Recent and emerging advances in neurovascular techniques and devices are providing new minimally invasive options for acute stroke patients and those with such challenging disorders as wide-neck brain aneurysms. Meanwhile, next-generation imaging technologies, such as 3-D neuroangiographic systems with dynamic CT scanning capability, are allowing neurovascular specialists to work in an environment of ever-increasing precision.

Although coiling has been the preferred minimally invasive intervention for aneurysms since the technique became available in the early 1990s, it was ineffective in the treatment of wide-neck aneurysms until the recent introduction of vascular remodeling devices. These specialized stents prevent the coils from escaping back into the artery and blocking it. One of the two available devices was approved by the Food and Drug Administration as recently as May 2007.

Acute stroke patients also are benefiting from recently introduced minimally invasive therapies. The use of an innovative clot retrieval device can actually reverse the symptoms of an acute stroke if performed in the first few hours after onset, and other interventional therapies can improve blood flow to the brain during acute stroke, offering the possibility of much better patient outcomes than previously expected.

While neurovascular procedures are becoming available to treat a widening spectrum of cases, some situations will continue to require more invasive procedures. A multidisciplinary, collaborative approach involving medical and surgical interventionalists is key to ensuring that each patient receives the most appropriate treatment.

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Endonasal Pituitary Technique Provides Direct Access to Tumors
Adam N. Mamelak, MD

The introduction of the endoscope is revolutionizing surgery for pituitary tumors, giving neurosurgeons unobstructed access and visibility for more complete tumor removal while diminishing post-operative pain and shortening recovery times.

With the operating microscope, a surgeon is working through a narrow corridor from a distance of about 30 centimeters. Because he or she is introducing instruments through that same corridor, the field is further narrowed or obstructed. Because the endoscope is small enough to fit within the nostril but sits only one centimeter from the pituitary gland, it gives a wide field of view. There is minimal tissue disruption and the surgeon can work through both nostrils because there is no need for the speculum that is required in the microscope-assisted procedure.

Using a direct endonasal approach or a binasal endonasal approach, we can now perform large operations that in the past could only be done by opening the skull.

There is so little tissue destruction we rarely need to pack the nose, and patients are very comfortable postoperatively.

One patient in his mid-30s was referred to Cedars-Sinai’s Pituitary Center when a fertility workup found a low testosterone count and subsequent diagnostics revealed a large mass extending up from the pituitary gland. We hoped to remove the tumor through a small incision in the eyebrow, but because of the size and position of the optic nerves, we could do nothing more than remove a specimen for biopsy.

This was a rare tumor called a pituicytoma. Only about 23 have been described in the medical literature. The cure rate is high with complete resection but the prognosis is less optimistic if even a little residual remains. We went back a few weeks later, using an expanded endonasal approach to remove a significant amount of bone. We were able to remove the whole tumor, allowing the patient to avoid radiation therapy.

Pituitary surgery – especially endoscopic surgery – requires a unique set of skills that are refined and maintained through repetition and experience. Studies have demonstrated that high-volume pituitary centers with a single surgeon tend to have significantly better outcomes than low-volume hospitals or even high-volume centers with multiple surgeons.

The medical care of a patient with a pituitary condition is extremely complex and demands the close involvement of neuroendocrinologists and other specialists. Every patient considered for surgery should be evaluated by multiple physicians from a variety of disciplines.

Dr. Mamelak is Co-director of the Pituitary Center and Director of Minimally Invasive Intracranial Neurosurgery. He performs about 75 pituitary operations a year.

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Complex Spine Cases Require Collaboration
J. Patrick Johnson, MD and Khawar Siddique, MD

While innovations in stem cell and other technologies are likely to improve the effectiveness and outcomes of spine procedures, we expect that collaboration among orthopaedic and neurosurgical spine specialists will remain critically important in the treatment of complex cases.

A recent example is the experience of a 19-year-old college student who developed over the course of a year a variety of symptoms related to progressive right-side weakness, including gait abnormalities and handwriting changes. Each manifestation was thought to be musculoskeletal and was treated accordingly with braces and physical therapy. Eventually, after the patient experienced issues with bladder control and proprioception, brain and cervical spine MRIs were ordered, revealing a large schwannoma in the spinal canal near the base of the brain. The patient’s local physician referred her to our center.

By the time the diagnosis was made, this schwannoma had become very large and was considered difficult to remove, if not completely resectable. The tumor had
invaded two of the upper cervical vertebrae, destroyed the joint between the bones and was wrapped around the vertebral artery. Working in collaboration with Dr. Brian Perri, our orthopaedic spine colleague, we performed a two-stage operation to completely resect the tumor and stabilize the spine. The patient is now back to normal, seven months after surgery, and has an excellent long-term prognosis.

In addition to working together to treat patients, our orthopaedic surgeons and neurosurgeons collaborate in their research efforts. Early laboratory work with stem cells appears to offer promising results in the areas of orthopaedic and spinal repair. Our laboratory research using adult stem cells is aimed at improving the fusion and healing of bone, and the repair of damaged disks, ligaments, tendons and articular cartilage.

Spine centers that foster a cooperative rather than competitive approach among orthopaedic surgeons and neurosurgeons encourage innovation and the development of expertise, and patients are the beneficiaries.

Dr. John S. Yu, MD and Behrooz Hakimian, MD

Radiosurgery has become an attractive alternative to conventional approaches in treating brain tumors and other lesions in some patients.

A 62-year-old patient was referred to Cedars-Sinai neurosurgeons when renal cell carcinoma metastasized to his brain, causing speech difficulty and right-side weakness. After resection of this lesion, a second appeared, and the treatment team debated various options.

We decided to treat the post-op bed and new lesion with the Gamma Knife® hoping to delay or even avoid the use of whole-brain radiation therapy. Two to three weeks after this procedure, the patient developed a new lesion, which we again treated with the Gamma Knife. There have been no recurrences since that time, and the systemic disease also appears stable without any active treatment.

The Gamma Knife’s fixed, extremely precise system delivers a full dose of radiation in one session, making it an ideal treatment for such conditions as arteriovenous malformations, certain functional disorders and many brain tumors. This complements the capabilities of the X-Knife™ which provides fractionated treatment.

Dr. Yu is Director of Surgical Neuro-Oncology at Cedars-Sinai. Dr. Hakimian, a radiation oncologist, has performed radiosurgery at Cedars-Sinai for the past seven years, with brain tumors accounting for about half of his practice. Drs. Yu and Hakimian are among authors of a chapter, “Radiosurgery of Intracranial Lesions,” in a recently released edition of The Neurosurgical Operative Atlas: Neuro-Oncology, published by the American Association of Neurological Surgeons.

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Deep Brain Stimulation Enhances Long-Term Control of Parkinson’s Disease

Ajay K. Ananda, MD

In randomized clinical trials, patients with Parkinson’s disease who underwent implantation of deep brain stimulators (DBS) scored far better in multiple parameters compared to their counterparts who were maintained on optimal medical treatment alone.

Medicines such as dopamine and Sinemet® (carbidopa and levodopa) usually work well for the first couple of years, but over time, efficacy declines and dosage is increased to compensate. We know that the average ‘therapeutic life’ of dopamine is between seven and 14 years. By then, patients are often taking it three or four times a day and not getting good control.

When a patient has deep brain stimulation, however, their average medicine requirements decrease significantly, between 50 and 100 percent, with many being able to discontinue their medicines completely.

DBS is also used in the treatment of tremor and dystonia, conditions for which medications are ineffective. To treat Parkinson’s disease, the stimulating electrode is placed in the subthalamic nucleus. For tremor, the target is the ventralis intermedius nucleus of the thalamus, and for dystonia, the electrode is placed in the globus pallidus interna.

We recently performed DBS surgery on a patient in his early 50s who was unable to tolerate his Parkinson’s disease medication because it caused intense pain. When he stopped taking it, however, he sat motionless in a wheelchair.

Approximately three months after bilateral implantation surgery, the patient’s medication dose had been cut in half, and the patient no longer suffers from the mysterious pains he was having on Sinemet, while at the same time enjoys the greatest mobility he’s had in a decade. As the dose continues to decrease, the neurologist will be able to make fine adjustments to the stimulator as there are thousands of combinations of different stimulation settings.

For every patient who is a candidate for a stimulator, we hold a multidisciplinary meeting that includes neurosurgeons, neuropsychologists, physical therapists, speech-language pathologists, neurologists, neurosurgeons and others to be sure that DBS is the best approach.

Dr. Ananda is a Cedars-Sinai neurosurgeon specializing in functional neurosurgery, particularly stereotactic radiosurgery and the surgical treatment of epilepsy, pain and movement disorders.

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Innovative Therapies Target Malignant Brain Tumors

Keith L. Black, MD; John S. Yu, MD and Surasak Phuphanich, MD, FAAN

In the battle against malignant brain tumors, traditional treatment options are gradually yielding to targeted therapies and patient longevity statistics are beginning to edge upward.

Because one of the greatest challenges in the treatment of malignant brain tumors is their ability to escape an immune response, our goal is to harness the immune system to target these tumors. Our dendritic cell immunotherapy trials have demonstrated a favorable survival outcome for patients as compared to those undergoing traditional therapy, and there have been minimal adverse effects as would be associated with more harsh chemotherapies and radiation therapies (IRB protocol 3368).

In the area of basic science research, we and other investigators recently described the isolation and characterization of a cancer stem cell, which appears to be both the initiator and the supporter of malignant brain tumors. We have demonstrated that these cancerous stem cells can escape traditional therapies, including radiation therapy and chemotherapy (IRB protocol 8922).

Medicine is moving into the next frontier in which technology and ongoing research allow us to design specific protocols for each patient by incorporating genomic and proteinomic clues from tumor tissue with transport systems that deliver medication in high concentration to specific targets and tumors without damaging normal cells.

With advances like these occurring, we remind patients that cancer statistics and prognoses can be misleading. It is true that patients diagnosed with glioblastoma multiforme (GBM) have an average survival of 14.6 months. But it is also true, according to statistics and previous studies, that seven percent of patients survive more than five years, and that some live much longer.

We recommend encouraging patients, especially those who are younger, to seek out innovative therapies by participating in clinical trials to fight the disease. With the advances now taking place in science, patients should not give up.

Dr. Black is Chairman of the Department of Neurosurgery and Director of the Maxine Dunitz Neurosurgical Institute. He also holds the Ruth and Lawrence Harvey Chair in Neurosciences. Dr. Yu is Director of Surgical Neuro-Oncology at Cedars-Sinai. Dr. Phuphanich is Director of the Medical Neuro-Oncology Program.

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