NEUROLOGICAL SURGERY: BRAIN ANEURYSMS AND BRAIN ARTERIOVENOUS MALFORMATIONS

INTRODUCTION

Strokes, ruptured aneurysms and other neurological conditions, such as ruptured arteriovenous malformations, require immediate response from an experienced cerebrovascular team. Harborview based UW Medicine physicians specialize in treating these complex conditions and in performing the latest procedures when every second counts.

- Our clinical care for acute stroke saves lives and reduces the risk of long term disability by following the latest Acute Stroke Algorithms.
- Expertise in both microsurgical and endovascular techniques allows us to offer patients the most appropriate treatment for cerebral aneurysms.
- New endovascular techniques allow our neurosurgeons to treat AVMs more safely than previously thought possible.

Along with providing the best possible emergent patient care, Harborview Medical Center serves the region as your stroke referral center. You can access our neurosurgery and stroke specialists around-the-clock by calling the UW MedCon consultation and referral line at (800) 326-5300 or the Harborview Transfer Center at (888) 731-4791.

Medical graphics and illustrations were provided by the respective manufacturers.
NEUROLOGICAL SURGERY DEPARTMENT FACTS

- Harborview cares for more than 2,000 patients with brain and spine disorders each year.
- Referrals received from 30 states and 11 countries in 2008.
- Multiple funded interdisciplinary studies.
- More than 20 novel adult or pediatric research protocols annually.
- Clinical site for NIH-funded study monitoring pediatric head injury.
- Clinical site for a DOD-funded study of traumatic brain injury.
- First medical center in Washington to offer Gamma Knife C radiosurgery — brain surgery with no incision.

TREATING ANEURYSMS

Three to 5 million people in the United States suffer from aneurysms every year. Ruptures causing subarachnoid hemorrhage (SAH) occur in only about eight to 10 cases per 100,000. However, the prognosis for these patients is very poor if the patient is not treated in a high volume center, such as Harborview, by highly experienced and skilled multi-disciplinary team.

Aneurysms may be treated by endovascular or microsurgical techniques. Endovascular options include coiling, balloon-assisted coiling and stent-assisted coiling. Microsurgical treatment includes clipping of the aneurysm, or dome of the vessel harboring the aneurysm, with simultaneous performance of a bypass procedure to provide new routes of blood flow. It is important to choose the right procedure for each patient.

The team of surgeons and endovascular specialists at Harborview has been at the forefront of advances in endovascular and surgical treatments.
MANAGING ANEURYSMS

Harborview is one of the largest treatment centers for brain aneurysms in the United States. Aneurysm treatment is an area of excellence within the neurosciences center at Harborview. The management of aneurysm patients requires an experienced team with overlapping expertise in cerebrovascular surgery, endovascular therapy, neuro-intensive care, neuroanesthesiology, critical care nursing and rehabilitation. The role each member of the team plays is detailed below.

- Cerebrovascular surgery: Operating on blood vessels in the brain.
- Endovascular therapy: Accessing blood vessels of the brain through blood vessels, usually in the groin, without opening the skull. It is used to treat various problems.
- Neuro-intensive care: Maintaining brain function after physical insult while supporting other systems during recovery.
- Neuroanesthesiology: Providing anesthesia and maintaining the normal functioning of the brain during procedures to treat these conditions.
- Critical care nursing: Monitoring and caring for patients with neurosurgical problems in the intensive care units.
- Rehabilitation: Supporting patients’ recovery and reintegration into society and work while assisting with activities of daily living.

ANEURYSM FACTS

Harborview provides state-of-the-art evaluation and treatment of intracranial aneurysms patients. It is one of the few centers in the world offering advanced endovascular treatments and advanced microsurgery, including brain arterial bypasses.

Harborview treats about 200 patients with aneurysms each year using innovative treatments and the coordinated efforts of the multidisciplinary team noted.

In addition, the department has established an aneurysm registry with Institutional Review Board Approval. By compiling information on aneurysm cases, the registry provides a better understanding of the disease and ways in which to positively impact outcomes for aneurysm patients.

ANEURYSM RESEARCH

A retrospective study of 298 of patients with aneurysms treated at Harborview between January 2005 and June 2006 showed that patients demonstrated the following outcomes at three-month check-ups:

- 90 percent of patients with unruptured aneurysms had good functional outcomes, defined as no disability or mild disability and were able to look after their own affairs without assistance.
- 79 percent of patients with unruptured aneurysms were fully recovered and an additional 11 percent displayed no restrictions in activities of daily living.
- 66 percent of patients with ruptured aneurysms had good functional outcomes, despite many being in poor condition upon admission to HMC.
- Among patients with ruptured aneurysms, 54 percent were fully recovered and an additional 12 percent displayed no restrictions in activities of daily living.

Previously reported studies have demonstrated a lower percentage of good functional outcomes among patients with ruptured aneurysms. Harborview has the highest level of favorable patient outcomes reported to date.

THREE-MONTH OUTCOME AFTER TREATING INTRA-CRANIAL ANEURYSMS

Percentages do not equal 100 because of rounding.
**TREATING ARTERIOVENOUS MALFORMATIONS**

Brain arteriovenous malformations can present with rupture, headaches, seizures or with any neurological deficits. The risk of an AVM rupture is approximately 3 percent per year. A younger patient with an unruptured AVM needs treatment more than an older patient.

Once the AVM ruptures, the risk of serious complications, such as death, paralysis or stroke is 50 percent. If an AVM ruptures, the risk of another rupture the next year is 25 percent, the second year is 6 percent. The risk returns to 3 percent the following year.

The main modality of treating brain AVMs is microsurgery. Gamma knife radiosurgery is used for AVMs that are less than 3cm in size and located in surgically inaccessible areas of the brain or for patients who are poor candidates for surgery.

Gamma knife radiosurgery is slow in its action and it takes up to three years to obliterate the AVM, during which time the patient is still at risk of rupture. Endovascular treatment of brain AVMs is used before surgery to decrease the vascularity of the AVM and make surgery safer, and is also used before gamma knife to decrease the risk of rupture in the interim period and make some difficult AVMs amenable to this surgery.

Before 2005, a cyanoacrylate glue (n-BCA) was used for AVM endovascular embolization. A new embolic agent, Onyx®, introduced in 2005, makes endovascular embolization of AVMs more controlled and safer.

Since 2005, Onyx® embolization followed by microsurgery or radiosurgery has been used in about 100 patients with very good results. Further research at Harborview is also being conducted in this area, specifically looking at the pathology of AVMs.

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**TREATING STROKES**

Neuro-emergency treatment for patients with stroke symptoms is guided by a set of protocols known as the Acute Stroke Algorithm. Within 90 minutes, the patient is evaluated and prepared for a CT scan to determine the cause of the stroke. Appropriate therapy must be delivered as soon as possible: intravenous (IV) tPA within three hours or intra-arterial thrombolytic therapy within six hours.

One of the latest endovascular therapies, the Penumbra® device, for ischemic stroke is a minimally invasive clot retrieval catheter that restores blood flow by removing blood clots up to eight hours after the stroke.

*Reported by Penumbra Inc., Alameda, Calif.*

If the stroke has been caused by a subarachnoid hemorrhage (SAH) due to a ruptured aneurysm, the patient will undergo emergency neurosurgical evaluation. The stroke may also be the result of a hypertension-induced intraparenchymal hemorrhage (IPH).

Patients often require neurological and psychological rehabilitation to become independent and return to their former activities. The use of minimally invasive techniques and new embolization therapies can result in faster recovery for patients. Faculty and staff in the Department of Neurological Surgery can help determine the right course of treatment for each patient.
UW MEDICINE NEUROSURGICAL AND NEUROINTERVENTIONAL FACULTY BASED AT HARBORVIEW MEDICAL CENTER

Richard G. Ellenbogen, M.D., F.A.C.S.
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Laligam N. Sekhar, M.D., F.A.C.S.
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Michael Souter, M.D.
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Specialty: Neurosurgical critical care, cerebrovascular anesthesiology

The Transfer Center is a service provided by Harborview Medical Center that allows physicians in Washington, Alaska, Montana and Idaho (WAMI) to receive prompt telephone consultations for patients who need either emergency or elective care.

- For neurosurgery patients requiring emergent care, contact the Harborview Transfer Center at (888) 731-4791. A transfer center nurse will help coordinate a conversation with a Harborview physician and coordinate patient transport.

- For routine referrals to Harborview neurological surgeons, call (206) 744-9300.

- For general questions, call Harborview's neurological surgery service manager at (206) 744-9314.

The Department of Neurological Surgery takes a multidisciplinary approach to patient care, finding the right expertise and the best care for your referral patients.

GET TO KNOW THE DEPARTMENT OF NEUROLOGICAL SURGERY: UWTV PRODUCTIONS

Get to know the faculty and see some of the latest treatments from the Department of Neurological Surgery on UWTV at www.uwtv.org. Current features include a documentary program about endovascular treatments and brain artery bypass surgery at the UW Medicine Brain Aneurysm Center at Harborview.

www.haborview.org

Harborview Medical Center has the highest reported level of favorable patient outcomes of any center treating brain aneurysms.

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