Professor Paul S. D'Urso
MBBS(Hons), PhD, FRACS
Neurosurgeon
Provider Nº: 081161DY

The Epworth Centre
Suite 7 Level 8
32 Erin Street Richmond 3121
Tel: 03 9421 5844
Fax: 03 9421 4186
AH: 03 9256 6037
eMail: paul@pauldurso.com
Web: www.pauldurso.com

What you should know about AVMs

What are "strokes" and "TIA's"?

Like all parts of the body, the brain is composed of living cells that require a blood supply to provide oxygen and nutrients. The term ***stroke*** includes any disease process that kills cells in any region of the brain. A stroke can cause different symptoms, depending on which part of the brain is hurt. Some regions of the brain can die and yet the patient will have no symptoms at all. Other areas of the brain are more important, and even a tiny stroke in these locations can cause severe disabilities, including difficulty with speech, blindness, paralysis of an arm or leg or even death.

Blockage or rupture of blood vessels supplying parts of the brain cause most strokes. When a blood vessel becomes blocked, the part of the brain served by that vessel doesn't receive enough oxygen containing blood. Doctors call this an ***ischaemic infarct.*** If the blockage lasts long enough, brain cells die and a stroke results. However, if the blockage is temporary the blood supply may not be interrupted long enough to damage cells. This temporary blockage causes short-term symptoms, usually lasting only minutes or hours. Called mini strokes or TIA's (short for ***transient ischaemic attacks),*** these attacks are a sign of a serious problem that can lead to a permanent stroke if the problem isn't treated.

Even if some cells are permanently damaged in a stroke, other cells in the surrounding area sometimes take on the function of the dead cells. This is why some stroke patients eventually recovery some or all of their abilities.

Haemorrhage is the other common cause of a stroke. Haemorrhage refers to bleeding into the brain, usually because of a problem with a blood vessel. The problem is sometimes an AVM.

What is an AVM (and AVF)?

An ***arteriovenous malformation (AVM)*** is a tangle of abnormally connecting arteries and veins. An ***arteriovenous fistula (AVF)*** is also a combination of vessels with abnormal connections. Although the "plumbing" is slightly different in these two abnormalities, we will consider them together in this discussion.

As normal vessels course toward the region of brain that they supply, they divide into smaller and smaller branches. By the time they reach their destination, they have branched into many tiny vessels called capillaries. Capillaries have the diameter of a single blood cell, about one-fifth the diameter of a human hair. Because there are normally so many capillaries, blood flow within them is slow and under low pressure.

AVM's have abnormal connections between arteries and veins, with no capillaries between. The blood coursing through the abnormal vessels of an AVM is under high pressure and moves very quickly. In fact, it never slows down enough to supply the brain with the oxygen it's carrying.

AVM's can cause many different problems, but the two most common are:

1. rupture, resulting in a haemorrhagic stroke and
2. pressure against the adjacent brain, resulting in seizures. Your doctor may suggest an ***arteriogram*** if an AVM is suspected.

What is an arteriogram?

An ***arteriogram*** (also called ***angiogram***) is a diagnostic study, usually performed by a radiologist, to assist in determining the cause of a stroke and the treatment alternatives. A very thin, flexible tube called a ***catheter*** is introduced into an artery (usually at the groin) and then steered through the blood vessels of the body to the arteries supplying the AVM. This is performed in an angiography suite, using xrays to see the position of the catheter.

A liquid called ***contrast,*** which can be seen on xrays, is injected through the catheter and xray images are obtained. This gives detailed pictures of the locations, size and shape of the AVM as well as a map of the arterial tree from which it arises. With this information, a decision will be made by you and your doctors as to how that particular AVM should be treated.

How are AVM's treated?

AVM's can be treated from outside the blood vessels using surgery or radiosurgery, from inside the blood vessels using ***endovascular embolization*** or by any combination of these three techniques.

A surgical approach requires creating an opening in the skull through which the surgeon's instruments can enter. The AVM is removed and any vessels supplying it are disconnected.

Despite its name, ***radiosurgery*** does not require any surgical instruments to be placed within the head. Radiosurgery tightly focuses a beam of radiation on the abnormal vessels and after a period varying between six months and two years, the vessels gradually close off and are replaced with scar tissue. Radiosurgery works best with AVM's which are small and in which the abnormal connections between the vessels are also small.

Endovascular techniques can also be used to treat an AVM without opening the skull. The treatment is performed in the angiography suite with a catheter similar to that used during the arteriogram. Through the catheter, the AVM is blocked off (**embolized**) so that blood no longer flows through it. A variety of different materials may be used.

Endovascular embolization of an AVM is usually performed before surgery to minimize blood loss, making the operation safer and shorter.

It can also be performed before radiosurgery to make the AVM smaller and increase the chance that radiosurgery will be successful. In some cases, endovascular embolization alone can permanently cure an AVM.

Who performs endovascular embolization procedures?

The endovascular treatment of AVM's is a relatively new procedure and requires specialised training. Most endovascular therapists are neuro radiologists or neurosurgeons who have completed additional training – ranging from one to three years – in endovascular techniques.

What is the endovascular embolization procedure like?

The patient may either already be in the hospital or may arrive the night before or morning of the embolization. The patient will be asked not to eat anything after midnight the night before the procedure. AVM embolization procedures can be performed under general anaesthesia or under light sedation. The length of the procedure is often not predictable, and waiting family members should not be frightened simply because a case takes longer than expected.

After the procedure is completed the patient will need to remain still, lying flat on his/her back for up to eight hours. This rest period allows the needle hole in the groin artery to heal. The patient usually remains under observation in the hospital for one to several days before returning home.

Multiple embolization procedures may be necessary to completely block off the AVM, or to block off as much as possible before surgery or radiosurgery. Patients who undergo surgical removal of the AVM after the embolization usually stay in the hospital and are operated on within several days of the last embolization.

Will all symptoms go away after the AVM is embolized? Will any other visits to the docto0r be necessary?

It is important to understand that treating the AVM by embolization or surgery does not repair areas of the brain already permanently injured by a stroke. The AVM is treated to prevent rebleeding and injury to other areas in the future. A patient who has had a severe stroke may continue to need intensive medical care even after the AVM has been embolized or surgically removed.

Most patients treated by embolization and/or radiosurgery will also need to return for a follow up arteriogram, usually performed several months after the treatment. This will show how much, if any, of the AVM remains and if additional embolization or other procedures are needed.

How do you get an AVM? Are they hereditary? Should family members be tested?

AVM/AVF's can be congenital (present at birth) or they can be acquired. Some types of AVF can be caused by trauma, prior surgery, infection or other diseases. Most AVM/AVF's however, do not result from any identifiable cause. They are not hereditary and family members are not at increased risk.

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

Glossary

Arteriogram: *(also called an angiogram) a diagnostic study that gives detailed pictures of the body's blood vessels*

AVF-arteriovenous fistula: *a combination of vessels with abnormal connections*

AVM – arteriovenous malformation: *a tangle of abnormally connecting arteries and veins*

Catheter: *a thin, flexible tube that is injected with a contrast material so vessels can be visualized on an xray image*

Contrast: *water and iodine salts that can be injected into vessels and seen on xray*

Embolization: *blockage of a blood vessel so blood no longer flows through it*

Endovascular: *occurring within blood vessels*

Haemorrhage: *bleeding in the brain, which can cause a stroke*

Ischaemic infarct: *one type of stroke, caused by blockage of a vessel supplying oxygen-rich blood to a region of the brain*

Radiosurgery: *a non-surgical procedure, which involves tightly focusing a beam of radiation on abnormal vessels, which will gradually close off, being replaced by scar tissue*

Stroke: *any disease process, which results in the death of cells in any region of the brain*

TIA – transient ischaemic attack: *(also known as a mini-stroke) a temporary interruption of the blood supply, which does not cause death of brain cells*