Minimally Invasive Brain Surgery at Mount Sinai: Endoscopic Skull Base Surgery

Under the guidance of Joshua B. Bederson, MD, Mount Sinai Department of Neurosurgery Vice-Chairman, and Eric M. Genden, MD, Chairman of the Department of Otolaryngology, the expanded endonasal endoscopic-assisted technique for resection of skull base lesions is being used more frequently and for a wider range of pathology. Until recently, approaches to the anterior skull base, with the exception of the transsphenoidal approach to the sellar region, were performed primarily using open craniotomy techniques such as subfrontal, transmaxillary/transfacial, and combined craniofacial exposures. Although advances in intraoperative visualization and localization technologies have made these techniques safer, recent interest has developed in endonasal and endoscopic-assisted approaches. Proponents of these techniques claim fewer post-operative complications, greater patient satisfaction, and shorter length of stay. Increasingly, patients come in having extensively researched their options, and they are asking for minimally invasive procedures.

One such patient is Maria Cea, a mother of two young children on Long Island, who had originally been told that she would need open brain surgery, a procedure involving an incision across the top of her skull that requires retraction of the brain and is often associated with complications. In the course of looking for other options, Mrs. Cea learned about the minimally invasive procedure performed jointly by neurosurgeons and otolaryngologists at Mount Sinai: brain tumors are removed endoscopically through the nose without facial incisions or manipulation of the brain.

Drs. Bederson and Genden have teamed up to expand the applications of the endonasal endoscopic-assisted technique for a wider range of skull base lesions. This method provides less invasive access to surgical lesions from the anterior skull base to the clivus, adequate visualization of anatomical structures, and generally obviates the need for brain retraction, potentially reducing complications.
morbidity and mortality. In Mrs. Cea’s surgery, the two surgeons worked simultaneously, each manipulating instruments in both hands and watching video screens. Dr. Bederson explains, “We use a four-handed technique with both surgeons operating at the same time through both nostrils...we have learned how to work in the same operative field at the same time. It’s rare to find two surgeons from two different specialties who are able to work simultaneously like we do. It has led to a new treatment paradigm that benefits patients.” “In ENT, we have been operating through the nose for years,” says Dr. Genden. “Neurosurgeons have been removing tumors at the base of the skull for years. This is a combined approach in its richest form—and is emblematic of the Multidisciplinary Head and Neck Cancer Center” at Mount Sinai. “We are taking disciplines that have worked in parallel in different venues for years, ENT and Neurosurgery, and bringing them together for the benefit of the patient.”

The procedure is not without challenges, however, including learning how to interpret a 3D perspective through the endoscope, learning how to avoid and control hemorrhage, and learning how to perform dural repair to avoid cerebrospinal fluid (CSF) leakage. Careful selection of patients is essential, as is having available neuro- and otolaryngology surgeons who are experienced with traditional skull base approaches and transsphenoidal pituitary surgery. Because of the steep learning curve involved and the need for specialized imaging, surgical tools, and a neuro- and skull base anatomy laboratory, this technique is generally performed only at major medical centers.

Neurosurgery resident Arien J. Smith, MD, and Otolaryngology resident Jean Anderson Eloy, MD, have been writing up the Skull Base Team’s recent experience with 15 consecutive patients who had intracranial skull base lesions treated via endonasal or sublabial endoscopic-assisted technique. Types of tumors included a petroclival chondrosarcoma, planum sphenoidale or tuberculum sella meningioma, cranioopharyngioma, fifth cranial nerve schwannoma, basilar trunk aneurysm, esthesioneuroblastoma, adenoid cystic carcinoma, nasopharyngeal squamous cell cancer, clival cordoma, and a petrous apex granuloma. This study aims to identify pre- and/or intraoperative factors which may prevent development of CSF leaks. Three patients developed a CSF leak, but there were no deaths, disabling, or life threatening complications. Although this study represents early experience, the authors believe that anatomical closure and structural support are the important factors in reconstruction, as opposed to the size of the opening, the type of dural substitute that is used, or the use of prophylactic lumbar drainage in preventing CSF leak. The average length of stay was 6.4 days overall (excluding the patient with grade III subarachnoid hemorrhage from a ruptured basilar trunk aneurysm) and only 2.5 days for those who did not have lumbar drains.

Minimally invasive approaches to the skull base are feasible in selected patients and complete resections are possible. The Skull Base Team is currently expanding the applications of this technique to include lesions of the medial petrous bone, the infratemporal fossa and the posterior fossa. Although this is a technically demanding surgical technique, it is “safe” in terms of serious complications, and patients report high levels of satisfaction.

Mrs. Cea is representative of these patients. She had the endoscopic-assisted procedure to remove a planum sphenoidale meningioma (a benign tumor) of the frontal skull base and was discharged a few days later—sent home with nothing more than some salt water nasal spray. “When I left the hospital,” says Mrs. Cea, who is now at home with her children and tumor-free, “you couldn’t even tell I had had surgery. It was unbelievable. It looked like I was in for something minor. I wanted to tell everyone that I’d had brain surgery.”

The different types of dural repair are depicted in these six figures.

Thanks to Lisa Wagner, NP, for her contributions to this article.
Stroke is the third leading cause of death in North America, occurring approximately 750,000 times per year, and intracerebral hemorrhage accounts for 10-20% of all stroke cases. The standard treatment for bleeding into the brain includes giving medications in an effort to control blood pressure and to try to reduce brain tissue swelling caused by the blood in the brain. Standard treatment, however, does not remove the blood clot that has formed in the brain. Large blood clots take longer to dissolve than smaller ones and may lead to more lasting and severe disabilities. The drug rt-PA is approved by the Food and Drug Administration to dissolve blood clots that cause heart attacks and strokes, but it is not approved for dissolving blood clots in the brain. The Minimally Invasive Surgery Plus rt-PA for ICH Evacuation (MISTIE) Study is looking at rt-PA to see if it can decrease and/or dissolve the blood clot in the brain.

The study is unique in several respects. First, rt-PA has been used in the past to treat blood clots within arteries that reduced blood flow to the heart or brain, but has not been used to treat bleeding in the brain. Although it may seem counterintuitive to give a “blood thinning” medication to someone who has bled, the early evidence is that pressure on the brain caused by the blood clot is an important determinant of poor outcome. If the size of the blood clot could be reduced in a minimally invasive way, patients may improve faster and more completely. The other unique aspect of this study is the group of patients it is designed to help. Patients with intracerebral hemorrhages that are very small tend to improve spontaneously without treatment and are not eligible for the study. Patients with very large bleeds have an extremely high mortality rate and are not amenable to any intervention. Patients with intermediate size bleeds, the ones eligible for this study, may still have a chance for recovery, but currently there are no effective treatments.

Joshua B. Bederson, MD, is serving as Principal Investigator at Mount Sinai in the MISTIE trial, which is organized by Daniel F. Hanley, MD, at Johns Hopkins University. During the first phase of the study, investigators will attempt to find the best dose of rt-PA to use and assess its safety. Patients admitted to the study and assigned to the surgical group will receive one of three different doses of rt-PA, every eight hours for approximately 72 hours, for a maximum of nine doses. Patients assigned to the standard care group will receive neither surgery nor rt-PA. During the second phase, this study will attempt to assess treatment safety and outcomes. Patients admitted to the study and assigned to the surgical group will receive the previously determined optimal rt-PA doses every eight hours for approximately 72 hours, for a maximum of nine doses. Patients assigned to the standard care group will receive neither surgery nor rt-PA.

Screening procedures at Mount Sinai started on May 11, 2006. Twenty-nine patients have been screened so far. On October 16, a screened patient was considered eligible, and after the family signed a consent, the patient was enrolled in the study. The patient received investigational surgery and intracerebral rt-PA. No severe adverse events related to the investigational procedure were observed. A second patient was enrolled on November 11. A third patient was enrolled on November 30, with no adverse events. Both were randomized to investigational surgery and intracerebral rt-PA. All three continue to improve and are receiving inpatient rehabilitation services.

All participating sites have received local institutional review board approval and are actively screening patients. As of year end 2006, MSMC had enrolled the most patients of any site.

Thanks to Lisa Wagner, NP, for her contributions to this article.

Endoscopic Skull Base Surgery & the MISTIE Trial

Dr. Bederson and Andrea Carai, MD, Visiting Research Scholar in Cerebrovascular Surgery

Go Team

Save Saturday, June 9th, for the Annual Baseball Tournament. That Mount Sinai Neurosurgery has received a bye has been attributed to our outstanding performance last year! All members of the Department are invited to play. Bring plenty of fans to cheer the team.
Grand Rounds for the Department of Neurosurgery take place Wednesday mornings from 7 to 9 AM. In addition to presentations by the members of the Department of Neurosurgery, there have been recent lectures by Mount Sinai faculty from Radiology, Anesthesia, Neuropathology, Neurology and Otolaryngology. Outside speakers, besides the named lecturers, include Jay L. Shils, PhD, Director of Intra-Operative Monitoring at the Lahey Clinic and Assistant Professor of Neurosurgery at Tufts University School of Medicine. His talk was entitled “Deep brain stimulation of the basal ganglia: computational model.” Wolff Kirsch, MD, Professor of Surgery, Biochemistry and Microbiology at Loma Linda University School of Medicine in California spoke on “Brain microhemorrhages and sporadic late-onset dementia.”

The neurosurgeons have presented Grand Rounds for other departments. Dr. Joshua Bederson’s lecture to the neurologists in late September was titled “Minimally invasive approaches to the skull base.” Two other Neurology Grand Rounds were presented in November by members of the Neurosurgery Department: Dr. Ron L. Alterman spoke about “Current and future applications of deep brain stimulation;” Dr. Jennifer Frontera’s topic on November 27 was “Clinical role of cerebrovascular autoregulation.” She also discussed that topic at Grand Rounds of the Neurology Department at Beth Israel Hospital in January.

Dr. David Johnson has spoken at Rehabilitation Medicine Grand Rounds about “New strategies in vertebral compression fractures.” Holding joint appointments in Neurology and Neurosurgery, Dr. Robert Aiken gives grand rounds to both departments. In January he spoke to the neurologists about “Neurological complications of cancer: basic problems from an advanced viewpoint,” and in February his talk at Neurosurgery Oncology Grand Rounds was “Upcoming clinical trials.” Finally, Dr. Kalmon Post gives Grand Rounds every three months to the endocrine division on different pituitary issues.

**Hollin Lecture**

Steven Giannotta, MD, presented the sixteenth Sidney A. Hollin, MD, Endowed Memorial Lecture on October 25. Dr. Giannotta is the Professor and Chair of the Department of Neurological Surgery at the Keck School of Medicine of the University of California in Los Angeles. He has held many important positions in national neurosurgery organizations including the Chairmanship of the American Board of Neurological Surgeons and a position on the Residency Review Committee. The large audience appreciated his clear and thorough discussion, “Comprehensive management of acoustic neuromas.” Previous lecturers include a list of distinguished physicians: M. Gazi Yasargil, MD (1985), Eugene Flamm, MD (1992), L. Nick Hopkins, MD (1993), Bennett M. Stein, MD (1994), Robert Spetzler, MD (1995), Joshua B. Bederson, MD (1996), Laligam Sekhar, MD (1997), Marc Mayberg (1998), J. Max Findlay, MD, PhD (1999), Robert H. Rosenwasser, MD (2000), Philip E. Steig, MD (2001), Nobuo Hashimoto, MD (2002), H. Richard Winn, MD (2003), Ralph G. Dacey, MD (2004), Neil A. Martin, MD (2005).

**Malis Lectureship Update**

The following have generously donated to the Malis Lectureship since the last newsletter: Marc Letellier, MD, Jay More, MD, Allen Rothman, MD, and Ruth Malis.

The first Leonard I. Malis Lecture will be given on Wednesday, September 26, 2007, by Peter W. Carmel, Chairman of the Department of Neurological Surgery at the University of Medicine and Dentistry of New Jersey (UMDNJ) and a Professor of Surgery at the New Jersey Medical School in Newark. Dr. Carmel is an internationally renowned pediatric neurosurgeon.

Please save the date.
Course Director **Isabelle M. Germano, MD**, structured an impressive roster of faculty from national and international medical schools for *Advanced Techniques and Technology in Brain and Spine Surgery, an Intensive Review & Hands-on Practical Course*. The Neurosurgery faculty, members of Radiology, Neurology, Orthopedics and Otolaryngology from Mount Sinai, and the following guest lecturers offered expert advice: David Andrews, MD, from Jefferson Medical College, Peter M. Black, MD, PhD, from Harvard, Giovanni Broggi, MD, from Istituto Tumori Besta in Milan, Italy, Peter Carmel, MD, from New Jersey Medical School, J. Max Findlay, MD, from Edmonton University, Jack P. Rock, MD, from Henry Ford Hospital, Antonio A.F.de Salles, MD, from UCLA, and Ronald Warnick, MD, from University of Cincinnati. The attendees gained hands-on experience in image-guided surgery, spinal instrumentation and radiosurgery planning. Areas covered included: advances in spine surgery; new trends in neurosurgical practice; advances in neurosurgical oncology; treatment of cerebrovascular diseases; head-trauma, intensive care and anesthesia; movement disorders: contemporary management; state-of-the-art skull base surgery. The course was held at Mount Sinai on December 8 through 10.

Course directors, **Jamie Ullman, MD, Tanvir Choudhri, MD,** and **Aman Patel, MD**, organized an ambitious one day course, *Neurosurgery for Primary Care Providers*, held Saturday, January 20, at Mount Sinai. The course was designed for family medicine, internal medicine, neurologists and emergency room physicians, along with nurse practitioners and physician assistants. The goal was to gain familiarity with the various disease entities and emergencies seen in neurosurgery practice. The course focused on the latest advances in neurosurgical care, contributing to early intervention and improved patient outcomes. The four sections of the course addressed General Neurosurgery/Trauma, Spinal Neurosurgery, Cerebrovascular Neurosurgery, General Neurosurgery/Tumor/Functional. Mount Sinai faculty from the Department of Neurosurgery were joined by faculty from Neurology, Hematology and Medical Oncology, Radiology, Radiation Oncology, Rehabilitation Medicine and Cardiology. The attendees were very pleased with the presentations and suggested a longer course in the future.

Course participants at one of the hands-on stations featuring image-guided spine surgery.

**New Endowed Resident Award**

A family foundation has recently established and endowed the *Kalmon D. Post Neurosurgery Resident Publication Award*. This prize, intended to acknowledge and promote excellence in scholarship, will be awarded annually for the best peer-reviewed manuscript that has been published or accepted for publication by a resident during the preceding year. The Department’s full professors will determine the award’s recipient, who will be asked to present the selected paper when the award is given during the Department of Neurosurgery Research Day. This award is intended as a tribute to Dr. Post’s interest in the academic development of residents and his commitment to their scholarship.
Update of Former Residents

Simone Betchen, MD, who graduated in 2005 and did a Neurooncology Fellowship with Phil Gutin, MD, at Memorial Sloan Kettering Institute, has accepted a position as an Attending Neurosurgeon at Maimonides Medical Center in Brooklyn.

Dr. Manny Cacdac, who lives in Terre Haute, Indiana, was the team leader of a group of physicians, nurses and support staff from the Society of Philippine Surgeons in America who went on a surgical mission to Samar, the third largest island in the Philippines, from January 14–21, 2006. Planning and obtaining funds for this mission took over a year. Medical supplies were shipped three months in advance. Due to the overwhelming number of patients who needed care, the supplies started running out by midweek but were replenished through contacts in Manila and Cebu City. Although the team did more than 548 operations, a record breaking number, they wished that they had had more time to treat all the patients who needed care. They considered their mission a rousing success and look forward to the next one. Contact Dr. Cacdac if you have an interest in helping. (fejcacdac@aol.com)

Dr. Ron Benveniste, finishing a tumor surgery fellowship at MD Anderson in Houston, Texas, and his wife Rachel, welcomed daughter Deborah in March. Ron has accepted a position as Assistant Professor of Neurosurgery at the University of Miami to develop a tumor program.

Chirag Gandhi, MD, will be heading to UMDNJ in July as an Assistant Professor in Neurosurgery after he finishes his endovascular fellowship at Mount Sinai with Aman Patel, MD.

Welcome New Faculty

Eliza B. Geer, MD, joined the faculty at Mount Sinai in July, 2006, with an appointment in the Department of Medicine, Division of Endocrinology, and a secondary appointment in the Department of Neurosurgery. After graduating from Columbia University, she attended Mount Sinai School of Medicine, where she graduated with Distinction in Research in 2000. She completed her Internship and Residency in Internal Medicine at Columbia Presbyterian Medical Center, where she became involved in neuroendocrine research, conducting studies on the hypothalamic-pituitary-adrenal-axis and acromegaly. After completing her residency in 2003, she conducted a year of clinical research at Columbia’s Obesity Research Center, funded by a NIH T32 grant, where she focused on body composition and appetite in acromegaly. She then completed a fellowship in Endocrinology, Diabetes, and Bone Disease at Mount Sinai, graduating in 2006. During her fellowship, she was the Principal Investigator on a study investigating body composition and appetite in Cushing’s Disease, for which she received a CReFF Award. As faculty, she plans to continue her clinical research and see patients in the area of pituitary diseases. She currently sees pituitary patients with Dr. Post on Tuesdays in the faculty practice, and also has office hours as part of the Endocrine Division. When she is not working, she enjoys running (she completed the San Diego marathon) and traveling, but recently her free time is spent with her husband and one year old daughter.

Save the Dates

Research Day

Ved P. Sachdev Endowed Lecture

John H. Morrison, PhD
Dean of Basic Sciences and the Graduate School of Biological Sciences Mount Sinai School of Medicine Tuesday, May 29, 4-5 PM

Jeannette and Bernard S. Post, MD, Endowed Lecture

Kim Burchiel, MD
John Raaf Professor and Chairman Department of Neurological Surgery Oregon Health and Science University Portland, Oregon Wednesday, May 30, 8-9 AM
The Trauma Section of the AANS/CNS traditionally gives several resident research awards, the latest of which is being sponsored by Novo-Nordisk. Arien Smith, MD, PGY4, is the first recipient of the new Novo-Nordisk Resident Research Award on Critical Care for the abstract entitled “Effect of alcohol and aspirin consumption on worsening intracranial hemorrhage in head trauma.” He and Dr. Jamie Ullman, Director of Neurosurgery at Elmhurst Hospital Center, collaborated on this abstract. Dr. Smith will be invited to present the abstract during the Trauma Section Open Papers Session at the AANS meeting in Washington, DC, in April 2007. There will be a plaque and cash award to accompany the honor.

Jennifer Brown, NP, and her husband Dave Anderson, welcomed their big boy, Connor William Anderson, on December 20, at 9:07 PM. Connor weighed 9 pounds, 6 ounces and was 55cm long. Working with Dr. Art Jenkins, Jennifer was a nurse practitioner in the department since 2003. She “retired” after Connor’s birth.

Dr. Richard Winn has been sharing his expertise with other departments to which he has been invited as a visiting professor. His schedule included the Department of Neurological Surgery at Montefiore Medical Center on October 30, the Surgical Neurology Branch at the National Institutes of Health and also the Department of Neurosurgery at George Washington University in December, the Department of Neurosurgery at the University of Texas Health Science Center at Houston in January. Dr. Winn was honored to speak to the Neurosurgery Department at LSU (Louisiana State University) as the Ray Dahl Lecturer in February: he and Dr. Dahl served simultaneously as neurosurgeons at the Second General Hospital in Landstuhl, Germany, in the early seventies. In February at the Winter Clinics for Cranial and Spinal Surgery in Snowmass, Colorado, Dr. Winn, a participating speaker in the forum titled “Legends in Neurosurgery,” discussed the natural history of cerebral aneurysms. He was a visiting professor at LSU in Shreveport, Louisiana, and also at Peter Bent Brigham in Boston, in March.

Dr. Aman Patel was interviewed by WB News about a French study published in The New England Journal of Medicine concerning carotid stenting to treat conditions leading to strokes. This study compared carotid artery stenting with carotid endarterectomy in average risk patients with symptomatic carotid artery stenosis. The study’s finding was that, currently, in average risk patients, endarterectomy is preferable to stenting. Dr. Patel agrees with the stipulations in the United States that only patients at high risk for surgery should be considered for stenting. There are ongoing studies in the US evaluating average risk patients for carotid artery stenting which should help shed light on whether the indications for stenting can be expanded. Dr. Patel also presented “Intra-arterial t-PA therapy for acute ischemic stroke” at a Neurology Stroke Conference in November.

David Johnson, MD, participated in Mount Sinai 2006 Update, a four day neuroradiology conference to update practicing neuroradiologists and people getting ready for boards or CAQ (the additional board exam for neuroradiology). Dr. Johnson shared his knowledge about vertebral compression fractures as well as endovascular treatment of cerebrovascular disease. He also spoke about compression fractures at the Orthopedic course, Orthopedics for the Primary Care Giver, in November.

Dr. Isabelle Germano was the guest speaker at Harvard Medical School’s Department of Continuing Education course, Brain Tumor Management, December 4-5, 2006, in Boston. Sponsored by the Dana Farber Cancer Center, the Department of Neurosurgery, Brigham and Women’s Hospital, Children’s Hospital and the Department of Radiation Oncology, Massachusetts General Hospital, this was the 14th Annual Tumors of the Central Nervous System Course. Dr. Germano’s talk was entitled “Image-guided surgery and immune therapy for gliomas.”

On February 2, Tanvir Choudhri, MD, gave a lecture, “Management of degenerative cervical spine disorders” to the Department of Medicine World Trade Center (WTC) Program. The month before, he presented the first lecture to the Neurosurgery Medical Student Interest Group, newly established by the Student Council. The title of his talk was “Neurosurgery as a career.” Drs. Winn and Choudhri are mentors of that fledgling group.

Joshua Bederson, MD, will serve for one year as the AANS Ex-officio Board Liaison to the AANS/CNS Section on Cerebrovascular Surgery. He is Chair of the AANS section on Cerebrovascular Surgery.

The Neurosurgery Department continues to grow—and the growth has required new space. A project that began in mid-October displaced five staff members, four of whom relocated temporarily to the Malis Library, and two faculty who moved into the fellows’ room during construction. The old cardiothoracic biopsy area was
converted into faculty offices, a secretarial area for five secretaries, a library and a waiting area. When construction was completed in February, Dr. Bederson and his staff relocated to the new area, Annenberg 8-28, and Dr. Frontera and Chen also moved into new offices.

The 20th Annual Neurosurgery in the Rockies Program, held in Vail, Colorado, from February 24-28, was attended by three of our residents and Dr. Post. All three residents gave presentations: Harlan Bruner spoke on “The longitudinal comparison of costs of medical therapy vs. deep brain stimulation in patients with Parkinson’s;” Scott Meyer’s talk was entitled “Posterior brainstem complication following IPSS for Cushing’s disease diagnosis.” Brian Snyder debated Josh Seinfeld from the University of Colorado School of Medicine on “Deep arteriovenous malformations: observation vs. treatment.” Besides benefiting from the information gained at the meeting, the residents enjoyed skiing on the fresh powder in Beaver Creek. Our department was looking forward to a win in the Nastar competition, but the race was cancelled due to heavy snow conditions on the course!

The Department of Neurosurgery hosted a party on March 19 to thank the people who responded to the crisis in the Annenberg Building on Wednesday, March 7, at 8 AM. A fire on the seventh floor disrupted activities on the sixth, seventh and eighth floors. Patients were moved quickly and no one was injured. The hospital’s rapid and efficient actions led to an expedient resumption of activity.