The Vascular Neurosurgery Program at UCSF
The UCSF Vascular Neurosurgery Program is the busiest in California and the 6th busiest in the nation*.
High surgical volume equates to better patient outcomes; more than 450 aneurysms were treated last year (2009) at UCSF, including 260 aneurysms treated microsurgically.
The UCSF Center for Stroke and Cerebrovascular Disease is accredited by the Joint Commission as a primary stroke center.
The UCSF Center for Cerebrovascular Research has 11 dedicated investigators, a Program Project Grant from the National Institutes of Health, an active AVM Study Project, and is a Center of Excellence in Patient Research.
The UCSF Vascular Neurosurgery Program helped form the Aneurysm and AVM Foundation (www.aneurysmfoundation.org).

* University Hospital Consortium database
The Vascular Neurosurgery Program at UCSF takes a multidisciplinary approach to treating aneurysms, with a team of neurosurgeons, interventional neuroradiologists, and neurologists that collaborates to choose the best treatment for each patient. We offer both surgical and endovascular approaches, such as coiling, to treat aneurysms. Some small aneurysms (<7 mm in diameter) can be observed without treatment.

Microsurgical clipping requires refined technique and skill. Aneurysms referred for surgery are often complex, with broad necks or unusual anatomy that makes them unfavorable for coiling, or have recurred after previous coiling. In these cases, an advanced surgical technique such as bypass may be needed. Care after aneurysm treatment, particularly for patients with ruptured aneurysms, requires intensive care, monitoring for vasospasm with transcranial Doppler velocity measurements, and endovascular therapies like intra-arterial vasodilators and angioplasty. At UCSF the complete team and range of services is available 24 hours to ensure the highest quality of care.

Studies demonstrate a direct relationship between clinical volume and patient outcome; there are significantly fewer adverse outcomes and deaths in high-volume hospitals. For this reason, it is risky to treat aneurysm patients outside of regional centers of excellence. There is also a significant cost justification to transfer patients from low-volume hospitals that treat less than 45 aneurysm patients per year. At UCSF, steadily climbing aneurysm volume and excellent patient outcomes reflect these results and our regional strength. We maintain a Subarachnoid Hemorrhage Bed, ready to receive patients with ruptured aneurysms immediately.
An arteriovenous malformation (AVM) is an abnormal tangle of arteries connected directly to veins, without intervening capillaries, resulting in a high-flow, low-resistance pathway for blood. This abnormal circulation makes AVMs susceptible to rupture, causing bleeding in the brain. AVM hemorrhage is fatal in 10% of patients and causes neurological deficits in 25%.

Brain AVMs are curable. Many AVMs can be embolized by injecting agents that clog feeding arteries and reduce blood flow through the tangle. Other AVMs can be removed surgically by disconnecting the abnormal vessels and separating the tangle from the brain. Smaller AVMs can be treated with stereotactic radiation, using the Gamma Knife® to precisely target the tangle and induce occlusive scarring over a 2-year period.

The optimal combination of treatment modalities and their sequence depends on the anatomy of the AVM and the patient’s clinical presentation. Sometimes optimal therapy is observation. Therefore, treatment planning requires an experienced and selective team.

At UCSF, AVMs are one of our specialties and our surgical experience includes nearly 500 AVMs over the last decade. Our surgical results are measured and analyzed as part of the UCSF AVM Study Project, which has been used to develop new methods, such as the Lawton-Young Grading Scale, to select patients for surgical therapy. Our surgical specimens are studied in the laboratories of the Center for Cerebrovascular Research to discover mechanisms for AVM development and hemorrhage. Our studies are identifying genetic predictors of hemorrhage risk that may lead to individualized risk assessment and improve treatment decisions.

This AVM was located adjacent to language cortex, and speech mapping during an awake craniotomy identified Wernicke's area (#40).

This AVM had clean margins, was dissected away from eloquent areas, and was removed completely.
Accessible cavernous malformations, especially those that come to a brain surface, can be removed safely with surgery. These lesions can be separated from the brain and removed without violating normal brain tissue. Even cavernous malformations that surface on the brainstem can be removed safely, and one third of the cavernous malformations in our surgical experience have been located in the brainstem.

Surgical results depend on selecting the best approach. Over 25 different approaches are used to optimize exposure and minimize brain disruption. New approaches to access difficult lesions, like the supracarotid-infrafrontal approach to the anterior-inferior basal ganglia and the supracerebellar-supratrochlear approach to the posterior-inferior thalamus were developed by the UCSF Vascular Neurosurgery team. We have also developed schemes to standardize selection of surgical approach.

Our surgical experience with cavernous malformations includes over 350 patients. Intraoperative navigation, neurophysiological mapping, and sophisticated microsurgical techniques are used to provide superior outcomes. After surgery, 73% of our patients were completely seizure-free and 16% of patients had improvement in seizures.
A stroke occurs every minute, and death from stroke occurs every three minutes. Most strokes are caused by blood clots that block the flow of blood to the brain, resulting in the death of brain cells.

Carotid artery atherosclerosis is one of the most common causes of stroke. Carotid bruits and transient ischemic attacks often lead to the diagnosis of carotid stenosis and impending stroke. Symptomatic carotid stenosis greater than 50% is an indication for carotid endarterectomy.

During carotid endarterectomy, the exposed artery is temporarily clamped and atherosclerotic plaque is removed. The carotid artery is sutured closed using microsurgical technique, which makes patch grafts unnecessary. The brain is protected using the same techniques as with brain aneurysms, with general anesthesia and neurophysiological monitoring for ischemia during cross-clamping.

Bypass surgery is another treatment for ischemia offered by the UCSF Vascular Neurosurgery Program. Extracranial-to-intracranial (EC-IC) bypasses augment blood flow to the brain by connecting scalp arteries or high-flow grafts to the brain's arteries. Bypasses are indicated for patients with intracranial atherosclerosis and moyamoya disease. Bypasses are also indicated for patients with cervical carotid artery occlusion and inadequate blood flow from other arteries, namely the opposite carotid artery and the vertebrobasilar circulation. We are currently enrolling patients in the Carotid Occlusion Surgery Study (COSS), which is comparing results with bypass surgery versus those with medical management.
Laboratory Research

Basic science research at UCSF focuses on:

- Determining the role of inflammatory oxidative stress in cerebral aneurysms.
- Comparing anatomical and clinical exposure in cerebrovascular surgical approaches to optimize surgical outcomes.
- Examining the effects of radiation on transgenic arteriovenous fistula.
- Developing gene and cell-based therapy for the treatment of ischemic stroke.
- Developing clinically relevant animal models of cerebrovascular disorders:
  - Animal models combining manipulation of genetic background and growth factor stimulation to induce brain arteriovenous malformations.
  - Animal models of intracranial aneurysm used to study the influence of hemodynamics and inflammatory pathways on lesion progression.

Clinical Research

- In the UCSF Brain Arteriovenous Malformation Study, researchers are building a prospective registry of AVMs and other vascular malformations of the brain, and are tracking treatment results and patient outcomes.
- UCSF is currently participating in an NIH-funded, randomized clinical trial to determine if extracranial-intracranial (EC/IC) bypass surgery combined with best medical therapy can reduce subsequent ipsilateral ischemic stroke (the Carotid Occlusion Surgery Study).
- Epidemiology and clinical course studies of brain arteriovenous malformations are underway to identify risk factors for disease susceptibility or spontaneous intracranial hemorrhage.
- Genomic studies, including genome-wide SNP and expression, are being conducted to help identify genes involved in brain arteriovenous malformation or hemorrhage.
- Risk-stratification algorithms are being developed to predict surgical outcomes.

- UCSF is a member of the multi-center Brain Vascular Malformation Consortium, which studies the clinical behavior and genetics of three cerebrovascular disorders: cavernous malformations, Sturge-Weber Syndrome, and Hereditary Hemorrhagic Telangiectasia. The consortium is part of the Rare Disease Clinical Research Network program administered by the NIH Office of Rare Disease Research and the National Institute of Neurological Disorders and Stroke.
Vascular Neurosurgery at UCSF

Contact Us

Aneurysm/Brain Attack Hot Line
877-BRAIN-1-1

Neurosurgical Clinic Referrals
415-353-7500

Neurosurgery On Call
415-443-HEAD

Vascular Neurosurgery On Call
415-443-STROKE

Dr. Lawton's Office
415-353-2529

Vascular Neurosurgery is at your service. Our physician-to-physician Brain Attack Hotline is available 24 hours a day, seven days a week for emergency consultations and referrals to UCSF Medical Center. We maintain a Subarachnoid Hemorrhage Bed that is ready to receive patients with ruptured aneurysms immediately.

Physicians are invited to send cases for film review. Films or CDs should be mailed with a brief clinical summary to:

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