minimally invasive spine surgery, Dr. Kanter's specialty interests include endosurgical spinal techniques, spinal tumors, and experimental therapies for spinal cord regeneration.

In announcing Dr. Kanter's arrival, department chairman Amin Kassam, MD, stated, "Dr. Kanter has had a remarkable focus on the development of innovative and minimally invasive techniques in the management of complex spinal disease. He is a consummate surgeon that is exceptionally skilled, a wonderful teacher and perhaps most importantly, a compassionate physician.

"Dr. Kanter's experience represents an exquisitely unique resource not only for our patients but for our colleagues in the Pennsylvania and tri-state region. He is pursuing ways of dealing with spinal disease with minimal disruption to the patient, optimizing and expediting recovery."

Dr. Kanter received his medical degree from the University of Vermont in 2001 and completed his neurosurgical residency at the University of Virginia in 2005. He recently completed further subspecialty fellowship training at the University of California in San Francisco and Auckland City Hospital in Auckland, New Zealand.

Dr. Kanter has also published numerous papers in refereed journals and authored several book chapters. •

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The Honorable Bernard Leo McGinley

Tomycz Lecture Selected Best at Rowe Lectureship

Third-year resident **Nestor D. Tomycz, MD**, received the best presentation award at the third annual Department of Neurological Surgery Stuart Rowe Society Lectureship held on December 5. Tomycz's presentation on "MRI Fails to Identify Unstable Cervical Spine Injury Misses By CT in Obtunded or Comatose Trauma Patients: The Four-Year Experience of a Level I Trauma Center" was one of eight research lectures presented by department residents during the day honoring Stuart Niles Rowe, the department's first chairman and an early advocate of broad neurosurgical training.

The award was chosen and presented by the lectureship's honored guest, John A. Jane, Sr, MD, PhD, professor of neurological surgery at the University of Virginia Health System.

In addition to the resident lectures, the Stuart Rowe Society Lectureship Day featured a lecture on craniofacial surgery by Dr. Jane. Dr. Jane also presided over a journal club session and later capped the day with a dinner talk at the Fox Chapel Golf Club on his experiences in spine surgery.

Lunsford Receives Two Prestigious Awards

L. Dade Lunsford, MD, has been selected by Castle Connolly Medical Ltd, to receive one of its "Physician of The Year Awards in Clinical Excellence" at its annual National Physician of the Year Awards dinner in New York in March.

The prestigious event honors a select group of physicians who have made notable contributions to the field of medicine. Honorees are selected from more than 600,000 physicians currently practicing medicine in the United States.

Dr. Lunsford was also named recipient of the 2007 Ralph C. Wilde Award from the Allegheny County Medical Society. Established in 1975, the Ralph C. Wilde Award—named in honor of the former society president—is considered the most prestigious award presented by the ACMS. It is given to a member of the society who demonstrates noteworthy personal and professional characteristics.

Research Grants

• "Molecular Predictors of Prognosis for Childhood Oligodendrogliomas." **Ian Pollack, MD**, Children's Brain Tumor Foundation, $150,000. *(See article on back page).*

• "Synaptic Connectivity Following Experimental TBI and Hypothermia Treatment In the Immune Rat." **P. David Adelson, MD**, The Pittsburgh Foundation, $20,000.

• "Signal Transduction Inhibition as a Therapeutic Strategy for Gliomas." **Ian Pollack, MD**, The Pittsburgh Foundation, $20,000.

• "Novel Therapies for Pediatric TBI." **Larry W. Jenkins, PhD**, (co-investigator), The Pittsburgh Foundation, $10,000.

Prominent Lectures

• **Dr. Lunsford** was a visiting professor at Cairo University, Ain Shams University, AlAzhar University and the International Medical Center of Cairo, Egypt, December 1-6.

• **Peter Gerszten, MD**, was a visiting professor at Stanford University on November 29.

• **Douglas Kondziolka, MD**, was the E. H. Botterell Visiting Professor at the University of Toronto, November 26-27. He was also a visiting professor at the University of Alabama at Birmingham, October 14-15.

• **Amin Kassam, MD**, was the honored guest at the Annual Meeting of the Société de Neurochirurgie de Langue Française (SNCLF), Paris, France, November 26-27.

Congratulations

• **Richard Singleton, MD, PhD**, and **Johnathan Engh, MD**, won second place in the Congress of Neurological Surgeons Resident SANS Challenge at the 2007 CNS Annual Meeting in San Diego.

• **Rick Madhok, MD**, took first place in the clinical category for his presentation, "Endoscopic Endonasal Skull Base Surgery: Analysis of Complications in the Initial 700 Patients" given at the Pennsylvania Medical Society's Annual Business and House of Delegates Meeting held October 19 in Hershey, PA.

• **Dr. Tomycz**, took second prize in the Resident Trauma Paper Competition held at the American College of Surgeons/Pennsylvania Trauma Conference in Lancaster, PA on October 18. Dr. Tomycz presented the paper "MRI Fails to Detect Unstable Cervical Spine Injury Missed by CT in Obtunded and Comatose Patients: The Four-Year Experience of a Level I Trauma Center." **David Okonkwo, MD, PhD**, was principal investigator on this project.

Welcome

Donna Huesey, administrative assistant for Pedro Aguilar, MD; **Jane Mason**, clinic patient information coordinator; **Dana Quinlan**, administrative assistant for Adnan Abla, MD; **Evann Pierre**, pediatric physician assistant; **Carol Kennedy**, research nurse for Dr. Gerszten, **Marianna Hegedus**, operations manager; **Jennifer Cochran**, pediatric appointment secretary.

A warm welcome is also extended to **Drs. Eric M. Altschuler, John R. Baker, John Bookwalter, Daniel M. Bursick** and **David J. Engle, MD** and their staffs who recently joined the University of Pittsburgh Department of Neurological Surgery in December.

Personal Congratulations

• **Edward Monaco, MD**, and wife (Sara) had a baby girl (Julia Ann) on September 25.

Upcoming Events

• March 31 - April 4: **Principles and Practice of Gamma Knife Radiosurgery**. For neurosurgeons, radiation oncologists, medical physicists and other physicians interested in Gamma Knife treatment certification. This course will also be offered May 5-9. (412) 881-0602.

• April 8-10: **Gamma Knife Perfexion Training Course**. Advanced training course targeted at physicians interested in training on latest Gamma Knife unit. (412) 881-0602.

April 18: **Visiting Professor Lecture Series**. Edward Benzel, MD, director, Center for Spine Health, Cleveland Clinic. (412) 647-6358.

• June 1-3: **Minimally Invasive Endoscopic Surgery of the Cranial Base and Pituitary Fossa Course**. Presentation of minimally invasive techniques for endoscopic surgery of the cranial base and pituitary fossa. (412) 647-6358. •

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Pediatric neurosurgery chief awarded grant to study childhood oligodendrogliomas

by Marc Lukasiak, MD
Children's Hospital of Pittsburgh

Ian F. Pollack, MD—chief of pediatric neurosurgery at Children's Hospital of Pittsburgh and co-director of the University of Pittsburgh Cancer Institute's Brain Tumor Center—has received a grant from the Children's Brain Tumor Foundation for his pioneering work in the field of neuro-oncology. His project, "Molecular Makers of Outcome in Childhood Oligodendrogliomas," focuses on a category of brain tumors that he says has previously not been well studied in children.

"We're identifying the molecular features of the tumor, which will allow doctors to better tailor a specific treatment for the patient," Dr. Pollack said. "For example, we are looking forward to the day when physicians can predict which patients will respond to new therapies and which will benefit from more conventional treatments."

Dr. Pollack said Children's Hospital has continued to serve as a leader in this type of research because of the continued support of foundations like the Children's Brain Tumor Foundation. This grant totaled $150,000.

"This grant, and others we have received previously, will enable us to explore new areas of brain tumor research at Children's and broaden our scope on eventual treatments," Dr. Pollack said.

Dr. Pollack's primary research interests focus on identifying and evaluating innovative strategies for classifying and treating malignant brain tumors, improving the treatment of children with brain tumors and optimizing the management of childhood craniofacial disorders.

He has been listed in *Best Doctors in America* and *Who's Who in Science and Engineering* and has been awarded several research grants from the National Institutes of Health.

"Dr. Pollack represents the epitome of the translational researcher and is one of the very few true neurosurgical physician-scientists in the nation," said Amin Kassam, MD, department chairman. "Accordingly, this allows us to remain at the forefront of neuro-oncology in the nation."

In July, Dr. Pollack was awarded $200,000 in funding from the Brain Tumor Society, for his study titled, "Predictors of Outcome in Pediatric Low-Grade Astrocytomas." According to Dr. Pollack, this project focuses on the most common type of pediatric brain tumors, but the goal is similar: to better characterize the molecular changes that are associated with tumor development and recurrence, so that treatments can be better targeted to those tumors at high risk for regrowth.

The Children's Hospital Neuro-Oncology Program provides comprehensive, multidisciplinary care for patients with brain and spinal cord tumors. •