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Brain Aneurysms

What Is a Brain Aneurysm?

A brain aneurysm, also called a cerebral or intracranial aneurysm, is an abnormal bulging outward of one of the arteries in the brain. It is estimated that as many as one in 17 people in the United States will develop a brain aneurysm during their lifetime(1). Aneurysms can occur in people of all ages, but are most commonly detected in those ages 35 to 60(2).

Brain aneurysms are often discovered when they rupture, causing bleeding into the brain or the space closely surrounding the brain, called the "subarachnoid space". A subarachnoid haemorrhage from a ruptured brain aneurysm can lead to brain damage or death. Ten to 15% of these patients will die before reaching the hospital, and more than 50% will die within the first 30 days after rupture(3). Of those who survive, approximately half suffer some level of permanent brain damage(4).

Unruptured aneurysms are sometimes treated to prevent rupture. The main goals of treatment once an aneurysm has ruptured are to stop the bleeding and potential permanent damage to the brain and to reduce the risk of recurrence.

How Are Aneurysms Treated?

Brain aneurysms have traditionally been treated by surgical clipping. However, increasingly, more patients are receiving less invasive "endovascular" treatment. Studies have shown that endovascular treatment, also called "coiling", produces better outcomes than neurosurgical clipping in select patients suffering from aneurysms(5). It is important to note, however, that not all aneurysms are treated at the time of diagnosis or are amenable to both forms of treatment. Patients need to consult a neurovascular specialist to determine if they are a candidate for either treatment.

What is Surgical Clipping?

In surgical clipping, to get to the aneurysm, the surgeon must first remove a section of the skull, a procedure called a craniotomy. The aneurysm is carefully separated from the surrounding brain tissue, and a small metal clip is placed across the neck (base) of the aneurysm. After clipping the aneurysm, bone is secured in its original place and the wound is closed.

What Is Endovascular Therapy?

Endovascular therapy is a minimally invasive procedure that accesses the treatment area from within the blood vessel. In the case of aneurysms, this treatment is called coil embolization or "coiling". In contrast to surgery, coiling does not require open surgery. Instead, physicians use real time xray technology, called fluoroscopic imaging, to visualize the patient's vascular system and treat the disease from inside the blood vessel. Endovascular treatment involves inserting a catheter (small plastic tube) into the femoral artery in the patient's leg and navigating it through the vascular system into the head and into the aneurysm.

Tiny platinum coils are threaded through the catheter and deployed into the aneurysm, blocking blood flow into the aneurysm and reducing the chance of rupture or re-rupture. This filling of the aneurysm is called "embolization" and is performed under general anaesthesia or light sedation. Hundreds of thousands of patients world wide have been treated with detachable platinum coils.

Coiling vs. Clipping

Treatment of Ruptured Aneurysms

Until recently, most studies on surgical and endovascular treatment of aneurysms were either small scale studies or retrospectives that relied on analysing historical case records. The only multi centre prospective randomised clinical trial – considered the gold standard in study design – comparing clipping and endovascular treatment of ruptured aneurysms is the International Subarachnoid Aneurysm Trial (ISAT) (5).

This study found that, in patients equally suited for both treatment options, endovascular coiling is significantly more likely to leave patients alive and free of disability than surgical clipping at one year. The relative risk of death or significant disability at one year for patients treated with coils was 22.6% lower than in surgically treated patients.

The results were so compelling that the trial was halted early after enrolling 2,143 of the planned 2,500 patients because the trial steering committee determined it was no longer ethical to randomise patients to neurosurgical clipping.

It is important to note that patients enrolled in the ISAT were evaluated by both a neurosurgeon and an endovascular specialist, and both physicians had to agree the aneurysm was treatable by either technique. This study provides compelling evidence that, if medically possible, all patients with ruptured brain aneurysms should receive and endovascular consultation as part of the treatment protocol to determine if endovascular treatment is appropriate.

Treatment of Unruptured Aneurysms

Although no multi centre, randomised clinical trial comparing endovascular and surgical treatment of unruptured aneurysms has yet been conducted, retrospective analyses have found that endovascular treatment is associated with less risk of bad outcomes, with shorter hospital stays and shorter recovery times compared with surgery.

Studies have shown that:

- Average hospital stays are more than twice as long with surgery as compared to endovascular treatment(6)
- Patients treated surgically have three times the risk of adverse outcomes compared to those treated with coiling(7)
- There can be a dramatic difference in recovery times. One study showed that surgically treated patients had an average recovery time of one year compared to coiled patients who recovered in 27 days(7)

Not all aneurysms are treated at the time of diagnosis. In deciding whether or not to treat an unruptured aneurysm, neurovascular specialists consider the risk of the aneurysm rupturing; the size and location of the aneurysm; the patient's age, health and family history; and the risks associated with treatment.

Who Does Endovascular Treatment?

Most doctors who perform endovascular treatments are "interventional neuroradiologists" or endovascular neurosurgeons" who have completed additional specialized training, ranging from one to three years, in endovascular techniques. There are about 300 major centres in the United States that provide endovascular coiling. To find a doctor near you, visit www.brainaneurysm.com

For further information please consult Prof. D'Urso's website: www.pauldurso.com. If you were to have any further questions please contact Prof. D'Urso's rooms directly.

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Glossary of Terms

Aneurysm: An abnormal bulging outward of an artery wall.

Brain Aneurysm: A weak bulging spot on the wall of one of the arteries in the brain – also called an intracranial or cerebral aneurysm.

Catheter: A hollow flexible tube for insertion into a body cavity, duct, or vessel to allow the passage of fluids or distend a passageway. Used in the endovascular treatment of cerebral aneurysms.

Cerebral Aneurysm: A weak bulging spot on the wall of the brain artery – also called a brain or intracranial aneurysm.

Craniotomy: Surgical procedure where ea section of the skull cap is removed. Necessary in the surgical treatment of cerebral aneurysms.

Detachable Platinum coils: Small platinum coils used to occlude (fill) cerebral aneurysms. The coils are attached to a delivery wire and are fed through a microcatheter into the aneurysm. Once properly positioned within the aneurysm, the coil is detached from the delivery wire via electrolytic detachment.

Endovascular: Within the vascular system.

Endovascular Embolization: A technique, also referred to as coiling, that seals off the cerebral aneurysm and stops further blood from entering. This method uses the natural access to the brain through the bloodstream via arteries to diagnosis and treat cerebral aneurysms.

Guide Catheters: In the endovascular treatment of cerebral aneurysms, these flexible tubes are introduced into the patient's carotid artery (the principal artery in the neck). Once positioned in the artery, the guide catheter functions as a working channel through which smaller devices, like microcatheters, may be introduced into the brain.

Guidewire: A thin, usually flexible wire that can be inserted into a confined or tortuous space to act as a guide to facilitated passage of instrumentation, such as a catheter. Used in the endovascular treatment of cerebral aneurysms.

Haemorrhagic Stroke: A stroke caused by a ruptured blood vessel and characterized by bleeding within or surrounding the brain. A subarachnoid haemorrhage from a ruptured cerebral aneurysm can lead to a haemorrhagic stroke.

Minimally-Invasive Medical Technologies: Alternatives to traditional surgery and other medical procedures that reduce risk, trauma, cost, procedure time and the need for aftercare. Can be used to treat cerebral aneurysms.

Microcatheter: A very small catheter used to deliver diagnostic and therapeutic agents such as embolic devices used in the endovascular treatment of cerebral aneurysms. Over the wire microcatheters are fed along a guidewire to the area of the body for treatment. Flow directed microcatheters utilize the blood flow within the vessel to direct the microcatheter through the vascular system.

Subarachnoid Haemorrhage (SAH): When a cerebral aneurysm ruptures, it causes bleeding into the compartment surrounding the brain, causing a subarachnoid haemorrhage. A subarachnoid haemorrhage from a ruptured cerebral aneurysm can lead to a haemorrhagic stroke, brain damage and death.

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