

Welcome to **Neuroscience Pearls**, a new publication from the UW Medicine Neuroscience Institute. In the coming months and years we will bring you highly focused, up-to-date reports on important subjects in clinical neuroscience. Our goal is to provide useful information in a readable format that is easy to digest and pertinent to your practice. We hope these will be both interesting and of practical utility. In this issue we bring you the key points on recognition and evidence based shifts in the treatment of cerebral aneurysms.

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In this issue we bring you the key points on recognition and evidence-based shifts in the treatment of cerebral aneurysms. We thank Associate Professor Louis Kim for contributing to this report.

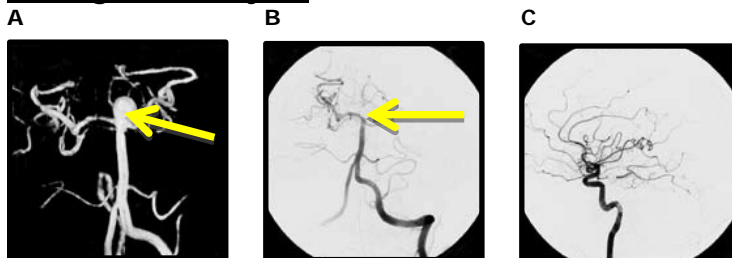
WHAT IS A CEREBRAL ANEURYSM: A cerebral aneurysm is a weakness, dilatation or ballooning of a cerebral artery wall. Aneurysms can lead to intracranial hemorrhages in the subarachnoid space (SAH). The estimated annual bleed rate of aneurysms in the USA is about 6-8/100,000 population. The overall mortality of an untreated aneurysm is about 45%. About 15% of patients will die before they seek medical attention. About 30% of those who receive adequate treatment and survive suffer a neurological disability.

DIAGNOSIS: Over 95% of symptomatic patients present with a severe headache. The classic description is that it is "the worst headache in my life." The signs include nuchal rigidity, neurological deficits, vomiting, or coma. Over 60% of patients present with a warning headache that may get better over 24 hours but is a result of a small "sentinel" hemorrhage.

WORK-UP: The best yield for diagnosis is a non-contrast CT scan. However, in patients where the suspicion is high and the CT scan is negative for blood in the head, performing a lumbar puncture is warranted. A cerebral angiogram, CTA or MRA remains the gold standard to confirm the diagnosis.

TREATMENT: The treatment of choice for aneurysms has shifted dramatically in the past decade due to technical advances in minimally invasive techniques. In the past, a microsurgical clipping of the aneurysm neck was required for successful treatment. However, now more minimally invasive endovascular techniques with platinum coils and stents are utilized with equivalent success and less morbidity to the patients. The main goal is preventing initial rupture or rebleeding in ruptured aneurysms. Patients most suitable for endovascular procedures with these specially fabricated platinum coils are those with aneurysms with a) small neck size, b) luminal diameter <25mm, and c) those that are distinct from the parent vessel. However, technological advances such as stents have made coiling of many other aneurysms possible as well. High volume aneurysm surgery centers with open and endovascular treatment capabilities demonstrate significantly higher favorable outcomes and lower mortality and morbidity rates compared to those that perform these operations less frequently. Both ruptured and un-ruptured cerebral aneurysms range widely in their mode of presentation, anatomical complexity, and optimal treatment path. Here are some examples demonstrating the wide range of presentation:

Coiling of Aneurysm



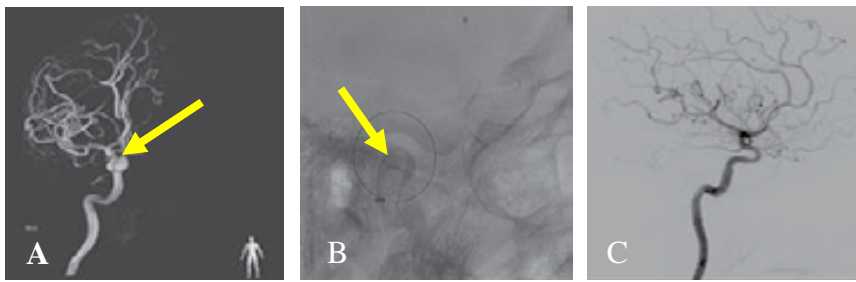
(A) 3-D angiography identifies the large, broad based ruptured basilar apex aneurysm. This was successfully treated with balloon-assisted coil embolization. **(B)** Left vertebral artery injection shows complete obliteration of the aneurysm after coiling with preserved flow through the left posterior cerebral artery on **(C)**: lateral left internal carotid artery angiography.

Clipping of Aneurysm



(A) Left internal carotid angiogram shows a giant complex aneurysm adjacent to anterior choroidal artery off the distal ICA. **(B)** Post clipping 3-D angiography and **(C)** oblique ICA angiogram shows complete obliteration of the aneurysm with preservation of blood flow through the carotid and anterior choroidal arteries.

Clinical Example - Flow diverting stent treatment



(A) Right internal carotid angiogram shows a large proximal supraclinoid ICA aneurysm. (B) Placement of a flow diverting stent known as the Pipeline Embolization Device was used as a “stand alone” treatment that causes progressive obliteration/shrinkage (C) of the aneurysm. Flow diverting stents are the state of the art tool for aneurysm treatment today and are offered at select centers in the USA.

Clinical Pearls

1. In the U.S., an estimated 6 million people harbor a brain aneurysm.

2. Given the tremendous shift in evolving technology available, many aneurysms today can be treated by endovascular technique. In certain cases, open surgery remains part of the cutting edge treatment algorithm. A center which includes dually trained endovascular neurological surgeons expert in open microvascular and endovascular techniques can provide a more balanced approach to treatment.

3. Some studies have questioned the efficacy of endovascular coiling over more traditional open surgical clipping. The large International Subarachnoid Aneurysm Trial tested the efficacy of coiling vs clipping. Initial favorable results for coiling were criticized on methodological grounds. Since its 2002/2005 release, new studies have found higher recurrence rates with coiling, while others conclude there is no clear consensus on which procedure is preferred. The shift towards a balanced approach with coiling and microvascular clipping has occurred at select worldwide centers of excellence, including ours.

4. Patients with ruptured cerebrovascular aneurysms have a life threatening condition. The patient can experience multiple issues to include re-bleeding and vasospasm which is constriction of the cerebral vessels and stroke like symptoms. The goal of early surgery is to reduce the risk of re-bleeding which is highest in the first 2 weeks and can be as high as 20%. Ruptured aneurysms (Figure 1) are most successfully treated by a multidisciplinary team consisting of neuro-critical care, neuro-specialty nursing, neuro-interventional radiologists and neurological surgeons.

5. Morbidity and mortality rates following subarachnoid hemorrhage are directly correlated with yearly hospital volumes of patients treated with the condition. There has been a seismic shift in treatment options from purely open craniotomy techniques, in the past, to endovascular minimally invasive techniques currently.

ESSENTIAL CITATIONS:

- 1) Wiebers DO, et al; International Study of Unruptured Intracranial Aneurysms Investigators. Unruptured intracranial aneurysms: natural history, clinical outcome, and risks of surgical and endovascular treatment. [Lancet. 2003 Jul 12; 362\(9378\):103-10.](#)
- 2) Molyneux AJ, et al; International Subarachnoid Aneurysm Trial (ISAT) Collaborative Group. International subarachnoid aneurysm trial (ISAT) of neurosurgical clipping versus endovascular coiling in 2143 patients with ruptured intracranial aneurysms: a randomised comparison of effects on survival, dependency, seizures, rebleeding, subgroups, and aneurysm occlusion. [Lancet. 2005 Sep 3-9; 366\(9488\):809-17.](#)
- 3) Molyneux AJ, et al. Risk of recurrent subarachnoid hemorrhage, death, or dependence and standardized mortality ratios after clipping or coiling of an intracranial aneurysm in the international subarachnoid aneurysm trial (ISAT): long-term follow-up. [Lancet Neurol. 2009 May; 8\(5\): 427-433.](#)

**Ruptured aneurysms
UW Medicine/Harborview, N = 756
(Total aneurysms treated at UW Medicine
during this period: N = 1,125)**

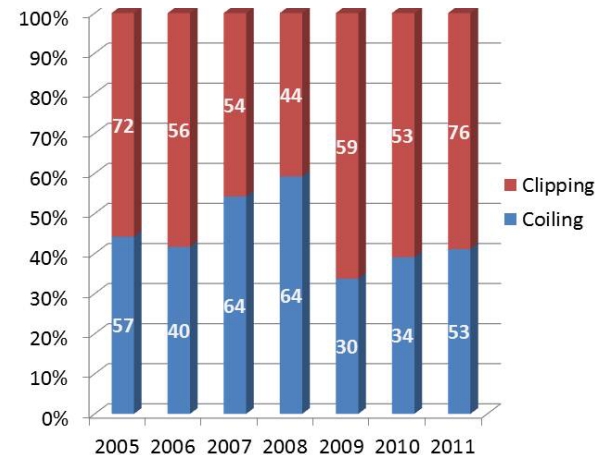
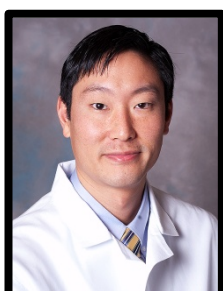


FIGURE 1 SHOWS THE PROPORTION OF ANEURYSM CLIPPING (414) VS COILING (342) (N=756) IN A 7-YEAR SERIES AT HARBOVIEW MEDICAL CENTER/UWMC.



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Both are among a select group of neurosurgeons, fellowship trained to treat complex cerebrovascular and spinal vascular diseases, by both open vascular/skull base microsurgery and endovascular techniques. They are nationally renowned experts with the largest combined experience in the Northwest.

UW Cerebrovascular Team

Immediate Evaluation by our team can be arranged 24/7/365

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